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.

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.

R601.3 Vapor retarders. Reserved.

R601.3.1 Class III vapor retarders. Reserved.

Table 601.3.1 Class III vapor retarders. Reserved.

R601.3.2 Material vapor retarder class. Reserved.

R601.3.3 Minimum clear air spaces and vented openings for vented cladding. Reserved.

SECTION R602
WOOD WALL FRAMING

R602.1 General requirements.

R602.1.1 [IRC 602.1] 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.

R602.1.1.1 [IRC 602.1.1] End-jointed lumber. *Approved* end-jointed lumber identified by a grade mark conforming to Section R602.1.1 may be used interchangeably with solid-sawn members of the same species and grade.

R602.1.1.2 [IRC 602.1.2] Structural glued laminated timbers. Glued laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D 3737.

R602.1.1.3 [IRC 602.1.3] 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.

R602.1.2 [IRC 602.8] Fireblocking required. Fireblocking shall be provided in accordance with Section R302.11.

R602.1.3 [IRC 602.7.2] 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.

R602.1.3.1 [IRC 602.5] 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 R302.11.

R602.1.4 [IRC 602.6] 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 R602.1.1.4(1) and R602.1.1.4(2).

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

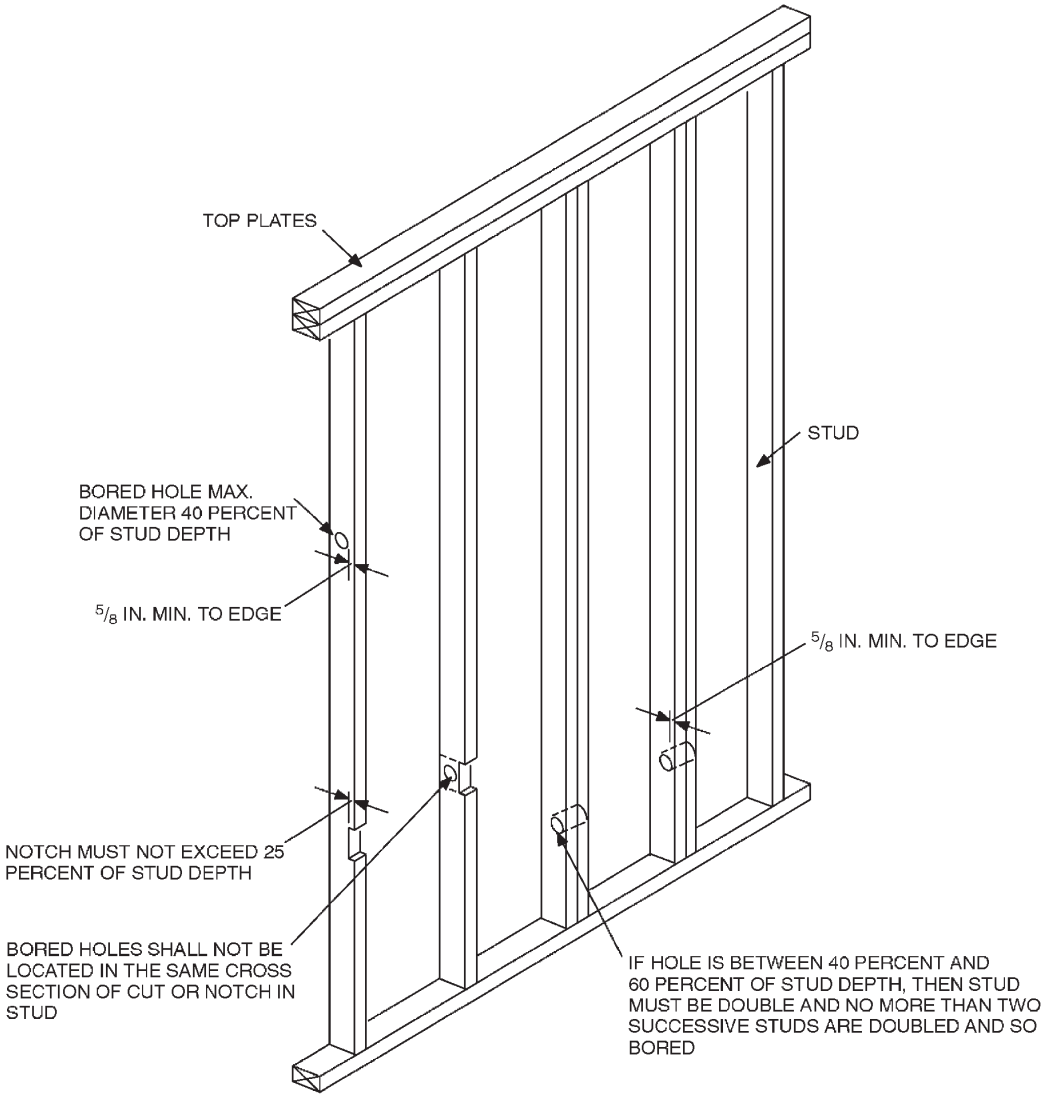
R602.1.4.1 [R602.6.1] Drilling and notching of top plate. When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie not less than 0.054 inch 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 R602.1.4.1.

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

R602.2 Grade. Reserved.

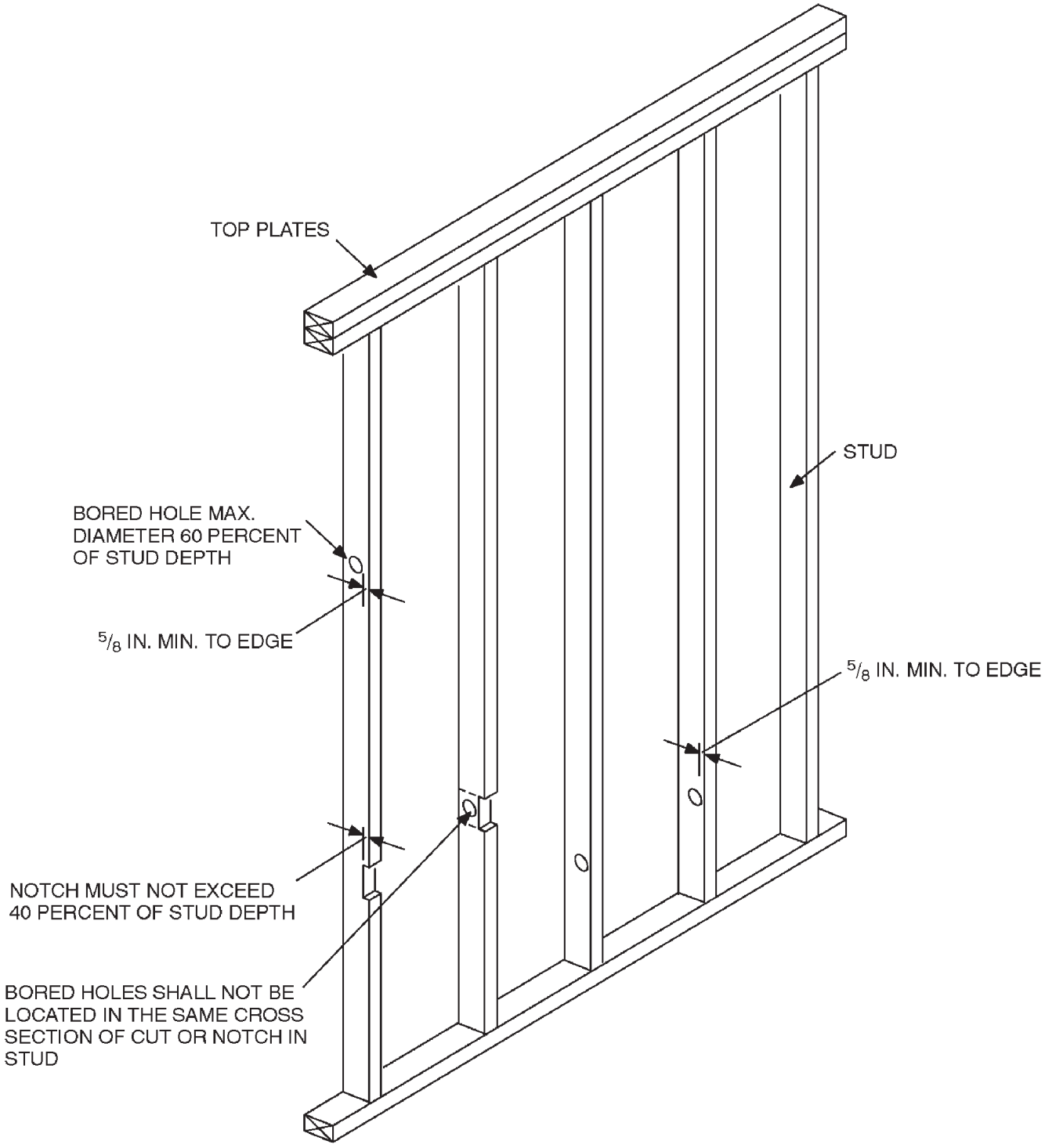
R602.3 Design and construction. Exterior walls of light-frame wood construction shall be designed and constructed in accordance with the provisions of Section R301.2.1.1 or in accordance with the AF&PA NDS. Exterior wall of light-frame wood construction shall also comply with Section R602.1.1.

Table R602.3(1) Fastener Schedule For Structural Members. Reserved.



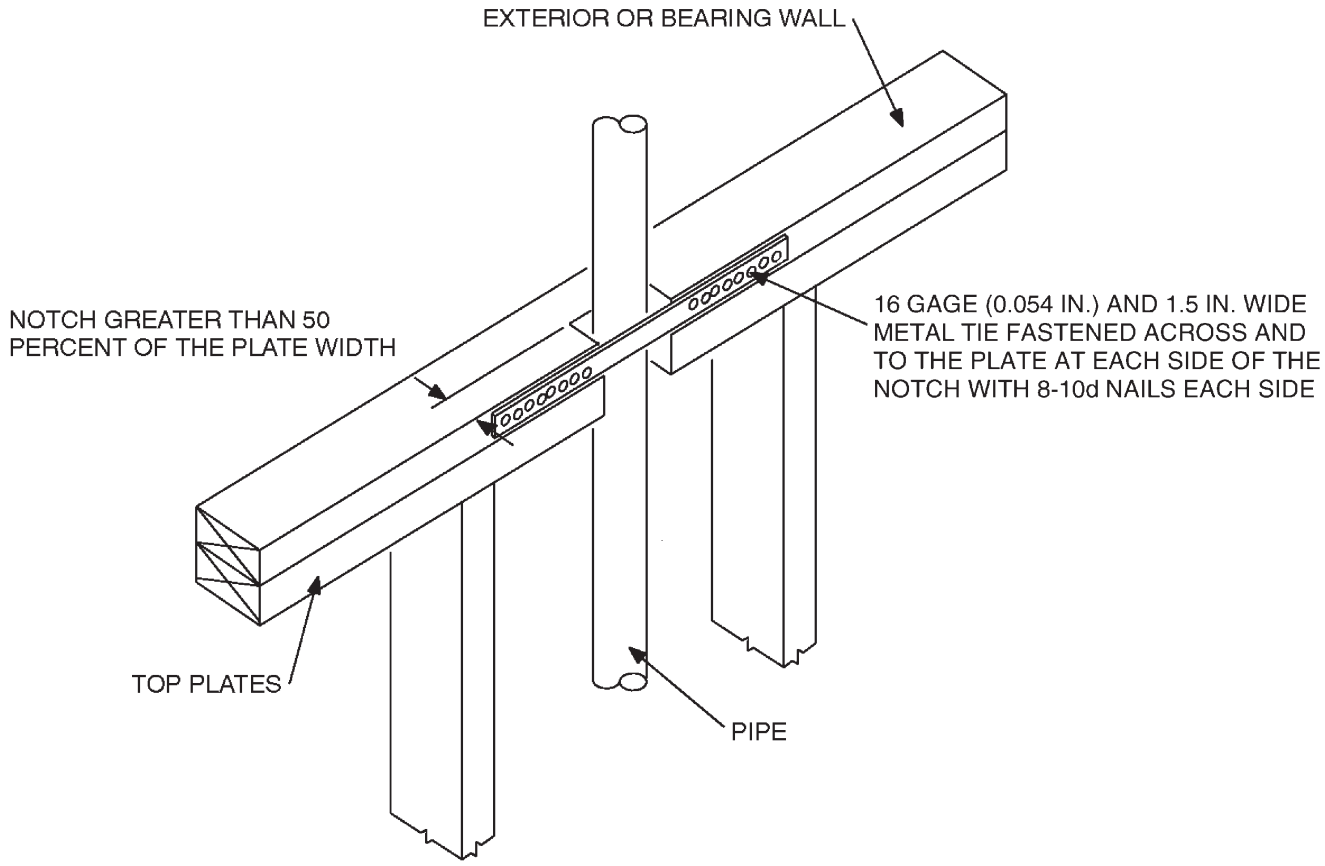
For SI: 1 inch = 25.4 mm.
NOTE: Condition for exterior and bearing walls.

FIGURE R602.1.4(1)
NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS



For SI: 1 inch = 25.4 mm.

FIGURE R602.1.4(2)
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS



For SI: 1 inch = 25.4 mm.

FIGURE R602.1.4.1
TOP PLATE FRAMING TO ACCOMMODATE PIPING

Figure R602.3(1) Typical Wall, Floor And Roof Framing. Reserved.

Table R602.3(2) Alternate Attachments. Reserved.

Figure R602.3(2) Framing Details. Reserved.

Table R602.3(3) Requirements For Wood Structural Panel Wall Sheathing Used To Resist Wind Pressures[a,b,c]. Reserved.

Table R602.3(4) Allowable Spans For Particleboard Wall Sheathing[a]. Reserved.

Table R602.3(5) Size, Height And Spacing Of Wood Studs[a]. Reserved.

R602.3.1 Stud size, height and spacing. Reserved.

Table R602.3.1 Maximum Allowable Length Of Wood Wall Studs Exposed To Wind Speeds Of 100 mph Or Less In Seismic Design Categories A, B, C, D_0, D_1 and D_2. Reserved.

R602.3.2 Top plate. Reserved.

R602.3.3 Bearing studs. Reserved.

R602.3.4 Bottom (sole) plate. Reserved.

R602.4 Interior load-bearing walls. Reserved.

R602.5 Interior non-bearing walls. [Moved to R602.1.3.1]

Figure R602.6 (1) Notching and Bored Hole Limitations for Exterior and Bearing Walls. [Moved to R602.1.4(1)]

Figure R602.6 (2) Notching and Bored Hole Limitations for Interior Nonbearing Walls. [Moved to R602.1.4(2)]

Figure R602.6 .1 Top Plate Framing to Accomodate Piping. [Moved to R602.1.4.1]

R602.7 Headers. Reserved.

R602.7.1 Wood structural panel box headers. Reserved.

R602.7.2 Nonbearing walls. [Moved to R602.1.3.1]

Table R602.7.2 Maximum Spans for Wood Structural Panel Box Headers. Reserved.

Figure R602.7.2 Typical Wood Structural Panel Box Header Construction. Reserved.

R602.8 Fireblocking required. [Moved to R602.1.2]

R602.9 Cripple walls. Reserved.

R602.10 Wall bracing. Reserved.

R602.10.1 Braced wall lines. Reserved.

R602.10.1.1 Braced wall panels. Reserved.

R602.10.1.2 Length of bracing. Reserved.

Table R602.10.1.2(1) Bracing Requirements Based On Wind Speed. Reserved.

Table R602.10.1.2(2) Bracing Requirements Based On Seismic Design Category (As A Function Of Braced Wall Line Length. Reserved.

Table R602.10.1.2(3) Adjustment Factors To The Length Of Required Seismic Wall Bracing. Reserved.

R602.10.1.2.1 Braced wall panel uplift load path. Reserved.

R602.10.1.3 Angled corners. Reserved.

Figure R602.10.1.3 Angled Corners. Reserved.

R602.10.1.4 Braced wall panel location. Reserved.

Figure R602.10.1.4(1) Braced Wall Panels And Braced Wall Lines. Reserved.

Figure R602.10.1.4(2) Braced Wall Panels End Distance Requirements (SDC A, B And C). Reserved.

Figure R602.10.1.4(3) Offsets Permitted For Braced Wall Lines. Reserved.

Figure R602.10.1.4(4) Braced Wall Line Spacing. Reserved.

R602.10.1.4.1 Braced wall panel location in Seismic Design Categories D_0, D_1 and D_2. Reserved.

Figure R602.10.1.4.1 Braced Wall Panels at Ends of Braced Wall Lines in Seismic Design Categories D_0, D_1 and D_2. Reserved.

R602.10.1.5 Braced wall line spacing for Seismic Design Categories D_0, D_1 and D_2. Reserved.

Table R602.10.1.5 Adjustments of Bracing Length for Braced Wall Lines Greater Than 25 Feet. Reserved.

R602.10.2 Intermittent braced wall panel construction methods. Reserved.

Table R602.10.2 Intermittent Bracing Methods. Reserved.

R602.10.2.1 Intermittent braced wall panel interior finish material. Reserved.

R602.10.2.2 Adhesive attachment of sheathing in Seismic Design Categories C, D_0, D_1 and D_2. Reserved.

R602.10.3 Minimum length of braced panels. Reserved.

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]). Reserved.

R602.10.3.1 Adjustment of length of braced panels. Reserved.

Table R602.10.3.1 Minimum Length Requirements for Braced Wall Panels Reserved.

R602.10.3.2 Method ABW: Alternate braced wall panels. Reserved.

Figure R602.10.3.2 Alternate Braced Wall Panel. Reserved.

Table R602.10.3.2 Minimum Length Requirements and Hold-Down Forced for Method ABW Braced Wall Panels Reserved.

R602.10.3.3 Method PFH: Portal frame with hold-downs. Reserved.

Figure R602.10.3.3 Method PFH: Portal Frame With Hold-Downs. Reserved.

R602.10.3.4 Method PFG: at garage door openings in Seismic Design Categories A, B and C. Reserved.

Figure R602.10.3.4 Method PFG Portal Frame at Garage Door Openings in Seismic Categories A, B and C. Reserved.

R602.10.4 Continuous sheathing. Reserved.

R602.10.4.1 Continuous sheathing braced wall panels. Reserved.

Table R602.10.4.1 Continuous Sheathing Methods. Reserved.

R602.10.4.1.1 Continuous portal frame. Reserved.

Figure R602.10.4.1.1 Method CS-PF: Continuous Portal Frame Panel Construction. Reserved.

Table R602.10.4.1.1 Tension Strap Capacity Required For Resisting Wind Pressures Perpendicular To 6:1 Aspect Ratio Walls. Reserved.

R602.10.4.2 Length of braced wall panels with continuous sheathing. Reserved.

Table R602.10.4.2 Length Requirements For Braced Wall Panels With Continuous Sheathing[a] (inches). Reserved.

Figure R602.10.4.2 Braced Wall Panels With Continuous Sheathing. Reserved.

R602.10.4.3 Length of bracing for continuous sheathing. Reserved.

R602.10.4.4 Continuously sheathed braced wall panel location and corner construction. Reserved.

Figure R602.10.4.4(1) Typical Exterior Corner Framing for Continuous Sheathing. Reserved.

Figure R602.10.4.4(2) Braced Wall Line With Continuous Sheathing With Corner Return Panel. Reserved.

Figure R602.10.4.4(3) Braced Wall Line With Continuous Sheathing Without Corner Return Panel. Reserved.

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. Reserved.

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. Reserved.

R602.10.5 Continuously-sheathed braced wall line using Method CS-SFB (structural fiberboard sheathing). Reserved.

R602.10.5.1 Continuously sheathed braced wall line requirements. Reserved.

R602.10.5.2 Braced wall panel length. Reserved.

Table R602.10.5.2 Minimum Length Requirements For Structural Fiberboard Braced Wall Panels In A Continuously-Sheathed Wall. Reserved.

R602.10.5.3 Braced wall panel location and corner construction. Reserved.

R602.10.5.4 Continuously sheathed braced wall lines. Reserved.

R602.10.6 Braced Wall Panel Connections. Reserved.

Figure R602.10.6(1) Braced Wall Panel Connection When Perpendicular To Floor/Ceiling Framing. Reserved.

Figure R602.10.6(2) Braced Wall Panel Connection When Parallel To Floor/Ceiling Framing. Reserved.

R602.10.6.1 Braced Wall Panel Connections For Seismic Design Categories D_0, D_1 and D_2. Reserved.

R602.10.6.2 Connections to Roof Framing. Reserved.

Figure R602.10.6.2(1) Braced Wall Panel Connection To Perpendicular Rafters. Reserved.

Figure R602.10.6.2(2) Braced Wall Panel Connection Option To Perpendicular Rafters Or Roof Trusses. Reserved.

Figure R602.10.6.2(3) Braced Wall Panel Connection Option To Perpendicular Rafters Or Roof Trusses. Reserved.

R602.10.7 Braced wall panel support. Reserved.

Figure R602.10.7 Masonry Stem Walls Supporting Braced Wall Panels. Reserved.

R602.10.7.1 Braced wall panel support for Seismic Design Category D_2. Reserved.

R602.10.8 Panel joints. Reserved.

R602.10.9 Cripple wall bracing. Reserved.

R602.10.9.1 Cripple wall bracing in Seismic Design Categories D_0, D_1 and D_2. Reserved.

R602.10.9.2 Redesignation of cripple walls. Reserved.

R602.11 Wall anchorage. Reserved.

R602.11.1 Wall anchorage for all buildings in Seismic Design Categories D_0, D_1 and D_2 and townhouses in Seismic Design Category C. Reserved.

R602.11.2 Stepped foundations in Seismic Design Categories D_0, D_1 and D_2. Reserved.

Figure R602.11.2 Stepped Foundation Construction. Reserved.

R602.12 Wall bracing and stone and masonry veneer. Reserved.

Figure R602.12 Hold Downs At Exterior And Interior Braced Wall Panels. Reserved.

R602.12.1 Seismic Design Categories D_0, D_1 and D_2. Reserved.

Table R602.12(1) Stone or Masonry Veneer Wall Bracing Requirements, Wood or Steel Framing, Seismic Design Category A, B and C. Reserved.

Table R602.12(2) Stone or Masonry Veneer Wall Bracing Requirements, Wood or Steel Framing, One- and Two-Family Detached Dwellings, Seismic Design Categories D_0, D_1 and D_2. Reserved.

R602.12.1.1 Length of bracing. Reserved.

R602.12.1.2 Braced wall panel location. Reserved.

R602.12.1.3 Braced wall panel construction. Reserved.

R602.12.1.4 Minimum length of braced panel. Reserved.

R602.12.1.5 Alternate braced wall panel. Reserved.

R602.12.1.6 Continuously sheathed wall bracing. Reserved.

SECTION R603
STEEL WALL FRAMING
RESERVED

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 the standards used for the design of the building as specified in Section R301.2.1.1.

R604.3 Installation. Wood structural panel wall sheathing shall be attached to framing in accordance with the standards used for the design of the building as specified in Section R301.2.1.1. 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 standards used for the design of the building as specified in Section R301.2.1.1.

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.

R606.2 Thickness of masonry. The minimum nominal thickness of exterior concrete masonry walls shall be 8 inches (203 mm) or shall be designed in accordance with Section R606.1.

R606.2.1 Minimum thickness. Reserved.

R606.2.2 Rubble stone masonry wall. Reserved.

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 parapets shall be reinforced in accordance with ACI 530/ASCE 5/TMS 402.

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. Concrete masonry units shall be hollow or solid unit masonry in accordance with ASTM C 90 and shall have a minimum net area compressive strength of 1900 psi in compliance with ASTM C 90. Mortar shall comply with Section R607.1. 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).

Table R606.5 Allowable Compressive Stresses for Empirical Design of Masonry Reserved.

R606.6 Piers. Reserved.

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 maxi-

mum 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 Bond. Masonry walls shall be running bond or stack bond construction.

R606.8.1 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 more than 16 inches (406 mm) on center vertically.

R606.9 Reinforcement. Reinforcing steel shall be a minimum of Grade 60 or Grade 40 No. 5 or No. 4 bars and shall be identified in an approved manner.

R606.9.1 Bundling. Bundling shall be permitted when two bars are required at the same location in a wall or in a bond beam.

TABLE R606.9.2
LAP SPLICE LENGTHS

Bar Size (No.)	Lap Length (in.)
3	15
4	20
5	25
6	34
7	42

R606.9.1.1 Bonding pattern. Reserved.

R606.9.1.2 Metal reinforcement. Reserved.

R606.9.2 Splicing. Splices shall be lap splices. Noncontact lap splices shall be permitted, provided reinforcing bars are not spaced farther apart than 5 inches (127 mm). Splice lengths shall be in accordance with Table R606.9.2 and shall be a minimum of 25 inches (635 mm) for No. 5 bars and 20 inches (508 mm) for No. 4 bars.

R606.9.3 Bending. Reinforcement shall be bent in the shop or in the field. All reinforcement shall be bent cold. The diameter of the bend, measured on the inside of the bar, shall not be less than six-bar diameters. Reinforcement partially embedded in concrete shall not be field bent.

Exception: Where bending is necessary to align dowel bars with a vertical cell, bars partially embedded in concrete shall be permitted to be bent at a slope of not more than 1 inch (25 mm) of horizontal displacement to 6 inches (152 mm) of vertical bar length.

R606.9.4 Clearance from masonry. Reinforcing bars embedded in grouted masonry cells shall have a minimum clear distance between reinforcing bars and any face of a cell of $^1/_4$-inch (6.4 mm) for fine grout or $^1/_2$-inch (12.7 mm) for coarse grout.

R606.9.5 Cover for reinforcing steel. Reinforcing bars used in masonry walls shall have a masonry cover, including grout, of not less than 2 inches (51 mm) for masonry units with face exposed to earth or weather and $1^1/_2$ inch (38 mm) for masonry units not exposed to earth or weather.

R606.9.6 Joint reinforcement embedment. Longitudinal wires of joint reinforcement shall be fully embedded in mortar or grout with a minimum cover of $^5/_8$-inch (15.9 mm) when exposed to earth or weather and $^1/_2$-inch (12.7 mm) when not exposed to earth or weather.

R606.9.7 Cleanout openings. Cleanout openings shall be provided for cells containing spliced reinforcement when the grout pour exceeds 5 feet (1524 mm) in height. Where cleanout openings are required, an opening shall be provided in the bottom course of the masonry cell to be filled. Cleanout openings shall have a minimum opening dimension of 3 inches (76 mm).

R606.9.8 Termination. All vertical wall reinforcement shall be terminated by hooking into a bond beam or footing with a standard hook. Standard hooks shall be formed by bending the vertical wall reinforcement in accordance with Section R606.9.3 or shall be a prefabricated standard hook. Splices to standard hooks shall be lap splices with the minimum extension length beyond the bend for standard hooks of 10 inches (254 mm) for No. 5 bars and 8 inches (203 mm) for No. 4 bars. Hooks at bond beams shall extend to the uppermost horizontal reinforcement of the bond beam and shall be embedded a minimum of 6 inches (152 mm) into the bond beam as detailed in Figures R606.9.9A and R606.9.9B. Where multiple bars are required, a single standard hook shall terminate into the bond beam or footing. In narrow footings where the width is insufficient to accommodate a standard 90-degree (1.57 rad) hook and provide the concrete cover required by Section 1907.7 of the *Florida Building Code, Building*, the hook shall be rotated in the horizontal direction until the required concrete cover is achieved.

R606.9.9 Continuity multistory construction. Vertical wall reinforcement in multistory construction shall extend through bond beams and shall be continuous with the verti-

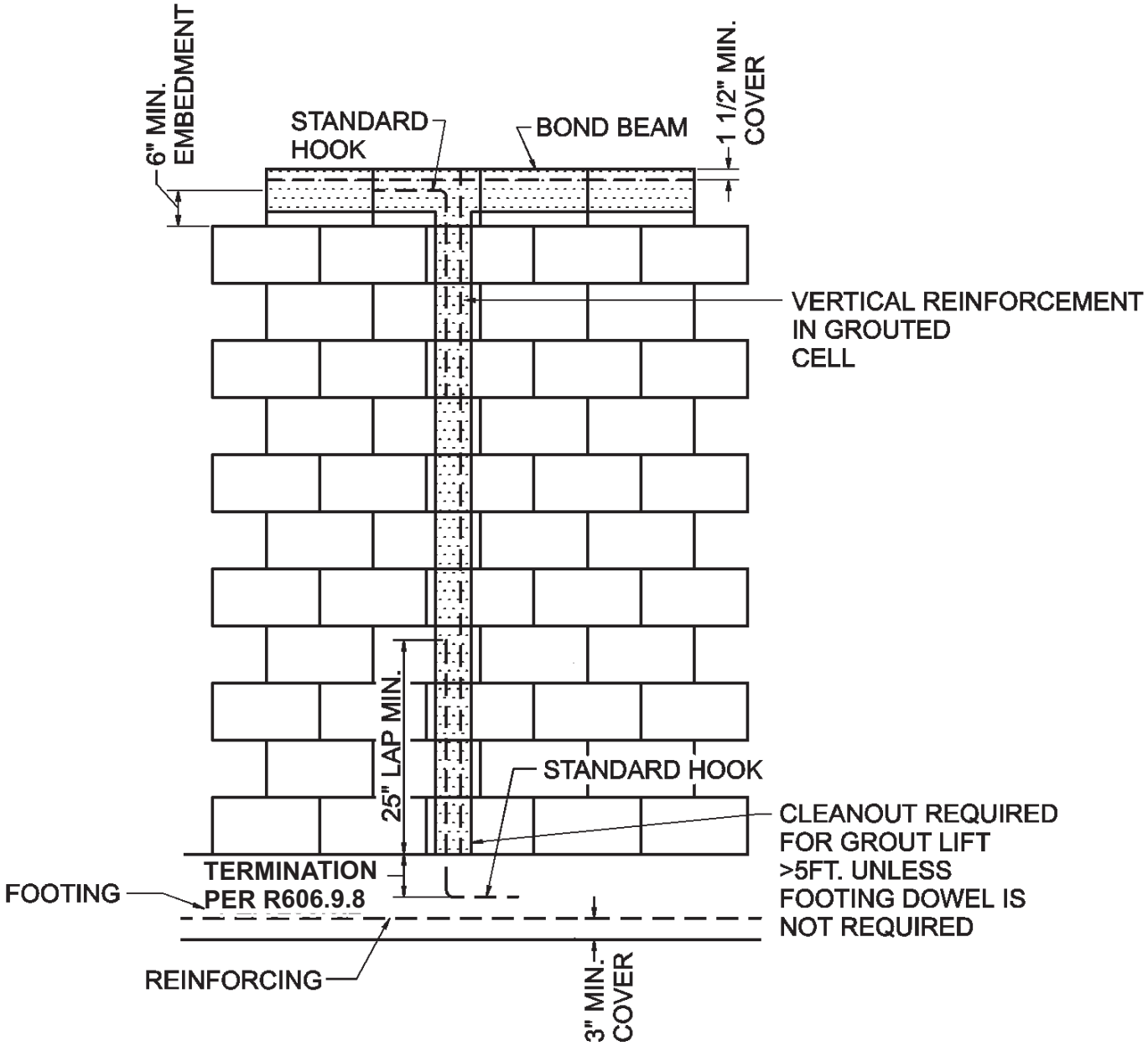


FIGURE R606.9.9A
CONTINUITY OF REINFORCEMENT
ONE STORY MASONRY WALL

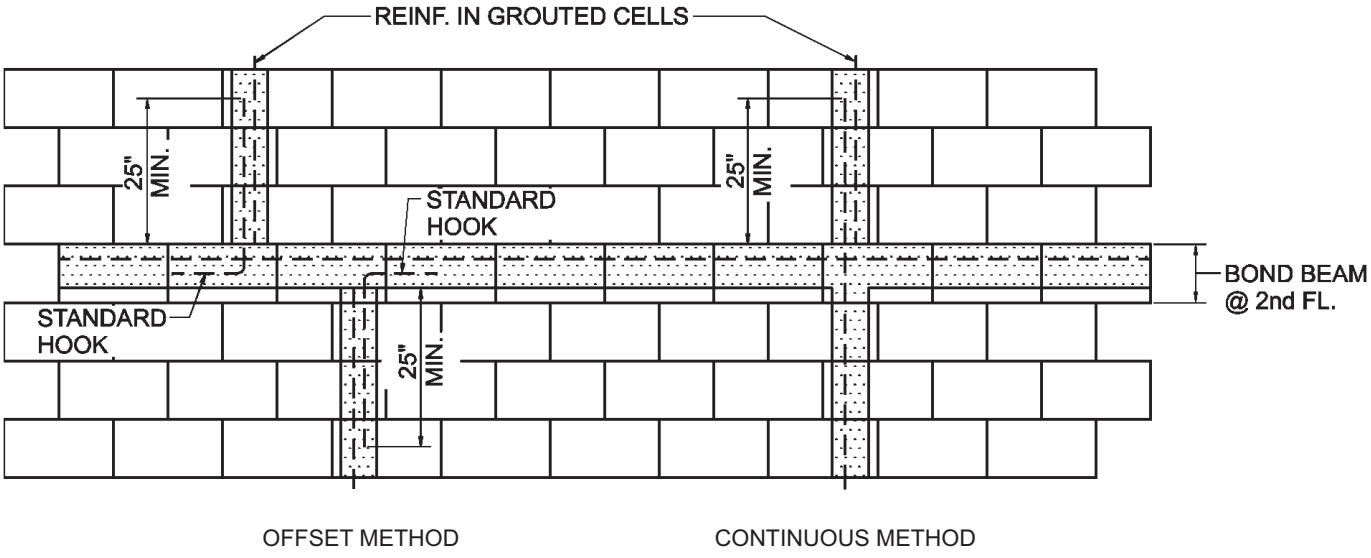


FIGURE R606.9.9B
CONTINUITY OF FIRST AND SECOND FLOOR VERTICAL WALL REINFORCEMENT

cal wall reinforcement of the wall above or be offset in accordance with Section R606.9.9.1 and Figure R606.9.9B.

Exception: Where more than one bar in the same cell is required for vertical wall reinforcement, only one bar shall be required to be continuous between stories.

R606.9.9.1 Offset reinforcement. Vertical reinforcement shall be permitted to be offset between floor levels. Reinforcement for the lower story shall be anchored into the upper floor level bond beam, and reinforcement for the upper story shall be anchored into the bond beams above and below in accordance with Section R606.9.8 and Figures R606.9.9A and R606.9.9B.

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. Reserved.

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. Reserved.

Figure R606.11(2) Requirements for Reinforced Grounted Masonry Construction in Seismic Design Category C. Reserved.

Figure R606.11(3) Requirements for Reinforced Masonry Construction in Seismic Design Category D_0, D_1, or D_2. Reserved.

R606.12 Seismic requirements. Reserved.

R606.12.1 General. Reserved.

R606.12.1.1 Floor and roof diaphragm construction. Reserved.

R606.12.2 Seismic Design Category C. Reserved.

R606.12.2.1 Minimum length of wall without openings. Reserved.

Table R606.12.2.1 Minimum Solid Wall Length Along Exterior Wall Lines. Reserved.

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

R606.12.2.2.1 Load-bearing frames or columns. Reserved.

R606.12.2.2.2 Masonry partition walls. Reserved.

R606.12.2.2.3 Reinforcement requirements for masonry elements. Reserved.

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

R606.12.2.3.1 Connections to masonry shear walls. Reserved.

R606.12.2.3.2 Connections to masonry columns. Reserved.

R606.12.2.3.3 Minimum reinforcement requirements for masonry shear walls. Reserved.

R606.12.3 Seismic Design Category D_0 or D_1. Reserved.

R606.12.3.1 Design requirements. Reserved.

R606.12.3.2 Minimum reinforcement requirements for masonry walls. Reserved.

Table R606.12.3.2 Minimum Distributed Wall Reinforcement For Building Assigned to Seismic Design Category D_0 or D_1. Reserved.

R606.12.3.2.1 Shear wall reinforcement requirements. Reserved.

R606.12.3.3 Minimum reinforcement for masonry columns. Reserved.

R606.12.3.4 Material restrictions. Reserved.

R606.12.3.5 Lateral tie anchorage. Reserved.

R606.12.4 Seismic Design Category D_2. Reserved.

R606.12.4.1 Design of elements not part of the lateral-force-resisting system. Reserved.

R606.12.4.2 Design of elements part of the lateral-force-resisting system. Reserved.

Table R606.12.4.1 Minimum Reinforcing for Stacked Bonded Masonry Walls in Seismic Design Category D_2. Reserved.

Table R606.12.4.2 Minimum Reinforcing for Stacked Bonded Masonry Walls in Seismic Design Category D_2. Reserved.

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. Except where supported on a 1-inch by 4-inch (25.4 mm by 102 mm) ribbon strip and nailed to the adjoining stud and as provided in Section R606.11, the ends of each joist shall not have less than $1^1/_2$ inches (38 mm) of bearing on wood or metal, or less than 3 inches (76 mm) on masonry.

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

R606.16 Masonry opening tolerances. Masonry rough openings may vary in the cross section dimension or elevation dimension specified on the approved plans from - $^1/_4$ inches (6.4 mm) to + $^1/_2$ inches (12.7 mm). For exterior window and door installation provisions see Sections R612.11 and R612.12.

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. Reserved.

R607.1.3 Masonry in Seismic Design Categories D_0, D_1 and D_2. Reserved.

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

TABLE R607.1
MORTAR PROPORTIONS[a, b]

MORTAR	TYPE	PROPORTIONS BY VOLUME (cementitious materials)								
		Portland cement or blended cement	Mortar cement			Masonry cement			Hydrated lime[c] or lime putty	Aggregate ratio (measured in damp, loose conditions)
			M	S	N	M	S	N		
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.

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.

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 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 when it has been tested in accordance with ASTM C 1019 and is shown to meet the minimum required specified strength of 2500 psi or the specified f'_m if greater than 2500 psi. Additionally, a slump test must be done to each batch to assure that it meets the required 8 to 11 inch slump.

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 joints shall be formed by stopping all tiers at the same elevation and with the grout 1 inch (25 mm) below the top.

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.

R609.1.3 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. Cleanouts shall be provided at the bottom course at each pour of grout where such pour exceeds 5 feet (1524 mm) in height and 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.

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. Reserved.

R609.2 Bond beams. A reinforced bond beam shall be provided in masonry walls at the top of the wall and at each floor level of each exterior wall. Masonry walls not extending to the roof line shall have a bond beam at the top of the wall.

Exceptions:

1. A bond beam is not required at the floor level for slab-on-ground floors.
2. Gable end walls shall be in conformance with Section R609.4.

R609.2.1 Bond beam types. Bond beams shall be one of the following:

1. 1.8" thick × 8" high masonry

   8" thick × 12" high masonry

   8" thick × 16" high masonry

   8" thick by 24" high masonry

   8" thick × 32" high masonry

2. Precast units certified by the manufacturer for the uplift loads as set forth in Table R802.1.9. Precast units shall be installed in accordance with the manufacturer's specifications and approved by the building official.

R609.2.2 Bond beam reinforcement. The minimum reinforcement for bond beam roof diaphragm chord tension reinforcement steel shall be as set forth in Tables R609.2.2A-1 through R609.2.2A-4 for the appropriate grade of steel and exposure category. The minimum reinforcement for bond beam uplift resisting reinforcement steel shall be as set forth in Tables R609.2.2B-1 through R609.2.2B-8 for the loads set forth in Table R802.1.9. The total minimum area of bond beam reinforcement shall be the sum of the required area of the diaphragm chord tension steel and the required area of bond beam uplift steel. Bond beam area shall be converted to bar size in accordance with Table R609.2.2C.

R609.2.3 Location of reinforcement. Reinforcement shall be located in the top of bond beams and in the top and bottom of bond beams also serving as lintels.

R609.2.4 Corner continuity. Reinforcement in bond beams shall be continuous around corners as detailed in Figure R609.2.4.

Exception: In bond beams requiring two reinforcing bars, one bar shall be continuous around corners.

R609.2.5 Change in height. Changes in bond beam height shall be permitted as detailed in Figure R609.2.5.

R609.2.6 Precast units reinforcement. Precast bond beams shall properly receive and retain all vertical wall reinforcement. Precast bond beams shall contain the minimum amount of continuous reinforcement set forth in Sections R609.2.2 and R609.6 as applicable and shall be reinforced at joints to act as drag struts and diaphragm chords.

TABLE R609.2.2C
BOND BEAM AREA OF STEEL PROVIDED IN^2/FT

NUMBER OF BARS	BAR SIZE		
	No. 4	No. 5	No. 6
1	0.20	0.31	0.44
2	0.40	0.62	0.88

R609.3 Vertical reinforcement. Vertical reinforcement shall be provided in conformance with Sections R609.3.1 through R609.3.6.

R609.3.1 One reinforcement bar shall be provided in each corner, including interior corners and corners created by changes in wall direction or offsetting of walls.

R609.3.2 Openings. A minimum of one bar of the size used for vertical wall reinforcement shall be provided on each side of openings wider than 6 feet (1829 mm). If more vertical reinforcement is interrupted by an opening than is provided beside the opening (total in the first and second cells adjacent to the opening), one-half of the equivalent area of reinforcement interrupted by the opening shall be placed on each side of the opening. This reinforcement shall be placed within the first and/or second cells beside the opening.

R609.3.2.1 Girders. At least one reinforcement bar shall be provided where girders or girder trusses bear on masonry walls.

R609.3.3 Spacing. Vertical reinforcement shall be provided as set forth in Tables R609.3.3.A-1 through R609.3.3A-4 and Tables R609.3.3.B-1, through R609.3.3B-4 as applicable.

R609.3.4 Precast bond beams. Vertical reinforcement used in conjunction with precast bond beams shall be spaced the same as for masonry bond beams. Reinforcement shall terminate in the precast beam as set forth in Section R606.9.8.

R609.3.5 Duplication. Reinforcing steel requirements shall not be additive. A single bar shall be permitted to satisfy multiple requirements.

R609.3.6 Termination. Vertical reinforcement shall terminate in footings and bond beams as set forth in Section R606.9.8.

R609.4 Masonry gables. Gable end walls of concrete or masonry shall be constructed full height to the roof line.

Exception: Gable end trusses or wood framed gable end walls in conformance with Tables R609.4A and R609.4B and Figure R609.4. Wood gable stud wall connectors shall be capable of resisting the vertical and horizontal loads of Table R609.4B as well as the uplift load stipulated at Figure R609.4. Where masonry gable end walls do not go to the roof, a bond beam complying with Section R609.2 shall be provided at the top of the masonry.

R609.4.1 Rake beam. Where concrete or masonry is carried full height to the roof line, a cast-in-place rake beam as detailed in Figure R609.4.1 shall be provided. The minimum thickness of the rake beam from top of masonry shall be 4 inches (102 mm). One No. 5 continuous reinforcing bar shall be placed in the rake beam along the roof line.

R609.4.2 Vertical reinforcement. Vertical reinforcement shall be provided at the maximum spacing as set forth in Tables R609.3.3B-1 through R609.3.3.B-4 as applicable.

R609.4.3 Termination. Required vertical reinforcement shall terminate at the rake beam in accordance with Section R606.9.8.

R609.4.4 Nailer. A minimum 2 feet 4 inch nailer for connecting roof sheathing shall be bolted to the top of the wall with a minimum of $^1/_2$ inch (12.7 mm) anchor bolts spaced as set forth in Table R609.4.4. The nailer shall be permitted to be bolted to the inside or outside of the wall.

R609.4.5 Gable overhang. Gable overhangs up to 2 feet (610 mm) in width complying with Figure R609.4.5 shall be permitted.

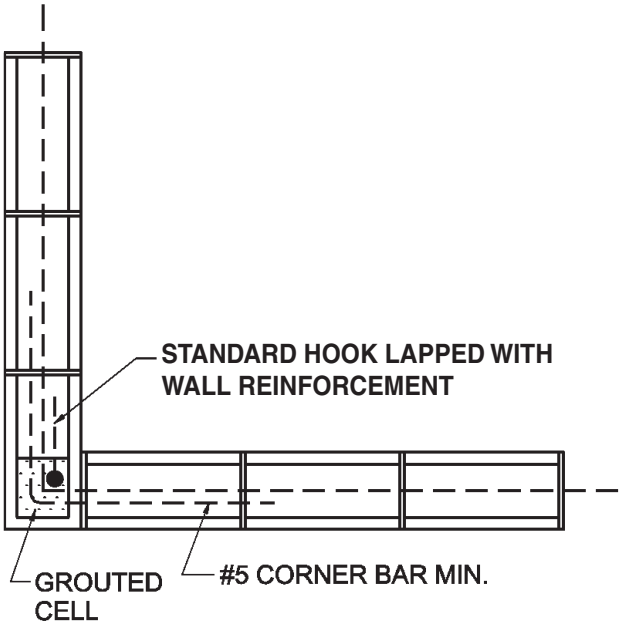


FIGURE R609.2.4
CORNER CONTINUITY OF BOND BEAM AND WALL REINFORCEMENT

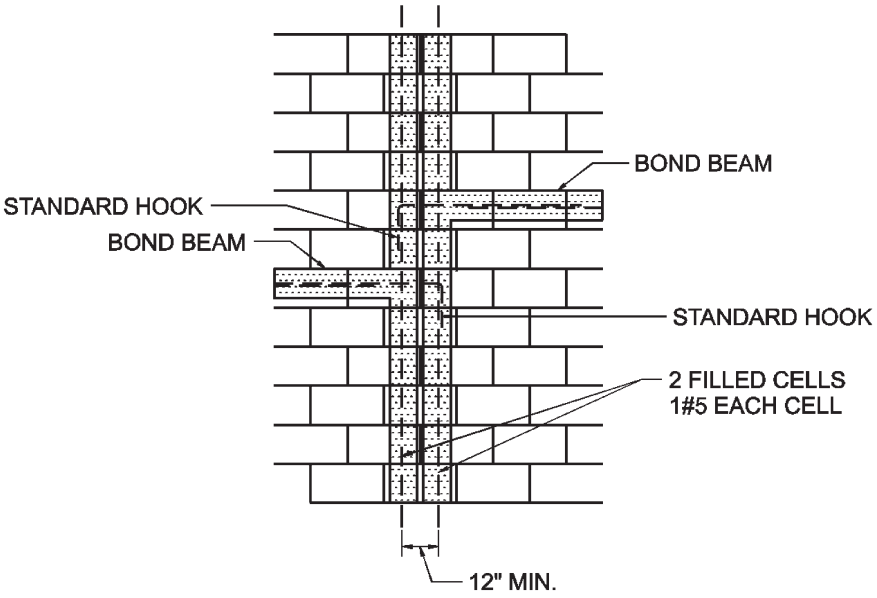


FIGURE R609.2.5
CHANGES IN BOND BEAM HEIGHT

TABLE R609.2.2A-1 GRADE 60 EXPOSURE B
ROOF DIAPHRAGM CHORD TENSION BOND BEAM STEEL AREA, IN^2

V_{asd} as determined in accordance with Section R301.2.1.3	BUILDING WIDTH	WALL HEIGHT	BUILDING LENGTH				
			40	50	60	70	80
100	24	10	0.037	0.052	0.069	0.088	0.110
	24	8	0.030	0.042	0.055	0.071	0.088
	32	10	0.029	0.040	0.053	0.067	0.084
	32	8	0.023	0.032	0.042	0.054	0.067
	40	10	0.026	0.036	0.047	0.059	0.073
	40	8	0.021	0.029	0.037	0.047	0.058
110	24	10	0,045	0.063	0.084	0.107	0.133
	24	8	0.036	0.050	0.067	0.086	0.107
	32	10	0.035	0.048	0.064	0.082	0.101
	32	8	0.028	0.039	0.051	0.065	0.081
	40	10	0.032	0.043	0.057	0.072	0.088
	40	8	0.025	0.035	0.045	0.057	0.070
120	24	10	0.054	0.075	0.099	0.127	0.158
	24	8	0.043	0.060	0.080	0.102	0.127
	32	10	0.041	0.058	0.076	0.097	0.121
	32	8	0.033	0.046	0.061	0.078	0.097
	40	10	0.038	0.052	0.067	0.085	0.105
	40	8	0.030	0.041	0.054	0.068	0.084
130	24	10	0.063	0.088	0.117	0.149	0.186
	24	8	0.050	0.070	0.093	0.120	0.149
	32	10	0.049	0.068	0.089	0.114	0.142
	32	8	0.039	0.054	0.071	0.091	0.113
	40	10	0.044	0.061	0.079	0.100	0.123
	40	8	0.035	0.048	0.063	0.080	0.098
140	24	10	0.073	0.102	0.135	0.173	0.216
	24	8	0.058	0.082	0.108	0.139	0.173
	32	10	0.056	0.078	0.104	0.132	0.164
	32	8	0.045	0.063	0.083	0.106	0.131
	40	10	0.051	0.070	0.092	0.116	0.143
	40	8	0.041	0.056	0.073	0.093	0.114
150	24	10	0.084	0.117	0.155	0.199	0.248
	24	8	0.067	0.094	0.124	0.159	0.198
	32	10	0.065	0.090	0.119	0.152	0.189
	32	8	0.052	0.072	0.095	0.121	0.151
	40	10	0.059	0.081	0.105	0.133	0.164
	40	8	0.047	0.064	0.084	0.106	0.131

Notes:
1. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.
2. The tabular value for diaphragm chord tension steel area shall be permitted to be multiplied by a factor of 0.65 for bond beam spans located in the end zone.

TABLE R609.2.2A-2 GRADE 60 ROOF EXPOSURE C
ROOF DIAPHRAGM CHORD TENSION BOND BEAM STEEL AREA, IN^2

V_{asd} as determined in accordance with Section R301.2.1.3	BUILDING WIDTH	WALL HEIGHT	BUILDING LENGTH				
			40	50	60	70	80
100	24	10	0.052	0.073	0.097	0.124	0.154
	24	8	0.042	0.058	0.077	0.099	0.123
	32	10	0.040	0.056	0.074	0.095	0.118
	32	8	0.032	0.045	0.059	0.076	0.094
	40	10	0.037	0.050	0.066	0.083	0.102
	40	8	0.029	0.040	0.052	0.066	0.082
110	24	10	0.063	0.088	0.117	0.150	0.187
	24	8	0.051	0.071	0.094	0.120	0.149
	32	10	0.049	0.068	0.090	0.114	0.142
	32	8	0.039	0.054	0.072	0.092	0.114
	40	10	0.044	0.061	0.079	0.100	0.124
	40	8	0.035	0.049	0.063	0.080	0.099
120	24	10	0.075	0.105	0.139	0.178	0.222
	24	8	0.060	0.084	0.112	0.143	0.178
	32	10	0.058	0.081	0.107	0.136	0.169
	32	8	0.046	0.065	0.085	0.109	0.135
	40	10	0.053	0.072	0.094	0.119	0.147
	40	8	0.042	0.058	0.076	0.095	0.118
130	24	10	0.088	0.123	0.164	0.209	0.261
	24	8	0.071	0.099	0.131	0.168	0.209
	32	10	0.068	0.095	0.125	0.160	0.199
	32	8	0.055	0.076	0.100	0.128	0.159
	40	10	0.062	0.085	0.111	0.140	0.173
	40	8	0.050	0.068	0.089	0.112	0.138
140	24	10	0.102	0.143	0.190	0.243	0.302
	24	8	0.082	0.114	0.152	0.194	0.242
	32	10	0.079	0.110	0.145	0.185	0.230
	32	8	0.063	0.088	0.116	0.148	0.184
	40	10	0.072	0.098	0.129	0.162	0.200
	40	8	0.057	0.079	0.103	0.130	0.160
150	24	10	0.118	0.164	0.218	0.279	0.347
	24	8	0.094	0.131	0.174	0.223	0.278
	32	10	0.091	0.126	0.167	0.213	0.264
	32	8	0.073	0.101	0.133	0.170	0.212
	40	10	0.082	0.113	0.148	0.187	0.230
	40	8	0.066	0.090	0.118	0.149	0.184

Notes:
1. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.
2. The tabular value for diaphragm chord tension steel area shall be permitted to be multiplied by a factor of 0.65 for bond beam spans located in the end zone.

TABLE R609.2.2A-3 GRADE 40 EXPOSURE B
ROOF DIAPHRAGM CHORD TENSION BOND BEAM STEEL AREA, IN^2

V_{asd} as determined in accordance with Section R301.2.1.3	BUILDING WIDTH	WALL HEIGHT	BUILDING LENGTH				
			40	50	60	70	80
100	24	10	0.056	0.078	0.104	0.133	0.165
	24	8	0.045	0.062	0.083	0.106	0.132
	32	10	0.043	0.060	0.079	0.101	0.126
	32	8	0.035	0.048	0.063	0.081	0.101
	40	10	0.039	0.054	0.070	0.089	0.109
	40	8	0.031	0.043	0.056	0.071	0.087
110	24	10	0.068	0.094	0.125	0.160	0.200
	24	8	0.054	0.076	0.100	0.128	0.160
	32	10	0.052	0.073	0.096	0.122	0.152
	32	8	0.042	0.058	0.077	0.098	0.122
	40	10	0.047	0.065	0.085	0.107	0.132
	40	8	0.038	0.052	0.068	0.086	0.106
120	24	10	0.081	0.112	0.149	0.191	0.238
	24	8	0.064	0.090	0.119	0.153	0.190
	32	10	0.062	0.086	0.114	0.146	0.181
	32	8	0.050	0.069	0.091	0.117	0.145
	40	10	0.056	0.077	0.101	0.128	0.157
	40	8	0.045	0.062	0.081	0.102	0.126
130	24	10	0.095	0.132	0.175	0.224	0.279
	24	8	0.076	0.106	0.140	0.179	0.223
	32	10	0.073	0.101	0.134	0.171	0.212
	32	8	0.058	0.081	0.107	0.137	0.170
	40	10	0.066	0.091	0.119	0.150	0.185
	40	8	0.053	0.073	0.095	0.120	0.148
140	24	10	0.110	0.153	0.203	0.260	0.324
	24	8	0.088	0.122	0.162	0.208	0.259
	32	10	0.085	0.117	0.155	0.198	0.246
	32	8	0.068	0.094	0.124	0.159	0.197
	40	10	0.077	0.105	0.138	0.174	0.214
	40	8	0.062	0.084	0.110	0.139	0.171
150	24	10	0.126	0.176	0.233	0.298	0.371
	24	8	0.101	0.140	0.186	0.239	0.297
	32	10	0.097	0.135	0.178	0.228	0.283
	32	8	0.078	0.108	0.143	0.182	0.226
	40	10	0.088	0.121	0.158	0.200	0.246
	40	8	0.071	0.097	0.126	0.160	0.197

Notes:
1. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C
2. The tabular value for diaphragm chord tension steel area shall be permitted to be multiplied by a factor of 0.65 for bond beam spans located in the end zone.

TABLE R609.2.2A-4 GRADE 40 EXPOSURE C
ROOF DIAPHRAGM CHORD TENSION BOND BEAM STEEL AREA, IN^2

V_{asd} as determined in accordance with Section R301.2.1.3	BUILDING WIDTH	WALL HEIGHT	BUILDING LENGTH				
			40	50	60	70	80
100	24	10	0.078	0.109	0.145	0.186	0.231
	24	8	0.063	0.088	0.116	0.149	0.185
	32	10	0.060	0.084	0.111	0.142	0.176
	32	8	0.048	0.067	0.089	0.114	0.141
	40	10	0.055	0.075	0.098	0.124	0.153
	40	8	0.044	0.060	0.079	0.099	0.123
110	24	10	0.095	0.132	0.176	0.225	0.280
	24	8	0.076	0.106	0.141	0.180	0.224
	32	10	0.073	0.102	0.135	0.172	0.213
	32	8	0.059	0.081	0.108	0.137	0.171
	40	10	0.067	0.091	0.119	0.150	0.185
	40	8	0.053	0.073	0.095	0.120	0.148
120	24	10	0.113	0.158	0.209	0.268	0.333
	24	8	0.090	0.126	0.167	0.214	0.267
	32	10	0.087	0.121	0.160	0.204	0.254
	32	8	0.070	0.097	0.128	0.163	0.203
	40	10	0.079	0.108	0.142	0.179	0.221
	40	8	0.063	0.087	0.113	0.143	0.176
130	24	10	0.133	0.185	0.245	0.314	0.391
	24	8	0.1066	0.148	0.196	0.251	0.313
	32	10	0.102	0.142	0.188	0.240	0.298
	32	8	0.082	0.114	0.150	0.192	0.238
	40	10	0.093	0.127	0.166	0.210	0.259
	40	8	0.074	0.102	0.133	0.168	0.207
140	24	10	0.154	0.214	0.285	0.364	0.454
	24	8	0.123	0.172	0.288	0.291	0.363
	32	10	0.119	0.165	0.218	0.278	0.345
	32	8	0.095	0.132	0.174	0.223	0.276
	40	10	0.108	0.148	0.193	0.244	0.300
	40	8	0.086	0.118	0.154	0.195	0.240
150	24	10	0.176	0.246	0.327	0.418	0.521
	24	8	0.141	0.197	0.261	0.335	0.417
	32	10	0.136	0.189	0.250	0.319	0.397
	32	8	0.109	0.151	0.200	0.255	0.317
	40	10	0.124	0.169	0.221	0.280	0.345
	40	8	0.099	0.136	0.177	0.224	0.276

Notes:
1. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.
2. The tabular value for diaphragm chord tension steel area shall be permitted to be multiplied by a factor of 0.65 for bond beam spans located in the end zone.

TABLE R609.2.2B-1 GRADE 60
AREA OF STEEL REQUIRED IN BOND BEAM FOR UPLIFT BENDING, IN^2

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	8 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.009	0.021	0.038	0.060	0.088	0.123	NP	NP
150	0.016	0.037	0.067	0.107	0.159	NP	NP	NP
200	0.023	0.053	0.096	0.157	NP	NP	NP	NP
250	0.030	0.069	0.127	0.211	NP	NP	NP	NP
300	0.037	0.086	0.160	0.270	NP	NP	NP	NP
350	0.044	0.103	0.194	NP	NP	NP	NP	NP
400	0.051	0.120	0.230	NP	NP	NP	NP	NP
450	0.058	0.138	0.269	NP	NP	NP	NP	NP
500	0.065	0.156	NP	NP	NP	NP	NP	NP
550	0.073	0.175	NP	NP	NP	NP	NP	NP
600	0.080	0.195	NP	NP	NP	NP	NP	NP
650	0.088	0.215	NP	NP	NP	NP	NP	NP
700	0.095	0.235	NP	NP	NP	NP	NP	NP
750	0.103	0.257	NP	NP	NP	NP	NP	NP
800	0.110	0.280	NP	NP	NP	NP	NP	NP
850	0.118	NP	NP	NP	NP	NP	NP	NP
900	0.126	NP	NP	NP	NP	NP	NP	NP
950	0.134	NP	NP	NP	NP	NP	NP	NP
1000	0.142	NP	NP	NP	NP	NP	NP	NP
1050	0.150	NP	NP	NP	NP	NP	NP	NP
1100	0.158	NP	NP	NP	NP	NP	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-2 GRADE 60
AREA OF STEEL REQUIRED IN BOND BEAM FOR UPLIFT BENDING, IN²

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	16 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.005	0.010	0.019	0.029	0.042	0.58	0.076	0.097
200	0.007	0.017	0.030	0.046	0.067	0.092	0.121	0.154
250	0.010	0.023	0.040	0.063	0.092	0.126	0.167	0.214
300	0.013	0.029	0.051	0.081	0.117	0.162	0.214	0.275
350	0.015	0.035	0.062	0.098	0.143	0.197	0.262	NP
400	0.018	0.041	0.073	0.116	0.169	0.234	0.312	NP
450	0.021	0.047	0.084	0.134	0.195	0.271	NP	NP
500	0.023	0.053	0.096	0.152	0.222	0.309	NP	NP
550	0.026	0.059	0.107	0.170	0.249	0.348	NP	NP
600	0.029	0.066	0.118	0.188	0.277	0.388	NP	NP
650	0.032	0.072	0.130	0.206	0.305	0.429	NP	NP
700	0.034	0.078	0.141	0.225	0.334	NP	NP	NP
750	0.037	0.084	0.152	0.244	0.363	NP	NP	NP
800	0.040	0.091	0.164	0.263	0.392	NP	NP	NP
850	0.042	0.097	0.176	0.282	0.422	NP	NP	NP
900	0.045	0.103	0.187	0.302	0.453	NP	NP	NP
950	0.048	0.110	0.199	0.321	NP	NP	NP	NP
1000	0.051	0.116	0.211	0.341	NP	NP	NP	NP
1050	0.053	0.122	0.223	0.362	NP	NP	NP	NP
1100	0.056	0.129	0.235	0.382	NP	NP	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-3 GRADE 60
AREA OF STEEL REQUIRED IN BOND BEAM FOR UPLIFT BENDING, IN^2

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	24 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.004	0.008	0.014	0.022	0.032	0.043	0.057	0.072
250	0.005	0.012	0.021	0.032	0.047	0.064	0.084	0.106
300	0.007	0.015	0.027	0.043	0.062	0.085	0.1111	0.142
350	0.009	0.019	0.034	0.054	0.077	0.106	0.139	0.177
400	0.010	0.023	0.041	0.064	0.093	0.127	0.167	0.213
450	0.012	0.027	0.048	0.075	0.108	0.148	0.195	0.249
500	0.014	0.031	0.054	0.086	0.124	0.170	0.224	0.286
550	0.015	0.034	0.061	0.096	0.140	0.192	0.253	0.323
600	0.017	0.038	0.068	0.107	0.155	0.213	0.282	0.361
650	0.019	0.042	0.075	0.118	0.171	0.235	0.311	0.399
700	0.020	0.046	0.082	0.129	0.187	0.257	0.341	0.438
750	0.022	0.050	0.089	0.140	0.203	0.280	0.371	0.477
800	0.024	0.053	0.095	0.150	0.219	0.302	0.401	0.517
850	0.025	0.057	0.102	0.161	0.235	0.325	0.423	0.558
900	0.027	0.061	0.109	0.172	0.251	0.347	0.462	NP
950	0.029	0.065	0.116	0.183	0.268	0.370	0.494	NP
1000	0.030	0.069	0.123	0.194	0.284	0.394	0.525	NP
1050	0.032	0.072	0.130	0.206	0.301	0.417	0.557	NP
1100	0.034	0.076	0.137	0.217	0.317	0.440	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-4 GRADE 60
AREA OF STEEL REQUIRED IN BOND BEAM FOR UPLIFT BENDING, IN^2

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	32 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
250	0.003	0.007	0.012	0.019	0.027	0.037	0.048	0.061
300	0.004	0.009	0.017	0.026	0.038	0.052	0.068	0.086
350	0.005	0.012	0.022	0.034	0.049	0.067	0.087	0.111
400	0.007	0.015	0.027	0.042	0.060	0.082	0.107	0.136
450	0.008	0.018	0.031	0.049	0.071	0.097	0.127	0.161
500	0.009	0.020	0.036	0.057	0.082	0.112	0.147	0.187
550	0.010	0.023	0.041	0.065	0.093	0.127	0.167	0.213
600	0.011	0.026	0.046	0.072	0.104	0.143	0.187	0.239
650	0.013	0.029	0.051	0.080	0.116	0.158	0.208	0.265
700	0.014	0.031	0.056	0.088	0.127	0.174	0.288	0.291
750	0.015	0.034	0.061	0.095	0.138	0.189	0.249	0.317
800	0.016	0.037	0.066	0.103	0.149	0.205	0.269	0.344
850	0.018	0.040	0.071	0.111	0.161	0.220	0.290	0.370
900	0.019	0.042	0.076	0.119	0.172	0.236	0.311	0.397
950	0.020	0.045	0.081	0.127	0.183	0.252	0.332	0.424
1000	0.021	0.048	0.085	0.134	0.195	0.267	0.353	0.451
1050	0.022	0.051	0.090	0.142	0.206	0.283	0.374	0.479
1100	0.024	0.053	0.095	0.150	0.218	0.299	0.395	0.506

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-5 GRADE 40
AREA BOND BEAM/LINTEL UPLIFT STEEL DESIGN

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	8 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.014	0.032	0.057	0.090	0.132	0.184	NP	NP
150	0.024	0.055	0.100	0.160	0.239	NP	NP	NP
200	0.034	0.079	0.144	0.235	NP	NP	NP	NP
250	0.045	0.103	0.191	NP	NP	NP	NP	NP
300	0.055	0.128	0.240	NP	NP	NP	NP	NP
350	0.066	0.154	NP	NP	NP	NP	NP	NP
400	0.076	0.180	NP	NP	NP	NP	NP	NP
450	0.087	0.207	NP	NP	NP	NP	NP	NP
500	0.098	0.234	NP	NP	NP	NP	NP	NP
550	0.109	0.263	NP	NP	NP	NP	NP	NP
600	0.120	NP	NP	NP	NP	NP	NP	NP
650	0.131	NP	NP	NP	NP	NP	NP	NP
700	0.143	NP	NP	NP	NP	NP	NP	NP
750	0.154	NP	NP	NP	NP	NP	NP	NP
800	0.166	NP	NP	NP	NP	NP	NP	NP
850	0.177	NP	NP	NP	NP	NP	NP	NP
900	0.189	NP	NP	NP	NP	NP	NP	NP
950	0.201	NP	NP	NP	NP	NP	NP	NP
1000	0.213	NP	NP	NP	NP	NP	NP	NP
1050	0.225	NP	NP	NP	NP	NP	NP	NP
1100	0.238	NP	NP	NP	NP	NP	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-6 GRADE 40
AREA BOND BEAM/LINTEL UPLIFT STEEL DESIGN

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	16 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.007	0.016	0.028	0.044	0.063	0.087	0.114	0.145
200	0.011	0.025	0.044	0.069	0.101	0.138	0.181	0.231
250	0.015	0.034	0.061	0.095	0.138	0.190	0.250	0.320
300	0.019	0.043	0.077	0.121	0.176	0.242	0.321	0.413
350	0.023	0.052	0.093	0.147	0.215	0.296	0.393	NP
400	0.027	0.061	0.110	0.174	0.254	0.351	0.468	NP
450	0.031	0.071	0.127	0.200	0.293	0.407	NP	NP
500	0.035	0.080	0.143	0.227	0.333	0.464	NP	NP
550	0.039	0.089	0.160	0.254	0.374	0.523	NP	NP
600	0.043	0.098	0.177	0.282	0.415	0.583	NP	NP
650	0.047	0.108	0.194	0.310	0.458	0.644	NP	NP
700	0.051	0.117	0.211	0.338	0.500	NP	NP	NP
750	0.056	0.126	0.229	0.366	0.544	NP	NP	NP
800	0.060	0.136	0.246	0.394	0.588	NP	NP	NP
850	0.064	0.145	0.264	0.423	0.633	NP	NP	NP
900	0.068	0.155	0.281	0.453	0.679	NP	NP	NP
950	0.072	0.164	0.299	0.482	NP	NP	NP	NP
1000	0.076	0.174	0.317	0.512	NP	NP	NP	NP
1050	0.080	0.183	0.335	0.542	NP	NP	NP	NP
1100	0.084	0.193	0.353	0.573	NP	NP	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-7 GRADE 40
AREA BOND BEAM/LINTEL UPLIFT STEEL DESIGN

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	24 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.005	0.012	0.021	0.033	0.048	0.065	0.085	0.108
250	0.008	0.017	0.031	0.049	0.070	0.096	0.126	0.160
300	0.010	0.023	0.041	0.065	0.093	0.127	0.167	0.212
350	0.013	0.029	0.051	0.080	0.116	0.159	0.209	0.266
400	0.015	0.034	0.061	0.096	0.139	0.191	0.251	0.319
450	0.018	0.040	0.072	0.112	0.163	0.223	0.293	0.374
500	0.020	0.046	0.082	0.128	0.186	0.255	0.336	0.429
550	0.023	0.051	0.092	0.144	0.209	0.287	0.379	0.485
600	0.025	0.057	0.102	0.161	0.233	0.320	0.423	0.542
650	0.028	0.063	0.112	0.177	0.257	0.353	0.467	0.599
700	0.030	0.069	0.123	0.193	0.280	0.386	0.511	0.657
750	0.033	0.074	0.133	0.209	0.304	0.419	0.556	0.716
800	0.035	0.080	0.143	0.226	0.329	0.453	0.601	0.776
850	0.038	0.086	0.154	0.242	0.353	0.487	0.647	0.837
900	0.040	0.091	0.164	0.259	0.377	0.521	0.694	NP
950	0.043	0.097	0.174	0.275	0.402	0.556	0.741	NP
1000	0.045	0.103	0.185	0.292	0.426	0.590	0.788	NP
1050	0.048	0.109	0.195	0.308	0.451	0.625	0.836	NP
1100	0.051	0.114	0.205	0.325	0.476	0.661	NP	NP

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.2.2B-8 GRADE 40
AREA BOND BEAM/LINTEL UPLIFT STEEL DESIGN

UPLIFT, plf (ALLOWABLE STRESS DESIGN)	32 IN. BOND BEAM/LINTEL SPAN, FT.							
	4	6	8	10	12	14	16	18
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
250	0.004	0.010	0.018	0.028	0.040	0.055	0.072	0.091
300	0.006	0.014	0.025	0.039	0.057	0.077	0.101	0.129
350	0.008	0.018	0.033	0.051	0.073	0.100	0.131	0.166
400	0.010	0.022	0.040	0.062	0.090	0.123	0.161	0.204
450	0.012	0.026	0.047	0.074	0.107	0.145	0.191	0.242
500	0.014	0.031	0.054	0.085	0.123	0.168	0.221	0.281
550	0.015	0.035	0.062	0.097	0.140	0.191	0.251	0.319
600	0.017	0.039	0.069	0.108	0.157	0.214	0.281	0.358
650	0.019	0.043	0.077	0.120	0.173	0.237	0.312	0.397
700	0.021	0.047	0.084	0.132	0.190	0.260	0.342	0.436
750	0.023	0.051	0.091	0.143	0.207	0.284	0.373	0.476
800	0.025	0.055	0.099	0.155	0.224	0.307	0.404	0.515
850	0.026	0.059	0.106	0.166	0.241	0.330	0.435	0.556
900	0.028	0.064	0.113	0.178	0.258	0.354	0.466	0.596
950	0.030	0.068	0.121	0.190	0.275	0.377	0.497	0.636
1000	0.032	0.072	0.128	0.201	0.292	0.401	0.529	0.677
1050	0.034	0.076	0.136	0.213	0.309	0.425	0.561	0.718
1100	0.035	0.080	0.143	0.225	0.326	0.449	0.592	0.760

Notes:
1. When reinforcement required is 0.00, only diaphragm chord tension reinforcement is required.
2. Diaphragm chord tension steel area shall be added to bond beam uplift steel area for total required bond beam area of steel. Select appropriate bar size and number of bars from Table R609.2.2C.

TABLE R609.3.3A-1 GRADE 60
SINGLE STORY AND TOP STORY WALLS PARALLEL TO RIDGE VERTICAL REINFORCEMENT SPACING NO. 5 BARS ($^5/_8$ IN.)

EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
100	8.00	9.87	9.87	9.87	8.34	8.34	8.34
	8.67	9.97	9.97	9.97	8.42	8.42	8.42
	9.33	10.06	10.06	10.06	8.49	8.49	8.49
	10.00	10.14	10.14	10.14	8.57	8.57	8.54
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
110	8.00	8.97	8.7	8.97	7.58	7.58	7.58
	8.67	9.06	9.06	9.06	7.65	7.56	7.65
	9.33	9.14	9.14	9.14	7.72	7.72	7.72
	10.00	9.22	9.22	9.22	7.79	7.79	7.79
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
120	8.00	8.23	8.23	8.23	6.95	6.95	6.95
	8.67	8.30	8.30	8.30	7.01	7.01	7.01
	9.33	8.38	8.38	8.38	7.08	7.08	7.08
	10.00	8.45	8.45	8.45	6.87	6.87	6.87
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
130	8.00	7.59	7.59	7.59	6.41	6.41	6.21
	8.67	7.67	7.67	7.67	6.47	6.14	5.67
	9.33	7.73	7.73	7.57	6.03	5.58	5.19
	10.00	7.80	7.36	6.90	5.44	5.07	4.74
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
140	8.00	7.05	7.05	7.05	5.95	5.76	5.27
	8.67	7.12	7.12	7.01	5.70	5.22	4.82
	9.33	7.18	6.88	6.40	5.14	4.75	4.41
	10.00	6.70	6.24	5.85	4.64	4.32	4.04
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
150	8.00	6.58	6.58	6.58	5.46	4.96	4.54
	8.67	6.64	6.50	6.01	4.91	4.50	4.15
	9.33	6.39	5.91	5.49	4.43	4.09	3.80
	10.00	5.76	5.37	5.02	4.00	3.72	3.48

TABLE R609.3.3A-2 GRADE 60
SINGLE STORY AND TOP STORY WALLS PARALLEL TO RIDGE VERTICAL REINFORCEMENT SPACING NO. 4 BARS ($^1/_2$ IN.)

EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
100	8.00	9.87	9.87	9.87	8.34	7.97	7.32
	8.67	9.97	9.97	9.97	7.79	7.17	6.65
	9.33	10.06	9.69	9.08	6.98	6.48	6.05
	10.00	9.06	8.72	8.22	6.27	5.87	5.51
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
110	8.00	8.97	8.97	8.76	7.01	6.38	5.85
	8.67	9.06	9.06	9.06	6.83	6.83	6.83
	9.33	8.45	8.45	8.45	5.99	5.99	5.99
	10.00	7.47	7.47	7.47	5.30	5.30	5.30
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
120	8.00	8.23	7.72	7.09	5.75	5.23	4.80
	8.67	8.07	8.07	8.07	5.72	5.72	5.72
	9.33	7.08	7.08	7.08	5.02	5.02	5.02
	10.00	6.26	6.26	6.26	4.43	4.43	4.43
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
130	8.00	7.04	6.41	5.88	4.82	4.38	4.01
	8.67	6.29	5.78	5.35	4.32	3.96	3.66
	9.33	5.65	5.24	4.88	3.89	3.60	3.35
	10.00	5.09	4.75	4.45	3.51	3.27	3.06
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
140	8.00	5.95	5.41	4.08	4.09	3.72	3.40
	8.67	5.33	4.89	4.52	3.68	3.37	3.11
	9.33	4.79	4.44	4.13	3.31	3.08	2.85
	10.00	4.32	4.00	3.77	2.99	2.78	2.60
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
150	8.00	5.10	4.63	4.25	3.53	3.20	2.93
	8.67	4.57	4.20	3.87	3.17	2.90	2.68
	9.33	4.12	3.81	3.54	2.86	2.64	2.45
	10.00	3.71	3.46	3.24	2.58	2.40	2.24

TABLE R609.3.3A-3 GRADE 40
SINGLE STORY AND TOP STORY WALLS PARALLEL TO RIDGE VERTICAL REINFORCEMENT SPACING NO. 5 BARS ($^5/_8$ IN.)

EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
100	8.00	9.87	9.87	9.87	8.34	8.23	7.57
	8.67	9.97	9.97	9.97	8.05	7.41	6.87
	9.33	10.06	10.01	9.38	7.22	6.70	6.25
	10.00	9.36	9.01	8.49	6.48	6.06	5.69
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
110	8.00	8.97	8.97	8.97	7.24	6.59	6.05
	8.67	9.06	9.06	9.06	7.06	7.06	7.06
	9.33	8.73	8.73	8.73	6.19	6.19	6.19
	10.00	7.72	7.72	7.72	5.47	5.47	5.47
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
120	8.00	8.23	7.98	7.33	5.95	5.41	4.96
	8.67	8.30	8.30	8.30	5.92	5.92	5.92
	9.33	7.32	7.32	7.32	5.19	5.19	5.19
	10.00	6.47	6.47	6.47	4.58	4.58	4.58
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
130	8.00	7.27	6.62	6.07	4.98	4.52	4.14
	8.67	6.50	5.98	5.53	4.47	4.10	3.78
	9.33	5.84	5.41	5.04	4.02	3.72	3.46
	10.00	5.26	4.91	4.60	3.63	3.38	3.16
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
140	8.00	6.15	5.59	5.13	4.23	3.84	3.52
	8.67	5.51	5.06	4.67	3.80	3.48	3.21
	9.33	4.95	4.59	4.27	3.43	3.17	2.94
	10.00	4.46	4.16	3.90	3.09	2.88	2.69
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
150	8.00	5.27	4.79	4.39	3.64	3.31	3.02
	8.67	4.73	4.34	4.00	3.27	3.00	2.76
	9.33	4.26	3.94	3.66	2.95	2.73	2.53
	10.00	3.84	3.58	3.35	2.66	2.48	2.32

TABLE R609.3.3A-4 GRADE 40
SINGLE STORY AND TOP STORY WALLS PARALLEL TO RIDGE VERTICAL REINFORCEMENT SPACING NO. 4 BARS ($^1/_2$ IN.)

EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
100	8.00	8.78	8.04	7.42	5.82	5.31	4.88
	8.67	7.77	7.19	6.69	5.19	4.78	4.43
	9.33	6.83	6.46	6.05	4.66	4.32	4.03
	10.00	6.04	5.81	5.48	4.18	3.91	3.67
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
110	8.00	6.94	6.34	5.84	4.67	4.25	3.90
	8.67	6.42	6.42	6.42	4.56	4.56	4.56
	9.33	5.63	5.63	5.63	4.00	4.00	4.00
	10.00	4.98	4.98	4.98	3.53	3.53	3.53
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
120	8.00	5.64	5.15	4.73	3.84	3.49	3.20
	8.67	5.38	5.38	5.38	3.82	3.82	3.82
	9.33	4.72	4.72	4.72	3.35	3.35	3.35
	10.00	4.17	4.17	4.17	2.95	2.95	2.95
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
130	8.00	4.69	4.27	3.92	3.21	2.92	2.67
	8.67	4.19	3.86	3.57	2.88	2.64	2.44
	9.33	3.77	3.49	3.25	2.60	2.40	2.23
	10.00	3.39	3.17	2.97	2.34	2.18	2.04
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
140	8.00	3.97	3.61	3.31	2.73	2.46	2.27
	8.67	3.55	3.26	3.01	2.45	2.25	2.07
	9.33	3.20	2.96	2.75	2.21	2.04	1.90
	10.00	2.88	2.69	2.52	1.99	1.86	1.74
EXPOSURE		B	B	B	C	C	C
V_{asd} as determined in accordance with Section R301.2.1.3		BUILDING WIDTH					
	WALL HEIGHT	24	32	40	24	32	40
150	8.00	3.40	3.09	2.83	2.35	2.13	1.95
	8.67	3.05	2.80	2.58	2.11	1.93	1.78
	9.33	2.75	2.54	2.36	1.90	1.76	1.63
	10.00	2.48	2.31	2.16	1.72	1.60	1.50

TABLE R609.3.3B-1 GRADE 60
MAXIMUM SPACING OF NO. 5 ($^5/_8$ IN.) VERTICAL REINFORCEMENT AT CONTINUOUS CONCRETE MASONRY LOWER STORIES OF MULTISTORY AND GABLE ENDS SINGLE STORY OR TOP STORY OF MULTISTORY, FEET

V_{asd} as determined in accordance with Section R301.2.1.3		100		110		120		130		140		150	
EXP	WALL HT	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE
B	8	9.87	10.53	8.97	9.57	8.23	8.78	7.59	8.10	7.05	7.52	6.58	7.02
	8.67	9.97	10.59	9.06	9.63	8.30	8.82	7.67	8.15	7.12	7.56	6.64	7.06
	9.33	10.06	10.64	9.14	9.68	8.38	8.87	7.73	8.19	7.18	7.60	6.70	7.10
	10	10.14	10.69	9.22	9.72	8.45	8.91	7.80	8.23	7.08	7.64	6.14	6.85
	12	10.17	10.83	8.38	9.14	7.01	7.65	5.95	6.49	5.10	5.57	4.42	4.83
	14	7.75	8.29	6.37	6.82	5.33	5.70	4.51	4.83	3.86	4.14	3.34	3.58
	16	6.12	6.43	5.03	5.29	4.19	4.41	3.55	3.73	3.03	3.19	2.62	2.76
	18	4.97	5.14	4.07	4.21	3.39	3.51	2.86	2.96	2.44	2.53	2.10	2.18
	20	4.12	4.20	3.38	3.44	2.81	2.86	2.36	2.41	2.01	2.05	1.72	1.76
	22	3.48	3.49	2.84	2.85	2.36	2.36	1.98	1.99	1.68	1.68	1.43	1.44
C	8	8.34	8.89	7.58	8.09	6.95	7.41	6.41	6.84	5.95	6.35	5.56	5.93
	8.67	8.42	8.94	7.65	8.13	7.01	7.45	6.47	6.88	6.01	6.39	5.24	5.96
	9.33	8.49	8.99	7.72	8.17	7.08	7.49	6.52	6.91	5.53	6.37	4.75	5.53
	10	8.57	9.03	7.79	8.21	6.87	7.53	5.83	6.50	5.00	5.58	4.31	4.84
	12	7.21	7.86	5.92	6.47	4.95	5.40	4.19	4.58	3.59	3.92	3.10	3.39
	14	5.47	5.86	4.49	4.81	3.75	4.01	3.16	3.39	2.70	2.90	2.33	2.50
	16	4.31	4.54	3.53	3.72	2.94	3.09	2.47	2.61	2.11	2.22	1.81	1.91
	18	3.49	3.61	2.85	2.95	2.37	2.45	1.99	2.06	1.68	1.75	1.44	1.49
	20	2.89	2.94	2.35	2.40	1.94	1.98	1.63	1.66	1.37	1.40	1.16	1.19
	22	2.43	2.43	1.97	1.98	1.62	1.63	1.35	1.35	1.13	1.14	1.03	1.26

TABLE R609.3.3B-2 GRADE 60
MAXIMUM SPACING OF NO. 4 ($^1/_2$ IN.) VERTICAL REINFORCEMENT AT CONTINUOUS MASONRY LOWER STORIES OF MULTISTORY AND GABLE ENDS SINGLE STORY OR TOP STORY OF MULTISTORY, FEET

V_{asd} as determined in accordance with Section R301.2.1.3		100		110		120		130		140		150	
EXP	WALL HT	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE
B	8	9.87	10.53	8.97	9.57	8.23	8.78	7.59	8.10	6.42	7.52	5.47	6.68
	8.67	9.97	10.59	9.06	9.63	8.07	8.82	6.86	7.76	5.77	6.68	4.93	5.80
	9.33	10.06	10.64	8.45	9.48	7.08	7.95	6.02	6.76	5.17	5.81	4.46	5.05
	10	9.06	10.09	7.47	8.32	6.26	6.97	5.32	5.92	4.57	5.09	3.96	4.42
	12	6.56	7.16	5.40	5.89	4.52	4.93	3.84	4.19	3.29	3.59	2.85	3.12
	14	5.00	5.35	4.11	4.40	3.44	3.68	2.91	3.12	2.49	2.67	2.16	2.31
	16	3.95	4.15	3.24	3.41	2.71	2.85	2.29	2.41	1.96	2.06	1.69	1.78
	18	3.21	3.31	2.63	2.72	2.19	2.27	1.85	1.91	1.58	1.63	1.36	1.41
	20	2.66	2.71	2.18	2.22	1.81	1.84	1.52	1.55	1.30	1.32	1.11	1.13
	22	2.25	2.25	1.83	1.84	1.52	1.53	1.28	1.28	1.08	1.09	0.93	0.93
C	8	8.34	8.89	7.58	8.09	6.20	7.41	5.15	6.29	4.36	5.30	3.73	4.53
	8.67	8.29	8.94	6.83	7.73	5.58	6.48	4.65	5.50	3.94	4.73	3.38	4.09
	9.33	7.28	8.17	5.99	6.73	5.02	5.64	4.21	4.79	3.57	4.11	3.06	3.57
	10	6.43	7.16	5.30	5.90	4.43	4.94	3.76	4.19	3.22	3.60	2.78	3.12
	12	4.65	5.07	3.82	4.17	3.19	3.49	2.70	2.95	2.31	2.53	2.00	2.19
	14	3.53	3.78	2.90	3.10	2.42	2.59	2.04	2.19	1.74	1.87	1.50	1.61
	16	2.78	2.93	2.28	2.40	1.90	2.00	1.60	1.68	1.36	1.43	1.17	1.23
	18	2.25	2.33	1.84	1.90	1.53	1.58	1.28	1.33	1.09	1.13	0.93	0.96
	20	1.86	1.90	1.52	1.55	1.25	1.28	1.05	1.07	0.88	0.90	0.75	0.77
	22	1.57	1.57	1.27	1.28	1.05	1.05	0.87	0.87	0.73	0.73	0.67	0.81

TABLE R609.3.3B-3 GRADE 40
MAXIMUM SPACING OF NO. 5 ($^5/_8$ IN.) VERTICAL REINFORCEMENT AT CONTINUOUS CONCRETE MASONRY LOWER STORIES OF MULTISTORY AND GABLE ENDS SINGLE STORY OR TOP STORY OF MULTISTORY, FEET

V_{asd} as determined in accordance with Section R301.2.1.3		100		110		120		130		140		150	
EXP	WALL HT	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE
B	8	9.87	10.53	8.97	9.57	8.23	8.78	7.59	8.10	6.63	7.52	5.65	6.91
	8.67	9.97	10.59	9.06	9.63	8.30	8.82	7.09	8.02	5.97	6.90	5.09	5.99
	9.33	10.06	10.64	8.73	9.68	7.32	8.21	6.22	6.98	5.35	6.00	4.61	5.21
	10	9.36	10.42	7.72	8.60	6.47	7.20	5.49	6.12	4.72	5.26	4.10	4.57
	12	6.78	7.39	5.58	6.09	4.67	5.10	3.96	4.33	3.40	3.71	2.95	3.22
	14	5.16	5.53	4.25	4.55	3.55	3.80	3.01	3.22	2.58	2.76	2.23	2.39
	16	4.08	4.29	3.35	3.52	2.80	2.94	2.36	2.49	2.02	2.13	1.74	1.84
	18	3.31	3.43	2.72	2.81	2.26	2.34	1.91	1.98	1.63	1.69	1.40	1.45
	20	2.75	2.80	2.25	2.29	1.87	1.90	1.57	1.60	1.34	1.36	1.15	1.17
	22	2.32	2.33	1.90	1.90	1.57	1.58	1.32	1.32	1.12	1.12	0.00	0.00
C	8	8.34	8.89	7.58	8.09	6.40	7.41	5.32	6.50	4.50	5.47	3.86	4.68
	8.67	8.42	8.94	7.06	7.99	5.77	6.69	4.80	5.69	4.07	4.89	3.49	4.22
	9.33	7.52	8.44	6.19	6.95	5.19	5.82	4.35	4.95	3.69	4.25	3.17	3.68
	10	6.65	7.40	5.47	6.10	4.58	5.10	3.88	4.33	3.33	3.72	2.87	3.22
	12	4.80	5.24	3.95	4.31	3.30	3.60	2.79	3.05	2.39	2.61	2.07	2.26
	14	3.65	3.91	3.00	3.21	2.50	2.68	2.11	2.26	1.80	1.93	1.55	1.67
	16	2.88	3.02	2.35	2.48	1.96	2.06	1.65	1.74	1.40	1.48	1.21	1.27
	18	2.33	2.41	1.90	1.97	1.58	1.63	1.32	1.37	1.12	1.16	0.00	0.00
	20	1.92	1.96	1.57	1.60	1.30	1.32	1.08	1.10	0.00	0.00	0.00	0.00
	22	1.62	1.62	1.31	1.32	1.08	1.09	0.00	0.00	0.00	0.00	0.00	0.00

TABLE R609.3.3B-4 GRADE 40
MAXIMUM SPACING OF NO. 4 ($^1/_2$ IN.) VERTICAL REINFORCEMENT AT CONTINUOUS CONCRETE OR MASONRY LOWER STORIES OF MULTISTORY AND GABLE ENDS SINGLE STORY OR TOP STORY OF MULTISTORY, FEET

V_{asd} as determined in accordance with Section R301.2.1.3		100		110		120		130		140		150	
EXP	WALL HT	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE	END ZONE	INT ZONE
B	8	8.89	10.23	7.41	8.44	6.21	7.08	5.10	6.02	4.28	5.18	3.64	4.46
	8.67	7.78	8.80	6.42	7.26	5.38	6.09	4.57	5.17	3.85	4.45	3.29	3.87
	9.33	6.83	7.66	5.63	6.32	4.72	5.30	4.01	4.50	3.45	3.87	2.97	3.36
	10	6.04	6.73	4.98	5.55	4.17	4.65	3.54	3.95	3.05	3.39	2.64	2.95
	12	4.38	4.77	3.60	3.93	3.02	3.29	2.56	2.79	2.19	2.40	1.90	2.08
	14	3.33	3.56	2.74	2.93	2.29	2.45	1.94	2.08	1.66	1.78	1.44	1.54
	16	2.63	2.77	2.16	2.27	1.80	1.90	1.53	1.61	1.30	1.37	1.13	1.19
	18	2.14	2.21	1.75	1.81	1.46	1.51	1.23	1.27	1.05	1.09	0.90	0.94
	20	1.77	1.81	1.45	1.48	1.21	1.23	1.02	1.03	0.86	0.88	0.74	0.76
	22	1.50	1.50	1.22	1.23	1.01	1.02	0.85	0.85	0.72	0.72	0.00	0.00
C	8	6.38	7.28	5.08	6.00	4.13	5.03	3.43	4.19	2.90	3.53	2.49	3.02
	8.67	5.53	6.25	4.56	5.15	3.72	4.32	3.10	3.67	2.62	3.15	2.25	2.72
	9.33	4.85	5.44	4.00	4.49	3.35	3.76	2.80	3.19	2.38	2.74	2.04	2.38
	10	4.29	4.78	3.53	3.93	2.95	3.29	2.51	2.79	2.15	2.40	1.85	2.08
	12	3.10	3.38	2.55	2.78	2.13	2.32	1.80	1.97	1.54	1.69	1.33	1.46
	14	2.35	2.52	1.93	2.07	1.61	1.73	1.36	1.46	1.16	1.25	1.00	1.08
	16	1.85	1.95	1.52	1.60	1.26	1.33	1.06	1.12	0.91	0.96	0.78	0.82
	18	1.50	1.55	1.23	1.27	1.02	1.05	0.85	0.89	0.72	0.75	0.00	0.00
	20	1.24	1.26	1.01	1.03	0.84	0.85	0.70	0.71	0.00	0.00	0.00	0.00
	22	1.04	1.05	0.85	0.85	0.70	0.70	0.00	0.00	0.00	0.00	0.00	0.00

TABLE R609.4A
WOOD GABLE BRACE NAILING

	V_{asd} as determined in accordance with Section R301.2.1.3	NAIL SIZE	RAKE HEIGHT					
			12	14	16	18	20	22
EXPOSURE B	100	10d	4	4	5	5	6	6
		8d	6	7	8	8	9	10
	110	10d	4	5	6	6	7	7
		8d	7	8	9	10	11	11
	120	10d	5	6	7	7	8	8
		8d	9	10	11	12	13	13
	130	10d	6	7	8	9	10	10
		8d	10	11	13	14	15	15
	140	10d	7	8	9	10	11	11
		8d	12	13	15	16	18	18
	150	10d	8	9	11	12	13	13
		8d	13	15	17	19	20	20
EXPOSURE C	100	10d	5	6	7	7	8	8
		8d	8	9	11	12	13	13
	110	10d	6	7	8	9	10	10
		8d	10	11	13	14	15	15
	120	10d	7	8	9	10	11	11
		8d	12	14	15	17	18	18
	130	10d	9	10	11	12	13	13
		8d	14	16	18	20	22	22
	140	10d	10	12	13	14	15	15
		8d	16	19	21	23	25	25
	150	10d	12	13	15	16	18	18
		8d	19	21	24	26	29	29

TABLE R609.4B
WOOD GABLE STUD CONNECTOR LOADS

	V_{asd} as determined in accordance with Section R301.2.1.3	ROOF ZONE	CONNECTOR LOADS (Allowable Stress Design)		WALL ZONE
			VERT	HORIZ[1]	
EXPOSURE B	100	2E	43	16	1E
		2E	43	11	1
	110	2E	53	20	1E
		2E	53	13	1
	120	2E	62	23	1E
		2E	62	15	1
	130	2E	73	27	1E
		2E	73	18	1
	140	2E	85	32	1E
		2E	85	21	1
	150	2E	98	36	1E
		2E	98	24	1
EXPOSURE C	100	2E	61	23	1E
		2E	61	15	1
	110	2E	74	28	1E
		2E	74	18	1
	120	2E	88	33	1E
		2E	88	22	1
	130	2E	103	38	1E
		2E	103	25	1
	140	2E	119	45	1E
		2E	119	30	1
	150	2E	137	51	1E
		2E	137	34	1

1. Unit load on stud. Multiply by $^1/_2$ stud length plus $^1/_2$ wall height for total connector load.

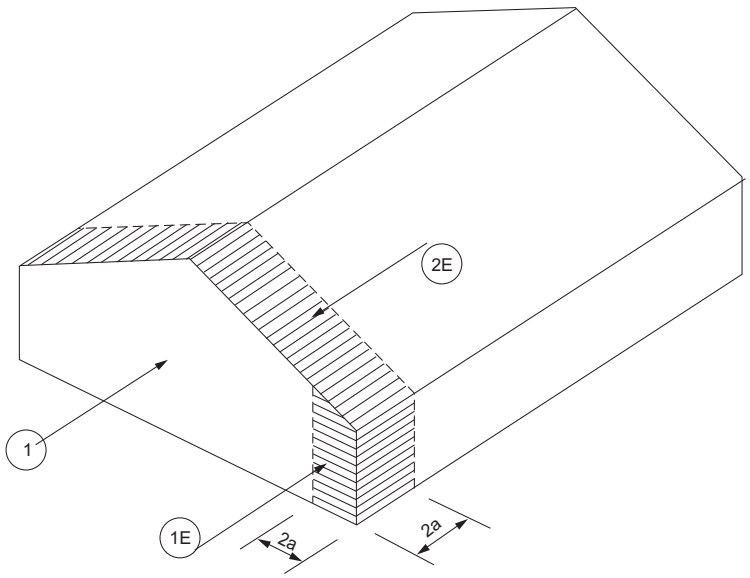


TABLE R609.4.4
ANCHOR BOLT SPACING FOR ATTACHING 2 × 4 MINIMUM WOOD NAILER TO RAKE BEAM

REQUIRED ROOF DIAPHRAGM CAPACITY (ALLOWABLE STRESS DESIGN)	1/2-INCH ANCHOR BOLT MAXIMUM SPACING
≤105	6′- 0″
145	5′ - 0″
195	4′- 0″
230	3′- 6″
270	3′- 0″
325	2′- 6″
415	2′- 0″
565	1′- 6″
700	1′- 2″
845	1′- 0″

R609.5 Exterior shearwalls. Each exterior wall shall have the required length of effective shearwall to resist horizontal movement or forces at the ends of diaphragms in conformance with this section.

R609.5.1 Shearwall lengths. The required shearwall segment length shall be as set forth in Tables R609.5.1A through R609.5.1R as applicable.

R609.5.2 Multistory shearwalls. Shearwall segments in an upper story shall be located directly over and within the length of shearwall segments in the story below. Reinforcement at the ends of shearwall segments shall be continuous from the bond beam of the upper story through the story below.

R609.5.3 The connector load for total shear at the top story wall shall be determined in accordance with Table R609.5.3A and Figure R609.5.3. Transverse connector loads shall be in accordance with Table R609.5.3B and Figure R609.5.3.

R609.5.4 Endwall roof shear loads shall be in accordance with Table R609.5.4.

R609.6 Assemblies and beams spanning openings.

R609.6.1 Preengineered assemblies for masonry walls.

R609.6.1.1 Unreinforced masonry units above an opening and 8-inch (203 mm) high bond beams above an opening shall be supported by an assembly.

R609.6.1.2 Preengineered assemblies shall be selected from a manufacturer's approved schedule or other approved tables for the load capacities based on the appropriate minimum gravity load carrying capacities established in Tables R609.6.1.2(1), R609.6.1.2(2), and R609.6.1.2(3).

R609.6.1.3 Preengineered assemblies may function as a bond beam over an opening provided that:

1. The bond beam reinforcement is continuous through the assembly.
2. The assembly has an uplift rating that equals or exceeds the appropriate value stipulated in Table R609.6.1.2(1) if the lintel directly supports a roof.

Exception: If the reinforcement in the top of the assembly is equal to or greater than the reinforcement required in the bottom of the assembly by the manufacturer, uplift need not be considered.

R609.6.1.4 Preengineered assemblies spanning openings shall extend a minimum of 4 inches (102 mm) nominal past each side of the opening.

609.6.2 Continuous bond beams spanning openings.

609.6.2.1 Under the provisions of this section, bond beams shall:

1. Be 16 inches (406 mm) high nominal over openings, except cast-in-place concrete bond beams, which may be 12 inches (305 mm) high nominal.
2. Have top reinforcement continuous over the wall and opening.
3. Have bottom reinforcement extending past each side of the opening a minimum of 24 inches (610 mm) for concrete walls and 4 inches (102 mm) for masonry walls.
4. Meet the provisions of Tables R609.6.2.1(1), R609.6.2.1 (2) and R609.6.2.1 (3) as appropriate.

609.6.2.2 Top reinforcement required over the opening which is in addition to that required over the wall shall extend past the opening a minimum of 24 inches (610 mm).

609.6.2.3 When pre-engineered assemblies are utilized to form the bottom portion of the bond beam over the opening in masonry walls, the bottom reinforcement of the pre-engineered assemblies shall be counted toward the additional bottom reinforcement required over the opening.

R609.6.3 Bond beams combined with lintels.

R609.6.3.1 The provisions of this section shall apply when the lintel, the wall area between the lintel and the bond beam, and the bond beam itself are solid grouted masonry units or cast together as one unit.

R609.6.3.2 Combined bond beams/lintels shall meet the requirements of the appropriate Table R609.6.3.2(1), R609.6.3.2(2) or R609.6.3.2(3).

R609.6.3.3 Top reinforcement which is in addition to that required in the bond beam over the wall shall extend a minimum of 24 inches (610 mm) past each side of the opening. Top bond beam reinforcement shall be continuous over wall and opening.

609.6.3.4 Bottom reinforcing shall extend past each side of the opening a minimum of 24 inches (610 mm) for concrete walls and 4 inches (102 mm) for masonry walls. When using a precast lintel, the reinforcing in the precast lintel shall be included when determining the total amount of bottom reinforcement furnished.

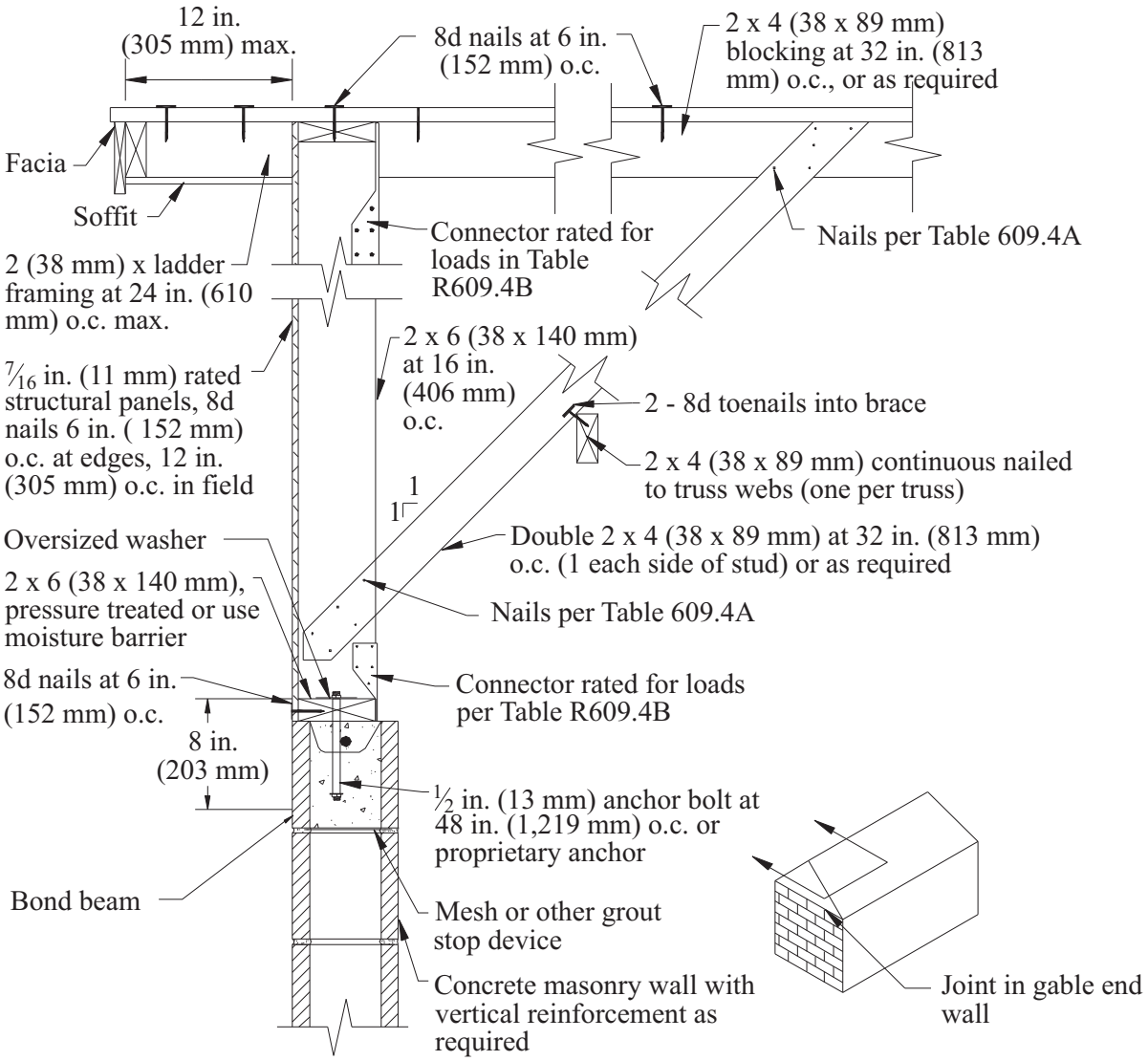


FIGURE R609.4
GABLE END BRACING FOR MASONRY WALLS NOT CONTINUOUS TO THE ROOF DIAPHRAGM

609.6.3.5 For masonry walls, a cleanout shall be provided in the cells directly above the ends of the lintel when the reinforcing steel in the bottom of the lintel is more than 22 inches (559 mm) below the top of the bond beam.

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. Design wind pressures calculated according to ASCE 7 or obtained from Table R301.2(2) are permitted to be multiplied by 0.6.

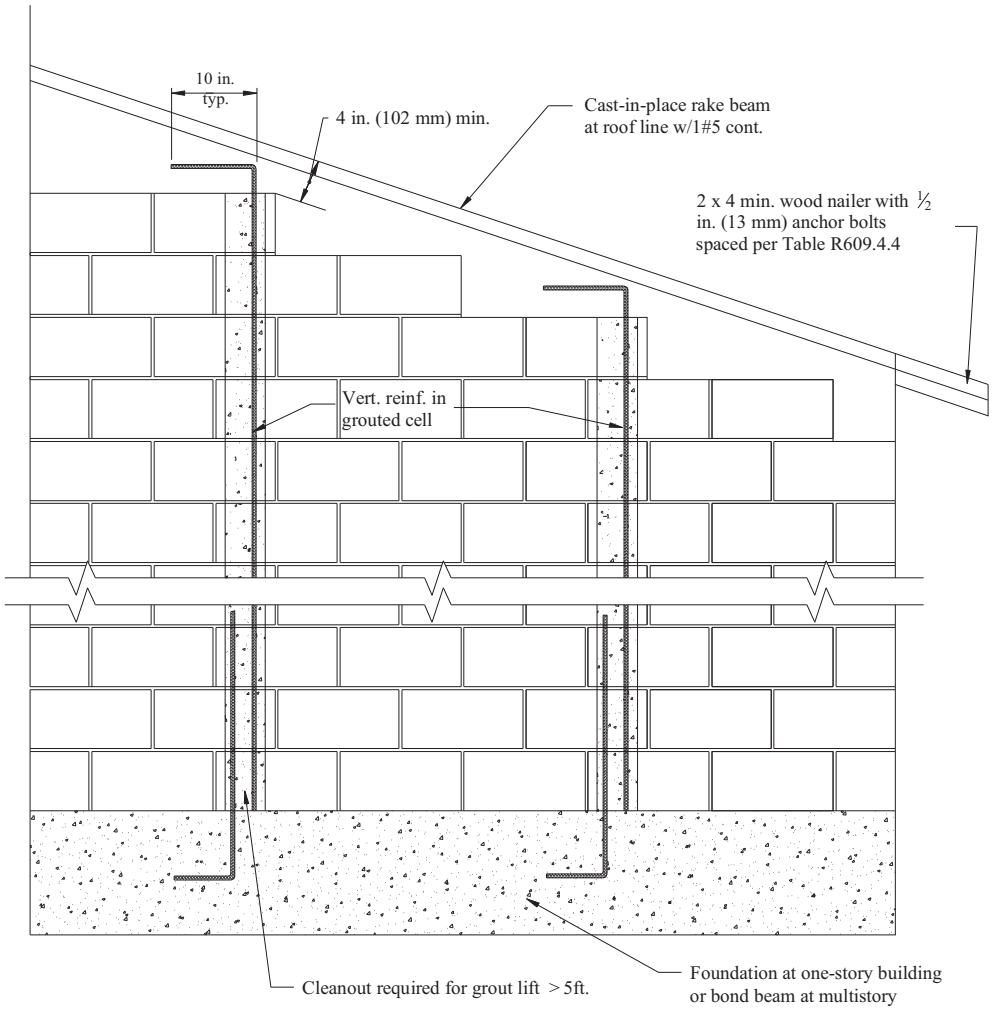


FIGURE R609.4.1
CONTINUOUS GABLE ENDWALL REINFORCEMENT ONE AND MULTISTORY

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 33 psf (958 Pa). Design wind pressures calculated according to ASCE 7 or obtained from Table R301.2(2) are permitted to be multiplied by 0.6.

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 $^{l}/_{600}$.

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 single unit panels, lateral support shall be provided by panel

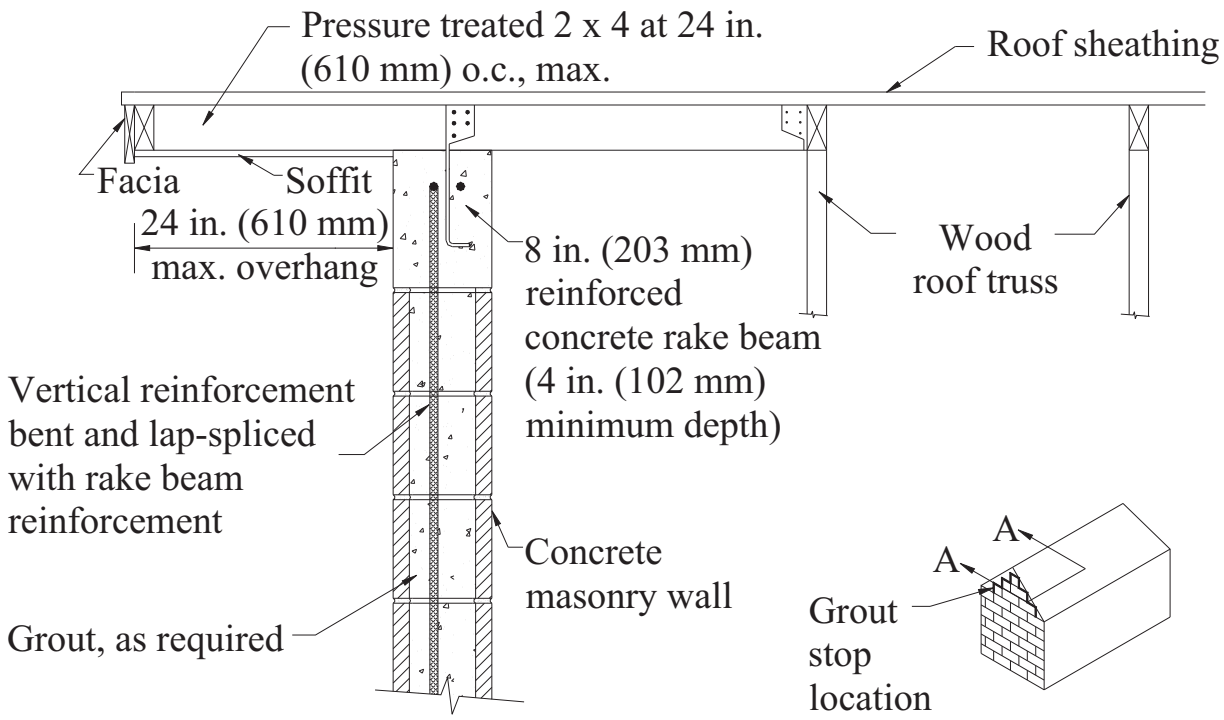


FIGURE R609.4.5
GABLE OVERHANG

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.

TABLE R609.5.1A GRADE 60
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1,2,3,5]
ROOF ANGLE ≤ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.62	2.31	3.14	3.68	4.98	6.49	5.41	7.28	9.43
	110	1.96	2.79	3.80	4.45	6.03	7.85	6.55	8.81	11.42
	120	2.33	3.32	4.52	5.30	7.17	9.34	7.79	10.48	13.58
	130	2.73	3.90	5.31	6.22	8.42	10.96	9.14	12.30	15.94
	140	3.17	4.52	6.16	7.22	9.376	12.71	10.60	14.27	18.49
	150	3.64	5.19	7.07	8.28	11.21	14.59	12.17	16.38	21.23
C	100	1.92	2.77	3.82	4.86	6.63	8.69	7.56	10.15	13.13
	110	2.32	3.35	4.62	5.88	8.02	10.52	9.14	12.28	15.88
	120	2.76	3.99	5.50	7.00	9.54	12.52	10.88	14.61	18.90
	130	3.24	4.68	6.46	8.21	11.20	14.69	12.77	17.15	22.18
	140	3.76	5.43	7.49	9.53	12.99	17.04	14.81	19.89	25.73
	150	4.32	6.23	8.59	10.94	14.91	19.56	17.00	22.83	29.53

REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1,2,3,6]
ROOF ANGLE ≤ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.09	1.55	2.12	2.48	3.35	4.37	3.64	4.90	6.35
	110	1.32	1.88	2.56	3.00	4.06	5.28	4.41	5.93	7.68
	120	1.57	2.23	3.05	3.57	4.83	6.29	5.24	7.06	9.14
	130	1.84	2.62	3.57	4.19	5.67	7.38	6.16	8.28	10.73
	140	2.13	3.04	4.15	4.86	6.57	8.56	7.14	9.60	12.45
	150	2.45	3.49	4.76	5.58	7.54	9.82	8.19	11.02	14.29
C	100	1.29	1.86	2.57	3.27	4.46	5.85	5.09	6.83	8.84
	110	1.56	2.26	3.11	3.96	5.40	7.08	6.16	8.26	10.69
	120	1.86	2.68	3.70	4.71	6.42	8.43	7.33	9.84	12.72
	130	2.18	3.15	4.35	5.53	7.54	9.89	8.60	11.54	14.93
	140	2.53	3.65	5.04	6.41	8.74	11.47	9.97	13.39	17.32
	150	2.91	4.19	5.79	7.36	10.04	13.17	11.45	15.37	19.88

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shearwall piers and shearwall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shearwall segments above and below piers. The total area of openings in any one segment of shearwall shall not exceed 144 square inches.
4. Required shearwall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1B GRADE 60
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1,2,3,5]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.66	2.45	3.40	3.55	4.92	6.49	5.18	7.13	9.36
	110	2.01	2.96	4.11	4.30	5.96	7.86	6.27	8.63	11.32
	120	2.39	3.52	4.89	5.12	7.09	9.35	7.46	10.27	13.47
	130	2.81	4.13	5.74	6.00	8.32	10.97	8.76	12.05	15.81
	140	3.26	4.79	6.66	6.96	9.65	12.73	10.15	13.98	18.34
	150	3.74	5.50	7.64	7.99	11.08	14.61	11.66	16.05	21.05
C	100	2.00	2.99	4.21	4.73	6.62	8.82	7.22	9.92	12.97
	110	2.42	3.62	5.10	5.72	8.01	10.67	8.74	12.00	15.70
	120	2.88	4.30	6.07	6.81	9.53	12.70	10.40	14.28	18.68
	130	3.37	5.05	7.12	7.99	11.19	14.90	12.20	16.76	21.92
	140	3.91	5.86	8.26	9.27	12.98	17.28	14.15	19.43	25.43
	150	4.49	6.73	9.48	10.64	14.90	19.84	16.25	22.31	29.19

REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1,2,3,6]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.12	1.65	2.29	2.39	3.31	4.37	3.49	4.80	6.30
	110	1.35	1.99	2.77	2.89	4.01	5.29	4.22	5.81	7.62
	120	1.61	2.37	3.29	3.44	4.77	6.29	5.02	6.91	9.07
	130	1.89	2.78	3.86	4.04	5.60	7.39	5.89	8.11	10.64
	140	2.19	3.23	4.48	4.69	6.50	8.57	6.84	9.41	12.34
	150	2.52	3.71	5.14	5.38	7.46	9.83	7.85	10.80	14.17
C	100	1.34	2.01	2.84	3.18	4.46	5.93	4.86	6.67	8.73
	110	1.63	2.44	3.43	3.85	5.39	7.18	5.88	8.08	10.57
	120	1.94	2.90	4.08	4.58	6.42	8.55	7.00	9.61	12.57
	130	2.27	3.40	4.79	5.38	7.53	10.03	8.21	11.28	14.76
	140	2.63	3.94	5.56	6.24	8.74	11.63	9.53	13.08	17.12
	150	3.02	4.53	6.38	7.16	10.03	13.35	10.94	15.02	19.65

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shearwall piers and shearwall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shearwall segments above and below piers. The total area of openings in any one segment of shearwall shall not exceed 144 square inches.
4. Required shearwall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1C GRADE 60
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1,2,3,5]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	2.11	3.24	4.64	2.11	5.72	7.73	5.77	8.17	11.00
	110	2.56	3.92	5.61	4.85	6.92	9.36	6.98	9.89	13.31
	120	3.05	4.67	6.68	5.77	8.23	11.13	8.31	11.77	15.85
	130	3.57	5.48	7.84	6.77	9.66	13.07	9.75	13.81	18.60
	140	4.15	6.35	9.09	7.85	11.20	15.16	11.31	16.02	21.57
	150	4.76	7.29	10.43	9.01	12.86	17.40	12.98	18.39	24.76
C	100	2.63	4.13	6.03	5.45	7.90	10.84	7.22	9.92	12.97
	110	3.18	4.99	7.30	6.60	9.56	13.12	8.74	12.00	15.70
	120	3.79	5.94	8.68	7.85	11.38	15.61	10.40	14.28	18.68
	130	4.45	6.97	10.19	9.21	13.35	18.32	12.20	16.76	21.92
	140	5.16	8.09	11.82	10.68	15.48	21.25	14.15	19.43	25.43
	150	5.92	9.28	13.57	12.26	17.77	24.39	16.25	22.31	29.19

REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1,2,3,6]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.42	2.18	3.12	2.70	3.85	5.21	3.88	5.50	7.41
	110	1.72	2.64	3.78	3.26	4.66	6.30	4.70	6.66	8.96
	120	2.05	3.14	4.49	3.88	5.54	7.50	5.59	7.92	10.67
	130	2.41	3.69	5.27	4.56	6.50	8.80	6.56	9.30	12.52
	140	2.79	4.27	6.12	5.29	7.54	10.20	7.61	10.78	14.52
	150	3.20	4.91	7.02	6.07	8.66	11.71	8.74	12.38	16.67
C	100	1.77	2.78	4.06	3.67	5.32	7.30	5.38	7.59	10.18
	110	2.14	3.36	4.91	4.44	6.43	8.83	6.51	9.19	12.32
	120	2.55	4.00	5.85	5.28	7.66	10.51	7.75	10.93	14.66
	130	2.99	4.69	6.86	6.20	8.99	12.33	9.09	12.83	17.21
	140	3.47	5.44	7.96	7.19	10.42	14.30	10.55	14.88	19.96
	150	3.98	6.25	9.13	8.26	11.96	16.42	12.11	17.09	22.91

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shearwall piers and shearwall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shearwall segments above and below piers. The total area of openings in any one segment of shearwall shall not exceed 144 square inches.
4. Required shearwall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1D GRADE 60
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,5]
ROOF ANGLE 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.054	0.053	0.053	0.142	0.142	0.141	0.231	0.231	0.230
	110	0.065	0.065	0.064	0.172	0.172	0.171	0.279	0.279	0.278
	120	0.077	0.077	0.076	0.205	0.204	0.204	0.333	0.332	0.331
	130	0.091	0.090	0.089	0.240	0.240	0.239	0.390	0.390	0.389
	140	0.105	0.104	0.103	0.279	0.278	0.277	0.453	0.452	0.451
	150	0.121	0.120	0.119	0.320	0.319	0.318	0.520	0.519	0.518
C	100	0.075	0.075	0.074	0.199	0.199	0.198	0.324	0.323	0.322
	110	0.091	0.090	0.089	0.241	0.241	0.240	0.392	0.391	0.390
	120	0.108	0.108	0.106	0.287	0.287	0.285	0.466	0.466	0.464
	130	0.127	0.126	0.125	0.337	0.336	0.335	0.547	0.546	0.545
	140	0.147	0.147	0.145	0.391	0.390	0.388	0.635	0.634	0.632
	150	0.169	0.168	0.166	0.449	0.448	0.446	0.729	0.728	0.726

REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,6]
ROOF ANGLE 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY PF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.036	0.036	0.035	0.096	0.096	0.095	0.155	0.155	0.155
	110	0.044	0.043	0.043	0.116	0.116	0.115	0.188	0.188	0.187
	120	0.052	0.052	0.051	0.138	0.138	0.137	0.224	0.224	0.223
	130	0.061	0.061	0.060	0.162	0.162	0.161	0.263	0.262	0.262
	140	0.071	0.070	0.070	0.188	0.187	0.186	0.305	0.304	0.303
	150	0.081	0.081	0.080	0.215	0.215	0.214	0.350	0.349	0.348
C	100	0.051	0.050	0.050	0.134	0.134	0.133	0.218	0.218	0.217
	110	0.061	0.061	0.060	0.162	0.162	0.161	0.264	0.263	0.263
	120	0.073	0.072	0.072	0.193	0.193	0.192	0.314	0.313	0.313
	130	0.086	0.085	0.084	0.227	0.226	0.225	0.368	0.368	0.367
	140	0.099	0.099	0.097	0.263	0.263	0.261	0.427	0.427	0.425
	150	0.114	0.113	0.112	0.302	0.301	0.300	0.490	0.490	0.488

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shearwall piers and shearwall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shearwall segments above and below piers. The total area of openings in any one segment of shearwall shall not exceed 144 square inches.
4. Required shearwall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1E GRADE 60
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,5]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.088	0.102	0.117	0.166	0.180	0.195	0.243	0.257	0.272
	110	0.107	0.124	0.142	0.201	0.217	0.236	0.294	0.311	0.329
	120	0.127	0.147	0.169	0.239	0.259	0.280	0.350	0.371	0.392
	130	0.149	0.173	0.198	0.280	0.304	0.329	0.411	0.435	0.460
	140	0.173	0.200	0.230	0.325	0.352	0.382	0.477	0.504	0.534
	150	0.199	0.230	0.264	0.373	0.404	0.438	0.548	0.579	0.613
C	100	0.124	0.143	0.164	0.232	0.252	0.273	0.341	0.361	0.382
	110	0.150	0.173	0.199	0.281	0.305	0.330	0.413	0.437	0.462
	120	0.178	0.206	0.237	0.335	0.363	0.393	0.491	0.519	0.550
	130	0.209	0.242	0.278	0.393	0.426	0.461	0.577	0.610	0.645
	140	0.242	0.281	0.322	0.456	0.494	0.535	0.669	0.707	0.748
	150	0.278	0.322	0.370	0.523	0.567	0.614	0.768	0.812	0.859

REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,6]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.059	0.069	0.079	0.112	0.121	0.131	0.164	0.173	0.183
	110	0.072	0.083	0.095	0.135	0.146	0.159	0.198	0.210	0.222
	120	0.086	0.099	0.114	0.161	0.174	0.189	0.236	0.249	0.264
	130	0.100	0.116	0.133	0.189	0.204	0.222	0.277	0.293	0.310
	140	0.116	0.135	0.155	0.219	0.237	0.257	0.321	0.339	0.359
	150	0.134	0.155	0.177	0.251	0.272	0.295	0.369	0.390	0.412
C	100	0.083	0.096	0.111	0.156	0.170	0.184	0.230	0.243	0.257
	110	0.101	0.117	0.134	0.189	0.205	0.222	0.278	0.294	0.311
	120	0.120	0.139	0.159	0.225	0.244	0.265	0.331	0.350	0.370
	130	0.141	0.163	0.187	0.264	0.287	0.311	0.388	0.410	0.434
	140	0.163	0.189	0.217	0.307	0.333	0.360	0.450	0.476	0.504
	150	0.187	0.217	0.249	0.352	0.382	0.413	0.517	0.546	0.578

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shearwall piers and shearwall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shearwall segments above and below piers. The total area of openings in any one segment of shearwall shall not exceed 144 square inches.
4. Required shearwall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1F GRADE 60
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,5]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.118	0.142	0.168	0.196	0.220	0.246	0.273	0.297	0.323
	110	0.143	0.172	0.204	0.237	0.266	0.297	0.331	0.360	0.391
	120	0.170	0.205	0.242	0.282	0.317	0.354	0.393	0.428	0.466
	130	0.200	0.241	0.284	0.331	0.372	0.415	0.462	0.503	0.546
	140	0.232	0.279	0.330	0.384	0.431	0.482	0.536	0.583	0.634
	150	0.266	0.320	0.378	0.440	0.495	0.553	0.615	0.669	0.727
C	100	0.166	0.200	0.236	0.274	0.308	0.345	0.383	0.417	0.453
	110	0.200	0.241	0.285	0.332	0.373	0.417	0.464	0.505	0.549
	120	0.239	0.287	0.340	0.395	0.444	0.496	0.552	0.600	0.653
	130	0.280	0.337	0.399	0.464	0.521	0.582	0.647	0.705	0.766
	140	0.325	0.391	0.462	0.538	0.604	0.675	0.751	0.817	0.888
	150	0.373	0.449	0.531	0.617	0.694	0.775	0.862	0.938	1.020

REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1,2,3,4,6]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.080	0.096	0.113	0.132	0.148	0.165	0.184	0.200	0.218
	110	0.096	0.116	0.137	0.159	0.179	0.200	0.223	0.242	0.263
	120	0.115	0.138	0.163	0.190	0.213	0.238	0.265	0.288	0.313
	130	0.134	0.162	0.191	0.223	0.250	0.280	0.311	0.338	0.368
	140	0.156	0.188	0.222	0.258	0.290	0.324	0.361	0.392	0.427
	150	0.179	0.216	0.255	0.296	0.333	0.372	0.414	0.450	0.490
C	100	0.111	0.134	0.159	0.185	0.208	0.232	0.258	0.281	0.305
	110	0.135	0.163	0.192	0.223	0.251	0.281	0.312	0.340	0.369
	120	0.161	0.193	0.229	0.266	0.299	0.334	0.371	0.404	0.439
	130	0.188	0.227	0.268	0.312	0.351	0.392	0.436	0.474	0.516
	140	0.219	0.263	0.311	0.362	0.407	0.455	0.505	0.550	0.598
	150	0.251	0.302	0.357	0.416	0.467	0.522	0.580	0.632	0.687

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not one continuous shear wall segment, the total shear wall length required shall be increased by 0.67 feet (8 inches) for each additional shear wall segment making up the total shear wall length on a side.
2. The minimum shear wall segment length shall be 2 feet-0 inches. Values less than 2 feet-0 inches are shown only for summation of shear wall segments and for interpolation purposes. A grouted cell with vertical reinforcement of the size indicated is required at each end of every shear wall segment.
3. Other than incidental utility penetrations, shear wall piers and shear wall segments shall not contain openings with a maximum horizontal or vertical dimension of 5 inches for piers and 12 inches for portions of shear wall segments above and below piers. The total area of openings in any one segment of shear wall shall not exceed 144 square inches.
4. Required shear wall lengths normal (perpendicular) to the ridge are per lineal foot of building length. Multiply tabular values by building length distance between adjacent shear walls perpendicular to the ridge if interior shear walls are used for total shear wall length required.
5. Shear wall lengths are based on shear wall segment heights of 80 inches (height from the floor to the top of the highest opening adjacent to the shear segment—corners and openings as permitted by Note 3 of this table are not considered for the purpose of this measurement). For shear segment heights other than 80 inches, multiply tabular length values as follows:

Segment Height (inches)	Length Multiplier
88	1.09
96	1.19
104	1.28
112	1.37

TABLE R609.5.1G GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1, 2, 3, 5]
ROOF ANGLE ≤ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	2.32	3.31	4.51	5.29	7.15	9.31	7.77	10.45	13.55
	110	2.81	4.01	5.46	6.40	8.65	11.27	9.40	12.65	16.39
	120	3.35	4.77	6.50	7.61	10.30	13.41	11.19	15.05	19.51
	130	3.93	5.59	7.63	8.94	12.09	15.74	13.13	17.67	22.90
	140	4.55	6.49	8.84	10.36	14.02	18.26	15.23	20.49	26.56
	150	5.23	7.45	10.15	11.90	16.09	20.96	17.48	23.52	30.48
C	100	2.75	3.98	5.49	6.98	9.52	12.49	10.85	14.57	18.85
	110	3.33	4.81	6.64	8.45	11.52	15.11	13.13	17.63	22.81
	120	3.97	5.73	7.90	10.05	13.70	17.98	15.63	20.98	27.14
	130	4.66	6.72	9.27	11.80	16.08	21.10	18.34	24.63	31.86
	140	5.40	7.79	10.75	13.68	18.65	24.47	21.27	28.56	36.95
	150	6.20	8.95	12.34	15.71	21.41	28.10	24.42	32.79	42.41

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length required.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches and shearwall segment length of 24 inches.
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches and shearwall segment length of 24 inches.

TABLE R609.5.1H GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1, 2, 3, 6]
ROOF ANGLE ≤ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY BUILDING WIDTH			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY BUILDING WIDTH			1ST STORY OF 3 STORY BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.59	2.26	3.08	3.61	4.88	6.36	5.30	7.14	9.25
	110	1.92	2.73	3.73	4.37	5.91	7.69	6.42	8.63	11.19
	120	2.28	3.25	4.44	5.20	7.03	9.16	7.64	10.28	13.32
	130	2.68	3.82	5.21	6.10	8.25	10.75	8.96	12.06	15.63
	140	3.11	4.43	6.04	7.07	9.57	12.46	10.40	13.99	18.13
	150	3.57	5.08	6.93	8.12	10.99	14.31	11.93	16.06	20.81
C	100	1.88	2.71	3.75	4.77	6.50	8.52	7.41	9.95	12.87
	110	2.28	3.28	4.53	5.77	7.86	10.31	8.96	12.04	15.57
	120	2.71	3.91	5.39	6.86	9.36	12.28	10.67	14.32	18.53
	130	3.18	4.59	6.33	8.05	10.98	14.41	12.52	16.81	21.75
	140	3.69	5.32	7.34	9.34	12.73	16.71	14.52	19.50	25.22
	150	4.23	6.11	8.43	10.72	14.62	19.18	16.67	22.38	28.95

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length required.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches and shearwall segment length of 24 inches.
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches and shearwall segment length of 24 inches.

TABLE R609.5.1I GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1, 2, 3, 5]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	2.39	3.51	4.88	5.10	7.07	9.32	7.44	10.24	13.44
	110	2.89	4.25	5.90	6.17	8.55	11.28	9.00	12.39	16.26
	120	3.43	5.06	7.02	7.35	10.18	13.43	10.71	14.75	19.35
	130	4.03	5.94	8.24	8.62	11.95	15.76	12.57	17.31	22.71
	140	4.67	6.89	9.56	10.00	13.86	18.28	14.58	20.08	26.34
	150	5.37	7.90	10.98	11.48	15.91	20.98	16.74	23.05	30.23
C	100	2.87	4.29	6.05	6.79	9.51	12.66	10.37	14.24	18.63
	110	3.47	5.19	7.32	8.22	11.51	15.32	12.55	17.23	22.54
	120	4.13	6.18	8.71	9.78	13.69	18.23	14.93	20.51	26.83
	130	4.85	7.26	10.23	11.48	16.07	21.40	17.53	24.06	31.49
	140	5.62	8.41	11.86	13.31	18.64	24.82	20.33	27.91	36.52
	150	6.45	9.66	13.62	15.28	21.39	28.49	23.33	32.04	41.92

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length required.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1J GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1, 2, 3, 6]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	1.63	2.40	3.33	3.48	4.83	6.37	5.08	6.99	9.17
	110	1.97	2.90	4.03	4.21	5.84	7.70	6.15	8.46	11.10
	120	2.34	3.45	4.80	5.02	6.95	9.17	7.31	10.07	13.21
	130	2.75	4.05	5.63	5.89	8.16	10.76	8.58	11.82	15.50
	140	3.19	4.70	6.53	6.83	9.46	12.48	9.96	13.71	17.98
	150	3.66	5.40	7.49	7.84	10.86	14.32	11.43	15.73	20.64
C	100	1.96	2.93	4.13	4.64	6.49	8.64	7.08	9.72	12.72
	110	2.37	3.55	5.00	5.61	7.85	10.46	8.57	11.76	15.39
	120	2.82	4.22	5.95	6.68	9.35	12.45	10.19	14.00	18.31
	130	3.31	4.95	6.98	7.84	10.97	14.61	11.96	16.43	21.49
	140	3.84	5.74	8.10	9.09	12.72	16.94	13.88	19.05	24.93
	150	4.41	6.59	9.29	10.43	14.61	19.45	15.93	21.87	28.62

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length required.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1K GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 4 REINFORCEMENT[1, 2, 3, 5]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	3.04	4.65	6.66	3.04	8.21	11.11	8.28	11.74	15.80
	110	3.68	5.63	8.06	6.96	9.93	13.44	10.02	14.20	19.12
	120	4.37	6.70	9.59	8.29	11.82	15.99	11.93	16.90	22.76
	130	5.13	7.86	11.25	9.72	13.87	18.77	14.00	19.84	26.71
	140	5.95	9.12	13.05	11.28	16.09	21.77	16.24	23.01	30.97
	150	6.83	10.47	14.98	12.95	18.47	24.99	18.64	26.41	35.56
C	100	3.78	5.93	8.66	7.83	11.34	15.57	10.37	14.24	18.63
	110	4.57	7.17	10.48	9.47	13.73	18.84	12.55	17.23	22.54
	120	5.44	8.53	12.47	11.27	16.34	22.42	14.93	20.51	26.83
	130	6.39	10.01	14.64	13.23	19.17	26.31	17.53	24.06	31.49
	140	7.41	11.61	16.98	15.34	22.24	30.52	20.33	27.91	36.52
	150	8.50	13.33	19.49	17.61	25.53	35.03	23.33	32.04	41.92

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall required.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1L GRADE 40
REQUIRED SHEARWALL LENGTH PARALLEL TO RIDGE NO. 5 REINFORCEMENT[1, 2, 3, 6]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	2.07	3.18	4.55	3.93	5.60	7.58	5.66	8.01	10.79
	110	2.51	3.84	5.50	4.75	6.78	9.17	6.84	9.70	13.05
	120	2.99	4.57	6.55	5.66	8.07	10.92	8.14	11.54	15.54
	130	3.50	5.37	7.68	6.64	9.47	12.81	9.56	13.54	18.23
	140	4.06	6.23	8.91	7.70	10.99	14.86	11.08	15.71	21.15
	150	4.67	7.15	10.23	8.84	12.61	17.06	12.72	18.03	24.27
C	100	2.58	4.05	5.91	5.34	7.74	10.63	7.84	11.06	14.83
	110	3.12	4.89	7.15	6.47	9.37	12.86	9.48	13.38	17.94
	120	3.71	5.83	8.51	7.69	11.15	15.31	11.29	15.93	21.36
	130	4.36	6.84	9.99	9.03	13.09	17.96	13.25	18.69	25.06
	140	5.06	7.93	11.59	10.47	15.18	20.83	15.36	21.68	29.07
	150	5.80	9.10	13.30	12.02	17.43	23.92	17.63	24.88	33.37

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1M GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 5]
ROOF ANGLE ≤ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.077	0.077	0.076	0.204	0.204	0.203	0.332	0.331	0.330
	110	0.093	0.093	0.092	0.247	0.247	0.246	0.401	0.401	0.400
	120	0.111	0.110	0.109	0.294	0.294	0.292	0.478	0.477	0.476
	130	0.130	0.129	0.128	0.345	0.345	0.343	0.561	0.560	0.558
	140	0.151	0.150	0.148	0.400	0.400	0.398	0.650	0.649	0.647
	150	0.173	0.172	0.170	0.460	0.459	0.457	0.746	0.745	0.743
C	100	0.108	0.107	0.106	0.286	0.286	0.285	0.465	0.464	0.463
	110	0.131	0.130	0.128	0.347	0.346	0.344	0.563	0.562	0.560
	120	0.155	0.155	0.153	0.413	0.412	0.410	0.670	0.669	0.667
	130	0.182	0.181	0.179	0.484	0.483	0.481	0.786	0.785	0.783
	140	0.212	0.210	0.208	0.562	0.560	0.558	0.911	0.910	0.908
	150	0.243	0.242	0.239	0.645	0.643	0.640	1.046	1.045	1.042

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1N GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 6]
ROOF ANGLE $\leq$ 23°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.053	0.052	0.052	0.139	0.139	0.139	0.226	0.226	0.226
	110	0.064	0.063	0.063	0.169	0.168	0.168	0.274	0.274	0.273
	120	0.076	0.075	0.074	0.201	0.200	0.200	0.326	0.326	0.325
	130	0.089	0.088	0.087	0.236	0.235	0.234	0.383	0.382	0.381
	140	0.103	0.102	0.101	0.273	0.273	0.272	0.444	0.443	0.442
	150	0.118	0.118	0.116	0.314	0.313	0.312	0.509	0.509	0.507
C	100	0.074	0.073	0.072	0.196	0.195	0.194	0.317	0.317	0.316
	110	0.089	0.089	0.088	0.237	0.236	0.235	0.384	0.384	0.383
	120	0.106	0.106	0.104	0.282	0.281	0.280	0.457	0.457	0.455
	130	0.125	0.124	0.122	0.331	0.330	0.328	0.536	0.536	0.534
	140	0.144	0.144	0.142	0.383	0.383	0.381	0.622	0.621	0.620
	150	0.166	0.165	0.163	0.440	0.439	0.437	0.714	0.713	0.711

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1O GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 5]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.127	0.147	0.168	0.238	0.258	0.280	0.349	0.370	0.391
	110	0.153	0.178	0.204	0.288	0.312	0.338	0.423	0.447	0.473
	120	0.182	0.211	0.242	0.343	0.372	0.403	0.503	0.532	0.563
	130	0.214	0.248	0.284	0.402	0.436	0.473	0.591	0.624	0.661
	140	0.248	0.288	0.330	0.467	0.506	0.548	0.685	0.724	0.766
	150	0.285	0.330	0.379	0.536	0.581	0.629	0.786	0.831	0.880
C	100	0.178	0.206	0.236	0.334	0.362	0.392	0.490	0.518	0.548
	110	0.215	0.249	0.285	0.404	0.438	0.474	0.593	0.627	0.663
	120	0.256	0.296	0.340	0.481	0.521	0.565	0.706	0.746	0.789
	130	0.300	0.348	0.399	0.564	0.612	0.663	0.828	0.876	0.926
	140	0.348	0.403	0.462	0.654	0.709	0.768	0.960	1.015	1.074
	150	0.400	0.463	0.531	0.751	0.814	0.882	1.102	1.166	1.233

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1P GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 6]
ROOF ANGLE 30°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.087	0.100	0.115	0.163	0.176	0.191	0.239	0.252	0.267
	110	0.105	0.121	0.139	0.197	0.213	0.231	0.289	0.305	0.323
	120	0.125	0.144	0.165	0.234	0.254	0.275	0.344	0.363	0.384
	130	0.146	0.169	0.194	0.275	0.298	0.323	0.403	0.426	0.451
	140	0.170	0.196	0.225	0.319	0.345	0.374	0.468	0.494	0.523
	150	0.195	0.225	0.258	0.366	0.397	0.430	0.537	0.568	0.601
C	100	0.121	0.140	0.161	0.228	0.247	0.268	0.334	0.354	0.374
	110	0.147	0.170	0.195	0.276	0.299	0.324	0.405	0.428	0.453
	120	0.175	0.202	0.232	0.328	0.356	0.385	0.482	0.509	0.539
	130	0.205	0.237	0.272	0.385	0.418	0.452	0.565	0.598	0.632
	140	0.238	0.275	0.316	0.447	0.484	0.525	0.656	0.693	0.734
	150	0.273	0.316	0.362	0.513	0.556	0.602	0.753	0.796	0.842

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1Q GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 4 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 5]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.170	0.204	0.242	0.281	0.316	0.353	0.392	0.427	0.464
	110	0.205	0.247	0.292	0.340	0.382	0.427	0.475	0.517	0.562
	120	0.244	0.294	0.348	0.405	0.455	0.508	0.565	0.615	0.669
	130	0.287	0.345	0.408	0.475	0.534	0.597	0.663	0.722	0.785
	140	0.333	0.401	0.474	0.551	0.619	0.692	0.769	0.837	0.910
	150	0.382	0.460	0.544	0.632	0.710	0.794	0.883	0.961	1.045
C	100	0.238	0.287	0.339	0.394	0.443	0.495	0.550	0.599	0.651
	110	0.288	0.347	0.410	0.477	0.536	0.599	0.666	0.725	0.788
	120	0.343	0.413	0.488	0.567	0.637	0.713	0.792	0.862	0.937
	130	0.402	0.484	0.572	0.666	0.748	0.836	0.930	1.012	1.100
	140	0.466	0.562	0.664	0.772	0.868	0.970	1.078	1.174	1.276
	150	0.535	0.645	0.762	0.887	0.996	1.113	1.238	1.347	1.465

Notes:
1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.1R GRADE 40
REQUIRED SHEARWALL LENGTH PERPENDICULAR TO RIDGE NO. 5 REINFORCEMENT PER FOOT OF BUILDING LENGTH[1, 2, 3, 4, 6]
ROOF ANGLE 45°

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	TOP STORY			1ST STORY OF 2 STORY OR 2ND STORY OF 3 STORY			1ST STORY OF 3 STORY		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	0.116	0.140	0.165	0.192	0.216	0.241	0.268	0.292	0.317
	110	0.140	0.169	0.200	0.232	0.261	0.292	0.324	0.353	0.384
	120	0.167	0.201	0.237	0.276	0.310	0.347	0.386	0.420	0.456
	130	0.196	0.236	0.279	0.324	0.364	0.407	0.453	0.493	0.536
	140	0.227	0.273	0.323	0.376	0.422	0.472	0.525	0.572	0.621
	150	0.261	0.314	0.371	0.432	0.485	0.542	0.603	0.656	0.713
C	100	0.162	0.196	0.231	0.269	0.302	0.338	0.376	0.409	0.444
	110	0.196	0.237	0.280	0.325	0.366	0.409	0.454	0.495	0.538
	120	0.234	0.282	0.333	0.387	0.435	0.486	0.541	0.589	0.640
	130	0.274	0.331	0.391	0.455	0.511	0.571	0.635	0.691	0.751
	140	0.318	0.383	0.453	0.527	0.592	0.662	0.736	0.801	0.871
	150	0.365	0.440	0.520	0.605	0.680	0.760	0.845	0.920	1.000

Notes:

1. The cumulative shear wall segment length for each side of the building shall be equal to or greater than the tabular shear wall length required. If the required shear wall segment length provided is not continuous the total shear wall length required shall be increased by 8" for each additional shear wall segment on a side.
2. Minimum shear wall segment length shall be 2′-0". A grouted cell with reinforcing steel shall be provided at each end of every shear wall segment. A minimum length of 24 inches (610 mm) of solid wall segment, extending the full height of each wall, shall be provided at exterior corners of exterior walls. A fully grouted cell with reinforcing steel shall be provided at each end of every shear wall segment.
3. Portions of walls with openings shall not be considered part of the shear wall length.
4. Required shearwall lengths perpendicular to the ridge are per lineal foot of building length. Multiply tabular values by building length for total shear wall length.
5. Shearwall lengths for no. 4 reinforcement are based on shearwall segment height of 80 inches (2032 mm) and shearwall segment length of 24 inches (610 mm).
6. Shearwall lengths for no. 5 reinforcement are based on shearwall segment height of 96 inches (2438 mm) and shearwall segment length of 24 inches (610 mm).

TABLE R609.5.3A
TOTAL SHEAR AT TOP OF TOP STORY WALL[1,2]

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	VEL PRESSURE	ROOF ANGLE UP TO 45° BUILDING WIDTH			ROOF ANGLE UP TO 30° BUILDING WIDTH		
			24	32	40	24	32	40
B	100	15.2	2022	3113	4456	1568	2319	3215
	110	18.4	2447	3767	5392	1897	2806	3890
	120	22.0	2912	4483	6417	2258	3339	4630
	130	25.8	3418	5262	7531	2649	3919	5433
	140	29.9	3964	6102	8734	3073	4545	6301
	150	34.3	4550	7005	10,027	3527	5218	7234
C	100	21.4	2835	4365	6248	2198	3251	4507
	110	25.9	3431	5282	7560	2660	3934	5454
	120	30.8	4083	6286	8997	3165	4682	6491
	130	36.1	4792	7377	10,559	3715	5495	7618
	140	41.9	5557	8555	12,246	4308	6372	8835
	150	48.1	6380	9821	14,058	4946	7315	10,142

1. Loads are based on 10' wall height. Multiply by 0.9 for 8-foot (2438 mm) wall heights.
2. To determine individual connector load parallel to the wall, divide shear value by the number of connectors (Load F1 from Figure R609.5.3).

TABLE R609.5.3B
TRANSVERSE CONNECTOR LOAD (F2)[1, 2]

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	VEL PRESSURE	ROOF ANGLE £23°		ROOF ANGLE >23°
			EDGE ZONE	INT ZONE	
B	100	15.2	394	319	289
	110	18.4	477	386	349
	120	22.0	568	460	416
	130	25.8	667	539	488
	140	29.9	773	626	566
	150	34.3	887	718	650
C	100	21.4	553	448	405
	110	25.9	669	541	490
	120	30.8	796	644	583
	130	36.1	935	756	684
	140	41.9	1084	877	793
	150	48.1	1244	1007	911

1. Loads are based on 10-foot wall height. Multiply by 0.8 for 8-foot (2438 mm) wall height.
2. F2 load in accordance with Figure R609.5.3.

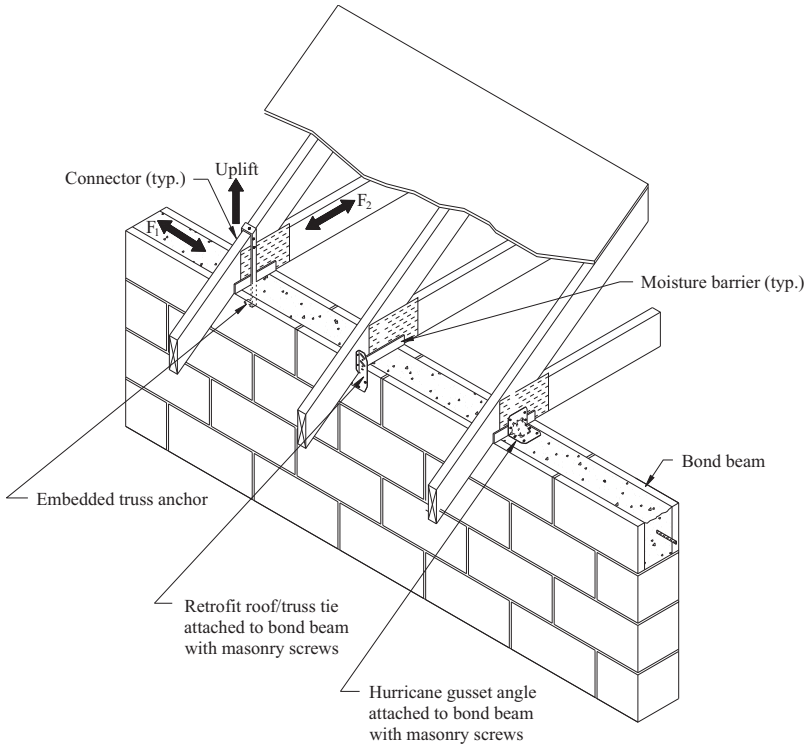


FIGURE R609.5.3
TYPICAL ROOF TO WALL CONNECTIONS

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.

TABLE R609.5.4
END WALL ROOF SHEAR PER FOOT OF BUILDING LENGTH

EXP	V_{asd} as determined in accordance with Section R301.2.1.3	POUNDS PER FT OF BLDG LENGTH FOR 23° ROOF SLOPE			POUNDS PER FT OF BLDG LENGTH FOR 30° ROOF SLOPE			POUNDS PER FT OF BLDG LENGTH FOR 45° ROOF SLOPE		
		BUILDING WIDTH			BUILDING WIDTH			BUILDING WIDTH		
		24	32	40	24	32	40	24	32	40
B	100	43.6	42.8	43.1	76.9	87.8	100.1	104.4	123.8	145.1
	110	52.7	51.8	52.2	93.1	106.3	121.1	126.3	149.8	175.5
	120	62.8	61.7	62.1	110.8	126.5	144.2	150.3	178.3	208.9
	130	73.7	72.4	72.8	130.0	148.5	169.2	176.4	209.2	245.1
	140	85.4	84.0	84.5	150.8	172.2	196.2	204.6	242.6	284.3
	150	98.1	96.4	97.0	173.1	197.7	225.3	234.8	278.5	326.4
C	100	61.1	60.1	60.4	107.9	123.2	140.4	146.3	173.6	203.4
	110	73.9	72.7	73.1	130.5	149.0	169.9	177.1	210.0	246.1
	120	88.0	86.5	87.0	155.3	177.4	202.1	210.7	249.9	292.9
	130	103.3	101.5	102.1	182.3	208.1	237.2	247.3	293.3	343.7
	140	119.8	117.7	118.4	211.4	241.4	275.1	286.8	340.2	398.6
	150	137.5	135.2	136.0	242.7	277.1	315.8	329.2	390.5	457.6

Notes:
1. Tabular values between 23° and 30° and between 30° and 45° are permitted to be interpolated.
2. Multiply by total building length for total end wall shear. Divide total shear by building width for required shear capacity of roof diaphragm and connections.

TABLE R609.6.1.2(1)
SUPERIMPOSED LOADS MINIMUM RATED LOAD CAPACITY OF 6-INCH- OR 8-INCH-THICK PRE-ENGINEERED ASSEMBLIES SPANNING OPENINGS OF ONE STORY AND TOP STORY OF MULTI-STORY BUILDINGS[1, 3, 4]

ROOF SPAN (FT)	UPLIFT (plf)			
	GRAVITY (plf)	100 mph	120 mph	140 mph
42	150	85	112	165
12	330	152	204	305
24	600	262	351	525
36	870	374	502	745
44	1,050	451	605	900
52	1,230	530	710	1,055
60	1,410	609	816	1,215

Notes:
1. All loads are superimposed at the top of the wall and do not include dead loads of the bond beam or masonry above the assembly. Add 100% of additional dead loads to the gravity loads and subtract 85% of these loads from the uplift loads.
2. Use 4-foot roof span for assemblies in endwalls.
3. For total roof dead loads over 10 psf, increase gravity loads by the following amount: (Roof Dead Load - 10 psf) × (Roof Span + 2 ft)/2
4. Uplift rating is required only if a pre-engineered assembly is used to directly support a roof. See Section R609.6.1.3 for cases where uplift need not be considered.

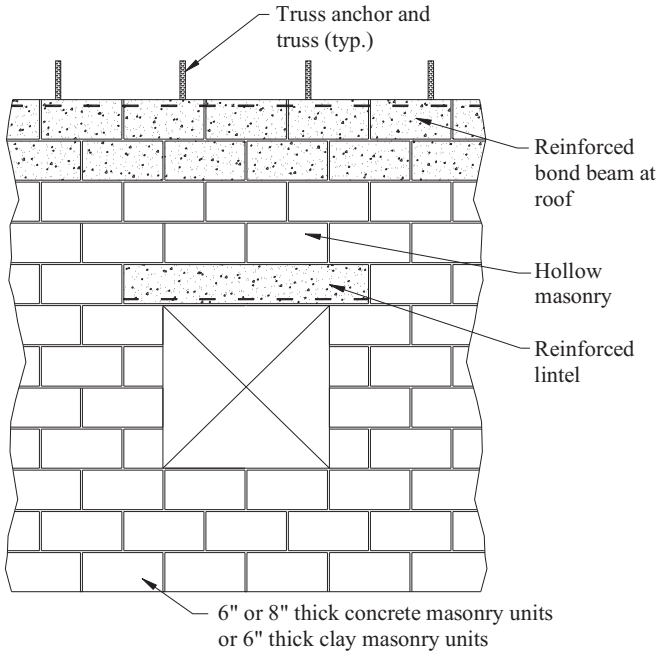


TABLE R609.6.1.2(2)
SUPERIMPOSED LOADS MINIMUM RATED LOAD CAPACITY 8-INCH-THICK PREENGINEERED ASSEMBLIES SPANNING OPENINGS OF BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—WOOD FLOOR SYSTEM[3, 4, 5]

	MINIMUM RATED GRAVITY LOAD ASSEMBLY (plf)					
	ASSEMBLY CLEAR SPAN (FT)					
FLOOR SPAN1 (FT)	4	6	8	12	16	20
42	210	260	310	410	510	610
12	430	480	530	630	730	830
24	760	810	860	960	1,060	1,160
36	1,090	1,140	1,190	1,290	1,390	1,490
44	1,310	1,360	1,410	1,510	1,610	1,710
52	1,530	1,580	1,630	1,730	1,830	1,930
60	1,750	1,800	1,850	1,950	2,050	2,150

Notes:
1. For a wall supporting floors on both sides, enter table with the sum of the 2 full spans.
   NOTE: Tabular values are for $^1/_2$ the load of the full span shown.
2. Use 4 ft building width for assemblies in walls not supporting floors (normally endwalls and interior masonry walls and shearwalls).
3. The values in this table may be interpolated.
4. These loads take into account the dead load of any masonry in the wall above the assembly and live and dead loads of the roof and floor supported. Dead load of the assembly is not included in the table and if not included in the preengineered concrete design must be added to the loads in the table.
5. This table is applicable for all roof dead loads.

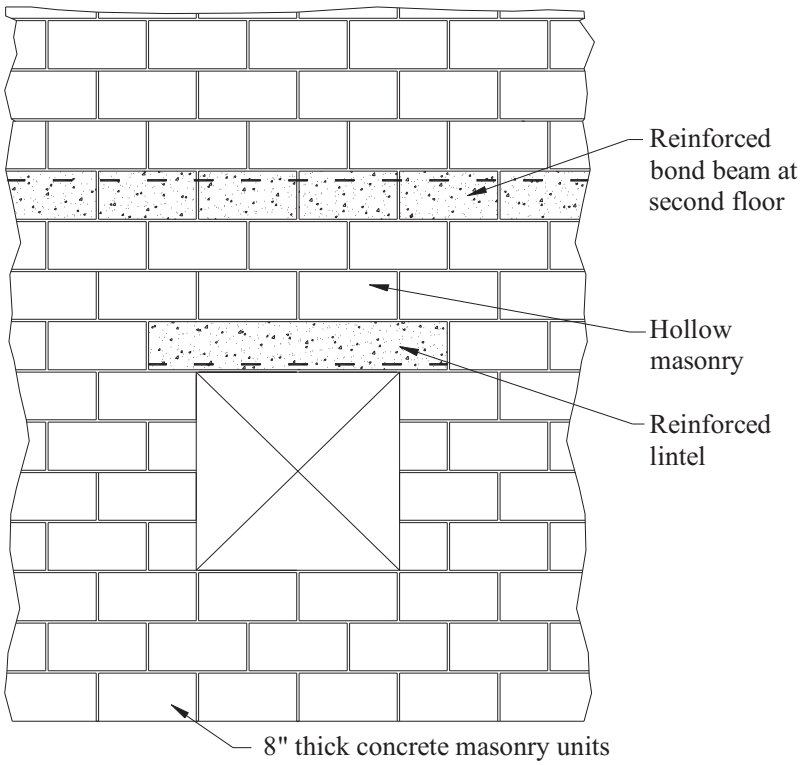


TABLE R609.6.1.2(3)
SUPERIMPOSED LOADS MINIMUM RATED LOAD CAPACITY 8-INCH-THICK PREENGINEERED ASSEMBLIES SPANNING OPENINGS OF BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—HOLLOWCORE FLOOR SYSTEM[3, 4, 5]

	MINIMUM RATED GRAVITY LOAD ASSEMBLY (plf)					
	ASSEMBLY CLEAR SPAN (FT)					
FLOOR SPAN[1] (FT)	4	6	8	12	16	20
42	290	340	390	490	590	690
12	670	720	770	870	970	1,070
24	1,240	1,290	1,340	1,440	1,540	1,640
36	1,810	1,860	1,910	2,010	2,110	2,210
44	2,190	2,240	2,290	2,390	2,490	2,590
52	2,570	2,620	2,670	2,770	2,870	2,970
60	2,950	3,000	3,050	3,150	3,250	3,350

Notes:
1. For a wall supporting floors on both sides, enter table with the sum of the 2 full spans.
   NOTE: Tabular values are for $^1/_2$ the load of the full span shown.
2. Use 4 ft building width for assemblies in nonfloor bearing walls (normally endwalls and interior masonry walls and shearwalls).
3. The values in this table may be interpolated.
4. These loads take into account the dead load of any masonry in the wall above the assembly and live and dead loads of the roof and floor supported. Dead load of the assembly is not included in the table and if not included in the preengineered concrete assembly design must be added to the loads in the table.
5. This table is applicable for all roof dead loads.

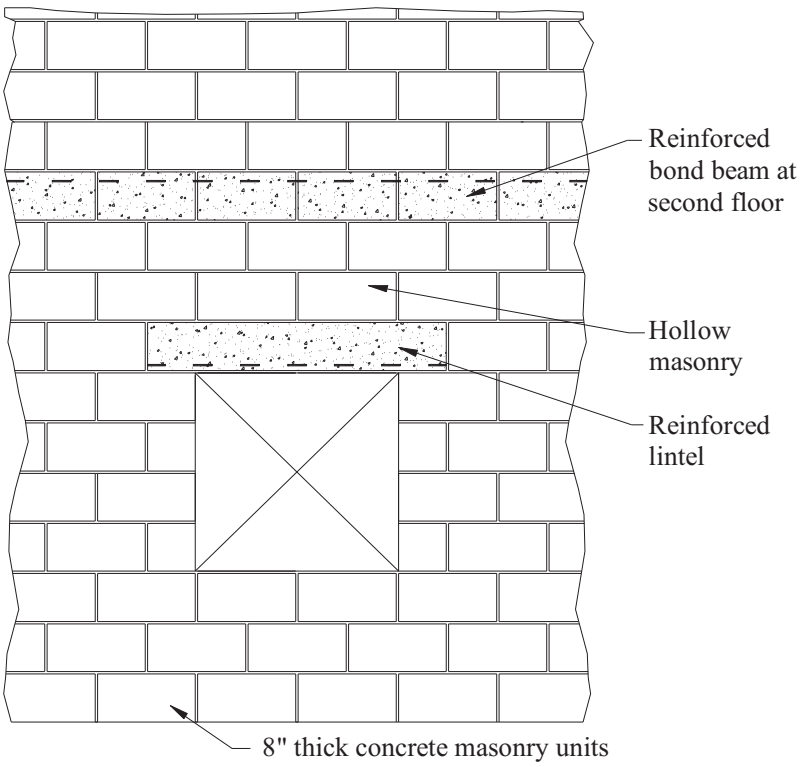


TABLE R609.6.2.1(1)
MAXIMUM CLEAR SPAN CAPACITY OF CONTINUOUS BOND BEAMS ACTING AS LINTELS
ONE STORY AND TOP STORY OF MULTISTORY BUILDINGS

ROOF SPAN (FT)	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)[e]											
	BOND BEAM 6" THICK WALL[1, 2, 4]						BOND BEAM 8" THICK WALL[1, 2, 4]					
	16-1	16-2	C12-1	C12-2	C16-1	C16-2	16-1	16-2	C12-1	C12-2	C16-1	C16-2
43	16-0	17-4	16-0	20-8	18-0	24-8	16-0	18-8	15-4	20-8	17-4	23-4
12	12-0	13-4	12-0	15-4	14-0	18-8	12-8	14-0	11-4	16-0	13-4	18-0
24	8-8	8-8	9-4	10-8	10-8	14-8	10-0	11-4	8-8	12-8	10-8	14-8
36	6-8	6-8	8-0	8-0	9-4	11-4	8-8	8-8	7-4	10-0	8-8	12-0
44	6-0	6-0	7-4	7-4	8-0	10-0	7-4	7-4	6-8	8-8	8-0	11-4
52	5-4	5-4	6-0	6-0	8-0	8-8	6-8	6-8	6-8	8-0	7-4	10-8
60	4-8	4-8	6-0	6-0	7-4	8-0	6-0	6-0	6-0	7-4	7-4	10-0

Notes:

1. Designation of bond beam types over openings:
   a. Letter C designates a concrete bond beam. All other bond beams are masonry.
   b. The first number denotes the nominal height of the bond beam in inches.
   c. The second number denotes the number of No.5 reinforcing bars in the top and the bottom of the beam. A single (1) No.7 bar may be used in lieu of two No.5 bars. The bottom reinforcing steel shall be located no more than $2\ ^3/_4$ inches clear distance from the bottom of masonry bond beams and $1\ ^1/_2$ inches for concrete bond beams.
2. All bond beams have reinforcement in the top as required by Tables R609.2.2A-1 through 609.2.2A-4 and Tables R609.2.2B-1 through R609.2.2B-8 as appropriate. If two No.5 are required in this table and only one No.5 is required by Tables R609.2.2A-1 through R609.2.2A-4 and Tables R609.2.2B-1 through R609.2.2B-8 as appropriate, the additional bar shall be placed in the top of the bond beam over the opening and shall extend past the opening a minimum of 24 inches.
3. Use 4 foot roof span for lintels in endwalls.
4. The bottom reinforcement in precast lintels may be used to satisfy the continuous bond beam bottom reinforcement requirement.
5. For roof dead loads more than 10 psf:
   a. For 20 psf roof dead load, multiply allowable clear spans by 0.85.
   b. For 30 psf roof dead load, multiply allowable clear spans by 0.75.
   c. Values for other roof dead loads may be interpolated.

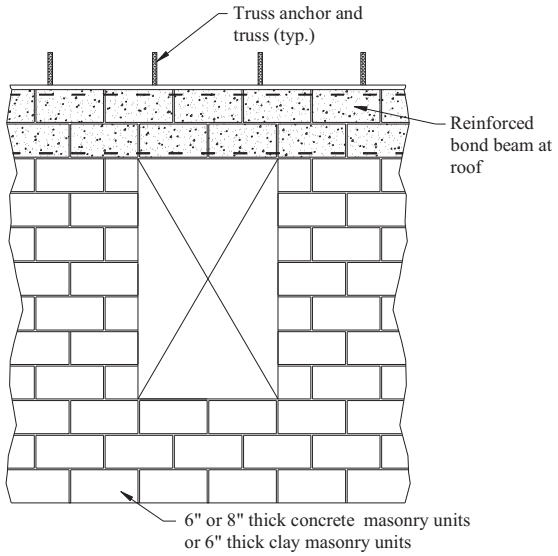


TABLE R609.6.2.1(2)
MAXIMUM CLEAR SPAN OF CONTINUOUS BOND BEAMS ACTING AS LINTELS BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—WOOD FLOOR SYSTEM

BUILDING WIDTH (FT)	BOND BEAM 8" THICK WALL[1, 2, 4]						
	16-1	16-2	C12-1	C12-2	C16-1	C16-2	C16-3
	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)[5]						
43	11-4	13-4	10-8	14-0	12-0	15-4	18-0
12	10-0	11-4	9-4	12-0	10-8	14-0	16-0
24	8-8	8-8	8-0	10-0	8-8	12-0	12-8
36	6-8	6-8	6-8	8-0	8-0	10-8	10-8
44	6-0	6-0	6-0	7-4	7-4	9-4	9-4
52	5-4	5-4	6-0	6-8	6-8	8-8	8-8
60	4-8	4-8	5-4	6-0	6-8	8-0	8-0

Notes:
1. Designation of bond beam over openings:
   a. Letter C designates a concrete bond beam. All other bond beams are masonry.
   b. The first number denotes the nominal height of the bond beam in inches.
   c. The second number denotes the number of No.5 reinforcing bars in the top and the bottom of the beam. One No.7 may be used in lieu of two No.5. The bottom reinforcing steel shall be located no more than $2\,^3/_4$ inches clear distance from the bottom of masonry bond beams and $1\,^1/_2$ inches for concrete bond beams.
2. All bond beams shall have reinforcement in the top in accordance with Section R609.6.2.
3. Use 4-foot floor span for lintels in walls parallel to hollowcore.
4. The bottom reinforcement in precast lintels may be used to satisfy the continuous bond beam bottom reinforcement requirement.
5. This table is applicable for all roof dead loads.

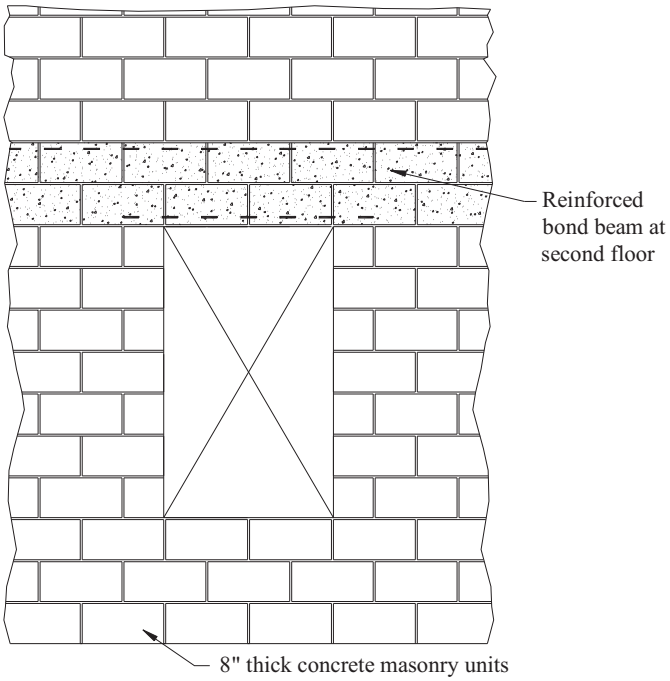


TABLE R609.6.2.1(3)
MAXIMUM CLEAR SPAN OF CONTINUOUS BOND BEAMS ACTING LINTELS BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—HOLLOWCORE SECOND FLOOR

BUILDING WIDTH (FT)	BOND BEAM 8" THICK WALL[1, 2, 4]						
	16-1	16-2	C12-1	C12-2	C16-1	C16-2	C16-3
	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)[5]						
43	10-8	12-0	10-0	13-4	11-4	14-8	17-4
12	8-8	9-4	8-0	10-8	9-4	12-0	13-4
24	6-0	6-0	6-0	7-4	7-4	10-0	10-0
36	4-8	4-8	5-4	6-0	6-0	8-0	8-0
44	4-0	4-0	4-8	5-4	6-0	7-4	7-4
52	4-0	4-0	4-8	4-8	5-4	6-8	6-8
60	3-4	3-4	4-0	4-0	5-4	6-0	6-0

Notes:
1. Designation of bond beam over openings:
   d Letter C designates a concrete bond beam. All other bond beams are masonry.
   e. The first number denotes the nominal height of the bond beam in inches.
   f. The second number denotes the number of No.5 reinforcing bars in the top and the bottom of the beam. One No.7 may be used in lieu of two No.5. The bottom reinforcing steel shall be located no more than $2\,^3/_4$ inches clear distance from the bottom of masonry bond beams and $1\,^1/_2$ inches for concrete bond beams.
2. All bond beams shall have reinforcement in the top in accordance with Section R609.6.2.
3. Use 4-foot floor span for lintels in walls parallel to hollowcore.
4. The bottom reinforcement in precast lintels may be used to satisfy the continuous bond beam bottom reinforcement requirement.
5. This table is applicable for all roof dead loads.

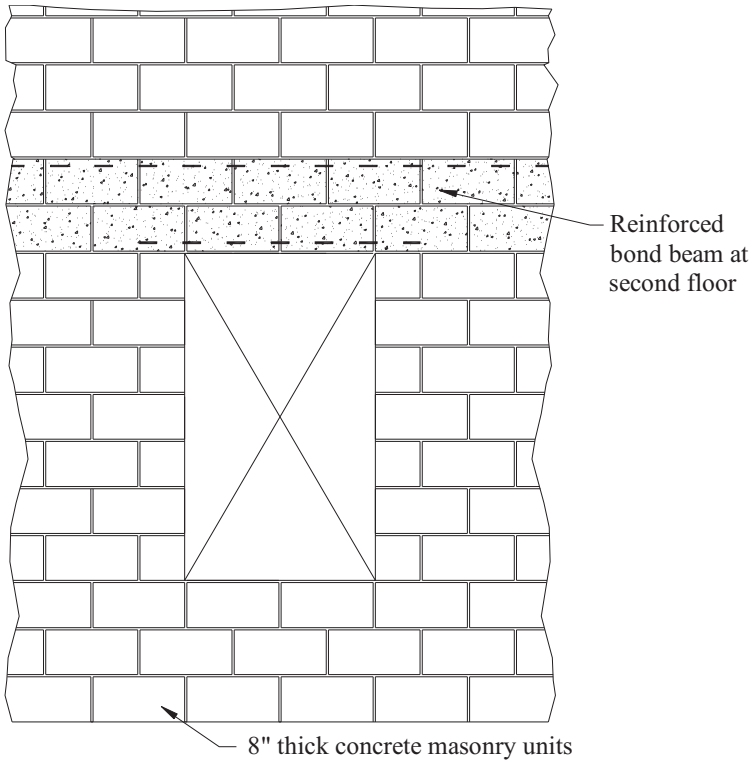


TABLE R609.6.3.2(1)
COMBINED BOND BEAM/LINTELS ONE STORY AND TOP STORY OF MULTISTORY BUILDINGS

BOND BEAM HEIGHT	ROOF SPAN (FT)	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)															
		COMBINED BOND BEAM/LINTEL 8" THICK WALL[1, 2]															
		12-1	12-2	16-1	16-2	24-1	24-2	24-3	32-2	32-3	32-4	40-2	40-3	40-4	48-3	48-4	48-5
6"	4	11-4	12-0	14-8	16-0	18-8	22-8	23-4	27-4	29-4	30-0	29-4	34-0	35-4	38-0	39-4	40-8
	12	8-0	8-8	11-4	12-0	14-8	17-4	17-4	18-8	22-9	23-3	24-8	24-8	28-9	29-4	31-4	33-4
	24	6-0	6-9	8-8	8-8	11-4	14-0	14-0	18-0	18-0	18-0	20-0	22-0	20-0	26-0	26-0	26-0
	36	4-8	4-8	6-8	6-8	10-0	10-8	10-8	14-0	14-0	14-0	17-4	17-4	17-4	20-8	20-8	20-8
	44	4-0	4-0	6-0	6-0	9-4	9-4	9-4	12-8	12-8	12-8	15-4	15-4	15-4	18-0	18-0	18-0
	52	3-4	3-4	5-4	5-4	8-0	8-0	8-0	11-4	11-4	11-4	14-0	14-0	14-0	16-8	16-8	16-8
	60	3-4	3-4	4-8	4-8	7-4	7-4	7-4	10-0	10-0	10-0	12-8	12-8	12-8	15-4	15-4	15-4
8"	4	12-0	12-8	14-8	16-8	17-4	23-4	24-8	25-4	30-0	30-8	26-8	32-8	35-4	34-0	39-4	40-8
	12	8-8	9-4	11-4	13-4	14-0	18-8	20-8	21-4	24-8	26-0	22-8	28-0	30-0	29-4	34-0	35-4
	24	6-8	7-4	9-4	10-0	11-4	15-4	16-0	17-4	20-8	21-4	19-4	23-4	25-4	25-4	28-8	30-0
	36	6-0	6-0	8-0	8-8	9-4	13-4	13-4	15-4	17-4	17-4	16-8	20-8	21-4	22-0	24-8	24-8
	44	5-4	5-4	7-4	7-4	8-8	11-4	11-4	14-0	15-4	15-4	16-0	18-8	18-8	20-8	22-0	22-0
	52	4-8	4-8	6-8	6-8	8-0	10-0	10-0	13-4	14-0	14-0	14-8	17-4	17-4	19-4	20-0	20-0
	60	4-0	4-0	6-0	6-0	8-0	9-4	9-4	12-8	12-8	12-8	14-0	15-4	15-4	18-8	18-8	18-8

Notes:
1. Designation of combined bond beam/lintels:
   a. The first number denotes the nominal height of the bond beam/lintel in inches.
   b. The second number denotes the number of No.5 reinforcing bars in the bottom of the bond beam/lintel. The equivalent or greater area of reinforcement may be obtained by using reinforcement other than No.5. For example, when three No.5 are required, one No.9 may be used. Also, one No.7 may be used to replace two No.5 or two No.7 to replace four No.5. The bottom reinforcing steel is to be located not more than $2^{3}/_{4}$ inches clear distance from the bottom of the lintel.
2. All bond beams shall have reinforcement in the top in accordance with Tables R609.2.2A-1 through R609.2.2A-4 and Tables R609.2.2B-1 through R609.2.2B-8, as appropriate.

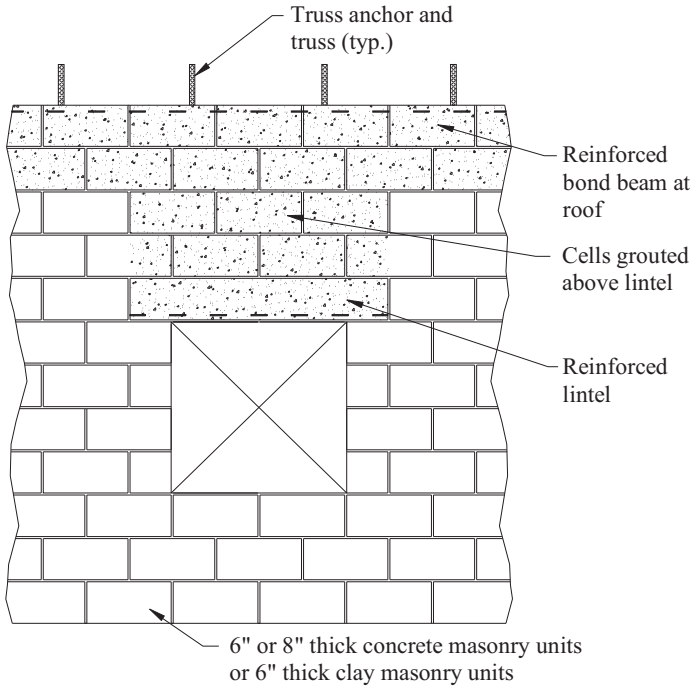


TABLE R609.6.3.2(2)
COMBINED BOND BEAM/LINTELS BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—WOOD FLOOR SYSTEM

FLOOR SPAN SUPPORTED (FT)	COMBINED BOND BEAM/LINTEL 8" THICK WALL[1, 2, 4]									
	12-2	16-2	24-2	24-3	32-2	32-3	40-3	40-4	48-3	48-4
	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)[5]									
43	9-4	12-0	16-0	16-8	18-0	20-0	22-8	24-0	24-0	26-8
12	8-0	10-8	14-0	15-4	16-0	18-8	20-8	22-0	22-0	24-0
24	6-0	8-8	12-0	12-0	14-0	15-4	18-0	18-0	20-0	20-8
36	4-8	6-8	10-0	10-0	12-8	13-4	16-0	16-0	18-0	18-0
44	4-0	6-0	9-4	9-4	12-0	12-0	14-8	14-8	16-8	16-8
52	4-0	5-4	8-8	8-8	10-8	10-8	13-4	13-4	16-0	16-0
60	3-4	4-8	8-0	8-0	10-0	10-0	12-8	12-8	14-8	14-8

Notes:
1. Designation of combined bond beam/lintels:
   a. The first number denotes the nominal height of the bond beam/lintel in inches.
   b. The second number denotes the number of No.5 reinforcing bars in the bottom of the bond beam/lintel. The equivalent or greater area of reinforcement may be obtained by using reinforcement other than No.5 bars. For example, when three No.5 are required, one No.9 may be used. Also, one No.7 may be used to replace two No.5 or two No.7 may be used to replace four No.5. The bottom reinforcing steel is to be located not more than $2\,^{3}/_{4}$ inches clear distance from the bottom of the lintel.
2. All bond beams shall have reinforcement in the top in accordance with Section R609.6.2.
3. Use 4 foot floor span for walls parallel to hollowcore (nonloadbearing).
4. All The bottom reinforcement in precast lintels may be used to satisfy the continuous bond beam bottom reinforcement requirement.
5. This table is applicable for all roof dead loads.

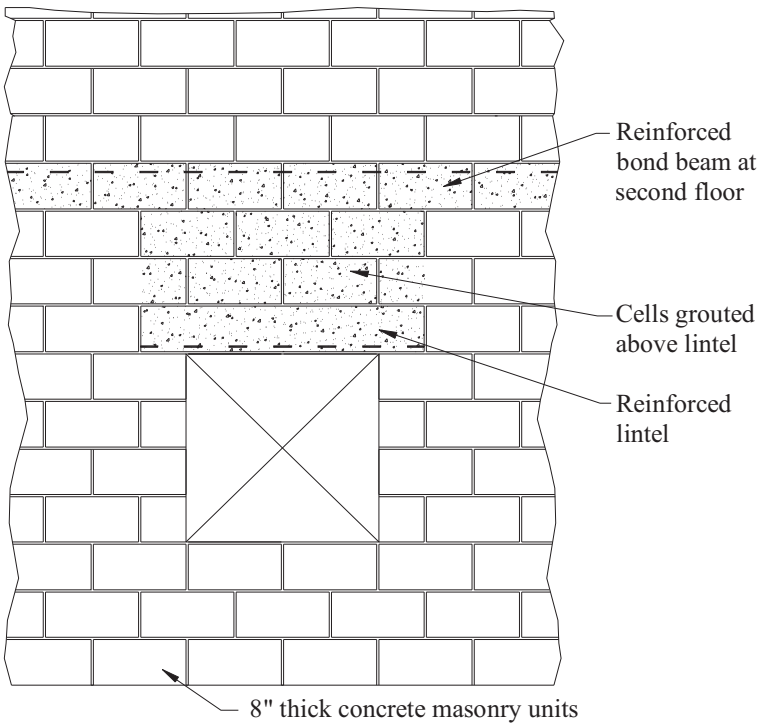
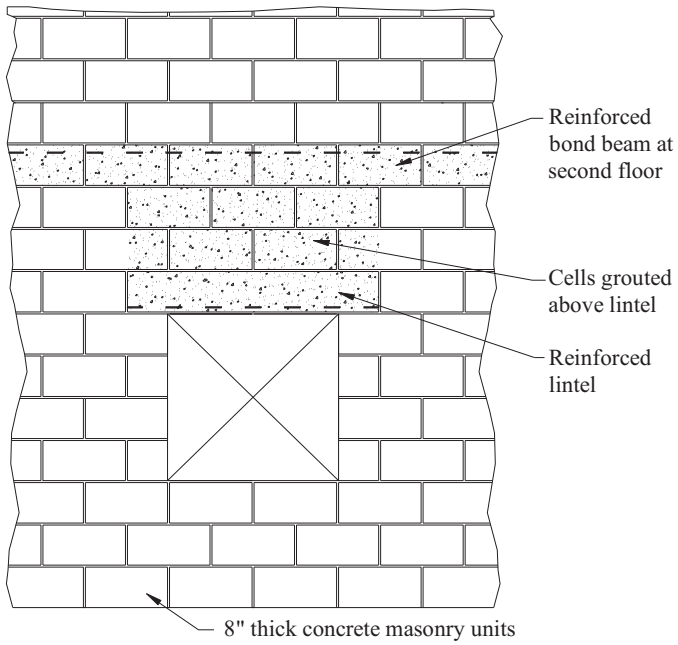
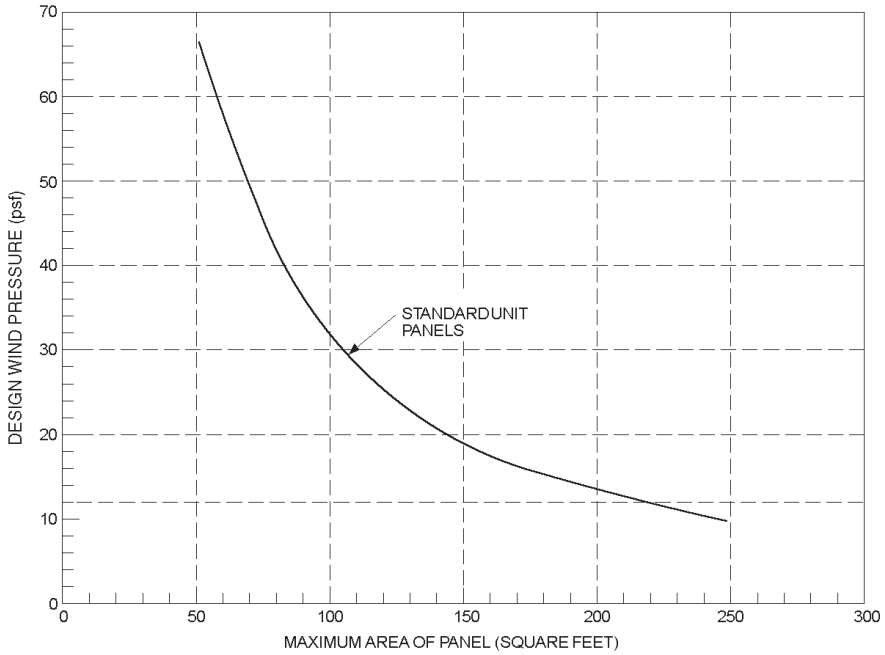


TABLE R609.6.3.2(3)
COMBINED BOND BEAM/LINTELS BOTTOM STORY OF TWO-STORY BUILDINGS, SECOND AND BOTTOM STORIES OF THREE-STORY BUILDINGS—HOLLOWCORE FLOOR SYSTEM

FLOOR SPAN SUPPORTED (FT)	COMBINED BOND BEAM/LINTEL 8" THICK WALL[1, 2, 4]									
	12-2	16-2	24-2	24-3	32-2	32-3	40-3	40-4	48-3	48-4
	MAXIMUM ALLOWABLE CLEAR SPAN (FT-IN)[5]									
43	8-8	11-4	15-4	16-0	17-4	19-4	22-0	23-4	23-4	25-4
12	6-8	9-4	12-8	12-8	14-8	16-0	18-8	18-8	20-8	21-4
24	4-8	6-0	9-4	9-4	12-0	12-0	14-8	14-8	17-4	17-4
36	3-4	4-8	7-4	7-4	10-0	10-0	12-0	12-0	14-8	14-8
44	2-8	4-0	6-8	6-8	8-8	8-8	11-4	11-4	13-4	13-4
52	2-8	4-0	6-0	6-0	8-0	8-0	10-0	10-0	12-0	12-0
60	2-8	3-4	5-4	5-4	7-4	7-4	9-4	9-4	11-4	11-4

Notes:
1. Designation of combined bond beam/lintels:
   a. The first number denotes the nominal height of the bond beam/lintel in inches.
   b. The second number denotes the number of No.5 reinforcing bars in the bottom of the bond beam/lintel. The equivalent or greater area of reinforcement may be obtained by using reinforcement other than No.5 bars. For example, when three No.5 are required, one No.9 may be used. Also, one No.7 may be used to replace two No.5 or two No.7 may be used to replace four No.5. The bottom reinforcing steel is to be located not more than $2\,^3/_4$ inches clear distance from the bottom of the lintel.
2. All bond beams shall have reinforcement in the top in accordance with Section R609.6.2.
3. Use 4-foot floor span for walls parallel to hollowcore (non-loadbearing).
4. All the bottom reinforcement in precast lintels may be used to satisfy the continuous bond beam bottom reinforcement requirement.
5. This table is applicable for all roof dead loads.





For SI:1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kN/m^2.

FIGURE R610.4.1
GLASS UNIT MASONRY DESIGN WIND LOAD RESISTANCE

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 V_{asd}, determined in accordance with Section R301.2.1.3, 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.

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.

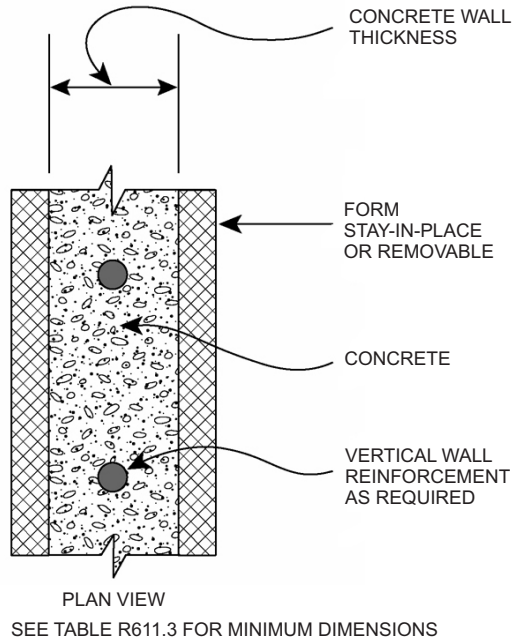


FIGURE R611.3(1)
FLAT WALL SYSTEM

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).

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.

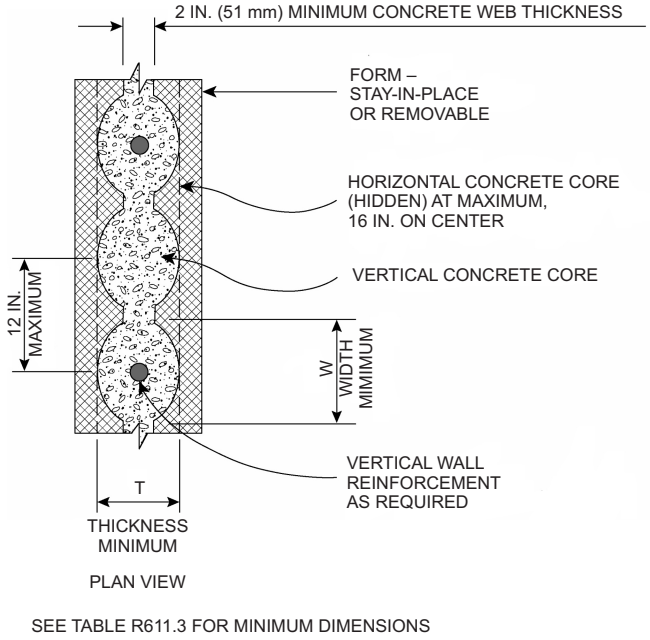
d. Nominal wall thickness. The actual as-built thickness of a flat wall shall not be more than $^1/_2$-inch less or more than $^1/_4$-inch more than the nominal dimension indicated.

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.

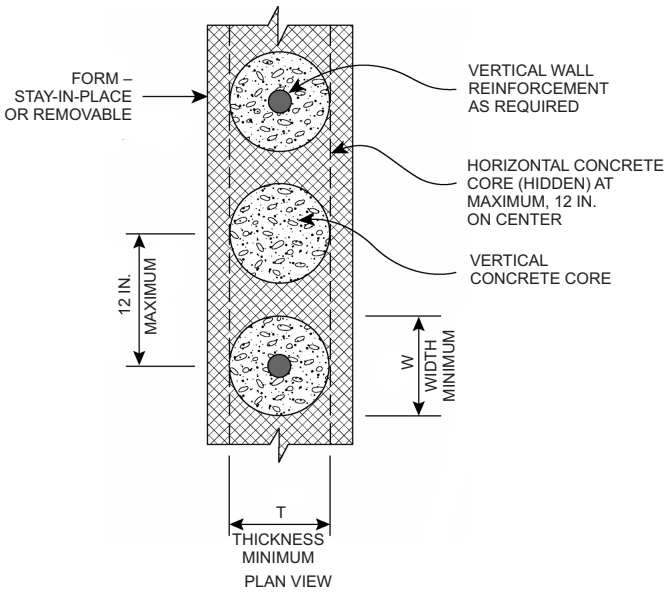
R611.3.2 Waffle-grid wall systems. Waffle-grid wall systems shall comply with Table R611.3 and Figure R611.3(2). and shall have a minimum nominal thickness of 6 inches (152 mm) for the horizontal and vertical concrete members (cores). The core and web dimensions shall comply with Table R611. 3. The maximum weight of waffle-grid walls shall comply with Table R611.3.



For SI: 1 inch = 25.4 mm.

FIGURE R611.3(2)
WAFFLE-GRID WALL SYSTEM

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.



For SI: 1 inch = 25.4 mm.

FIGURE R611.3(3)
SCREEN-GRID WALL SYSTEM

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.

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.

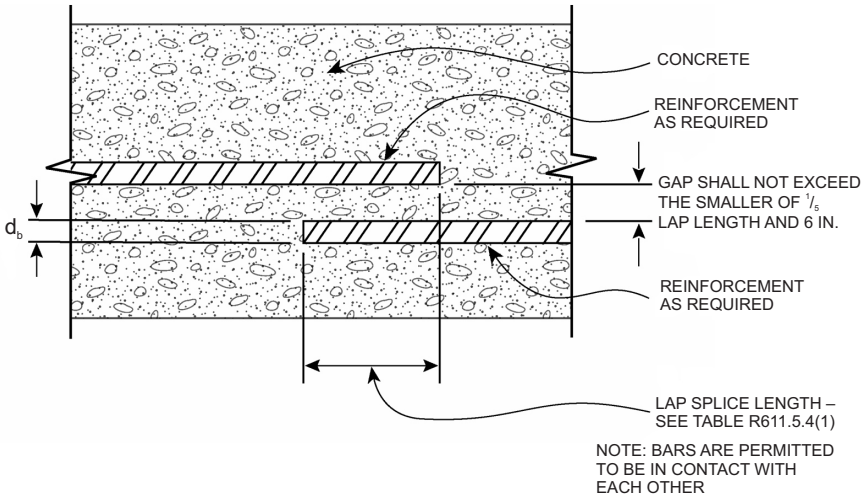
R611.5.4.2 Location of reinforcement in walls. For location of reinforcement in foundation walls and above-grade walls, see Sections R404.1.2.3.7.2 and R611.6.5, respectively.

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

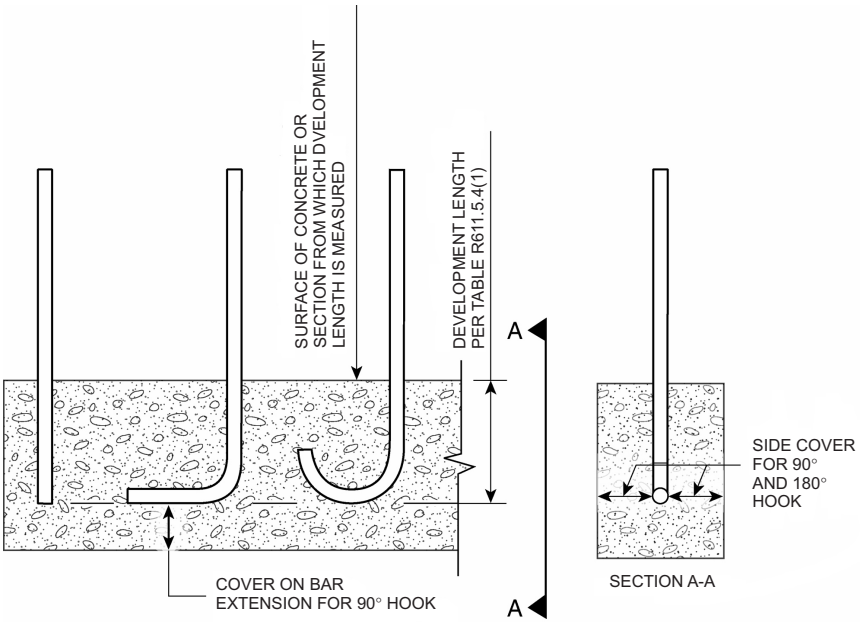
	BAR SIZE NO.	YIELD STRENGTH OF STEEL, f_y - psi (MPa)	
		40,000 (280)	60,000 (420)
		Splice length or tension development length (inches)	
Lap splice length–tension	4	20	30
	5	25	38
	6	30	45
Tension development length for straight bar	4	15	23
	5	19	28
	6	23	34
Tension development length for: a. 90-degree 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.



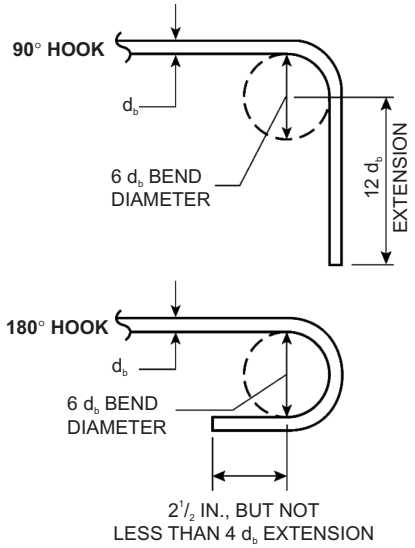
For SI: 1 inch = 25.4 mm.

FIGURE R611.5.4(1)
LAP SPLICES

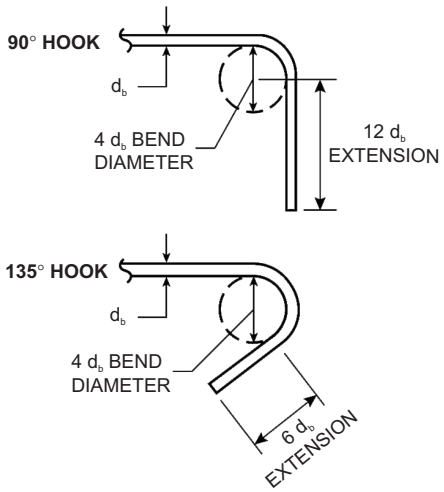


For SI: 1 degree = 0.0175 rad.

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

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).

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).

R611.5.4.6 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.

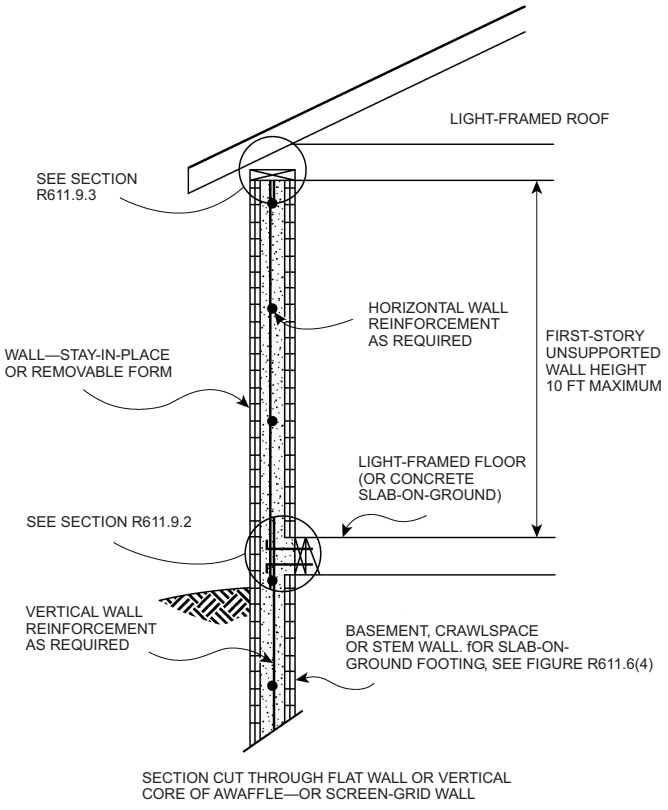
R611.6.2 Wall reinforcement for wind. Vertical wall reinforcement for resistance to out-of-plane wind forces shall be determined from Table R611.6(1), R611.6(2), R611.6(3) or R611.6(4). Also, see Sections R611.7.2.2.2 and R611.7.2.2.3. There shall be a vertical bar at all corners of exterior walls. Unless 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.



For SI: 1 foot = 304.8 mm.

FIGURE R611.6(1)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION ONE

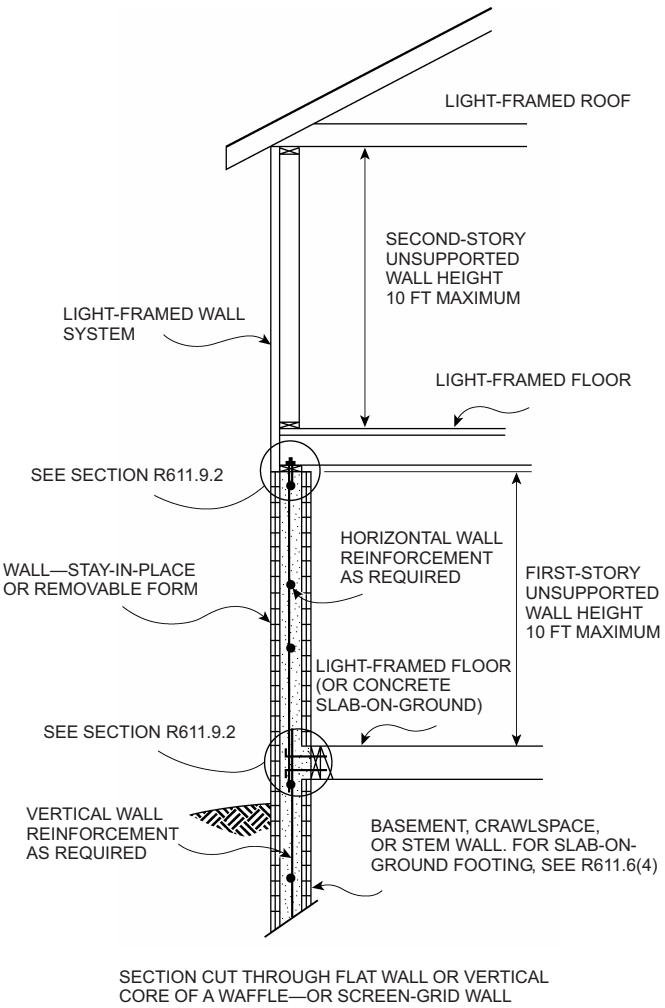
R611.6.4 Termination of reinforcement. Where indicated in items 1 through 3 below, vertical wall reinforcement in the top-most *story* with concrete walls shall be terminated with a 90-degree (1.57 rad) standard hook complying with Section R611.5.4.5 and Figure R611.5.4(3).

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.

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).

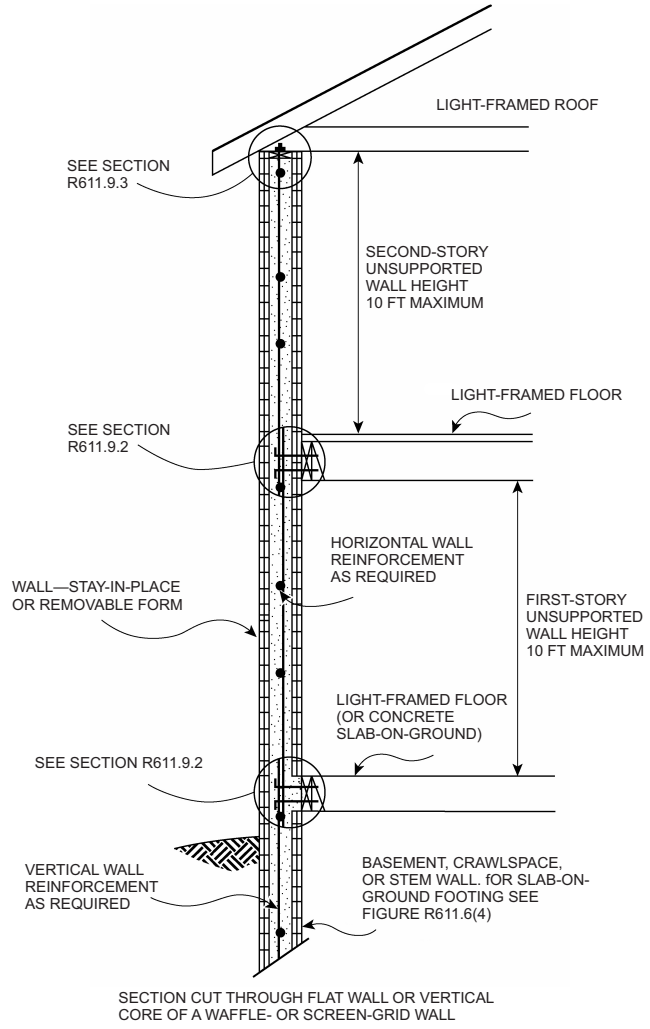


For SI: 1 foot = 304.8 mm.

FIGURE R611.6(2)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION CONCRETE FIRST-STORY AND LIGHT-FRAMED SECOND-STORY

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



For SI: 1 foot = 304.8 mm.

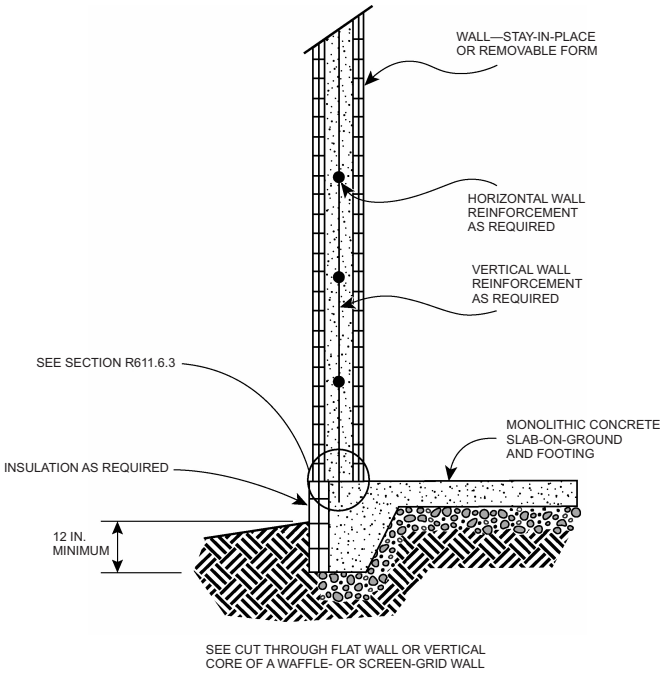
FIGURE R611.6(3)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION
TWO-STORY

to provide not less than the minimum cover required by Section R611.5.4.1.

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



For SI: 1 inch = 25.4 mm.

FIGURE R611.6(4)
ABOVE-GRADE CONCRETE WALL SUPPORTED ON MONOLITHIC SLAB-ON GROUND FOOTING

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,

TABLE R611.6(1)
MINIMUM VERTICAL REINFORCEMENT FOR FLAT ABOVE-GRADE WALLS[a, b, c, d, e]

MAXIMUM V_{asd} as determined in accordance with Section R301.2.1.3			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 = 1.895 kPa.

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.

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.

TABLE R611.6(2)
MINIMUM VERTICAL REINFORCEMENT FOR WAFFLE-GRID ABOVE-GRADE WALLS[a, b, c, d, e]

MAXIMUM V_{asd} as determined in accordance with Section R301.2.1.3			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 = 6.895 kPa.

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 V_{asd} as determined in accordance with Section R301.2.1.3			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 = 6.895 kPa.

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 V_{asd} as determined in accordance with Section R301.2.1.3			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 = 0.1571 kPa/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.

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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (mph) Exposure						
			85B	90B	100B	110B	120B	130B	Minimum[b]
					85C	90C	100C	110C	
						85D	90D	100D	
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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (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]
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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (mph) Exposure						
			85B	90B	100B	110B	120B	130B	
					85C	90C	100C	110C	
						85D	90D	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)						
			V_{asd} determined in accordance with Section R301.2.1.3 (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.

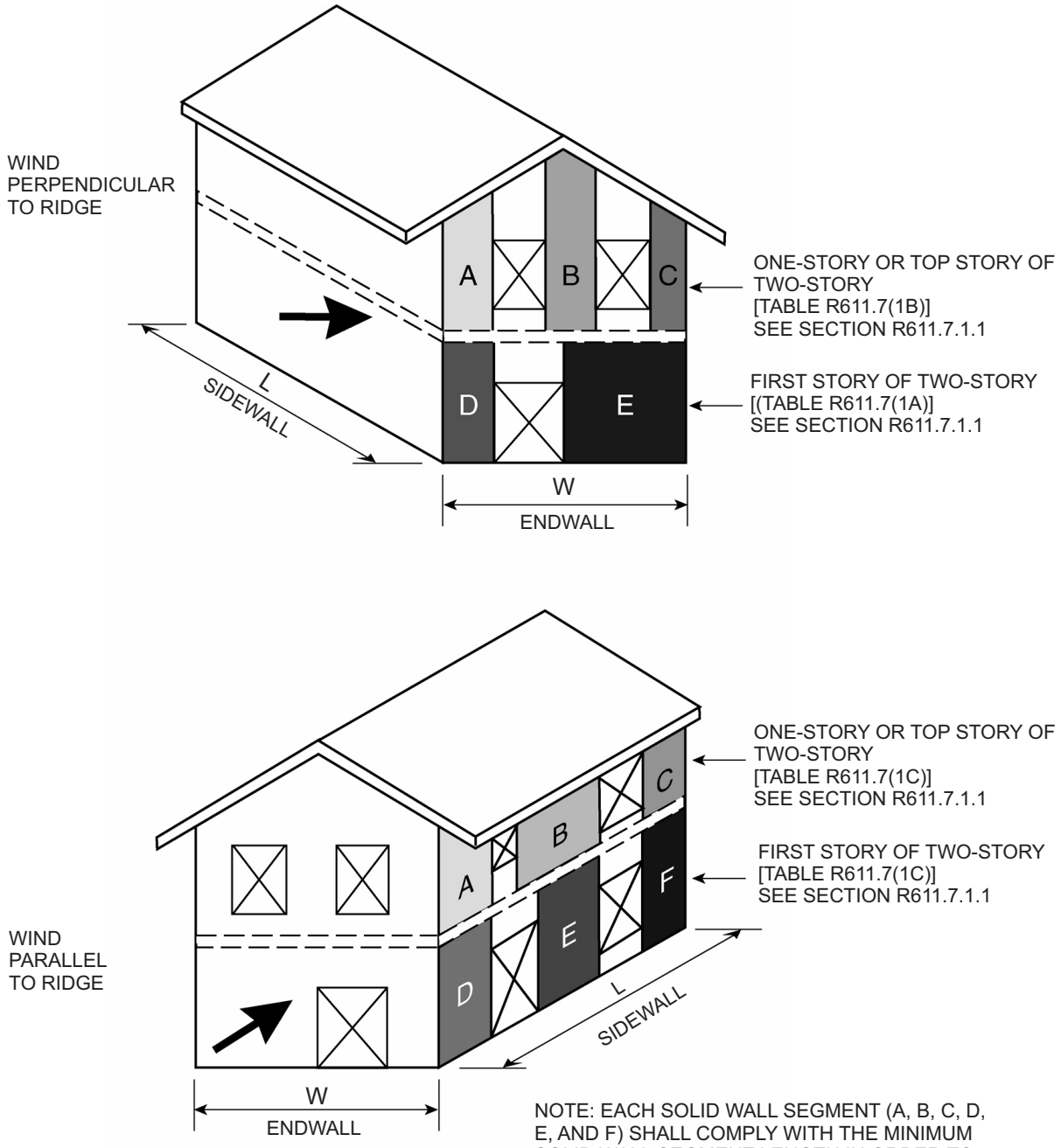


FIGURE R611.7(1)
MINIMUM SOLID WALL LENGTH

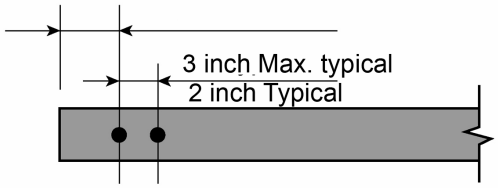
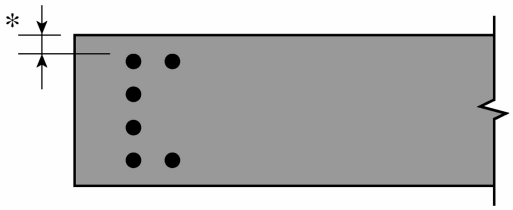
DETAIL NO.	NOM. WALL THICKNESS, IN.	REINFORCEMENT LAYOUT AT ENDS OF SOLID WALL SEGMENTS	NOTES
1	4		For SI: 1 inch = 25.4 mm. 1. See Table R611.7(4) for use of details. 2. Minimum length of solid wall segment and size and grade of reinforcement in each end of each solid wall segment shall be determined 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.

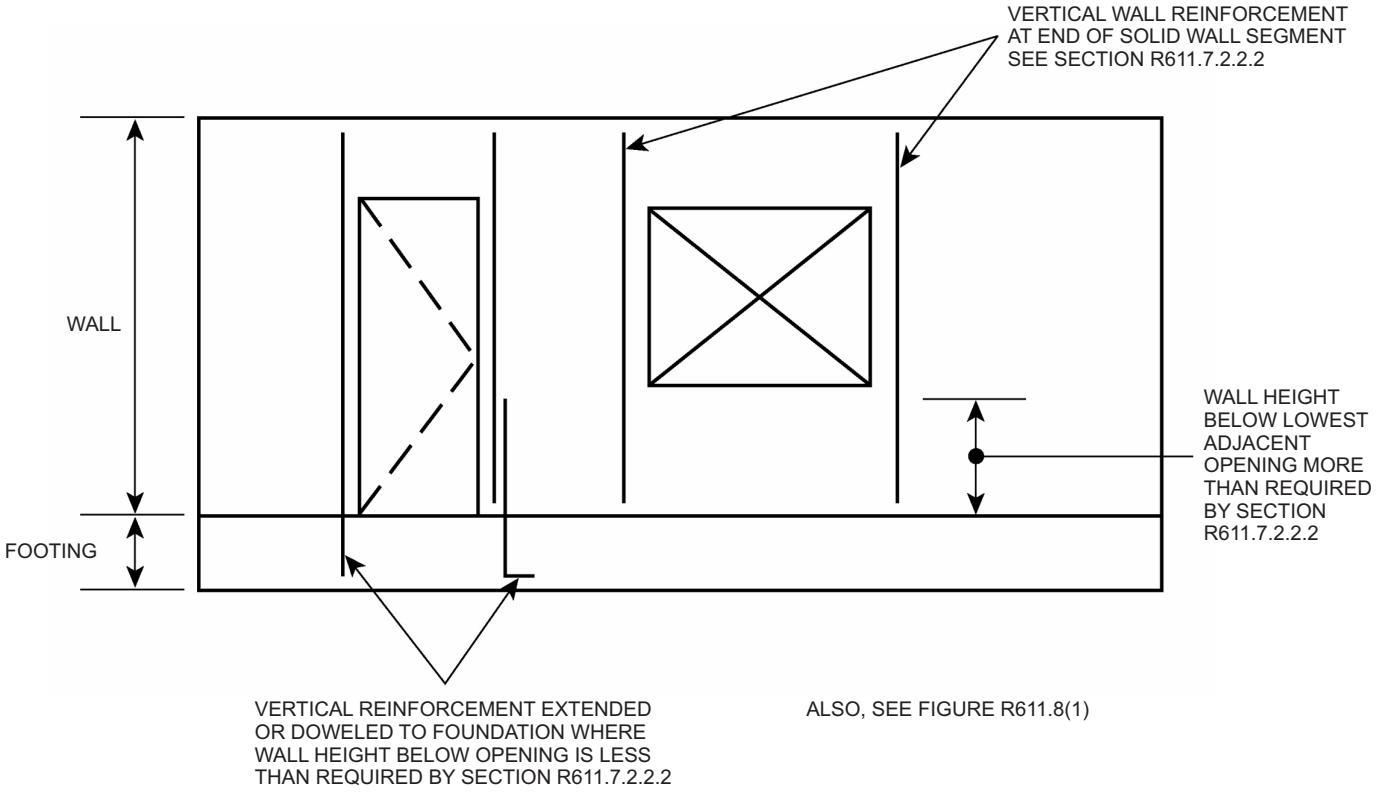


FIGURE R611.7(3)
VERTICAL WALL REINFORCEMENT ADJACENT TO WALL OPENINGS

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.

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.

$$R_3 \le \frac{TL}{R_1 \cdot R_2 \cdot UR} \qquad \textbf{(Equation R611-2)}$$

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 dimen-

sion 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.

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.

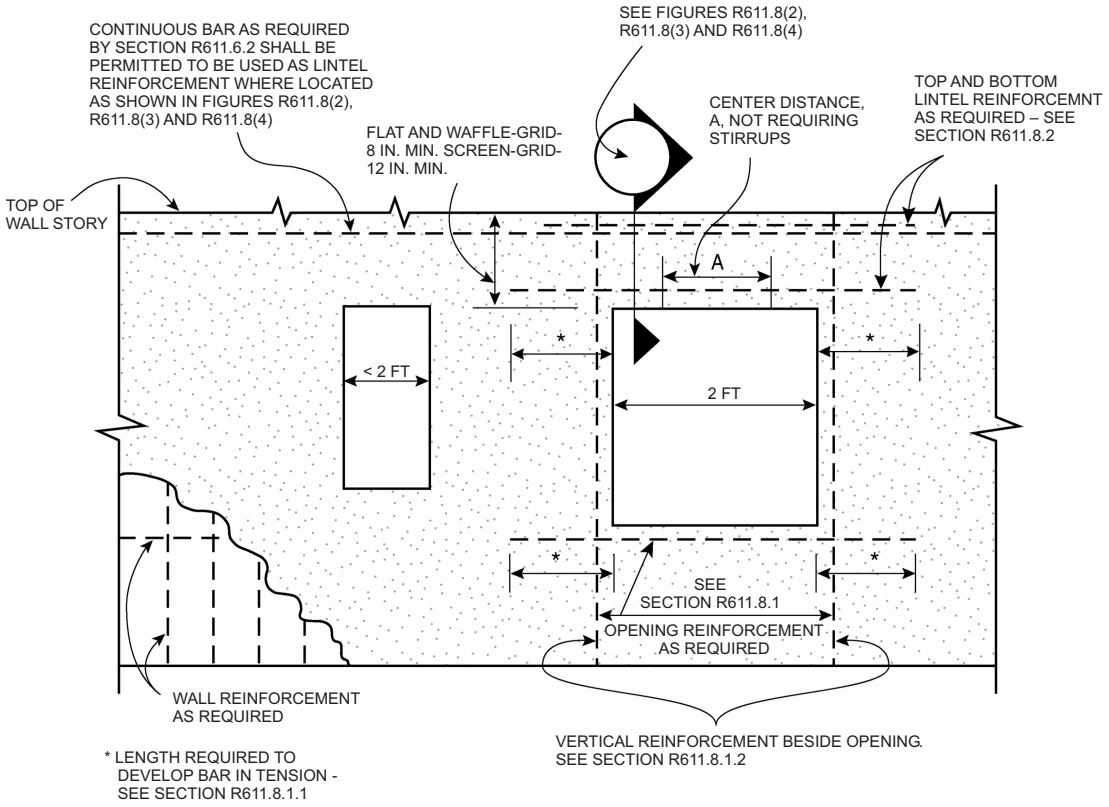
R611.8.1.1 Horizontal reinforcement. Lintels complying with Section R611.8.2 shall be provided above wall openings equal to or greater than 2 feet (610 mm) in width.

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.

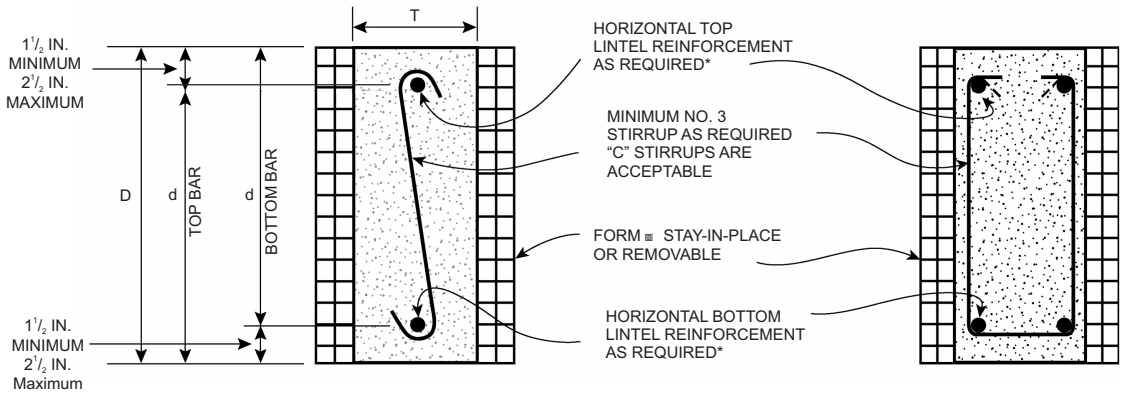
R611.8.1.2 Vertical reinforcement. Not less than one No. 4 bar [Grade 40 (280 MPa)] shall be provided on each side of openings equal to or greater than 2 feet (610 mm) in width. The vertical reinforcement required by this section shall extend the full height of the wall *story* and shall be located within 12 inches (305 mm) of each



ELEVATION OF WALL

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

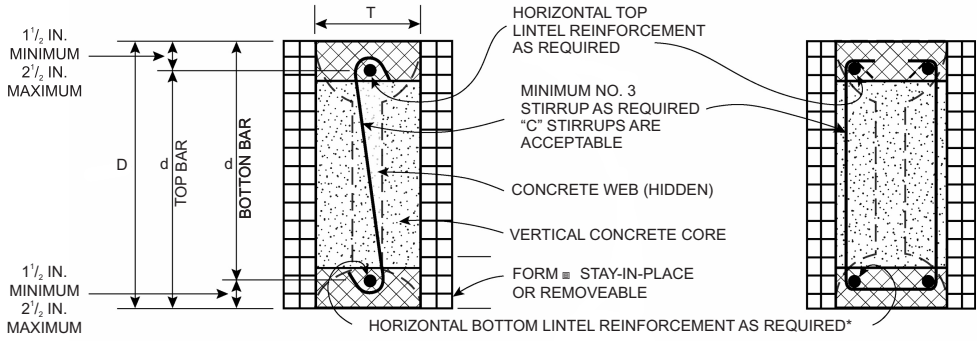
FIGURE R611.8(1)
REINFORCEMENT OF OPENINGS



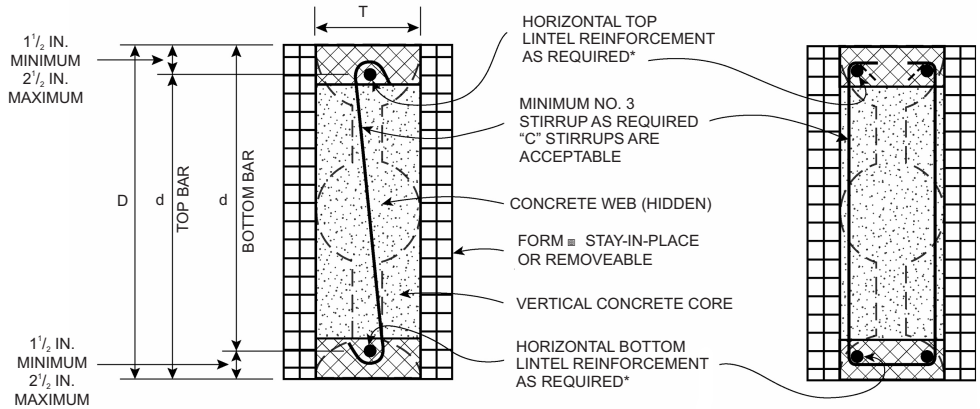
*FOR BUNDLED BARS, SEE SECTION R611.8.2.2.
SECTION CUT THROUGH FLAT WALL LINTEL

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



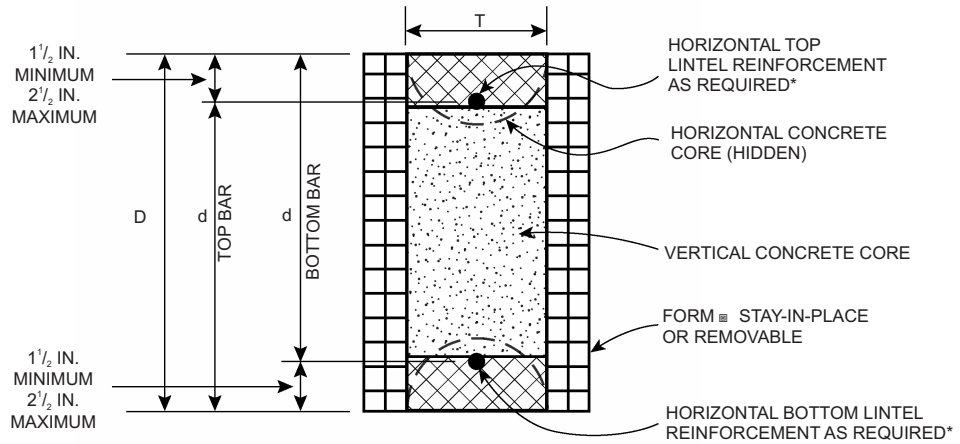
(b) DOUBLE FORM HEIGHT SECTION CUT THROUGH VERTICAL CORE OF A WAFFLE-GRID LINTEL

*FOR BUNDLED BARS, SEE SECTION R611.8.2.2.

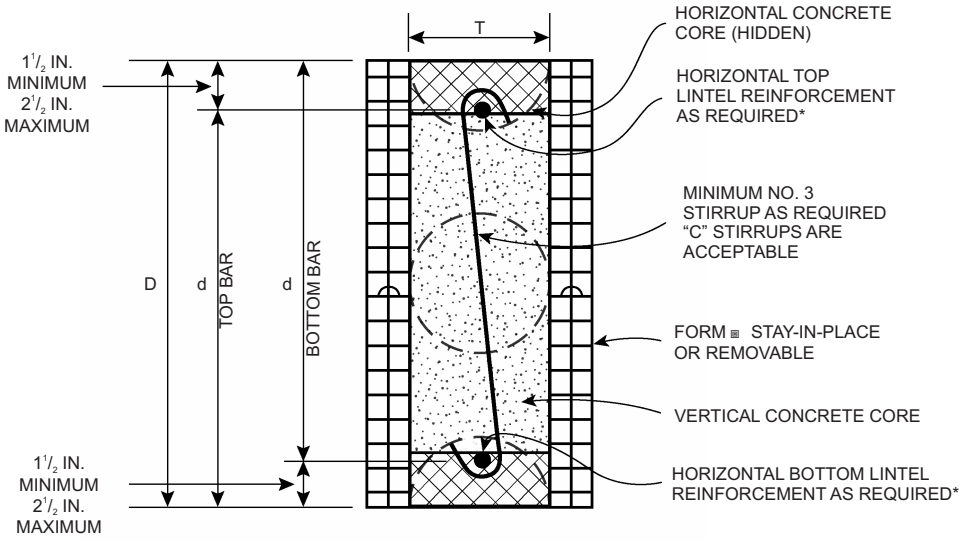
NOTE: CROSS-HATCHING REPRESENTS THE AREA IN WHICH FORM MATERIAL SHALL BE REMOVED, IF NECESSARY, TO CREATE FLANGES CONTINUOUS THE LENGTH OF THE LINTEL. FLANGES SHALL HAVE A MINIMUM THICKNESS OF 3 IN., AND A MINIMUM WIDTH OF 5 IN. AND 7 IN. IN 6 IN. NOMINAL AND 8 IN. NOMINAL WAFFLE-GRID WALLS, RESPECTIVELY. 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

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	
			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 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. Reserved.

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 clear span of lintel (feet - inches)				
8	Span without stirrups[i, j]		4-2	4-8	3-3	2-6	2-0
	1-#4	40,000	5-1	5-5	4-3	3-6	2-8
		60,000	6-2	6-7	5-2	4-2	3-3
	1-#5	40,000	6-3	6-8	5-3	4-3	3-3
		60,000	7-6	8-0	6-4	5-1	3-8
	2-#4 1-#6	40,000	7-0	7-6	5-11	4-9	3-8
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		1-7	1-10	1-2	0-9	0-5
12	Span without stirrups[i, j]		4-2	4-8	3-6	2-11	2-5
	1-#4	40,000	5-7	6-1	4-10	3-11	3-0
		60,000	7-9	8-6	6-9	5-6	4-3
	1-#5	40,000	7-11	8-8	6-11	5-7	4-4
		60,000	9-7	10-6	8-4	6-9	5-2
	2-#4 1-#6	40,000	8-11	9-9	7-9	6-3	4-10
		60,000	10-8	11-9	9-4	7-6	5-10
	2-#5	40,000	10-11	12-0	9-6	7-8	5-6
		60,000	12-11	14-3	11-3	9-0	6-1
	2-#6	40,000	12-9	14-0	11-1	8-1	5-6
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-6	3-0	1-10	1-3	0-9
16	Span without stirrups[i, j]		5-7	6-5	4-11	4-0	3-4
	1-#4	40,000	6-5	7-2	5-9	4-8	3-7
		60,000	7-10	8-9	7-0	5-8	4-4
	1-#5	40,000	7-11	8-11	7-1	5-9	4-5
		60,000	11-1	12-6	9-11	8-0	6-2
	2-#4 1-#6	40,000	10-3	11-7	9-2	7-6	5-9
		60,000	12-5	14-0	11-1	9-0	7-0
	2-#5	40,000	12-8	14-3	11-4	9-2	6-9
		60,000	15-2	17-1	13-7	11-0	7-11
	2-#6	40,000	14-11	16-9	13-4	9-8	6-9
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		3-3	4-1	2-7	1-9	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 clear span of lintel (feet - inches)				
20	Span without stirrups[i, j]		6-11	8-2	6-3	5-2	4-4
	1-#5	40,000	8-9	10-1	8-0	6-6	5-1
		60,000	10-8	12-3	9-9	8-0	6-2
	2-#4 1-#6	40,000	9-11	11-4	9-1	7-4	5-8
		60,000	13-9	15-10	12-8	10-3	7-11
	2-#5	40,000	14-0	16-2	12-11	10-6	7-11
		60,000	16-11	19-6	15-6	12-7	9-1
	2-#6	40,000	16-7	19-1	15-3	11-3	7-11
		60,000	19-11	22-10	18-3	13-2	9-1
	Center distance A[k, l]		3-11	5-2	3-3	2-2	1-4
24	Span without stirrups[i, j]		8-2	9-10	7-8	6-4	5-3
	1-#5	40,000	9-5	11-1	8-10	7-3	5-7
		60,000	11-6	13-6	10-9	8-9	6-10
	2-#4 1-#6	40,000	10-8	12-6	10-0	8-2	6-4
		60,000	12-11	15-2	12-2	9-11	7-8
	2-#5	40,000	15-2	17-9	14-3	11-7	9-0
		60,000	18-4	21-6	17-3	14-0	10-4
	2-#6	40,000	18-0	21-1	16-11	12-9	9-2
		60,000	21-7	25-4	20-4	14-9	10-4
	Center distance A[k, l]		4-6	6-2	4-0	2-8	1-7

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. Reserved.

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 clear span of lintel (feet - inches)				
8	Span without stirrups[i, j]		4-4	4-9	3-9	2-10	2-1
	1-#4	40,000	4-4	4-9	3-9	2-11	2-3
		60,000	6-1	6-7	5-3	4-0	3-1
	1-#5	40,000	6-2	6-9	5-4	4-1	3-2
		60,000	7-5	8-1	6-5	4-11	3-9
	2-#4 1-#6	40,000	6-11	7-6	6-0	4-7	3-6
		60,000	8-3	9-0	7-2	5-6	4-2
	2-#5	40,000	8-5	9-2	7-3	5-7	4-2
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-1	2-6	1-6	0-11	0-6
12	Span without stirrups[i, j]		4-10	5-8	4-2	3-2	2-7
	1-#4	40,000	5-5	6-1	4-10	3-9	2-10
		60,000	6-7	7-5	5-11	4-7	3-6
	1-#5	40,000	6-9	7-7	6-0	4-8	3-7
		60,000	9-4	10-6	8-4	6-6	5-0
	2-#4 1-#6	40,000	8-8	9-9	7-9	6-0	4-7
		60,000	10-6	11-9	9-5	7-3	5-7
	2-#5	40,000	10-8	12-0	9-7	7-5	5-6
		60,000	12-10	14-5	11-6	8-11	6-7
	2-#6	40,000	12-7	14-2	11-3	8-3	5-6
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		3-2	4-0	2-6	1-6	0-11
16	Span without stirrups[i, j]		6-5	7-9	5-10	4-5	3-7
	1-#4	40,000	6-2	7-1	5-8	4-5	3-5
		60,000	7-6	8-8	6-11	5-5	4-2
	1-#5	40,000	7-8	8-10	7-1	5-6	4-3
		60,000	9-4	10-9	8-7	6-8	5-2
	2-#4 1-#6	40,000	8-8	10-0	8-0	6-2	4-9
		60,000	12-0	13-11	11-2	8-8	6-8
	2-#5	40,000	12-3	14-2	11-4	8-10	6-9
		60,000	14-10	17-2	13-8	10-8	7-11
	2-#6	40,000	14-6	16-10	13-5	10-1	6-11
		60,000	17-5	20-2	16-1	11-10	7-11
	Center distance[k, l]		4-1	5-5	3-6	2-1	1-3

(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 clear span of lintel (feet - inches)				
20	Span without stirrups[i, j]		7-10	9-10	7-5	5-8	4-7
	1-#5	40,000	8-4	9-11	8-0	6-3	4-9
		60,000	10-2	12-1	9-9	7-7	5-10
	2-#4 1-#6	40,000	9-5	11-3	9-0	7-0	5-5
		60,000	11-6	13-8	11-0	8-7	6-7
	2-#5	40,000	11-9	13-11	11-2	8-9	6-8
		60,000	16-4	19-5	15-7	12-2	9-3
	2-#6	40,000	16-0	19-0	15-3	11-10	8-3
		60,000	19-3	22-11	18-5	13-7	9-3
	Center distance A[k, l]		4-10	6-10	4-5	2-8	1-7
24	Span without stirrups[i, j]		9-2	11-9	8-11	6-11	5-7
	1-#5	40,000	8-11	10-10	8-9	6-10	5-3
		60,000	10-11	13-3	10-8	8-4	6-5
	2-#4 1-#6	40,000	10-1	12-3	9-11	7-9	6-0
		60,000	12-3	15-0	12-1	9-5	7-3
	2-#5	40,000	12-6	15-3	12-4	9-7	7-5
		60,000	17-6	21-3	17-2	13-5	10-4
	2-#6	40,000	17-2	20-11	16-10	13-2	9-7
		60,000	20-9	25-3	20-4	15-4	10-7
	Center distance A[k, l]		5-6	8-1	5-3	3-3	1-11

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. Reserved.

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 clear span of lintel (feet - inches)				
8	Span without stirrups[i, j]		6-0	7-2	4-10	3-1	2-3
	1-#4	40,000	4-3	4-9	3-9	2-9	2-1
		60,000	5-11	6-7	5-3	3-10	2-11
	1-#5	40,000	6-1	6-9	5-4	3-11	3-0
		60,000	7-4	8-1	6-5	4-9	3-7
	2-#4 1-#6	40,000	6-10	7-6	6-0	4-5	3-4
		60,000	8-2	9-1	7-2	5-4	4-1
	2-#5	40,000	8-4	9-3	7-4	5-5	4-1
		60,000	9-11	11-0	8-9	6-6	4-8
	2-#6	40,000	9-9	10-10	8-7	6-4	4-1
		60,000	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-6	3-1	1-11	1-1	0-7
12	Span without stirrups[i, j]		5-5	6-7	4-10	3-5	2-8
	1-#4	40,000	5-3	6-0	4-10	3-7	2-9
		60,000	6-5	7-4	5-10	4-4	3-4
	1-#5	40,000	6-6	7-6	6-0	4-5	3-5
		60,000	7-11	9-1	7-3	5-5	4-2
	2-#4 1-#6	40,000	7-4	8-5	6-9	5-0	3-10
		60,000	10-3	11-9	9-5	7-0	5-4
	2-#5	40,000	10-5	12-0	9-7	7-2	5-5
		60,000	12-7	14-5	11-6	8-7	6-6
	2-#6	40,000	12-4	14-2	11-4	8-5	5-7
		60,000	14-9	17-0	13-6	10-0	6-6
	Center distance A[k, l]		3-9	4-11	3-2	1-9	1-0
16	Span without stirrups[i, j]		7-1	9-0	6-8	4-9	3-9
	1-#4	40,000	5-11	7-0	5-8	4-3	3-3
		60,000	7-3	8-7	6-11	5-2	3-11
	1-#5	40,000	7-4	8-9	7-0	5-3	4-0
		60,000	9-0	10-8	8-7	6-5	4-11
	2-#4 1-#6	40,000	8-4	9-11	7-11	5-11	4-6
		60,000	10-2	12-0	9-8	7-3	5-6
	2-#5	40,000	10-4	12-3	9-10	7-4	5-8
		60,000	14-4	17-1	13-8	10-3	7-10
	2-#6	40,000	14-1	16-9	13-5	10-1	7-0
		60,000	17-0	20-2	16-2	12-0	8-0
	Center distance[k, l]		4-9	6-8	4-4	2-5	1-5

(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 clear span of lintel (feet - inches)				
20	Span without stirrups[i, j]		8-7	11-4	8-5	6-1	4-10
	1-#4	40,000	6-5	7-10	6-4	4-9	3-8
		60,000	7-10	9-7	7-9	5-10	4-5
	1-#5	40,000	8-0	9-9	7-11	5-11	4-6
		60,000	9-9	11-11	9-8	7-3	5-6
	2-#4 1-#6	40,000	9-0	11-1	8-11	6-9	5-2
		60,000	11-0	13-6	10-11	8-2	6-3
	2-#5	40,000	11-3	13-9	11-1	8-4	6-5
		60,000	15-8	19-2	15-6	11-8	8-11
	2-#6	40,000	15-5	18-10	15-2	11-5	8-6
		60,000	18-7	22-9	18-5	13-10	9-5
	Center distance A[k, l]		5-7	8-4	5-5	3-1	1-10
24	Span without stirrups[i, j]		9-11	13-7	10-2	7-5	5-10
	1-#5	40,000	8-6	10-8	8-8	6-6	5-0
		60,000	10-5	13-0	10-7	8-0	6-1
	2-#4 1-#6	40,000	9-7	12-1	9-9	7-5	5-8
		60,000	11-9	14-9	11-11	9-0	6-11
	2-#5	40,000	12-0	15-0	12-2	9-2	7-1
		60,000	14-7	18-3	14-10	11-2	8-7
	2-#6	40,000	14-3	17-11	14-7	11-0	8-5
		60,000	19-11	25-0	20-3	15-3	10-10
	Center distance A[k, l]		6-3	9-11	6-6	3-9	2-2

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. Reserved.
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 clear span of lintel (feet - inches)				
8[i]	Span without stirrups[k, l]		2-7	2-9	2-1	2-0	2-0
	1-#4	40,000	5-2	5-5	4-3	3-3	2-4
		60,000	5-9	6-3	4-3	3-3	2-4
	1-#5	40,000	5-9	6-3	4-3	3-3	2-4
		60,000	5-9	6-3	4-3	3-3	2-4
	2-#4 1-#6	40,000	5-9	6-3	4-3	3-3	2-4
		60,000	DR	DR	DR	DR	DR
	Center distance A[m, n]		0-9	0-10	0-6	0-5	STL
12[i]	Span without stirrups[k, l]		2-11	3-1	2-7	2-4	2-1
	1-#4	40,000	5-9	6-2	4-10	4-1	3-2
		60,000	8-0	8-7	6-9	5-5	3-11
	1-#5	40,000	8-1	8-9	6-11	5-5	3-11
		60,000	9-1	10-3	7-0	5-5	3-11
	2-#4 1-#6	40,000	9-1	9-9	7-0	5-5	3-11
	Center distance A[m, n]		1-3	1-5	0-11	0-8	STL
16[i]	Span without stirrups[k, l]		4-0	4-4	3-7	3-3	2-10
	1-#4	40,000	6-7	7-3	5-9	4-10	3-9
		60,000	8-0	8-10	7-0	5-11	4-7
	1-#5	40,000	8-2	9-0	7-2	6-0	4-8
		60,000	11-5	12-6	9-9	7-7	5-6
	2-#4 1-#6	40,000	10-7	11-7	9-3	7-7	5-6
		60,000	12-2	14-0	9-9	7-7	5-6
	2-#5	40,000	12-2	14-2	9-9	7-7	5-6
		60,000	DR	DR	DR	DR	DR
	Center distance A[m, n]		1-8	2-0	1-3	0-11	STL
20[i]	Span without stirrups[k, l]		5-0	5-6	4-7	4-1	3-8
	1-#4	40,000	7-2	8-2	6-6	5-6	4-3
		60,000	8-11	9-11	7-11	6-8	5-2
	1-#5	40,000	9-1	10-2	8-1	6-10	5-4
		60,000	12-8	14-2	11-3	9-6	7-1
	2-#4 1-#6	40,000	10-3	11-5	9-1	7-8	6-0
		60,000	14-3	15-11	12-5	9-9	7-1
	2-#5	40,000	14-6	16-3	12-1	9-6	6-11
		60,000	DR	DR	DR	DR	DR
	Center distance A[m, n]		2-0	2-6	1-7	1-1	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 clear span of lintel (feet - inches)				
24w[j]	Span without stirrups[k, l]		6-0	6-8	5-7	5-0	4-6
	1-#4	40,000	7-11	9-0	7-2	6-0	4-8
		60,000	9-8	10-11	8-9	7-4	5-9
	1-#5	40,000	9-10	11-2	8-11	7-6	5-10
		60,000	12-0	13-7	10-10	9-2	7-2
	2-#4 1-#6	40,000	11-1	12-7	10-1	8-6	6-7
		60,000	15-6	17-7	14-0	11-10	8-7
	2-#5	40,000	15-6	17-11	13-4	10-7	7-10
		60,000	DR	DR	DR	DR	DR
	Center distance A[m, n]		2-4	3-0	1-11	1-4	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. Reserved.

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 clear span of lintel (feet - inches)				
8[i]	Span with stirrups[k, l]		2-6	2-9	2-1	2-0	2-0
	1-#4	40,000	4-5	4-9	3-9	3-0	2-3
		60,000	5-6	6-2	4-3	3-1	2-3
	1-#5	40,000	5-6	6-2	4-3	3-1	2-3
	Center distance A[m, n]		0-9	0-10	0-6	0-4	STL
12[i]	Span without stirrups[k, l]		2-10	3-1	2-7	2-3	2-0
	1-#4	40,000	5-7	6-1	4-10	3-11	3-0
		60,000	6-9	7-5	5-11	4-9	3-8
	1-#5	40,000	6-11	7-7	6-0	4-10	3-9
		60,000	8-8	10-1	7-0	5-2	3-9
	2-#4 1-#6	40,000	8-8	9-10	7-0	5-2	3-9
		60,000	8-8	10-1	7-0	5-2	3-9
	Center distance A[m, n]		1-2	1-5	0-11	0-7	STL
16[i]	Span without stirrups[k, l]		3-10	4-3	3-7	3-2	2-10
	1-#4	40,000	6-5	7-2	5-9	4-8	3-7
		60,000	7-9	8-9	7-0	5-8	4-4
	1-#5	40,000	7-11	8-11	7-1	5-9	4-5
		60,000	9-8	10-11	8-8	7-0	5-2
	2-#4 1-#6	40,000	9-0	10-1	8-0	6-6	5-0
		60,000	11-5	13-10	9-8	7-2	5-2
	Center distance A[m, n]		1-6	1-11	1-3	0-10	STL
20[i]	Span without stirrups[k, l]		4-10	5-5	4-7	4-0	3-7
	1-#4	40,000	7-0	8-1	6-5	5-3	4-1
		60,000	8-7	9-10	7-10	6-5	4-11
	1-#5	40,000	8-9	10-1	8-0	6-6	5-1
		60,000	10-8	12-3	9-10	8-0	6-2
	2-#4 1-#6	40,000	9-10	11-4	9-1	7-4	5-8
		60,000	12-0	13-10	11-0	9-0	6-8
	2-#5	40,000	12-3	14-1	11-3	8-11	6-6
		60,000	14-0	17-6	12-3	9-1	6-8
	Center distance A[m, n]		1-10	2-5	1-7	1-0	STL
24[j]	Span without stirrups[k, l]		5-9	6-7	5-6	4-11	4-5
	1-#4	40,000	7-6	8-10	7-1	5-9	4-6
		60,000	9-2	10-9	8-8	7-1	5-6
	1-#5	40,000	9-5	11-0	8-10	7-2	5-7
		60,000	11-5	13-5	10-9	8-9	6-10
	2-#4 1-#6	40,000	10-7	12-5	10-0	8-1	6-3
		60,000	12-11	15-2	12-2	9-11	7-8
	2-#5	40,000	13-2	15-6	12-5	9-11	7-5
		60,000	16-3	21-0	14-10	11-1	8-1
	2-#6	40,000	14-4	18-5	13-2	9-11	7-5
	Center distance A[m, n]		2-1	2-11	1-10	1-3	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. Reserved.

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 clear span of lintel (feet - inches)				
12[i,j]	Span without stirrups		2-9	2-11	2-5	2-3	2-0
16[i,j]	Span without stirrups		3-9	4-0	3-5	3-1	2-9
20[i,j]	Span without stirrups		4-9	5-1	4-4	4-0	3-7
24[k]	Span without stirrups[l, m]		5-8	6-3	5-3	4-10	4-4
	1-#4	40,000	7-11	9-0	7-2	6-1	4-9
		60,000	9-9	11-0	8-9	7-5	5-9
	1-#5	40,000	9-11	11-2	8-11	7-7	5-11
		60,000	12-1	13-8	10-10	9-3	7-2
	2-#4 1-#6	40,000	11-2	12-8	10-1	8-7	6-8
		60,000	15-7	17-7	13-4	10-8	7-11
	2-#5	40,000	14-11	18-0	12-10	10-3	7-8
		60,000	DR	DR	DR	DR	DR
	Center distance A[n, o]		2-0	2-6	1-7	1-2	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. Reserved.

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^f (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.

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.

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).

R611.9 Requirements for connections – general. Concrete walls shall be connected to footings, floors, ceilings and roofs in accordance with this section.

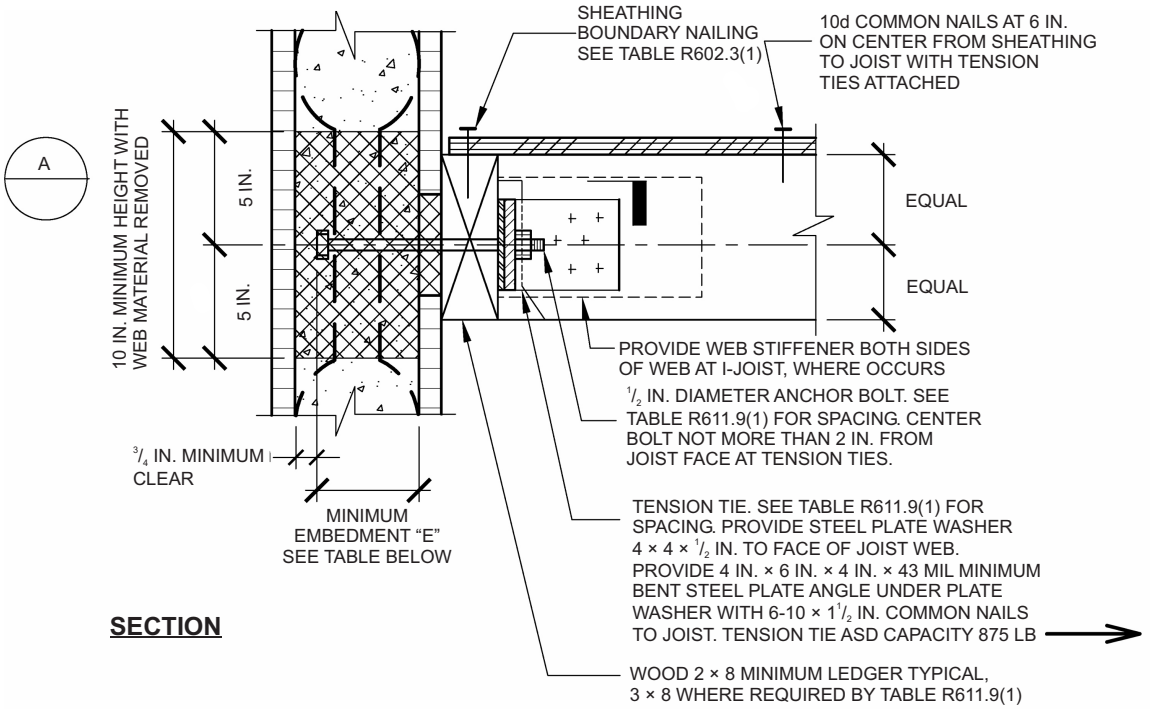
R611.9.1 Connections between concrete walls and light-framed floor, ceiling and roof systems. Connections between concrete walls and light-framed floor, ceiling and roof systems using the prescriptive details of Figures R611.9(1) through R611.9(12) shall comply with this section and Sections R611.9.2 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.



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]

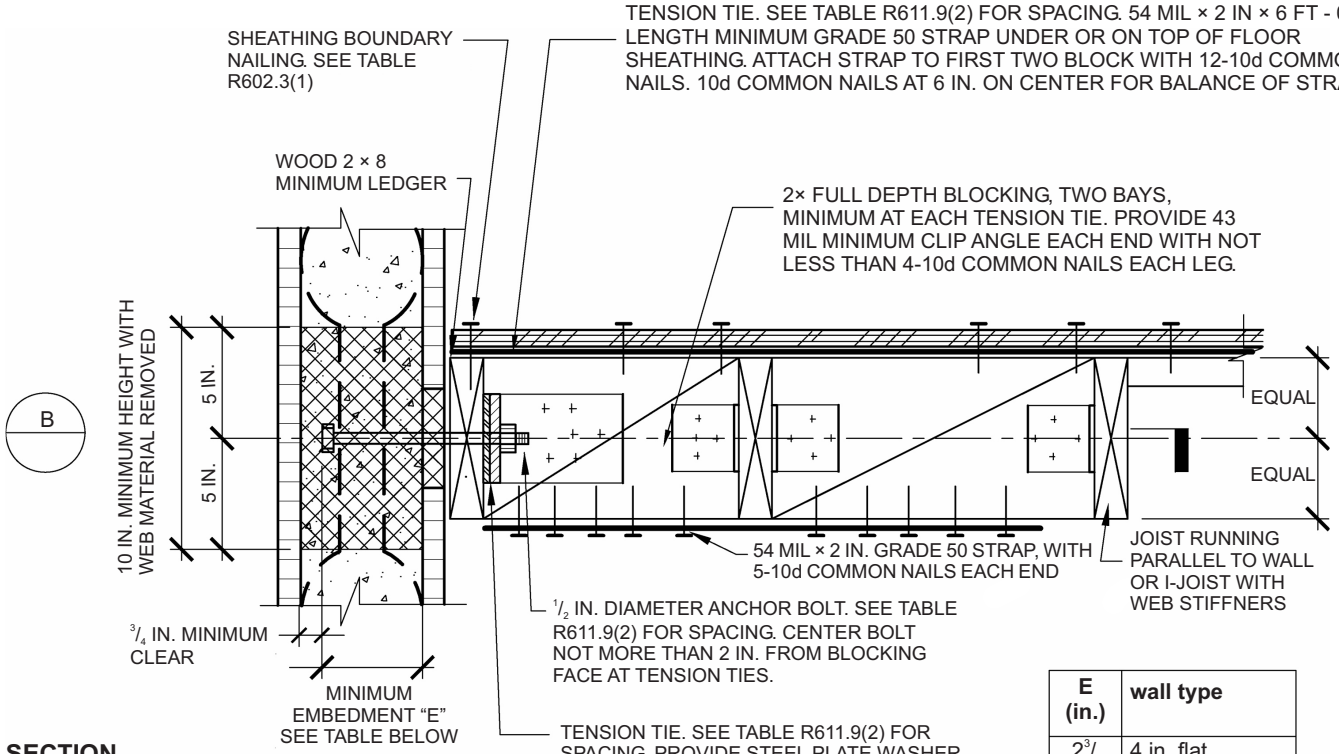
ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	V_{asd} determined in accordance with Section R301.2.1.3 (mph)					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16					A	A
16	32						
16	48						
19.2	19.2	A	A	A	A	A	
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

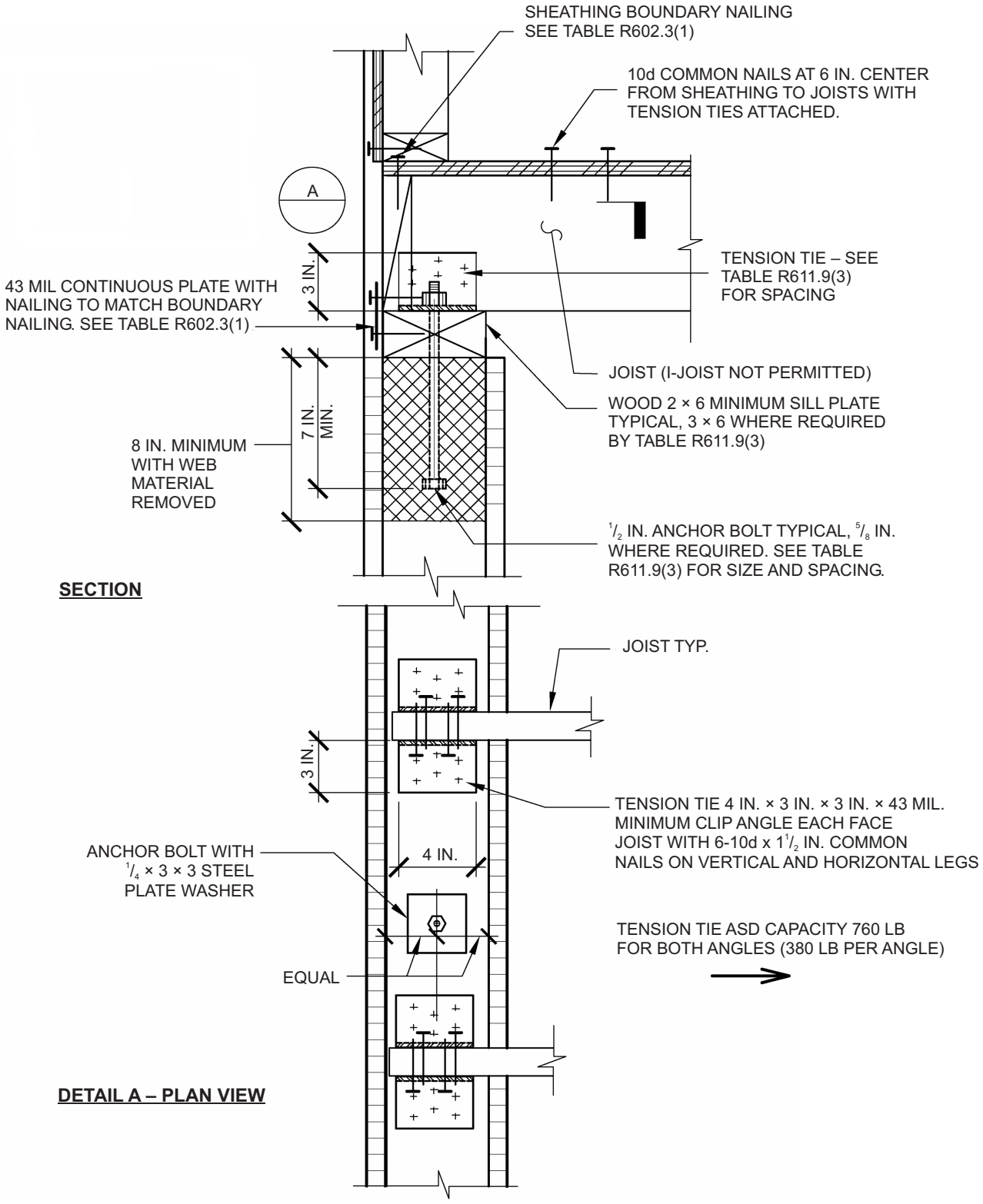
TABLE R611.9(2)
WOOD FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PARALLEL[a, b]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

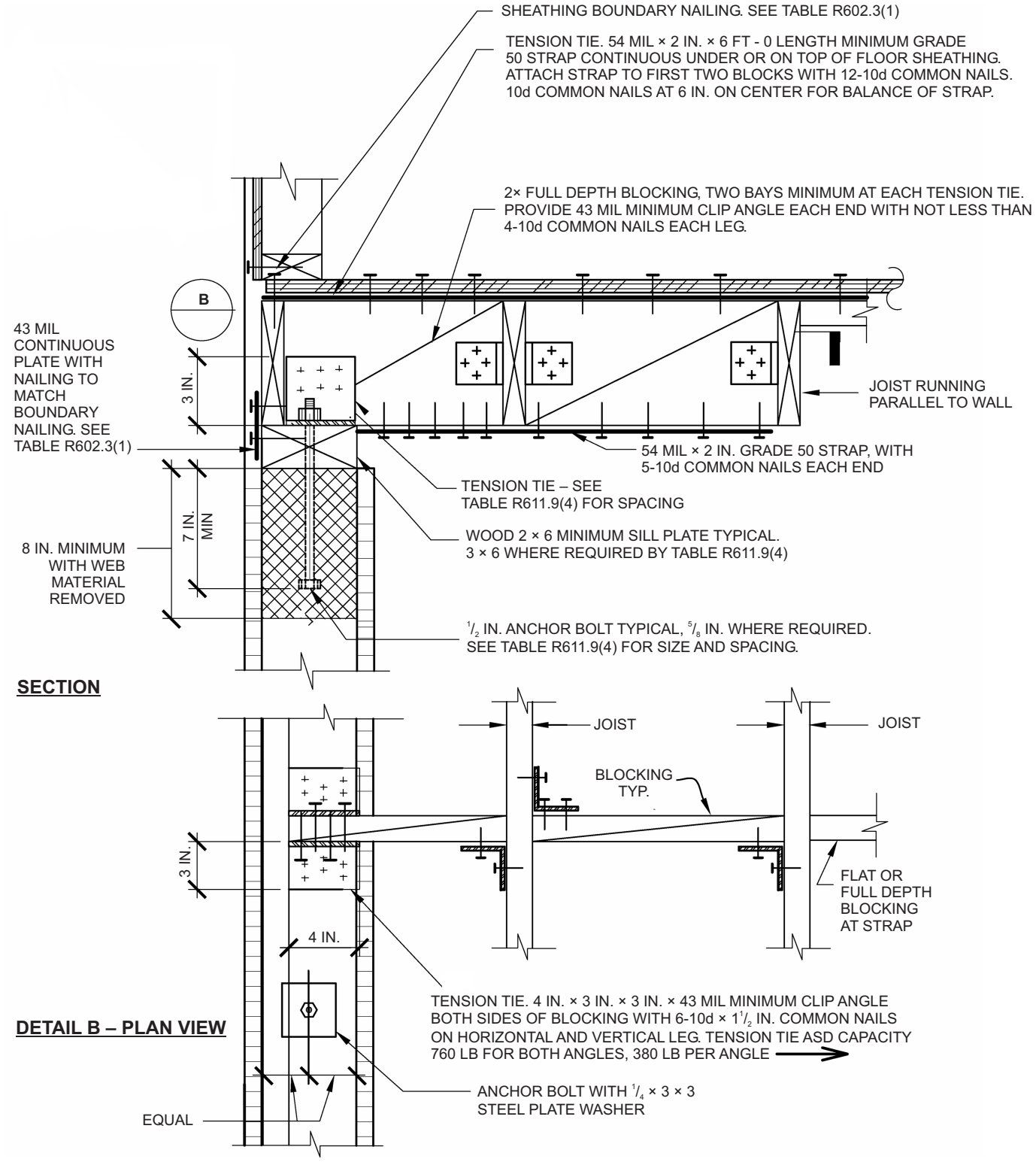
a. This table is for use with the detail in Figure R611.9(3). Use of this detail is permitted where cell is not shaded, prohibited where shaded.

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 pound-force = 4.448 N.
F C

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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

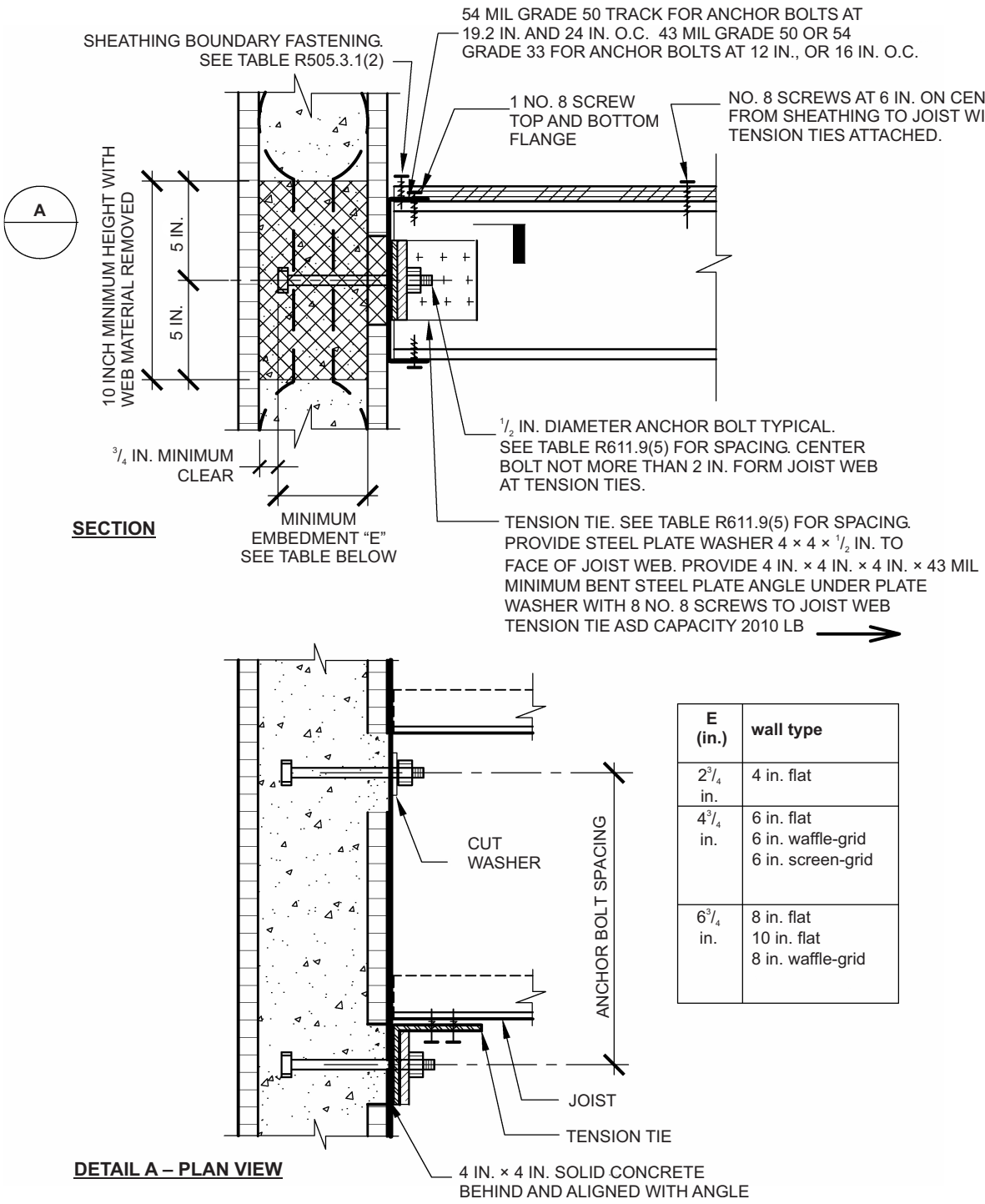
a. This table is for use with the detail in Figure R611.9(4). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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

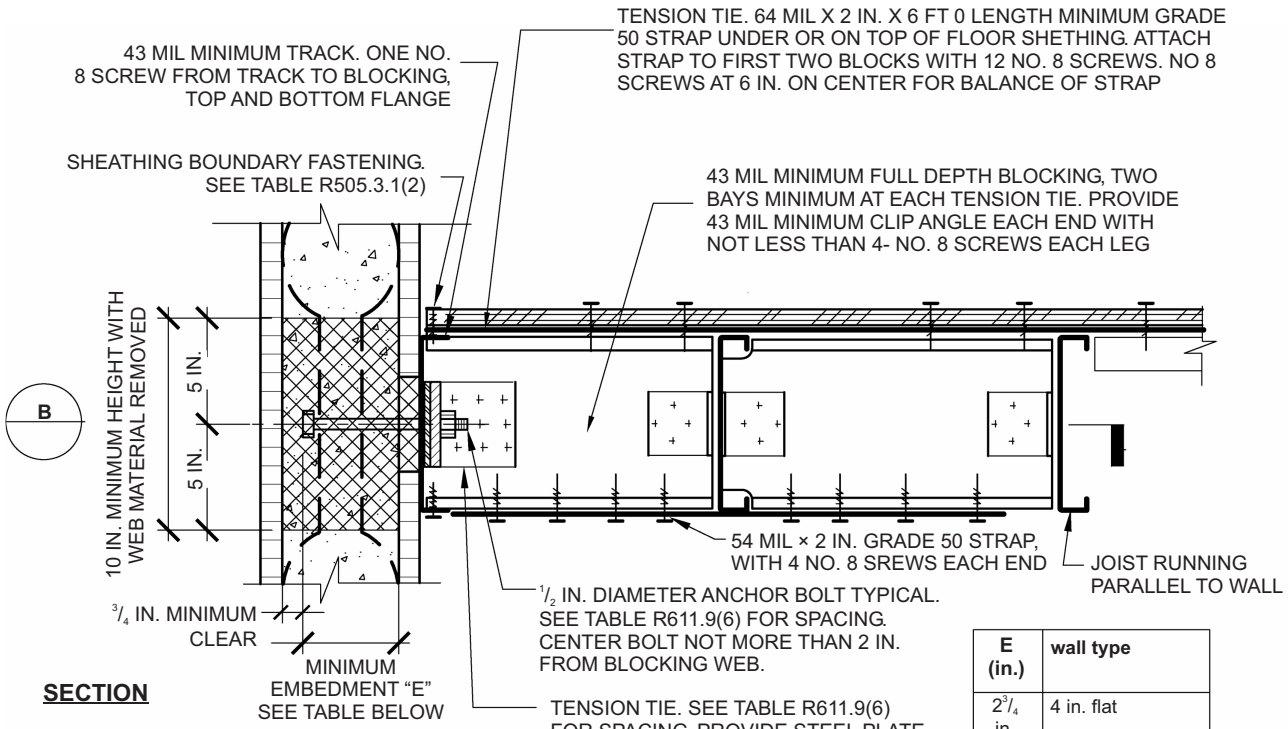
For SI: 1 inch = 25.4 mm; 1 mile per hour = 0.4470 m/s.

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.

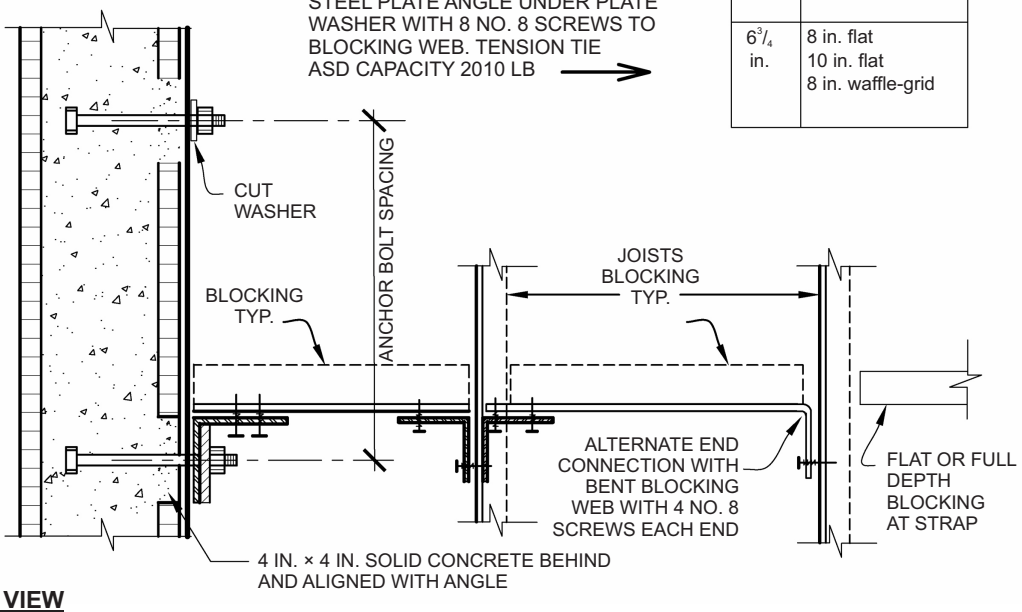
c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

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.



SECTION

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



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(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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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

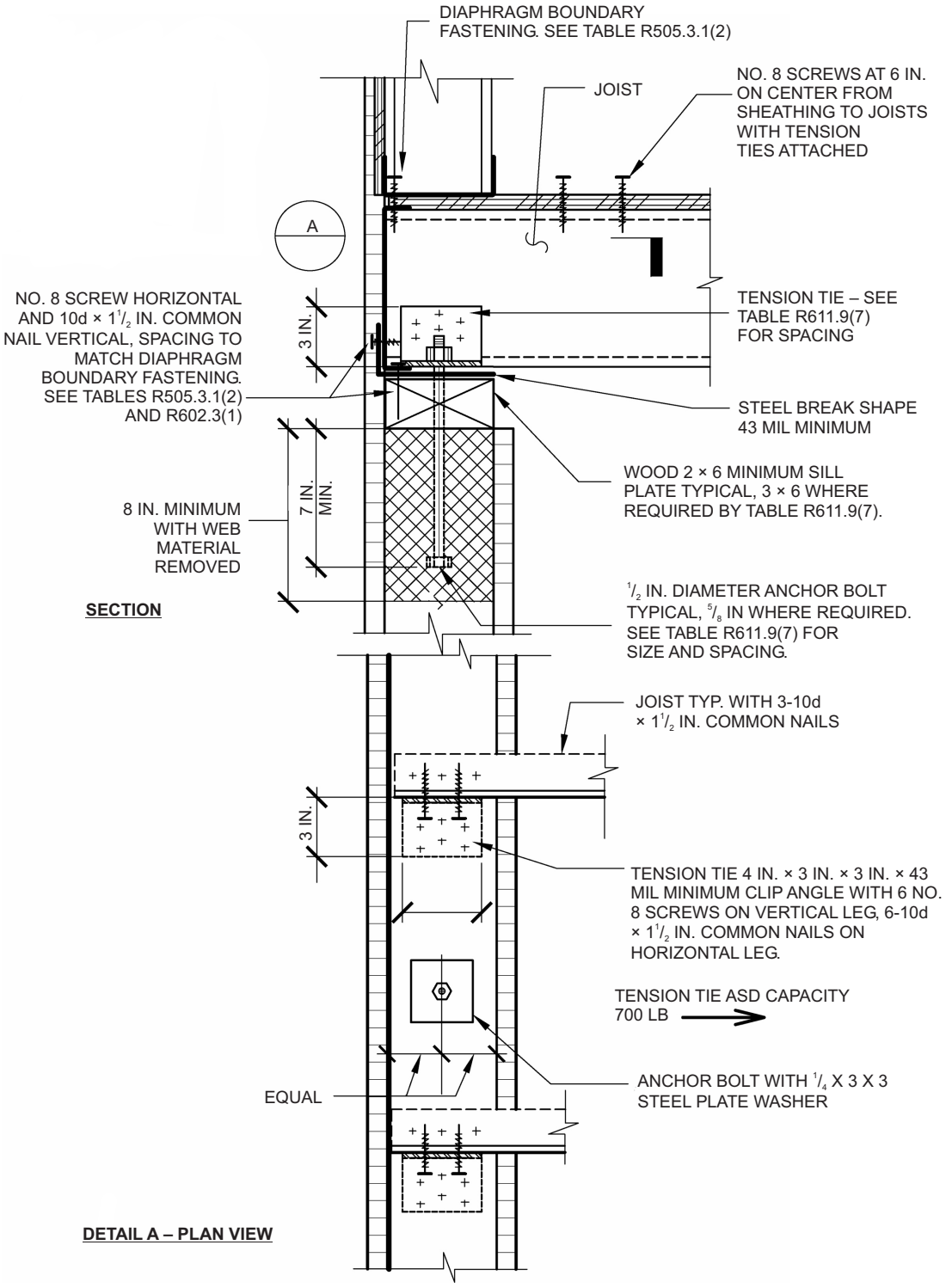
For SI: 1 inch = 25.4 mm; 1 mile per hour = 0.447 m/s.

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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

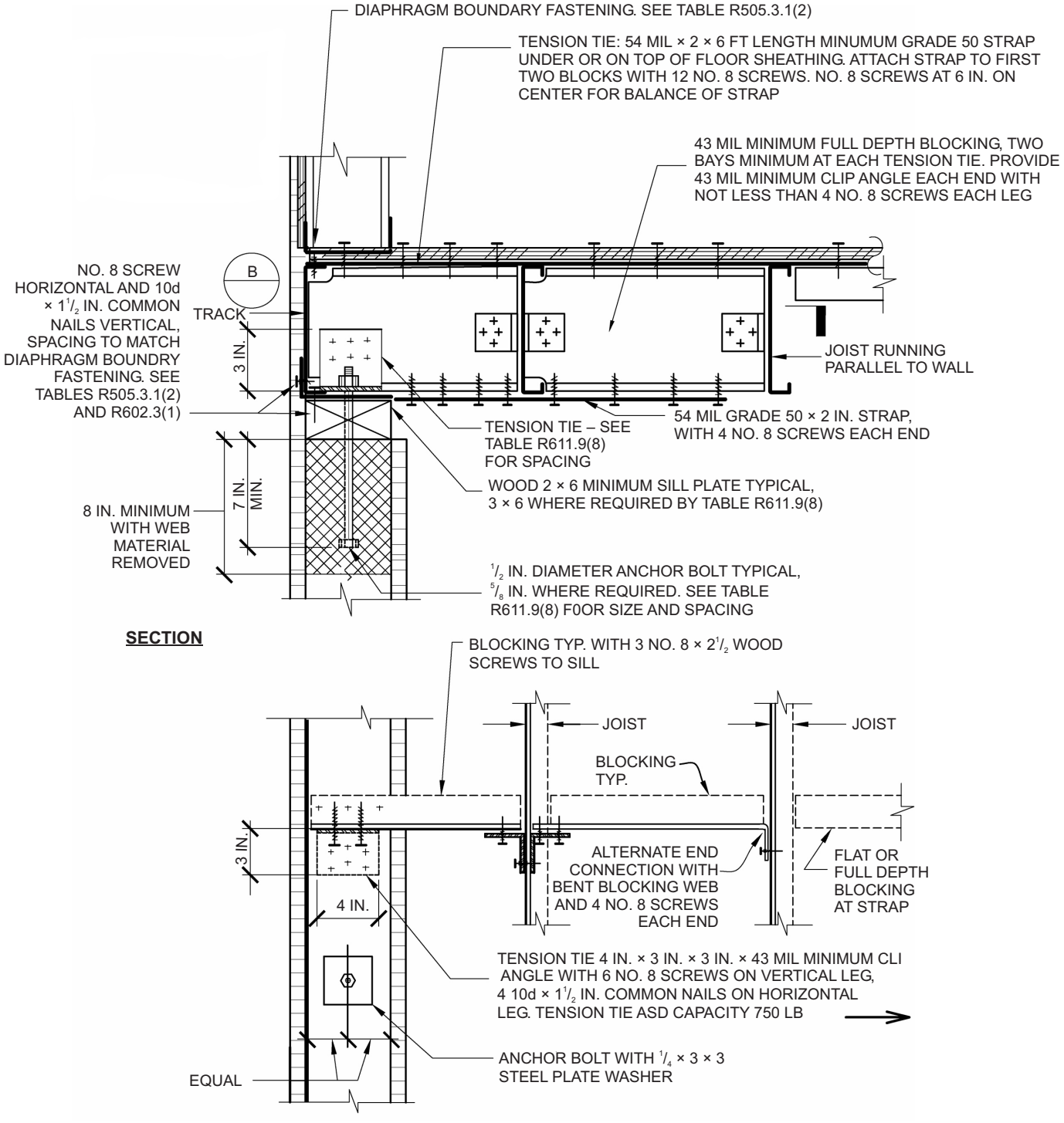
a. This table is for use with the detail in Figure R611.9(7). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

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.



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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

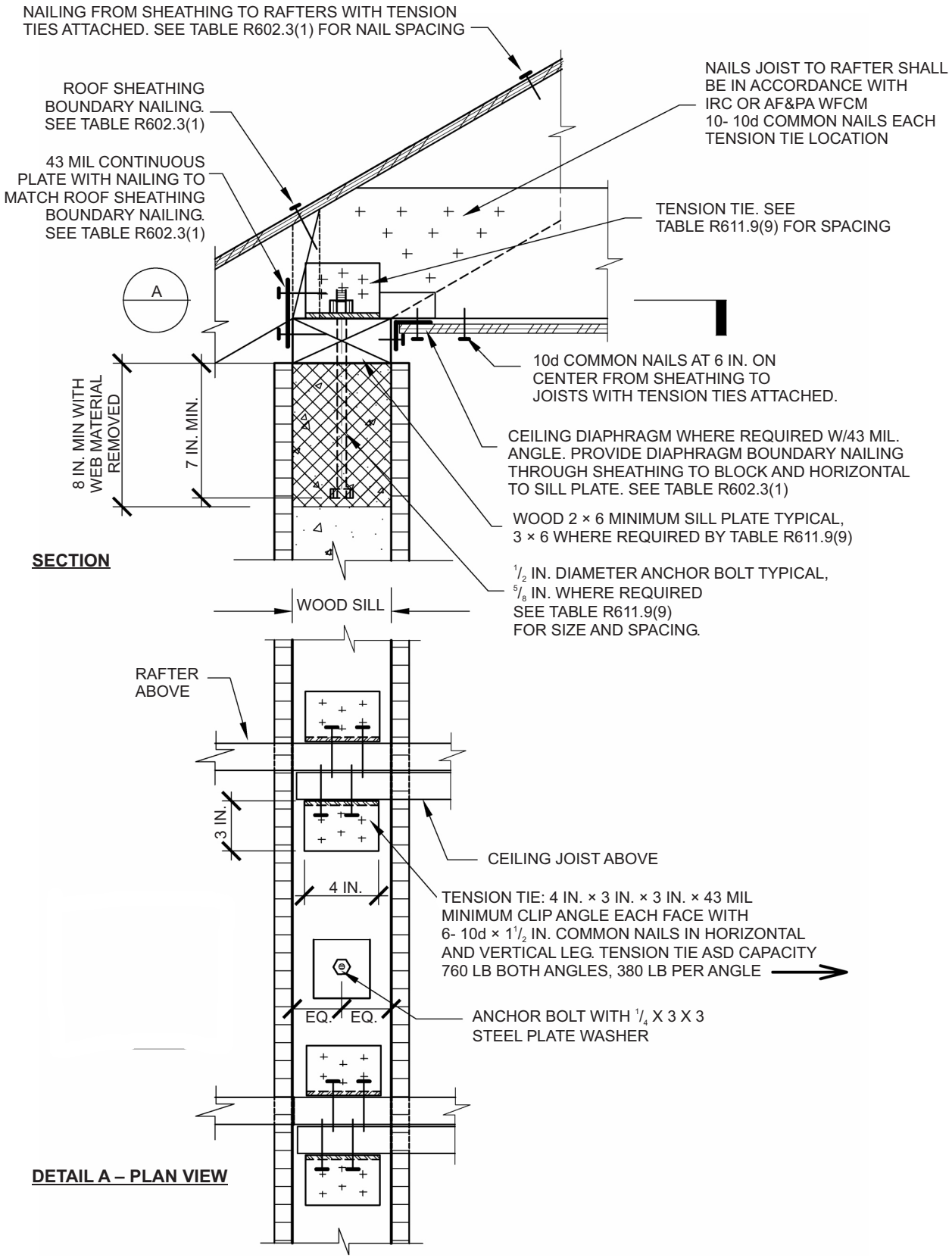
a. This table is for use with the detail in Figure R611.9(8). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

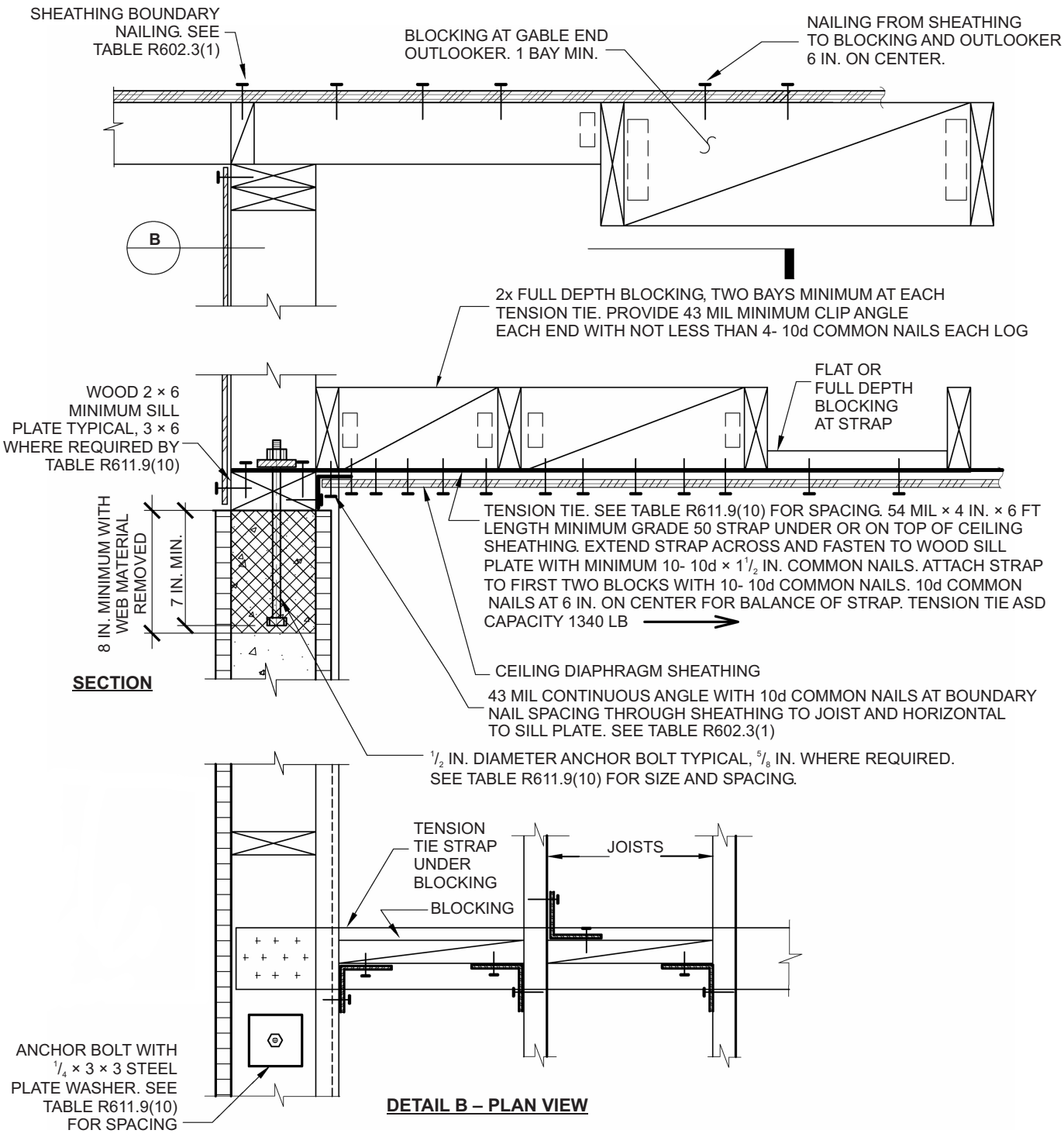
a. This table is for use with the detail in Figure R611.9(9). Use of this detail is permitted where cell a is not shaded, prohibited where shaded.

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 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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

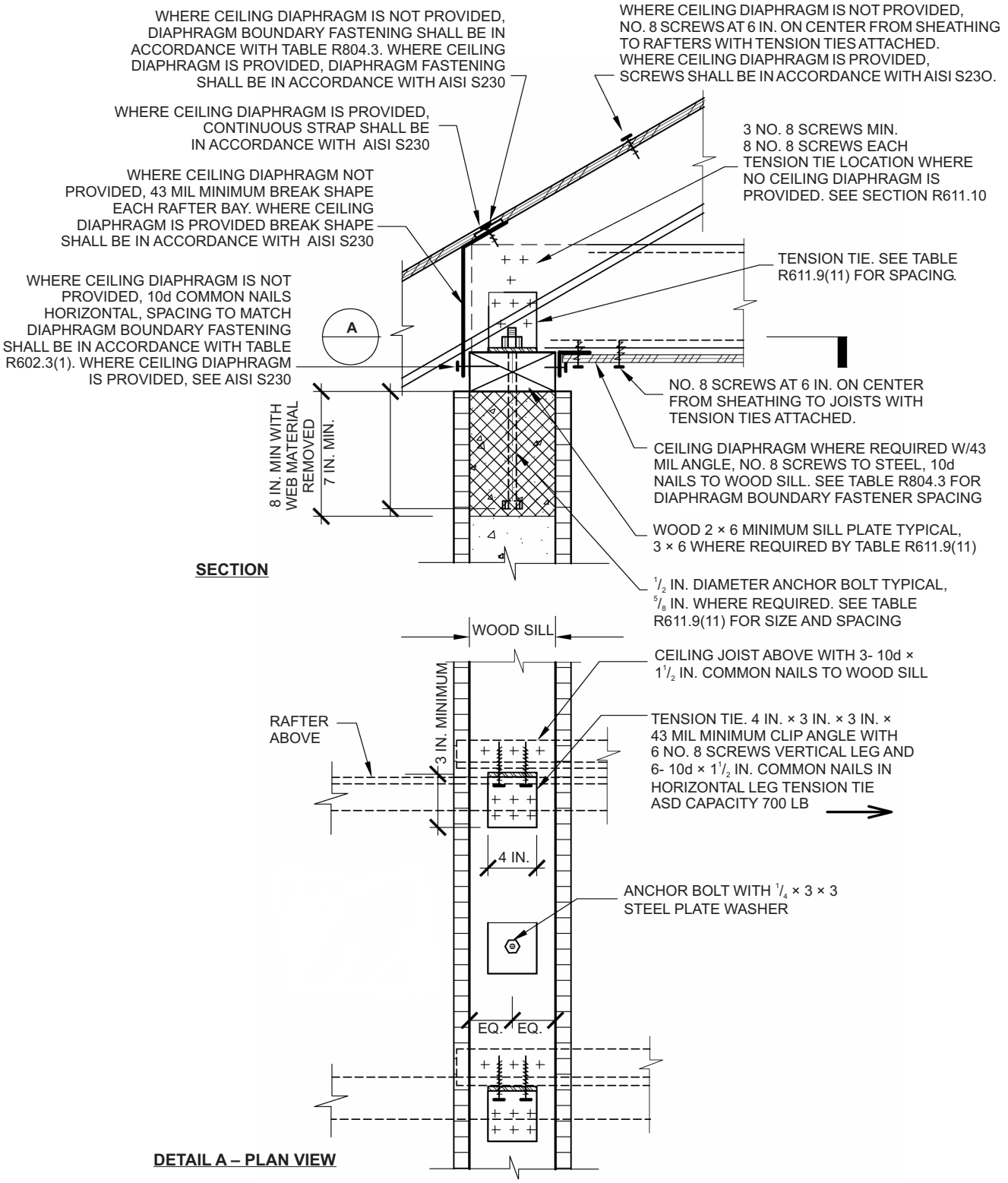
a. This table is for use with the detail in Figure R611.9(10). Use of this detail is permitted where a cell is not shaded.

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 foot = 304.8 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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

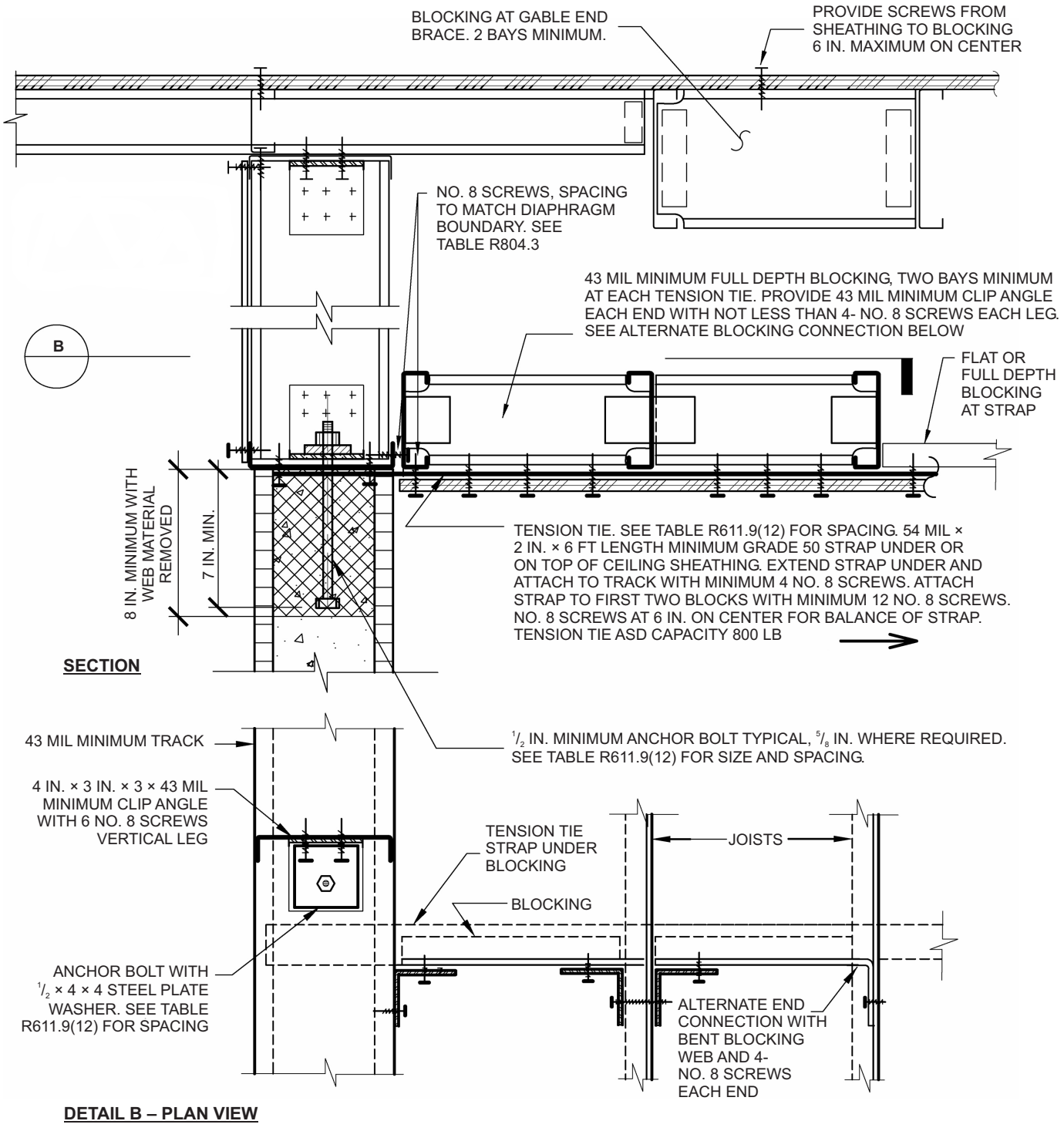
a. This table is for use with the detail in Figure R611.9(11). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

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)	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3 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.

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.

SECTION R612
EXTERIOR WINDOWS AND DOORS

R612.1 General. This section prescribes performance and construction requirements for exterior windows and doors installed in walls. Windows 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. Written installation instructions shall be provided by the manufacturer.

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. Exterior windows and doors shall be designed to resist the design wind loads specified in Table R301.2(2) adjusted for height and exposure per Table R301.2(3). For testing required in Sections R612.6, R612.7, and R612.8, design pressures determined from Table R301.2(2) or ASCE 7 are permitted to be multiplied by 0.6.

R612.6 Testing and labeling. Exterior windows and glass doors shall be tested by an approved independent testing laboratory, and shall be labeled to indicate compliance with the requirements of one of the following specifications:

ANSI/AAMA/NWWDA101/I.S.2 or ANSI/AAMA/WDMA 101/I.S.2/NAFS or AAMA/WDMA/CSA 101/I.S.2/A440 or TAS 202 (HVHZ shall comply with TAS 202 utilizing ASTM E 1300-98 or ASTM E 1300-04 02).

Exterior windows and sliding glass doors shall be labeled with a permanent label, marking, or etching providing traceability to the manufacturer and product. The following shall also be required either on a permanent label or on a temporary supplemental label applied by the manufacturer: information identifying the manufacturer, the product model/series number, positive and negative design pressure rating, product maximum size, glazing thickness, impact resistance. Approval number, applicable test standard(s), and approved product certification agency, testing laboratory, evaluation entity or Miami-Dade Product Approval.

The labels are limited to one design pressure rating per reference standard. The temporary supplemental label shall remain on the window or door until final approval by the building official.

Exceptions:

1. Door assemblies installed in nonhabitable areas where the door assembly and area are designed to accept water infiltration need not be tested for water infiltration.
2. Door assemblies installed where the overhang (OH) ratio is equal to or more than 1 need not be tested for water infiltration. The overhang ratio shall be calculated by the following equation:

   OH ratio = OH length/OH height

   Where:

   OH length = The horizontal measure of how far an overhang over a door projects out from door's surface.

   OH height = The measure of the distance from the door's sill to the bottom of the overhang over a door.
3. Pass-through windows for serving from a single-family kitchen where protected by a roof overhang of 5 feet (1.5 m) or more shall be exempted from the requirements of the water infiltration test.
4. Decorative glazed openings.

Glass Strength: Products tested and labeled as conforming to ANSI/AAMA/NWWDA 101/I.S.2 or ANSI/AAMA/WDMA 101/I.S.2/NAFS or AAMA/WDMA/CSA 101/I.S.2/A440 or TAS 202 shall not be subject to the requirements of the *Florida Building Code, Building*. Determination of load resistance of glass for specific loads of products not tested and certified in accordance with Section R612.6 shall be designed to comply with ASTM E 1300. The temporary supplemental label shall designate the type and thickness of glass or glazing material.

R612.6.1 Comparative Analysis Label. A temporary supplemental label conforming to AAMA 203, Procedural Guide for the Window Inspection and Notification System, shall be acceptable for establishing and communicating the calculated allowable design pressures higher than indicated on the label required by Section R612.6 for window or door sizes smaller than that required by the

TABLE R612.8
MINIMUM TEST SIZES, INCLUDING FRAMING

Performance Class*	Width x Height (mm)	Width x Height (in.)	Minimum Performance Grade (Design Pressure)
Residential (R)	900 × 2000	(36 × 79)	720 Pa (15 psf)
Light Commercial (LC)	900 × 2100	(36 × 83)	1200 Pa (25 psf)
Commercial (C)	1000 × 2100	(40 × 83)	1440 Pa (30 psf)
Heavy Commercial (HC)	1200 × 2400	(48 × 95)	1920 Pa (40 psf)
Architectural (AW)	1200 × 2400	(48 × 95)	1920 Pa (40 psf)

*Performance Class and Performance Grade per ANSI/AAMA/NWWDA 101/I.S.2-97

ANSI/AAMA/NWWDA 101/I.S.2 or ANSI/AAMA/WDMA 101/I.S.2/NAFS or AAMA/WDMA/CSA 101/I.S.2/A440 test requirements. This temporary supplemental label shall be applied by the manufacturer and remain on the window or door until final approval by the building official.

Exception 1:

Comparative analysis of operative windows and glazed doors may be made, provided the proposed unit complies with the following:

1. Shall always be compared with a tested and currently approved unit.
2. Varies only in width, height and/or load requirements.
3. Shall not exceed 100 percent of the proportional deflection for fiber stress of the intermediate members of the approved unit.
4. Shall conform as to extruded members, reinforcement and in all other ways with the tested approved unit.
5. Shall not exceed 100 percent of the concentrated load at the juncture of the intermediate members and the frame of the approved unit.
6. Shall not permit more air and water infiltration than the approved unit based on the height above grade.
7. Compared unit shall not exceed the maximum cyclic pressure when tested per TAS 203 or ASTM E 1886 and ASTM E 1996.

Exception 2:

Comparative analysis of fixed glass windows may be made, provided the proposed unit complies with the following:

1. Shall always be compared with a tested and currently approved unit.
2. Varies only in width, height and/or load requirements.
3. The design is identical in all respects. e.g., extrusions, glazing system, joinery, fasteners, etc.
4. Shall not permit more air and water infiltration than the approved unit based on height above grade.
5. The maximum uniform load distribution (ULD) of any side is equal to the uniform load carried by the side divided by the length of the side.
6. The ULD of any member must not exceed the ULD of the corresponding member of the tested window.
7. The uniform load distribution on each member shall be calculated in accordance to Section 2, Engineering Design Rules, of the AAMA 103.3 Procedural Guide.
8. Compared unit shall not exceed the maximum cyclic pressure when tested per TAS 203 or ASTM E 1886 and ASTM E 1996.

R612.7 Vehicular access doors. Vehicular access doors shall be tested in accordance with either ASTM E 330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108.

R612.8 Exterior door assemblies. Exterior door assemblies not covered by Sections R612.6 or R612.8.3 shall comply with Sections R612.8.1 or R612.8.2.

R612.8.1 Exterior door assemblies shall be tested for structural integrity in accordance with ASTM E 330 Procedure A at a load of 1.5 times the required design pressure load. The load shall be sustained for 10 seconds with no permanent deformation of any main frame or panel member in excess of 0.4 percent of its span after the load is removed. HVHZ shall comply with TAS 202. After each specified loading, there shall be no glass breakage, permanent damage to fasteners, hardware parts, or any other damage which causes the door to be inoperable.

The minimum test sizes and minimum design pressures shall be as indicated in Table R612.8.

The unit size tested shall qualify all units smaller in width and/or height of the same operation type and be limited to cases where frame, panels and structural members maintain the same profile as tested.

R612.8.2 Sectional garage doors shall be tested for determination of structural performance under uniform static air pressure difference in accordance with ANSI/DASMA 108 or TAS 202 (HVHZ shall comply with TAS 202).

R612.8.3 Custom doors. Custom (one of a kind) exterior door assemblies shall be tested by an approved testing laboratory or be engineered in accordance with accepted engineering practices.

R612.8.4 Door components evaluated by an approved product evaluation entity, certification agency, testing laboratory or engineer may be interchangeable in exterior door assemblies provided that the door component(s) provide equal or greater structural performance as demonstrated by accepted engineering practices.

R612.8.4.1 Optional exterior door component testing. With the exception of HVHZ, exterior side-hinged door assemblies not covered by Section R612.6 shall have the option to have the components of the assembly tested and rated for structural integrity in accordance with the following specification:

SDI A250.13

Following the structural testing of exterior door components, there shall be no permanent deformation of any perimeter frame or panel member in excess of 0.4 percent of its span after the load is removed. After each specified loading, there shall be no glass breakage, permanent damage to fasteners, hardware parts, or any other damage that causes the door to be inoperable, as applicable.

R612.8.5 Garage door labeling. Garage doors shall be labeled with a permanent label provided by the manufacturer. The label shall identify the manufacturer, the garage door model/series number, the positive and negative design pressure rating, indicate impact rated if applicable, the installation instruction drawing reference number, the Florida Product Approval or Miami-Dade Product Approval number if applicable, and the applicable test standards.

The required garage door components for an approved garage door assembly may be indicated using a checklist format on the label. If a checklist format is used on the label, the installer or manufacturer shall mark the selected components on the checklist that are required to assemble an approved garage door system.

The installation instructions shall be provided and available on the job site.

R612.9 Wind-borne debris protection. Protection of exterior windows , glass doors and other glazed areas shall be in accordance with Section R 301.2.1.2.

R612.9.1 Fenestration testing and labeling. Reserved.

R612.10 Anchorage methods.

R612.10.1 Anchoring requirements. Window and door assembly anchoring systems shall be tested to achieve the design pressure specified. Substitute anchoring systems shall provide equal or greater anchoring performance as demonstrated by accepted engineering practice. When provided, the manufacturer's published installation instructions for as tested or substitute anchoring systems can be used. In no case shall the anchorage exceed the spacing for the tested rated performance.

R612.10.2 Anchorage details.

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 door assemblies shall be anchored through the main frame or by jamb clip or subframe system, in accordance with the manufacturers published installation instructions. Anchors shall be securely fastened directly into the masonry, concrete or other structural substrate material. Unless otherwise tested, bucks shall extend beyond the interior face of the window or door frame such that full support of the frame is provided. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame to the rough opening substrate.

Where the wood buck thickness is $1^1/_2$ inches (38 mm) or greater, the buck shall be securely fastened to transfer load to the masonry, concrete or other structural substrate and the buck shall extend beyond the interior face of the window or door frame. Window and door assemblies shall be anchored through the main frame or by jamb clip or subframe system or through the flange to the secured wood buck in accordance with the manufacturers published installation instructions. Unless otherwise tested, bucks shall extend beyond the interior face of the window or door frame such that full support of the frame is provided. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame assembly to the secured wood buck.

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 main frame or by jamb clip or subframe system or through the flange in accordance with the manufacturer's published installation instructions. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame to the rough opening substrate.

R612.11 Mullions. Mullions, other than mullions which are an integral part of a window or glass door assembly tested and labeled in accordance with Section R612.6, shall be tested by an approved testing laboratory in accordance with AAMA 450 or be engineered in accordance with accepted engineering practice and shall meet the following criteria:

1. Engineered mullions. Mullions qualified by accepted engineering practice shall comply with the performance criteria in Sections R612.11.1, R612.11.2 and R612.11.3.
2. Mullions tested as stand alone units. Mullions tested as stand alone units in accordance with AAMA 450 shall comply with the performance criteria in Sections R612.11.1, R612.11.2 and R612.11.3.
3. Mullions tested in an assembly. Mullions qualified by a test of an entire assembly in accordance with AAMA 450 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.

R612.12 Flashing, sealants and weatherstripping. Flashing and sealants for exterior windows and doors shall comply with Section R703.8.

R612.12.1 All exterior fenestration products shall be sealed at the juncture with the building wall with a sealant complying with AAMA 800 or ASTM C 920 Class 25 Grade NS or greater for proper joint expansion and contraction, ASTM C 1281, AAMA 812, or other approved standard as appropriate for the type of sealant.

R612.12.2 Masonry rough openings. Masonry rough opening dimensions shall be within the tolerances specified at Section R606.16 and in addition shall provide for a window perimeter sealant joint a maximum of $^1/_4$ inches in width.

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 V_{asd}, determined in accordance with Section R301.2.1.3, of 130 miles per hour (58 m/s), and Exposure A, B or 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

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-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-in^2/ft = 9.415 × 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.

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).

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.

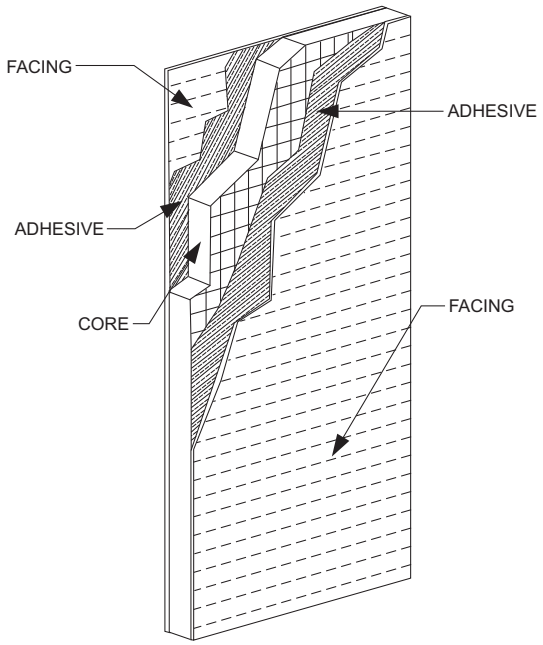


FIGURE R613.4
SIP WALL PANEL

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 Section R602.3.

Framing shall be attached in accordance with R602.3 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 used for wall bracing shall be designed for wind loads in accordance with Section R301.1 or Section R602. SIP walls shall be considered continuous wood structural panel sheathing for purposes of computing required bracing. SIP 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 Section R602.3.

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.

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.

TABLE R613.5(1)
MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP LIGHT-FRAME ROOF ONLY (inches)

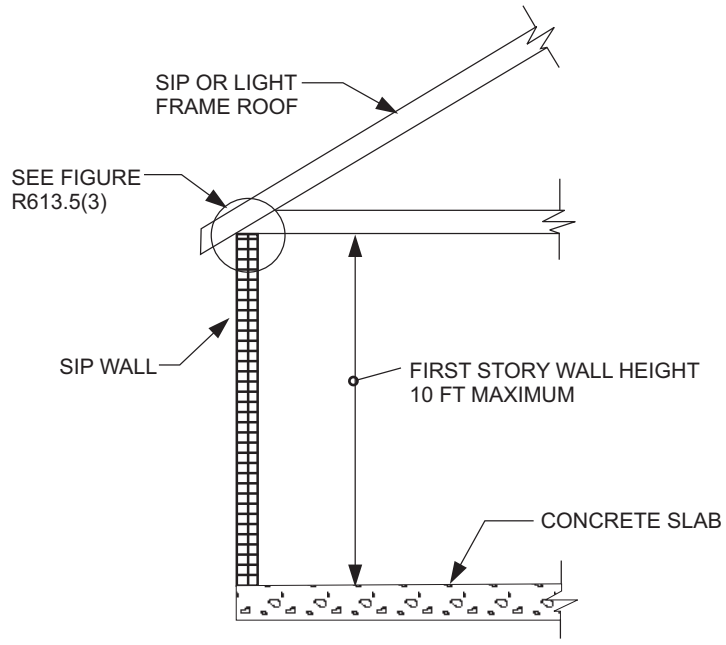
MAXIMUM V_{asd} DETERMINED IN ACCORDANCE WITH SECTION R301.2.1.3		BUILDING WIDTH (feet)														
		24			28			32			36			40		
Exp. A/B	Exp. C	Wall Height (ft)			Wall Height (ft)			Wall Height (ft)			Wall Height (ft)			Wall Height (ft)		
		8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
85	—	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
100	85	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	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	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
130	120	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
—	130	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

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)

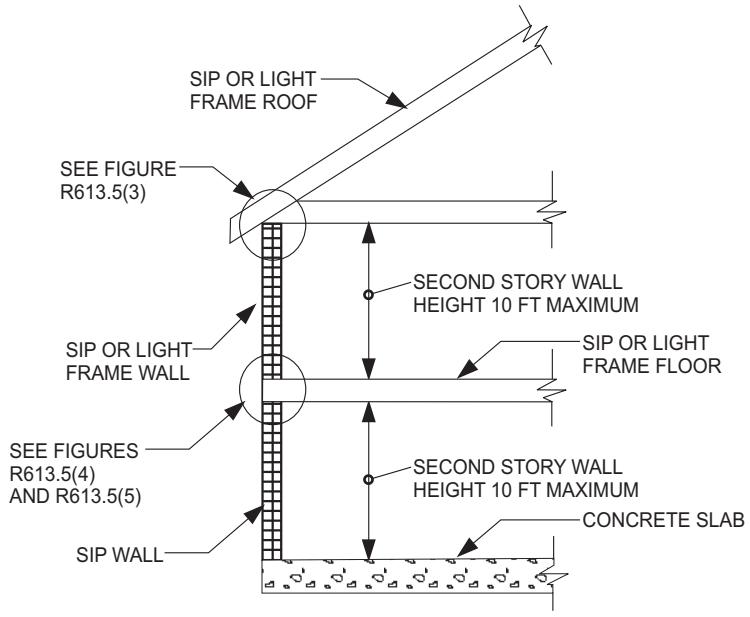
MAXIMUM V_{asd} DETERMINED IN ACCORDANCE WITH SECTION R301.2.3		BUILDING WIDTH (feet)														
		24			28			32			36			40		
Exp. A/B	Exp. C	Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)		
		8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
85	—	4.5	4.5	4.5	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	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	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
120	110	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
130	120	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
—	130	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

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.



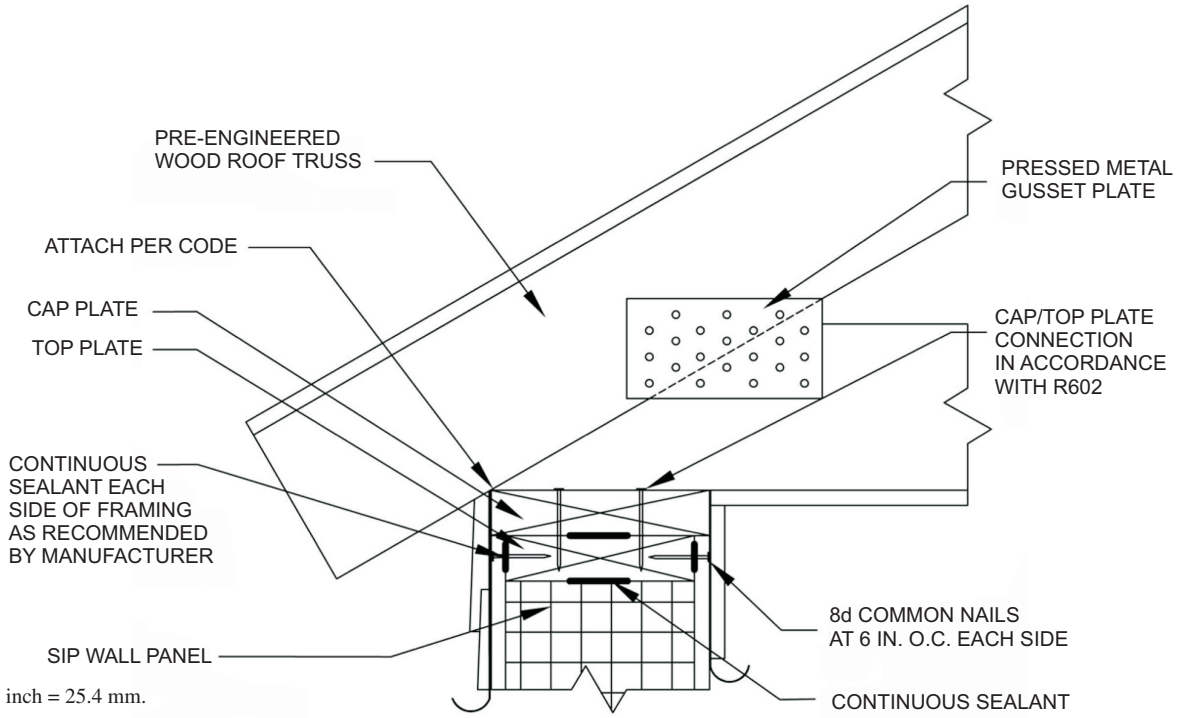
For SI: 1 foot = 304.8 mm.

FIGURE R613.5(1)
MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS



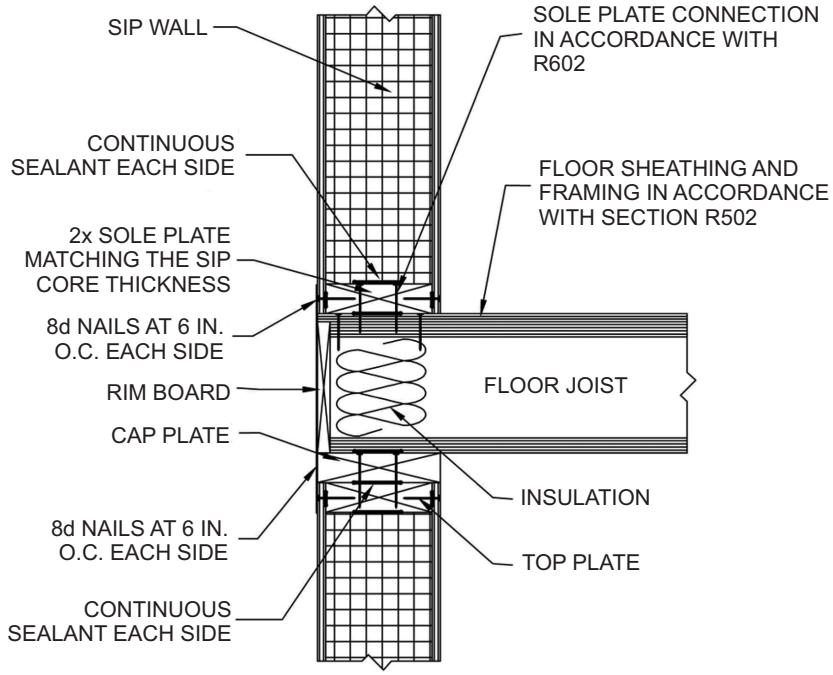
For SI: 1 foot = 304.8 mm.

FIGURE R613.5(2)
MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS



For SI: 1 inch = 25.4 mm.

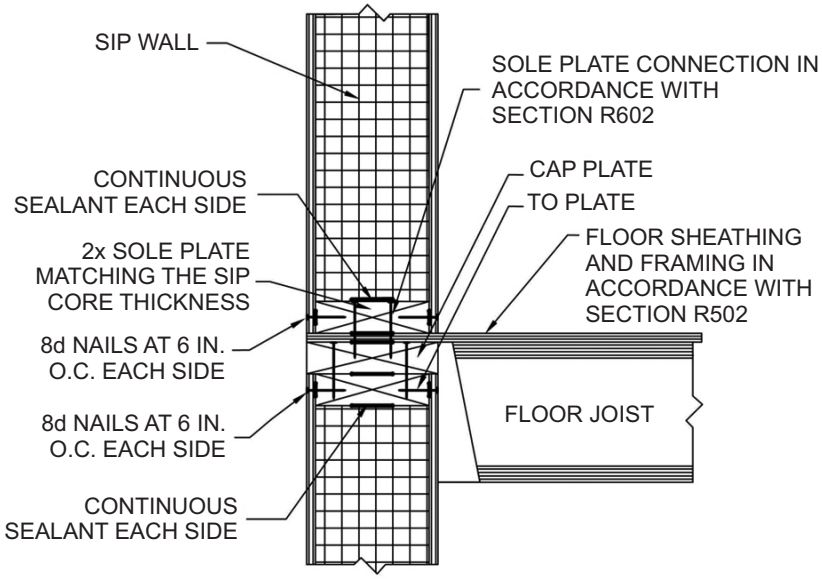
FIGURE R613.5(3)
TRUSSED ROOF TO TOP PLATE CONNECTION



For SI: 1 inch = 25.4 mm.

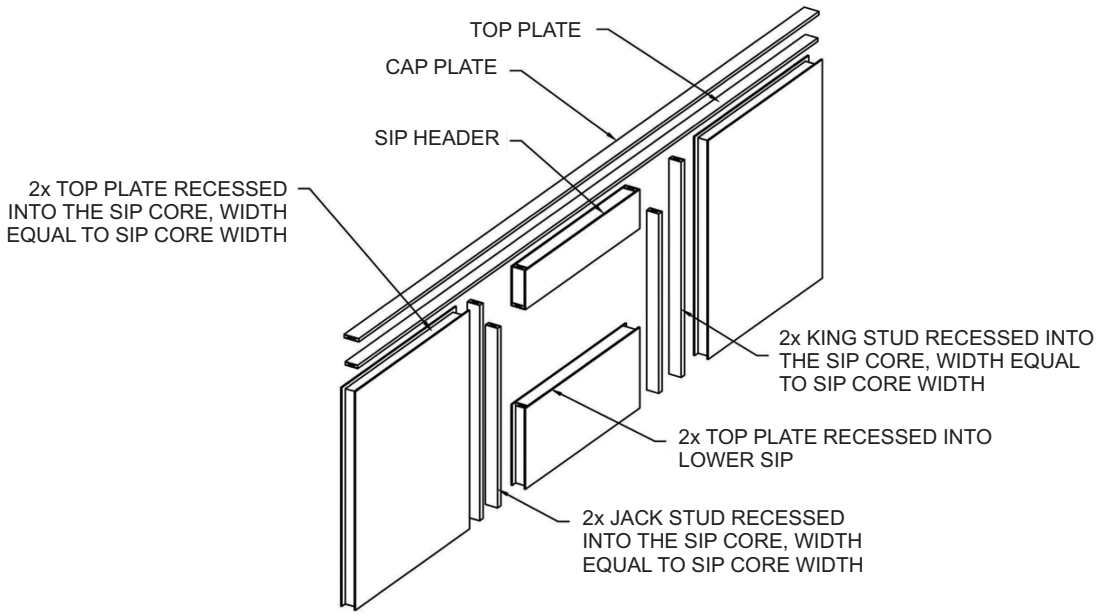
Note: Figures illustrate SIP-specific attachment requirements. Other connections shall be made in accordance with Section R602 as appropriate.

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 Section R602 as appropriate.

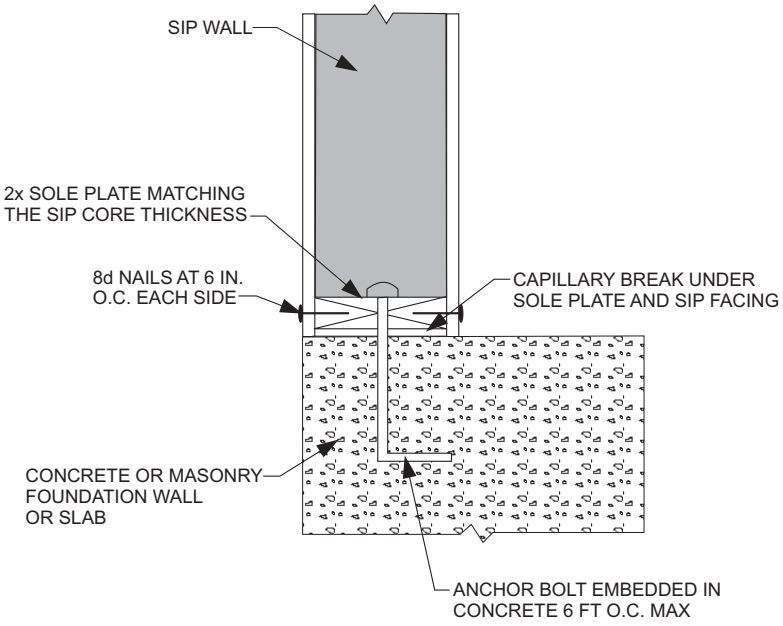
FIGURE R613.5(5)
SIP WALL TO WALL BALLOON FRAME CONNECTION
(I-Joist floor shown for Illustration only)



For SI: 1 inch = 25.4 mm.

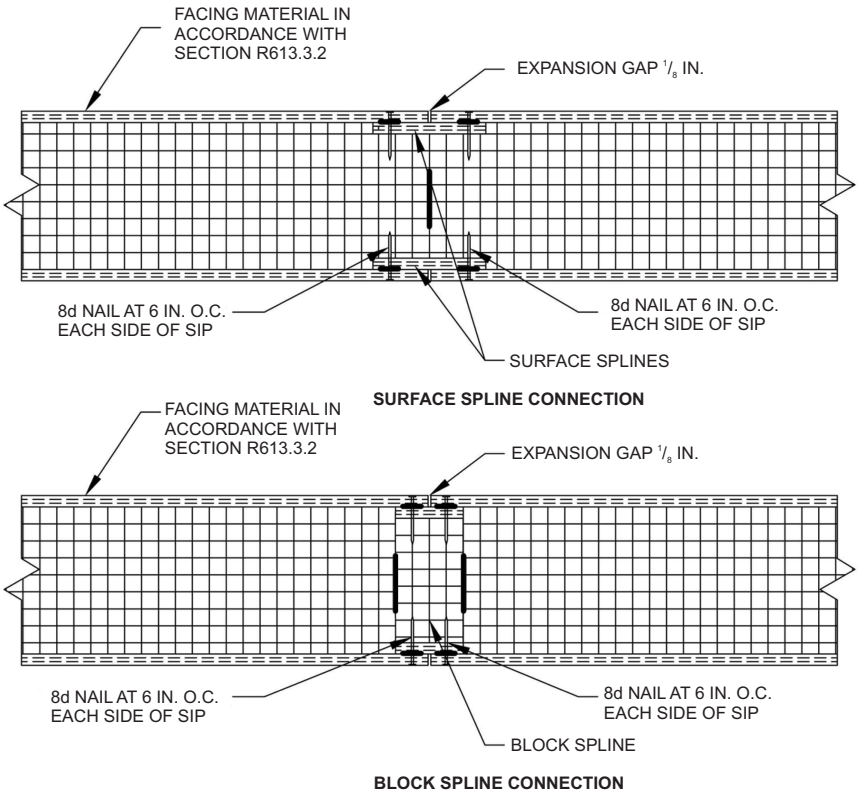
Notes:
1. Top plates shall be continuous over header.
2. Lower 2x top plate shall have a width equal to the SIP core width and shall be recessed into the top edge of the panel. Cap plate shall be placed over the recessed top plate and shall have a width equal to the SIPs width.
3. SIP facing surfaces 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 unless otherwise provide for in Section R613.

FIGURE R613.5.1
SIP WALL FRAMING CONFIGURATION



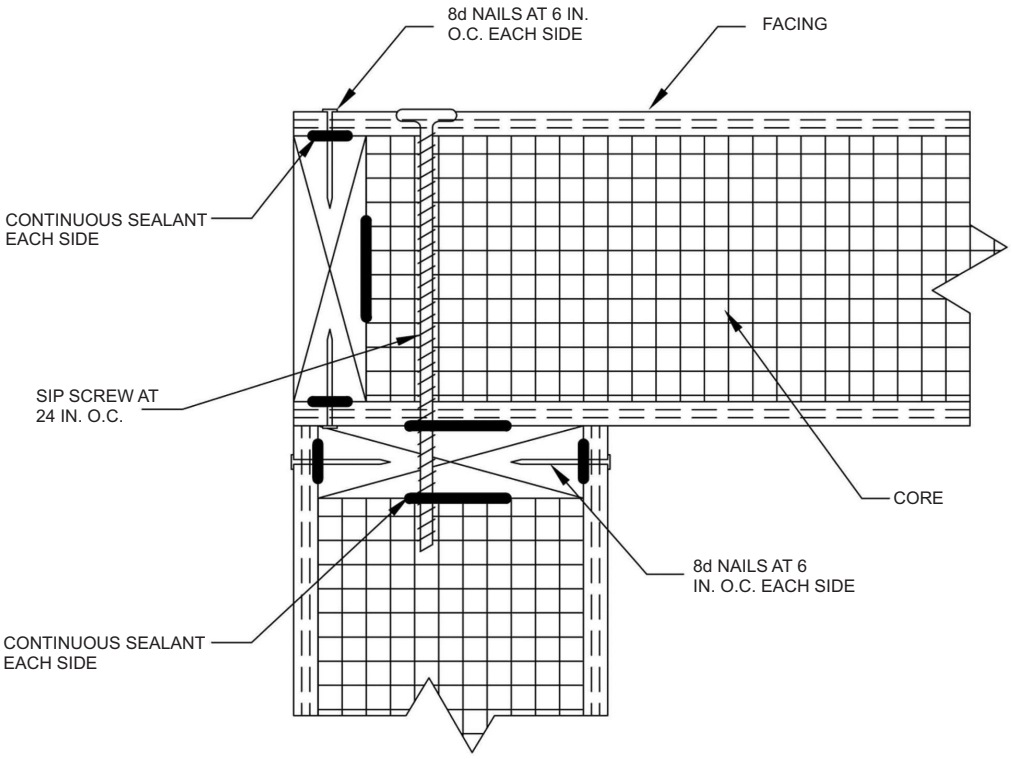
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

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	BUILDING WIDTH (feet)				
	24	28	32	36	40
Supporting roof only	4	4	4	4	2
Supporting roof and one-story	2	2	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.

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 Section R602.

SECTION R614
COMBINED CONCRETE, MASONRY, OR ICF AND WOOD EXTERIOR WALL CONSTRUCTION

R614.1 General. This section prescribes construction requirements for individual building elements where one or more exterior walls above the foundation contain multiple construction types. Where specific construction requirements are not specifically prescribed in this section, the requirements in the applicable sections of each material shall govern.

R614.2 Concrete, masonry, or ICF first story, wood frame second and third story.

R614.2.1 Foundation. The foundation system shall be designed in accordance with Chapter 4.

R614.2.2 First-story construction. The concrete, masonry or ICF first-story shall be in accordance with Chapter 6 for the applicable first-story construction method.

R614.2.3 Floor systems. The second- and third-story floor system shall be in accordance with Chapter 5.

R614.2.4 Second- and third-story construction. The second- and third-story walls, ceilings and roof shall be in accordance with the appropriate sections in Chapters 6, 8 and 9.

R614.2.5 Shear wall connections. Second-story shearwalls shall be connected to first-story walls in accordance with Tables 3.2A, 3.2B, 3.2C, A-3.2A, A-3.2B or A-3.2C of the AF&PA Wood Frame Construction Manual for One- and Two-Family Dwellings as applicable.

R614.3 Wood frame gable endwalls above concrete, masonry, or ICF walls. This condition is not permitted unless there is a ceiling diaphragm in accordance with Figures 3.7a and 3.15 of the AF&PA Wood Frame Construction Manual for One- and Two-Family Dwellings.

R614.3.1 Gable construction. Gable construction shall be in accordance with the AF&PA Wood Frame Construction Manual for One- and Two-Family Dwellings.

R614.3.2 Wall construction. Concrete, masonry or ICF wall construction shall be in accordance with Chapter 6.

R614.3.3 Gable connection. The connection of the wood frame gable endwall to the concrete, masonry or ICF wall shall be in accordance with Figures R614.3(1) and R614.3(2), or Figure R609.4.

SECTION R615
IMPACT-RESISTANT COVERINGS

R615.1 Impact resistant coverings shall be tested at 1.5 times the design pressure (positive or negative) expressed in pounds per square feet as determined by the *Florida Building Code, Building* Section 1609 for which the specimen is to be tested. The design pressures, as determined from Section 1609 of the Florida Building Code, Building or ASCE 7, are permitted to be multiplied by 0.6.

R615.1.1 Impact resistant coverings shall be labeled in accordance with the provisions of Section R615.

R615.2. Labels. A permanent label shall be provided by the product approval holder on all impact resistant coverings.

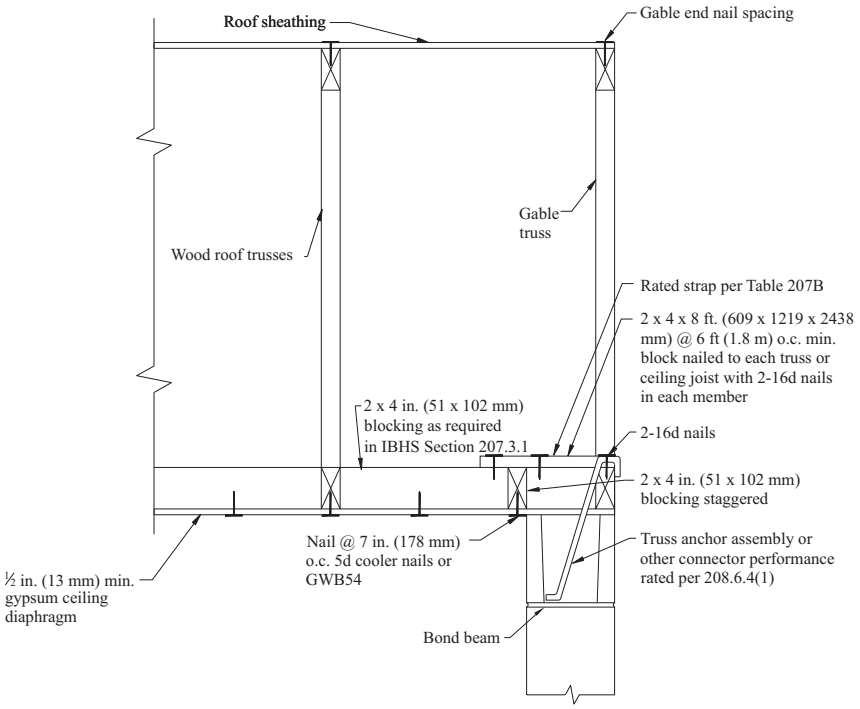
R615.2.1 The following information shall be included on the labels on impact resistant coverings:

1. Product approval holder name and address.
2. All applicable methods of approval. Methods of approval include, but, are not limited to Miami-Dade NOA; Florida Building Commission, TDI Product Evaluation; ICC-ES.
3. The test standard or standards specified at Section R301.2.1.2, including standards referenced within the test standards specified at Section R301.2.1.2 used to demonstrate code compliance.
4. For products with a Florida Product Approval Number or a Miami-Dade County Building and Neighborhood Compliance Department Notice of Acceptance Number (NOA), such numbers shall be included on the label.

R615.3 Location of label. The location of the label on the impact resistant covering shall be as follows:

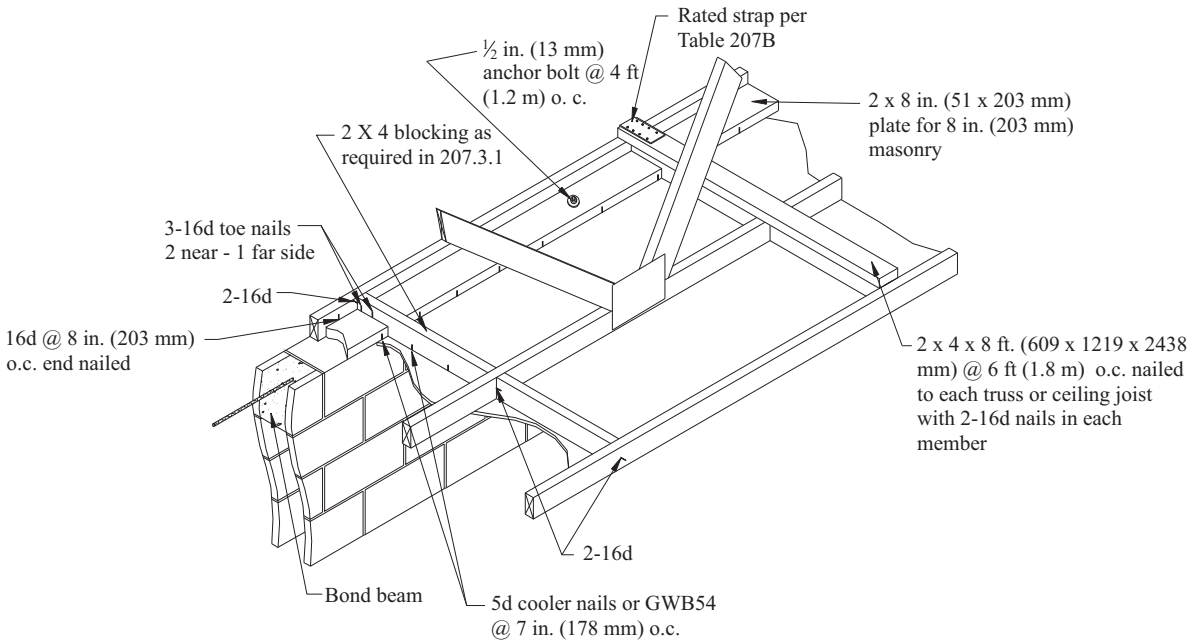
1. Accordions: Bottom of the locking bar or center mate facing the exterior or outside.
2. Rollup: On the bottom of the hood facing the exterior or outside or on the bottom slat facing the exterior or outside.
3. Bahama Awning or Colonial Hinged: On the bottom, placed on the back of the shutter.
4. Panels: For metal and plastic panels the label may be embossed or printed spaced not more than every three (3) lineal feet on each panel. The label shall be applied by the holder of the product approval and shall face the exterior or outside.
5. Framed products: The label shall be on the side or bottom facing the exterior or outside.
6. Labels on all other products shall face the exterior or outside.

R615.4 Installation. All impact resistant coverings shall be installed in accordance with the manufacturer's installation instructions and in accordance with the product approval. Installation instructions shall be provided and shall be available to inspection personnel on the job site. Opening protection components, fasteners, and other parts evaluated by an approved product evaluation entity, certification agency, testing laboratory, architect, or engineer and approved by the holder of the product approval may be interchangeable in opening protection assemblies provided that the opening protection component(s) provide equal or greater structural performance and durability as demonstrated by testing in accordance with approved test standards.



Note: For Table 207B, Section 207.3.1 and Section 208.6.4(1), see IBHS Guidelines for Hurricane Resistant Residential Construction. Ceiling diaphragms where provided shall comply with IBHS Section 207.2.

FIGURE R614.3(1)
DIRECT TRUSS TO CONCRETE, MASONRY OR ICF WALL CONNECTION FOR GYPSUM BOARD CEILING DIAPHRAGM



Note: For Table 207B and Section 207.3.1, see IBHS Guidelines for Hurricane Resistant Residential Construction. Ceiling diaphragms where provided shall comply with IBHS Section 207.2.

FIGURE R614.3(2)
DIRECT TRUSS TO CONCRETE, MASONRY OR ICF WALL FOR GYPSUM BOARD CEILING DIAPHRAGM

SECTION R616
SOFFIT

R616.1 Product Approval. Manufactured soffit materials and systems shall be subject to statewide or local product approval as specified in FAC Rule 9N-3. The net free area of the manufactured soffit material or system shall be included in the product approval submittal documents.

R616.2 Labels. Individual manufactured soffit pieces shall be permanently marked at not more than four feet on center with a number or marking that ties the product back to the manufacturer.

R616.3 The following information shall be included on the manufactured soffit material packaging or on the individual manufactured soffit material or system pieces:

1. Product approval holder and/or manufacturer name and city and state of manufacturing plant.
2. Product model number or name.
3. Method of approval and approval numbers as applicable. Methods of approval include, but are not limited to: Florida Building Commission FL #; Miami-Dade NOA; TDI Product Evaluation; and, ICC-ES.
4. The test standard or standards specified in Chapter 14 of the *Florida Building Code, Building* used to demonstrate code compliance.
5. The net free area shall be included on the packaging or label.

R616.4 Installation. All manufactured soffit materials shall be installed in accordance with the manufacturer's installation instructions and in accordance with the product approval. Installation instructions shall be provided and shall be available to inspection personnel on the job site. Soffit pieces, components, fasteners, and other parts evaluated by an approved product evaluation entity, certification agency, testing laboratory, architect, or engineer and approved by the holder of the product approval may be interchangeable in manufactured soffit systems provided that the soffit system component or components provide equal or greater structural performance and durability as demonstrated by testing in accordance with approved test standards.

All exterior wall coverings and soffits shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section R703.1.1. Manufactured soffits shall be tested at 1.5 times the design pressure. For testing purposes, the design pressures determined from Section 1609 of the *Florida Building Code, Building* or ASCE 7, are permitted to be multiplied by 0.6.