



AISI S230-07 (2012)



AISI STANDARD

Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings

**2007 Edition with
Supplements 2 and 3 (Reaffirmed 2012)**

**Revision of:
AISI/COFS/PM-2006**

Endorsed by



DISCLAIMER

The material contained herein has been developed by the American Iron and Steel Institute Committee on Framing Standards. The Committee has made a diligent effort to present accurate, reliable, and useful information on cold-formed steel framing design and installation. The Committee acknowledges and is grateful for the contributions of the numerous researchers, engineers, and others who have contributed to the body of knowledge on the subject. Specific references are included in the *Commentary*.

With anticipated improvements in understanding of the behavior of cold-formed steel framing and the continuing development of new technology, this material will become dated. It is anticipated that AISI will publish updates of this material as new information becomes available, but this cannot be guaranteed.

The materials set forth herein are for general purposes only. They are not a substitute for competent professional advice. Application of this information to a specific project should be reviewed by a design professional. Indeed, in many jurisdictions, such review is required by law. Anyone making use of the information set forth herein does so at their own risk and assumes any and all liability arising therefrom.

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PREFACE

The American Iron and Steel Institute Committee on Framing Standards has developed AISI S230-07, the 2007 edition of the *Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings* to provide prescriptive requirements for cold-formed steel-framed detached one- and two-family dwellings, townhouses, attached multi-family dwellings, and other attached single-family dwellings. This edition supersedes the previous edition designated as AISI/COFS/PM-2006.

In 2008, the Committee on Framing Standards has developed Supplement 2 to AISI S230-07 to revise and clarify certain wall bracing provisions.

Supplement 2 to AISI S230-07 replaced Supplement 1 to AISI S230-07 and has been fully integrated into this document.

The Committee acknowledges and is grateful for the contributions of the numerous engineers, researchers, producers and others who have contributed to the body of knowledge on the subjects. The Committee wishes to also express their appreciation for the support of the Steel Framing Alliance.

The Committee acknowledges the significant investment and guidance provided by the Construction Market Council of the Steel Market Development Institute, a business unit of AISI.

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**STANDARD FOR COLD-FORMED STEEL FRAMING –
PRESCRIPTIVE METHOD FOR ONE AND TWO FAMILY DWELLINGS
2007 EDITION WITH SUPPLEMENTS 2 AND 3**

A. GENERAL

A1 Scope

The provisions in this standard shall apply to the construction of detached one- and two-family dwellings, townhouses, and other attached single-family dwellings not more than three stories in height using *repetitive* in-line *framing* practices.

Buildings complying with the limitations herein shall be constructed in accordance with this standard and AISI S200. Alternatively, such dwellings shall be permitted to be designed by a *design professional*.

This standard shall not preclude the use of other materials, assemblies, structures or designs not meeting the criteria herein, when the other materials, assemblies, structures or designs demonstrate equivalent performance for the intended use to those specified in this standard. Where there is a conflict between this standard and other reference documents, the requirements contained within this standard shall govern.

The *basic wind speed* and *seismic design category* shall be determined in accordance with the *applicable building code*, or, in the absence of an *applicable building code*, ASCE 7. For use in this standard, the *basic wind speed*, as determined by the *applicable building code*, shall be converted in accordance with Table A1-3.

This standard shall include Sections A through F inclusive.

A1.1 Limits of Applicability

This standard shall be limited to buildings meeting the limitations set forth in Table A1-1.

In *high seismic areas*, the limits of applicability of this standard shall be modified as shown in Table A1-2.

Detached one and two family dwellings classified in *Seismic Design Category E*, but meeting the limitations for a *regular building* and having no floors cantilevering past exterior walls, shall be permitted to be designed in accordance with the requirements for *Seismic Design Category D₂*.

In *high seismic areas*, buildings in locations with ground snow loads greater than 30 psf (1.44 kN/m²) and with either a *normal weight roof/ceiling assembly* or *light weight roof/ceiling assembly*, shall be constructed in accordance with the requirements for buildings with a *heavy weight roof/ceiling assembly*.

A1.2 Limitations in High Seismic Areas and High Wind Areas

In *high seismic areas*, stemwall height shall be limited to 4 feet (1220 mm) from top of footing to top of stemwall.

Buildings in *high seismic areas* and *high wind areas* shall be subject to the additional limitations of this section.

Floor and roof *diaphragm* aspect ratios shall not be less than 0.25:1 nor exceed 4:1. The *diaphragm* aspect ratio shall be determined by dividing the distance between *braced wall lines* (*diaphragm span*) by the length of the *diaphragm* parallel to the *braced wall lines*.

Floor and roof *diaphragm* plan offsets shall not exceed 4 feet (1220 mm).

Exception: Buildings where *diaphragm* plan offsets exceed four feet shall be analyzed as separate buildings, separated by a *braced wall line* or lines. See Figure A1-1.

Braced wall lines shall be placed on all exterior walls, and on interior walls as required.

Where a *braced wall line* separates two portions of a building, the required length of braced wall panels separating the two portions shall be determined by summing the required lengths of braced wall panels for each portion of the building as shown in Figure A1-1.

Vertical offsets in floor and roof *diaphragms* shall be supported by *braced wall lines*. See Figure A1-2(a).

Braced wall lines shall be continuous from foundation and in a single vertical plane from the foundation to the uppermost story in which they are required.

There shall be no horizontal offsets of *braced wall lines*. See Figure A1-2(b).

A1.2.1 Irregular Buildings In High Seismic Areas and High Wind Areas

In *high seismic areas*, a building with one or more irregularities, as defined in this Section, shall have an engineered lateral-force resisting system designed in accordance with the *applicable building code*.

Where an irregularity is isolated to a portion of a building and that portion of the building is designed in accordance with accepted engineering practice so that the irregularity does not affect the performance of the remaining building, the remainder of the building shall be permitted to be designed in accordance with the provisions of this standard.

For the purposes of this standard, any of the following conditions constitute an irregularity:

- When exterior *braced wall lines* are not in one plane vertically from the foundation to the uppermost story in which they are required.
- When a section of a floor or roof is not laterally supported by *braced wall lines* on all edges.

Exception: Portions of floors that do not support *Type I* or *Type II braced walls* above, or roofs, shall be permitted to extend not more than 6 feet (1829 mm) beyond a *braced wall line*. See Figure A1-3.

- When an opening in a floor or roof exceeds the lesser of 12 feet (3658 mm) or 50 percent of the least floor or roof dimension.
- When portions of a floor are vertically offset and not supported by a *braced wall line*.
- When *braced wall lines* do not occur in two perpendicular directions.
- When a *braced wall line* is constructed of dissimilar *bracing systems* or *braced wall lines* in a given plan direction on any one level above grade are constructed of dissimilar *bracing systems*.

A2 Definitions

Where terms appear in this standard in italics, such terms shall have the meaning as defined in AISI S200 or as defined herein. Where terms are included in both this standard and AISI S200, such terms shall have the meaning as defined herein. Where terms are not included, such terms shall have ordinary accepted meaning in the context for which they are intended.

Basic Wind Speed. The 3-second gust wind speed.

Braced Wall Line. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.

Eave Height. The distance from the ground surface adjacent to the building to the roof eave line at a particular wall. If the height of the eave varies along the wall, the average height shall be used.

Heavy Weight Roof/Ceiling Assembly. A roof/ceiling assembly with an average unit weight greater than 15 psf (0.72 kN/m²) and less than or equal to 25 psf (1.20 kN/m²).

Heavy Weight Exterior Walls. An exterior wall with a unit weight greater than 7 psf (0.34 kN/m²) and less than or equal to 14 psf (0.68 kN/m²).

High Seismic Area. An area where the *Seismic Design Category* is *D₀*, *D₁*, *D₂* or *E*.

High Wind Area. An area where *basic wind speeds* are equal to 110 mph (177 km/hr) up to and including 150 mph (241 km/hr).

Light Weight Roof/Ceiling Assembly. A roof/ceiling assembly with an average unit weight less than or equal to 12 psf (0.51 kN/m²).

Light Weight Exterior Walls. An exterior wall with a unit weight less than or equal to 7 psf (0.34 kN/m²).

Limited Attic Storage. Attic where the maximum clear height between *joist* and *roof rafter* is greater than or equal to 42 inches and the attic area is accessible by a pull-down stairway or framed opening.

Normal Weight Roof/Ceiling Assembly. A roof/ceiling assembly with an average unit weight greater than 12 psf (0.51 kN/m²) and less than or equal to 15 psf (0.72 kN/m²).

No Attic Storage. Attic where the maximum clear height between *joist* and *roof rafter* is less than 42 inches.

SDC D₀. The *Seismic Design Category* corresponding to a calculated Short Period Design Spectral Response Acceleration greater than 0.50g, and less than or equal to 0.67g.

SDC D₁. The *Seismic Design Category* corresponding to a calculated Short Period Design Spectral Response Acceleration greater than 0.67g, and less than or equal to 0.83g.

SDC D₂. The *Seismic Design Category* corresponding to a calculated Short Period Design Spectral Response Acceleration greater than 0.83g, and less than or equal to 1.17g.

SDC E. The *Seismic Design Category* corresponding to a calculated Short Period Design Spectral Response Acceleration greater than 1.17g.

Seismic Design Category (SDC). A classification assigned to a building based upon its importance and the severity of the design earthquake ground motion at the building site.

Wind Exposure B. The *wind exposure* generally referring to suburban or wooded terrain.

Wind Exposure C. The *wind exposure* generally referring to open terrain with scattered obstructions or water exposure in hurricane-prone regions.

A3 Referenced Documents

The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document.

2. AISI S200-12, *North American Standard for Cold-Formed Steel Framing –General Provisions*, American Iron and Steel Institute, Washington, DC.
3. AISI S201-12, *North American Standard for Cold-Formed Steel Framing – Product Data*, American Iron and Steel Institute, Washington, DC.
4. AISI S214-12, *North American Standard for Cold-Formed Steel Framing –Truss Design*, American Iron and Steel Institute, Washington, DC.
5. ASCE 7-10 Including Supplement 1, *Minimum Design Load for Buildings and Other Structures*, American Society of Civil Engineers, Reston, VA.
6. ASTM A307-10, *Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength*, ASTM International, West Conshohocken, PA.
7. ASTM Standard A653/A653M-11, *Standard Specification for Steel sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process*, ASTM International, West Conshohocken, PA.
8. ASTM Standard A792/ A792M-10, *Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot Dip Process*, ASTM International, West Conshohocken, PA.
9. ASTM A1003/A1003M-11, *Standard Specification for Steel Sheet, Carbon, Metallic- and Non-Metallic-Coated for Cold-Formed Framing Members*, ASTM International, West Conshohocken, PA.
11. ASTM F1554-07, *Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength*, ASTM International, West Conshohocken, PA.
12. CSA O325-07 Including Update No. 1 (2008), *Construction Sheathing*, Canadian Standards Association, Mississauga, Ontario, Canada.
13. CSA O437-Series-93 (R2006), *Standards on OSB and Waferboard*, Canadian Standards Association, Mississauga, Ontario, Canada.
14. DOC PS 1-09, *Structural Plywood*, United States Department of Commerce, National Institute of Standards and Technology, Gaithersburg, MD.
15. DOC PS 2-10, *Performance Standard for Wood-Based Structural-Use Panels*, United States Department of Commerce, National Institute of Standards and Technology, Gaithersburg, MD.

A4 Limitations of Framing Members

A4.1 General

Structural members and *nonstructural members* shall comply with AISI S201 and the additional limitations of this section. Such limitations shall not apply where design is provided by a *design professional*.

A4.2 Physical Dimensions

Cold-formed structural steel members shall comply with the dimensional requirements specified in Table A4-1.

A4.3 Material Properties

The minimum *yield strength*, F_y , of cold-formed steel framing members shall be 33 ksi (230 MPa) unless otherwise specified as 50 ksi (340 MPa).

A4.3.1 Material Properties in High Wind Areas and High Seismic Areas

Wall *studs* and *track* used in the construction of braced walls in *high seismic areas* shall be Grade 33 (Grade 230) for members with a *designation thickness* of 33 or 43 and Grade 50 (Grade 340) for members with a *designation thickness* equal to or greater than 54.

Steel sheet used as a wall *bracing* material in *high wind areas* and *high seismic areas* shall have a minimum *base steel thickness* of 0.0269 inches (0.683 mm) and shall be of ASTM A1003 Structural Grade 33 (Grade 230) Type H steel.

A4.4 Web Holes

Holes in *webs* of *structural members* shall comply with the requirements for factory *punchouts* (perforations) in Section C5 of AISI S201, as shown in Figure A4-1 and all the following requirements:

- (1) *Web* hole width for *studs* shall not be greater than 1-1/2 inches (38.1 mm).
- (2) Minimum distance between the edge of bearing and the near edge of a *web* hole shall be 10 inches (254 mm), as shown in Figure A4-2.

Members with holes violating the above requirements shall be reinforced in accordance with Section A4.5, patched in accordance with Section A4.6 or designed in accordance with accepted engineering practices.

A4.5 Hole Reinforcing

Web holes in *floor joists*, *ceiling joists* and gable endwall *studs* violating the requirements of Section A4.4 shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the *span* and the depth and length of the hole does not exceed 65% of the flat width of the *web*. The reinforcing shall be a steel plate or *C-shape* section with a hole that does not exceed the above *web* hole size limitation for the member being reinforced. The steel reinforcing shall be of a minimum thickness as the receiving member and shall extend at least 1 inch (25.4 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the *web* of the receiving member with No.8 screws spaced no greater than 1 inch (25.4 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (12.7 mm).

A4.6 Hole Patching

Web holes violating the requirements of Section A4.4 shall be permitted to be patched if the depth of the hole does not exceed 70% of the flat width of the *web* and the length of the hole measured along the *web* does not exceed 10 inches (254 mm) or the depth of the *web*, whichever is greater. The patch shall be a solid steel plate, *stud* section, or *track* section in accordance with Figures A4-3 or A4-4. The steel patch shall be of a minimum thickness as the receiving member and shall extend at least 1 inch (25.4 mm) beyond all edges of the hole. The steel patch shall be fastened to the *web* of the receiving member with No.8 screws spaced no greater than 1 inch (25.4 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (12.7 mm).

Structural members shall be replaced or designed in accordance with accepted engineering practices when *web* holes exceed either of the following size limits:

- (a) The depth of the hole, measured across the *web*, exceeds 70% of the flat width of the *web*.
- (b) The length of the hole measured along the *web*, exceeds 10 inches (254 mm) or the depth of the *web*, whichever is greater.

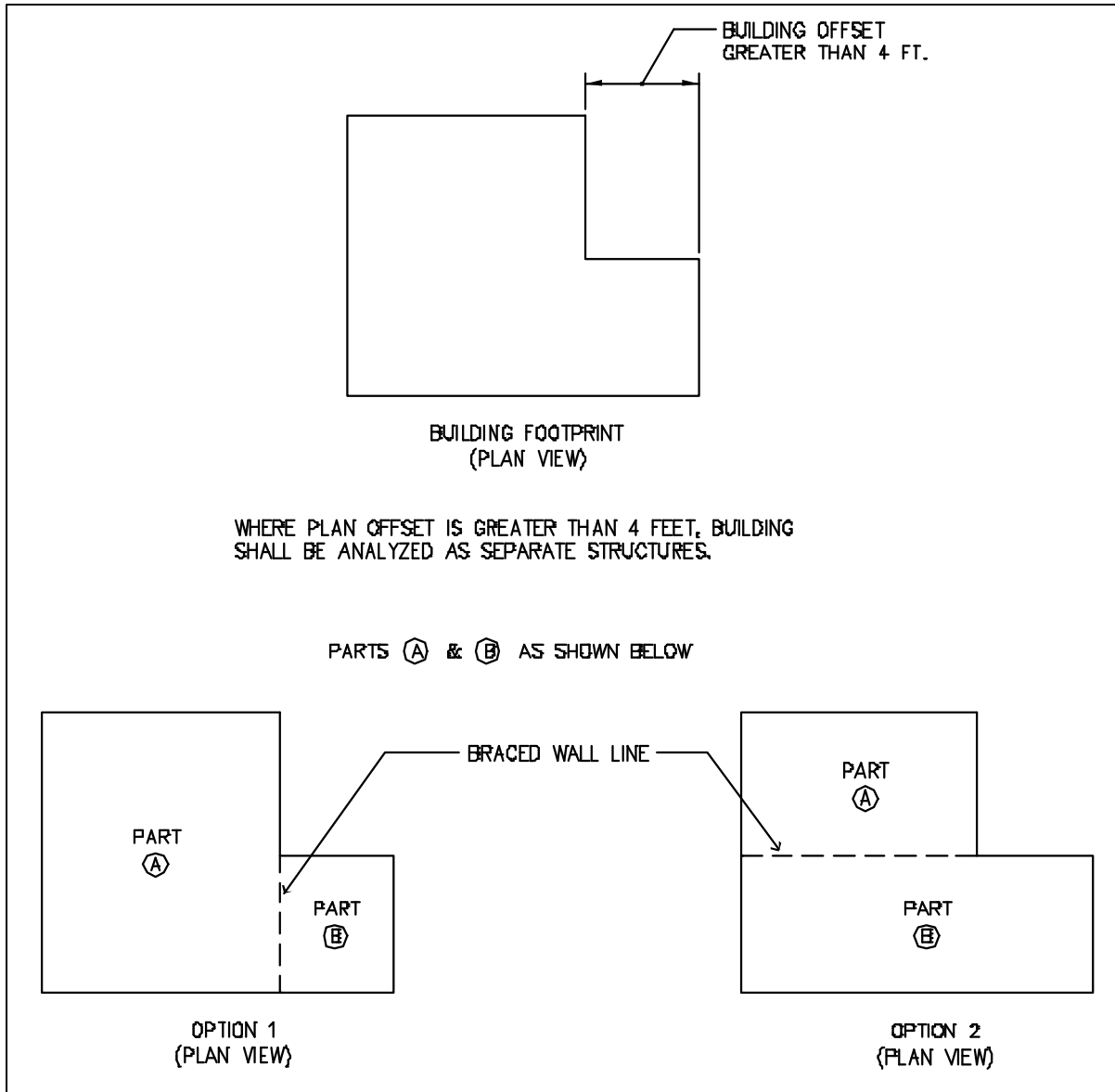


Figure A1-1 Building Configuration

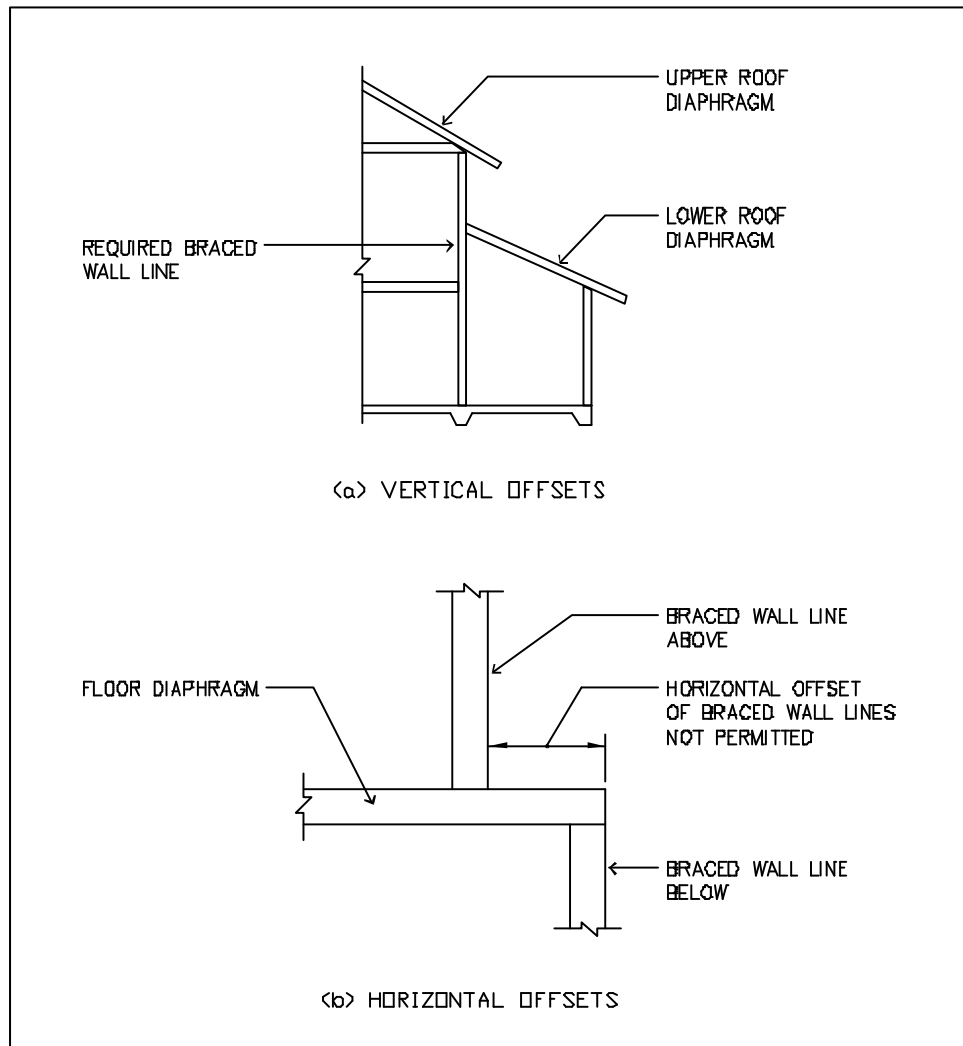


Figure A1-2 Building Configuration Limitations

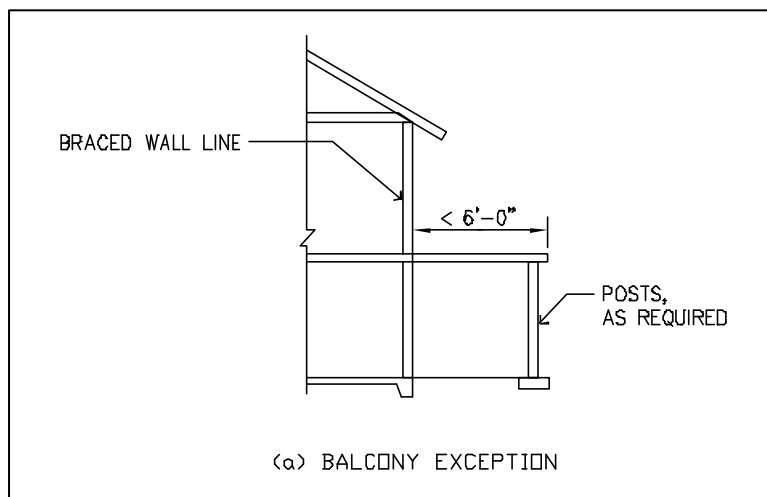


Figure A1-3 Irregular Buildings

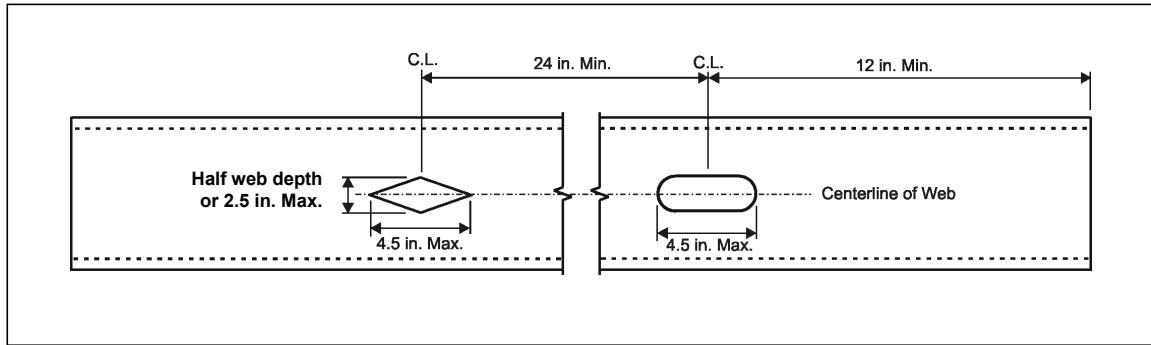


Figure A4-1 Web Hole Limitations

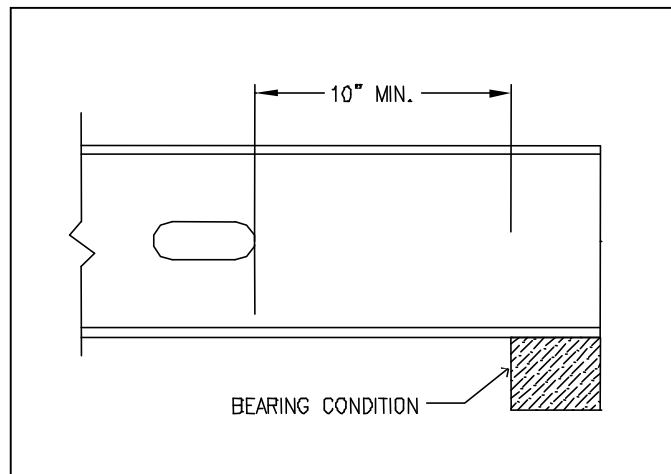


Figure A4-2 Web Hole Limitation Adjacent to Bearing

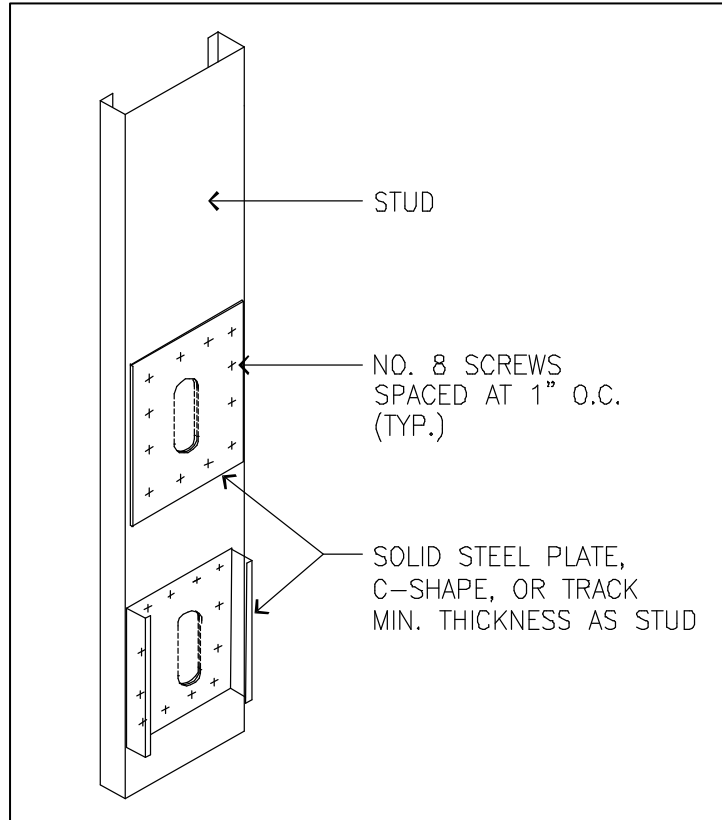


Figure A4-3 Stud Web Hole Patch

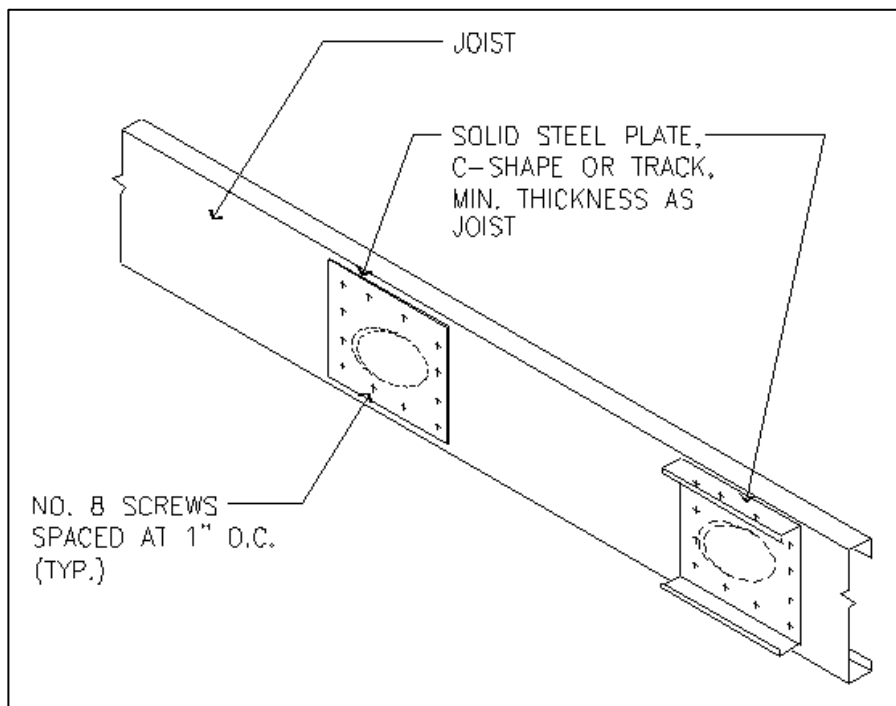


Figure A4-4 Joist Web Hole Patch

Table A1-1
Limits of Applicability

ATTRIBUTE	LIMITATION
General	
Building Dimension	Maximum width ¹ is 40 feet (12.2 m) Maximum length ² is 60 feet (18 m)
Number of Stories	3 story with a basement
Maximum Story Height	10 feet (3.05 m), plus a height of floor or roof framing at the eaves not to exceed 16 inches (406 mm)
Maximum Mean Roof Height	33 feet (10.1 m) above <i>average grade</i>
<i>Basic Wind Speed</i>	Up to 150 mph (241 km/hr) ³
<i>Wind Exposure</i>	Exposures C (open terrain or hurricane coastline) Exposures B (suburban/wooded)
Ground Snow Load	70 psf (3.35 kN/m ²) maximum ground snow load
<i>Seismic Design Category</i>	A, B, C, D ₀ , D ₁ , D ₂ and E
Floors	
Floor Dead Load	10 psf (0.48 kN/m ²) maximum
Floor Live Load	40 psf (1.92 kN/m ²) maximum (rooms other than sleeping rooms) 30 psf (1.44 kN/m ²) maximum (sleeping rooms)
Cantilever	24 inches (610 mm) maximum
Walls	
Wall Dead Load	10 psf (0.48 kN/m ²) maximum
Structural Wall Height	10 feet (3.05 m) maximum
Roofs	
Roof Dead Load	12 psf (0.58 kN/m ²) maximum total roof and ceiling load 7 psf (0.34 kN/m ²) maximum for roof covering only
Roof Snow/Live Load	70 psf (3.35 kN/m ²) maximum ground snow load (16 psf (0.77 kN/m ²) minimum roof live load)
Ceiling Dead Load	5 psf (0.24 kN/m ²) maximum
Roof Slope	3:12 to 12:12
<i>Rake Overhang</i>	12 inches (305 mm) maximum
<i>Eave Overhang</i>	24 inches (610 mm) maximum
Attic Live Load (Attics with storage)	20 psf (0.96 kN/m ²) maximum
Attic Live Load (Attics without storage)	10 psf (0.48 kN/m ²) maximum

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m.

¹ Building width is in the direction of horizontal framing members supported by the wall *studs*.

² Building length is in the direction perpendicular to *floor joists*, *ceiling joists*, or *roof trusses*.

³ To convert to fastest-mile wind speed refer to Table A1-3.

Table A1-2
Additional Limitations in High Seismic Areas

ATTRIBUTE	LIMITATION
General	
Number of Stories	3 story slab on grade or on continuous concrete or masonry foundation ¹
Ground Snow Load ³	70 psf (3.35 kN/m ²) maximum with <i>normal</i> or <i>light weight</i> ² roof system 30 psf (1.44 kN/m ²) maximum with <i>heavy weight</i> ² roof system
Seismic Design Category	Seismic Design Category <i>D₀, D₁, D₂, E</i> ⁴
Walls	
Wall Dead Load	7 psf (0.34 kN/m ²) maximum for <i>light weight</i> wall system 14 psf (0.68 kN/m ²) maximum for <i>heavy weight</i> wall system
Roofs	
Roof/Ceiling Dead Load	12 psf (0.57 kN/m ²) maximum total load for <i>light weight</i> roof system 15 psf (0.72 kN/m ²) maximum total load for <i>normal weight</i> roof system 25 psf (1.20 kN/m ²) maximum total load for <i>heavy weight</i> roof system
Roof Slope	3:12 to 6:12

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr = 0.447 m/s, 1 foot = 0.305 m

¹ Maximum height from *average grade to mean roof height* is limited to 33' (10.1 m).

² *Normal, light, and heavy weight roof systems* are as defined in this table

³ In *high seismic areas*, buildings in locations with ground snow loads greater than 30 psf (1.44 kN/m²) and with a *normal or light weight roof/ceiling assembly* are to be constructed in accordance with the requirements for buildings with a *heavy weight roof/ceiling assembly*.

⁴ Buildings constructed in *Seismic Design Category E* per this standard are limited to *regular buildings* which do not have any floors cantilevered past exterior walls.

Table A1-3
Conversion of ASCE 7 Basic Wind Speeds to AISI S230 Basic Wind Speeds (mph) ¹

ASCE 7 Basic Wind Speed	110	115	126	139	152	164	177	190
AISI S230 Basic Wind Speed	85	90	100	110	120	130	140	150

For SI: 1 mph = 1.61 km/hr = 0.447 m/sec

¹ ASCE 7 permits linear interpolation between the contours of the *basic wind speed* maps.

Table A4-1
Cold-Formed Steel Member Sizes

Member Designation ¹	Web Depth (inches)	Minimum Flange Width (inches)	Maximum Flange Width (inches)	Minimum Lip Size (inches)
350S162-t	3.5	1.625	2	0.5
550S162-t	5.5	1.625	2	0.5
800S162-t	8	1.625	2	0.5
1000S162-t	10	1.625	2	0.5
1200S162-t	12	1.625	2	0.5

For SI: 1 inch = 25.4 mm.

¹ "t" indicates the *designation thickness* of the steel; i.e., the minimum *base steel thickness* expressed in mils (1/1000 inches) and rounded to a whole number.

B. CONNECTIONS

B1 Fastening Requirements

Screw fasteners shall conform to the requirements of AISI S200. All screw sizes specified in this standard shall be minimums. Other fastening techniques, such as the use of pneumatically driven fasteners, powder-actuated fasteners, crimping, clinching, or welding, shall be permitted when *approved*.

Where No.8 screws are specified, the required number of screws in a steel-to-steel connection shall be permitted to be reduced in accordance with the reduction factors in Table B1-1 when larger screws are used or when one of the sheets of steel being connected is thicker than 33 mils (0.84 mm). When applying the reduction factor, the resulting number of screws shall be rounded up.

B2 Bearing Stiffeners

A *bearing stiffener* shall be fabricated from a *C-shaped*, *track* or clip angle member with a minimum size that is in accordance with the one of following:

(a) *C-shaped* Bearing Stiffeners:

- a. Where the *joist* is not carrying a structural wall above, the *bearing stiffener* shall be a minimum 33 mil (0.84 mm) thickness.
- b. Where the *joist* is carrying a structural wall above, the *bearing stiffener* shall be at least the same *designation thickness* as the wall *stud* above.

(b) *Track* Bearing Stiffeners:

- a. Where the *joist* is not carrying a structural wall above, the *bearing stiffener* shall be a minimum 43 mil (1.09 mm) thickness.
- b. Where the *joist* is carrying a structural wall above, the *bearing stiffener* shall be at least one *designation thickness* greater than the wall *stud* above.

(c) Clip Angle Bearing Stiffeners:

- a. Where the clip angle *bearing stiffener* is fastened to both the *web* of the member it is stiffening and an adjacent *rim track* using the fastener pattern shown in Figure B2-1, the *bearing stiffener* shall be a minimum 2-inch x 2-inch (51 mm x 51 mm) angle sized in accordance with Tables B2-1 through B2-4.

The minimum length of a *bearing stiffener* shall be the depth of member being stiffened minus 3/8 inch (9.5 mm). Each *bearing stiffener* shall be fastened to the *web* of the member it is stiffening as shown in Figure B2-1. Each clip angle *bearing stiffener* shall also be fastened to the *web* of the adjacent *rim track* using the fastener pattern shown in Figure B2-1. No. 8 screws shall be used for *C-shaped* and *track* members of any thickness and for clip angle members with a *designation thickness* less than or equal to 54. No. 10 screws shall be used for clip angle members with a *designation thickness* greater than 54. *Bearing stiffeners* shall be installed in accordance with the alignment requirements of Section C1 of AISI S200 for inline framing.

B3 Clip Angles

Clip angles shall have a minimum size of 2 inches x 2 inches by 33 mil (51 mm x 51 mm x 0.84 mm) and have sufficient leg length to provide minimum 1-inch (25.4 mm) overlap on the connected material, unless otherwise noted. All *clip angle* materials shall comply with Section A.

B4 Anchor Bolts

Anchor bolts connecting steel framing to the foundation structure shall be installed so that the distance from the center of the bolt hole to the edge of the connected member is not less than one and one-half bolt diameters. Anchor bolts shall include appropriate size and grade washers. Anchor bolts shall meet or exceed the requirements of ASTM F1554.

In *high wind areas* and *high seismic areas*, anchor bolts shall have a minimum 3"x3"x 0.229" (76 mm by 76 mm by 5.8 mm) steel plate washer, unless a standard hole size is provided in the connected member and a standard cut or hardened washer is provided between the connected member and the nut.

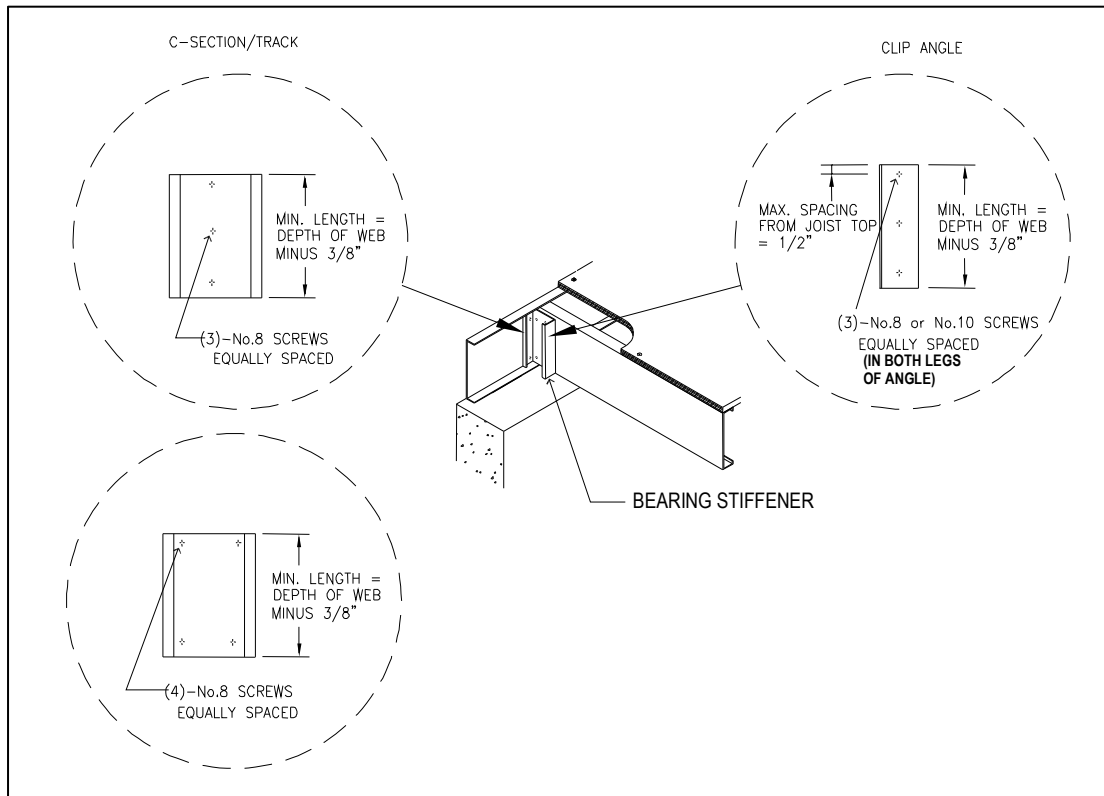


Figure B2-1 Bearing Stiffener (Web Stiffener)

**Table B1-1
 Screw Substitution Factor**

Screw Size	Thinnest Connected Steel Sheet (mils)	
	33	43
No.8	1.0	0.67
No.10	0.93	0.62
No.12	0.86	0.56

For SI: 1 mil = 0.0254 mm.

Table B2-1
Clip Angle Bearing Stiffeners
20 psf Equivalent Snow Load

Joist Designation	Minimum Thickness (Mils) of 2-inch x 2-inch (50.8 mm x 50.8 mm) Clip Angle											
	Top Floor				Bottom Floor in 2 Story Middle Floor in 3 Story				Bottom Floor in 3 Story			
	Joist Spacing (inches)				Joist Spacing (inches)				Joist Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	43	43	43	43	43	54	68	68	68	-	-	-
800S162-43	43	43	43	43	54	54	68	68	-	-	-	-
800S162-54	43	43	43	43	43	54	68	68	68	-	-	-
800S162-68	43	43	43	43	43	43	54	68	54	-	-	-
800S162-97	43	43	43	43	43	43	43	43	43	43	54	-
1000S162-43	43	43	43	43	54	68	-	-	-	-	-	-
1000S162-54	43	43	43	43	54	68	68	-	-	-	-	-
1000S162-68	43	43	43	43	54	68	-	-	-	-	-	-
1000S162-97	43	43	43	43	43	43	43	54	43	68	-	-
1200S162-43	43	54	54	54	-	-	-	-	-	-	-	-
1200S162-54	54	54	54	54	-	-	-	-	-	-	-	-
1200S162-68	43	43	54	54	68	-	-	-	-	-	-	-
1200S162-97	43	43	43	43	43	54	68	-	-	-	-	-

For SI: 1 mil = 0.0254 mm.

Table B2-2
Clip Angle Bearing Stiffeners
30 psf Equivalent Snow Load

Joist Designation	Minimum Thickness (Mils) of 2-inch x 2-inch (50.8 mm x 50.8 mm) Clip Angle											
	Top Floor				Bottom Floor in 2 Story Middle Floor in 3 Story				Bottom Floor in 3 Story			
	Joist Spacing (inches)				Joist Spacing (inches)				Joist Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	43	43	43	43	54	68	68	-	-	-	-	-
800S162-43	43	43	43	54	68	68	68	-	-	-	-	-
800S162-54	43	43	43	43	54	68	68	-	-	-	-	-
800S162-68	43	43	43	43	43	54	68	-	68	-	-	-
800S162-97	43	43	43	43	43	43	43	43	43	43	68	-
1000S162-43	54	54	54	54	68	-	-	-	-	-	-	-
1000S162-54	54	54	54	54	68	-	-	-	-	-	-	-
1000S162-68	43	43	54	68	68	-	-	-	-	-	-	-
1000S162-97	43	43	43	43	43	43	54	68	54	-	-	-
1200S162-43	54	68	68	68	-	-	-	-	-	-	-	-
1200S162-54	68	68	68	68	-	-	-	-	-	-	-	-
1200S162-68	68	68	68	68	-	-	-	-	-	-	-	-
1200S162-97	43	43	43	43	54	68	-	-	-	-	-	-

For SI: 1 mil = 0.0254 mm.

Table B2-3
Clip Angle Bearing Stiffeners
50 psf Equivalent Snow Load

Joist Designation	Minimum Thickness (Mils) of 2-inch x 2-inch (50.8 mm x 50.8 mm) Clip Angle											
	Top Floor				Bottom Floor in 2 Story Middle Floor in 3 Story				Bottom Floor in 3 Story			
	Joist Spacing (inches)				Joist Spacing (inches)				Joist Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	54	54	54	54	68	-	-	-	-	-	-	-
800S162-43	68	68	68	68	-	-	-	-	-	-	-	-
800S162-54	54	68	68	68	-	-	-	-	-	-	-	-
800S162-68	43	43	54	54	68	-	-	-	-	-	-	-
800S162-97	43	43	43	43	43	43	43	54	54	68	-	-
1000S162-43	-	68	68	68	-	-	-	-	-	-	-	-
1000S162-54	-	-	68	68	-	-	-	-	-	-	-	-
1000S162-68	68	-	-	-	-	-	-	-	-	-	-	-
1000S162-97	43	43	43	43	54	68	-	-	-	-	-	-
1200S162-43	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-68	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-97	54	68	68	-	-	-	-	-	-	-	-	-

For SI: 1 mil = 0.0254 mm.

Table B2-4
Clip Angle Bearing Stiffeners
70 psf Equivalent Snow Load

Joist Designation	Minimum Thickness (Mils) of 2-inch x 2-inch (50.8 mm x 50.8 mm) Clip Angle											
	Top Floor				Bottom Floor in 2 Story Middle Floor in 3 Story				Bottom Floor in 3 Story			
	Joist Spacing (inches)				Joist Spacing (inches)				Joist Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	68	68	68	68	-	-	-	-	-	-	-	-
800S162-43	-	-	-	-	-	-	-	-	-	-	-	-
800S162-54	-	-	-	-	-	-	-	-	-	-	-	-
800S162-68	68	68	68	-	-	-	-	-	-	-	-	-
800S162-97	43	43	43	43	43	54	68	-	-	-	-	-
1000S162-43	-	-	-	-	-	-	-	-	-	-	-	-
1000S162-54	-	-	-	-	-	-	-	-	-	-	-	-
1000S162-68	-	-	-	-	-	-	-	-	-	-	-	-
1000S162-97	68	68	68	68	-	-	-	-	-	-	-	-
1200S162-43	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-68	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-97	-	-	-	-	-	-	-	-	-	-	-	-

For SI: 1 mil = 0.0254 mm.

C. FOUNDATION

C1 General

The building foundation shall comply with the applicable building code. Steel framing shall be attached to the foundation structure according to the requirements of Sections D and E of this document. Foundation anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom *tracks*.

D. FLOOR FRAMING

D1 Floor Construction

Floor framing shall be constructed in accordance with this section.

D2 Floor to Foundation or Structural Wall Connection

Floor framing shall be anchored to foundations, wood sills, or structural walls in accordance with Table D2-1 and Figures D2-1 through D2-6. Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom *tracks*. Continuous steel joists supported by interior structural walls shall be constructed in accordance with Figure D2-7. Lapped steel joists shall be constructed in accordance with Figure D2-8. End *floor joists* constructed on foundation walls parallel to the joist *span* shall be doubled unless a *C-shaped bearing stiffener*, sized in accordance with Section B2, is installed *web-to-web* with the *floor joist* beneath each supported wall *stud*, as shown in Figure D2-9. Fastening of steel joists to other framing members shall be in accordance with Table D2-2.

In *high seismic areas* and *high wind areas*, the anchorage of floors to foundations and structural walls shall be in accordance with the provisions of Sections E11, E12 and E13 as applicable.

D3 Minimum Floor Joist Sizes

Floor joist size and thickness shall be determined in accordance with the limits set forth in Table D3-1 for *single spans*, and Tables D3-2a and D3-2b for *multiple spans*. When continuous joist members are used, the interior bearing supports shall be located within two feet (0.61 m) of mid-*span* of the steel joists, and the individual *spans* shall not exceed the *spans* in Tables D3-2a or D3-2b as applicable. *Floor joists* shall have a bearing support length of not less than 1.5 inches (38 mm) for exterior wall supports and 3.5 inches (89 mm) for interior wall supports. *Tracks* shall be a minimum of 33 mils (0.84 mm) thick except when used as part of floor *header* or trimmer in accordance with Section D7.

D3.1 Floor Cantilevers

Floor cantilevers for the top floor of a two or three story building or the first floor of a one-story building shall not exceed 24 inches (610 mm). Cantilevers, not exceeding 24 inches (610 mm) and supporting two stories and roof (i.e., first floor of a two-story building), shall be permitted provided that all cantilevered joists are doubled (nested or back-to-back). The doubled cantilevered joists shall extend a minimum of 6 feet (1.83 m) toward the inside and shall be fastened with a minimum of two No.8 screws spaced at 24 inches (610 mm) on center through the *webs* (for back-to-back) or *flanges* (for nested joists).

D4 Bearing Stiffeners

Bearing stiffeners shall be installed at each joist bearing location in accordance with Section B2, except for *joists* lapped over an interior support not carrying a structural wall above. Floor *joists* supporting jamb *studs* with multiple members shall have two *bearing stiffeners* in accordance with Figure D4-1.

D5 Joist Bracing and Blocking

D5.1 Joist Top Flange Bracing

The top *flanges* of *floor joist* members shall be laterally braced by the application of floor sheathing fastened to the joists in accordance with Section D9.

D5.2 Joist Bottom Flange Bracing/Blocking

Floor joists with *spans* that exceed 12 feet (3.66 m) shall have the bottom *flanges* laterally braced in accordance with one of the following:

- (a) Gypsum board installed with No.6 screws at 12 inches (305 mm) on center on edges and in the field. Edges perpendicular to framing members need not be blocked.
- (b) Continuous steel *straps* installed in accordance with Figure D5-1. Steel *straps* shall be spaced at a maximum of 12 feet (3.66 m) on center and shall be at least 1-1/2 inches (38 mm) in width and 33 mils (0.84 mm) in thickness. *Straps* shall be fastened to the bottom *flange* of each joist with one No.8 screw, fastened to *blocking* with two No.8 screws, and fastened at each end (of *strap*) with two No.8 screws. *Blocking* (Figure D5-1 or Figure D5-2) shall be installed between joists at each end of the continuous *strapping* and at a maximum spacing of 12 feet (3.66 m) measured along the continuous *strapping* (perpendicular to the joist run). *Blocking* shall also be located at the termination of all *straps*. As an alternative to *blocking* at the ends, the *strap* shall be permitted to be anchored to a stable building component with two No.8 screws.

D5.3 Blocking at Interior Bearing Supports

Blocking is not required for continuous back-to-back *floor joists* at bearing supports. *Blocking* shall be installed between every other joist for single continuous *floor joists* across bearing supports in accordance with Figure D2-7. *Blocking* shall consist of *C-shape* or *track* section with a minimum thickness of 33 mils (0.84 mm). *Blocking* shall be fastened to each adjacent joist through a 33 mil *clip angle*, bent *web* of *blocking* or *flanges* of *web* stiffener with two No.8 screws on each side. The minimum depth of the *blocking* shall be equal to the depth of the joist minus 2 inches (51 mm). The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm).

D5.4 Blocking at Cantilevers

Blocking shall be installed between every other joist over cantilever bearing supports in accordance with Figures D2-4, D2-5 or D2-6. *Blocking* shall consist of *C-shape* or *track* section with minimum thickness of 33 mils (0.84 mm). *Blocking* shall be fastened to each adjacent joist through bent *web* of *blocking*, 33 mil *clip angle* or *flange* of *web* stiffener with two No.8 screws at each end. The depth of the *blocking* shall be equal to the depth of the joist. The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm). *Blocking* shall be fastened through the floor sheathing and to the support with 3 No.8 screws (top and bottom).

D6 Splicing

Joists and other *structural members* shall not be spliced without an *approved* design. Splicing of *tracks* shall conform to Figure D6-1.

D7 Framing of Floor Openings

Openings in floors shall be framed with *header* and *trimmer* joists. *Header* joist *spans* shall not exceed 6 feet (1.83 m) or 8 feet (2.44 m) in length in accordance with Figures D7-1 and D7-2, respectively. *Header* and *trimmer* joists shall be fabricated from joist and *track* members, having a minimum size and thickness at least equivalent to the adjacent *floor joists* and shall be installed in accordance with Figures D7-1, D7-2, D7-3, and D7-4. Each *header* joist shall be connected to *trimmer* joists with four 2 inch x 2 inch (51 mm x 51 mm) *clip angles*. Each *clip angle* shall be fastened to both the *header* and *trimmer* joists with four No.8 screws evenly spaced through each leg of the *clip angle*. The *clip angles* shall have a thickness not less than that of the *floor joist*. Each *track* section for a built-up *header* or *trimmer* joist shall extend the full length of the joist (continuous).

D8 Floor Trusses

Cold-formed steel floor *trusses* shall be designed, braced, and installed in accordance with the *Standard for Cold-Formed Steel Framing – Truss Design*. *Truss* members shall not be notched, cut, or altered in any manner without an *approved* design.

D9 Diaphragms

A floor *diaphragm* shall be provided by attaching a minimum of 19/32 inch (15.1 mm) wood structural panel, which complies with DOC PS 1, DOC PS 2, CSA O437, or CSA O325 to *floor joists* in accordance with Table D2-2. Screws used to attach the *floor diaphragm* shall have minimum head diameter of 0.29 inch (7 mm).

D9.1 Floor Diaphragms in High Seismic Areas and High Wind Areas

In *high seismic areas* and *high wind areas*, floor *diaphragms* shall be constructed in accordance with Section D9 except that the screw spacing shall be 6 inches (152 mm) on panel edges and in the field. The *diaphragms* shall be permitted to be unblocked, and shall be permitted to be constructed in any panel configuration.

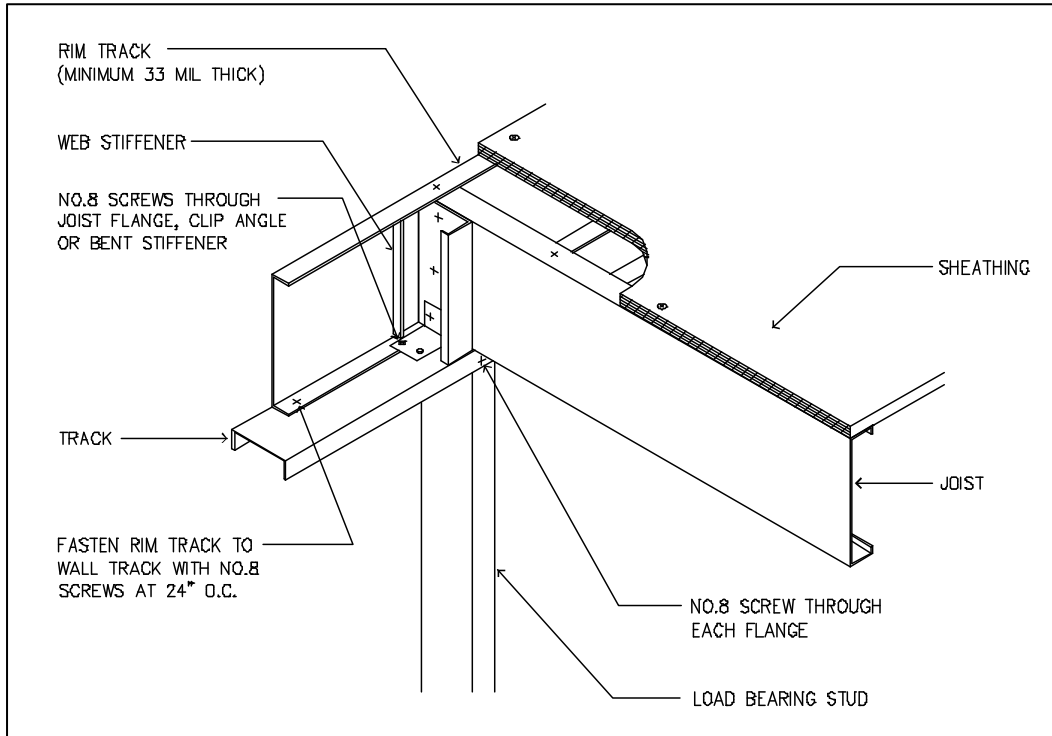


Figure D2-1 Floor to Exterior Structural Wall Connection

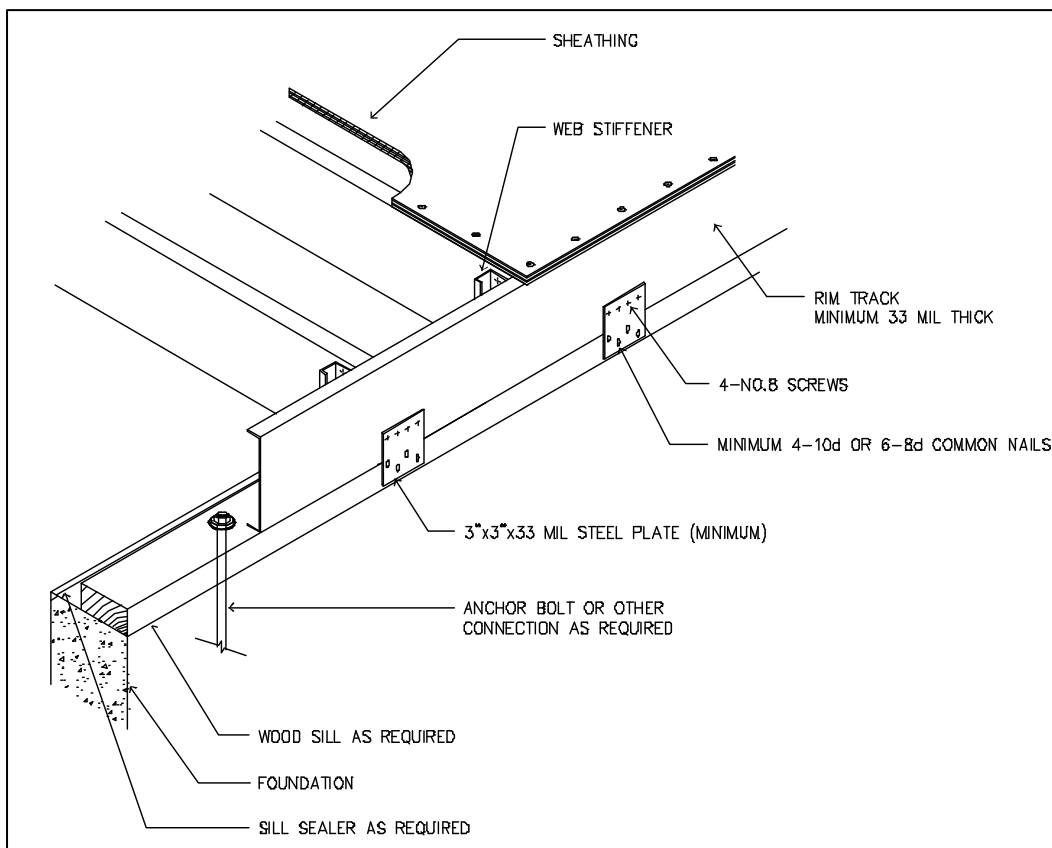


Figure D2-2 Floor to Wood Sill Connection

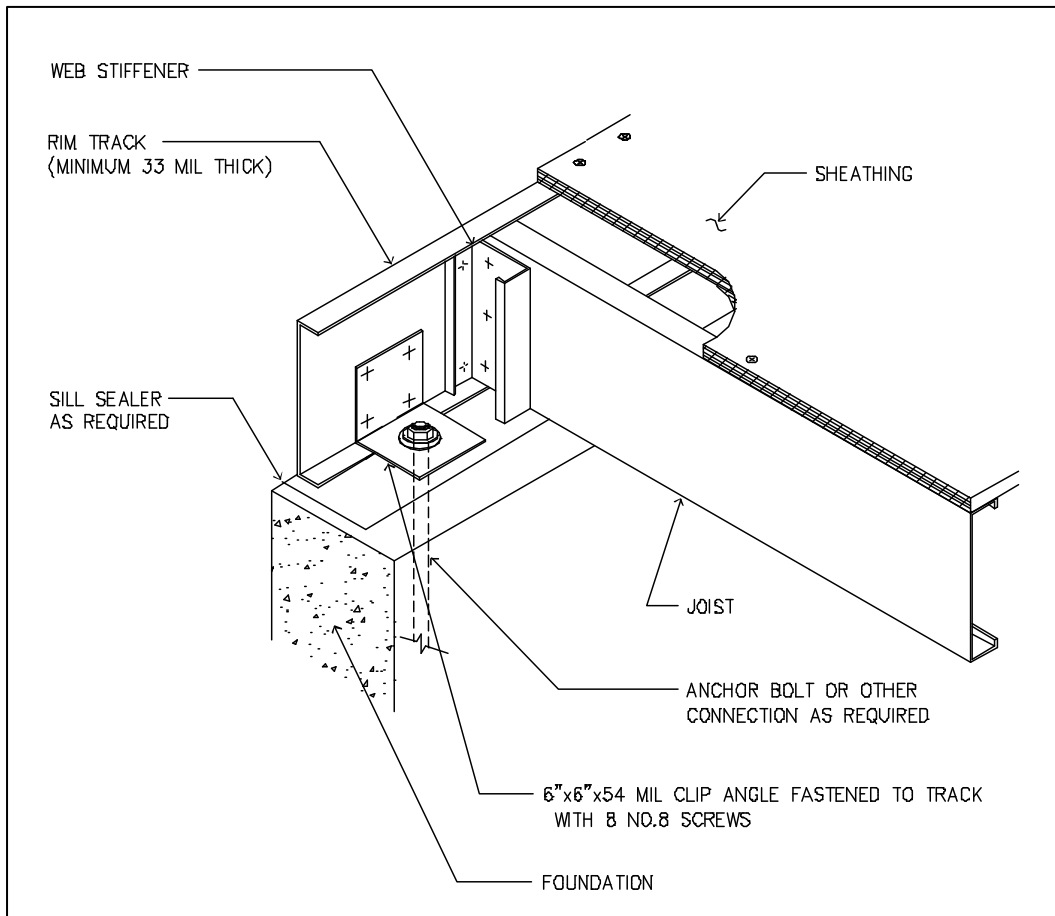


Figure D2-3 Floor to Foundation Connection

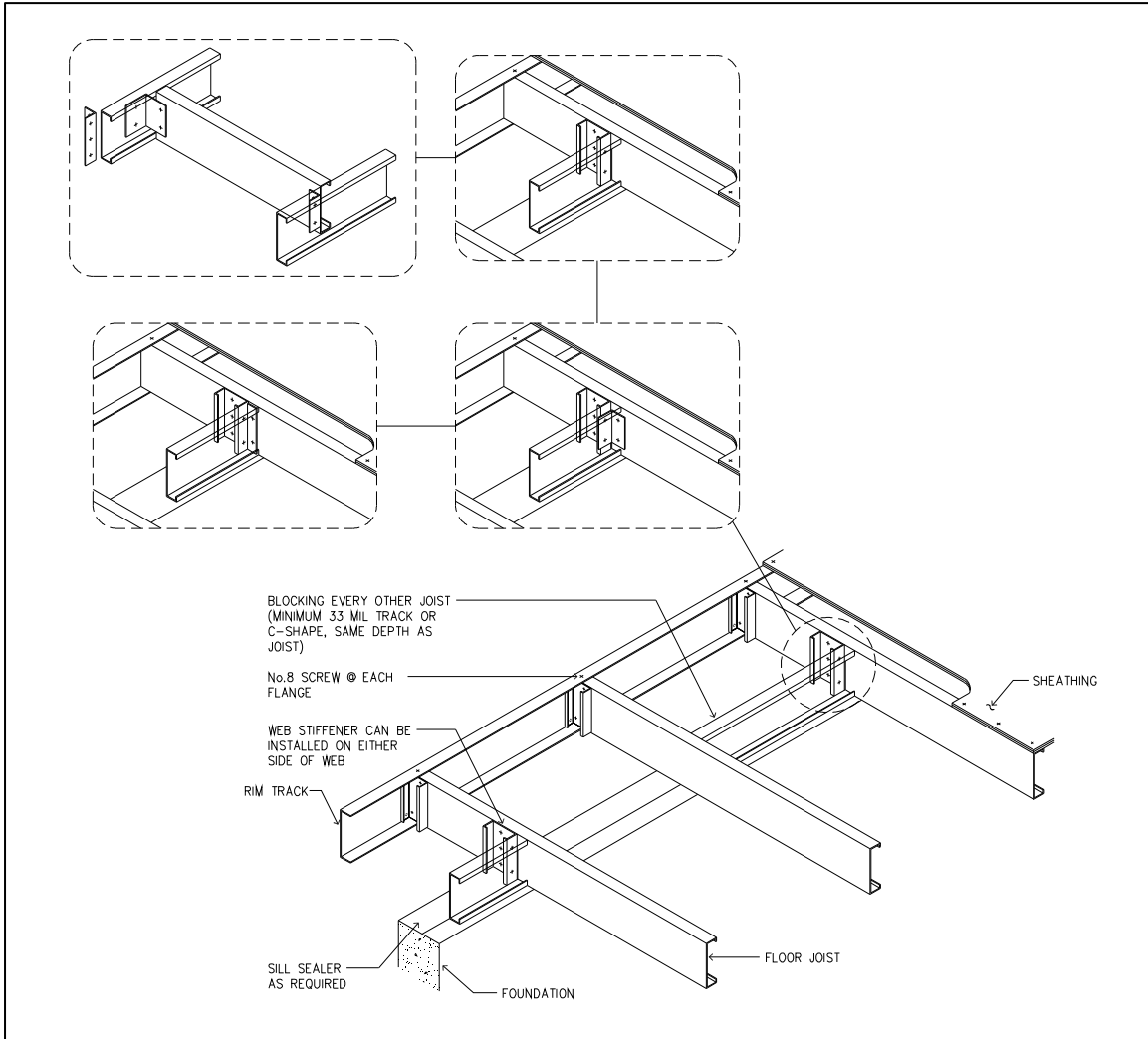


Figure D2-4 Cantilevered Floor to Foundation Connection

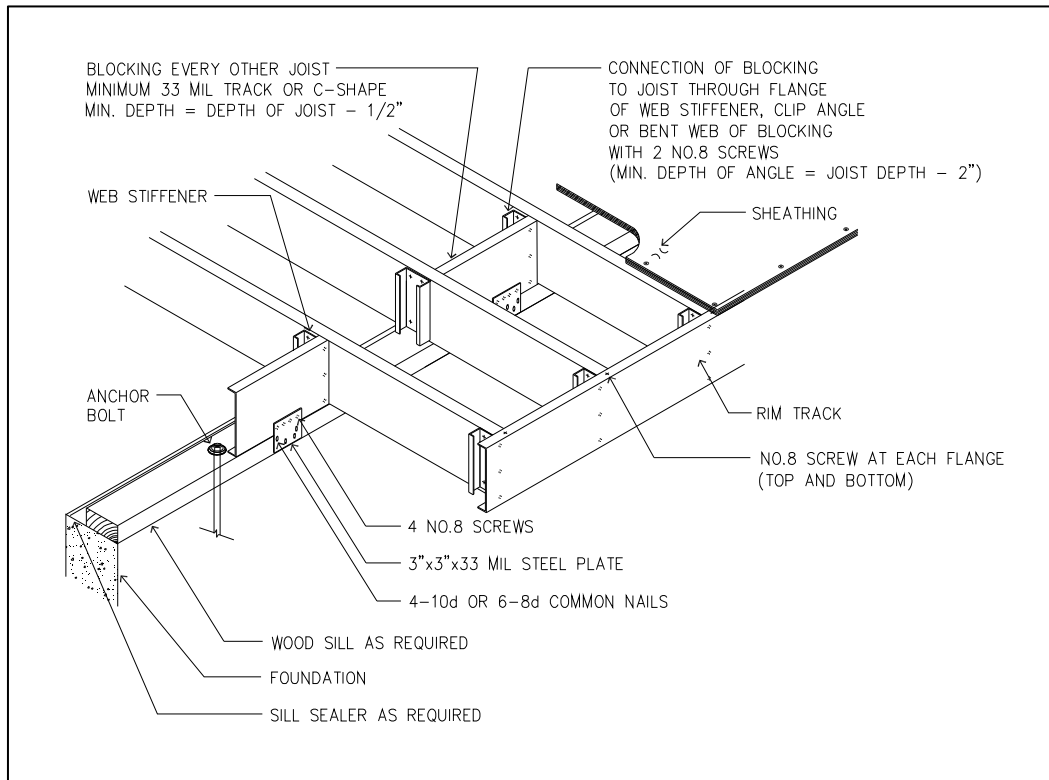


Figure D2-5 Cantilevered Floor to Wood Sill Connection

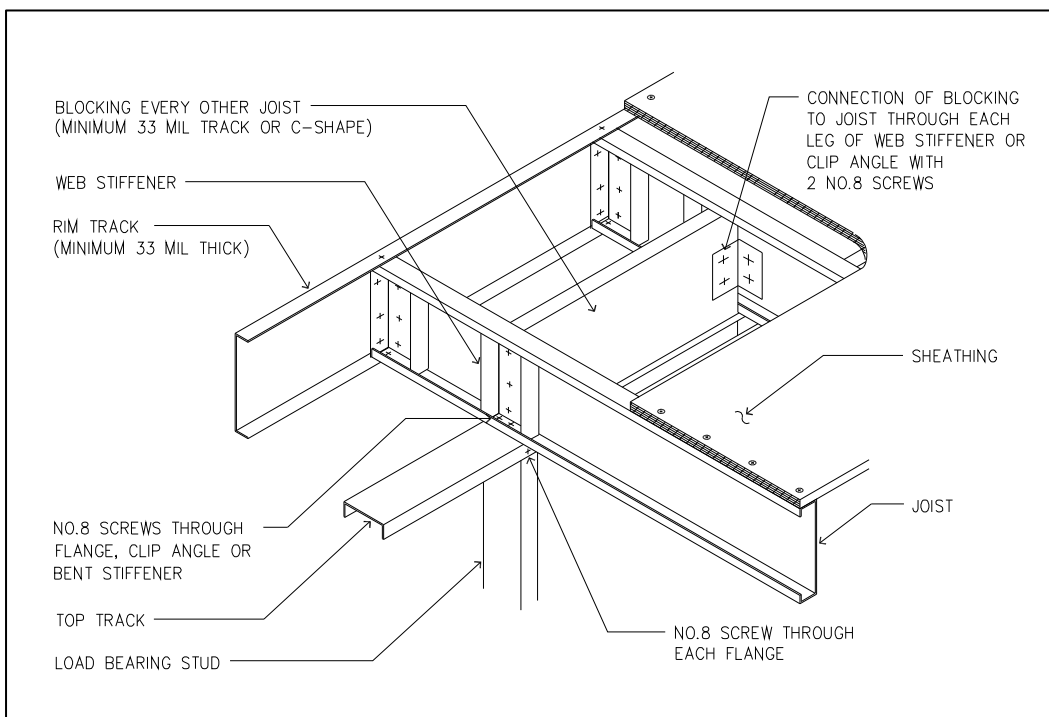


Figure D2-6 Cantilevered Floor to Exterior Structural Wall Connection

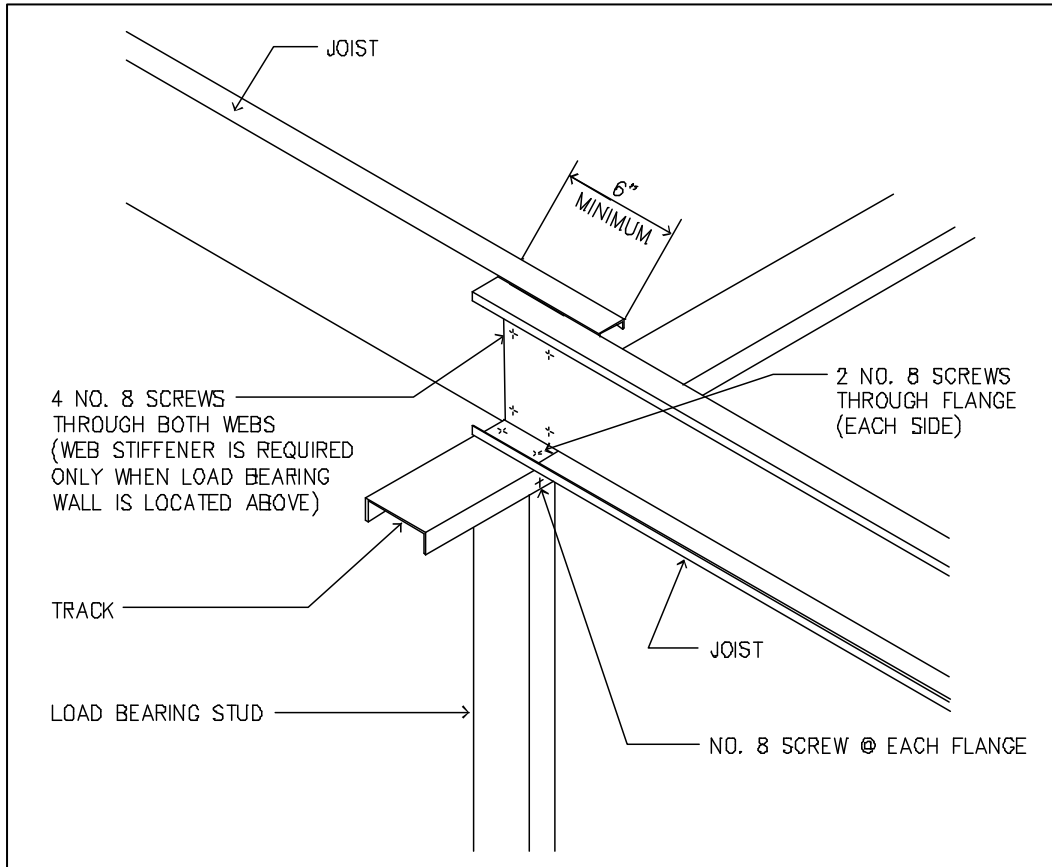


Figure D2-8 Lapped Joist Supported on Interior Structural Wall

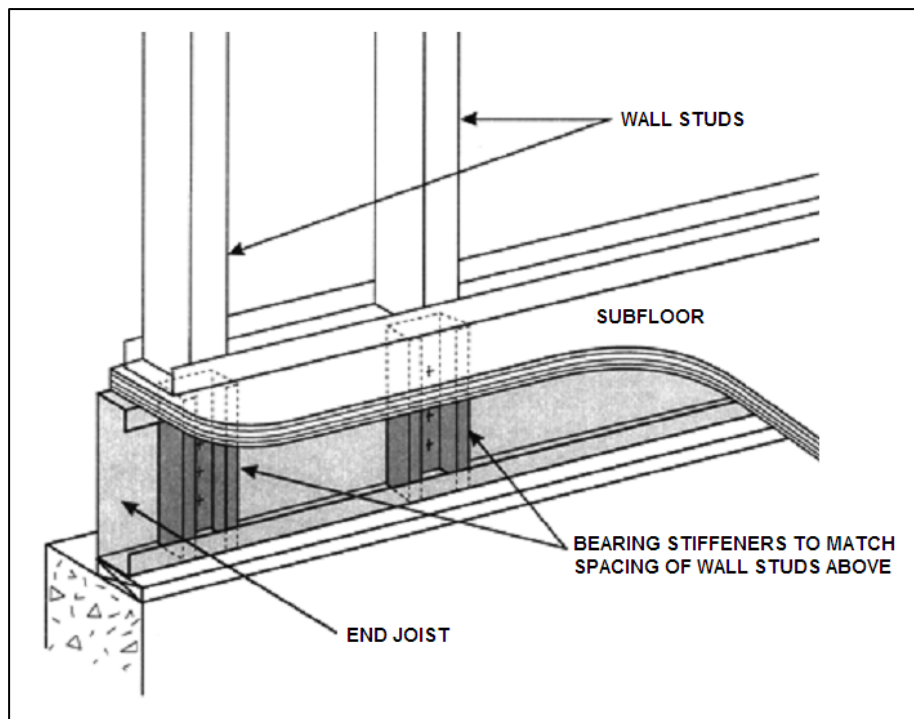


Figure D2-9 Bearing Stiffeners for End Joist

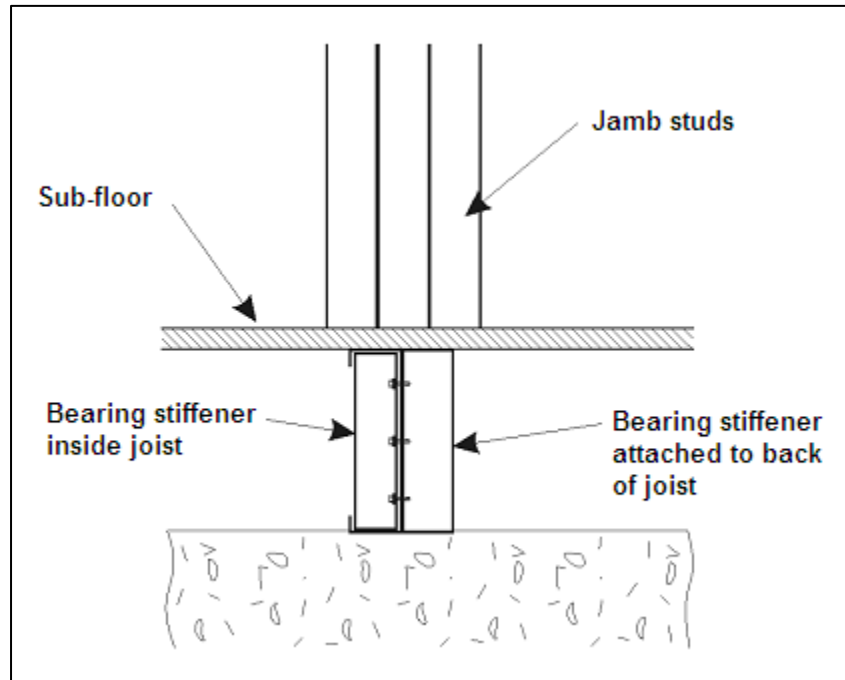


Figure D4-1 Bearing Stiffeners Under Jamb Studs

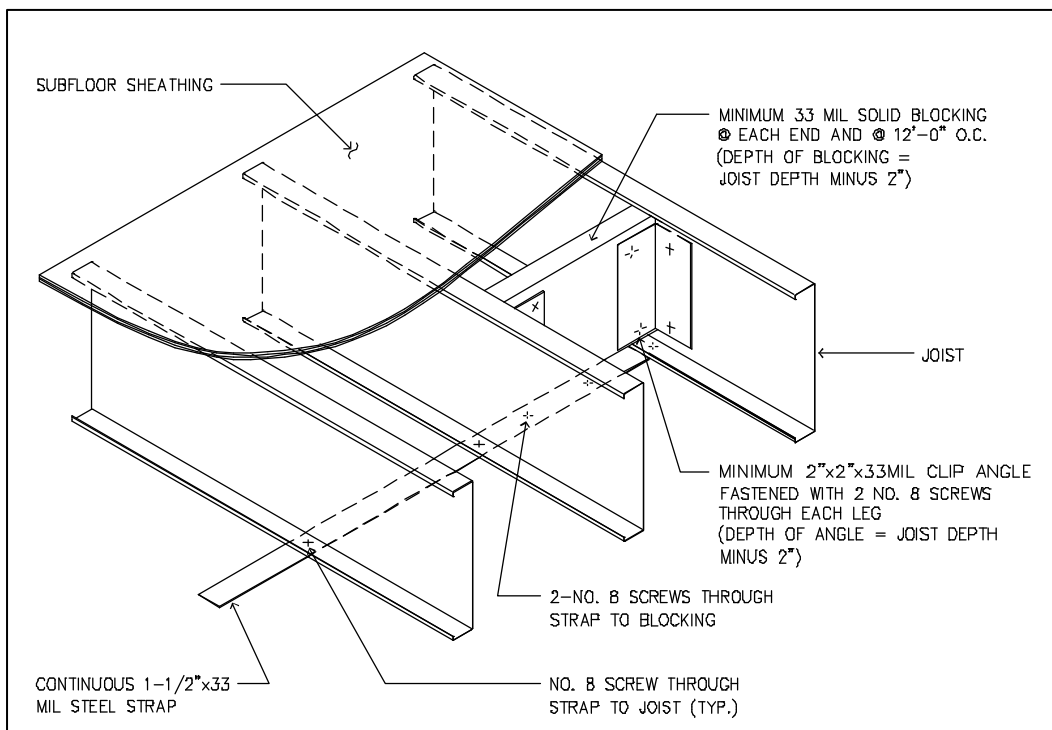


Figure D5-1 Joist Blocking (Solid)

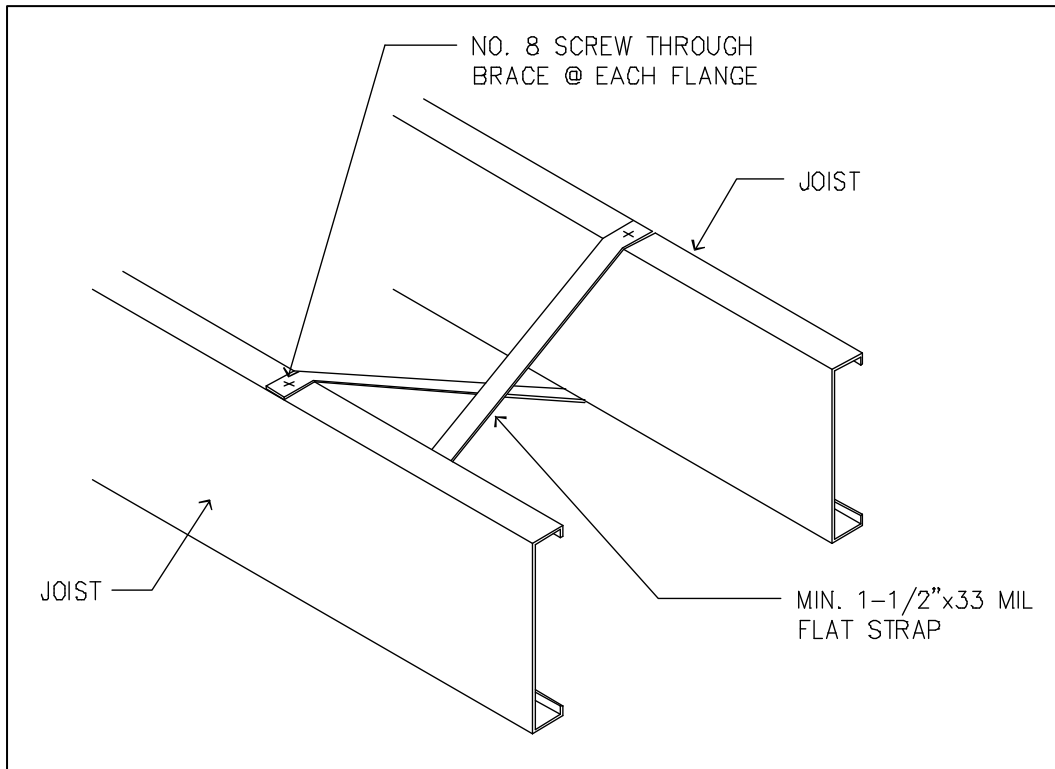


Figure D5-2 Joist Blocking (Strap)

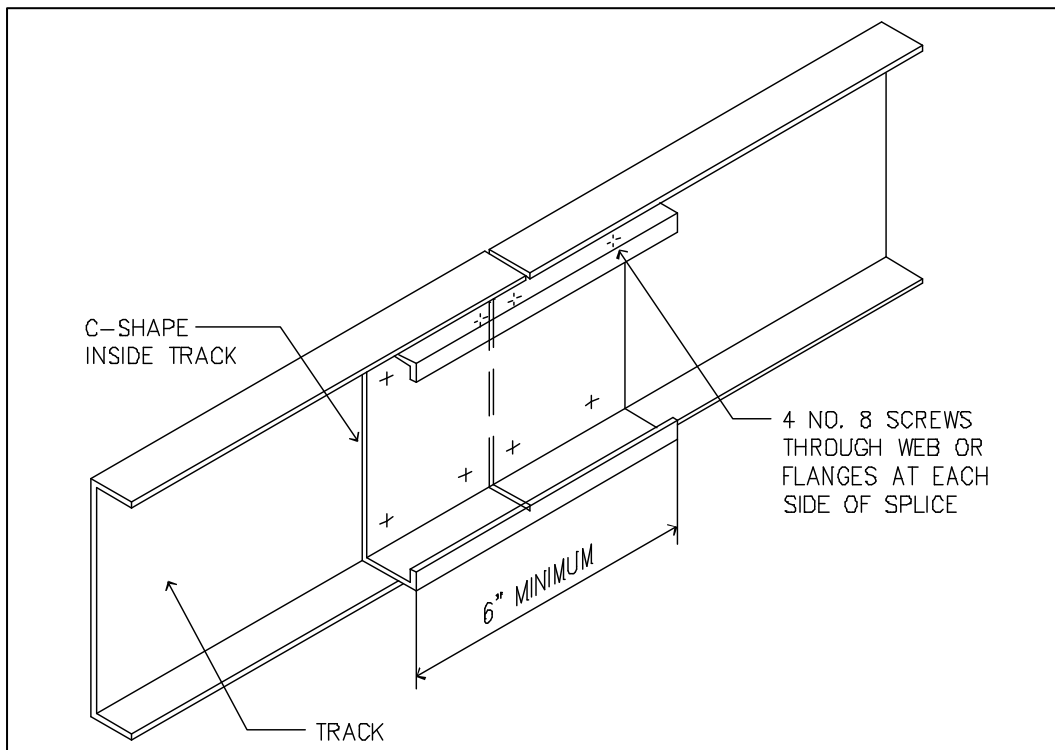


Figure D6-1 Track Splice

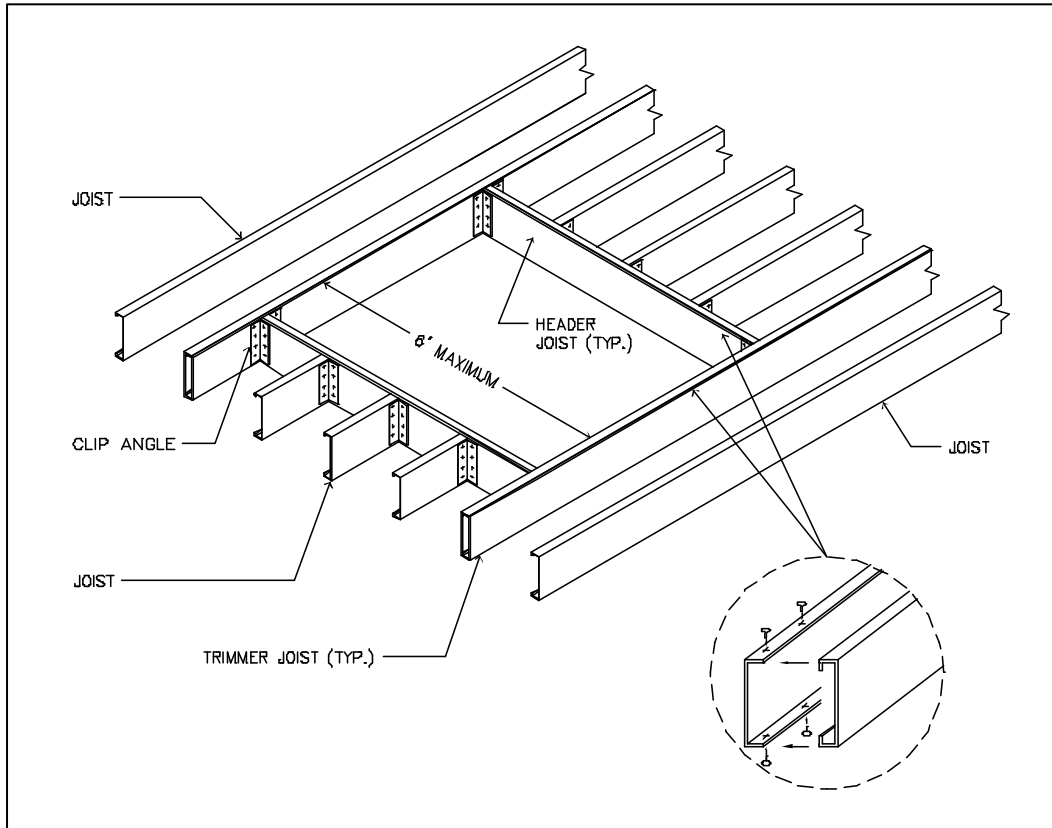


Figure D7-1 Six-Foot Floor Opening

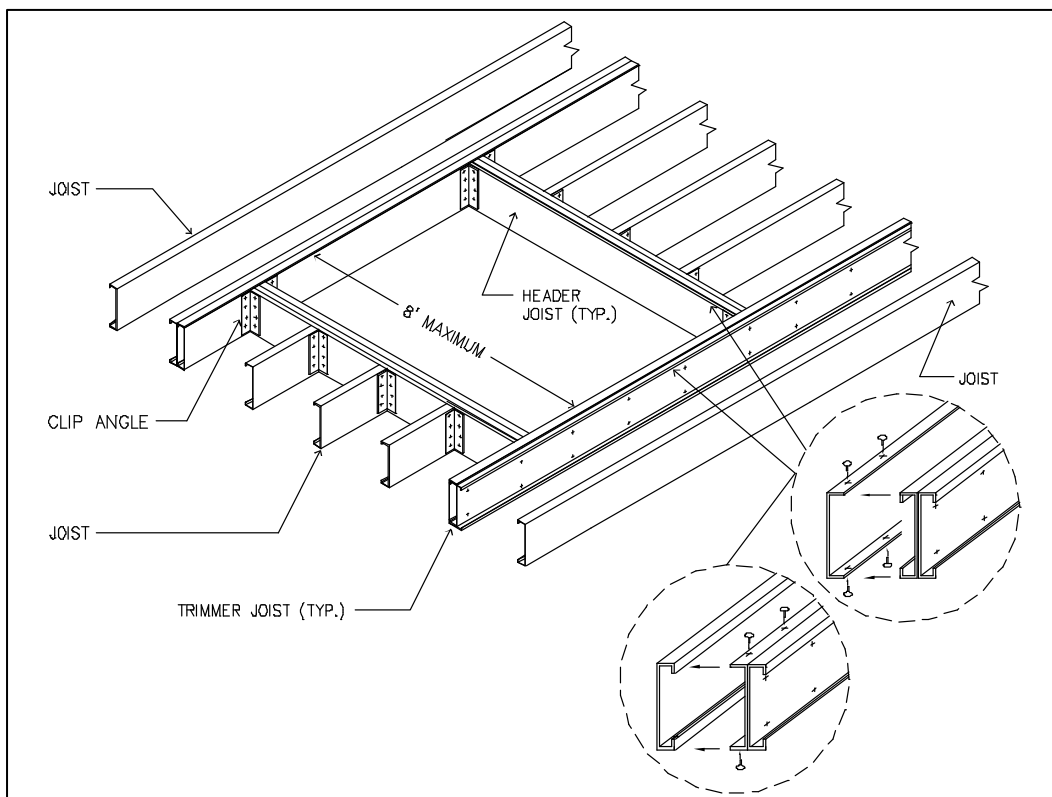


Figure D7-2 Eight-Foot Floor Opening

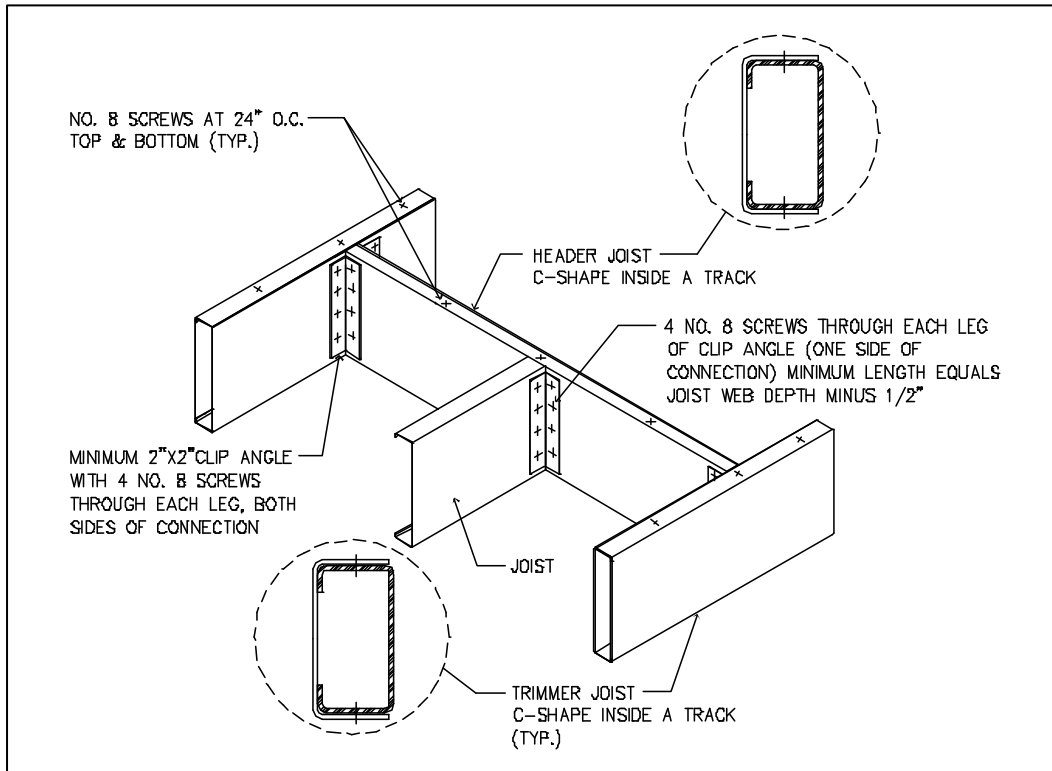


Figure D7-3 Floor Header to Trimmer Connection – 6-Foot Opening

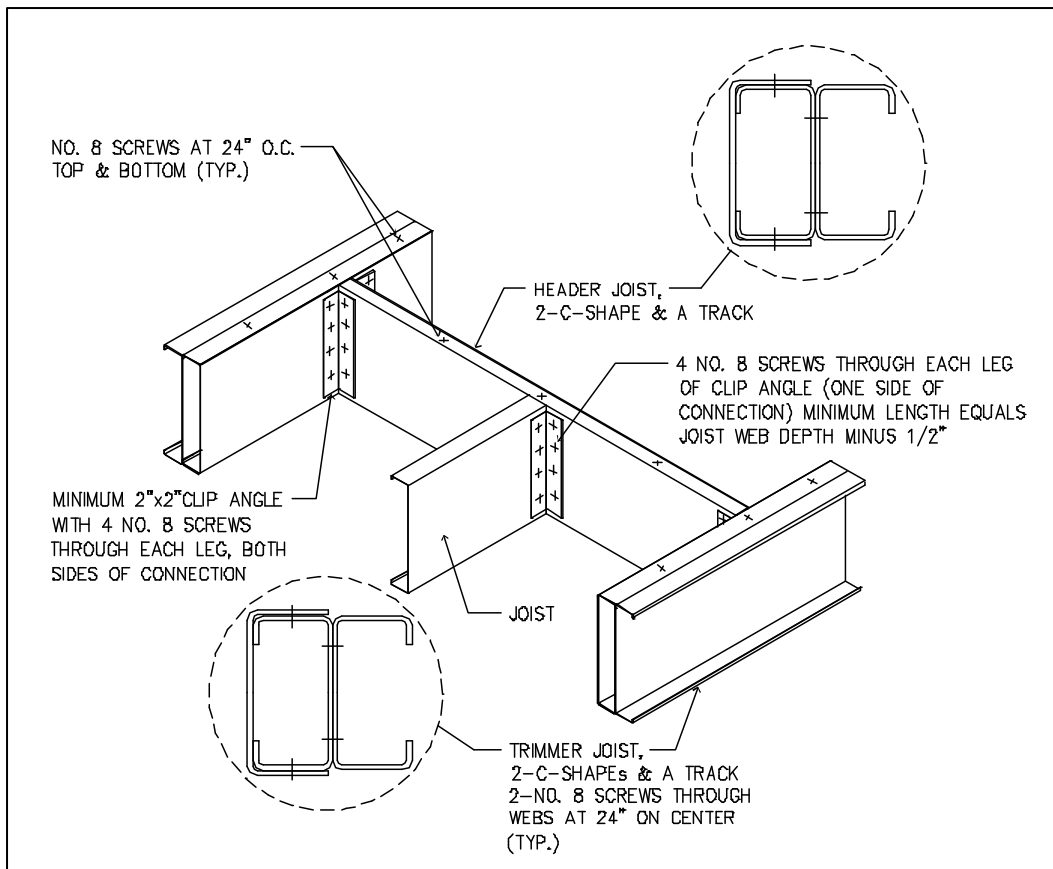


Figure D7-4 Floor Header to Trimmer Connection – 8-Foot Opening

Table D2-1
Floor to Foundation or Structural Wall Connection Requirements^{1, 2}

Framing Condition	Basic Wind Speed (mph), Exposure, and Seismic Design Category ³	
	85 MPH Exposure C or less than 110MPH Exposure B – Seismic Design-Categories A, B & C	Less than 110 MPH Exposure C
<i>Floor joist to wall track of exterior wall per Figure D2-1</i>	2-No.8 screws	3-No.8 screws
<i>Rim track or end joist to structural wall top track per Figure D2-1</i>	1-No.8 screw at 24" o.c.	1-No.8 screw at 24" o.c.
<i>Rim track or end joist to wood sill per Figure D2-2</i>	Steel plate spaced at 4' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails
<i>Rim track or end joist to foundation per Figure D2-3</i>	1/2" minimum diameter anchor bolt and <i>clip angle</i> spaced at 6' o.c. with 8-No.8 screws	1/2" minimum diameter anchor bolt and <i>clip angle</i> spaced at 4' o.c. with 8-No.8 screws
<i>Cantilevered joist to foundation per Figure D2-4</i>	1/2" minimum diameter anchor bolt and <i>clip angle</i> spaced at 6' o.c. with 8-No.8 screws	1/2" minimum diameter anchor bolt and <i>clip angle</i> spaced at 4' o.c. with 8-No.8 screws
<i>Cantilevered joist to wood sill per Figure D2-5</i>	Steel plate spaced at 4' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails
<i>Cantilevered joist to wall track per Figure D2-6</i>	2-No.8 screws	3-No.8 screws

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Use the highest of the wind speed and exposure or the seismic requirements for a given site.

² Anchor bolts are to be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks (e.g. at door openings or corners).

³ See Sections E11 through E13 for floor connection requirements in *high seismic areas* and *high wind areas*.

Table D2-2
Floor Fastening Schedule

Description of Building Elements	Number and Size of Fasteners	Spacing of Fasteners
<i>Floor joist to track of an interior structural wall in accordance with Figures D2-7 and D2-8</i>	2-No.8 screws	Each joist
<i>Floor joist to rim track at end of joist</i>	2-No.8 screws	One per <i>flange</i> or two per <i>bearing stiffener</i>
<i>Subfloor sheathing to floor joists</i>	No.8 screws ¹	6 inches on center on edges and 12 inches on center at intermediate supports ²

For SI: 1 inch = 25.4 mm

¹ Screws to attach subfloor sheathing to *floor joists* are to have minimum head diameter of 0.29 inch (7 mm).

² Fastener spacing on intermediate supports is 6 inches o.c. for *high seismic areas* and *high wind areas* per Section D9.1.

33
KSI

Table D3-1
Floor Joists – Single Spans ^{1,2,3,4}
F_y = 33 ksi

Joist Designation	30 psf Live Load				40 psf Live Load			
	Spacing (inches)				Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	11'-7"	10'-7"	9'-6"	8'-6"	10'-7"	9'-3"	8'-6"	7'-6"
550S162-43	12'-8"	11'-6"	10'-10"	10'-2"	11'-6"	10'-5"	9'-10"	9'-1"
550S162-54	13'-7"	12'-4"	11'-7"	10'-9"	12'-4"	11'-2"	10'-6"	9'-9"
550S162-68	14'-7"	13'-3"	12'-6"	11'-7"	13'-3"	12'-0"	11'-4"	10'-6"
550S162-97	16'-2"	14'-9"	13'-10"	12'-10"	14'-9"	13'-4"	12'-7"	11'-8"
800S162-33	15'-8"	13'-11"	12'-9"	11'-5"	14'-3"	12'-5"	11'-3"	9'-0"
800S162-43	17'-1"	15'-6"	14'-7"	13'-7"	15'-6"	14'-1"	13'-3"	12'-4"
800S162-54	18'-4"	16'-8"	15'-8"	14'-7"	16'-8"	15'-2"	14'-3"	13'-3"
800S162-68	19'-9"	17'-11"	16'-10"	15'-8"	17'-11"	16'-3"	15'-4"	14'-2"
800S162-97	22'-0"	20'-0"	18'-10"	17'-5"	20'-0"	18'-2"	17'-1"	15'-10"
1000S162-43	20'-6"	18'-8"	17'-6"	15'-8"	18'-8"	16'-11"	15'-6"	13'-11"
1000S162-54	22'-1"	20'-0"	18'-10"	17'-6"	20'-0"	18'-2"	17'-2"	15'-11"
1000S162-68	23'-9"	21'-7"	20'-3"	18'-10"	21'-7"	19'-7"	18'-5"	17'-1"
1000S162-97	26'-6"	24'-1"	22'-8"	21'-0"	24'-1"	21'-10"	20'-7"	19'-1"
1200S162-43	23'-9"	20'-10"	19'-0"	16'-8"	21'-5"	18'-6"	16'-6"	13'-2"
1200S162-54	25'-9"	23'-4"	22'-0"	20'-1"	23'-4"	21'-3"	20'-0"	17'-10"
1200S162-68	27'-8"	25'-1"	23'-8"	21'-11"	25'-1"	22'-10"	21'-6"	21'-1"
1200S162-97	30'-11"	28'-1"	26'-5"	24'-6"	28'-1"	25'-6"	24'-0"	22'-3"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m.

¹ Table provides the maximum clear span in feet and inches.

² *Bearing stiffeners* are to be installed at all support points and concentrated loads.

³ Deflection criteria: L/480 for live loads, L/240 for total loads.

⁴ Floor dead load = 10 psf (0.479 kN/m²)

33
KSI

Table D3-2a
Floor Joists – Multiple Spans ^{1,2,3,4,5,6}
F_y = 33 ksi

Joist Designation	30 psf Live Load				40 psf Live Load			
	Spacing (inches)				Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	12'-1"	10'-5"	9'-6"	8'-6"	10'-9"	9'-3"	8'-6"	7'-6"
550S162-43	14'-5"	12'-5"	11'-4"	10'-2"	12'-9"	11'-11"	10'-1"	9'-0"
550S162-54	16'-3"	14'-1"	12'-10"	11'-6"	14'-5"	12'-6"	11'-5"	10'-2"
550S162-68	19'-7"	17'-9"	16'-9"	15'-6"	17'-9"	16'-2"	15'-2"	14'-1"
550S162-97	21'-9"	19'-9"	18'-7"	17'-3"	19'-9"	17'-11"	16'-10"	15'-4"
800S162-33	14'-8"	11'-10"	10'-4"	8'-8"	12'-4"	9'-11"	8'-7"	7'-2"
800S162-43	20'-0"	17'-4"	15'-9"	14'-1"	17'-9"	15'-4"	14'-0"	12'-0"
800S162-54	23'-7"	20'-5"	18'-8"	16'-8"	21'-0"	18'-2"	16'-7"	14'-10"
800S162-68	26'-5"	23'-1"	21'-0"	18'-10"	23'-8"	20'-6"	18'-8"	16'-9"
800S162-97	29'-6"	26'-10"	25'-3"	22'-8"	26'-10"	24'-4"	22'-6"	20'-2"
1000S162-43	22'-2"	18'-3"	16'-0"	13'-7"	18'-11"	15'-5"	13'-6"	11'-5"
1000S162-54	26'-2"	22'-8"	20'-8"	18'-6"	23'-3"	20'-2"	18'-5"	16'-5"
1000S162-68	31'-5"	27'-2"	24'-10"	22'-2"	27'-11"	24'-2"	22'-1"	19'-9"
1000S162-97	35'-6"	32'-3"	29'-11"	26'-9"	32'-3"	29'-2"	26'-7"	23'-9"
1200S162-43	21'-8"	17'-6"	15'-3"	12'-10"	18'-3"	14'-8"	12'-8"	10'-6"
1200S162-54	28'-5"	24'-8"	22'-6"	19'-6"	25'-3"	21'-11"	19'-4"	16'-6"
1200S162-68	33'-7"	29'-1"	26'-6"	23'-9"	29'-10"	25'-10"	23'-7"	21'-1"
1200S162-97	41'-5"	37'-8"	34'-6"	30'-10"	37'-8"	33'-6"	30'-7"	27'-5"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Table provides the maximum clear *span* in feet and inches to either side of the interior support.

² Interior bearing supports for *multiple span* joists consist of structural walls or beams.

³ *Bearing stiffeners* are to be installed at all support points and concentrated loads.

⁴ Deflection criteria: L/480 for live loads, L/240 for total loads

⁵ Floor dead load = 10 psf (0.479 kN/m²)

⁶ Interior supports shall be located within two feet (0.61 m) of mid *span* provided that each of the resulting *spans* does not exceed the appropriate maximum *span* shown in the table above.

50
KSI

Table D3-2b
Floor Joists – Multiple Spans ^{1,2,3,4,5,6}
F_y = 50 ksi

Joist Designation	30 psf Live Load				40 psf Live Load			
	Spacing (inches)				Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	13'-11"	12'-0"	11'-0"	9'-3"	12'-3"	10'-8"	9'-7"	8'-4"
550S162-43	16'-3"	14'-1"	12'-10"	11'-6"	14'-6"	12'-6"	11'-5"	10'-3"
550S162-54	18'-2"	16'-6"	15'-4"	13'-8"	16'-6"	14'-11"	13'-7"	12'-2"
550S162-68	19'-6"	17'-9"	16'-8"	15'-6"	17'-9"	16'-1"	15'-2"	14'-0"
550S162-97	21'-9"	19'-9"	18'-6"	17'-2"	19'-8"	17'-10"	16'-8"	15'-8"
800S162-33	15'-6"	12'-6"	10'-10"	9'-1"	13'-0"	10'-5"	8'-11"	6'-9"
800S162-43	22'-0"	19'-1"	17'-5"	15'-0"	19'-7"	16'-11"	14'-10"	12'-8"
800S162-54	24'-6"	22'-4"	20'-6"	17'-11"	22'-5"	19'-9"	17'-11"	15'-10"
800S162-68	26'-6"	24'-1"	22'-8"	21'-0"	24'-1"	21'-10"	20'-7"	19'-2"
800S162-97	29'-3"	26'-8"	25'-2"	23'-5"	26'-8"	24'-3"	22'-11"	21'-4"
1000S162-43	23'-6"	19'-2"	16'-9"	14'-2"	19'-11"	16'-2"	14'-0"	11'-9"
1000S162-54	28'-2"	23'-10"	21'-7"	18'-11"	24'-8"	20'-11"	18'-9"	18'-4"
1000S162-68	31'-10"	28'-11"	27'-2"	25'-3"	28'-11"	26'-3"	24'-9"	22'-9"
1000S162-97	35'-4"	32'-1"	30'-3"	28'-1"	32'-1"	29'-2"	27'-6"	25'-6"
1200S162-43	22'-11"	18'-5"	16'-0"	13'-4"	19'-2"	15'-4"	13'-2"	10'-6"
1200S162-54	32'-8"	28'-1"	24'-9"	21'-2"	29'-0"	23'-10"	20'-11"	17'-9"
1200S162-68	37'-1"	32'-5"	29'-4"	25'-10"	33'-4"	28'-6"	25'-9"	22'-7"
1200S162-97	41'-2"	37'-6"	35'-3"	32'-9"	37'-6"	34'-1"	32'-1"	29'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Table provides the maximum clear *span* in feet and inches to either side of the interior support.

² Interior bearing supports for *multiple span* joists consist of structural walls or beams.

³ *Bearing stiffeners* are to be installed at all support points and concentrated loads.

⁴ Deflection criteria: L/480 for live loads, L/240 for total loads

⁵ Floor dead load = 10 psf (0.479 kN/m²)

⁶ Interior supports are to be located within two feet (0.61 m) of mid *span* provided that each of the resulting *spans* does not exceed the appropriate maximum *span* shown in the table above.

E. WALL FRAMING

E1 Wall Construction

Structural walls shall be constructed in accordance with the provisions of this section. Non-structural walls shall be constructed in accordance with ASTM C 645 and shall have a minimum *base metal thickness* of 18 mils (0.45 mm).

E2 Wall to Foundation or Floor Connection

Structural walls shall be anchored to foundations or floors in accordance with Table E2-1 and Figures E2-1 through E2-4. Gable endwalls with *stud* heights greater than 10 feet (3.05 m) shall be anchored to foundations or floors in accordance with Tables E2-2 and E2-3. In *high seismic areas* and *high wind areas*, the anchorage of structural walls to foundations and floors shall be in accordance with the provisions of Sections E11, E12 and E13 as applicable.

Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom *tracks*. Anchor bolts shall extend a minimum of 15 inches (381 mm) into masonry or 7 inches (178 mm) into concrete. Foundation anchor straps shall be permitted, in lieu of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements. Anchorage requirements shall also be determined in the foundation design in accordance with Section C1.

E2.1 Uplift Connection In High Wind Areas - Wall Assembly to Foundation or Floor Assembly

In *high wind areas*, exterior wall *studs* in bottom story walls shall be attached to a wood sill plate or directly attached to the foundation by connections capable of resisting the uplift loads listed in Table E2-4. Alternatively, a continuous 1-1/4 inch (32 mm) by 33 mil (0.84 mm) steel uplift *strap* shall be permitted when placed under the wood sill and attached to both *flanges* of the exterior *stud* as shown in Figure E2-5. The uplift *strap* shall be fastened to each *flange* with minimum No.8 screws as required by Table E2-5. Uplift connection requirements shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners.

E3 Minimum Stud Sizes

Structural walls shall be constructed in accordance with Figures E2-1, E2-2, E2-3 and E2-4, as applicable. The alternate wall to foundation connection shown in Figure E2-2 shall be permitted only where the centerline of the anchor bolt or other connection, as required, is located not greater than 3 inches from the *stud*. Exterior wall *stud* size and thickness shall be determined in accordance with the limits set forth in Tables E3-1a through E3-15b. The size and thickness of gable endwall *studs* with heights less than or equal to 10 feet (3.05 m) shall be permitted to be determined in accordance with the limits set forth in Tables E3-16a and E3-16b. The size and thickness of gable endwall *studs* with heights greater than 10 feet (2.94 m) shall be determined in accordance with the limits set forth in Tables E3-17a and E3-17b. Interior structural wall *stud* size and thickness shall be determined in accordance with the limits set forth in Tables E3-1a through E3-15b based upon an 85 mph (137 km/hr) Exposure B wind value and the building width, *stud* spacing and snow load as appropriate. Fastening requirements shall be in accordance with Section B and Table E3-18. Top and bottom *tracks* shall have the same minimum thickness as the wall *studs*.

Exterior wall *studs* shall be permitted to be reduced to the next thinner size, as shown in Tables E3-1a through E3-15b, but not less than 33 mils (0.84 mm) when both of the following

conditions exist:

- (1) Minimum of 1/2 inch (13 mm) gypsum board is installed and fastened in accordance with Table E3-18 on the interior surface.
- (2) Wood *structural sheathing* panels of minimum 7/16 inch (11 mm) thick oriented strand board or 15/32 inch (12 mm) thick plywood is installed and fastened in accordance with Section E8.2 on the outside surface.

Interior structural walls shall be permitted to be reduced to the next thinner size, as shown in Tables E3-1a through E3-15b, but not less than 33 mils (0.84 mm) when a minimum of 1/2 inch (13 mm) gypsum board is installed and fastened in accordance with Table E3-18 on both sides of the wall.

The tabulated *stud* thickness for structural walls shall be used when the attic load is 10 psf (0.48 kN/m²) or less. A *limited attic storage* load of 20 psf (0.96 kN/m²) shall be permitted provided that the next higher snow load column is used to select the *stud* size from Tables E3-1a through E3-15b.

For two-story buildings, the tabulated *stud* thickness for walls supporting one floor, roof and ceiling shall be used when the second floor live load is 30 psf (1.44 kN/m²). Second floor live loads of 40 psf (1.92 kN/m²) shall be permitted provided that the next higher snow load column is used to select the *stud* size from Tables E3-1a through E3-10b.

For three-story buildings, the tabulated *stud* thickness for walls supporting one or two floors, roof and ceiling shall be used when the third floor live load is 30 psf (1.44 kN/m²). Third floor live loads of 40 psf (1.92 kN/m²) shall be permitted provided that the next higher snow load column is used to select the *stud* size from Tables E3-11a through E3-15b.

E4 Stud Bracing

The *flanges* of *structural studs* shall be laterally braced in accordance with one of the following methods:

1. Gypsum board on both sides, *structural sheathing* on both sides, or gypsum board on one side and *structural sheathing* on the other side of structural walls fastened in accordance with Table E3-18 and Figure E4-1. Screws for attachment of *structural sheathing* panels shall be bugle-head, flat-head, or similar head style with a minimum head diameter of 0.29 inches (8 mm).
2. Horizontal steel *straps* fastened in accordance with Figure E4-2 on both sides at mid-height for 8 foot (2.44 m) walls, and at one-third points for 9 and 10 foot (2.74 and 3.05 m) walls. Horizontal steel *straps* shall be at least 1-1/2 inches in width and 33 mils in thickness (38 x 0.84 mm). *Straps* shall be attached to the *flanges* of *studs* with one No.8 screw. In-line *blocking* shall be installed between *studs* at the termination of all *straps* and at 12 foot (3.66 m) intervals along the *strap*. *Straps* shall be fastened to the *blocking* with two No.8 screws.
3. Sheathing on one side and *strapping* on the other side fastened in accordance with Figure E4-3. Sheathing shall be installed in accordance with Method 1 above. Steel *straps* shall be installed in accordance with Method 2 above.

E5 Splicing

Structural studs and *headers* shall not be spliced without an *approved* design. Splicing of *tracks* shall conform to Figure E5-1.

E6 Corner Framing

In exterior walls, corner *studs* and the top *track* shall be installed in accordance with Figure E6-1. Other *approved* corner framing details shall be permitted.

E7 Headers

Headers shall be installed above wall openings in structural walls in accordance with Sections E7.1 through E7.4. *Headers* shall not be required for openings in non-structural walls.

E7.1 Box Beam Headers

Box beam *headers* shall be constructed in accordance with Figure E7-1 and Tables E7-1a through E7-6b. *Header spans* for building widths between those tabulated shall be permitted to be determined by interpolation. *Headers* shall be constructed from two equal sized *C-shaped* members in a box type configuration. *Headers* shall be connected to *king studs* in accordance with Table E7-13. One-half of the total number of required screws shall be applied to the *header* and one half to the *king stud* by use of *C-shaped* or *track* member in accordance with Figure E7-1. The *track* or *C-shape* sections shall extend the depth of the *header* minus 1/2 inch (13 mm) and shall have a minimum thickness not less than the wall *studs*.

Exceptions:

1. *Headers* in gable endwalls shall be permitted to be constructed with the header directly above the opening, as shown in Figure E7-3.
2. *Headers* in gable endwalls shall be permitted to be sized as follows:
 - (a) 362S162-33 for openings less than or equal to 4 feet (1.22 m)
 - (b) 600S162-43 for openings greater than 4 feet (1.22 m) but less than or equal to 6 feet (1.83 m)
 - (c) 800S162-54 for openings greater than 6 feet (1.83 m) but less than or equal to 9 feet (2.74 m)

E7.2 Back-to-Back Headers

Back-to-back *headers* shall be constructed in accordance with Figure E7-2 and Tables E7-7a through E7-12b. *Header spans* for house widths between those tabulated shall be permitted to be determined by interpolation. *Headers* shall be formed from two equal sized *C-shaped* members in a back-to-back configuration. *Headers* shall be connected to *king studs* in accordance with Table E7-13. One-half of the total number of screws shall be applied to the *header* and one half to the *king stud* by use of a minimum 2 x 2 inch (51 x 51 mm) *clip angle* in accordance with Figure E7-2. The *clip angle* shall extend the depth of the *header* minus 1/2 inch (13 mm) and shall have a minimum thickness not less than the wall *studs*.

Exceptions:

1. *Headers* in gable endwalls shall be permitted to be constructed with the header directly above the opening, as shown in Figure E7-4.
2. *Headers* in gable endwalls shall be permitted to be sized as follows:
 - (a) 362S162-33 for openings less than or equal to 4 feet (1.22 m)
 - (b) 600S162-43 for openings greater than 4 feet (1.22 m) but less than or equal to 6 feet (1.83 m)
 - (c) 800S162-54 for openings greater than 6 feet (1.83 m) but less than or equal to 9 feet (2.74 m)

E7.3 L-Headers

An *L-header* shall consist of a cold-formed steel angle with one short leg lapping over the top *track* of the wall and one leg extending down the side of the wall above window or door openings, as shown in Figures E7-5 and E7-6. Each angle shall be fastened to top *track* above an opening with No.8 screws spaced at 12 inches (305 mm) on center. The "L" angle shall be placed on both sides of the wall opening to form a double angle L-shaped *header* (double *L-header*). The long leg of the *L-header* angle shall be attached to each *cripple stud(s)* and a minimum of one *king stud* at each end with one No.8 screw at top and bottom.

E7.3.1 Double L-Headers

Double *L-headers* shall be constructed in accordance with Figure E7-5 and Tables E7-14a through E7-19b for gravity loading and Tables E7-20a through E7-34b for uplift loading.

E7.3.2 Single L-Headers

Single *L-headers* shall be constructed in accordance with Figure E7-6 and Tables E7-35a through E7-40b. Use of single *L-headers* shall be limited to the following applications:

1. Single *L-headers* supporting one floor, roof and ceiling, where the wind speed is less than or equal to 85 mph Exposure C.
2. Single *L-headers* supporting two floors, roof and ceiling, where the wind speed is less than or equal to 100 mph Exposure C.

E7.3.3 Inverted L-Header Assemblies

Inverted double *L-headers* shall be constructed in accordance with Tables E7-14a through E7-19b for gravity loading and Tables E7-41a through E7-55b for uplift loading.

Inverted single *L-headers* shall be constructed in accordance with Tables E7-35a through E7-40b for gravity loading and Tables E7-56a through E7-70b for uplift loading.

Inverted double or single *L-headers* shall be constructed in accordance with the following, as shown in Figure E7-7:

- (1) The horizontal leg of the inverted *L-header* shall be coped to permit the vertical leg to lap over at least one bearing *stud* at each end. The horizontal leg after coping shall be within ½ inch (12.7 mm) of the bearing *stud* at each end.
- (2) The horizontal leg of the inverted *L-header* shall be attached to the head *track* at each end and at 12 inches (304.8 mm) on center with minimum #8 screws.
- (3) The vertical leg of the inverted *L-header* shall be attached to at least one bearing *stud* at each end and each *cripple stud* with a minimum #8 screw top and bottom. The top screw in the vertical leg of the inverted *L-header* shall be located not more than 1 inch (25.4 mm) from the top edge of the vertical leg.

E7.4 Jack and King Studs

The number of jack and *king studs*, installed on each side of a *header* shall comply with Table E7-71. Jack, king, and *cripple studs* shall be of the same dimension and thickness as the adjacent wall *studs*. Jack and *king studs* shall be interconnected with *structural sheathing* in accordance with Figures E7-1 and E7-2.

E7.5 Head and Sill Track

Head *track spans*, above door and window openings, and sill *track spans*, beneath window openings, shall not exceed those shown in Table E7-72. For openings less than 4 feet (1.22 m) in height that have both a head *track* and a sill *track*, the spans in Table E7-72 shall be permitted to be multiplied by 1.75. For openings less than or equal to 6 feet (1.83 m) in height that have both a head *track* and a sill *track*, the spans in Table E7-72 shall be permitted to be multiplied by a factor of 1.5.

E8 Wall Bracing

Exterior walls shall be braced to provide in-plane lateral resistance to wind and seismic loads with diagonal steel *straps* or *structural sheathing* in accordance with Sections E8.1 or E8.2.

E8.1 Strap Bracing (X-brace)

Diagonal steel *straps* or "X-braces" and their connections shall be designed and installed in accordance with an *approved* design.

E8.2 Structural Sheathing

Structural sheathing shall be installed on all sheathable exterior wall surfaces, including areas above and below openings, in accordance with Figure E8-1 and this section.

E8.2.1 Sheathing Materials

Structural sheathing panels shall consist of minimum 7/16-inch (11 mm) thick oriented strand board or 15/32-inch (12 mm) thick plywood.

E8.2.2 Determination of Minimum Length of Full Height Sheathing

The minimum length of full height sheathing on each *braced wall line* shall be determined by multiplying the length of the *braced wall line* by the larger of the percentage for wind or seismic loads obtained from Tables E8-1, E8-2 and E8-3 and by the *plan aspect ratio* adjustment factors obtained from Tables E8-4 and E8-5 for wind and seismic, as applicable. The minimum length of full height sheathing shall not be less than 20 percent of the *braced wall line* length.

To be considered full height sheathing, *structural sheathing* shall extend from the bottom to the top of the wall without interruption by openings. Only sheathed, full height wall sections, uninterrupted by openings, which are a minimum of 48 inches (1220 mm) wide, shall be counted toward meeting the minimum percentages in Tables E8-1, E8-2 and E8-3.

In addition, *structural sheathing* shall comply with all of the following requirements:

- (1) Be installed with the long dimension parallel to the *stud* framing (i.e. vertical orientation) and shall cover the full vertical height of wall from the bottom of the bottom *track* to the top of the top *track* of each story. It shall be permitted to install the long dimension perpendicular to the *stud* framing or to use shorter segments provided that the horizontal joint is blocked as described in Item 2 below.
- (2) Be blocked when the long dimension installed perpendicular to the *stud* framing (i.e. horizontal orientation). *Blocking* shall be a minimum of 33 mil (0.84 mm) thickness. Each horizontal *structural sheathing* shall be fastened with No.8 screws spaced at 6 inches (152 mm) on center to the *blocking* at the joint.

- (3) Be applied to each end (corners) of each of the exterior walls with a minimum 48 inch (1220 mm) wide panel.

E8.2.2.1 The minimum percentage of full-height *structural sheathing* shall be multiplied by 1.10 for 9-foot (2.74 m) high walls and multiplied by 1.20 for 10-foot (3.05 m) high walls.

E8.2.2.2 For hip roofed homes, the minimum percentage of full height sheathing in Table E8-1, based upon wind, shall be permitted to be multiplied by a factor of 0.95 for roof slopes not exceeding 7:12 and a factor of 0.9 for roof slopes greater than 7:12.

E8.2.2.3 In the lowest story of a dwelling, the percent of full height sheathing required in Table E8-1 shall be permitted to be multiplied by 0.6, provided *hold down anchors* are provided in accordance with Section 8.2.4.2.

E8.2.3 Structural Sheathing Fastening

All edges and interior areas of *structural sheathing* panels shall be fastened to framing members and *tracks* in accordance with Figure E8-1 and Table E3-18. Screws for attachment of *structural sheathing* panels shall be bugle-head, flat-head, or similar head style with a minimum head diameter of 0.29 inches (8 mm).

For continuously-sheathed *braced wall lines* using wood structural panels installed with No. 8 screws spaced 4-inch (102 mm) on center at all panel edges and 12-inch (305 mm) on center on intermediate framing members, the following shall apply:

- (1) The percentages of full height sheathing, in Table E8-1, E8-2 and E8-3, shall be permitted to be multiplied by 0.72.
- (2) For bottom *track* attached to foundations or framing below, the bottom *track* anchor or screw connection spacing in Table D2-1 and Table E2-1 shall be multiplied by 2/3.

E8.2.4 Uplift Connection Requirements

Uplift connections shall be provided in accordance with this section.

E8.2.4.1 Where wind speeds are in excess of 100-mph (161 km/hr) Exposure C, walls shall be provided wind direct uplift connections in accordance with Section E13.3 and Section F7.2, as required for 110 mph, Exposure C.

E8.2.4.2 Where the percent of full height sheathing is adjusted in accordance with Section E.8.2.2.3, a *hold down anchor*, with a strength of 4300 pounds (19.35 kN), shall be provided at each end of each full-height sheathed wall section used to meet the minimum percent sheathing requirements of Section E8.2.2. Hold down anchors shall be attached to back-to-back studs; structural sheathing panels shall have edge fastening to the studs, in accordance with Section E8.2.3 and Table E11-1.

A single *hold down anchor*, installed in accordance with Figure E8-2 shall be permitted at the corners of buildings.

E8.3 Structural Sheathing Fastening

All edges and interior areas of *structural sheathing* panels shall be fastened to framing members and *tracks* in accordance with Figure E8-1 and Table E3-18. Screws for attachment of *structural sheathing* panels shall be bugle-head, flat-head, or similar head style with a minimum head diameter of 0.29 inches (8 mm). The percentages of full height sheathing, in Table E8-1, E8-2 and E8-3, shall be permitted to be multiplied by 0.72 for 4-inch (102 mm) edge screw spacing.

E8.4 Hold-down Requirements

In conditions where wind speeds are in excess of 100-mph (161 km/hr) Exposure C, hold-down brackets shall be provided in accordance with Table E2-1. The percent of full height sheathing required in Table E8-1 shall be permitted to be multiplied by 0.6 where a *hold down anchor*, with a strength of 4300 pounds (19.35 kN), is provided at each end of exterior walls.

A single *hold down anchor*, installed in accordance with Figure E8-2 shall be permitted at the corners of buildings.

E9 Exterior Wall Covering

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

E10 Reserved

This section has intentionally been left blank.

E11 Braced Walls In High Wind Areas and High Seismic Areas

E11.1 General

In *high wind areas* and in *high seismic areas*, *braced wall lines* shall be constructed in accordance with this section. In *high seismic areas*, buildings shall also be constructed in accordance with Section E12. In *high wind areas*, buildings shall also be designed in accordance with Section E13.

Where a building, or portion thereof, does not comply with the provisions of this section those portions shall be designed and constructed in compliance with the building code, or with accepted engineering practice where no building code exists.

E11.2 Braced Wall Lines

Braced wall lines shall be composed of either *Type I* (solid) *braced wall panels* or *Type II* (perforated) *braced walls* as shown in Figure E11-1, and shall extend from the foundation to the roof *diaphragm* or floor *diaphragm* above.

Exception: The provisions of this standard for *Type II* (perforated) *braced walls* shall not be applicable to the first floor of a 3-story structure in a *high wind area* or a *high seismic area*.

The required length of bracing shall be determined in accordance with the greater requirement for seismic or wind loads. Each *braced wall line* shall have not less than two full height braced wall panels, each having a maximum height to width aspect ratio of 2:1.

Braced wall panels shall begin not more than 8 feet (2.44 m) from each end of a braced wall.

Sheathing on *Type I* and *Type II* *braced walls* shall be wood *structural sheathing* panels or *steel sheets* on one side. Sheathing panels or *steel sheets* used as part of the braced wall panel shall be a minimum of 12 inches (305 mm) wide.

Where wood *structural sheathing* panels are used they shall be 7/16-inch (11 mm) Rated Sheathing (OSB) or 15/32-inch (12 mm) Structural I Plywood Sheathing and shall be attached to framing members with minimum No.8 screws spaced a maximum of 12 inches (305 mm) in the field and 6 inches (152 mm) on all edges, unless a lesser spacing is used in accordance with Section E11.3 to adjust the required shearwall length.

Where *steel sheets* are used they shall be 27 mil (0.69 mm) thick and shall be attached to framing members with minimum No.8 screws spaced a maximum of 12 inches (305 mm) in the field and 4 inches (152 mm) on all edges, unless a lesser spacing is used in accordance with Section E11.3 to adjust the required shearwall length.

In *braced wall lines*, all edges of wood *structural sheathing* panels or *steel sheets* shall be attached to framing members, 33 mil minimum *blocking*, or 2 inch (51 mm) by 33 mil (0.84 mm) flat *strap*. Fasteners along the edges in shear panels shall be placed not less than 3/8 inches (9.5 mm) in from panel edges.

E11.3 Type I (Solid Sheathed) Braced Wall Panels

Type I braced wall panels shall have no openings and shall be continuous between *hold down anchors*. *Hold down anchors* shall be as required by Section E11.5.

For a wall panel to count toward the required length it shall have a maximum height to width ratio of 2:1.

The required length of *braced wall line* full height sheathing shall be permitted to be adjusted by the edge screw spacing adjustment factors in Table E11-1. The total length of *Type I braced wall panels* on a *braced wall line* shall be the sum of the lengths of panels conforming to the maximum height to width ratio herein. *Type I braced wall panels* shall have *hold down anchors* as required by Section E11.5 at each end of each panel segment.

E11.4 Type II (Perforated) Braced Wall Lines

Type II braced walls shall be permitted to have openings. Where sheathing, of a type specified in Section E11.2 and attached in accordance with that section, extends above and below window openings and above door openings, the height of the unrestrained opening shall be defined as the maximum opening height. Where such sheathing is not provided or does not comply with the minimum width requirements above and below window openings and above door openings, the height of the unrestrained opening shall be defined as the full height of the wall.

The required length of *braced wall line* full height sheathing panels as a percentage of overall length of *Type II braced wall* shall be determined by multiplying the required length of *Type I braced wall panels*, as modified by the adjustments permitted in Section E11.3, by the length adjustment factors in Table E11-2. For a segment to count toward the required length it shall have a maximum height to width ratio of 2:1. *Type II braced wall lines* shall have *hold down anchors* as required by Section E11.5 at each end, which shall be attached to wall segments meeting the maximum height to width ratio.

E11.5 Braced Wall Anchorage and Chord Stud Requirements

Hold down anchors shall be installed at each end of *Type I braced wall panels* and at each end of *Type II braced wall lines* as shown in Figure E11-1. Anchors shall be attached to a minimum of two back-to-back, *chord studs*. Minimum *chord stud* thickness shall be 33 mils (0.84 mm). These *chord studs* shall have the required sheathing edge fastening (see Figure E11-3). *Hold down anchors* shall attach to the foundation, or to framing members below which have the same or greater strength as the *chord studs* above, and which are in addition to the typical load bearing framing. Where *hold down anchors* attach to framing members below, the required anchor force shall be transferred to the foundation. Where *hold down anchors* from an upper story align with those at the lower story, the required lower story anchor force and the required lower story *chord stud* strength shall be determined by summing the upper and lower story chord forces (see Figure E11-4).

A single *hold down anchor* installed in accordance with Figure E11-2 shall be permitted at the corners of buildings.

E11.6 Attachment of Braced Walls to Foundations and Floor and Roof Diaphragms

The top *track* of *braced wall lines* shall be attached directly to the roof sheathing in accordance with Figure E11-5 or shall have *blocking* connecting the top *track* to the continuous flat *strap* at the roof sheathing at locations specified herein, installed in accordance with Figure E11-6. *Blocking* shall be installed at each end of *Type I braced wall panels*, at each end of *Type II braced wall lines*, at building corners, and at 4 feet (1.22 m) on-center maximum.

Splices in top *tracks* in braced walls shall comply with Figure E11-7. Screws used to attach *blocking* to the top *track* shall be permitted to be counted toward the required number of *track* splice screws. Splices in the top *track* and the *strap* at the roof sheathing shall not occur in the same *stud* bay.

The top and bottom *track* of braced walls shall be attached to floor *diaphragms* in accordance with Figure E11-8.

Splices in the *rim track* shall not occur in the same bay as splices in wall *track* immediately above or below the *rim track* splice. The minimum offset between splice locations shall be two *stud* bays.

The bottom *track* of braced walls supported on foundations shall have anchor bolts installed in accordance with Figure E11-9 or E11-10. Floor *track* or rim joists supporting *braced wall lines* shall be attached to foundations in accordance with Figure E11-11 or E11-12. Anchor bolts shall extend 15 inches (381 mm) into masonry or 7 inches (178 mm) into concrete. An anchor bolt shall be located not more than 12 inches (305 mm) from wall corners, the termination of bottom *track* sections, or splices in the brake shape shown in Figure E11-11 or E11-12.

E12 Braced Wall Design in High Seismic Areas

In *high seismic areas* the design of braced walls shall comply with this section, in addition to the requirements in Section E11.

E12.1 Length of Type I Braced Wall Panels

The required length of *Type I braced wall panels* shall be determined from Tables E12-1 through E12-15, where the *diaphragm span* is the dimension of the *diaphragm* perpendicular to the walls under consideration. Linear interpolation shall be permitted for determining *diaphragm span* values.

The required length of *Type I braced wall panels* shall be increased by the length adjustment factors in Table E12-16 where the dead weight of the roof/ceiling assembly is greater than 15 psf and meets the criteria for *heavy weight roof/ceiling assembly*. The required length of *Type I braced wall panels* shall be permitted to be adjusted by length adjustment factors in Table E12-16 where the average weight of the roof/ceiling assembly meets the criteria for a lightweight roof/ceiling or the exterior walls meet the criteria for lightweight exterior walls. Linear interpolation shall be permitted for roof/ceiling dead unit weights between 15 and 25 psf (0.72 and 1.20 kN/m²). The length adjustment factors in Table E12-16 shall be permitted to be multiplied by those in Table E11-1.

E12.2 Braced Wall Anchorage and Chord Stud Requirements

Minimum *hold down anchor* strengths to resist uplift in *Seismic Design Categories D₁* and *D₂* shall be as specified in Table E12-17. Where manufacturer's *hold down anchor* strengths are expressed as allowable loads, the anchor forces specified in Table E12-17 shall be permitted to be divided by 1.4 for the purpose of determining an acceptable *hold down anchor*. Published *hold down anchor* strengths that have been increased for wind or earthquake forces shall be reduced to their base values. Required *hold down anchor* strengths for anchors at the first floor of two story buildings and the first or second floor of three story buildings, which resist uplift from two or three stories, shall be determined by summing the required strengths for all floors. A continuous load path shall be provided from each hold down anchor to the foundation.

Maximum anchor bolt spacing requirements for transfer of shear loads shall be as specified in Table E12-18.

Required *chord stud* strength shall be determined from Table E12-17, and a *chord stud* having the required strength shall be selected from Table E12-19. *Chord stud* requirements for *chord studs* at the first floor of two story buildings and the first or second floor of three story buildings, where the first floor *chord studs* align with *chord studs* at the floor above, shall be determined by summing the required strengths for all floors. Where one pair of back-to-back *studs* does not have adequate strength to resist the sum of the accumulated chord forces, two pair of back-to-back *studs* shall be used at the lower floors as shown in Figure E11-3.

E12.3 Wall Top Track

The top *track* thickness of walls supporting floor or roof *diaphragms*, and the number of screws in the top *track* splices, shall be as required in Table E12-20. Minimum top *track* thickness shall be 33 mil (0.84 mm), except where indicated by shading in Table E12-20. In locations indicated by shading in Table E12-20, minimum top *track* thickness shall be 43 mils (1.09 mm).

E13 Braced Wall Design In High Wind Areas

E13.1 General

In *high wind areas* the design of braced walls shall comply with this section, in addition to the requirements in Section E11.

Braced walls shall be covered with *structural sheathing* on one side as required and the other side shall be covered by 1/2 inch (12.7 mm) minimum gypsum board.

For the purpose of this section, the endwall shall be defined as the exterior wall of the building perpendicular to the roof *ridge* and the sidewall shall be defined as the exterior wall of the building parallel to the roof *ridge*. For the purposes of determining uplift and lateral *bracing* requirements, the attic shall be considered an additional story when the roof slope is greater than 6.9 in 12.

E13.2 Length of Braced Walls

The minimum and maximum allowable sidewall lengths shall be determined from Tables E13-1 and E13-2.

The required length of *Type I braced wall panels* shall be determined from Tables E13-3 and E13-4. For 9-foot (2.74 m) wall heights the tabulated values shall be multiplied by 1.13. For 10-foot (3.05 m) wall heights the tabulated values shall be multiplied by 1.25. For *mean roof heights* of 15 feet (4.92 m) or less, the tabulated values shall be permitted to be multiplied

by 0.8. Required lengths shall be permitted to be multiplied by the adjustment factors in Table E11-1 for edge screw spacing other than 6 inch (152 mm), but the resulting sheathing length shall not be less than 5 feet (1.64 m).

Braced wall *hold down anchors* shall comply with Section E11.5. The height to width aspect ratio of *Type I braced wall panels* shall be limited to 3 ½:1. The height to width aspect ratio of full height sheathing segments in *Type II braced walls* shall be limited to 2:1.

Wood *structural sheathing* panels or structural *steel sheet* shall comply with Section E11.2 except in regions where the *basic wind speed* exceeds 110 mph (177 km/hr) wood *structural sheathing* panels attached to framing spaced 24 inches (610 mm) o.c. shall be a minimum of 19/32 inch (15.1 mm).

E13.3 Connections of Walls in High Wind Areas

E13.3.1 General

In *High Wind Areas*, walls shall be connected, as required by this section, to ensure a continuous load path capable of transferring shear and uplift loads from floors, *studs*, and roof framing to the foundation.

E13.3.2 Uplift Connection - Wall Assembly to Wall Assembly

Exterior wall *studs* in the upper story wall of a two or three story building shall be attached to the *in-line framing* wall *studs* in the supporting wall below with connections capable of resisting the uplift loads listed in Table E13-5. Alternatively, a steel uplift *strap* sized in accordance with Table E13-9 shall be permitted with minimum No.8 screws attached to each *stud*, as required by Table E13-6.

Required strengths in Table E13-5 shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners. Required strengths shall be permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

E13.3.3 Header Uplift Connections

When it is necessary to make an uplift *strap* connection to a back-to-back header the header beam shall be reinforced as shown in Figure E13-1. Uplift *straps* shall be installed on both sides of a back-to-back header beam (inside and outside of the wall) when the header is supporting loads from the roof and ceiling only.

E13.3.3.1 Single Story or Top of a Two or Three Story Building

Uplift connections shall be provided to fasten the *roof rafter* or *roof trusses* to the *header* by connectors capable of resisting the uplift loads listed in Table E13-7.

Uplift connections shall be provided to fasten the *header* to the *jack studs* by connectors capable of resisting the uplift loads listed in Table E13-7, multiplied by the number of framing members displaced, divided by two. An additional uplift *strap* shall be provided to fasten *roof rafters* or *roof trusses* to *king studs* that provide *in-line framing* support in accordance with Table E13-7.

Uplift connections shall be provided to fasten the *jack studs* to the foundation by connectors capable of resisting the uplift loads listed in Table E13-7, multiplied by the number of framing members displaced, divided by two.

As an alternative to the connectors required above, a steel uplift *strap* sized in accordance with Table E13-9 shall be permitted with minimum No.8 screws attached

to each *stud*, as required by Table E13-8.

Required strengths in Table E13-7 shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners. Required strengths shall be permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

E13.3.3.2 Middle and Bottom Stories of a Two or Three Story Building

Uplift connections shall be provided to fasten the exterior wall *studs* in the upper story walls of a two or three story building to the *header* below by connections capable of resisting the uplift loads listed in Table E13-5.

Uplift connections shall be provided to fasten the *header* to the *jack studs* by connectors capable of resisting the uplift loads listed in Table E13-5, multiplied by the number of framing members displaced, divided by two. An additional uplift *strap* shall be provided to fasten exterior wall *studs* in the upper story to *king studs* that provide *in-line framing* support in accordance with Table E13-5.

Uplift connections shall be provided to fasten the *jack studs* to the foundation by connectors capable of resisting the uplift loads listed in Table E13-5, multiplied by the number of framing members displaced, divided by two.

As an alternative to the connectors required above, a steel uplift *strap* sized in accordance with Table E13-9 shall be permitted with minimum No.8 screws attached to each *stud*, as required by Table E13-6.

Required strengths in Table E13-5 shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners. Required strengths shall be permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

E13.3.4 Wall Bottom Track to Foundation

Bottom *track* of exterior walls shall be connected to a wood sill plate as shown in Figure E2-5. The *track* shall be attached with steel plates spaced at 2 feet (0.61 m) on center and fastened with 4-No.8 screws and 4-10d or 6-8d common nails. Bottom *track* of interior braced walls shall be connected to supporting floors or foundations as required by Section E2.

The bottom *track* shall be connected to the foundation with ½ inch (13 mm) anchor bolts extending 14 inches (381 mm) into masonry or 7 inches (178 mm) into concrete. Anchor bolts shall be spaced a maximum of 3 feet (0.915 m) on center, with the following exceptions:

1. Anchor bolts located within the 8 feet (2.44 m) end zone in regions with a *basic wind speed* of 120 mph or greater shall be spaced a maximum of 2 feet (0.610 m) on center.
2. Anchor bolts located in exterior braced wall in which the perimeter screw spacing is less than 6 inches (152 mm) on center shall be spaced a maximum of 1-1/2 feet (0.457 m) on center.
3. An anchor bolt shall be located no more than 12 inches (305 mm) from wall corners or the termination of bottom *track* sections.

E13.4 Braced Wall Anchorage and Chord Stud Requirements

Minimum *hold down anchor* strengths to resist uplift in *High Wind Areas* shall be as specified in Table E13-10. Where manufacturer's *hold down anchor* strengths are expressed as allowable loads, the anchor forces specified in Table E13-10 shall be permitted to be divided by 1.3 for the purpose of determining an acceptable *hold down anchor*. Published *hold down anchor* strengths that have been increased for wind or earthquake forces shall be reduced to their base values. Required *hold down anchor* strengths for anchors at the first floor of two story buildings and the first or second floor of three story buildings, which resist uplift from two or three stories, shall be determined by summing the required strengths for all floors.

Required *chord stud* strength shall be determined from Table E13-10, and a *chord stud* having the required strength shall be selected from Table E12-18. *Chord stud* requirements for *chord studs* at the first floor of two story buildings and the first or second floor of three story buildings, where the first floor *chord studs* align with *chord studs* at the floor above, shall be determined by summing the required strengths for all floors. Where one pair of back-to-back *studs* does not have adequate strength to resist the sum of the accumulated chord forces, two pair of back-to-back *studs* shall be used at the lower floors as shown in Figure E11-3.

Required strengths in Table E13-10 shall be permitted to be multiplied by a factor equal to the required full height sheathing length divided by the actual full height sheathing length that is provided.

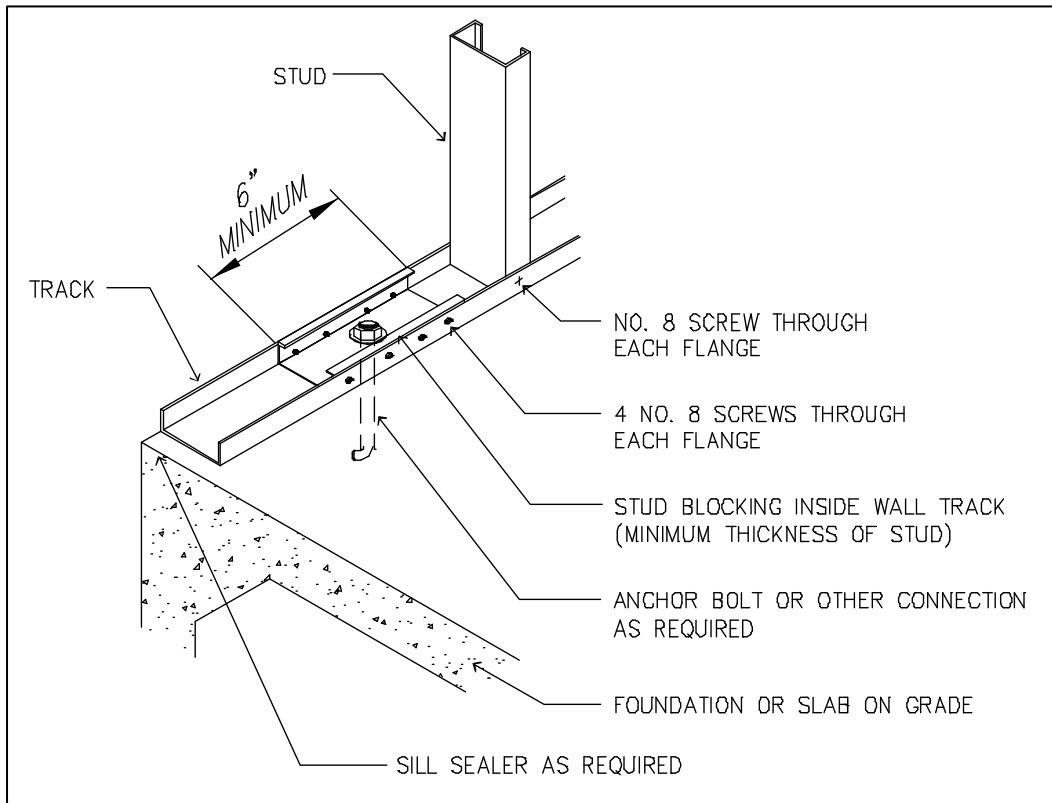


Figure E2-1 Wall to Foundation Connection

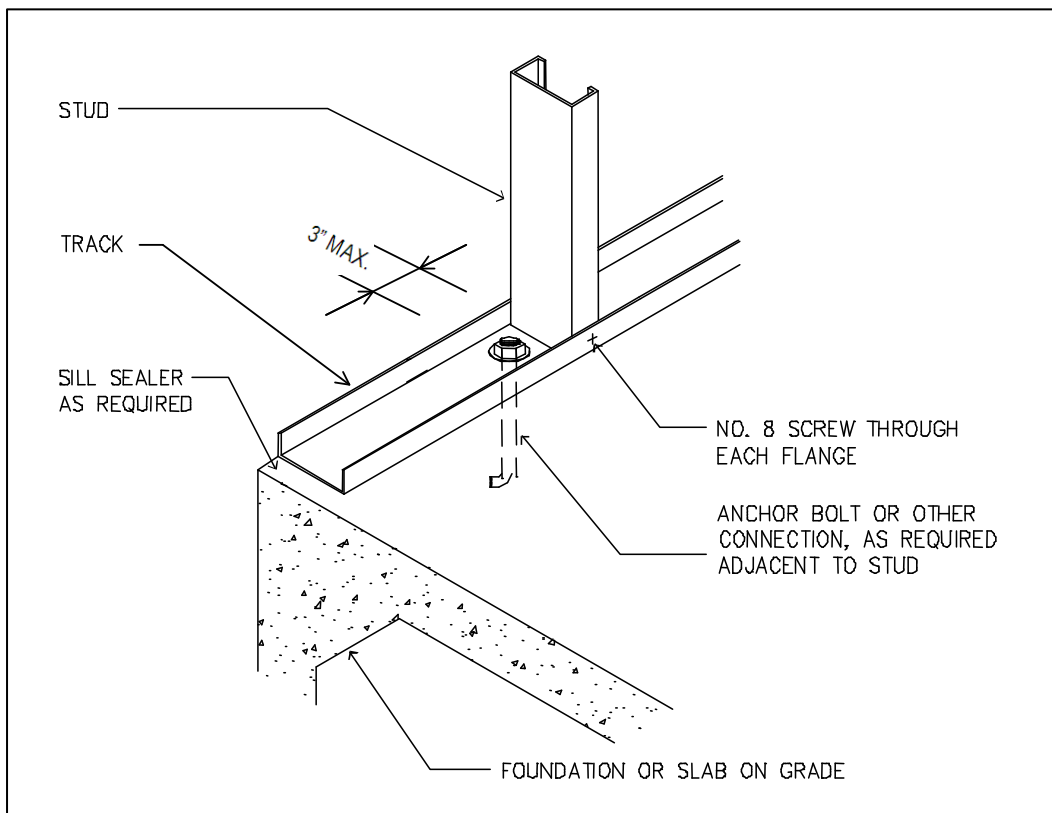


Figure E2-2 Alternate Wall to Foundation Connection

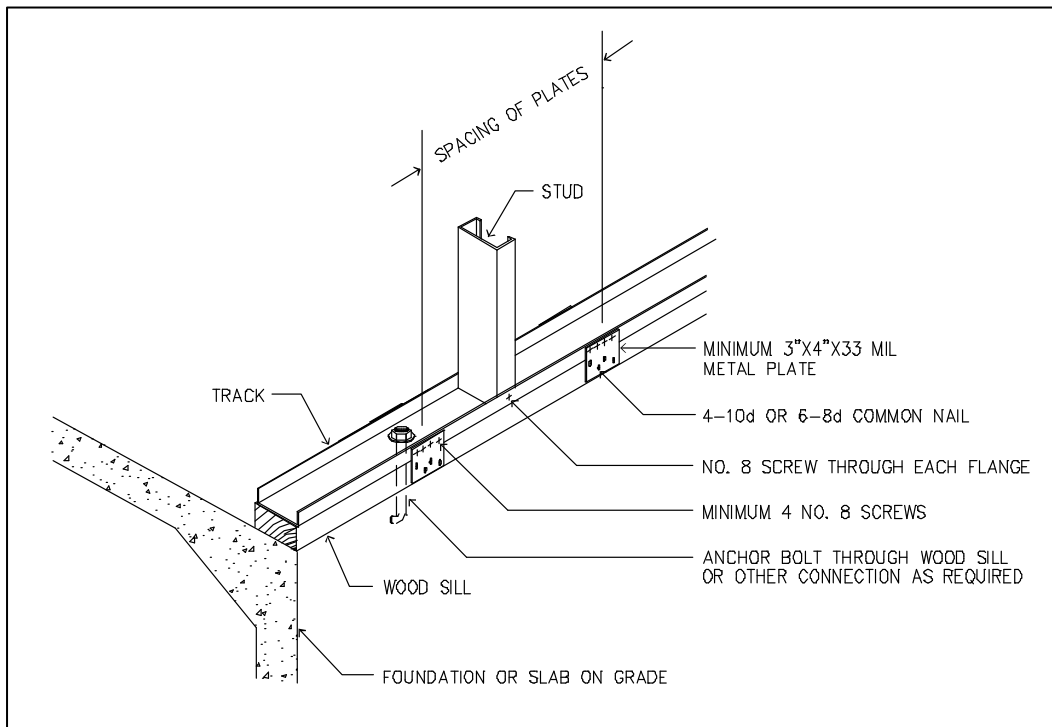


Figure E2-3 Wall to Wood Sill Connection

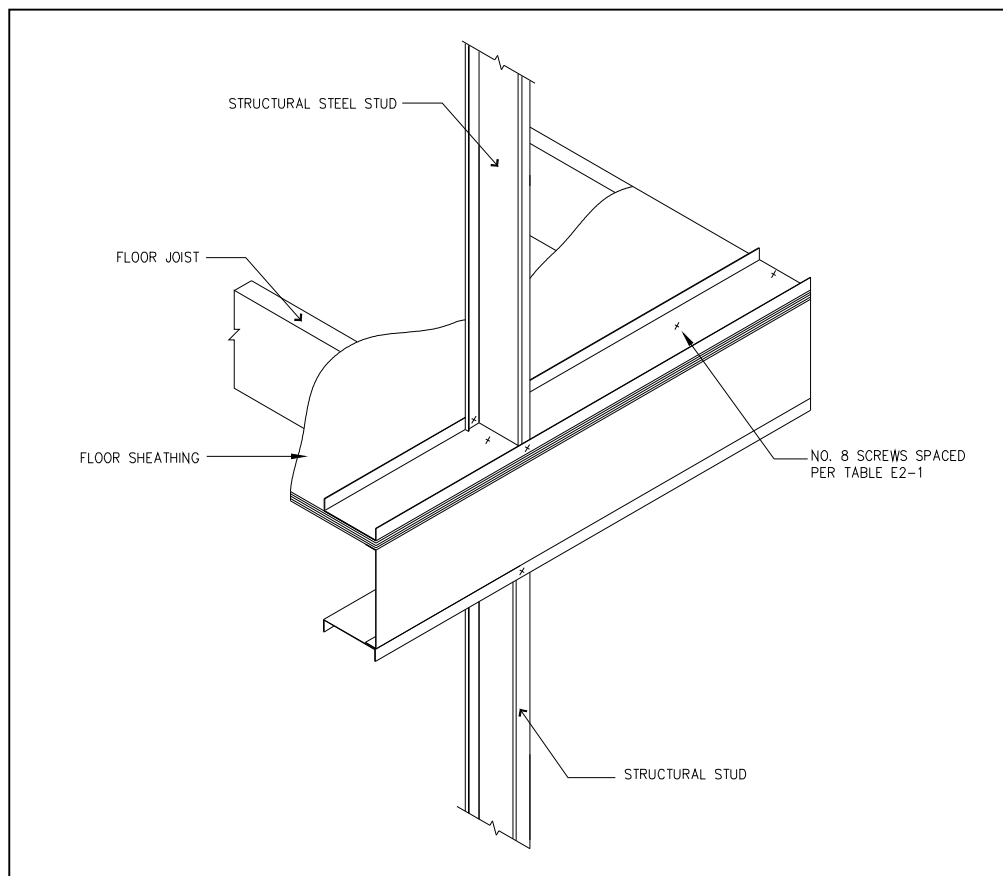


Figure E2-4 Wall to Floor Connection

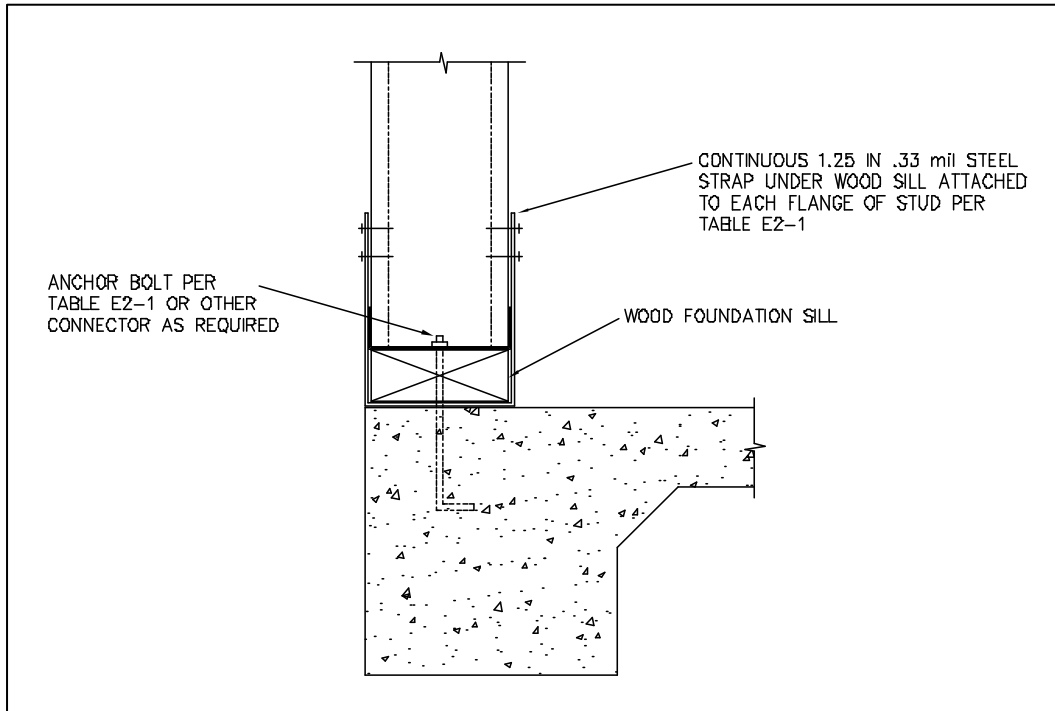


Figure E2-5 Wind Uplift Connector

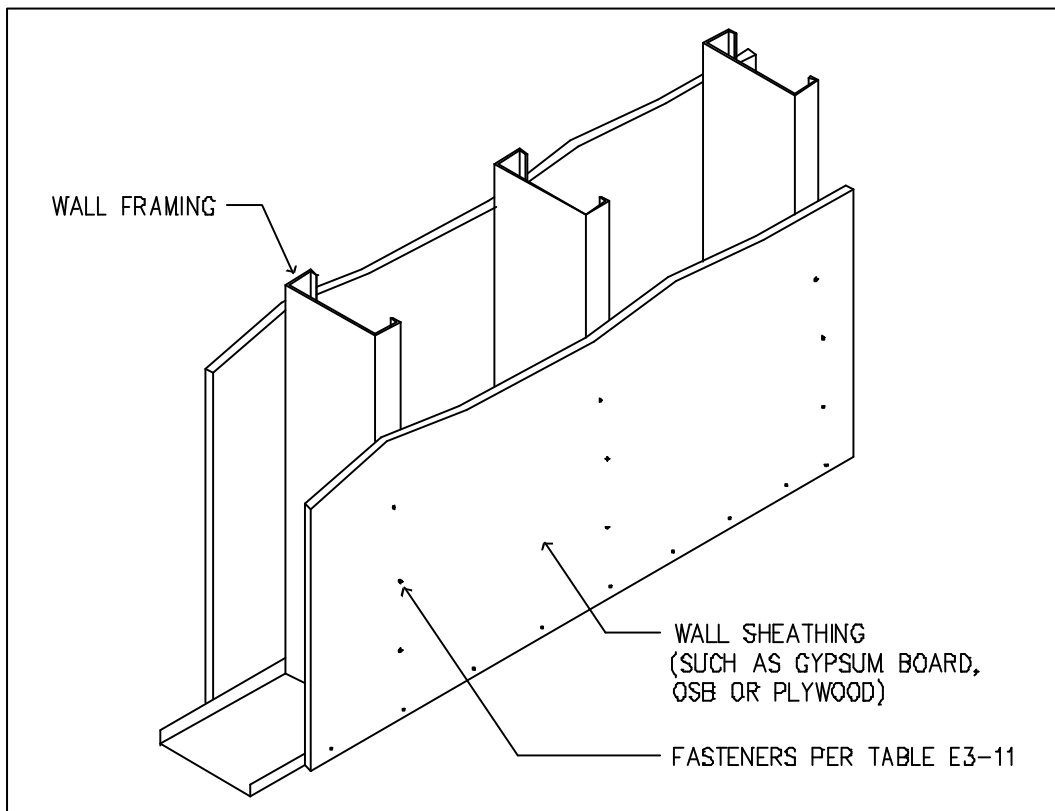


Figure E4-1 Stud Bracing with Sheathing Material Only

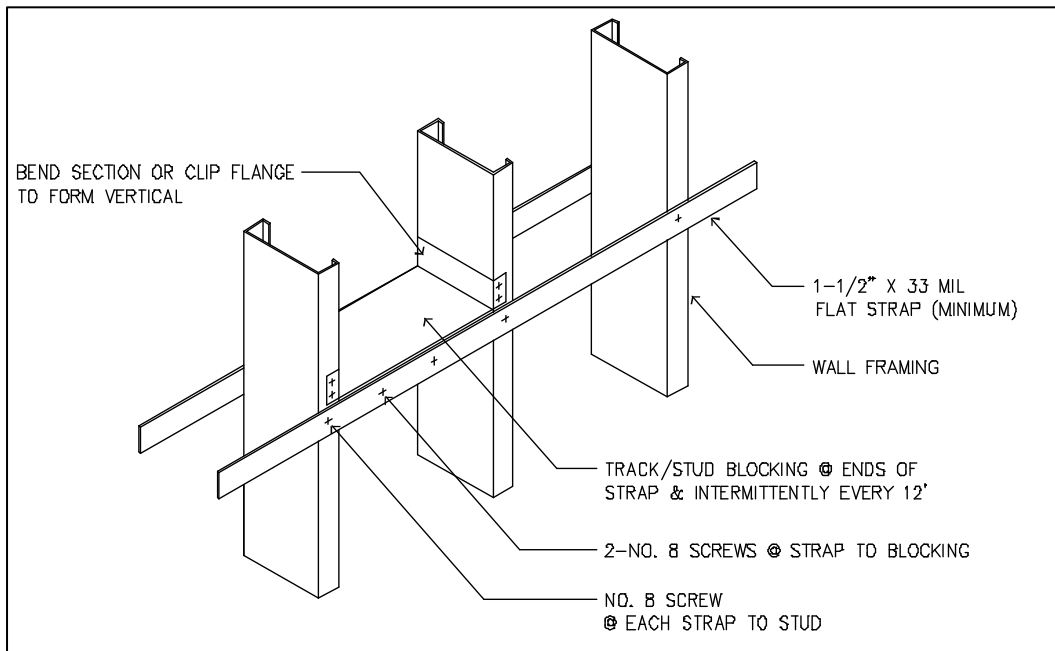


Figure E4-2 Stud Bracing with Strapping Only

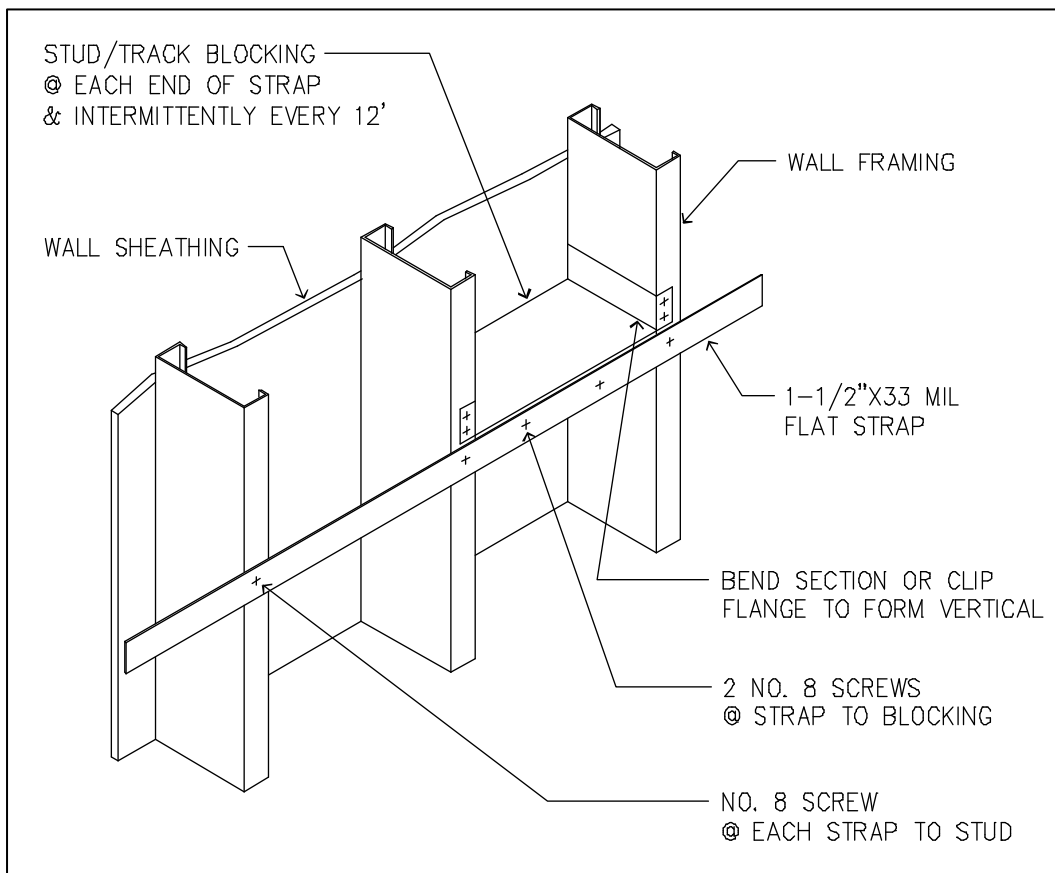


Figure E4-3 Stud Bracing with Strapping and Sheathing Material

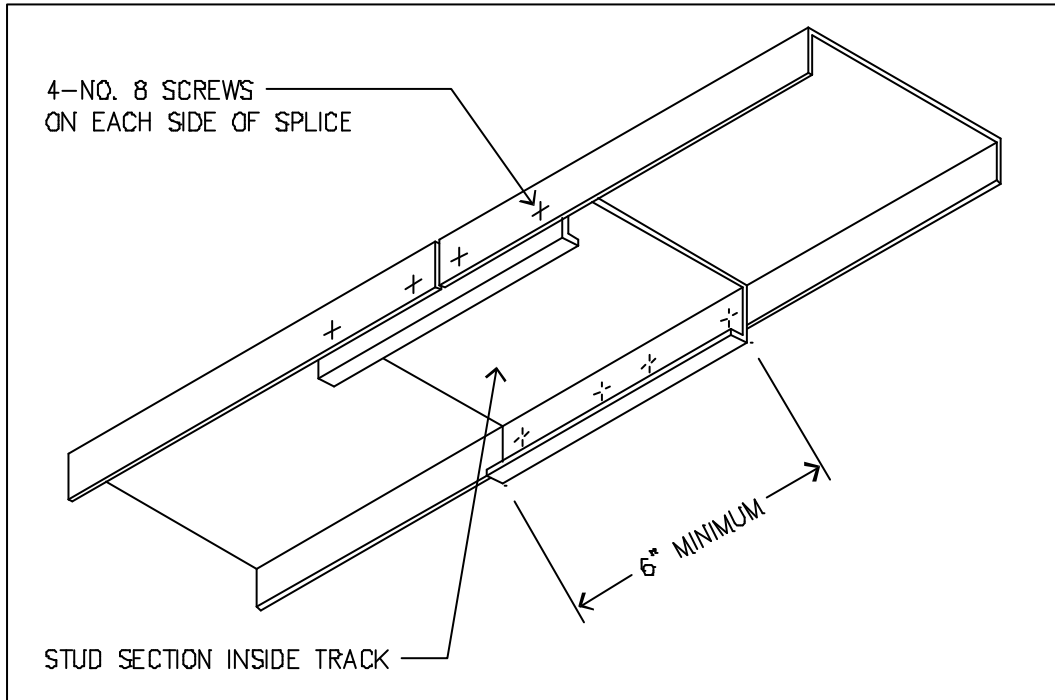


Figure E5-1 Top Track Splice

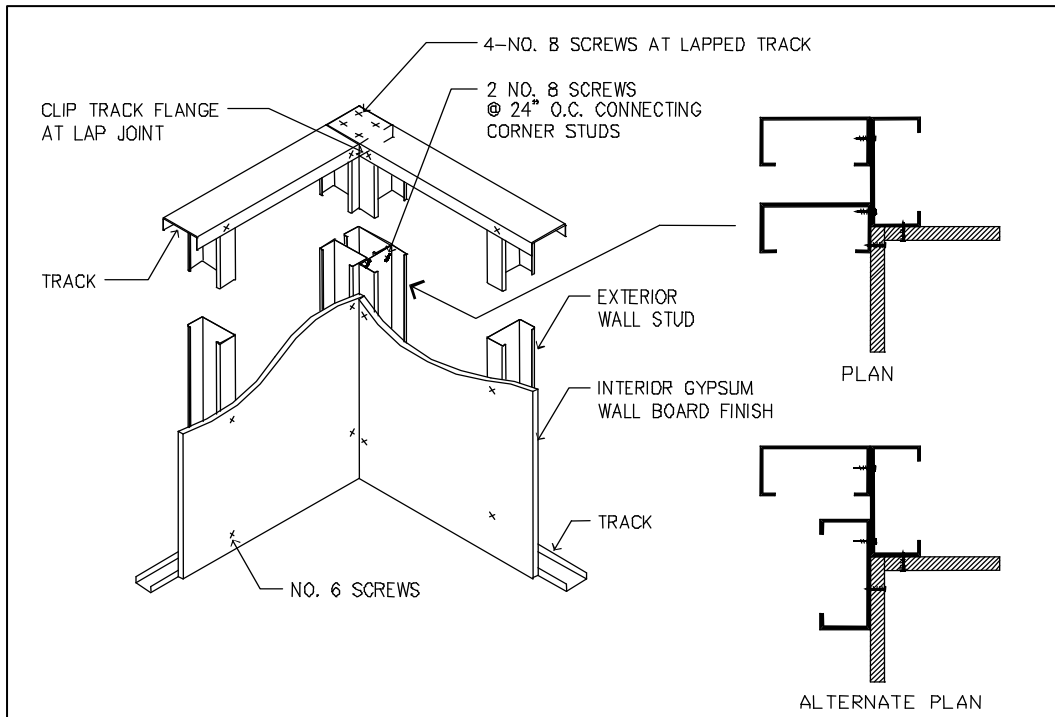


Figure E6-1 Corner Framing Detail

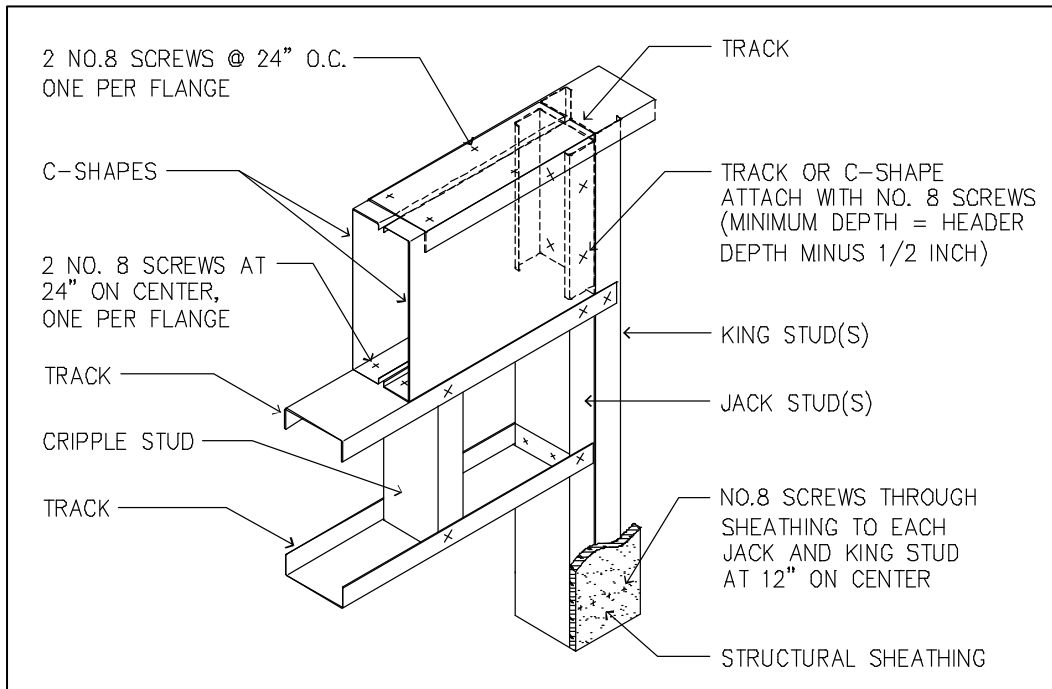


Figure E7-1 Box Beam Header Detail

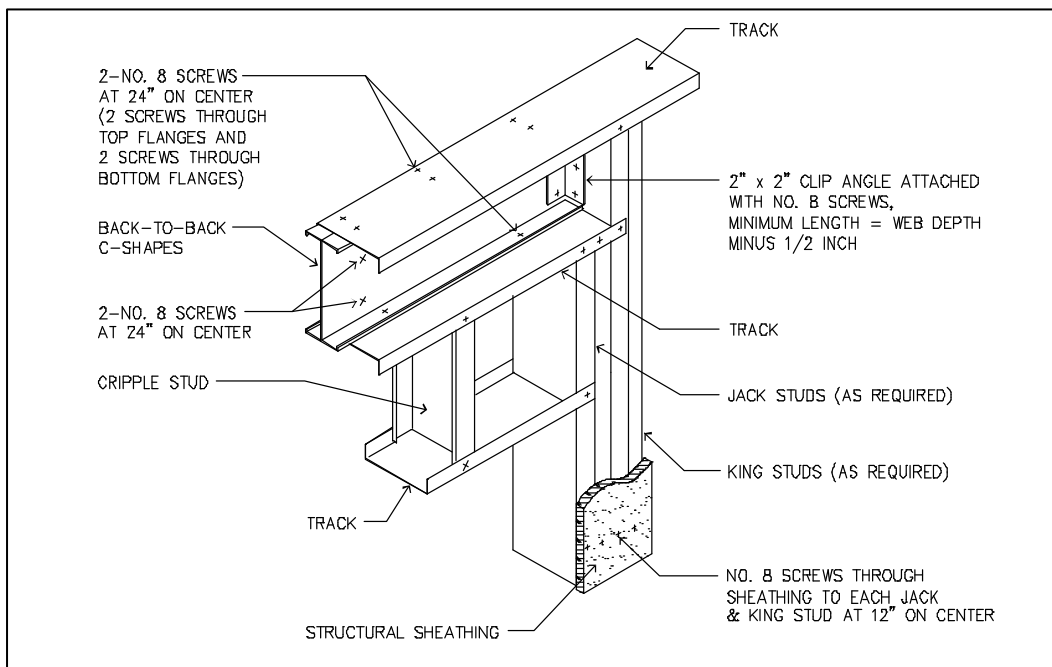


Figure E7-2 Back-to-Back Header Detail

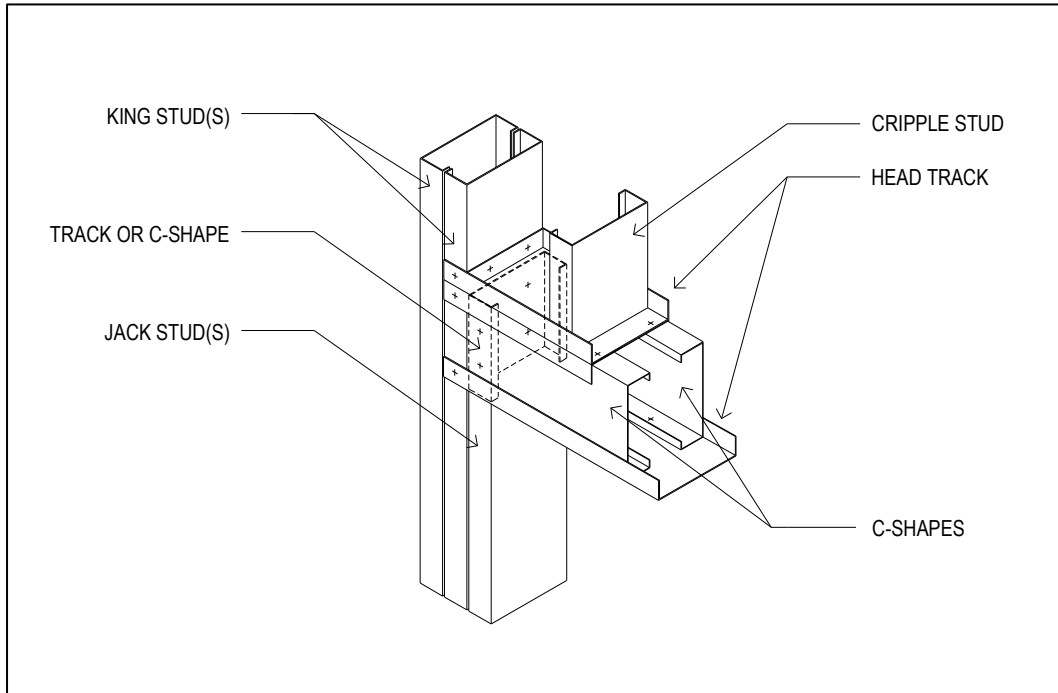


Figure E7-3 Box Beam Header in Gable Endwall

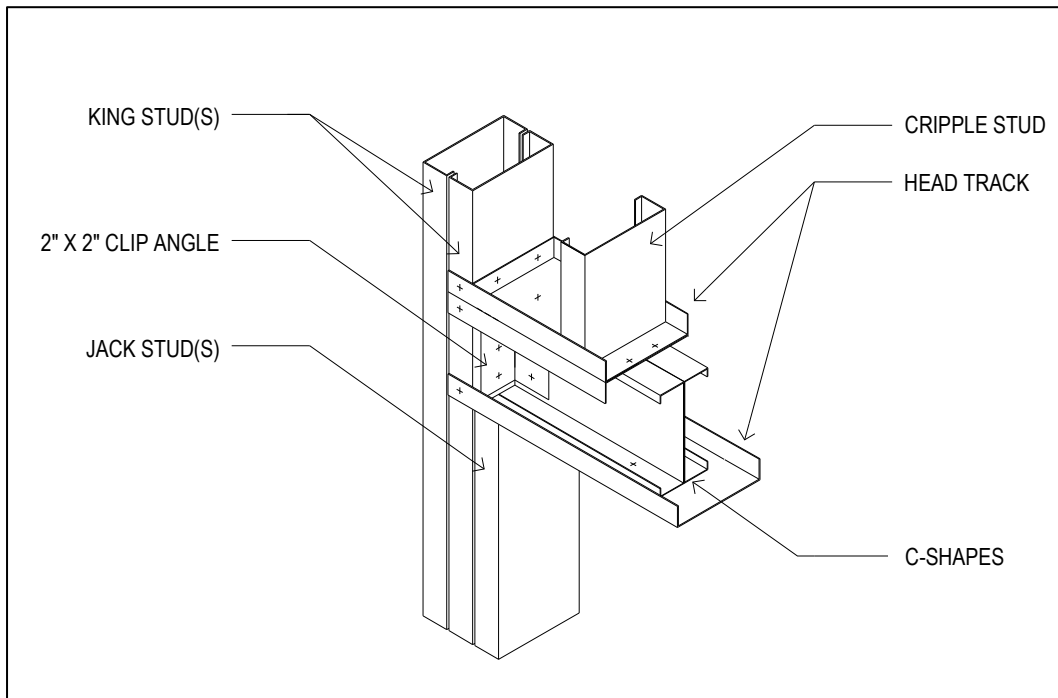


Figure E7-4 Back-to-Back Header in Gable Endwall

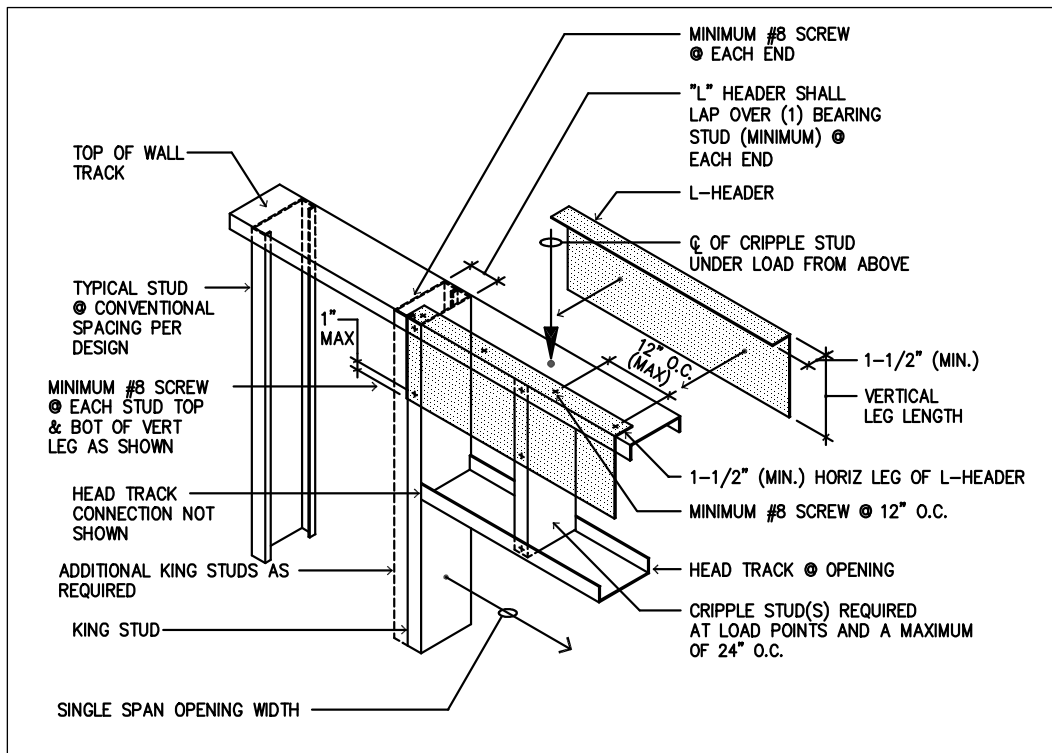


Figure E7-5 Double L-Header

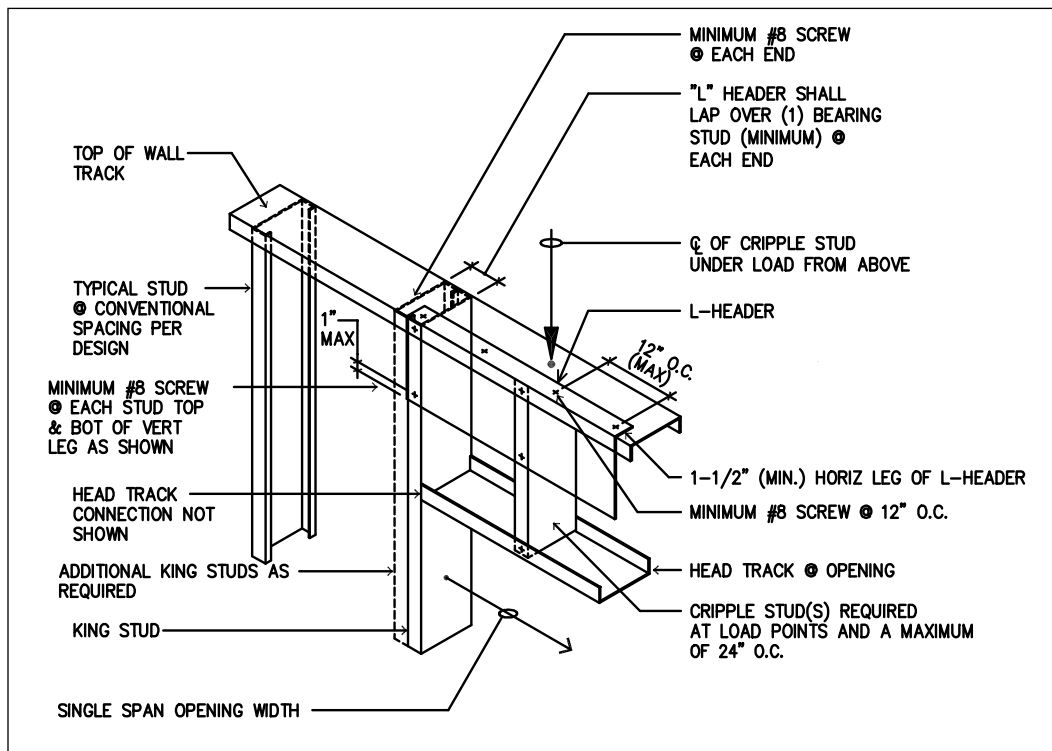


Figure E7-6 Single L-Header

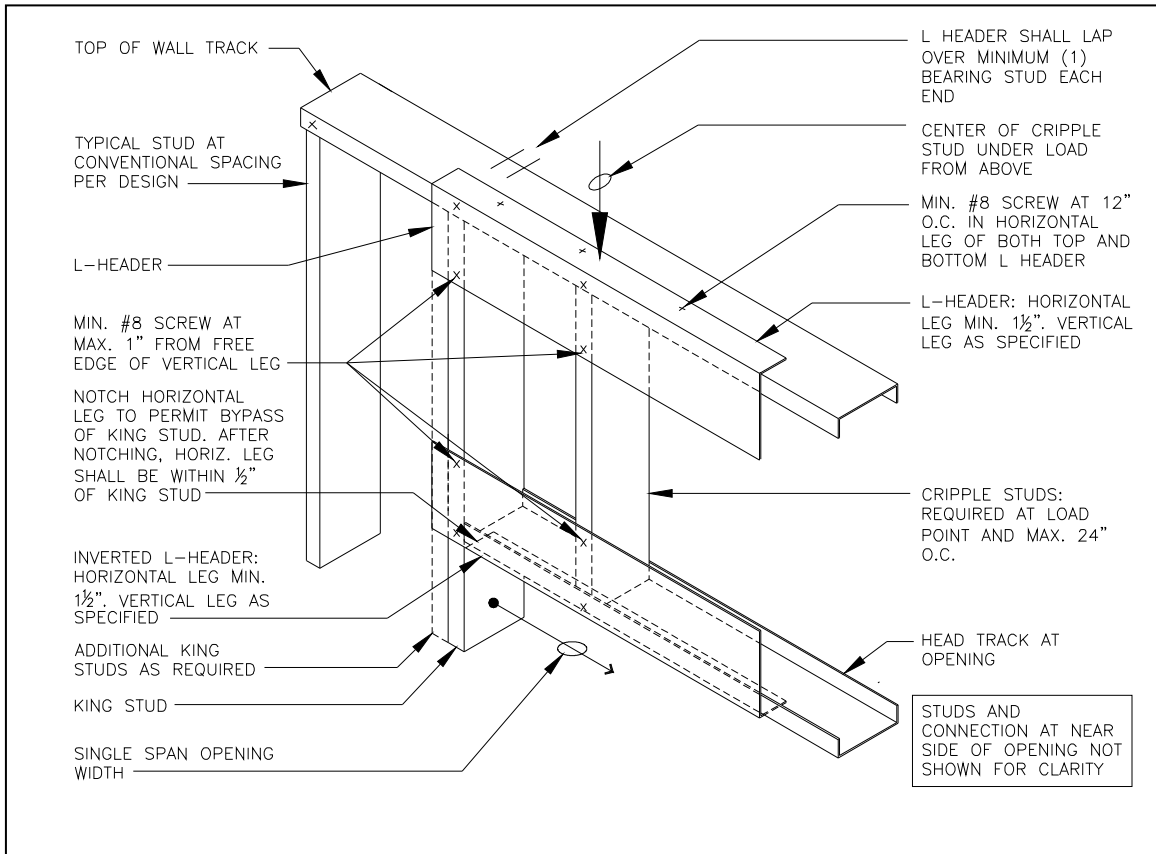


Figure E7-7 Inverted Single or Double L-Header Assembly (Single L-Header Shown)

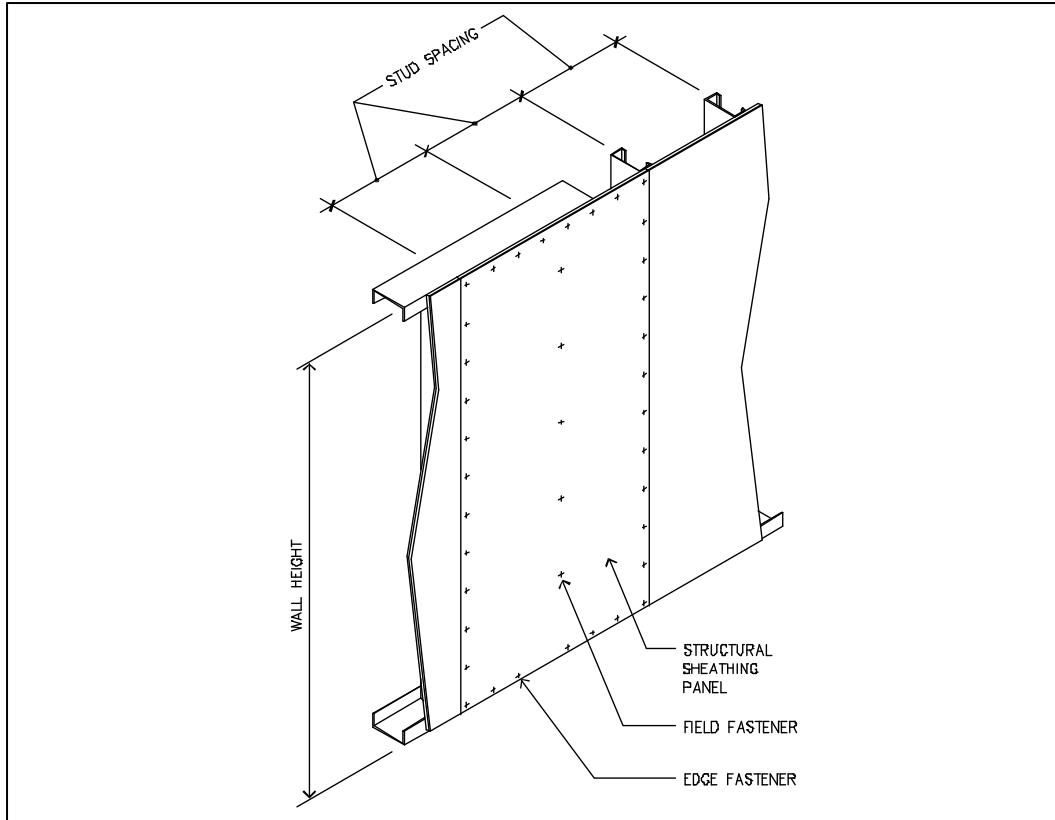


Figure E8-1 Structural Sheathing Fastening Pattern

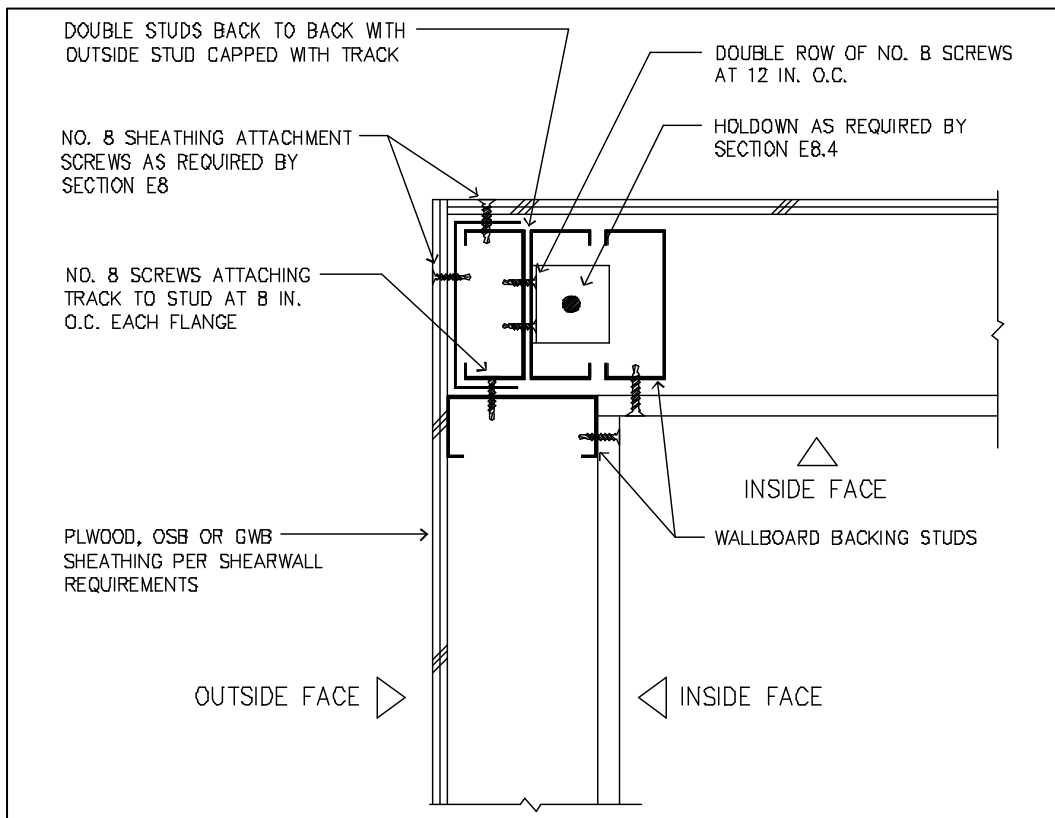


Figure E8-2 Corner Stud Hold-Down Detail

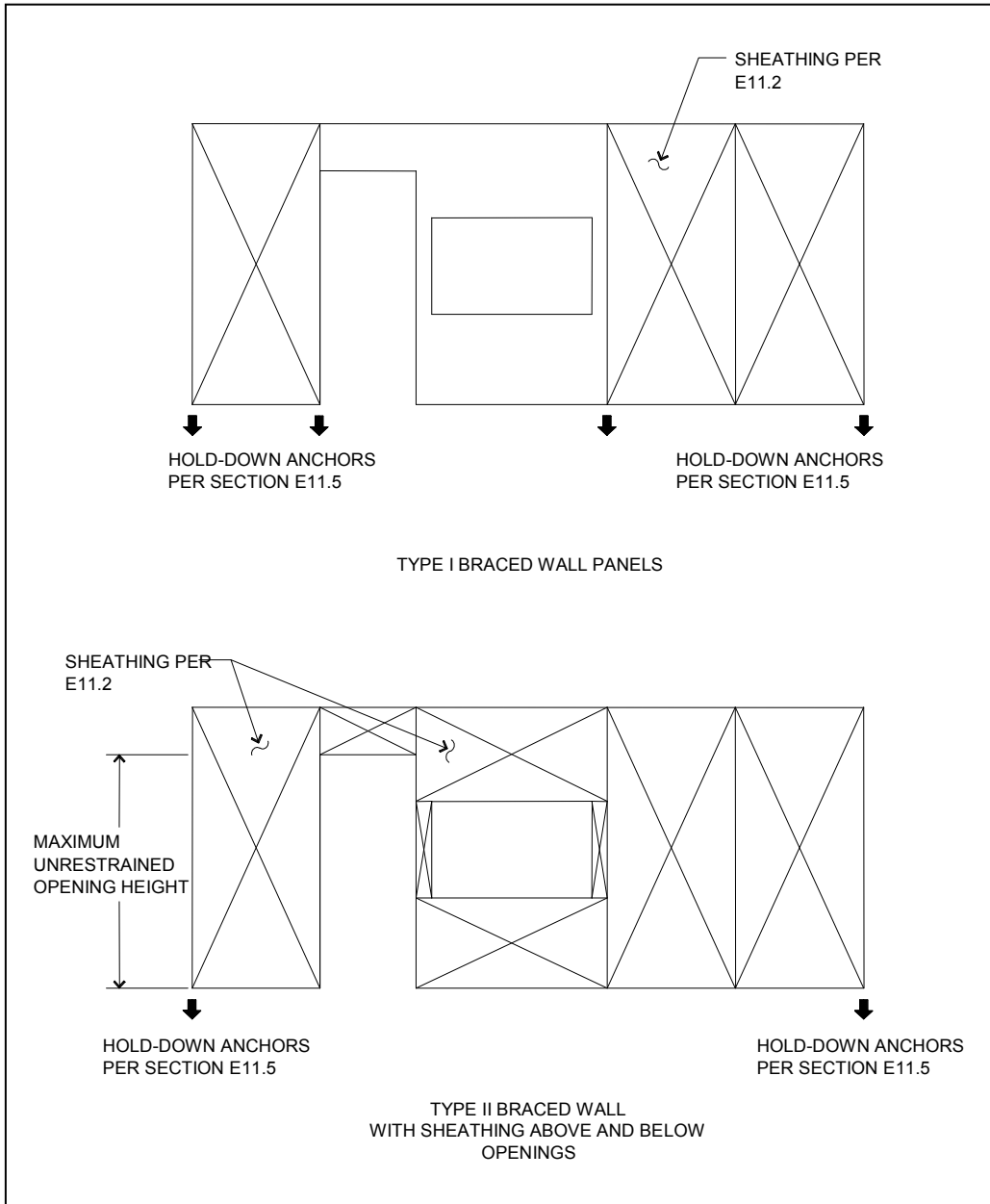


Figure E11-1 Type I and Type II Braced Wall Lines

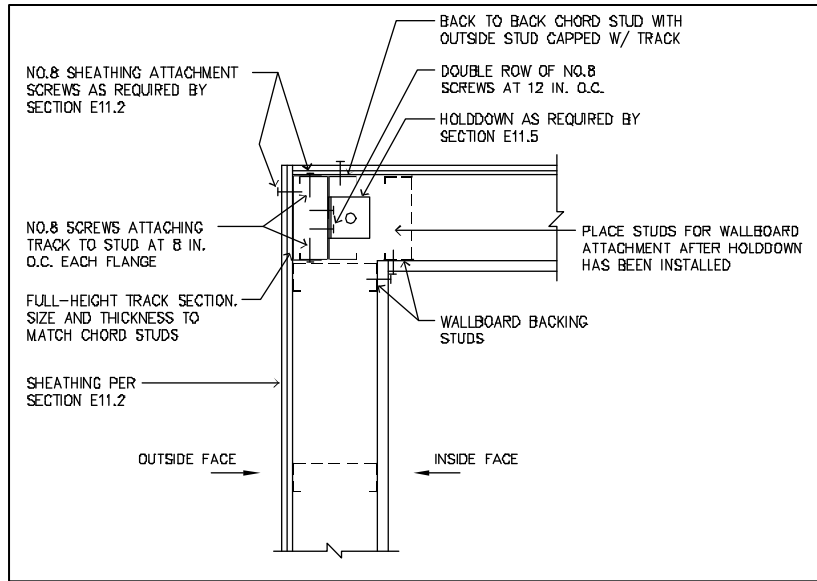


Figure E11-2 Corner Stud Holddown

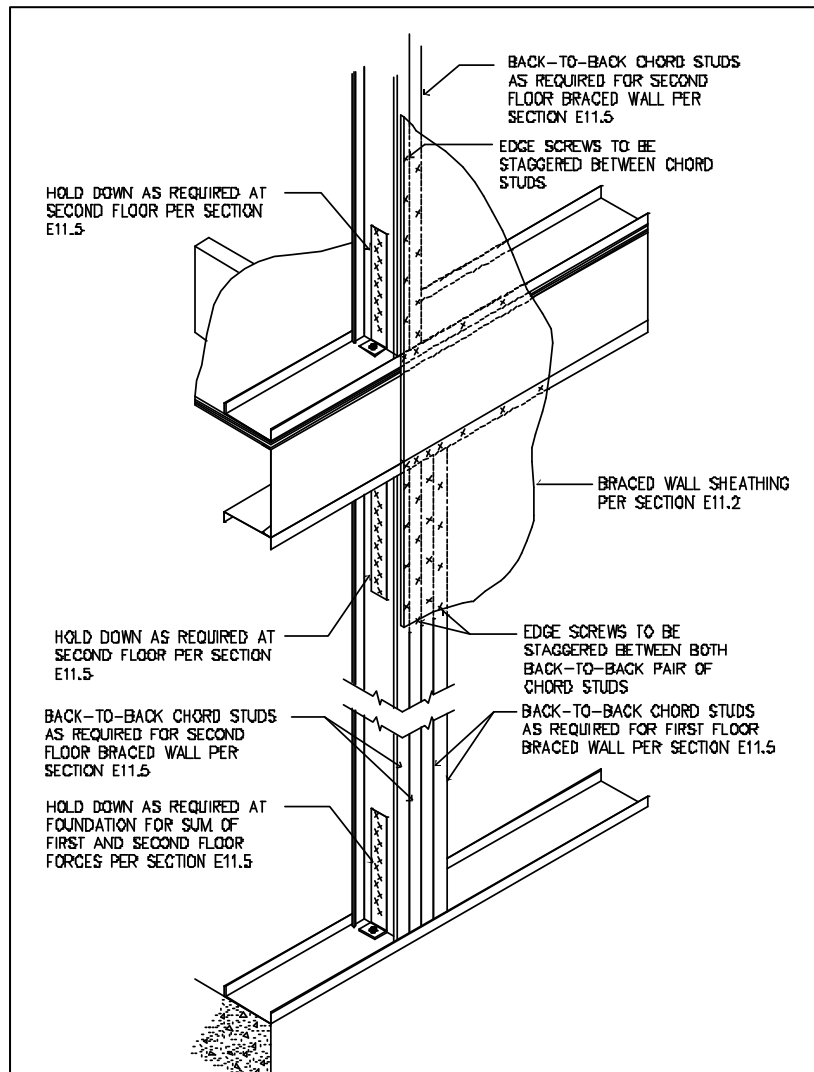


Figure E11-3 Supplemental Chord Stud at First Floor

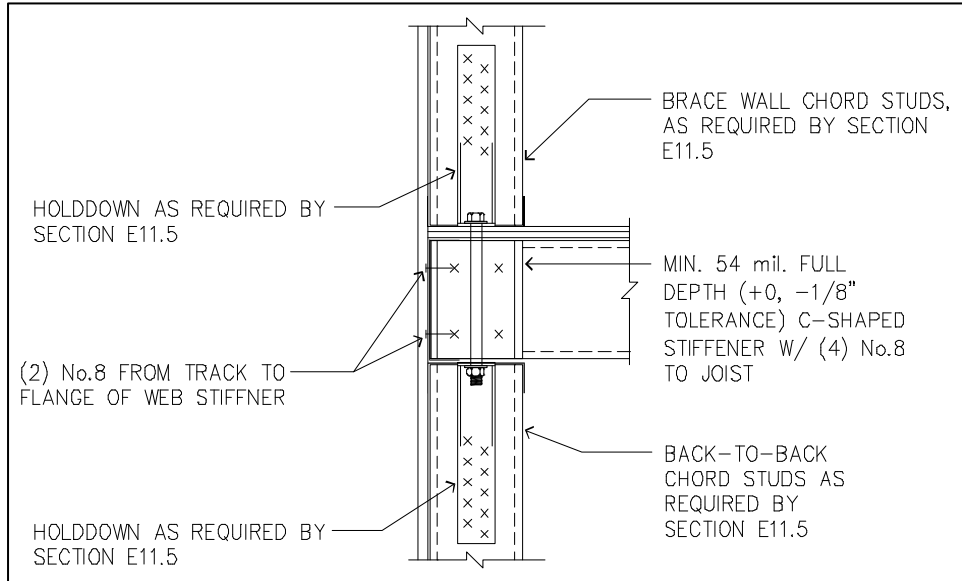


Figure E11-4 Floor to Floor Hold-Down

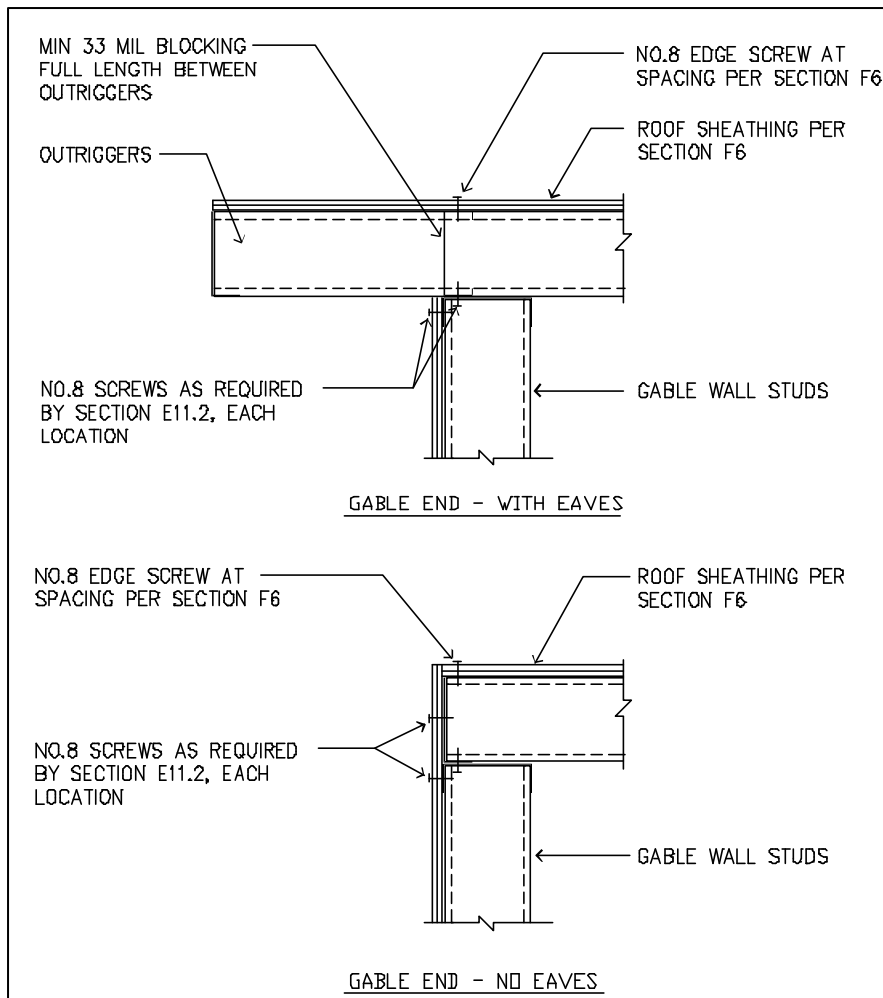


Figure E11-5 Gable Wall Roof Sheathing Attachment to Braced Walls

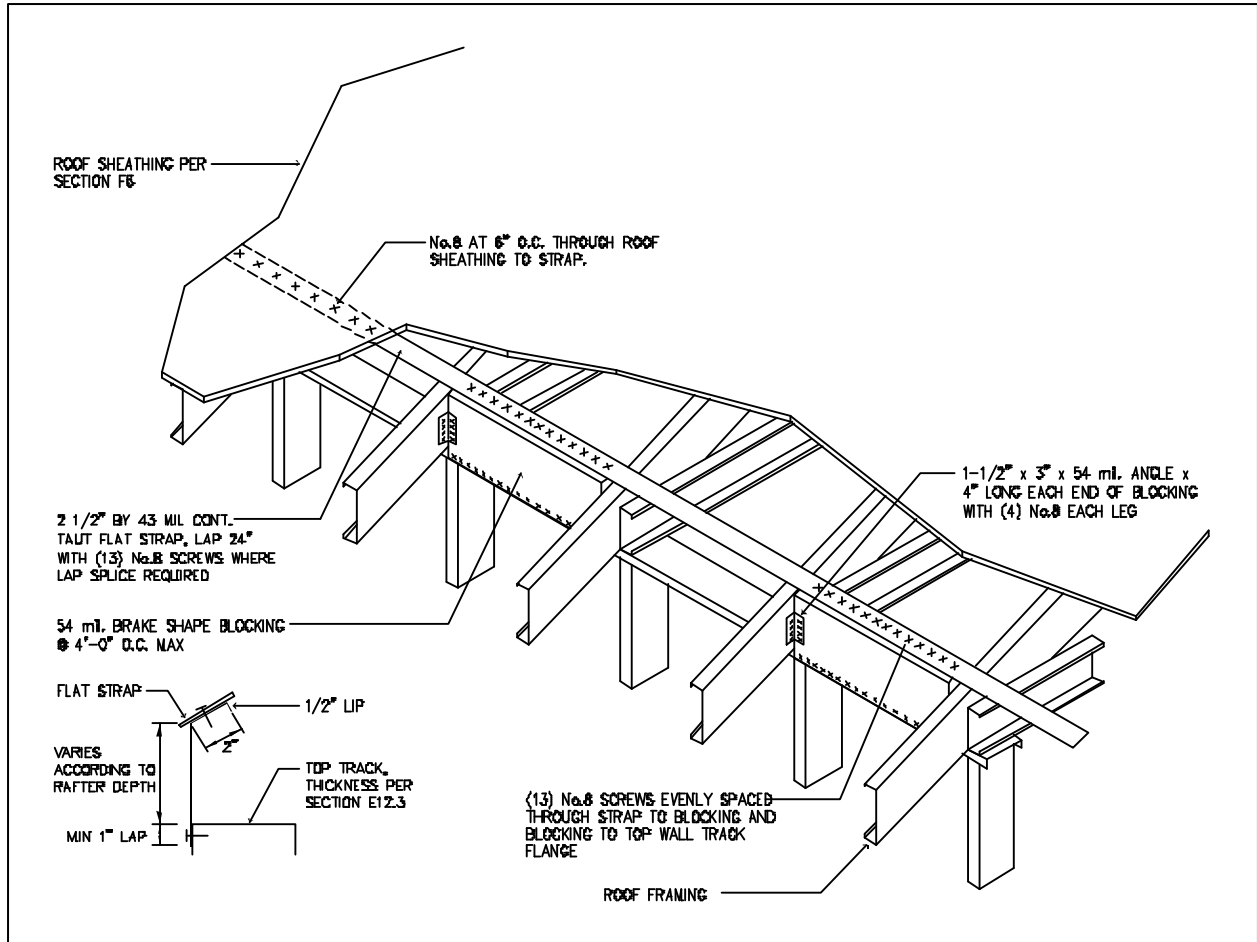


Figure E11-6 Strap and Blocking at Roof Eave

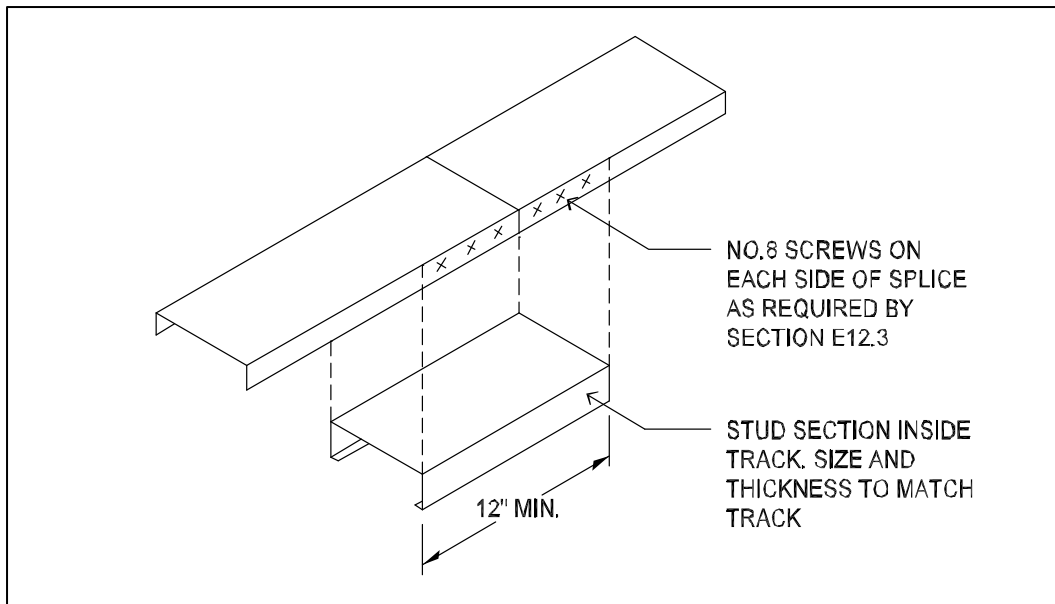


Figure E11-7 Top Track Splice

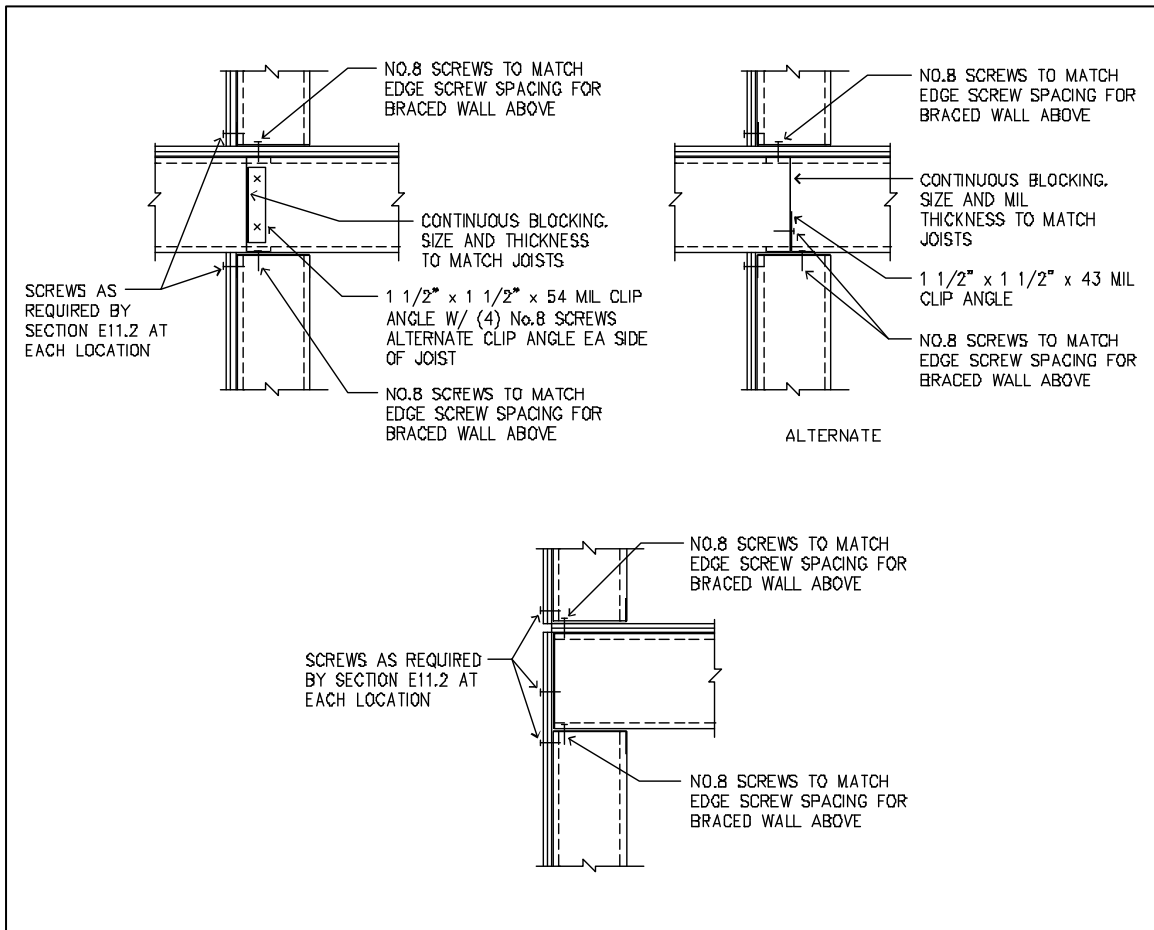


Figure E11-8 Floor Diaphragm Attachment to Braced Walls

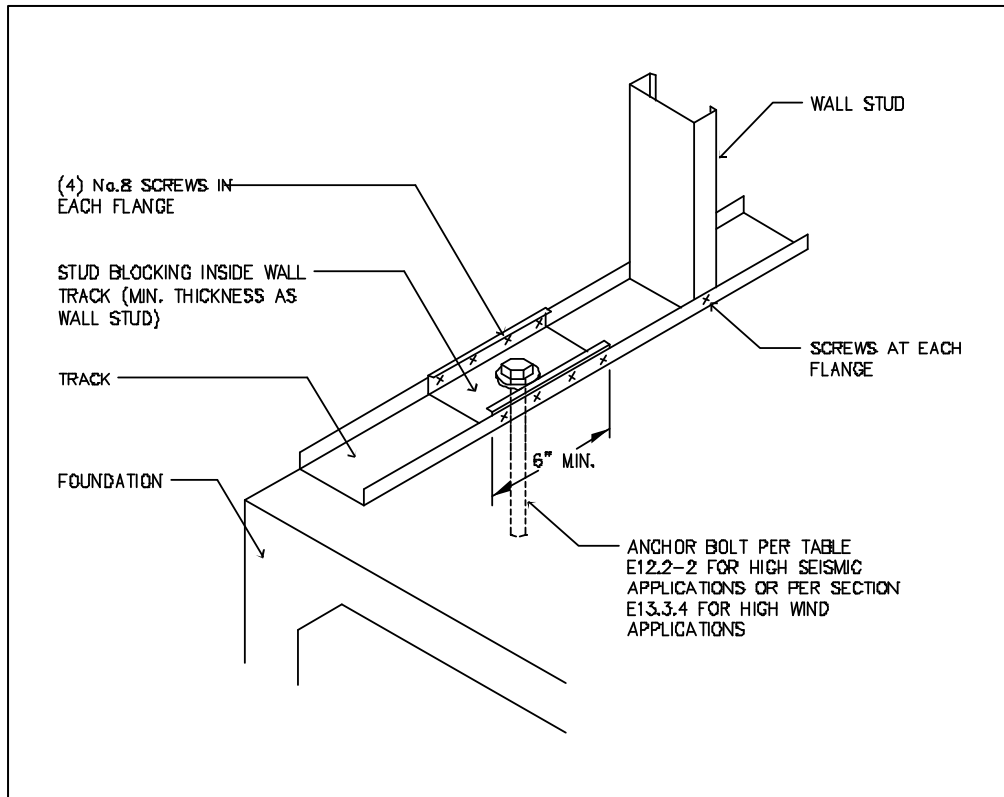


Figure E11-9 Braced Wall to Foundation Connection

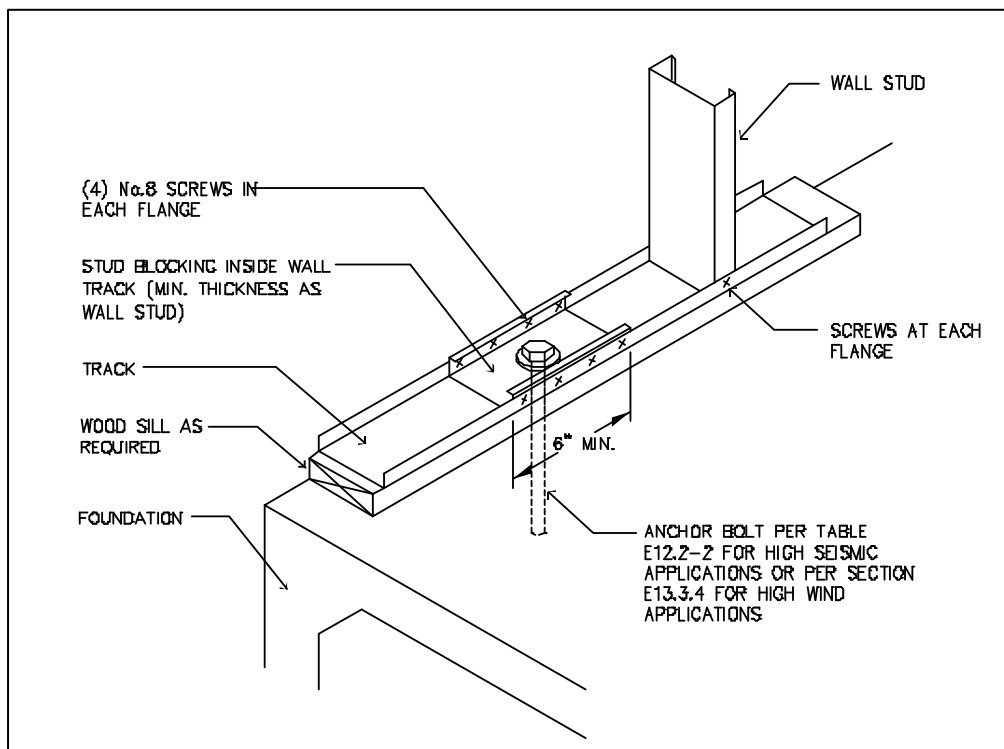


Figure E11-10 Braced Wall to Foundation Connection with Wood Sill

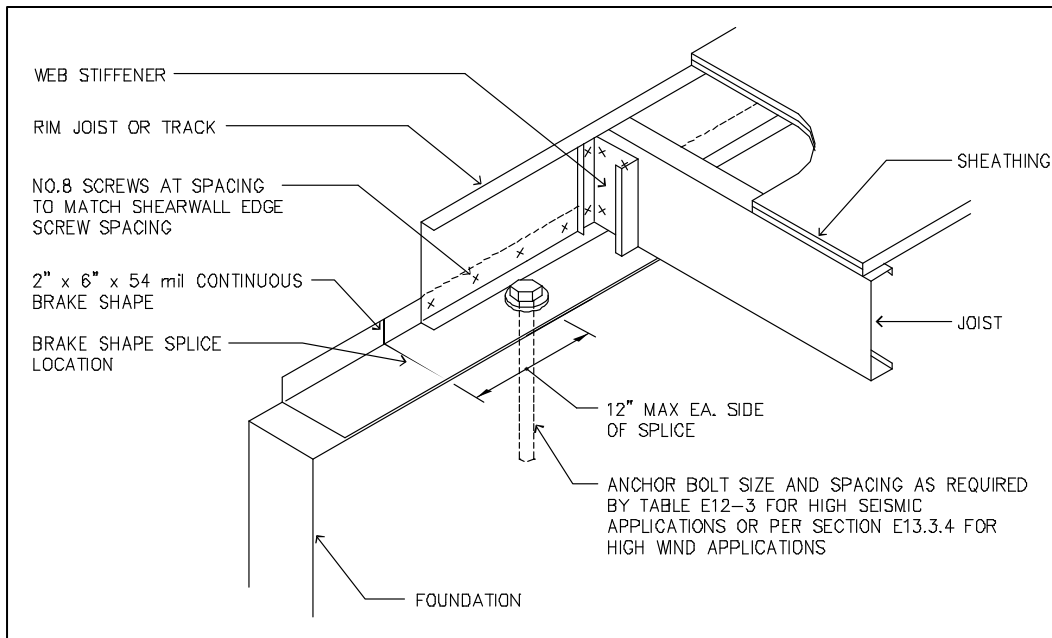


Figure E11-11 Floor to Foundation Connection at Braced Wall

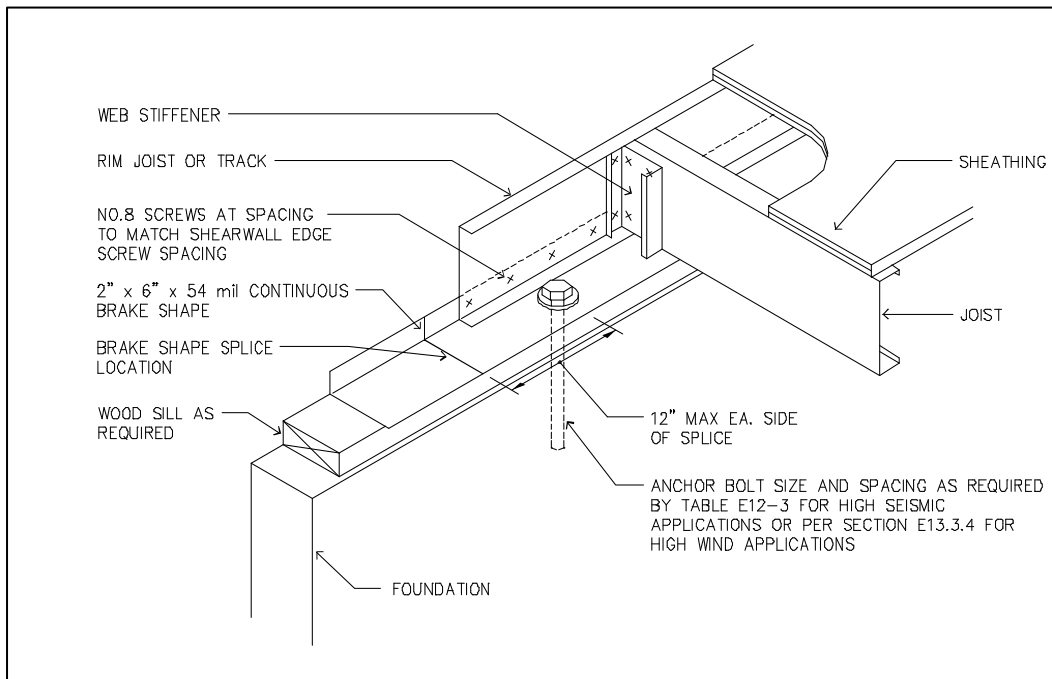


Figure E11-12 Floor to Foundation Connection at Braced Wall with Wood Sill

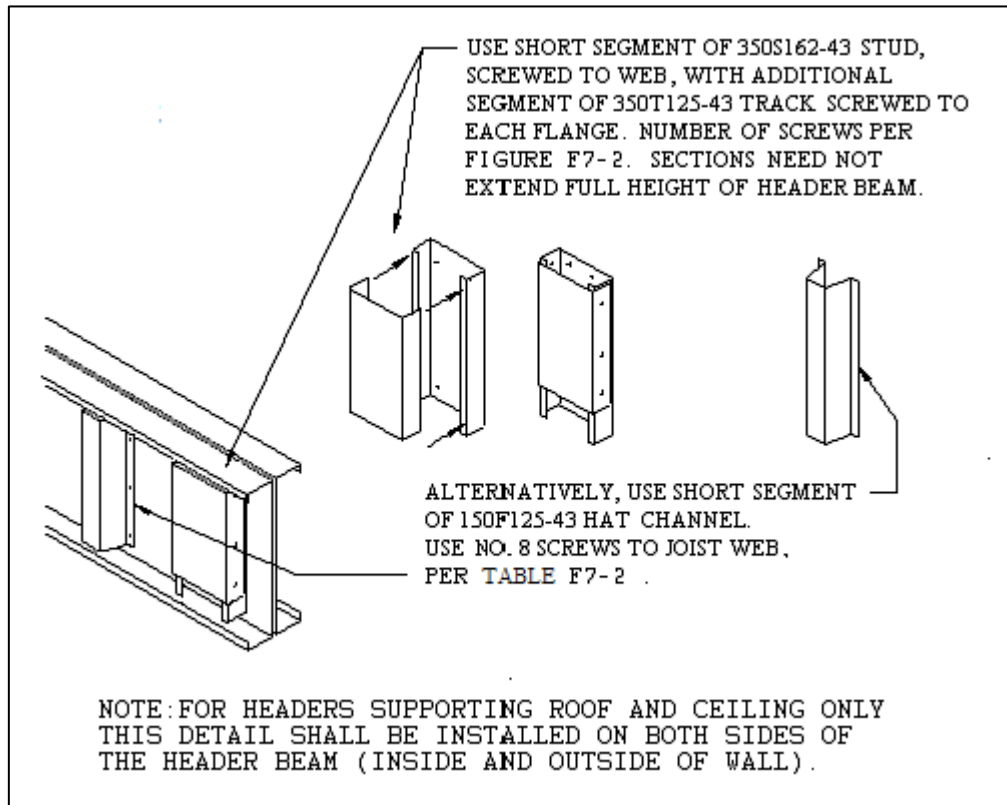


Figure E13-1 Back-to-Back Header Beam Reinforcement for Uplift Strap Connection

Table E2-1
Wall to Foundation or Floor Connection Requirements ¹

Framing Condition			Wind Speed (mph), Exposure, & Seismic Design Category ²					
			85 B or SDC A,B,C	90B	100B 85 C	110B 90 C	100 C	< 110 C
Wall bottom track to floor per Figure E2-4			1-No.8 screw at 12" o.c.	1-No.8 screw at 12" o.c.	1-No.8 screw at 12" o.c.	1 – No.8 screw at 12" o.c.	2 – No.8 screw at 12" o.c.	2 – No.8 screw at 12" o.c.
Wall bottom track to foundation per Figure E2-1 or E2-2 ⁴			1/2" minimum diameter anchor bolt at 6' o.c.	1/2" minimum diameter anchor bolt at 6' o.c.	1/2" minimum diameter anchor bolt at 4' o.c.	1/2" minimum diameter anchor bolt at 4' o.c.	1/2" minimum diameter anchor bolt at 4' o.c.	1/2" minimum diameter anchor bolt at 4' o.c.
Wall bottom track to wood sill per Figure E2-3			Steel plate spaced at 4' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 4' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c., with 4-No.8 screws and 4-10d or 6-8d common nails
Wind uplift connector strength (lbs) ^{3 5}	Stud Spacing (in)	Roof Span (ft)						
	16	24	N/R	N/R	N/R	N/R	124	209
		28	N/R	N/R	N/R	62	151	249
		32	N/R	N/R	N/R	79	179	289
		36	N/R	N/R	N/R	94	206	329
		40	N/R	N/R	61	117	239	374
	24	24	N/R	N/R	N/R	69	186	314
		28	N/R	N/R	N/R	93	227	374
		32	N/R	N/R	N/R	117	268	434
36		N/R	N/R	64	141	309	494	
40		N/R	N/R	92	176	359	562	

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr, 1 foot = 0.305 m, 1 lb = 4.45 N.

¹ Anchor bolts are to be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks (e.g. at door openings or corners). Bolts are to extend a minimum of 15 inches (381 mm) into masonry or 7 inches (178 mm) into concrete.

² SDC indicates Seismic Design Category. See Sections E11 through E13 for floor connection requirements in high seismic areas and high wind areas.

³ N/R = Uplift connector not required.

⁴ Foundation anchor straps are permitted, in lieu of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.

⁵ Refer to Figure E2-5.

Table E2-2
Gable Endwall to Floor Connection Requirements ^{1, 2, 3, 4}

Basic Wind Speed (mph)		Wall Bottom Track to Floor Joist or Track Connection		
Exposure		Stud Height, h (ft)		
B	C	10 < h ≤ 14	14 < h ≤ 18	18 < h ≤ 22
85		1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.
90		1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.
100	85	1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.
110	90	1-No.8 screw @ 12" o.c.	1-No.8 screw @ 12" o.c.	2-No.8 screws @ 12" o.c.
120	100	1-No.8 screw @ 12" o.c.	2-No.8 screws @ 12" o.c.	1-No.8 screw @ 8" o.c.
130	110	2-No.8 screws @ 12" o.c.	1-No.8 screw @ 8" o.c.	2-No.8 screws @ 8" o.c.
140	120	2-No.8 screws @ 12" o.c.	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.
150	130	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.
-	140	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.
	150	2-No.8 screws @ 8" o.c.	2-No.8 screws @ 8" o.c.	-

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr, 1 foot = 0.305 m, 1 lb = 4.45 N.

¹ Refer to Sections E11 - E13 for additional requirements for high wind and seismic areas.

² Refer to Table E2-3 for gable endwall bottom track to foundation connections.

³ Where attachment is not given, special design is required.

⁴ Stud height, h, is measured from wall bottom track to wall top track or brace connection height.

Table E2-3
Gable Endwall Bottom Track to Foundation Connection Requirements ^{1, 2, 3, 4}

Basic Wind Speed (mph)		Minimum Spacing for 1/2" Diameter Anchor Bolts ⁵		
Exposure		Stud Height, h (ft)		
B	C	10 < h ≤ 14	14 < h ≤ 18	18 < h ≤ 22
85 ⁶		6'-0" o.c.	6'-0" o.c.	6'-0" o.c.
90		6'-0" o.c.	5'-7" o.c.	6'-0" o.c.
100	85	5'-10" o.c.	6'-0" o.c.	6'-0" o.c.
110	90	4'-10" o.c.	5'-6" o.c.	6'-0" o.c.
120	100	4'-1" o.c.	6'-0" o.c.	6'-0" o.c.
130	110	5'-1" o.c.	6'-0" o.c.	5'-2" o.c.
140	120	4'-11" o.c.	5'-10" o.c.	-
150	130	5'-5" o.c.	5'-0" o.c.	-
-	140	5'-9" o.c.	4'-4" o.c.	-
	150	5'-0" o.c.	3'-9" o.c.	-

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr, 1 foot = 0.305 m, 1 lb = 4.45 N.

¹ Refer to Table E2-2 for gable endwall bottom track to floor joist or track connection connections.

² Where attachment is not given, special design is required.

³ Stud height, h, is measured from wall bottom track to wall top track or brace connection height.

⁴ Anchorage requirements shall also be determined in the foundation design in accordance with Section C1.

⁵ Foundation anchor *straps* are permitted, in lieu of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.

⁶ Values for 85 mph Exposure B shall apply to Seismic Design Categories A, B and C.

Table E2-4
Required Uplift Strength
Wall Assembly to Foundation or Floor Assembly

		Basic Wind speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Framing Spacing ³ (in.)	Roof Span (ft)	Required Connection Strength ^{1,2} (lbs)				
12	24	142	212	287	371	460
	28	172	253	341	435	537
	32	202	293	392	499	614
	36	232	336	445	564	691
	40	266	376	496	628	768
16	24	189	282	382	494	612
	28	229	336	454	579	714
	32	269	390	521	664	816
	36	309	447	592	750	919
	40	354	500	660	835	1021
19.2	24	227	339	459	594	736
	28	275	405	546	696	859
	32	323	469	627	799	982
	36	371	538	712	902	1105
	40	426	602	794	1004	1228
24	24	284	424	574	742	920
	28	344	506	682	871	1074
	32	404	586	784	999	1228
	36	464	672	890	1127	1381
	40	532	752	992	1256	1535

For SI: 1 inch = 25.4 mm, 1 foot = .305 m, 1 lb = 4.45 N, 1 mph = 1.61 km/hr

Uplift requirements assume a roof/ceiling dead load of 12 psf (0.51 kN/m²).

² Uplift connection requirements are permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners.

³ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

Table E2-5
Uplift Strap Connection Requirements
Wall Assembly to Foundation or Floor Assembly

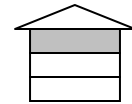
		Basic Wind speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Framing Spacing ¹ (in.)	Roof Span (ft)	Number of No.8 Screws in a 1-1/4 inch by 33 mil Steel Strap in each Flange of Stud (See Fig. E2-5)				
12	24	1	1	1	2	2
	28	1	1	2	2	2
	32	1	1	2	2	2
	36	1	2	2	2	3
	40	1	2	2	2	3
16	24	1	1	2	2	2
	28	1	2	2	2	3
	32	1	2	2	3	3
	36	1	2	2	3	3
	40	2	2	2	3	4
19.2	24	1	2	2	2	3
	28	1	2	2	3	3
	32	1	2	2	3	3
	36	2	2	3	3	4
	40	2	2	3	4	4
24	24	1	2	2	3	3
	28	2	2	3	3	4
	32	2	2	3	4	4
	36	2	3	3	4	5
	40	2	3	4	4	5

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 mph = 1.61 km/hr

¹ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

50
KSI

Table E3-1b
Stud Thickness
24-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	33	33	33	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	33	33	33	33	33	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	33	33	33	33	33	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	43	43	43	43	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	43	43	43	43	43	43	43	43	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
130 mph	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	43	43	43	43	54	54	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
140 mph	120 mph	350S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	43	43	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	43	43	43	43	43	43	43	43	43
150 mph	130 mph	350S162	16	33	33	33	33	33	43	43	43	43	43	54	54	54	54
			24	43	43	43	43	43	54	54	54	54	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	140 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	150 mph	350S162	16	43	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	54	54	54	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	33	43	43	43	43	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	54	54	54	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

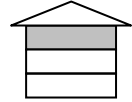
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
 KSI

Table E3-2a
Stud Thickness
28-Foot Wide Building Supporting Roof and Ceiling Only^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
Exp. B	Exp. C			Ground Snow Load (psf)											
				20	30	50	70	20	30	50	70	20	30	50	70
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
130 mph	110 mph	350S162	16	33	33	33	33	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
140 mph	120 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	68	68	68	68	97	97	97	97
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43
			24	43	43	43	43	43	43	43	43	54	54	54	54
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68
			24	54	54	54	54	68	68	68	68	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	43	54	54	54	54	54	54	54	54
	140 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68
			24	68	68	68	68	97	97	97	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	54	54	54	54	68	68	68	68

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

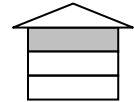
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-2b
Stud Thickness
28-Foot Wide Building Supporting Roof and Ceiling Only^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	33	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	33	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	43	43	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	43	43	43	43	43	43	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33
130 mph	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	54	54	54	54			
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	33	33	33	33	33	33	33	33	33	43	
140 mph	120 mph	350S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	43	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	33	33	33	33	33	43	43	43	43	54	54	54	54	
			24	43	43	43	43	54	54	54	54	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	140 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43		
			24	43	43	43	43	43	43	43	43	54	54	54	54		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

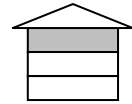
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-3a
Stud Thickness
32-Foot Wide Building Supporting Roof and Ceiling Only^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	43	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	43	43	43	54	43	43	43	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	43	43	43	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	43	43	43	43	43	43	43	43	43	43	43	43
130 mph	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	43	43	43	43	43	43	43	43	43	43	43	43	43	43
140 mph	120 mph	350S162	16	33	33	33	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	68	68	68	68	97	97	97	97	
550S162		16	33	33	33	33	43	43	43	43	43	43	43	43	43	43
		24	43	43	43	43	43	43	43	43	43	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	68
			24	54	54	54	54	68	68	68	68	97	97	97	97	
550S162		16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
		24	43	43	43	43	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	68
			24	68	68	68	68	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
	24		54	54	54	54	54	54	54	54	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-	
550S162		16	43	43	43	43	43	43	43	43	54	54	54	54	54	
	24	54	54	54	54	54	54	54	54	68	68	68	68	68		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

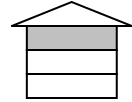
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-3b
Stud Thickness
32-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	43	43	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	33	43	33	33	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	33	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	33	33	43
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	43	
130 mph	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	43	43	43	43	54	54	54	54			
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	43		
140 mph	120 mph	350S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	54	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54		
			24	43	43	43	54	54	54	54	54	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43		
			24	43	43	43	43	43	43	43	43	43	43	43	43		
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43		
			24	43	43	43	43	43	43	43	43	54	54	54	54		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

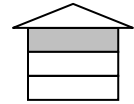
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-4a
Stud Thickness
36-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	33	33	43	54	33	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43	
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	33	33	43	54	33	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	33	33	43	54	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	43	43	43	43	43	43	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	54	54	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	43	
130 mph	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43	
			24	43	43	54	54	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	54	
140 mph	120 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43	
			24	43	43	43	54	43	43	43	43	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	43	43	43	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	68	68	68	68	97	97	97	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43		
			24	54	54	54	54	54	54	54	54	54	54	54		
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

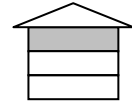
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-4b
Stud Thickness
36-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	43	43	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
130 mph	110 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	43	43	43	54	54	54	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	33	33	33	33	33	33	43
140 mph	120 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	43	
			24	43	43	43	54	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43	43	43
150 mph	130 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54		
			24	43	43	43	54	54	54	54	54	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43		
			24	43	43	43	43	43	43	43	43	43	43	43	43		
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43		
			24	43	43	43	43	43	43	43	43	54	54	54	54		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-5a
Stud Thickness
40-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
 $F_y = 33$ ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	33	33	43	54	43	43	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54	
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	33	33	43	54	43	43	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	43	43	54	33	43	43	54	43	43	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	
			24	33	43	43	54	43	43	43	54	43	43	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	43	43	43	54	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	43	43	54	68	43	43	54	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	43	43	43	54	43	43	43	54	
130 mph	110 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54	
			24	43	43	54	68	54	54	54	68	68	68	68	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	43	54	
140 mph	120 mph	350S162	16	33	33	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	43	43	43	54	54	54	54	54	68	68	68	68	
			24	68	68	68	68	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

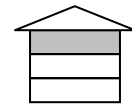
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

**50
KSI**

**Table E3-5b
 Stud Thickness
 40-Foot Wide Building Supporting Roof and Ceiling Only ^{1,2,3}
 F_y = 50 ksi**



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43	
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	43	33	33	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	54	33	33	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	43	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	54	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	33	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	43	43	43	54	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	33	43	33	33	43	43	
130 mph	110 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	33	33	43	54	43	43	43	54	54	54	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	33	43	33	33	43	43	
140 mph	120 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	43	43	43	54	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54	
			24	43	43	54	54	54	54	54	54	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
150 mph	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43	
	24		43	43	43	43	43	43	43	43	43	43	43	54		
	150 mph	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68
				24	54	54	54	68	68	68	68	68	97	97	97	97
550S162			16	33	33	33	33	43	43	43	43	43	43	43	43	
	24	43	43	43	43	43	43	43	43	54	54	54	54			

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

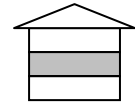
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-6a
Stud Thickness
24-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	33	43	43	43	43	43	43	43	43
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	33	43	43	43	43	43	43	43	54
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	43	43	43	43	43	43	43	43	43	43	43	54
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43	43
			24	43	43	43	43	43	43	43	43	54	54	54	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	
		24	33	33	33	43	33	33	33	43	43	43	43	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	43
			24	43	43	43	54	43	43	54	54	54	54	54	54	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	
		24	33	33	33	43	43	43	43	43	43	43	43	43	43	
130 mph	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68	
550S162		16	33	33	33	33	33	33	33	33	33	33	33	33	33	
		24	43	43	43	43	43	43	43	43	43	43	43	43	43	
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	68	68	68	68	97	97	97	97	
550S162		16	33	33	33	33	43	43	43	43	43	43	43	43	43	
		24	43	43	43	43	43	43	43	43	54	54	54	54		
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	54	54	68	68	68	68	97	97	97	97	
550S162		16	43	43	43	43	43	43	43	43	43	43	43	43		
		24	43	43	43	43	54	54	54	54	54	54	54	54		
	140 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	68	68	68	68	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-	
550S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54		
	24	54	54	54	54	54	54	54	54	68	68	68	68			

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

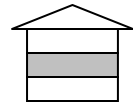
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-6b
Stud Thickness
24-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43	43	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	33	33	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	43	43	43	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	43	43	43	43		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	33	33	33	33	33	33	43	
130 mph	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	43	43		
			24	43	43	43	43	43	43	43	43	54	54	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33		
			24	33	33	33	43	33	33	33	33	33	33	33	43		
140 mph	120 mph	350S162	16	33	33	33	33	33	33	33	33	43	43	43	43		
			24	43	43	43	43	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33		
			24	33	33	33	43	43	43	43	43	43	43	43	43		
150 mph	130 mph	350S162	16	33	33	33	43	43	43	43	43	54	54	54	54		
			24	43	43	54	54	54	54	54	54	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33		
			24	43	43	43	43	43	43	43	43	43	43	43	43		
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43		
			24	43	43	43	43	43	43	43	43	43	43	43	43		
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43		
			24	43	43	43	43	43	43	43	43	54	54	54	54		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

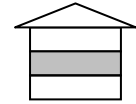
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-7a
Stud Thickness
28-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43	
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	43	43	43	54	43	43	43	54	54	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	43	43	43	43	43	43	
			24	43	43	43	54	54	54	54	54	54	54	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	43	
130 mph	110 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54	
			24	43	43	54	54	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43	
			24	43	43	43	43	43	43	43	43	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	43	43	43	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	43	43	43	54	54	54	54	54	68	68	68	68	
			24	68	68	68	68	97	97	97	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54		
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

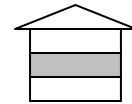
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-7b
Stud Thickness
28-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	43	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	43	33	33	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	43	43	43	43	43	43	43	43	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
120 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	
			24	43	43	43	54	43	43	43	43	43	43	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
130 mph	110 mph	350S162	16	33	33	33	43	33	33	33	33	43	43	43	43	43	
			24	43	43	43	54	43	43	43	43	54	54	54	54		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	33	33	43
140 mph	120 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	43	
			24	43	43	43	54	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43	43	43
150 mph	130 mph	350S162	16	33	33	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	54	54	54	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68		
			24	54	54	54	54	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

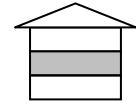
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-8a
Stud Thickness
32-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	54	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	43
			24	33	43	43	54	33	33	43	43	33	33	43	43	43	43
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	54	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	43
			24	33	43	43	54	33	33	43	43	33	33	43	43	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	43	43	43	43	
			24	43	43	43	54	43	43	43	54	54	54	54	68	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	43
			24	33	43	43	54	33	33	43	43	33	33	43	43	43	43
110 mph	90 mph	350S162	16	33	33	43	43	33	33	33	43	43	43	43	43	43	
			24	43	43	54	54	43	43	54	54	54	54	54	68	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	43
			24	33	43	43	54	33	33	43	43	43	43	43	43	54	54
120 mph	100 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	43	43	
			24	43	43	54	54	54	54	54	54	54	54	68	68	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	43
			24	33	43	43	54	43	43	43	43	43	43	43	43	54	54
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	54	
			24	54	54	54	68	54	54	54	68	68	68	68	68	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	33	43	43
			24	43	43	43	54	43	43	43	43	43	43	43	43	54	54
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54	54	54
150 mph	130 mph	350S162	16	43	43	43	43	54	54	54	54	54	68	68	68	68	
			24	54	54	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	54	54	54	54	54	54
	140 mph	350S162	16	43	43	54	54	54	54	54	54	54	68	68	68	68	
			24	68	68	68	68	97	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
	150 mph	350S162	16	54	54	54	54	68	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	43	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

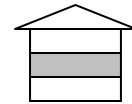
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-8b
Stud Thickness
32-Foot Wide Building Supporting One Floor, Roof & Ceiling ^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)															
				8-Foot Studs				9-Foot Studs				10-Foot Studs							
Exp. B	Exp. C			Ground Snow Load (psf)															
				20	30	50	70	20	30	50	70	20	30	50	70				
85 mph		350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	43	43	43	43	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
90 mph		350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	43	43	43	43	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	33	43	
			24	33	33	43	54	33	33	43	43	43	43	43	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	54	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	33	33	33	43	
			24	43	43	43	54	43	43	43	54	54	54	54	54	54	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
130 mph	110 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	43	43	43	
			24	43	43	43	54	43	43	43	54	54	54	54	54	54	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	33	33	33	33	43
140 mph	120 mph	350S162	16	33	33	33	43	33	33	43	43	43	43	43	43	43	43	43	
			24	43	43	54	54	54	54	54	54	54	68	68	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	43	43	43	43	43	43	43	43
150 mph	130 mph	350S162	16	33	43	43	43	43	43	43	43	43	54	54	54	54	54	54	
			24	54	54	54	54	54	54	54	54	54	97	97	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	54	54	54	
			24	54	54	54	54	68	68	68	68	97	97	97	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	43	43	43	43	43	43	43
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	97	97	97	97
			24	54	54	54	68	68	68	68	68	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

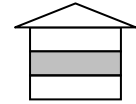
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-9a
Stud Thickness
36-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
Exp. B	Exp. C			Ground Snow Load (psf)											
				20	30	50	70	20	30	50	70	20	30	50	70
85 mph		350S162	16	33	33	43	43	33	33	43	43	33	33	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
90 mph		350S162	16	33	33	43	43	33	33	43	43	33	33	43	43
			24	43	43	54	54	43	43	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
100 mph	85 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	43
			24	43	43	54	68	43	43	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
110 mph	90 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
120 mph	100 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	68	54	68	68	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54
			24	54	54	54	68	54	54	54	68	68	68	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
140 mph	120 mph	350S162	16	43	43	43	54	43	43	43	54	54	54	54	54
			24	54	54	68	68	68	68	68	68	97	97	97	97
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
150 mph	130 mph	350S162	16	43	43	43	54	54	54	54	54	68	68	68	68
			24	68	68	68	68	68	68	68	68	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	54	54	54	54
	140 mph	350S162	16	43	43	54	54	54	54	54	54	68	68	68	68
			24	68	68	68	68	97	97	97	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	54	54	54	54	68	68	68	68

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

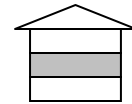
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-9b
Stud Thickness
36-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	33	33	43	54	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43	
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	33	33	43	54	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	43	43	43	54	43	43	43	54	54	54	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	33	33	43	43	
130 mph	110 mph	350S162	16	33	33	43	43	33	33	33	43	43	43	43	43	
			24	43	43	54	54	43	43	54	54	54	54	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	43	43	43	43	
140 mph	120 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54	
			24	54	54	54	54	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	54	54	54	54	97	97	97	97	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43	
			24	43	43	43	43	43	43	43	43	43	43	43	54	
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	33	33	33	33	43	43	43	43	
			24	43	43	43	54	43	43	43	43	43	43	43	54	
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	54	54	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43	
			24	43	43	43	54	43	43	43	43	43	43	43	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

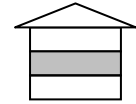
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-10a
Stud Thickness
40-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	43	43	33	33	43	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	43	54
90 mph		350S162	16	33	33	43	43	33	33	43	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	43	54
100 mph	85 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	43	54
110 mph	90 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	68	54	54	68	68	
		550S162	16	33	33	43	43	33	33	33	43	33	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	43	54
120 mph	100 mph	350S162	16	43	43	43	54	43	43	43	54	43	43	43	54	54
			24	54	54	54	68	54	54	54	68	68	68	68	97	
		550S162	16	33	33	43	43	33	33	33	43	33	33	43	43	
			24	43	43	54	54	43	43	43	54	43	43	54	54	
130 mph	110 mph	350S162	16	43	43	43	54	43	43	43	54	54	54	54	54	
			24	54	54	54	68	54	54	68	68	68	68	68	97	
		550S162	16	33	33	43	43	33	33	33	43	33	33	43	43	
			24	43	43	54	54	43	43	43	54	43	43	54	54	
140 mph	120 mph	350S162	16	43	43	43	54	43	43	54	54	54	54	54	54	
			24	54	54	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	43	43	43	43	43	43	43	43	43	43	
			24	43	43	54	54	43	43	43	54	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	54	54	54	54	54	54	54	68	68	68	68
			24	68	68	68	97	68	68	68	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	43	43	54	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68
			24	68	68	68	97	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	68	
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	43	
			24	54	54	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

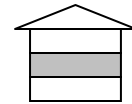
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-10b
Stud Thickness
40-Foot Wide Building Supporting One Floor, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33
			24	33	43	43	54	33	33	43	43	33	33	43	43	
90 mph		350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	33	33	43	43	33	33	43	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43	
			24	43	43	54	54	43	43	43	54	43	43	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	33	33	43	43	33	33	43	43	
110 mph	90 mph	350S162	16	33	33	43	43	33	33	33	43	33	33	43	43	
			24	43	43	54	54	43	43	43	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	33	33	43	43	33	33	43	43	
120 mph	100 mph	350S162	16	33	33	43	43	33	33	33	43	33	33	43	43	
			24	43	43	54	54	43	43	54	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	33	33	43	43	33	43	43	43	
130 mph	110 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54	
			24	43	43	54	68	54	54	54	54	54	54	54	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	33	33	43	43	43	43	43	54	
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	
			24	54	54	54	68	54	54	54	68	68	68	68	68	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	33	43	43	54	43	43	43	43	43	43	43	54	
150 mph	130 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	68	54	54	54	68	97	97	97	97	
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43	
			24	43	43	43	54	43	43	43	43	43	43	43	54	
	140 mph	350S162	16	43	43	43	54	43	43	43	54	54	54	54	54	
			24	54	54	54	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	43	43	43	54	43	43	43	54	43	43	54	54	
	150 mph	350S162	16	43	43	43	54	54	54	54	54	68	68	68	68	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43	
			24	43	43	43	54	43	43	43	54	54	54	54	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

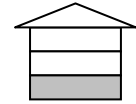
Second floor live load is 30 psf (1.44 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-11a
Stud Thickness
24-Foot Wide Building Supporting Two Floors, Roof & Ceiling ^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
Exp. B	Exp. C			Ground Snow Load (psf)											
				20	30	50	70	20	30	50	70	20	30	50	70
85 mph		350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
90 mph		350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
100 mph	85 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	68	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
120 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	68	54	54	68	68	68	68	68	97
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	97	97	97	97
		550S162	16	33	33	43	43	43	43	43	43	43	43	43	43
			24	43	43	54	54	43	43	43	43	54	54	54	54
150 mph	130 mph	350S162	16	43	43	43	54	54	54	54	54	68	68	68	68
			24	68	68	68	68	68	68	68	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	33	43	43	43	43	43
			24	43	43	54	54	54	54	54	54	54	54	54	54
	140 mph	350S162	16	54	54	54	54	54	54	54	54	68	68	68	68
			24	68	68	68	97	97	97	97	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-
		550S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	54	54	54	54	54	68	68	68	68

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

1 Deflection criteria: L/240

2 Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

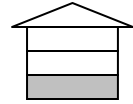
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

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

50
KSI

Table E3-11b
Stud Thickness
24-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33
			24	43	43	54	54	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43	43
90 mph		350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	43	43	54	54	43	43	43	43	43	43	43	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33	
			24	43	43	54	54	43	43	43	43	43	43	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43	43
			24	43	43	54	54	43	43	43	43	54	54	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
120 mph	100 mph	350S162	16	33	33	33	43	33	33	33	33	33	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	54	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
130 mph	110 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	68		
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
140 mph	120 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	54	54	54	54	54	68	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	43	43	43	43	43	
	140 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	33	33	33	33	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	43	54	54	
	150 mph	350S162	16	43	43	43	43	54	54	54	54	68	68	68	68	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	33	43	43	43	43	43	43	43	43	
			24	43	43	43	43	43	43	43	43	43	54	54	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

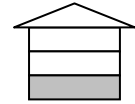
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-12a
Stud Thickness
28-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
90 mph		350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
120 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	68	68	68	68	68	68	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	68	68	68	68	68	68	68	68	68	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
140 mph	120 mph	350S162	16	43	43	43	54	54	54	54	54	54	54	54	54	54	
			24	68	68	68	68	68	68	68	68	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
150 mph	130 mph	350S162	16	43	43	54	54	54	54	54	54	54	68	68	68	68	
			24	68	68	68	97	68	68	97	97	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
	140 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68	
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68	68	
	150 mph	350S162	16	54	54	54	54	68	68	68	68	97	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-		
		550S162	16	43	43	43	43	43	43	43	43	43	54	54	43	43	
			24	54	54	54	54	54	54	54	54	54	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

1 Deflection criteria: L/240

2 Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

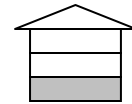
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

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

50
KSI

Table E3-12b
Stud Thickness
28-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	43	43	43	43	33	33	33	43	43	43	43	43	43	
			24	54	54	54	54	43	43	54	54	54	54	54	54	54	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	43
90 mph		350S162	16	43	43	43	43	33	33	33	43	43	43	43	43	43	
			24	54	54	54	54	43	43	54	54	54	54	54	54		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
100 mph	85 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43	43	
			24	54	54	54	54	43	43	54	54	54	54	54	54		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
110 mph	90 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43	43	
			24	54	54	54	54	43	43	54	54	54	54	54	54		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
120 mph	100 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	68		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	68	68	68	68		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	54	
			24	54	54	54	54	54	54	54	68	68	68	68	68		
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	33	
			24	43	43	43	54	43	43	43	43	43	43	43	43	43	
150 mph	130 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54	
			24	54	54	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33	43	
			24	43	43	43	54	43	43	43	43	43	43	43	54	54	
	140 mph	350S162	16	43	43	43	43	43	43	43	54	54	54	54	54		
			24	68	68	68	68	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	43	33	33	33	33	43	43	43	43		
			24	43	43	43	54	43	43	43	43	54	54	54	54		
	150 mph	350S162	16	43	43	54	54	54	54	54	54	68	68	68	68		
			24	68	68	68	68	68	68	68	68	97	97	97	97		
		550S162	16	33	33	33	43	43	43	43	43	43	43	43	43		
			24	43	43	43	54	43	43	43	43	54	54	54	54		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

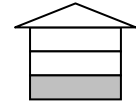
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-13a
Stud Thickness
32-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
Exp. B	Exp. C			Ground Snow Load (psf)											
				20	30	50	70	20	30	50	70	20	30	50	70
85 mph		350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
90 mph		350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	54	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
120 mph	100 mph	350S162	16	43	43	43	54	43	43	43	43	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
130 mph	110 mph	350S162	16	43	43	43	54	43	43	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
140 mph	120 mph	350S162	16	43	43	54	54	54	54	54	54	54	54	54	68
			24	68	68	68	97	68	68	68	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
150 mph	130 mph	350S162	16	54	54	54	54	54	54	54	54	68	68	68	68
			24	68	68	97	97	97	97	97	97	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
	140 mph	350S162	16	54	54	54	54	54	54	54	68	68	68	68	68
			24	97	97	97	97	97	97	97	97	97	97	-	-
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	68	68	68	68
	150 mph	350S162	16	54	54	54	68	68	68	68	68	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-
	550S162	16	43	43	43	43	43	43	43	43	43	43	43	54	
		24	54	54	54	68	54	54	54	68	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

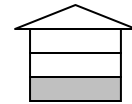
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-13b
Stud Thickness
32-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54	54
90 mph		350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
100 mph	85 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
120 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	68	68	68	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
130 mph	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	54	68	68	68	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
140 mph	120 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	68	54	54	68	68	68	68	68	68	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	43	43	54	54	
150 mph	130 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43	
			24	54	54	54	54	43	43	43	54	54	54	54	54	
	140 mph	350S162	16	43	43	43	54	54	54	54	54	54	54	54	54	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	33	33	33	43	43	43	43	43	
			24	54	54	54	54	43	43	43	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	54	54	54	54	68	68	68	68	
			24	68	68	68	68	68	68	68	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

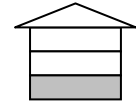
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-14a
Stud Thickness
36-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	54	
			24	68	68	68	97	68	68	68	68	68	68	68	68	68	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	68
90 mph		350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	54	
			24	68	68	68	97	68	68	68	68	68	68	68	68	97	
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
100 mph	85 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	54	
			24	68	68	68	97	68	68	68	68	68	68	68	68	97	
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
110 mph	90 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	54	
			24	68	68	68	97	68	68	68	68	68	68	97	97		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
120 mph	100 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	54	
			24	68	68	68	97	68	68	68	68	97	97	97	97		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
130 mph	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	68	
			24	68	68	68	97	68	68	68	97	97	97	97	97		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
140 mph	120 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68	
			24	68	68	97	97	97	97	97	97	97	97	97	97		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
150 mph	130 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68	
			24	97	97	97	97	97	97	97	97	97	97	97	97		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	54	54	68	68	68	
	140 mph	350S162	16	54	54	54	68	54	54	68	68	68	68	68	68	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-		
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43	54	
			24	68	68	68	68	54	54	54	68	68	68	68	68	68	
	150 mph	350S162	16	54	68	68	68	68	68	68	68	68	97	97	97	97	
			24	97	97	97	97	97	97	97	97	-	-	-	-		
		550S162	16	43	43	43	54	43	43	43	43	43	43	54	54	54	
			24	68	68	68	68	54	54	68	68	68	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

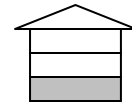
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-14b
Stud Thickness
36-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)													
				8-Foot Studs				9-Foot Studs				10-Foot Studs					
Exp. B	Exp. C			Ground Snow Load (psf)													
				20	30	50	70	20	30	50	70	20	30	50	70		
85 mph		350S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54
90 mph		350S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
100 mph	85 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
110 mph	90 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43	43	
			24	68	68	68	68	54	54	54	68	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
120 mph	100 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43	54	
			24	68	68	68	68	54	54	54	68	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
130 mph	110 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	54	54	54	
			24	68	68	68	68	54	54	68	68	68	68	68	68		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
140 mph	120 mph	350S162	16	43	43	43	54	43	43	43	43	43	54	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
150 mph	130 mph	350S162	16	43	43	43	54	43	43	43	43	43	54	54	54	54	
			24	68	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	68	
			24	68	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68	
			24	68	68	97	97	68	68	97	97	97	97	97	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

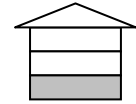
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-15a
Stud Thickness
40-Foot Wide Building Supporting Two Floors, Roof & Ceiling ^{1,2,3}
F_y = 33 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68	68
90 mph		350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
100 mph	85 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
110 mph	90 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
120 mph	100 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
130 mph	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	68	68	
			24	97	97	97	97	68	68	97	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
140 mph	120 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	68
			24	97	97	97	97	97	97	97	97	97	97	97	97	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
150 mph	130 mph	350S162	16	54	54	54	68	68	54	54	68	68	68	68	68	
			24	97	97	97	97	97	97	97	97	97	97	-	-	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
	140 mph	350S162	16	54	54	68	68	68	68	68	68	68	68	68	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
	150 mph	350S162	16	68	68	68	68	68	68	68	68	68	97	97	97	97
			24	97	97	97	97	97	97	97	97	-	-	-	-	
		550S162	16	54	54	54	54	43	43	54	54	54	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

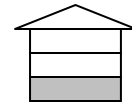
Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-15b
Stud Thickness
40-Foot Wide Building Supporting Two Floors, Roof & Ceiling^{1,2,3}
F_y = 50 ksi



Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)												
				8-Foot Studs				9-Foot Studs				10-Foot Studs				
Exp. B	Exp. C			Ground Snow Load (psf)												
				20	30	50	70	20	30	50	70	20	30	50	70	
85 mph		350S162	16	54	54	54	54	43	43	43	43	43	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54	54
90 mph		350S162	16	54	54	54	54	43	43	43	43	43	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
100 mph	85 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
110 mph	90 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
120 mph	100 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
130 mph	110 mph	350S162	16	54	54	54	54	43	43	43	43	54	54	54	54	
			24	68	68	68	68	68	68	68	68	68	68	97		
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
140 mph	120 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
150 mph	130 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	68	
			24	68	68	68	68	68	68	68	68	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
	140 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	
			24	68	68	68	97	68	68	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	54	
	150 mph	350S162	16	54	54	54	54	54	54	54	54	54	68	68	68	
			24	68	97	97	97	97	97	97	97	97	97	97	97	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	54	54	54	54	54	68	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Top and middle floor dead load is 10 psf (0.48 kN/m²)

Top floor live load is 30 psf (1.44 kN/m²)

Middle floor live load is 40 psf (1.92 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-16a
Stud Thickness
All Building Widths
Gable Endwalls 8, 9 or 10 Feet in Height ^{1,2,3}
 $F_y = 33$ ksi

Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)		
Exp. B	Exp. C			8-Foot Studs	9-Foot Studs	10-Foot Studs
85 mph		350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
90 mph		350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
100 mph	85 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
110 mph	90 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
120 mph	100 mph	350S162	16	33	33	43
			24	43	43	54
		550S162	16	33	33	33
			24	33	33	33
130 mph	110 mph	350S162	16	33	43	43
			24	43	54	54
		550S162	16	33	33	33
			24	33	33	43
140 mph	120 mph	350S162	16	43	43	54
			24	54	54	68
		550S162	16	33	33	33
			24	33	43	43
150 mph	130 mph	350S162	16	43	54	54
			24	54	68	97
		550S162	16	33	33	43
			24	43	43	54
140 mph	140 mph	350S162	16	43	54	68
			24	68	97	97
		550S162	16	33	43	43
			24	43	54	68
	150 mph	350S162	16	54	68	97
			24	97	97	-
		550S162	16	33	43	54
			24	43	54	68

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Roof and ceiling dead load is 12 psf (0.58 kN/m²)

Ground snow load is 70 psf (3.35 kN/m²)

Floor dead load is 10 psf (0.48 kN/m²)

Floor live load is 40 psf (1.92 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-16b
Stud Thickness
All Building Widths
Gable Endwalls 8, 9 or 10 Feet in Height ^{1,2,3}
F_y = 50 ksi

Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)		
Exp. B	Exp. C			8-Foot Studs	9-Foot Studs	10-Foot Studs
85 mph		350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
90 mph		350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
100 mph	85 mph	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
110 mph	90 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
120 mph	100 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
130 mph	110 mph	350S162	16	33	33	33
			24	33	43	54
		550S162	16	33	33	33
			24	33	33	33
140 mph	120 mph	350S162	16	33	33	43
			24	43	43	68
		550S162	16	33	33	33
			24	33	33	43
150 mph	130 mph	350S162	16	33	43	54
			24	43	54	68
		550S162	16	33	33	33
			24	33	33	43
150 mph	140 mph	350S162	16	43	43	54
			24	54	68	97
		550S162	16	33	33	33
			24	33	43	54
	150 mph	350S162	16	43	54	68
			24	54	68	97
		550S162	16	33	33	43
			24	43	43	54

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Roof and ceiling dead load is 12 psf (0.58 kN/m²)

Ground snow load is 70 psf (3.35 kN/m²)

Floor dead load is 10 psf (0.48 kN/m²)

Floor live load is 40 psf (1.92 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

33
KSI

Table E3-17a
Stud Thickness
All Building Widths
Gable Endwalls Over 10 Feet in Height ^{1,2,3}
F_y = 33 ksi

Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)					
Exp. B	Exp. C			Stud Height, h (feet)					
				10 < h ≤ 12	12 < h ≤ 14	14 < h ≤ 16	16 < h ≤ 18	18 < h ≤ 20	20 < h ≤ 22
85 mph		350S162	16	33	43	54	97	-	-
			24	43	54	97	-	-	
		550S162	16	33	33	33	43	43	54
			24	33	33	43	54	68	97
90 mph		350S162	16	33	43	68	97	-	-
			24	43	68	97	-	-	
		550S162	16	33	33	33	43	54	54
			24	33	33	43	54	68	97
100 mph	85 mph	350S162	16	43	54	97	-	-	-
			24	54	97	-	-	-	-
		550S162	16	33	33	43	54	54	68
			24	33	43	54	68	97	97
110 mph	90 mph	350S162	16	43	68	-	-	-	-
			24	68	-	-	-	-	-
		550S162	16	33	43	43	54	68	97
			24	43	54	68	97	97	-
120 mph	100 mph	350S162	16	54	97	-	-	-	-
			24	97	-	-	-	-	-
		550S162	16	33	43	54	68	97	-
			24	43	68	97	97	-	-
130 mph	110 mph	350S162	16	68	97	-	-	-	-
			24	97	-	-	-	-	-
		550S162	16	43	54	68	97	97	-
			24	54	68	97	-	-	-
140 mph	120 mph	350S162	16	68	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	43	54	97	97	-	-
			24	68	97	97	-	-	-
150 mph	130 mph	350S162	16	97	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	54	68	97	97	-	-
			24	97	97	-	-	-	-
	140 mph	350S162	16	97	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	68	97	97	-	-	-
			24	97	97	-	-	-	-
	150 mph	350S162	16	-	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	68	97	-	-	-	-
			24	97	-	-	-	-	-

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Ground snow load is 70 psf (3.35 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

50
KSI

Table E3-17b
Stud Thickness
All Building Widths
Gable Endwalls Over 10 Feet in Height ^{1,2,3}
F_y = 50 ksi

Wind Speed		Member Size	Stud Spacing (inch)	Minimum Stud Thickness (Mils)					
Exp. B	Exp. C			Stud Height, h (feet)					
				10 < h ≤ 12	12 < h ≤ 14	14 < h ≤ 16	16 < h ≤ 18	18 < h ≤ 20	20 < h ≤ 22
85 mph		350S162	16	33	43	54	97	-	-
			24	33	54	97	-	-	-
		550S162	16	33	33	33	33	43	54
			24	33	33	33	43	54	97
90 mph		350S162	16	33	43	68	97	-	-
			24	43	68	97	-	-	-
		550S162	16	33	33	33	33	43	54
			24	33	33	43	43	68	97
100 mph	85 mph	350S162	16	33	54	97	-	-	-
			24	54	97	-	-	-	-
		550S162	16	33	33	33	43	54	68
			24	33	33	43	54	97	97
110 mph	90 mph	350S162	16	43	68	-	-	-	-
			24	68	-	-	-	-	-
		550S162	16	33	33	43	43	68	97
			24	33	43	54	68	97	-
120 mph	100 mph	350S162	16	54	97	-	-	-	-
			24	97	-	-	-	-	-
		550S162	16	33	33	43	54	97	-
			24	43	54	54	97	-	-
130 mph	110 mph	350S162	16	54	97	-	-	-	-
			24	97	-	-	-	-	-
		550S162	16	33	43	54	68	97	-
			24	43	54	68	97	-	-
140 mph	120 mph	350S162	16	68	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	43	43	54	97	-	-
			24	54	54	97	-	-	-
150 mph	130 mph	350S162	16	97	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	43	54	68	97	-	-
			24	54	68	97	-	-	-
	140 mph	350S162	16	97	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	43	54	97	-	-	-
			24	68	68	-	-	-	
	150 mph	350S162	16	-	-	-	-	-	-
			24	-	-	-	-	-	-
		550S162	16	54	68	97	-	-	-
			24	68	97	-	-	-	-

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Deflection criteria: L/240

² Design load assumptions:

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Ground snow load is 70 psf (3.35 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the wall studs.

Table E3-18
Wall Fastening Schedule

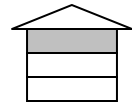
Connection	Number & Type of Fasteners	Spacing of Fasteners
<i>Stud</i> to top or bottom <i>track</i>	2 No.8 screws	Each end of <i>stud</i> , one per <i>flange</i>
<i>Structural sheathing</i> (oriented strand board or plywood) to framing	No.8 screws ¹	6" on edges 12" on intermediate supports
1/2" Gypsum board to framing	No.6 screws	12" o.c.

For SI: 1 inch = 25.4 mm

¹ Screws for attachment of *structural sheathing* panels are to be bugle-head, flat-head, or similar head styles with a minimum head diameter of 0.29 inches (8 mm).

33
KSI

Table E7-1a
Box-Beam Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	3'-3"	2'-8"	2'-2"	-	-	2'-8"	2'-2"	-	-	-
2-350S162-43	4'-2"	3'-9"	3'-4"	2'-11"	2'-7"	3'-9"	3'-4"	2'-11"	2'-7"	2'-2"
2-350S162-54	5'-0"	4'-6"	4'-1"	3'-8"	3'-4"	4'-6"	4'-1"	3'-8"	3'-3"	3'-0"
2-350S162-68	5'-7"	5'-1"	4'-7"	4'-3"	3'-10"	5'-1"	4'-7"	4'-2"	3'-10"	3'-5"
2-350S162-97	7'-1"	6'-6"	6'-1"	5'-8"	5'-3"	6'-7"	6'-1"	5'-7"	5'-3"	4'-11"
2-550S162-33	4'-8"	4'-0"	3'-6"	3'-0"	2'-6"	4'-1"	3'-6"	3'-0"	2'-6"	-
2-550S162-43	6'-0"	5'-4"	4'-10"	4'-4"	3'-11"	5'-5"	4'-10"	4'-4"	3'-10"	3'-5"
2-550S162-54	7'-0"	6'-4"	5'-9"	5'-4"	4'-10"	6'-5"	5'-9"	5'-3"	4'-10"	4'-5"
2-550S162-68	8'-0"	7'-4"	6'-9"	6'-3"	5'-10"	7'-5"	6'-9"	6'-3"	5'-9"	5'-4"
2-550S162-97	9'-11"	9'-2"	8'-6"	8'-0"	7'-6"	9'-3"	8'-6"	8'-0"	7'-5"	7'-0"
2-800S162-33	4'-5"	3'-11"	3'-5"	3'-1"	2'-10"	3'-11"	3'-6"	3'-1"	2'-9"	2'-3"
2-800S162-43	7'-3"	6'-7"	5'-11"	5'-4"	4'-10"	6'-7"	5'-11"	5'-4"	4'-9"	4'-3"
2-800S162-54	8'-10"	8'-0"	7'-4"	6'-9"	6'-2"	8'-1"	7'-4"	6'-8"	6'-1"	5'-7"
2-800S162-68	10'-5"	9'-7"	8'-10"	8'-2"	7'-7"	9'-8"	8'-10"	8'-1"	7'-6"	7'-0"
2-800S162-97	13'-1"	12'-1"	11'-3"	10'-7"	10'-0"	12'-2"	11'-4"	10'-6"	10'-0"	9'-4"
2-1000S162-43	7'-10"	6'-10"	6'-1"	5'-6"	5'-0"	6'-11"	6'-1"	5'-5"	4'-11"	4'-6"
2-1000S162-54	10'-0"	9'-1"	8'-3"	7'-7"	7'-0"	9'-2"	8'-4"	7'-7"	6'-11"	6'-4"
2-1000S162-68	11'-11"	10'-11"	10'-1"	9'-4"	8'-8"	11'-0"	10'-1"	9'-3"	8'-7"	8'-0"
2-1000S162-97	15'-3"	14'-3"	13'-5"	12'-6"	11'-10"	14'-4"	13'-5"	12'-6"	11'-9"	11'-0"
2-1200S162-54	11'-1"	10'-0"	9'-2"	8'-5"	7'-9"	10'-1"	9'-2"	8'-4"	7'-7"	7'-0"
2-1200S162-68	13'-3"	12'-1"	11'-2"	10'-4"	9'-7"	12'-3"	11'-2"	10'-3"	9'-6"	8'-10"
2-1200S162-97	16'-8"	15'-7"	14'-8"	13'-11"	13'-3"	15'-8"	14'-8"	13'-11"	13'-2"	12'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

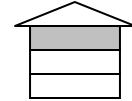
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-1b
Box-Beam Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
 $F_y = 50$ ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	4'-4"	3'-11"	3'-6"	3'-2"	2'-10"	3'-11"	3'-6"	3'-1"	2'-9"	2'-5"
2-350S162-43	5'-6"	5'-0"	4'-7"	4'-2"	3'-10"	5'-0"	4'-7"	4'-2"	3'-10"	3'-6"
2-350S162-54	6'-2"	5'-10"	5'-8"	5'-3"	4'-10"	5'-11"	5'-8"	5'-2"	4'-10"	4'-6"
2-350S162-68	6'-7"	6'-3"	6'-0"	5'-10"	5'-8"	6'-4"	6'-1"	5'-10"	5'-8"	5'-6"
2-350S162-97	7'-3"	6'-11"	6'-8"	6'-5"	6'-3"	7'-0"	6'-8"	6'-5"	6'-3"	6'-0"
2-550S162-33	6'-2"	5'-6"	5'-0"	4'-7"	4'-2"	5'-7"	5'-0"	4'-6"	4'-1"	3'-8"
2-550S162-43	7'-9"	7'-2"	6'-7"	6'-1"	5'-8"	7'-3"	6'-7"	6'-1"	5'-7"	5'-2"
2-550S162-54	8'-9"	8'-5"	8'-1"	7'-9"	7'-3"	8'-6"	8'-1"	7'-8"	7'-2"	6'-8"
2-550S162-68	9'-5"	9'-0"	8'-8"	8'-4"	8'-1"	9'-1"	8'-8"	8'-4"	8'-1"	7'-10"
2-550S162-97	10'-5"	10'-0"	9'-7"	9'-3"	9'-0"	10'-0"	9'-7"	9'-3"	8'-11"	8'-8"
2-800S162-33	4'-5"	3'-11"	3'-5"	3'-1"	2'-10"	3'-11"	3'-6"	3'-1"	2'-9"	2'-6"
2-800S162-43	9'-1"	8'-5"	7'-8"	6'-11"	6'-3"	8'-6"	7'-8"	6'-10"	6'-2"	5'-8"
2-800S162-54	10'-10"	10'-2"	9'-7"	9'-0"	8'-5"	10'-2"	9'-7"	8'-11"	8'-4"	7'-9"
2-800S162-68	12'-8"	11'-10"	11'-2"	10'-7"	10'-1"	11'-11"	11'-2"	10'-7"	10'-0"	9'-6"
2-800S162-97	14'-2"	13'-6"	13'-0"	12'-7"	12'-2"	13'-8"	13'-1"	12'-7"	12'-2"	11'-9"
2-1000S162-43	7'-10"	6'-10"	6'-1"	5'-6"	5'-0"	6'-11"	6'-1"	5'-5"	4'-11"	4'-6"
2-1000S162-54	12'-3"	11'-5"	10'-9"	10'-2"	9'-6"	11'-6"	10'-9"	10'-1"	9'-5"	8'-9"
2-1000S162-68	14'-5"	13'-5"	12'-8"	12'-0"	11'-6"	13'-6"	12'-8"	12'-0"	11'-5"	10'-10"
2-1000S162-97	17'-1"	16'-4"	15'-8"	14'-11"	14'-3"	16'-5"	15'-9"	14'-10"	14'-1"	13'-6"
2-1200S162-54	12'-11"	11'-3"	10'-0"	9'-0"	8'-2"	11'-5"	10'-0"	9'-0"	8'-1"	7'-4"
2-1200S162-68	15'-11"	14'-10"	14'-0"	13'-4"	12'-8"	15'-0"	14'-0"	13'-3"	12'-7"	11'-11"
2-1200S162-97	19'-11"	18'-7"	17'-6"	16'-8"	15'-10"	18'-9"	17'-7"	16'-7"	15'-9"	15'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

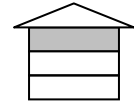
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-2a
Box-Beam Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-4"	-	-	-	-	-	-	-	-	-
2-350S162-54	3'-1"	2'-8"	2'-3"	-	-	2'-1"	-	-	-	-
2-350S162-68	3'-7"	3'-2"	2'-8"	2'-3"	-	2'-6"	-	-	-	-
2-350S162-97	5'-1"	4'-7"	4'-3"	3'-11"	3'-7"	4'-1"	3'-8"	3'-4"	3'-0"	2'-8"
2-550S162-33	2'-2"	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-8"	3'-1"	2'-6"	-	-	2'-3"	-	-	-	-
2-550S162-54	4'-7"	4'-0"	3'-6"	3'-0"	2'-6"	3'-3"	2'-8"	2'-1"	-	-
2-550S162-68	5'-6"	4'-11"	4'-5"	3'-11"	3'-6"	4'-3"	3'-8"	3'-1"	2'-7"	2'-1"
2-550S162-97	7'-3"	6'-7"	6'-1"	5'-8"	5'-3"	5'-11"	5'-4"	4'-11"	4'-6"	4'-1"
2-800S162-33	2'-7"	-	-	-	-	-	-	-	-	-
2-800S162-43	4'-6"	3'-9"	3'-1"	2'-5"	-	2'-10"	-	-	-	-
2-800S162-54	5'-10"	5'-1"	4'-6"	3'-11"	3'-4"	4'-3"	3'-6"	2'-9"	-	-
2-800S162-68	7'-2"	6'-6"	5'-10"	5'-3"	4'-8"	5'-7"	4'-10"	4'-2"	3'-7"	2'-11"
2-800S162-97	9'-7"	8'-9"	8'-2"	7'-7"	7'-0"	7'-11"	7'-2"	6'-7"	6'-0"	5'-7"
2-1000S162-43	4'-8"	4'-1"	3'-6"	2'-9"	-	3'-3"	2'-2"	-	-	-
2-1000S162-54	6'-7"	5'-10"	5'-1"	4'-5"	3'-9"	4'-10"	4'-0"	3'-2"	2'-3"	-
2-1000S162-68	8'-3"	7'-5"	6'-8"	6'-0"	5'-5"	6'-5"	5'-7"	4'-9"	4'-1"	3'-5"
2-1000S162-97	11'-4"	10'-5"	9'-8"	9'-0"	8'-5"	9'-5"	8'-6"	7'-10"	7'-2"	6'-7"
2-1200S162-54	7'-3"	6'-5"	5'-7"	4'-10"	4'-2"	5'-4"	4'-4"	3'-5"	2'-5"	-
2-1200S162-68	9'-2"	8'-2"	7'-5"	6'-8"	6'-0"	7'-1"	6'-2"	5'-4"	4'-6"	3'-9"
2-1200S162-97	12'-10"	11'-9"	10'-11"	10'-2"	9'-6"	10'-7"	9'-8"	8'-10"	8'-2"	7'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

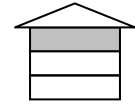
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-2b
Box-Beam Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	2'-7"	2'-2"	-	-	-	-	-	-	-	-
2-350S162-43	3'-8"	3'-3"	2'-10"	2'-6"	2'-1"	2'-8"	2'-3"	-	-	-
2-350S162-54	4'-8"	4'-2"	3'-9"	3'-5"	3'-1"	3'-7"	3'-2"	2'-9"	2'-5"	2'-0"
2-350S162-68	5'-7"	5'-2"	4'-9"	4'-4"	3'-11"	4'-7"	4'-1"	3'-7"	3'-2"	2'-10"
2-350S162-97	6'-2"	5'-11"	5'-8"	5'-6"	5'-4"	5'-8"	5'-5"	5'-3"	4'-11"	4'-7"
2-550S162-33	3'-11"	3'-4"	2'-10"	2'-4"	-	2'-7"	-	-	-	-
2-550S162-43	5'-4"	4'-10"	4'-4"	3'-10"	3'-5"	4'-2"	3'-7"	3'-1"	2'-7"	2'-1"
2-550S162-54	6'-11"	6'-3"	5'-9"	5'-3"	4'-9"	5'-6"	4'-11"	4'-5"	3'-11"	3'-5"
2-550S162-68	8'-0"	7'-6"	6'-11"	6'-5"	5'-11"	6'-9"	6'-1"	5'-6"	5'-0"	4'-7"
2-550S162-97	8'-11"	8'-6"	8'-2"	7'-11"	7'-8"	8'-1"	7'-9"	7'-6"	7'-1"	6'-7"
2-800S162-33	2'-8"	2'-4"	2'-1"	1'-11"	1'-9"	2'-0"	1'-9"	-	-	-
2-800S162-43	5'-10"	5'-2"	4'-7"	4'-2"	3'-10"	4'-5"	3'-11"	3'-6"	3'-0"	2'-6"
2-800S162-54	8'-0"	7'-3"	6'-8"	6'-1"	5'-7"	6'-5"	5'-9"	5'-1"	4'-7"	4'-0"
2-800S162-68	9'-9"	9'-0"	8'-3"	7'-8"	7'-1"	8'-0"	7'-3"	6'-7"	6'-0"	5'-6"
2-800S162-97	12'-1"	11'-7"	11'-2"	10'-8"	10'-2"	11'-0"	10'-4"	9'-9"	9'-2"	8'-7"
2-1000S162-43	4'-8"	4'-1"	3'-8"	3'-4"	3'-0"	3'-6"	3'-1"	2'-9"	2'-6"	2'-3"
2-1000S162-54	9'-1"	8'-2"	7'-3"	6'-7"	6'-0"	7'-0"	6'-2"	5'-6"	5'-0"	4'-6"
2-1000S162-68	11'-1"	10'-2"	9'-5"	8'-8"	8'-1"	9'-1"	8'-3"	7'-6"	6'-10"	6'-3"
2-1000S162-97	13'-9"	12'-11"	12'-2"	11'-7"	11'-1"	11'-11"	11'-3"	10'-7"	9'-11"	9'-4"
2-1200S162-54	7'-8"	6'-9"	6'-1"	5'-6"	5'-0"	5'-10"	5'-1"	4'-7"	4'-1"	3'-9"
2-1200S162-68	12'-3"	11'-3"	10'-4"	9'-7"	8'-11"	10'-1"	9'-1"	8'-3"	7'-6"	6'-10"
2-1200S162-97	15'-4"	14'-5"	13'-7"	12'-11"	12'-4"	13'-4"	12'-6"	11'-10"	11'-1"	10'-5"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

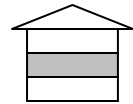
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-3a
Box-Beam Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-2"	-	-	-	-	2'-1"	-	-	-	-
2-350S162-54	2'-11"	2'-5"	-	-	-	2'-10"	2'-4"	-	-	-
2-350S162-68	3'-8"	3'-2"	2'-9"	2'-4"	-	3'-7"	3'-1"	2'-8"	2'-3"	-
2-350S162-97	4'-11"	4'-5"	4'-2"	3'-8"	3'-5"	4'-10"	4'-5"	4'-0"	3'-8"	3'-4"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-5"	2'-9"	2'-1"	-	-	3'-3"	2'-7"	-	-	-
2-550S162-54	4'-4"	3'-9"	3'-2"	2'-7"	2'-1"	4'-3"	3'-7"	3'-1"	2'-6"	-
2-550S162-68	5'-3"	4'-8"	4'-1"	3'-7"	3'-2"	5'-2"	4'-7"	4'-0"	3'-6"	3'-1"
2-550S162-97	7'-0"	6'-5"	5'-10"	5'-5"	5'-0"	6'-11"	6'-4"	5'-9"	5'-4"	4'-11"
2-800S162-33	2'-1"	-	-	-	-	-	-	-	-	-
2-800S162-43	4'-2"	3'-4"	2'-7"	-	-	4'-0"	3'-3"	2'-5"	-	-
2-800S162-54	5'-6"	4'-9"	4'-1"	3'-5"	2'-9"	5'-5"	4'-8"	3'-11"	3'-3"	2'-8"
2-800S162-68	6'-11"	6'-2"	5'-5"	4'-10"	4'-3"	6'-9"	6'-0"	5'-4"	4'-8"	4'-1"
2-800S162-97	9'-4"	8'-6"	7'-10"	7'-3"	6'-8"	9'-2"	8'-4"	7'-8"	7'-1"	6'-7"
2-1000S162-43	4'-4"	3'-9"	2'-11"	-	-	4'-3"	3'-8"	2'-9"	-	-
2-1000S162-54	6'-3"	5'-5"	4'-7"	3'-11"	3'-2"	6'-1"	5'-3"	4'-6"	3'-9"	3'-0"
2-1000S162-68	7'-11"	7'-0"	6'-3"	5'-6"	4'-10"	7'-9"	6'-10"	6'-1"	5'-4"	4'-9"
2-1000S162-97	11'-0"	10'-1"	9'-3"	8'-7"	8'-0"	10'-11"	9'-11"	9'-2"	8'-5"	7'-10"
2-1200S162-54	6'-11"	5'-11"	5'-1"	4'-3"	3'-5"	6'-9"	5'-9"	4'-11"	4'-1"	3'-3"
2-1200S162-68	8'-9"	7'-9"	6'-11"	6'-1"	5'-4"	8'-7"	7'-7"	6'-9"	5'-11"	5'-3"
2-1200S162-97	12'-4"	11'-5"	10'-6"	9'-8"	9'-0"	12'-3"	11'-3"	10'-4"	9'-6"	8'-10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

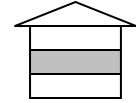
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-3b
Box-Beam Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	2'-4"	-	-	-	-	2'-3"	-	-	-	-
2-350S162-43	3'-4"	2'-11"	2'-6"	2'-1"	-	3'-3"	2'-10"	2'-5"	2'-0"	-
2-350S162-54	4'-4"	3'-10"	3'-5"	3'-1"	2'-9"	4'-3"	2'-9"	3'-4"	3'-0"	2'-8"
2-350S162-68	5'-0"	4'-9"	4'-7"	4'-2"	3'-9"	4'-11"	4'-8"	4'-6"	4'-1"	3'-9"
2-350S162-97	5'-6"	5'-3"	5'-1"	4'-11"	2'-9"	5'-5"	5'-2"	5'-0"	4'-10"	4'-8"
2-550S162-33	3'-6"	2'-11"	2'-4"	-	-	3'-5"	2'-10"	2'-3"	-	-
2-550S162-43	5'-0"	4'-5"	3'-11"	3'-5"	3'-0"	4'-11"	4'-4"	3'-10"	3'-4"	2'-11"
2-550S162-54	6'-6"	5'-10"	5'-3"	4'-9"	4'-4"	6'-4"	5'-9"	5'-2"	4'-8"	4'-3"
2-550S162-68	7'-2"	6'-10"	6'-5"	5'-11"	5'-6"	7'-0"	6'-9"	6'-4"	5'-10"	5'-4"
2-550S162-97	7'-11"	7'-7"	7'-3"	7'-0"	6'-10"	7'-9"	7'-5"	7'-2"	6'-11"	6'-9"
2-800S162-33	2'-5"	2'-2"	1'-11"	1'-9"	-	2'-5"	2'-1"	1'-10"	1'-8"	-
2-800S162-43	5'-5"	4'-9"	4'-3"	3'-9"	3'-5"	5'-3"	4'-8"	4'-1"	3'-9"	3'-5"
2-800S162-54	7'-6"	6'-9"	6'-2"	5'-7"	5'-0"	7'-5"	6'-8"	6'-0"	5'-5"	4'-11"
2-800S162-68	9'-3"	8'-5"	7'-8"	7'-1"	6'-6"	9'-1"	8'-3"	7'-7"	7'-0"	6'-5"
2-800S162-97	10'-9"	10'-3"	9'-11"	9'-7"	9'-3"	10'-7"	10'-1"	9'-9"	9'-5"	9'-1"
2-1000S162-43	4'-4"	3'-9"	3'-4"	3'-0"	2'-9"	4'-3"	3'-8"	3'-3"	2'-11"	2'-8"
2-1000S162-54	8'-6"	7'-6"	6'-8"	6'-0"	5'-5"	8'-4"	7'-4"	6'-6"	5'-10"	5'-4"
2-1000S162-68	10'-6"	9'-7"	8'-9"	8'-0"	7'-5"	10'-4"	9'-5"	8'-7"	7'-11"	7'-3"
2-1000S162-97	12'-11"	12'-4"	11'-8"	11'-1"	10'-6"	12'-9"	12'-2"	11'-6"	10'-11"	10'-5"
2-1200S162-54	7'-1"	6'-2"	5'-6"	5'-0"	4'-6"	6'-11"	6'-1"	5'-5"	4'-10"	4'-5"
2-1200S162-68	11'-7"	10'-7"	9'-8"	8'-11"	8'-2"	11'-5"	10'-5"	9'-6"	8'-9"	8'-0"
2-1200S162-97	14'-9"	13'-9"	13'-0"	12'-4"	11'-9"	14'-7"	13'-8"	12'-10"	12'-3"	11'-8"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

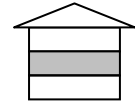
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-4a
Box-Beam Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	-	-	-	-	-	-	-	-	-	-
2-350S162-68	2'-8"	2'-3"	-	-	-	-	-	-	-	-
2-350S162-97	4'-0"	3'-7"	3'-3"	2'-11"	2'-7"	3'-4"	2'-11"	2'-6"	2'-2"	-
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-0"	-	-	-	-	-	-	-	-	-
2-550S162-54	3'-1"	2'-6"	-	-	-	-	-	-	-	-
2-550S162-68	4'-1"	3'-6"	2'-11"	2'-5"	-	3'-1"	2'-5"	-	-	-
2-550S162-97	5'-10"	5'-3"	4'-10"	4'-5"	4'-0"	4'-11"	4'-5"	3'-11"	3'-6"	3'-2"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	2'-6"	-	-	-	-	-	-	-	-	-
2-800S162-54	4'-0"	3'-3"	2'-6"	-	-	2'-8"	-	-	-	-
2-800S162-68	5'-5"	4'-8"	4'-0"	3'-4"	2'-8"	4'-2"	3'-4"	2'-6"	-	-
2-800S162-97	7'-9"	7'-1"	6'-6"	5'-11"	5'-5"	6'-7"	5'-11"	5'-4"	4'-10"	4'-4"
2-1000S162-43	2'-10"	-	-	-	-	-	-	-	-	-
2-1000S162-54	4'-7"	3'-8"	2'-9"	-	-	3'-0"	-	-	-	-
2-1000S162-68	6'-2"	5'-4"	4'-7"	3'-10"	3'-1"	4'-9"	3'-10"	2'-11"	-	-
2-1000S162-97	9'-3"	8'-5"	7'-8"	7'-1"	6'-6"	7'-10"	7'-1"	6'-5"	5'-9"	5'-2"
2-1200S162-54	5'-0"	4'-0"	3'-1"	-	-	3'-4"	-	-	-	-
2-1200S162-68	6'-10"	5'-11"	5'-0"	4'-3"	3'-5"	5'-3"	4'-3"	3'-2"	-	-
2-1200S162-97	10'-5"	9'-6"	8'-8"	8'-0"	7'-4"	8'-10"	8'-0"	7'-3"	6'-6"	5'-10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

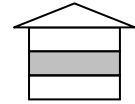
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-4b
Box-Beam Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-6"	-	-	-	-	-	-	-	-	-
2-350S162-54	3'-5"	3'-0"	2'-7"	2'-2"	-	2'-8"	2'-2"	-	-	-
2-350S162-68	4'-6"	4'-1"	3'-8"	3'-3"	2'-11"	3'-9"	3'-3"	2'-10"	2'-5"	2'-1"
2-350S162-97	5'-1"	4'-10"	4'-8"	4'-6"	4'-5"	4'-10"	4'-7"	4'-4"	4'-0"	3'-8"
2-550S162-33	2'-4"	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-10"	3'-4"	2'-9"	2'-3"	-	2'-11"	2'-3"	-	-	-
2-550S162-54	5'-3"	3'-8"	4'-1"	3'-8"	3'-2"	4'-3"	3'-8"	3'-1"	2'-7"	2'-0"
2-550S162-68	6'-5"	5'-10"	5'-3"	4'-9"	4'-4"	5'-5"	4'-9"	4'-3"	3'-9"	3'-4"
2-550S162-97	7'-4"	7'-0"	6'-9"	6'-6"	6'-4"	6'-11"	6'-8"	6'-3"	5'-10"	5'-5"
2-800S162-33	1'-11"	1'-8"	-	-	-	-	-	-	-	-
2-800S162-43	4'-2"	3'-8"	3'-4"	2'-9"	2'-2"	3'-5"	2'-9"	-	-	-
2-800S162-54	6'-1"	5'-5"	4'-10"	4'-3"	3'-9"	4'-11"	4'-3"	3'-8"	3'-0"	2'-5"
2-800S162-68	7'-8"	6'-11"	6'-3"	5'-9"	5'-2"	6'-5"	5'-9"	5'-1"	4'-6"	4'-0"
2-800S162-97	9'-11"	9'-6"	9'-2"	8'-10"	8'-3"	9'-5"	8'-10"	8'-2"	7'-7"	7'-0"
2-1000S162-43	3'-4"	2'-11"	2'-7"	2'-5"	2'-2"	2'-8"	2'-5"	2'-2"	-	-
2-1000S162-54	6'-7"	5'-10"	5'-3"	4'-9"	4'-3"	5'-4"	4'-9"	4'-1"	3'-5"	2'-9"
2-1000S162-68	8'-8"	7'-10"	7'-2"	6'-6"	5'-11"	7'-4"	6'-6"	5'-9"	5'-1"	4'-6"
2-1000S162-97	11'-7"	10'-11"	10'-3"	9'-7"	9'-0"	10'-5"	9'-7"	8'-10"	8'-2"	7'-8"
2-1200S162-54	5'-6"	4'-10"	4'-4"	3'-11"	3'-7"	4'-5"	3'-11"	3'-6"	3'-2"	2'-11"
2-1200S162-68	9'-7"	8'-8"	7'-11"	7'-2"	6'-6"	8'-1"	7'-2"	6'-4"	5'-8"	5'-0"
2-1200S162-97	12'-11"	12'-2"	11'-6"	10'-8"	10'-0"	11'-8"	10'-9"	9'-11"	9'-2"	8'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

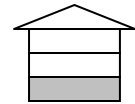
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-5a
Box-Beam Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	-	-	-	-	-	-	-	-	-	-
2-350S162-68	-	-	-	-	-	-	-	-	-	-
2-350S162-97	3'-1"	2'-8"	2'-3"	-	-	3'-1"	2'-7"	2'-2"	-	-
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	-	-	-	-	-	-	-	-	-	-
2-550S162-54	-	-	-	-	-	-	-	-	-	-
2-550S162-68	2'-9"	-	-	-	-	2'-8"	-	-	-	-
2-550S162-97	4'-8"	4'-1"	3'-7"	3'-2"	2'-9"	4'-7"	4'-0"	3'-6"	3'-1"	2'-8"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	-	-	-	-	-	-	-	-	-	-
2-800S162-54	2'-1"	-	-	-	-	-	-	-	-	-
2-800S162-68	3'-8"	2'-9"	-	-	-	3'-7"	2'-8"	-	-	-
2-800S162-97	6'-3"	5'-6"	4'-11"	4'-4"	3'-9"	6'-2"	5'-5"	4'-10"	4'-3"	3'-9"
2-1000S162-43	-	-	-	-	-	-	-	-	-	-
2-1000S162-54	2'-5"	-	-	-	-	2'-3"	-	-	-	-
2-1000S162-68	4'-3"	3'-2"	2'-0"	-	-	4'-2"	3'-1"	-	-	-
2-1000S162-97	7'-5"	6'-7"	5'-10"	5'-2"	4'-7"	7'-4"	6'-6"	5'-9"	5'-1"	4'-6"
2-1200S162-54	2'-7"	-	-	-	-	2'-6"	-	-	-	-
2-1200S162-68	4'-8"	3'-6"	2'-2"	-	-	4'-7"	3'-5"	2'-0"	-	-
2-1200S162-97	8'-5"	7'-5"	6'-7"	5'-10"	5'-2"	8'-3"	7'-4"	6'-6"	5'-9"	5'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

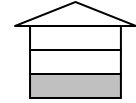
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-5b
Box-Beam Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	2'-5"	-	-	-	-	2'-4"	-	-	-	-
2-350S162-68	3'-6"	3'-0"	2'-6"	2'-1"	-	3'-5"	2'-11"	2'-6"	2'-0"	-
2-350S162-97	4'-9"	4'-6"	4'-1"	3'-8"	3'-4"	4'-8"	4'-5"	4'-0"	3'-8"	3'-4"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-7"	-	-	-	-	2'-6"	-	-	-	-
2-550S162-54	3'-11"	3'-3"	2'-8"	2'-0"	-	3'-10"	3'-3"	2'-7"	-	-
2-550S162-68	5'-1"	4'-5"	3'-10"	3'-3"	2'-9"	5'-0"	4'-4"	3'-9"	3'-3"	2'-9"
2-550S162-97	6'-10"	6'-5"	5'-10"	5'-5"	4'-11"	6'-9"	6'-4"	5'-10"	5'-4"	4'-11"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	3'-1"	2'-3"	-	-	-	3'-0"	2'-2"	-	-	-
2-800S162-54	4'-7"	3'-10"	3'-1"	2'-5"	-	4'-6"	3'-9"	3'-0"	2'-4"	-
2-800S162-68	6'-0"	5'-3"	4'-7"	3'-11"	3'-4"	6'-0"	5'-2"	4'-6"	3'-11"	3'-3"
2-800S162-97	9'-2"	8'-4"	7'-8"	7'-0"	6'-6"	9'-1"	8'-3"	7'-7"	7'-0"	6'-5"
2-1000S162-43	2'-6"	2'-2"	-	-	-	2'-6"	2'-2"	-	-	-
2-1000S162-54	5'-0"	4'-4"	3'-6"	2'-9"	-	4'-11"	4'-3"	3'-5"	2'-7"	-
2-1000S162-68	6'-10"	6'-0"	5'-3"	4'-6"	3'-10"	6'-9"	5'-11"	5'-2"	4'-5"	3'-9"
2-1000S162-97	10'-0"	9'-1"	8'-3"	7'-8"	7'-0"	9'-10"	9'-0"	8'-3"	7'-7"	7'-0"
2-1200S162-54	4'-2"	3'-7"	3'-3"	2'-11"	-	4'-1"	3'-7"	3'-2"	2'-10"	-
2-1200S162-68	7'-7"	6'-7"	5'-9"	5'-0"	4'-2"	7'-6"	6'-6"	5'-8"	4'-10"	4'-1"
2-1200S162-97	11'-2"	10'-1"	9'-3"	8'-6"	7'-10"	11'-0"	10'-0"	9'-2"	8'-5"	7'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

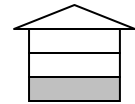
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-6a
Box-Beam Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	-	-	-	-	-	-	-	-	-	-
2-350S162-68	-	-	-	-	-	-	-	-	-	-
2-350S162-97	2'-11"	2'-5"	2'-0"	-	-	2'-7"	2'-2"	-	-	-
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	-	-	-	-	-	-	-	-	-	-
2-550S162-54	-	-	-	-	-	-	-	-	-	-
2-550S162-68	2'-5"	-	-	-	-	-	-	-	-	-
2-550S162-97	4'-4"	3'-10"	3'-4"	2'-10"	2'-5"	4'-0"	3'-6"	3'-1"	2'-7"	2'-2"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	-	-	-	-	-	-	-	-	-	-
2-800S162-54	-	-	-	-	-	-	-	-	-	-
2-800S162-68	3'-3"	2'-3"	-	-	-	2'-8"	-	-	-	-
2-800S162-97	5'-11"	5'-2"	4'-6"	4'-0"	3'-5"	5'-6"	4'-10"	4'-3"	3'-8"	3'-2"
2-1000S162-43	-	-	-	-	-	-	-	-	-	-
2-1000S162-54	-	-	-	-	-	-	-	-	-	-
2-1000S162-68	3'-9"	2'-7"	-	-	-	3'-1"	-	-	-	-
2-1000S162-97	7'-0"	6'-2"	5'-5"	4'-9"	4'-2"	6'-6"	5'-9"	5'-1"	4'-5"	3'-10"
2-1200S162-54	-	-	-	-	-	-	-	-	-	-
2-1200S162-68	4'-2"	2'-10"	-	-	-	3'-5"	2'-0"	-	-	-
2-1200S162-97	7'-11"	7'-0"	6'-2"	5'-5"	4'-8"	7'-4"	6'-6"	5'-9"	5'-0"	4'-4"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

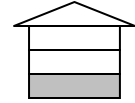
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-6b
Box-Beam Header Spans
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
 $F_y = 50$ ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	2'-2"	-	-	-	-	-	-	-	-	-
2-350S162-68	3'-3"	2'-9"	2'-3"	-	-	2'-11"	2'-5"	-	-	-
2-350S162-97	4'-6"	4'-3"	3'-10"	3'-6"	3'-2"	4'-3"	4'-0"	3'-7"	3'-3"	3'-0"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-3"	-	-	-	-	-	-	-	-	-
2-550S162-54	3'-7"	2'-11"	2'-3"	-	-	3'-3"	2'-7"	-	-	-
2-550S162-68	4'-9"	2'-1"	3'-6"	3'-0"	2'-5"	4'-4"	3'-9"	3'-2"	2'-8"	2'-1"
2-550S162-97	6'-5"	6'-1"	5'-7"	5'-1"	4'-8"	6'-3"	5'-10"	5'-4"	4'-10"	4'-5"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	2'-8"	-	-	-	-	2'-2"	-	-	-	-
2-800S162-54	4'-3"	3'-5"	2'-8"	-	-	3'-9"	3'-0"	2'-3"	-	-
2-800S162-68	5'-8"	4'-11"	4'-2"	3'-7"	2'-11"	5'-3"	4'-6"	3'-10"	3'-3"	2'-7"
2-800S162-97	8'-9"	8'-0"	7'-3"	6'-8"	6'-2"	8'-4"	7'-7"	6'-11"	6'-4"	5'-10"
2-1000S162-43	2'-4"	2'-0"	-	-	-	2'-2"	-	-	-	-
2-1000S162-54	4'-8"	3'-11"	3'-1"	2'-2"	-	4'-3"	3'-5"	2'-7"	-	-
2-1000S162-68	6'-5"	5'-7"	4'-9"	4'-1"	3'-4"	5'-11"	5'-1"	4'-5"	3'-8"	2'-11"
2-1000S162-97	9'-6"	8'-8"	7'-11"	7'-3"	6'-8"	9'-0"	8'-3"	7'-6"	6'-11"	6'-4"
2-1200S162-54	3'-11"	3'-5"	3'-0"	2'-4"	-	3'-7"	3'-2"	2'-10"	-	-
2-1200S162-68	7'-1"	6'-2"	5'-3"	4'-6"	3'-8"	6'-6"	5'-8"	4'-10"	4'-0"	3'-3"
2-1200S162-97	10'-8"	9'-8"	8'-10"	8'-1"	7'-5"	10'-1"	9'-2"	8'-5"	7'-9"	7'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

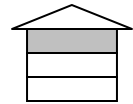
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-7a
Back-to-Back Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	2'-11"	2'-4"	-	-	-	2'-5"	-	-	-	-
2-350S162-43	4'-8"	3'-10"	3'-5"	3'-1"	2'-9"	3'-11"	3'-5"	3'-0"	2'-8"	2'-4"
2-350S162-54	5'-3"	4'-9"	4'-4"	4'-1"	3'-8"	4'-10"	4'-4"	4'-0"	3'-8"	3'-4"
2-350S162-68	6'-1"	5'-7"	5'-2"	4'-10"	4'-6"	5'-8"	5'-3"	4'-10"	4'-6"	4'-2"
2-350S162-97	7'-3"	6'-10"	6'-5"	6'-0"	5'-8"	6'-11"	6'-5"	6'-0"	5'-8"	5'-4"
2-550S162-33	4'-5"	3'-9"	3'-1"	2'-6"	-	3'-9"	3'-2"	2'-6"	-	-
2-550S162-43	6'-2"	5'-7"	5'-0"	4'-7"	4'-2"	5'-7"	5'-0"	4'-6"	4'-1"	3'-8"
2-550S162-54	7'-5"	6'-9"	6'-3"	5'-9"	5'-4"	6'-10"	6'-3"	5'-9"	5'-4"	4'-11"
2-550S162-68	6'-7"	7'-11"	7'-4"	6'-10"	6'-5"	8'-0"	7'-4"	6'-10"	6'-5"	6'-0"
2-550S162-97	10'-5"	9'-8"	9'-0"	8'-6"	8'-0"	9'-9"	9'-0"	8'-6"	8'-0"	7'-7"
2-800S162-33	4'-5"	3'-11"	3'-5"	3'-1"	2'-4"	3'-11"	3'-6"	3'-0"	2'-3"	-
2-800S162-43	7'-7"	6'-10"	6'-2"	5'-8"	5'-2"	6'-11"	6'-2"	5'-7"	5'-1"	4'-7"
2-800S162-54	9'-3"	8'-7"	7'-11"	7'-4"	6'-10"	8'-8"	7'-11"	7'-4"	6'-9"	6'-3"
2-800S162-68	10'-7"	9'-10"	9'-4"	8'-10"	8'-5"	9'-11"	9'-4"	8'-10"	8'-4"	7'-11"
2-800S162-97	13'-9"	12'-9"	12'-0"	11'-3"	10'-8"	12'-10"	12'-0"	11'-3"	10'-7"	10'-0"
2-1000S162-43	7'-10"	6'-10"	6'-1"	5'-6"	5'-0"	6'-11"	6'-1"	5'-5"	4'-11"	4'-6"
2-1000S162-54	10'-5"	9'-9"	9'-0"	8'-4"	7'-9"	9'-10"	9'-0"	8'-4"	7'-9"	7'-2"
2-1000S162-68	12'-1"	11'-3"	10'-8"	10'-1"	9'-7"	11'-4"	10'-8"	10'-1"	9'-7"	9'-1"
2-1000S162-97	15'-3"	14'-3"	13'-5"	12'-9"	12'-2"	14'-4"	13'-5"	12'-8"	12'-1"	11'-6"
2-1200S162-54	11'-6"	10'-9"	10'-0"	9'-0"	8'-2"	10'-10"	10'-0"	9'-0"	8'-1"	7'-4"
2-1200S162-68	13'-4"	12'-6"	11'-9"	11'-2"	10'-8"	12'-7"	11'-10"	11'-2"	10'-7"	10'-1"
2-1200S162-97	16'-8"	15'-7"	14'-8"	13'-11"	13'-3"	15'-8"	14'-8"	13'-11"	13'-2"	12'-7"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

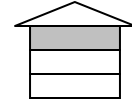
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-7b
Back-to-Back Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	4'-2"	3'-8"	3'-3"	2'-10"	2'-6"	3'-8"	3'-3"	2'-10"	2'-5"	2'-1"
2-350S162-43	5'-5"	5'-0"	4'-6"	4'-2"	3'-10"	5'-0"	4'-7"	4'-2"	3'-10"	3'-6"
2-350S162-54	6'-2"	5'-10"	5'-8"	5'-4"	5'-0"	5'-11"	5'-8"	5'-4"	5'-0"	4'-8"
2-350S162-68	6'-7"	6'-3"	6'-0"	5'-10"	5'-8"	6'-4"	6'-1"	5'-10"	5'-8"	5'-6"
2-350S162-97	7'-3"	6'-11"	6'-8"	6'-5"	6'-3"	7'-0"	6'-8"	6'-5"	6'-3"	6'-0"
2-550S162-33	5'-10"	5'-3"	4'-8"	4'-3"	3'-9"	5'-3"	4'-9"	4'-2"	3'-9"	3'-3"
2-550S162-43	7'-9"	7'-2"	6'-7"	6'-1"	5'-8"	7'-3"	6'-7"	6'-1"	5'-8"	5'-3"
2-550S162-54	8'-9"	8'-5"	8'-1"	7'-9"	7'-5"	8'-6"	8'-1"	7'-9"	7'-5"	6'-11"
2-550S162-68	9'-5"	9'-0"	8'-8"	8'-4"	8'-1"	9'-1"	8'-8"	8'-4"	8'-1"	7'-10"
2-550S162-97	10'-5"	10'-0"	9'-7"	9'-3"	9'-0"	10'-0"	9'-7"	9'-3"	8'-11"	8'-8"
2-800S162-33	4'-5"	3'-11"	3'-5"	3'-1"	2'-10"	3'-11"	3'-6"	3'-1"	2'-9"	2'-6"
2-800S162-43	9'-1"	8'-5"	7'-8"	6'-11"	6'-3"	8'-6"	7'-8"	6'-10"	6'-2"	5'-8"
2-800S162-54	10'-10"	10'-2"	9'-7"	9'-1"	8'-8"	10'-2"	9'-7"	9'-0"	8'-7"	8'-1"
2-800S162-68	12'-8"	11'-10"	11'-2"	10'-7"	10'-1"	11'-11"	11'-2"	10'-7"	10'-0"	9'-7"
2-800S162-97	14'-2"	13'-6"	13'-0"	12'-7"	12'-2"	13'-8"	13'-1"	12'-7"	12'-2"	11'-9"
2-1000S162-43	7'-10"	6'-10"	6'-1"	5'-6"	5'-0"	6'-11"	6'-1"	5'-5"	4'-11"	4'-6"
2-1000S162-54	12'-3"	11'-5"	10'-9"	10'-3"	9'-9"	11'-6"	10'-9"	10'-2"	9'-8"	8'-11"
2-1000S162-68	14'-5"	13'-5"	12'-8"	12'-0"	11'-6"	13'-6"	12'-8"	12'-0"	11'-5"	10'-11"
2-1000S162-97	17'-1"	16'-4"	15'-8"	14'-11"	14'-3"	16'-5"	15'-9"	14'-10"	14'-1"	13'-6"
2-1200S162-54	12'-11"	11'-3"	10'-0"	9'-0"	8'-2"	11'-5"	10'-0"	9'-0"	8'-1"	7'-4"
2-1200S162-68	15'-11"	14'-10"	14'-0"	13'-4"	12'-8"	15'-0"	14'-0"	13'-3"	12'-7"	12'-0"
2-1200S162-97	19'-11"	18'-7"	17'-6"	16'-8"	15'-10"	18'-9"	17'-7"	16'-7"	15'-9"	15'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

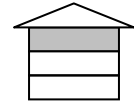
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-8a
Back-to-Back Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-6"	-	-	-	-	-	-	-	-	-
2-350S162-54	3'-6"	3'-1"	2'-8"	2'-4"	2'-0"	2'-7"	2'-1"	-	-	-
2-350S162-68	4'-4"	3'-11"	3'-7"	3'-3"	2'-11"	3'-5"	3'-0"	2'-8"	2'-4"	2'-1"
2-350S162-97	5'-5"	5'-0"	4'-8"	4'-6"	4'-1"	4'-6"	4'-2"	3'-10"	3'-6"	3'-3"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-10"	3'-3"	2'-9"	2'-2"	-	2'-6"	-	-	-	-
2-550S162-54	5'-1"	4'-7"	4'-1"	3'-8"	3'-4"	3'-11"	3'-5"	2'-11"	2'-6"	2'-0"
2-550S162-68	6'-2"	5'-8"	5'-2"	4'-9"	4'-5"	5'-0"	4'-6"	4'-1"	3'-9"	3'-4"
2-550S162-97	7'-9"	7'-2"	6'-8"	6'-3"	5'-11"	6'-6"	6'-0"	5'-7"	5'-2"	4'-10"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	4'-10"	4'-1"	3'-6"	2'-11"	2'-3"	3'-3"	2'-5"	-	-	-
2-800S162-54	6'-6"	5'-10"	5'-3"	4'-9"	4'-4"	5'-1"	4'-6"	3'-11"	3'-4"	2'-10"
2-800S162-68	8'-1"	7'-5"	6'-10"	6'-4"	5'-11"	6'-8"	6'-1"	5'-6"	5'-0"	4'-7"
2-800S162-97	10'-3"	9'-7"	8'-11"	8'-5"	7'-11"	8'-8"	8'-0"	7'-6"	7'-0"	6'-7"
2-1000S162-43	4'-8"	4'-1"	3'-8"	3'-4"	2'-8"	3'-6"	2'-10"	-	-	-
2-1000S162-54	7'-5"	6'-8"	6'-1"	5'-6"	5'-0"	5'-10"	5'-1"	4'-6"	3'-11"	3'-4"
2-1000S162-68	9'-4"	8'-7"	7'-11"	7'-4"	6'-10"	7'-8"	7'-0"	6'-4"	5'-10"	5'-4"
2-1000S162-97	11'-9"	11'-0"	10'-5"	9'-11"	9'-5"	10'-3"	9'-7"	8'-11"	8'-4"	7'-10"
2-1200S162-54	7'-8"	6'-9"	6'-1"	5'-6"	5'-0"	5'-10"	5'-1"	4'-7"	4'-1"	3'-9"
2-1200S162-68	10'-4"	9'-6"	8'-10"	8'-2"	7'-7"	8'-7"	7'-9"	7'-1"	6'-6"	6'-0"
2-1200S162-97	12'-10"	12'-1"	11'-5"	10'-10"	10'-4"	11'-2"	10'-6"	9'-11"	9'-5"	9'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

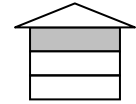
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-8b
Back-to-Back Header Spans
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	2'-3"	-	-	-	-	-	-	-	-	-
2-350S162-43	3'-8"	3'-3"	2'-10"	2'-6"	2'-2"	2'-8"	2'-3"	-	-	-
2-350S162-54	4'-9"	4'-4"	4'-0"	3'-8"	3'-8"	3'-10"	3'-5"	3'-1"	2'-9"	2'-5"
2-350S162-68	5'-7"	5'-4"	5'-2"	4'-11"	4'-7"	5'-1"	4'-8"	4'-3"	3'-11"	3'-8"
2-350S162-97	6'-2"	5'-11"	5'-8"	5'-6"	5'-4"	5'-8"	5'-5"	5'-3"	5'-0"	4'-11"
2-550S162-33	3'-6"	2'-10"	2'-3"	-	-	2'-0"	-	-	-	-
2-550S162-43	5'-5"	4'-10"	4'-4"	3'-11"	3'-6"	4'-2"	3'-8"	3'-2"	2'-8"	2'-3"
2-550S162-54	7'-2"	6'-6"	6'-0"	5'-7"	5'-2"	5'-10"	5'-3"	4'-10"	4'-5"	4'-0"
2-550S162-68	8'-0"	7'-8"	7'-3"	6'-11"	6'-6"	7'-2"	6'-7"	6'-1"	5'-8"	5'-4"
2-550S162-97	8'-11"	8'-6"	8'-2"	7'-11"	7'-8"	8'-1"	7'-9"	7'-6"	7'-2"	6'-11"
2-800S162-33	2'-8"	2'-4"	2'-1"	1'-11"	-	2'-0"	-	-	-	-
2-800S162-43	5'-10"	5'-2"	4'-7"	4'-2"	3'-10"	4'-5"	3'-11"	3'-6"	3'-2"	2'-9"
2-800S162-54	8'-4"	7'-8"	7'-1"	6'-7"	6'-1"	6'-10"	6'-3"	5'-8"	5'-2"	4'-9"
2-800S162-68	9'-9"	9'-2"	8'-8"	8'-3"	7'-10"	8'-6"	7'-11"	7'-4"	6'-10"	6'-5"
2-800S162-97	12'-1"	11'-7"	11'-2"	10'-8"	10'-2"	11'-0"	10'-4"	9'-9"	9'-3"	8'-10"
2-1000S162-43	4'-8"	4'-1"	2'-8"	3'-4"	3'-0"	3'-6"	10'-1"	2'-9"	2'-6"	2'-3"
2-1000S162-54	9'-3"	8'-2"	7'-3"	6'-7"	6'-0"	7'-0"	6'-2"	5'-6"	5'-0"	4'-6"
2-1000S162-68	11'-1"	10'-5"	9'-10"	9'-4"	8'-11"	9'-8"	9'-1"	8'-5"	7'-10"	7'-4"
2-1000S162-97	13'-9"	12'-11"	12'-2"	11'-7"	11'-1"	11'-11"	11'-3"	10'-7"	10'-1"	9'-7"
2-1200S162-54	7'-8"	6'-9"	6'-1"	5'-6"	5'-0"	5'-10"	5'-1"	4'-7"	4'-1"	3'-9"
2-1200S162-68	12'-3"	11'-6"	10'-11"	10'-4"	9'-11"	10'-8"	10'-0"	9'-2"	8'-4"	7'-7"
2-1200S162-97	15'-4"	14'-5"	13'-7"	12'-11"	12'-4"	13'-4"	12'-6"	11'-10"	11'-3"	10'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

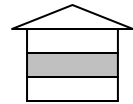
¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions: Roof/ceiling dead load is 12 psf (0.58 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-9a
Back-to-Back Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-2"	-	-	-	-	2'-1"	-	-	-	-
2-350S162-54	3'-3"	2'-9"	2'-5"	2'-0"	-	3'-2"	2'-9"	2'-4"	-	-
2-350S162-68	4'-4"	3'-8"	3'-3"	2'-11"	2'-8"	4'-0"	3'-7"	3'-2"	2'-11"	2'-7"
2-350S162-97	5'-2"	4'-9"	4'-4"	4'-1"	3'-9"	5'-1"	4'-8"	4'-4"	4'-0"	3'-9"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-6"	2'-10"	2'-3"	-	-	3'-5"	2'-9"	2'-2"	-	-
2-550S162-54	4'-9"	4'-2"	3'-9"	3'-3"	2'-10"	4'-8"	4'-1"	3'-8"	3'-2"	2'-9"
2-550S162-68	5'-10"	5'-3"	4'-10"	4'-5"	4'-1"	5'-9"	5'-3"	4'-9"	4'-4"	4'-0"
2-550S162-97	7'-4"	6'-9"	6'-4"	5'-11"	5'-6"	7'-3"	6'-9"	6'-3"	5'-10"	5'-5"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	4'-4"	3'-8"	2'-11"	2'-3"	-	4'-3"	3'-6"	2'-10"	2'-1"	-
2-800S162-54	6'-1"	5'-5"	4'-10"	4'-4"	3'-10"	6'-0"	5'-4"	4'-9"	4'-3"	3'-9"
2-800S162-68	7'-8"	7'-0"	6'-5"	5'-11"	5'-5"	7'-7"	6'-11"	6'-4"	5'-10"	5'-4"
2-800S162-97	9'-10"	9'-1"	8'-5"	7'-11"	7'-5"	9'-8"	8'-11"	8'-4"	7'-10"	7'-4"
2-1000S162-43	4'-4"	3'-9"	3'-4"	2'-8"	-	4'-3"	3'-8"	3'-3"	2'-6"	-
2-1000S162-54	6'-11"	6'-2"	5'-6"	5'-0"	4'-5"	6'-10"	6'-1"	5'-5"	4'-10"	4'-4"
2-1000S162-68	8'-10"	8'-1"	7'-5"	6'-10"	6'-4"	8'-8"	7'-11"	7'-3"	6'-8"	6'-2"
2-1000S162-97	11'-3"	10'-7"	9'-11"	9'-5"	8'-10"	11'-2"	10'-5"	9'-10"	9'-3"	8'-9"
2-1200S162-54	7'-1"	6'-2"	5'-6"	5'-0"	4'-6"	6'-11"	6'-1"	5'-5"	4'-10"	4'-5"
2-1200S162-68	9'-10"	9'-0"	8'-3"	7'-7"	7'-0"	9'-8"	8'-10"	8'-1"	7'-6"	6'-11"
2-1200S162-97	12'-4"	11'-7"	10'-11"	10'-4"	9'-10"	12'-3"	11'-5"	10'-9"	10'-3"	9'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

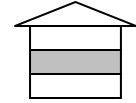
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-9b
Back-to-Back Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	3'-4"	2'-11"	2'-6"	2'-2"	-	3'-3"	2'-10"	2'-5"	2'-1"	-
2-350S162-54	4'-6"	4'-1"	3'-8"	3'-4"	3'-0"	4'-5"	4'-0"	3'-7"	3'-3"	2'-11"
2-350S162-68	5'-0"	4'-9"	4'-7"	4'-5"	4'-3"	4'-11"	4'-8"	4'-6"	4'-4"	4'-2"
2-350S162-97	5'-6"	5'-3"	5'-1"	4'-11"	4'-9"	5'-5"	5'-2"	5'-0"	4'-10"	4'-8"
2-550S162-33	3'-1"	2'-5"	-	-	-	3'-0"	2'-3"	-	-	-
2-550S162-43	5'-1"	4'-6"	4'-0"	3'-6"	3'-1"	4'-11"	4'-5"	3'-11"	3'-5"	3'-0"
2-550S162-54	6'-8"	6'-2"	5'-7"	5'-2"	4'-9"	6'-6"	6'-0"	5'-6"	5'-1"	4'-8"
2-550S162-68	7'-2"	6'-10"	6'-7"	6'-4"	6'-1"	7'-0"	6'-9"	6'-6"	6'-3"	6'-0"
2-550S162-97	7'-11"	7'-7"	7'-3"	7'-0"	6'-10"	7'-9"	7'-5"	7'-2"	6'-11"	6'-9"
2-800S162-33	2'-5"	2'-2"	1'-11"	-	-	2'-5"	2'-1"	1'-10"	-	-
2-800S162-43	5'-5"	4'-9"	4'-3"	3'-9"	3'-5"	5'-3"	4'-8"	4'-1"	3'-9"	3'-5"
2-800S162-54	7'-11"	7'-2"	6'-7"	6'-1"	5'-7"	7'-9"	7'-1"	6'-6"	6'-0"	5'-6"
2-800S162-68	9'-5"	8'-9"	8'-3"	7'-9"	7'-4"	9'-3"	8'-8"	8'-2"	7'-8"	7'-3"
2-800S162-97	10'-9"	10'-3"	9'-11"	9'-7"	9'-3"	10'-7"	10'-1"	9'-9"	9'-5"	9'-1"
2-1000S162-43	4'-4"	3'-9"	3'-4"	3'-0"	2'-9"	4'-3"	3'-8"	3'-3"	2'-11"	2'-8"
2-1000S162-54	8'-6"	7'-5"	6'-8"	6'-0"	5'-5"	8'-4"	7'-4"	6'-6"	5'-10"	5'-4"
2-1000S162-68	10'-8"	10'-0"	9'-5"	8'-11"	8'-4"	10'-7"	9'-10"	9'-4"	8'-9"	8'-3"
2-1000S162-97	12'-11"	12'-4"	11'-8"	11'-1"	10'-6"	12'-9"	12'-2"	11'-6"	10'-11"	10'-5"
2-1200S162-54	7'-1"	6'-2"	5'-6"	5'-0"	4'-6"	6'-11"	6'-1"	5'-5"	4'-10"	4'-5"
2-1200S162-68	11'-9"	11'-0"	10'-5"	9'-10"	9'-1"	11'-8"	10'-11"	10'-3"	9'-9"	8'-11"
2-1200S162-97	14'-9"	13'-9"	13'-0"	12'-4"	11'-9"	14'-7"	13'-8"	12'-10"	12'-3"	11'-8"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

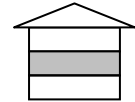
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-10a
Back-to-Back Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	2'-4"	-	-	-	-	-	-	-	-	-
2-350S162-68	3'-3"	2'-10"	2'-6"	2'-2"	-	2'-7"	2'-2"	-	-	-
2-350S162-97	4'-4"	4'-0"	3'-8"	3'-4"	3'-1"	3'-9"	3'-4"	3'-1"	2'-9"	2'-6"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-2"	-	-	-	-	-	-	-	-	-
2-550S162-54	3'-8"	3'-2"	2'-8"	2'-3"	-	2'-10"	2'-3"	-	-	-
2-550S162-68	4'-9"	4'-4"	3'-11"	3'-6"	3'-2"	4'-0"	3'-6"	3'-1"	2'-9"	2'-4"
2-550S162-97	6'-3"	5'-9"	5'-4"	5'-0"	4'-8"	5'-6"	5'-0"	4'-7"	4'-3"	3'-11"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	2'-11"	2'-0"	-	-	-	-	-	-	-	-
2-800S162-54	4'-9"	4'-2"	3'-7"	3'-1"	2'-7"	3'-9"	3'-1"	2'-5"	-	-
2-800S162-68	6'-4"	5'-9"	5'-3"	4'-9"	4'-4"	5'-4"	4'-9"	4'-3"	3'-10"	3'-4"
2-800S162-97	8'-5"	7'-9"	7'-3"	6'-9"	6'-4"	7'-4"	6'-9"	6'-3"	5'-10"	5'-5"
2-1000S162-43	3'-4"	2'-5"	-	-	-	-	-	-	-	-
2-1000S162-54	5'-6"	4'-10"	4'-2"	3'-7"	3'-0"	4'-4"	3'-7"	2'-11"	2'-2"	-
2-1000S162-68	7'-4"	6'-8"	6'-1"	5'-7"	5'-1"	6'-3"	5'-7"	5'-0"	4'-5"	4'-0"
2-1000S162-97	9'-11"	8'-3"	8'-7"	8'-1"	7'-7"	8'-9"	8'-1"	7'-6"	7'-0"	6'-6"
2-1200S162-54	5'-6"	4'-10"	4'-4"	3'-11"	3'-5"	4'-5"	3'-11"	3'-3"	2'-6"	-
2-1200S162-68	8'-2"	7'-5"	6'-9"	6'-3"	5'-8"	6'-11"	6'-3"	5'-7"	5'-0"	4'-6"
2-1200S162-97	10'-10"	10'-2"	9'-8"	9'-2"	8'-7"	9'-9"	9'-2"	8'-6"	7'-11"	7'-5"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

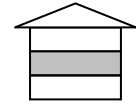
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-10b
Back-to-Back Header Spans
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	2'-6"	2'-0"	-	-	-	-	-	-	-	-
2-350S162-54	3'-8"	3'-3"	2'-11"	2'-7"	2'-3"	3'-0"	2'-7"	2'-2"	-	-
2-350S162-68	4'-7"	4'-5"	4'-1"	3'-9"	3'-6"	4'-2"	3'-9"	3'-5"	3'-1"	2'-10"
2-350S162-97	5'-1"	4'-10"	4'-8"	4'-6"	4'-5"	4'-10"	4'-7"	4'-5"	4'-3"	4'-1"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	3'-11"	3'-5"	2'-11"	2'-5"	-	3'-0"	2'-5"	-	-	-
2-550S162-54	5'-7"	5'-0"	4'-7"	4'-2"	3'-9"	4'-8"	4'-2"	3'-8"	3'-3"	2'-11"
2-550S162-68	6'-7"	6'-4"	5'-11"	5'-6"	5'-1"	6'-0"	5'-6"	5'-0"	4'-7"	4'-3"
2-550S162-97	7'-4"	7'-0"	6'-9"	6'-6"	6'-4"	6'-11"	6'-8"	6'-5"	6'-2"	6'-0"
2-800S162-33	1'-11"	-	-	-	-	-	-	-	-	-
2-800S162-43	4'-2"	3'-8"	3'-4"	3'-0"	2'-6"	3'-5"	3'-0"	2'-4"	-	-
2-800S162-54	6'-7"	5'-11"	5'-5"	4'-11"	4'-6"	5'-6"	4'-11"	4'-5"	3'-11"	3'-6"
2-800S162-68	8'-3"	7'-8"	7'-1"	6'-8"	6'-2"	7'-3"	6'-7"	6'-1"	5'-7"	5'-2"
2-800S162-97	9'-11"	9'-6"	9'-2"	8'-10"	8'-7"	9'-5"	9'-0"	8'-7"	8'-2"	7'-9"
2-1000S162-43	3'-4"	2'-11"	2'-7"	2'-5"	2'-2"	2'-8"	2'-5"	2'-2"	1'-11"	-
2-1000S162-54	6'-7"	5'-10"	5'-3"	4'-9"	4'-4"	5'-4"	4'-9"	4'-3"	3'-10"	3'-6"
2-1000S162-68	9'-4"	8'-9"	8'-1"	7'-7"	7'-1"	8'-3"	7'-7"	6'-11"	6'-5"	5'-11"
2-1000S162-97	11'-7"	10'-11"	10'-4"	9'-10"	9'-5"	10'-5"	9'-10"	9'-3"	8'-10"	8'-5"
2-1200S162-54	5'-6"	4'-10"	4'-4"	3'-11"	3'-7"	4'-5"	3'-11"	3'-6"	3'-2"	2'-11"
2-1200S162-68	10'-4"	9'-8"	8'-8"	7'-11"	7'-2"	8'-11"	7'-11"	7'-1"	6'-5"	5'-10"
2-1200S162-97	12'-11"	12'-2"	11'-6"	11'-0"	10'-6"	11'-8"	11'-0"	10'-5"	9'-10"	9'-5"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second floor dead load is 10 psf (0.48 kN/m²)

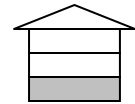
Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-11a
Back-to-Back Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	-	-	-	-	-	-	-	-	-	-
2-350S162-68	2'-5"	-	-	-	-	2'-4"	-	-	-	-
2-350S162-97	3'-6"	3'-2"	2'-10"	2'-6"	2'-3"	3'-6"	3'-1"	2'-9"	2'-6"	2'-3"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	-	-	-	-	-	-	-	-	-	-
2-550S162-54	2'-6"	-	-	-	-	2'-5"	-	-	-	-
2-550S162-68	3'-9"	3'-3"	2'-9"	2'-4"	-	3'-8"	3'-2"	2'-9"	2'-4"	-
2-550S162-97	5'-3"	4'-9"	4'-4"	3'-11"	3'-8"	5'-2"	4'-8"	4'-3"	3'-11"	3'-7"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	-	-	-	-	-	-	-	-	-	-
2-800S162-54	3'-5"	2'-8"	-	-	-	3'-4"	2'-7"	-	-	-
2-800S162-68	5'-1"	4'-5"	3'-11"	3'-4"	2'-11"	5'-0"	4'-4"	3'-10"	3'-4"	2'-10"
2-800S162-97	7'-0"	6'-5"	5'-11"	5'-5"	5'-0"	7'-0"	6'-4"	5'-10"	5'-5"	5'-0"
2-1000S162-43	-	-	-	-	-	-	-	-	-	-
2-1000S162-54	3'-11"	3'-1"	2'-3"	-	-	3'-10"	3'-0"	2'-2"	-	-
2-1000S162-68	5'-10"	5'-2"	4'-6"	4'-0"	3'-5"	5'-9"	5'-1"	4'-6"	3'-11"	3'-4"
2-1000S162-97	8'-5"	7'-8"	7'-1"	6'-6"	6'-1"	8'-4"	7'-7"	7'-0"	6'-6"	6'-0"
2-1200S162-54	4'-2"	3'-6"	2'-7"	-	-	4'-1"	3'-5"	2'-6"	-	-
2-1200S162-68	6'-6"	5'-9"	5'-1"	4'-6"	3'-11"	6'-6"	5'-8"	5'-0"	4'-5"	3'-10"
2-1200S162-97	9'-5"	8'-8"	8'-0"	7'-5"	6'-11"	9'-5"	8'-7"	7'-11"	7'-4"	6'-10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

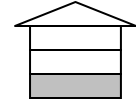
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-11b
Back-to-Back Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	2'-9"	2'-3"	-	-	-	2'-8"	2'-3"	-	-	-
2-350S162-68	3'-11"	3'-6"	3'-2"	2'-10"	2'-6"	3'-11"	3'-6"	3'-1"	2'-9"	2'-6"
2-350S162-97	4'-9"	4'-6"	4'-4"	4'-1"	3'-10"	4'-8"	4'-6"	4'-4"	4'-1"	3'-9"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-9"	2'-0"	-	-	-	2'-8"	-	-	-	-
2-550S162-54	4'-5"	3'-10"	3'-4"	2'-11"	2'-5"	4'-4"	3'-9"	3'-3"	2'-10"	2'-5"
2-550S162-68	5'-8"	5'-2"	4'-8"	4'-3"	3'-11"	5'-8"	5'-1"	4'-8"	4'-3"	3'-10"
2-550S162-97	6'-10"	6'-6"	6'-3"	6'-0"	5'-7"	6'-9"	6'-5"	6'-3"	5'-11"	5'-6"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	3'-2"	2'-7"	-	-	-	3'-1"	2'-6"	-	-	-
2-800S162-54	5'-2"	4'-7"	4'-0"	3'-6"	3'-0"	5'-2"	4'-6"	3'-11"	3'-5"	2'-11"
2-800S162-68	6'-11"	6'-3"	5'-8"	5'-2"	4'-9"	6'-10"	6'-2"	5'-7"	5'-2"	4'-8"
2-800S162-97	9'-3"	8'-8"	8'-3"	7'-9"	7'-4"	9'-2"	8'-8"	8'-2"	7'-9"	7'-4"
2-1000S162-43	2'-6"	2'-2"	2'-0"	-	-	2'-6"	2'-2"	1'-11"	-	-
2-1000S162-54	5'-0"	4'-4"	3'-11"	3'-6"	3'-2"	4'-11"	4'-4"	3'-10"	3'-6"	3'-2"
2-1000S162-68	7'-10"	7'-2"	6'-6"	5'-11"	5'-6"	7'-9"	7'-1"	6'-5"	5'-11"	5'-5"
2-1000S162-97	10'-1"	9'-5"	8'-11"	8'-6"	8'-0"	10'-0"	9'-5"	8'-10"	8'-5"	7'-11"
2-1200S162-54	-	-	-	-	-	-	-	-	-	-
2-1200S162-68	7'-4"	6'-8"	6'-1"	5'-6"	5'-1"	7'-3"	6'-7"	6'-0"	5'-6"	5'-0"
2-1200S162-97	9'-5"	8'-8"	8'-1"	7'-6"	7'-1"	9'-4"	8'-8"	8'-0"	7'-6"	7'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

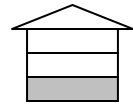
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

33
KSI

Table E7-12a
Back-to-Back Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 33 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	-	-	-	-	-	-	-	-	-	-
2-350S162-68	2'-2"	-	-	-	-	-	-	-	-	-
2-350S162-97	3'-3"	3'-0"	2'-8"	2'-4"	2'-1"	3'-1"	2'-9"	2'-6"	2'-2"	-
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	-	-	-	-	-	-	-	-	-	-
2-550S162-54	2'-2"	-	-	-	-	-	-	-	-	-
2-550S162-68	3'-6"	3'-0"	2'-6"	2'-1"	-	3'-2"	2'-9"	2'-3"	-	-
2-550S162-97	5'-0"	4'-6"	4'-1"	3'-9"	3'-5"	4'-8"	4'-3"	3'-11"	3'-7"	3'-3"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	-	-	-	-	-	-	-	-	-	-
2-800S162-54	3'-0"	2'-3"	-	-	-	2'-7"	-	-	-	-
2-800S162-68	4'-9"	4'-2"	3'-7"	3'-1"	2'-7"	4'-5"	3'-10"	3'-3"	2'-9"	2'-3"
2-800S162-97	6'-9"	6'-1"	5'-7"	5'-2"	4'-9"	6'-4"	5'-10"	5'-4"	4'-11"	4'-7"
2-1000S162-43	-	-	-	-	-	-	-	-	-	-
2-1000S162-54	3'-6"	2'-8"	-	-	-	3'-1"	2'-2"	-	-	-
2-1000S162-68	5'-6"	4'-10"	4'-2"	3'-7"	3'-1"	5'-1"	4'-6"	3'-10"	3'-4"	2'-9"
2-1000S162-97	8'-0"	7'-4"	6'-9"	6'-3"	5'-9"	7'-7"	7'-0"	6'-5"	5'-11"	5'-6"
2-1200S162-54	3'-11"	3'-0"	2'-0"	-	-	3'-5"	2'-6"	-	-	-
2-1200S162-68	6'-2"	5'-5"	4'-9"	4'-1"	3'-6"	5'-9"	5'-0"	4'-4"	3'-9"	3'-2"
2-1200S162-97	9'-1"	8'-4"	7'-8"	7'-1"	6'-7"	8'-8"	7'-11"	7'-4"	6'-9"	6'-3"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

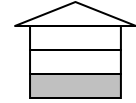
Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

50
KSI

Table E7-12b
Back-to-Back Header Spans
Headers Supporting Two Floors, Roof and Ceiling^{1,2}
F_y = 50 ksi



Member Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width ³					Building Width ³				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-350S162-33	-	-	-	-	-	-	-	-	-	-
2-350S162-43	-	-	-	-	-	-	-	-	-	-
2-350S162-54	2'-6"	2'-1"	-	-	-	2'-3"	-	-	-	-
2-350S162-68	3'-9"	3'-4"	2'-11"	2'-7"	2'-4"	3'-6"	3'-1"	2'-9"	2'-5"	2'-2"
2-350S162-97	4'-6"	4'-4"	4'-2"	3'-11"	3'-8"	4'-4"	4'-2"	4'-0"	3'-9"	3'-6"
2-550S162-33	-	-	-	-	-	-	-	-	-	-
2-550S162-43	2'-5"	-	-	-	-	-	-	-	-	-
2-550S162-54	4'-1"	3'-7"	3'-1"	2'-7"	2'-2"	3'-10"	3'-3"	2'-10"	2'-4"	-
2-550S162-68	5'-5"	4'-11"	4'-5"	4'-0"	3'-8"	5'-1"	4'-7"	4'-2"	3'-10"	3'-5"
2-550S162-97	6'-5"	6'-2"	5'-11"	5'-9"	5'-4"	6'-3"	6'-0"	5'-9"	5'-6"	5'-2"
2-800S162-33	-	-	-	-	-	-	-	-	-	-
2-800S162-43	2'-11"	2'-2"	-	-	-	2'-6"	-	-	-	-
2-800S162-54	4'-11"	4'-3"	3'-8"	3'-2"	2'-8"	4'-6"	3'-11"	3'-5"	2'-11"	2'-4"
2-800S162-68	6'-7"	5'-11"	5'-4"	4'-11"	4'-6"	6'-2"	5'-7"	5'-1"	4'-8"	4'-3"
2-800S162-97	8'-9"	8'-5"	7'-11"	7'-6"	7'-0"	8'-5"	8'-1"	7'-9"	7'-3"	6'-10"
2-1000S162-43	2'-4"	2'-1"	-	-	-	2'-2"	1'-11"	-	-	-
2-1000S162-54	4'-8"	4'-1"	3'-8"	3'-3"	3'-0"	4'-4"	3'-10"	3'-5"	3'-1"	2'-9"
2-1000S162-68	7'-6"	6'-9"	6'-2"	5'-8"	5'-2"	7'-1"	6'-5"	5'-10"	5'-4"	4'-11"
2-1000S162-97	9'-9"	9'-2"	8'-7"	8'-2"	7'-8"	9'-5"	8'-10"	8'-5"	7'-11"	7'-5"
2-1200S162-54	-	-	-	-	-	-	-	-	-	-
2-1200S162-68	7'-0"	6'-4"	5'-9"	5'-3"	4'-9"	6'-7"	6'-0"	5'-5"	5'-0"	4'-6"
2-1200S162-97	9'-1"	8'-4"	7'-9"	7'-3"	6'-9"	8'-8"	8'-0"	7'-6"	7'-0"	6'-7"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Deflection criteria: L/360 for live loads, L/240 for total loads

² Design load assumptions:

Second and third floor dead load is 10 psf (0.48 kN/m²)

Roof/ceiling dead load is 12 psf (0.58 kN/m²)

Second floor live load is 40 psf (1.92 kN/m²)

Third floor live load is 30 psf (1.44 kN/m²)

³ Building width is in the direction of horizontal framing members supported by the header.

Table E7-13
Number of Screws Required for Header to King Stud Connection

Header Span	Basic Wind Speed (mph), Exposure & Seismic Design Categories ^{1,2,3}					
	85 B Seismic Design Category A,B,C	90 B	100 B	110 B	100 C	< 110 C
			85 C	90 C		
< 4'	4-No.8 screws	4-No.8 screws	4-No.8 screws	4-No.8 screws	6-No.8 screws	6-No.8 screws
> 4' to 8'	4-No.8 screws	4-No.8 screws	4-No.8 screws	4-No.8 screws	6-No.8 screws	8-No.8 screws
> 8' to 12'	4-No.8 screws	4-No.8 screws	6-No.8 screws	6-No.8 screws	8-No.8 screws	10-No.8 screws
> 12' to 16'	4-No.8 screws	4-No.8 screws	6-No.8 screws	8-No.8 screws	10-No.8 screws	12-No.8 screws

For SI: 1 foot = 0.305 m, 1 mph = 1.61 km/hr

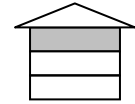
¹ For headers located on the first floor of a two-story building or the first or second floor of a three story building, the total number of screws is permitted to be reduced by 2 screws, but the total number of screws shall be no less than 4.

² For roof slopes of 6:12 or greater, the required number of screws is permitted to be reduced by 1/2, but the total number of screws shall be no less than 4.

³ Screws can be replaced by an uplift connector, which has the strength of the number of screws multiplied by 164 lbs (729 N) (e.g. 12-No.8 screws can be replaced by an up-lift connector whose strength exceeds 12 x 164 lbs = 1,968 lbs)

33
KSI

Table E7-14a
Double L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	5'-0"	4'-9"	4'-5"	4'-2"	4'-0"	4'-9"	4'-5"	4'-2"	4'-0"	3'-9"
2-600L150-54	5'-10"	5'-5"	5'-2"	4'-10"	4'-8"	5'-6"	5'-2"	4'-10"	4'-7"	4'-5"
2-600L150-68	6'-9"	6'-4"	6'-0"	5'-8"	5'-5"	6'-5"	6'-0"	5'-8"	5'-4"	5'-1"
2-800L150-43	6'-4"	6'-0"	5'-7"	5'-4"	5'-1"	6'-0"	5'-8"	5'-4"	5'-1"	4'-10"
2-800L150-54	7'-4"	6'-11"	6'-6"	6'-2"	5'-10"	6'-11"	6'-6"	6'-2"	5'-10"	5'-7"
2-800L150-68	8'-6"	8'-0"	7'-6"	7'-1"	6'-9"	8'-0"	7'-6"	7'-1"	6'-8"	6'-5"
2-1000L150-43	6'-6"	6'-2"	5'-9"	5'-5"	5'-2"	6'-2"	5'-9"	5'-5"	5'-2"	4'-11"
2-1000L150-54	7'-6"	7'-0"	6'-7"	6'-3"	6'-0"	7'-0"	6'-7"	6'-3"	5'-11"	5'-8"
2-1000L150-68	8'-7"	8'-1"	7'-7"	7'-2"	6'-10"	8'-1"	7'-7"	7'-2"	6'-10"	6'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

50
KSI

Table E7-14b
Double L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	6'-4"	5'-10"	5'-6"	5'-3"	5'-0"	5'-10"	5'-6"	5'-2"	4'-11"	4'-9"
2-600L150-54	7'-4"	6'-9"	6'-4"	6'-1"	5'-9"	6'-10"	6'-4"	6'-0"	5'-9"	5'-6"
2-600L150-68	8'-5"	7'-10"	7'-5"	7'-0"	6'-8"	7'-11"	7'-5"	7'-0"	6'-8"	6'-4"
2-800L150-43	7'-11"	7'-5"	7'-0"	6'-7"	6'-4"	7'-5"	7'-0"	6'-7"	6'-3"	6'-0"
2-800L150-54	9'-1"	8'-6"	8'-0"	7'-7"	7'-3"	8'-7"	8'-1"	7'-7"	7'-3"	6'-11"
2-800L150-68	10'-6"	9'-10"	9'-3"	8'-10"	8'-5"	9'-11"	9'-4"	8'-9"	8'-4"	8'-0"
2-1000L150-43	8'-1"	7'-7"	7'-1"	6'-9"	6'-5"	7'-7"	7'-1"	6'-9"	6'-4"	6'-1"
2-1000L150-54	9'-3"	8'-8"	8'-2"	7'-9"	7'-5"	8'-9"	8'-2"	7'-9"	7'-4"	7'-0"
2-1000L150-68	10'-8"	10'-0"	9'-5"	8'-11"	8'-6"	10'-0"	9'-5"	8'-11"	8'-5"	8'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

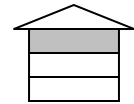
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

33
KSI

Table E7-15a
Double L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	3'-10"	3'-7"	3'-5"	3'-3"	3'-1"	3'-4"	3'-2"	3'-0"	2'-10"	2'-8"
2-600L150-54	4'-6"	4'-3"	4'-0"	3'-9"	3'-7"	3'-11"	3'-8"	3'-5"	3'-3"	3'-2"
2-600L150-68	3'-8"	3'-6"	3'-3"	3'-1"	3'-0"	4'-6"	4'-3"	4'-0"	3'-10"	3'-8"
2-800L150-43	4'-11"	4'-7"	4'-4"	4'-2"	3'-11"	4'-3"	4'-0"	3'-9"	3'-7"	3'-5"
2-800L150-54	5'-8"	5'-4"	5'-0"	4'-9"	4'-7"	4'-11"	4'-7"	4'-4"	4'-2"	3'-11"
2-800L150-68	6'-7"	6'-2"	5'-10"	5'-6"	5'-3"	5'-8"	5'-4"	5'-1"	4'-10"	4'-7"
2-1000L150-43	6'-0"	5'-7"	5'-3"	5'-0"	4'-10"	5'-2"	4'-10"	4'-7"	4'-4"	4'-2"
2-1000L150-54	6'-10"	6'-5"	6'-1"	5'-9"	5'-6"	5'-11"	5'-7"	5'-3"	5'-0"	4'-9"
2-1000L150-68	7'-11"	7'-5"	7'-0"	6'-8"	6'-4"	6'-10"	6'-5"	6'-1"	5'-9"	5'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

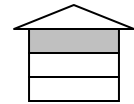
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

50
KSI

Table E7-15b
Double L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	4'-10"	5'-6"	4'-3"	4'-1"	3'-10"	4'-2"	3'-11"	3'-8"	3'-6"	3'-4"
2-600L150-54	5'-7"	5'-3"	4'-11"	4'-8"	4'-6"	4'-10"	4'-7"	4'-4"	4'-1"	3'-11"
2-600L150-68	6'-6"	6'-1"	5'-9"	5'-6"	5'-3"	5'-8"	5'-4"	5'-0"	4'-9"	4'-6"
2-800L150-43	6'-1"	5'-9"	5'-5"	5'-2"	4'-11"	5'-4"	5'-0"	4'-9"	4'-6"	4'-3"
2-800L150-54	7'-0"	6'-7"	6'-3"	5'-11"	5'-8"	6'-1"	5'-9"	5'-5"	5'-2"	4'-11"
2-800L150-68	8'-2"	7'-8"	7'-3"	6'-10"	6'-7"	7'-1"	6'-8"	6'-3"	5'-11"	5'-8"
2-1000L150-43	6'-3"	5'-10"	5'-6"	5'-3"	5'-0"	5'-5"	5'-1"	4'-10"	4'-7"	4'-4"
2-1000L150-54	7'-2"	6'-9"	6'-4"	6'-0"	5'-9"	6'-3"	5'-10"	5'-6"	5'-3"	5'-0"
2-1000L150-68	8'-3"	7'-9"	7'-4"	6'-11"	6'-8"	7'-2"	6'-9"	6'-4"	6'-0"	5'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

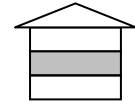
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

33
KSI

Table E7-16a
Double L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	3'-9"	3'-6"	3'-3"	3'-1"	2'-11"	3'-8"	3'-5"	3'-3"	3'-1"	2'-11"
2-600L150-54	4'-4"	4'-0"	3'-10"	3'-7"	3'-5"	4'-3"	4'-0"	3'-9"	3'-7"	3'-5"
2-600L150-68	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"
2-800L150-43	4'-9"	4'-5"	4'-2"	3'-11"	3'-9"	4'-8"	4'-4"	4'-1"	3'-11"	3'-9"
2-800L150-54	5'-5"	5'-1"	4'-10"	4'-7"	4'-4"	5'-5"	5'-0"	4'-9"	4'-6"	4'-4"
2-800L150-68	6'-4"	5'-11"	5'-7"	5'-3"	5'-0"	6'-3"	5'-10"	5'-6"	5'-3"	5'-0"
2-1000L150-43	4'-10"	4'-6"	4'-3"	4'-0"	3'-10"	4'-9"	4'-5"	4'-2"	4'-0"	3'-10"
2-1000L150-54	5'-6"	5'-2"	4'-11"	4'-8"	4'-5"	5'-6"	5'-1"	4'-10"	4'-7"	4'-4"
2-1000L150-68	6'-5"	6'-0"	5'-7"	5'-4"	5'-1"	6'-4"	5'-11"	5'-7"	5'-3"	5'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

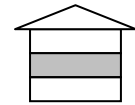
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-16b
Double L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	4'-7"	4'-4"	4'-1"	3'-10"	3'-8"	4'-7"	4'-3"	4'-0"	3'-10"	3'-8"
2-600L150-54	5'-4"	5'-0"	4'-9"	4'-6"	4'-3"	5'-4"	5'-0"	4'-8"	4'-5"	4'-3"
2-600L150-68	6'-3"	5'-10"	5'-6"	5'-3"	5'-0"	6'-2"	5'-9"	5'-5"	5'-2"	4'-11"
2-800L150-43	5'-10"	5'-6"	5'-2"	4'-11"	4'-8"	5'-9"	5'-5"	5'-1"	4'-10"	4'-8"
2-800L150-54	6'-9"	6'-4"	6'-0"	5'-8"	5'-5"	6'-8"	6'-3"	5'-11"	5'-7"	5'-4"
2-800L150-68	7'-10"	7'-4"	6'-11"	6'-5"	6'-3"	7'-9"	7'-3"	6'-10"	6'-6"	6'-2"
2-1000L150-43	6'-0"	5'-7"	5'-3"	5'-0"	4'-9"	5'-11"	5'-6"	5'-3"	4'-11"	4'-9"
2-1000L150-54	6'-10"	6'-5"	6'-1"	5'-9"	5'-6"	6'-9"	6'-4"	6'-0"	5'-8"	5'-5"
2-1000L150-68	7'-11"	7'-5"	7'-0"	6'-7"	6'-4"	7'-10"	7'-4"	6'-11"	6'-7"	6'-3"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

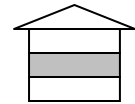
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-17a
Double L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"	2'-11"	2'-9"	2'-7"	2'-6"	2'-4"
2-600L150-54	3'-9"	3'-6"	3'-4"	3'-2"	3'-0"	3'-5"	3'-2"	3'-0"	2'-10"	2'-9"
2-600L150-68	4'-5"	4'-1"	3'-10"	3'-8"	3'-6"	4'-0"	3'-9"	3'-6"	3'-4"	3'-2"
2-800L150-43	4'-2"	3'-10"	3'-8"	3'-5"	3'-3"	3'-9"	3'-6"	3'-4"	3'-2"	3'-0"
2-800L150-54	4'-9"	4'-6"	4'-2"	4'-0"	3'-10"	4'-4"	4'-1"	3'-10"	3'-8"	3'-6"
2-800L150-68	5'-6"	5'-1"	4'-10"	4'-7"	4'-5"	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"
2-1000L150-43	4'-3"	3'-11"	3'-9"	3'-6"	3'-4"	3'-10"	3'-7"	3'-5"	3'-3"	3'-1"
2-1000L150-54	4'-10"	4'-6"	4'-3"	4'-1"	3'-10"	4'-4"	4'-1"	3'-11"	3'-8"	3'-6"
2-1000L150-68	5'-7"	5'-3"	4'-11"	4'-8"	4'-5"	5'-0"	4'-9"	4'-6"	4'-3"	4'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

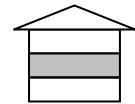
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/ m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-17b
Double L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	4'-1"	3'-9"	3'-7"	3'-5"	3'-3"	3'-8"	3'-5"	3'-3"	3'-1"	2'-11"
2-600L150-54	4'-8"	4'-5"	4'-2"	3'-11"	3'-9"	4'-3"	4'-0"	3'-9"	3'-7"	3'-5"
2-600L150-68	5'-6"	5'-1"	4'-10"	4'-7"	4'-4"	4'-11"	4'-8"	4'-4"	4'-2"	4'-0"
2-800L150-43	5'-2"	4'-1"	4'-6"	4'-4"	4'-1"	4'-8"	4'-4"	4'-1"	3'-11"	3'-9"
2-800L150-54	5'-11"	5'-7"	5'-3"	4'-11"	4'-9"	5'-4"	5'-0"	4'-9"	4'-6"	4'-4"
2-800L150-68	6'-10"	6'-5"	6'-0"	5'-9"	5'-5"	6'-2"	5'-1"	5'-6"	5'-3"	5'-0"
2-1000L150-43	5'-3"	4'-11"	4'-7"	4'-5"	4'-2"	4'-9"	4'-5"	4'-3"	4'-0"	3'-10"
2-1000L150-54	6'-0"	5'-8"	5'-4"	5'-0"	4'-10"	5'-5"	5'-1"	4'-10"	4'-7"	4'-5"
2-1000L150-68	6'-11"	6'-6"	6'-1"	5'-9"	5'-6"	6'-3"	5'-10"	5'-7"	5'-3"	5'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

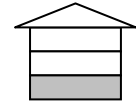
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/ m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-18a
Double L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 33 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	2'-8"	2'-6"	2'-4"	2'-3"	2'-2"	2'-8"	2'-6"	2'-4"	2'-3"	2'-2"
2-600L150-54	3'-2"	2'-11"	2'-9"	2'-7"	2'-6"	3'-1"	2'-11"	2'-9"	2'-7"	2'-6"
2-600L150-68	3'-8"	3'-5"	3'-3"	3'-1"	2'-11"	3'-8"	3'-5"	3'-2"	3'-0"	2'-11"
2-800L150-43	3'-5"	3'-3"	3'-0"	2'-10"	2'-9"	3'-5"	3'-2"	3'-0"	2'-10"	2'-9"
2-800L150-54	4'-0"	3'-8"	3'-6"	3'-4"	3'-2"	3'-11"	3'-8"	3'-6"	3'-3"	3'-2"
2-800L150-68	4'-7"	4'-4"	4'-0"	3'-10"	3'-8"	4'-7"	4'-3"	4'-0"	3'-10"	3'-8"
2-1000L150-43	3'-6"	3'-3"	3'-1"	2'-11"	2'-9"	3'-6"	3'-3"	3'-1"	2'-11"	2'-9"
2-1000L150-54	4'-0"	3'-9"	3'-7"	3'-4"	3'-2"	4'-0"	3'-9"	3'-6"	3'-4"	3'-2"
2-1000L150-68	4'-8"	4'-4"	4'-1"	3'-10"	3'-8"	4'-7"	4'-4"	4'-1"	3'-10"	3'-8"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

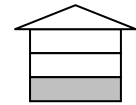
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-18b
Double L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 50 ksi



Double L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	3'-4"	3'-2"	3'-0"	2'-10"	2'-8"	3'-4"	3'-2"	2'-11"	2'-10"	2'-8"
2-600L150-54	3'-11"	3'-8"	3'-5"	3'-3"	3'-1"	3'-11"	3'-8"	3'-5"	3'-3"	3'-1"
2-600L150-68	4'-7"	4'-3"	4'-0"	3'-10"	3'-7"	4'-6"	4'-3"	4'-0"	3'-9"	3'-7"
2-800L150-43	4'-3"	4'-0"	3'-9"	3'-7"	3'-5"	4'-3"	4'-0"	3'-9"	3'-7"	3'-5"
2-800L150-54	4'-11"	4'-7"	4'-3"	4'-1"	3'-11"	4'-10"	4'-7"	4'-4"	4'-1"	3'-11"
2-800L150-68	5'-8"	5'-4"	5'-0"	4'-9"	4'-6"	5'-8"	5'-4"	5'-0"	4'-9"	4'-6"
2-1000L150-43	4'-4"	4'-1"	3'-11"	3'-8"	3'-6"	4'-4"	4'-1"	3'-10"	3'-8"	3'-6"
2-1000L150-54	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"	5'-0"	4'-8"	4'-5"	4'-2"	4'-0"
2-1000L150-68	5'-9"	5'-5"	5'-1"	4'-10"	4'-7"	5'-9"	5'-4"	5'-1"	4'-9"	4'-7"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

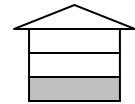
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-19a
Double L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 33 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	2'-7"	2'-5"	2'-4"	2'-2"	2'-1"	2'-7"	2'-5"	2'-3"	2'-2"	2'-0"
2-600L150-54	3'-1"	2'-10"	2'-8"	2'-6"	2'-5"	3'-0"	2'-9"	2'-7"	2'-6"	2'-4"
2-600L150-68	3'-7"	3'-4"	3'-1"	2'-11"	2'-10"	3'-6"	3'-3"	3'-1"	2'-11"	2'-9"
2-800L150-43	3'-4"	3'-1"	2'-11"	2'-9"	2'-8"	3'-3"	3'-1"	2'-10"	2'-9"	2'-7"
2-800L150-54	3'-10"	3'-7"	3'-5"	3'-2"	3'-1"	3'-9"	3'-6"	3'-4"	3'-2"	3'-0"
2-800L150-68	4'-5"	4'-2"	3'-11"	3'-8"	3'-6"	4'-4"	4'-1"	3'-10"	3'-8"	3'-6"
2-1000L150-43	3'-5"	3'-2"	3'-0"	2'-10"	2'-8"	3'-3"	3'-1"	2'-11"	2'-9"	2'-8"
2-1000L150-54	3'-11"	3'-8"	3'-5"	3'-3"	3'-1"	3'-10"	3'-7"	3'-4"	3'-2"	3'-0"
2-1000L150-68	4'-6"	4'-3"	4'-0"	3'-9"	3'-7"	4'-5"	4'-1"	3'-11"	3'-8"	3'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

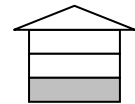
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-19b
Double L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 50 ksi



Double L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
2-600L150-43	3'-3"	3'-1"	2'-11"	2'-9"	2'-7"	3'-2"	3'-0"	2'-10"	2'-8"	2'-7"
2-600L150-54	3'-10"	3'-7"	3'-4"	3'-2"	3'-0"	3'-9"	3'-6"	3'-3"	3'-1"	3'-0"
2-600L150-68	4'-5"	4'-2"	3'-11"	3'-8"	3'-6"	4'-4"	4'-0"	3'-10"	3'-7"	3'-5"
2-800L150-43	4'-2"	3'-10"	3'-8"	3'-5"	3'-4"	4'-1"	3'-9"	3'-7"	3'-4"	3'-3"
2-800L150-54	4'-9"	4'-6"	4'-3"	4'-0"	3'-10"	4'-8"	4'-5"	4'-2"	3'-11"	3'-9"
2-800L150-68	5'-6"	5'-2"	4'-10"	4'-7"	4'-5"	5'-5"	5'-1"	4'-9"	4'-6"	4'-4"
2-1000L150-43	4'-3"	4'-0"	3'-9"	3'-6"	3'-4"	4'-2"	3'-10"	3'-8"	3'-5"	3'-4"
2-1000L150-54	4'-10"	4'-7"	4'-3"	4'-1"	3'-10"	4'-9"	4'-5"	4'-2"	4'-0"	3'-9"
2-1000L150-68	5'-7"	5'-3"	4'-11"	4'-8"	4'-5"	5'-6"	5'-1"	4'-10"	4'-7"	4'-4"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

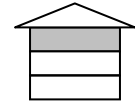
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-20a
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	7'-2"	6'-3"	4'-10"	4'-1"	3'-7"	3'-2"	2'-10"	2'-6"	2'-4"	2'-2"
2-600L150-54	8'-4"	7'-3"	5'-7"	4'-9"	4'-2"	3'-8"	3'-3"	2'-11"	2'-8"	2'-6"
2-600L150-68	9'-9"	8'-5"	6'-6"	5'-6"	4'-10"	4'-3"	3'-9"	3'-5"	3'-1"	2'-10"
2-800L150-43	8'-2"	7'-1"	5'-5"	4'-8"	4'-0"	3'-7"	3'-2"	2'-10"	2'-7"	2'-5"
2-800L150-54	10'-6"	9'-1"	7'-0"	6'-0"	5'-2"	4'-8"	4'-1"	3'-8"	3'-5"	3'-1"
2-800L150-68	12'-2"	10'-7"	8'-1"	6'-11"	6'-0"	5'-4"	4'-9"	4'-3"	3'-11"	3'-7"
2-1000L150-43	9'-5"	8'-2"	6'-3"	5'-4"	4'-8"	4'-1"	3'-8"	3'-4"	3'-0"	2'-9"
2-1000L150-54	10'-9"	9'-4"	7'-2"	6'-2"	5'-4"	4'-9"	4'-2"	3'-9"	3'-6"	3'-2"
2-1000L150-68	13'-10"	12'-0"	9'-3"	7'-11"	6'-10"	6'-1"	5'-5"	4'-11"	4'-5"	4'-1"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

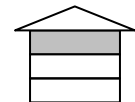
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-20b
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	8'-10"	7'-8"	5'-10"	5'-0"	4'-4"	3'-10"	3'-5"	3'-1"	2'-10"	2'-7"
2-600L150-54	10'-3"	8'-10"	6'-10"	5'-10"	5'-1"	4'-6"	4'-0"	3'-7"	3'-3"	3'-0"
2-600L150-68	11'-11"	10'-4"	7'-11"	6'-9"	5'-10"	5'-3"	4'-7"	4'-2"	3'-10"	3'-6"
2-800L150-43	10'-0"	8'-8"	6'-8"	5'-8"	4'-11"	4'-5"	3'-11"	3'-6"	3'-2"	2'-11"
2-800L150-54	12'-11"	11'-2"	8'-7"	7'-4"	6'-4"	5'-8"	5'-0"	4'-6"	4'-1"	3'-10"
2-800L150-68	14'-11"	12'-11"	9'-11"	8'-6"	7'-4"	6'-7"	5'-10"	5'-3"	4'-9"	4'-5"
2-1000L150-43	11'-6"	10'-0"	7'-8"	5'-6"	5'-8"	5'-0"	4'-6"	4'-0"	3'-8"	3'-5"
2-1000L150-54	13'-3"	11'-5"	8'-10"	7'-6"	6'-6"	5'-10"	5'-2"	4'-8"	4'-3"	3'-11"
2-1000L150-68	16'-0"	14'-9"	11'-4"	9'-8"	8'-5"	7'-6"	6'-7"	6'-0"	5'-5"	5'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

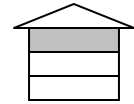
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-21a
Double L-Header Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	6'-10"	5'-11"	4'-6"	3'-10"	3'-4"	3'-0"	2'-8"	2'-5"	2'-2"	2'-0"
2-600L150-54	8'-0"	6'-11"	5'-3"	4'-6"	3'-11"	3'-6"	3'-1"	2'-9"	2'-6"	2'-4"
2-600L150-68	9'-3"	8'-0"	6'-2"	5'-3"	4'-6"	4'-0"	3'-7"	3'-3"	2'-11"	2'-8"
2-800L150-43	7'-9"	6'-9"	5'-2"	4'-5"	3'-10"	3'-5"	3'-0"	2'-9"	2'-6"	2'-3"
2-800L150-54	10'-0"	8'-8"	6'-8"	5'-8"	4'-11"	4'-4"	3'-10"	3'-6"	3'-2"	2'-11"
2-800L150-68	11'-7"	10'-0"	7'-8"	6'-7"	5'-8"	5'-1"	4'-6"	4'-0"	3'-8"	3'-5"
2-1000L150-43	8'-11"	7'-9"	5'-11"	5'-1"	4'-5"	3'-11"	3'-5"	3'-1"	2'-10"	2'-7"
2-1000L150-54	10'-3"	8'-10"	6'-10"	5'-9"	5'-0"	4'-6"	4'-0"	3'-7"	3'-3"	3'-0"
2-1000L150-68	13'-3"	11'-5"	8'-9"	7'-5"	6'-6"	5'-9"	5'-1"	4'-7"	4'-2"	3'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

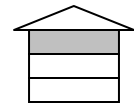
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-21b
Double L-Header Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	8'-5"	7'-3"	5'-7"	4'-9"	4'-1"	3'-8"	3'-3"	2'-11"	2'-8"	2'-5"
2-600L150-54	9'-9"	8'-5"	6'-5"	5'-6"	4'-9"	4'-3"	3'-9"	3'-4"	3'-1"	2'-10"
2-600L150-68	11'-4"	9'-10"	7'-6"	6'-5"	5'-7"	4'-11"	4'-4"	3'-11"	3'-7"	3'-3"
2-800L150-43	9'-6"	8'-3"	6'-4"	5'-4"	4'-8"	4'-2"	3'-8"	3'-4"	3'-0"	2'-9"
2-800L150-54	12'-4"	10'-8"	8'-2"	6'-11"	6'-0"	5'-4"	4'-9"	4'-3"	3'-11"	3'-7"
2-800L150-68	14'-3"	12'-4"	9'-5"	8'-0"	6'-11"	6'-2"	5'-6"	4'-11"	4'-6"	4'-2"
2-1000L150-43	11'-0"	9'-6"	7'-3"	6'-2"	5'-4"	4'-9"	4'-3"	3'-10"	3'-5"	3'-2"
2-1000L150-54	12'-7"	10'-11"	8'-4"	7'-1"	6'-2"	5'-6"	4'-10"	4'-4"	4'-0"	3'-8"
2-1000L150-68	16'-0"	14'-0"	10'-9"	9'-2"	7'-11"	7'-0"	6'-9"	5'-7"	5'-1"	4'-9"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

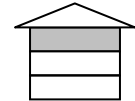
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-22a
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



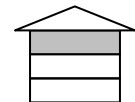
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	6'-7"	5'-8"	4'-4"	3'-8"	3'-2"	2'-10"	2'-6"	2'-3"	2'-1"	1'-11"
2-600L150-54	7'-7"	6'-7"	5'-0"	4'-3"	3'-8"	3'-3"	2'-11"	2'-7"	2'-5"	2'-2"
2-600L150-68	8'-10"	7'-8"	5'-10"	5'-0"	4'-4"	3'-10"	3'-5"	3'-1"	2'-9"	2'-7"
2-800L150-43	7'-5"	6'-5"	4'-11"	4'-2"	3'-7"	3'-3"	2'-10"	2'-7"	2'-4"	2'-2"
2-800L150-54	9'-7"	8'-3"	6'-4"	5'-5"	4'-8"	4'-2"	3'-8"	3'-4"	3'-0"	2'-9"
2-800L150-68	11'-1"	9'-7"	7'-4"	6'-3"	5'-5"	4'-10"	4'-3"	3'-10"	3'-6"	3'-3"
2-1000L150-43	8'-7"	7'-5"	5'-8"	4'-10"	4'-2"	3'-8"	3'-3"	2'-11"	2'-8"	2'-6"
2-1000L150-54	9'-10"	8'-6"	6'-6"	5'-6"	4'-9"	4'-3"	3'-9"	3'-5"	3'-1"	2'-10"
2-1000L150-68	12'-8"	10'-11"	8'-4"	7'-1"	6'-2"	5'-6"	4'-10"	4'-4"	4'-0"	3'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-22b
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



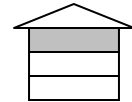
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	8'-0"	6'-11"	5'-3"	4'-6"	3'-11"	3'-5"	3'-1"	2'-9"	2'-6"	2'-4"
2-600L150-54	9'-4"	8'-1"	6'-2"	5'-3"	4'-6"	4'-0"	3'-7"	3'-2"	2'-11"	2'-8"
2-600L150-68	10'-10"	9'-4"	7'-2"	6'-1"	5'-3"	4'-8"	4'-2"	3'-9"	3'-5"	3'-1"
2-800L150-43	9'-2"	7'-10"	6'-0"	5'-1"	4'-5"	3'-11"	3'-6"	3'-1"	2'-10"	2'-7"
2-800L150-54	11'-9"	10'-2"	7'-9"	6'-7"	5'-8"	5'-1"	4'-6"	4'-0"	3'-8"	3'-5"
2-800L150-68	13'-8"	11'-9"	9'-0"	7'-7"	6'-7"	5'-10"	5'-2"	4'-8"	4'-3"	3'-11"
2-1000L150-43	10'-6"	9'-1"	6'-11"	5'-10"	5'-1"	4'-6"	4'-0"	3'-7"	3'-3"	3'-0"
2-1000L150-54	12'-1"	10'-5"	7'-11"	6'-9"	5'-10"	5'-2"	4'-7"	4'-2"	3'-9"	3'-6"
2-1000L150-68	15'-6"	13'-5"	10'-3"	8'-8"	7'-6"	6'-8"	5'-11"	5'-4"	4'-10"	4'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-23a
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



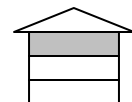
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	6'-4"	5'-5"	4'-2"	3'-6"	3'-0"	2'-8"	2'-5"	2'-2"	2'-0"	1'-10"
2-600L150-54	7'-4"	6'-4"	4'-10"	4'-1"	3'-6"	3'-2"	2'-9"	2'-6"	2'-3"	2'-1"
2-600L150-68	8'-6"	7'-4"	5'-7"	4'-9"	4'-1"	3'-8"	3'-3"	2'-11"	2'-8"	2'-5"
2-800L150-43	7'-2"	6'-2"	4'-8"	4'-0"	3'-5"	3'-1"	2'-9"	2'-5"	2'-3"	2'-1"
2-800L150-54	9'-3"	7'-11"	6'-0"	5'-2"	4'-5"	3'-11"	3'-6"	3'-2"	2'-11"	2'-8"
2-800L150-68	10'-8"	9'-2"	7'-0"	5'-11"	5'-2"	4'-7"	4'-1"	3'-8"	3'-4"	3'-1"
2-1000L150-43	8'-3"	7'-1"	5'-5"	4'-7"	4'-0"	3'-6"	3'-1"	2'-10"	2'-7"	2'-4"
2-1000L150-54	9'-5"	8'-1"	6'-2"	5'-3"	4'-7"	4'-0"	3'-7"	3'-3"	2'-11"	2'-9"
2-1000L150-68	12'-2"	10'-5"	8'-0"	6'-9"	5'-10"	5'-2"	4'-7"	4'-2"	3'-9"	3'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-23b
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



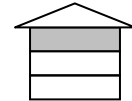
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	7'-9"	6'-8"	5'-1"	4'-3"	3'-8"	3'-3"	2'-11"	2'-7"	2'-5"	2'-2"
2-600L150-54	9'-0"	7'-9"	5'-10"	5'-0"	4'-4"	3'-10"	3'-5"	3'-1"	2'-9"	2'-7"
2-600L150-68	10'-5"	9'-0"	6'-10"	5'-10"	5'-0"	4'-5"	3'-11"	3'-7"	3'-3"	3'-0"
2-800L150-43	8'-9"	7'-7"	5'-9"	4'-10"	4'-3"	3'-9"	3'-4"	3'-0"	2'-9"	2'-6"
2-800L150-54	11'-4"	9'-9"	7'-5"	6'-3"	5'-5"	4'-10"	4'-3"	3'-10"	3'-6"	3'-3"
2-800L150-68	13'-1"	11'-3"	8'-7"	7'-3"	6'-4"	5'-7"	4'-11"	4'-5"	4'-1"	3'-9"
2-1000L150-43	10'-1"	8'-8"	6'-7"	5'-7"	4'-10"	4'-4"	3'-10"	3'-5"	3'-1"	2'-10"
2-1000L150-54	11'-7"	10'-0"	7'-7"	6'-5"	5'-7"	4'-11"	4'-4"	3'-11"	3'-7"	3'-4"
2-1000L150-68	14'-11"	12'-10"	9'-9"	8'-3"	7'-2"	6'-4"	5'-8"	5'-1"	4'-8"	4'-3"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-24a
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



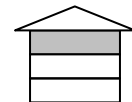
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	6'-1"	5'-3"	4'-0"	3'-4"	2'-11"	2'-7"	2'-3"	2'-1"	1'-11"	1'-9"
2-600L150-54	7'-1"	6'-1"	4'-7"	3'-11"	3'-5"	3'-0"	2'-8"	2'-5"	2'-2"	2'-0"
2-600L150-68	8'-2"	7'-0"	5'-4"	4'-6"	3'-11"	3'-6"	3'-1"	2'-9"	2'-6"	2'-4"
2-800L150-43	6'-11"	5'-11"	4'-6"	3'-10"	3'-4"	2'-11"	2'-7"	2'-4"	2'-2"	2'-0"
2-800L150-54	8'-11"	7'-8"	5'-10"	4'-11"	4'-3"	3'-9"	3'-4"	3'-0"	2'-9"	2'-6"
2-800L150-68	10'-3"	8'-10"	6'-8"	5'-8"	4'-11"	4'-5"	3'-11"	3'-6"	3'-2"	2'-11"
2-1000L150-43	7'-11"	6'-10"	5'-2"	4'-5"	3'-10"	3'-4"	3'-0"	2'-8"	2'-5"	2'-3"
2-1000L150-54	9'-1"	7'-10"	5'-11"	5'-0"	4'-4"	3'-11"	3'-5"	3'-1"	2'-10"	2'-7"
2-1000L150-68	11'-8"	10'-1"	7'-8"	6'-6"	5'-7"	5'-0"	4'-5"	4'-0"	3'-7"	3'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-24b
Double L-Header Spans - Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



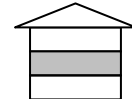
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	7'-5"	6'-5"	4'-10"	4'-1"	3'-7"	3'-2"	2'-9"	2'-6"	2'-3"	2'-1"
2-600L150-54	8'-8"	7'-5"	5'-7"	4'-9"	4'-2"	3'-8"	3'-3"	2'-11"	2'-8"	2'-5"
2-600L150-68	10'-1"	8'-8"	6'-7"	5'-7"	4'-10"	4'-3"	3'-9"	3'-5"	3'-1"	2'-10"
2-800L150-43	8'-5"	7'-3"	5'-6"	4'-8"	4'-0"	3'-7"	3'-2"	2'-10"	2'-7"	2'-5"
2-800L150-54	10'-11"	9'-4"	7'-1"	6'-0"	5'-3"	4'-7"	4'-1"	3'-8"	3'-4"	3'-1"
2-800L150-68	12'-7"	10'-10"	8'-3"	7'-0"	6'-0"	5'-4"	4'-9"	4'-3"	3'-11"	3'-7"
2-1000L150-43	9'-9"	8'-4"	6'-4"	5'-4"	4'-8"	4'-1"	3'-8"	3'-3"	3'-0"	2'-9"
2-1000L150-54	11'-2"	9'-7"	7'-3"	6'-2"	5'-4"	4'-9"	4'-2"	3'-9"	3'-5"	3'-2"
2-1000L150-68	14'-4"	12'-4"	9'-4"	7'-11"	6'-11"	6'-1"	5'-5"	4'-10"	4'-5"	4'-1"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-25a
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



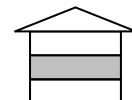
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	9'-7"	5'-9"	4'-5"	3'-7"	3'-1"	2'-8"	2'-5"
2-600L150-54	N/U	N/U	N/U	11'-1"	6'-8"	5'-2"	4'-2"	3'-7"	3'-1"	2'-10"
2-600L150-68	N/U	N/U	N/U	12'-11"	7'-9"	6'-0"	4'-10"	4'-1"	3'-7"	3'-3"
2-800L150-43	N/U	N/U	N/U	10'-10"	6'-6"	5'-0"	4'-1"	3'-6"	3'-1"	2'-9"
2-800L150-54	N/U	N/U	N/U	14'-0"	8'-5"	6'-6"	5'-3"	4'-6"	3'-11"	3'-6"
2-800L150-68	N/U	N/U	N/U	16'-0"	9'-9"	7'-6"	6'-1"	5'-2"	4'-7"	4'-1"
2-1000L150-43	N/U	N/U	N/U	12'-6"	7'-6"	5'-9"	4'-8"	4'-0"	3'-6"	3'-2"
2-1000L150-54	N/U	N/U	N/U	14'-4"	8'-7"	6'-7"	5'-4"	4'-7"	4'-0"	3'-7"
2-1000L150-68	N/U	N/U	N/U	16'-0"	11'-1"	8'-6"	6'-11"	5'-11"	5'-2"	4'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-25b
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



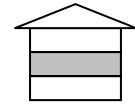
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	11'-9"	7'-0"	5'-5"	4'-4"	3'-9"	3'-3"	2'-11"
2-600L150-54	N/U	N/U	N/U	13'-7"	8'-2"	6'-3"	5'-1"	4'-4"	3'-10"	3'-5"
2-600L150-68	N/U	N/U	N/U	15'-10"	9'-6"	7'-4"	5'-11"	5'-0"	4'-5"	4'-0"
2-800L150-43	N/U	N/U	N/U	13'-4"	8'-0"	6'-2"	4'-11"	4'-3"	3'-9"	3'-4"
2-800L150-54	N/U	N/U	N/U	16'-0"	10'-4"	7'-11"	6'-5"	5'-6"	4'-10"	4'-4"
2-800L150-68	N/U	N/U	N/U	16'-0"	11'-11"	9'-2"	7'-5"	6'-4"	5'-7"	5'-0"
2-1000L150-43	N/U	N/U	N/U	15'-4"	9'-2"	7'-1"	5'-8"	4'-10"	4'-3"	3'-10"
2-1000L150-54	N/U	N/U	N/U	16'-0"	10'-7"	8'-1"	6'-7"	5'-7"	4'-11"	4'-5"
2-1000L150-68	N/U	N/U	N/U	16'-0"	13'-7"	10'-5"	8'-5"	7'-2"	6'-4"	5'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-26a
Double L-Header Spans - Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	8'-8"	5'-4"	4'-2"	3'-4"	2'-10"	2'-6"	2'-3"
2-600L150-54	N/U	N/U	N/U	10'-1"	6'-2"	4'-10"	3'-11"	3'-4"	2'-11"	2'-8"
2-600L150-68	N/U	N/U	N/U	11'-9"	7'-3"	5'-7"	4'-6"	3'-10"	3'-5"	3'-1"
2-800L150-43	N/U	N/U	N/U	9'-11"	6'-1"	4'-8"	3'-10"	3'-3"	2'-10"	2'-7"
2-800L150-54	N/U	N/U	N/U	12'-9"	7'-10"	6'-1"	4'-11"	4'-2"	3'-8"	3'-4"
2-800L150-68	N/U	N/U	N/U	14'-9"	9'-0"	7'-0"	5'-8"	4'-10"	4'-3"	3'-10"
2-1000L150-43	N/U	N/U	N/U	11'-4"	7'-0"	5'-5"	4'-4"	3'-9"	3'-3"	2'-11"
2-1000L150-54	N/U	N/U	N/U	13'-0"	8'-0"	6'-2"	5'-0"	4'-3"	3'-9"	3'-5"
2-1000L150-68	N/U	N/U	N/U	16'-0"	10'-4"	8'-0"	6'-5"	5'-6"	4'-10"	4'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

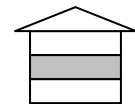
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-26b
Double L-Header Spans - Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	10'-8"	6'-6"	5'-1"	4'-1"	3'-6"	3'-1"	2'-9"
2-600L150-54	N/U	N/U	N/U	12'-5"	7'-7"	5'-10"	4'-9"	4'-1"	3'-7"	3'-2"
2-600L150-68	N/U	N/U	N/U	14'-5"	8'-10"	6'-10"	5'-6"	4'-9"	4'-2"	3'-9"
2-800L150-43	N/U	N/U	N/U	12'-1"	7'-5"	5'-9"	4'-8"	4'-0"	3'-6"	3'-1"
2-800L150-54	N/U	N/U	N/U	15'-8"	9'-7"	7'-5"	6'-0"	5'-1"	4'-6"	4'-0"
2-800L150-68	N/U	N/U	N/U	16'-0"	11'-1"	8'-7"	6'-11"	5'-11"	5'-2"	4'-8"
2-1000L150-43	N/U	N/U	N/U	13'-11"	8'-7"	6'-7"	5'-4"	4'-7"	4'-0"	3'-7"
2-1000L150-54	N/U	N/U	N/U	16'-0"	9'-10"	7'-7"	6'-2"	5'-3"	4'-7"	4'-2"
2-1000L150-68	N/U	N/U	N/U	16'-0"	12'-8"	9'-9"	7'-11"	6'-9"	5'-11"	5'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

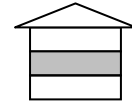
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-27a
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



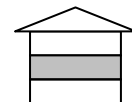
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	8'-1"	5'-0"	3'-11"	3'-2"	2'-8"	2'-5"	2'-2"
2-600L150-54	N/U	N/U	N/U	9'-4"	5'-10"	4'-6"	3'-8"	3'-2"	2'-9"	2'-6"
2-600L150-68	N/U	N/U	N/U	10'-10"	6'-9"	5'-3"	4'-3"	3'-8"	3'-3"	2'-11"
2-800L150-43	N/U	N/U	N/U	9'-2"	5'-8"	4'-5"	3'-7"	3'-1"	2'-8"	2'-5"
2-800L150-54	N/U	N/U	N/U	11'-9"	7'-4"	5'-8"	4'-8"	4'-0"	3'-6"	3'-2"
2-800L150-68	N/U	N/U	N/U	13'-7"	8'-6"	6'-7"	5'-4"	4'-7"	4'-0"	3'-7"
2-1000L150-43	N/U	N/U	N/U	10'-6"	6'-6"	5'-1"	4'-1"	3'-6"	3'-1"	2'-9"
2-1000L150-54	N/U	N/U	N/U	12'-0"	7'-6"	5'-10"	4'-9"	4'-1"	3'-7"	3'-2"
2-1000L150-68	N/U	N/U	N/U	15'-6"	9'-8"	7'-6"	6'-1"	5'-3"	4'-7"	4'-1"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-27b
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



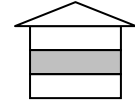
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	9'-10"	6'-2"	4'-9"	3'-10"	3'-3"	2'-11"	2'-7"
2-600L150-54	N/U	N/U	N/U	11'-5"	7'-2"	5'-6"	4'-6"	3'-10"	3'-3"	3'-0"
2-600L150-68	N/U	N/U	N/U	13'-4"	8'-3"	6'-5"	5'-3"	4'-5"	3'-11"	3'-6"
2-800L150-43	N/U	N/U	N/U	11'-2"	7'-0"	5'-5"	4'-5"	3'-9"	3'-3"	2'-11"
2-800L150-54	N/U	N/U	N/U	14'-5"	9'-0"	7'-0"	5'-8"	4'-10"	4'-3"	3'-10"
2-800L150-68	N/U	N/U	N/U	16'-0"	10'-5"	8'-1"	6'-6"	5'-7"	4'-11"	4'-5"
2-1000L150-43	N/U	N/U	N/U	12'-10"	8'-0"	6'-2"	5'-0"	4'-4"	3'-10"	3'-5"
2-1000L150-54	N/U	N/U	N/U	14'-10"	9'-2"	7'-2"	5'-9"	4'-11"	4'-4"	3'-11"
2-1000L150-68	N/U	N/U	N/U	16'-0"	11'-10"	9'-2"	7'-5"	6'-5"	5'-7"	5'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-28a
Double L-Header Spans - Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	9'-0"	5'-1"	3'-10"	3'-1"	2'-7"	2'-4"	2'-1"
2-600L150-54	N/U	N/U	N/U	10'-5"	5'-10"	4'-5"	3'-7"	3'-1"	2'-8"	2'-5"
2-600L150-68	N/U	N/U	N/U	12'-2"	6'-10"	5'-2"	4'-2"	3'-6"	3'-1"	2'-9"
2-800L150-43	N/U	N/U	N/U	10'-2"	5'-9"	4'-4"	3'-6"	3'-0"	2'-7"	2'-4"
2-800L150-54	N/U	N/U	N/U	13'-2"	7'-5"	5'-7"	4'-6"	3'-10"	3'-4"	3'-0"
2-800L150-68	N/U	N/U	N/U	15'-2"	8'-7"	6'-6"	5'-2"	4'-5"	3'-11"	3'-6"
2-1000L150-43	N/U	N/U	N/U	11'-9"	6'-7"	5'-0"	4'-0"	3'-5"	3'-0"	2'-8"
2-1000L150-54	N/U	N/U	N/U	13'-5"	7'-7"	5'-9"	4'-7"	3'-11"	3'-5"	3'-1"
2-1000L150-68	N/U	N/U	N/U	16'-0"	9'-9"	7'-5"	5'-11"	5'-1"	4'-5"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

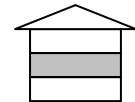
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-28b
Double L-Header Spans - Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	11'-0"	6'-2"	4'-8"	3'-9"	3'-2"	2'-9"	2'-6"
2-600L150-54	N/U	N/U	N/U	12'-10"	7'-2"	5'-5"	4'-4"	3'-8"	3'-3"	2'-11"
2-600L150-68	N/U	N/U	N/U	14'-11"	8'-4"	6'-4"	5'-1"	4'-4"	3'-9"	3'-5"
2-800L150-43	N/U	N/U	N/U	12'-6"	7'-0"	5'-4"	4'-3"	3'-7"	3'-2"	2'-10"
2-800L150-54	N/U	N/U	N/U	16'-0"	9'-1"	6'-10"	5'-6"	4'-8"	4'-1"	3'-8"
2-800L150-68	N/U	N/U	N/U	16'-0"	10'-6"	7'-11"	6'-4"	5'-5"	4'-9"	4'-3"
2-1000L150-43	N/U	N/U	N/U	14'-5"	8'-1"	6'-1"	4'-11"	4'-2"	3'-8"	3'-3"
2-1000L150-54	N/U	N/U	N/U	16'-0"	9'-3"	7'-0"	5'-8"	4'-9"	4'-2"	3'-9"
2-1000L150-68	N/U	N/U	N/U	16'-0"	11'-11"	9'-1"	7'-3"	6'-2"	5'-5"	4'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

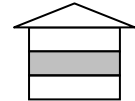
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-29a
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



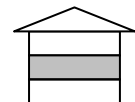
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	7'-1"	4'-6"	3'-6"	2'-10"	2'-5"	2'-2"	1'-11"
2-600L150-54	N/U	N/U	N/U	8'-2"	5'-3"	4'-1"	3'-4"	2'-10"	2'-6"	2'-3"
2-600L150-68	N/U	N/U	N/U	9'-6"	6'-1"	4'-9"	3'-10"	3'-4"	2'-11"	2'-7"
2-800L150-43	N/U	N/U	N/U	8'-0"	5'-1"	4'-0"	3'-3"	2'-9"	2'-5"	2'-2"
2-800L150-54	N/U	N/U	N/U	10'-4"	6'-7"	5'-2"	4'-2"	3'-7"	3'-2"	2'-10"
2-800L150-68	N/U	N/U	N/U	11'-11"	7'-7"	5'-11"	4'-10"	4'-2"	3'-8"	3'-3"
2-1000L150-43	N/U	N/U	N/U	9'-3"	5'-10"	4'-7"	3'-9"	3'-2"	2'-10"	2'-6"
2-1000L150-54	N/U	N/U	N/U	10'-7"	6'-9"	5'-3"	4'-3"	3'-8"	3'-3"	2'-11"
2-1000L150-68	N/U	N/U	N/U	13'-7"	8'-8"	6'-9"	5'-6"	4'-9"	4'-2"	3'-9"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-29b
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



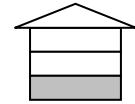
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	8'-8"	5'-6"	4'-3"	3'-6"	3'-0"	2'-7"	2'-4"
2-600L150-54	N/U	N/U	N/U	10'-1"	6'-5"	5'-0"	4'-1"	3'-6"	3'-1"	2'-9"
2-600L150-68	N/U	N/U	N/U	11'-8"	7'-5"	5'-10"	4'-9"	4'-0"	3'-7"	3'-1"
2-800L150-43	N/U	N/U	N/U	9'-10"	6'-3"	4'-10"	3'-11"	3'-5"	3'-0"	2'-8"
2-800L150-54	N/U	N/U	N/U	12'-8"	8'-1"	6'-3"	5'-1"	4'-5"	3'-10"	3'-6"
2-800L150-68	N/U	N/U	N/U	14'-8"	9'-4"	7'-3"	5'-11"	5'-1"	4'-6"	4'-0"
2-1000L150-43	N/U	N/U	N/U	11'-4"	7'-2"	5'-7"	4'-7"	3'-11"	3'-5"	3'-1"
2-1000L150-54	N/U	N/U	N/U	13'-0"	8'-3"	6'-5"	5'-3"	4'-6"	3'-11"	3'-7"
2-1000L150-68	N/U	N/U	N/U	16'-0"	10'-8"	8'-4"	6'-9"	5'-9"	5'-1"	4'-7"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-30a
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	5'-10"	4'-2"	3'-4"	2'-10"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-9"	4'-10"	3'-10"	3'-4"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-10"	5'-7"	4'-6"	3'-10"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-7"	4'-8"	3'-9"	3'-3"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-6"	6'-1"	4'-11"	4'-2"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-10"	7'-0"	5'-8"	4'-10"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-7"	5'-5"	4'-4"	3'-9"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-9"	6'-2"	5'-0"	4'-3"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	11'-3"	8'-0"	6'-5"	5'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

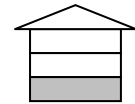
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-30b
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-2"	5'-1"	4'-1"	3'-6"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-3"	5'-10"	4'-9"	4'-0"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-8"	6'-10"	5'-6"	4'-8"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-1"	5'-9"	4'-8"	3'-11"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-5"	7'-5"	6'-0"	5'-1"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-1"	8'-7"	6'-11"	5'-11"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-4"	6'-7"	5'-4"	4'-6"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-8"	7'-7"	6'-1"	5'-2"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-9"	9'-9"	7'-10"	6'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

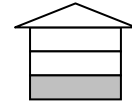
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-31a
Double L-Header Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



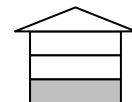
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	14'-1"	5'-4"	3'-10"	3'-1"	2'-8"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-2"	4'-5"	3'-7"	3'-1"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-2"	5'-2"	4'-2"	3'-7"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-0"	4'-4"	3'-6"	3'-0"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-9"	5'-7"	4'-6"	3'-11"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-0"	6'-6"	5'-3"	4'-6"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-11"	5'-0"	4'-1"	3'-6"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-11"	5'-9"	4'-8"	4'-0"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-3"	7'-4"	6'-0"	5'-1"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-31b
Double L-Header Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



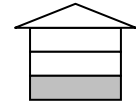
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-6"	4'-8"	3'-9"	3'-3"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-6"	5'-5"	4'-5"	3'-9"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-9"	6'-4"	5'-1"	4'-4"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-4"	5'-4"	4'-4"	3'-8"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-6"	6'-10"	5'-7"	4'-9"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	11'-0"	7'-11"	6'-5"	5'-6"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-6"	6'-1"	4'-11"	4'-3"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-9"	7'-0"	5'-8"	4'-10"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-6"	9'-0"	7'-4"	6'-3"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-32a
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	11'-5"	4'-11"	3'-7"	2'-11"	2'-6"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	13'-5"	5'-8"	4'-2"	3'-5"	2'-11"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	15'-6"	6'-7"	4'-10"	3'-11"	3'-5"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	13'-0"	5'-7"	4'-1"	3'-4"	2'-10"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-2"	5'-3"	4'-3"	3'-8"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-3"	6'-1"	4'-11"	4'-3"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	14'-11"	6'-5"	4'-8"	3'-10"	3'-3"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-4"	5'-4"	4'-4"	3'-9"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-5"	6'-11"	5'-7"	4'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

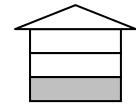
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-32b
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	14'-1"	6'-0"	4'-4"	3'-7"	3'-0"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-0"	5'-1"	4'-1"	3'-6"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-1"	5'-11"	4'-10"	4'-1"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	6'-10"	4'-11"	4'-0"	3'-5"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-9"	6'-5"	5'-3"	4'-6"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-2"	7'-5"	6'-0"	5'-2"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-10"	5'-8"	4'-8"	4'-0"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-0"	6'-7"	5'-4"	4'-7"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	11'-7"	8'-5"	6'-10"	5'-11"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

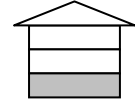
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-33a
Double L-Header Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



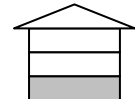
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	9'-11"	4'-7"	3'-4"	2'-9"	2'-4"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	11'-6"	5'-4"	3'-11"	3'-2"	2'-9"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	13'-4"	6'-2"	4'-7"	3'-9"	3'-2"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	11'-3"	5'-2"	3'-10"	3'-2"	2'-8"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	14'-6"	6'-8"	4'-11"	4'-0"	3'-6"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-9"	5'-8"	4'-8"	4'-0"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	12'-11"	6'-0"	4'-5"	3'-7"	3'-1"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	14'-10"	6'-10"	5'-1"	4'-2"	3'-7"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-10"	6'-6"	5'-4"	4'-7"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-33b
Double L-Header Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



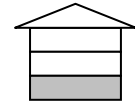
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	12'-2"	5'-7"	4'-1"	3'-4"	2'-11"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	14'-1"	6'-6"	4'-9"	3'-11"	3'-4"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-7"	5'-7"	4'-6"	3'-11"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	13'-9"	6'-4"	4'-8"	3'-10"	3'-3"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-2"	6'-0"	4'-11"	4'-3"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	9'-6"	7'-0"	5'-8"	4'-11"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	15'-10"	7'-4"	5'-4"	4'-5"	3'-9"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-5"	6'-2"	5'-0"	4'-4"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-10"	7'-11"	6'-6"	5'-7"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
 KSI

Table E7-34a
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	8'-10"	4'-4"	3'-2"	2'-7"	2'-3"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	10'-3"	5'-0"	3'-9"	3'-1"	2'-7"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	11'-11"	5'-10"	4'-4"	3'-6"	3'-1"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	10'-0"	4'-11"	3'-8"	3'-0"	2'-7"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	12'-11"	6'-4"	4'-8"	3'-10"	3'-4"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	14'-11"	7'-3"	5'-5"	4'-5"	3'-10"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	11'-6"	5'-7"	4'-2"	3'-5"	2'-11"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	13'-3"	6'-5"	4'-9"	3'-11"	3'-5"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-4"	6'-2"	5'-1"	4'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

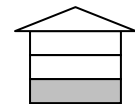
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
 KSI

Table E7-34b
Double L-Header Spans - Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	10'-10"	5'-3"	3'-11"	3'-2"	2'-9"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	12'-7"	6'-1"	4'-6"	3'-8"	3'-2"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	14'-7"	7'-1"	5'-3"	4'-4"	3'-8"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	12'-3"	6'-0"	4'-5"	3'-7"	3'-1"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	15'-10"	7'-9"	5'-9"	4'-8"	4'-0"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	8'-11"	6'-7"	5'-5"	4'-8"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	14'-2"	6'-11"	5'-1"	4'-2"	3'-7"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	7'-11"	5'-10"	4'-9"	4'-1"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-2"	7'-7"	6'-2"	5'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

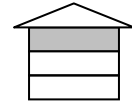
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-35a
Single L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	3'-7"	3'-4"	3'-2"	3'-0"	2'-10"	3'-4"	3'-2"	3'-0"	2'-10"	2'-8"
600L150-54	4'-0"	3'-10"	3'-8"	3'-6"	3'-4"	3'-11"	3'-8"	3'-6"	3'-3"	3'-2"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	4'-0"	4'-0"	4'-0"	3'-10"	3'-8"
800L150-43	4'-0"	4'-0"	3'-10"	3'-7"	3'-5"	4'-0"	3'-10"	3'-7"	3'-5"	3'-3"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-9"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

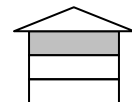
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

50
KSI

Table E7-35b
Single L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	4'-0"	4'-0"	3'-11"	3'-8"	3'-6"	4'-0"	3'-11"	3'-8"	3'-6"	3'-4"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

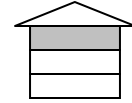
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

33
KSI

Table E7-36a
Single L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 33 ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-9"	2'-7"	2'-5"	2'-4"	2'-3"	2'-5"	2'-3"	2'-2"	2'-0"	1'-11"
600L150-54	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"	2'-9"	2'-7"	2'-6"	2'-4"	2'-3"
600L150-68	3'-9"	3'-6"	3'-4"	3'-2"	3'-0"	3'-3"	3'-0"	2'-10"	2'-9"	2'-7"
800L150-43	3'-4"	3'-1"	2'-11"	2'-10"	2'-8"	2'-11"	2'-9"	2'-7"	2'-5"	2'-4"
800L150-54	3'-10"	3'-7"	3'-5"	3'-3"	3'-1"	3'-4"	3'-2"	2'-11"	2'-10"	2'-8"
800L150-68	4'-0"	4'-0"	3'-11"	3'-9"	3'-7"	3'-10"	3'-7"	3'-5"	3'-3"	3'-1"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

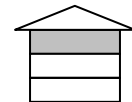
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

50
KSI

Table E7-36b
Single L-Header Spans – Gravity Loading
Headers Supporting Roof and Ceiling Only ^{1,2}
F_y = 50 ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	3'-5"	3'-2"	3'-0"	2'-10"	2'-9"	2'-11"	2'-9"	2'-7"	2'-6"	2'-5"
600L150-54	3'-11"	3'-8"	3'-6"	3'-4"	3'-2"	3'-5"	3'-3"	3'-1"	2'-11"	2'-9"
600L150-68	4'-0"	4'-0"	4'-0"	3'-10"	3'-8"	4'-0"	3'-9"	3'-6"	3'-4"	3'-3"
800L150-43	4'-0"	3'-10"	3'-8"	3'-5"	3'-4"	3'-7"	3'-4"	3'-2"	3'-0"	2'-10"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	4'-0"	3'-10"	3'-8"	3'-5"	3'-4"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

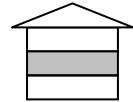
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)

2 foot (0.61 m) roof overhang

33
KSI

Table E7-37a
Single L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 33 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-8"	2'-6"	2'-4"	2'-3"	2'-1"	2'-7"	2'-5"	2'-4"	2'-2"	2'-1"
600L150-54	3'-1"	2'-11"	2'-9"	2'-7"	2'-5"	3'-1"	2'-10"	2'-8"	2'-7"	2'-5"
600L150-68	3'-7"	3'-4"	3'-2"	3'-0"	2'-10"	3'-6"	3'-4"	3'-2"	3'-0"	2'-10"
800L150-43	3'-2"	3'-0"	2'-10"	2'-8"	2'-7"	3'-2"	2'-11"	2'-9"	2'-8"	2'-6"
800L150-54	3'-8"	3'-5"	3'-3"	3'-1"	2'-11"	3'-8"	3'-5"	3'-3"	3'-1"	2'-11"
800L150-68	4'-0"	4'-0"	3'-9"	3'-7"	3'-5"	4'-0"	3'-11"	3'-9"	3'-6"	3'-4"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

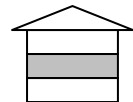
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-37b
Single L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling^{1,2}
F_y = 50 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	3'-3"	3'-1"	2'-11"	2'-9"	2'-7"	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"
600L150-54	3'-9"	3'-7"	3'-4"	3'-2"	3'-0"	3'-9"	3'-6"	3'-4"	3'-2"	3'-0"
600L150-68	4'-0"	4'-0"	3'-11"	3'-8"	3'-6"	4'-0"	4'-0"	3'-10"	3'-8"	3'-6"
800L150-43	3'-11"	3'-8"	3'-6"	3'-3"	3'-2"	3'-11"	3'-8"	3'-5"	3'-3"	3'-1"
800L150-54	4'-0"	4'-0"	4'-0"	3'-10"	3'-7"	4'-0"	4'-0"	3'-11"	3'-9"	3'-7"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

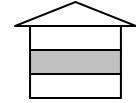
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-38a
Single L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling ^{1,2}
F_y = 33 ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-4"	2'-2"	2'-1"	1'-11"	1'-10"	2'-1"	2'-0"	1'-10"	1'-9"	1'-8"
600L150-54	2'-8"	2'-6"	2'-5"	2'-3"	2'-2"	2'-5"	2'-3"	2'-2"	2'-1"	2'-0"
600L150-68	3'-2"	2'-11"	2'-9"	2'-7"	2'-6"	2'-10"	2'-8"	2'-6"	2'-5"	2'-3"
800L150-43	2'-10"	2'-7"	2'-6"	2'-4"	2'-3"	2'-6"	2'-5"	2'-3"	2'-2"	2'-1"
800L150-54	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"	2'-11"	2'-9"	2'-7"	2'-6"	2'-4"
800L150-68	3'-9"	3'-6"	3'-3"	3'-1"	3'-0"	3'-4"	3'-2"	3'-0"	2'-10"	2'-9"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

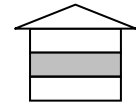
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-38b
Single L-Header Spans – Gravity Loading
Headers Supporting One Floor, Roof and Ceiling ^{1,2}
F_y = 50 ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-10"	2'-8"	2'-6"	2'-5"	2'-3"	2'-7"	2'-5"	2'-4"	2'-2"	2'-1"
600L150-54	3'-4"	3'-1"	2'-11"	2'-9"	2'-8"	3'-0"	2'-10"	2'-8"	2'-6"	2'-5"
600L150-68	3'-10"	3'-7"	3'-5"	3'-3"	3'-1"	3'-6"	3'-3"	3'-1"	2'-11"	2'-10"
800L150-43	3'-5"	3'-3"	3'-0"	2'-11"	2'-9"	3'-1"	2'-11"	2'-9"	2'-8"	2'-6"
800L150-54	4'-0"	3'-9"	3'-6"	3'-4"	3'-2"	3'-7"	3'-4"	3'-2"	3'-0"	2'-11"
800L150-68	4'-0"	4'-0"	4'-0"	3'-10"	3'-8"	4'-2"	3'-11"	3'-8"	3'-6"	3'-4"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

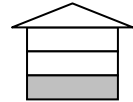
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-39a
Single L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 33 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	1'-11"	1'-10"	1'-8"	1'-7"	1'-7"	1'-11"	1'-10"	1'-8"	1'-7"	1'-6"
600L150-54	2'-3"	2'-1"	2'-0"	1'-11"	1'-9"	2'-3"	2'-1"	2'-0"	1'-10"	1'-9"
600L150-68	2'-7"	2'-5"	2'-4"	2'-2"	2'-1"	2'-7"	2'-5"	2'-3"	2'-2"	2'-1"
800L150-43	2'-4"	2'-2"	2'-1"	1'-11"	1'-10"	2'-4"	2'-2"	2'-1"	1'-11"	1'-10"
800L150-54	2'-8"	2'-6"	2'-4"	2'-3"	2'-2"	2'-8"	2'-6"	2'-4"	2'-3"	2'-2"
800L150-68	3'-1"	2'-11"	2'-9"	2'-7"	2'-6"	3'-1"	2'-11"	2'-9"	2'-7"	2'-6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

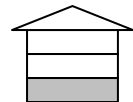
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-39b
Single L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
F_y = 50 ksi



Single L-Header Designation	20 psf Ground Snow Load					30 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-5"	2'-3"	2'-1"	2'-0"	1'-11"	2'-4"	2'-3"	2'-1"	2'-0"	1'-11"
600L150-54	2'-9"	2'-7"	2'-5"	2'-4"	2'-2"	2'-9"	2'-7"	2'-5"	2'-4"	2'-2"
600L150-68	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"	3'-2"	2'-11"	2'-10"	2'-8"	2'-7"
800L150-43	2'-10"	2'-8"	2'-6"	2'-5"	2'-3"	2'-10"	2'-8"	2'-6"	2'-5"	2'-3"
800L150-54	3'-4"	3'-1"	2'-11"	2'-9"	2'-8"	3'-4"	3'-1"	2'-11"	2'-9"	2'-7"
800L150-68	3'-10"	3'-7"	3'-4"	3'-2"	3'-1"	3'-10"	3'-7"	3'-4"	3'-2"	3'-0"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

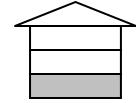
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
 2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-40a
Single L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
 $F_y = 33$ ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	1'-11"	1'-9"	1'-8"	1'-7"	1'-6"	1'-10"	1'-9"	1'-7"	1'-6"	1'-6"
600L150-54	2'-2"	2'-0"	1'-11"	1'-10"	1'-9"	2'-2"	2'-0"	1'-11"	1'-9"	1'-8"
600L150-68	2'-6"	2'-4"	2'-3"	2'-1"	2'-0"	2'-6"	2'-4"	2'-2"	2'-1"	2'-0"
800L150-43	2'-3"	2'-1"	2'-0"	1'-11"	1'-10"	2'-3"	2'-1"	1'-11"	1'-10"	1'-9"
800L150-54	2'-7"	2'-5"	2'-4"	2'-2"	2'-1"	2'-7"	2'-5"	2'-3"	2'-2"	2'-0"
800L150-68	3'-0"	2'-10"	2'-8"	2'-6"	2'-5"	2'-11"	2'-9"	2'-7"	2'-6"	2'-4"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

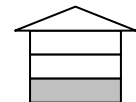
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

50
KSI

Table E7-40b
Single L-Header Spans – Gravity Loading
Headers Supporting Two Floors, Roof and Ceiling ^{1,2}
 $F_y = 50$ ksi



Single L-Header Designation	50 psf Ground Snow Load					70 psf Ground Snow Load				
	Building Width					Building Width				
	24'	28'	32'	36'	40'	24'	28'	32'	36'	40'
600L150-43	2'-3"	2'-2"	2'-0"	1'-11"	1'-10"	2'-3"	2'-1"	2'-0"	1'-11"	1'-10"
600L150-54	2'-8"	2'-6"	2'-4"	2'-3"	2'-2"	2'-8"	2'-5"	2'-4"	2'-2"	2'-1"
600L150-68	3'-2"	2'-11"	2'-9"	2'-7"	2'-6"	3'-1"	2'-10"	2'-8"	2'-7"	2'-5"
800L150-43	2'-9"	2'-7"	2'-5"	2'-4"	2'-3"	2'-9"	2'-7"	2'-5"	2'-3"	2'-2"
800L150-54	3'-3"	3'-0"	2'-10"	2'-8"	2'-7"	3'-2"	2'-11"	2'-9"	2'-8"	2'-6"
800L150-68	3'-9"	3'-6"	3'-3"	3'-1"	2'-11"	3'-8"	3'-5"	3'-2"	3'-0"	2'-11"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

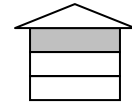
² Design assumptions:

Roof and ceiling dead load = 12 psf (0.58 kN/m²)
2 foot (0.61 m) roof overhang

Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²)

33
KSI

Table E7-41a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	14'-7"	11'-3"	9'-7"	8'-4"	7'-5"	6'-7"	5'-11"	5'-5"	5'-0"
2-600L150-54	16'-0"	16'-0"	13'-1"	11'-2"	9'-8"	8'-7"	7'-8"	6'-11"	6'-3"	5'-9"
2-600L150-68	16'-0"	16'-0"	15'-2"	13'-0"	11'-3"	10'-0"	8'-11"	8'-0"	7'-4"	6'-9"
2-800L150-43	16'-0"	16'-0"	14'-0"	12'-0"	10'-5"	9'-3"	8'-2"	7'-5"	6'-9"	6'-3"
2-800L150-54	16'-0"	16'-0"	16'-0"	14'-1"	12'-3"	10'-10"	9'-8"	8'-8"	7'-11"	7'-4"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	14'-1"	12'-7"	11'-2"	10'-0"	9'-2"	8'-5"
2-1000L150-43	16'-0"	16'-0"	14'-8"	12'-6"	10'-10"	9'-8"	8'-7"	7'-9"	7'-1"	6'-6"
2-1000L150-54	16'-0"	16'-0"	16'-0"	14'-4"	12'-6"	11'-1"	9'-10"	8'-11"	8'-1"	7'-6"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	14'-9"	13'-1"	11'-7"	10'-6"	9'-7"	8'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

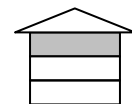
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-41b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	16'-0"	13'-10"	11'-10"	10'-3"	9'-1"	8'-1"	7'-3"	6'-8"	6'-1"
2-600L150-54	16'-0"	16'-0"	16'-0"	13'-9"	11'-11"	10'-7"	9'-4"	8'-5"	7'-8"	7'-1"
2-600L150-68	16'-0"	16'-0"	16'-0"	15'-11"	13'-10"	12'-3"	10'-11"	9'-10"	9'-0"	8'-3"
2-800L150-43	16'-0"	16'-0"	16'-0"	14'-9"	12'-10"	11'-4"	10'-1"	9'-1"	8'-3"	7'-7"
2-800L150-54	16'-0"	16'-0"	16'-0"	16'-0"	15'-0"	13'-4"	11'-10"	10'-8"	9'-9"	8'-11"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	15'-5"	13'-8"	12'-4"	11'-3"	10'-4"
2-1000L150-43	16'-0"	16'-0"	16'-0"	15'-5"	13'-5"	11'-10"	10'-6"	9'-6"	8'-8"	8'-0"
2-1000L150-54	16'-0"	16'-0"	16'-0"	16'-0"	15'-4"	13'-7"	12'-1"	10'-11"	9'-11"	9'-2"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	14'-3"	12'-10"	11'-9"	10'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

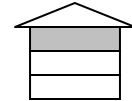
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-42a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	13'-11"	10'-8"	9'-1"	7'-11"	7'-0"	6'-2"	5'-7"	5'-1"	4'-8"
2-600L150-54	16'-0"	16'-0"	12'-4"	10'-6"	9'-2"	8'-1"	7'-2"	6'-6"	5'-11"	5'-5"
2-600L150-68	16'-0"	16'-0"	14'-4"	12'-3"	10'-8"	9'-5"	8'-4"	7'-7"	6'-11"	6'-4"
2-800L150-43	16'-0"	16'-0"	13'-3"	11'-4"	9'-10"	8'-9"	7'-9"	7'-0"	6'-4"	5'-10"
2-800L150-54	16'-0"	16'-0"	15'-7"	13'-3"	11'-6"	10'-3"	9'-1"	8'-2"	7'-6"	6'-11"
2-800L150-68	16'-0"	16'-0"	16'-0"	15'-4"	13'-4"	11'-10"	10'-6"	9'-6"	8'-8"	7'-11"
2-1000L150-43	16'-0"	16'-0"	13'-11"	11'-10"	10'-3"	9'-1"	8'-1"	7'-3"	6'-8"	6'-1"
2-1000L150-54	16'-0"	16'-0"	15'-11"	13'-7"	11'-9"	10'-6"	9'-3"	8'-4"	7'-8"	7'-0"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	13'-11"	12'-4"	10'-11"	9'-10"	9'-0"	8'-3"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

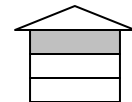
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-42b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	16'-0"	13'-1"	11'-2"	9'-8"	8'-7"	7'-7"	6'-10"	6'-3"	5'-9"
2-600L150-54	16'-0"	16'-0"	15'-2"	12'-11"	11'-3"	10'-0"	8'-10"	8'-0"	7'-3"	6'-8"
2-600L150-68	16'-0"	16'-0"	16'-0"	15'-0"	13'-1"	11'-7"	10'-3"	9'-3"	8'-5"	7'-9"
2-800L150-43	16'-0"	16'-0"	16'-0"	13'-10"	12'-0"	10'-8"	9'-6"	8'-7"	7'-9"	7'-2"
2-800L150-54	16'-0"	16'-0"	16'-0"	16'-0"	14'-2"	12'-7"	11'-2"	10'-1"	9'-2"	8'-5"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	14'-6"	12'-11"	11'-7"	10'-7"	9'-9"
2-1000L150-43	16'-0"	16'-0"	16'-0"	14'-6"	12'-7"	11'-2"	9'-11"	8'-11"	8'-2"	7'-6"
2-1000L150-54	16'-0"	16'-0"	16'-0"	16'-0"	14'-6"	12'-10"	11'-5"	10'-3"	9'-4"	8'-7"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	15'-2"	13'-5"	12'-1"	11'-1"	10'-2"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

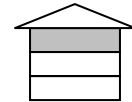
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-43a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	15'-5"	13'-3"	10'-2"	8'-8"	7'-6"	6'-8"	5'-11"	5'-4"	4'-10"	4'-5"
2-600L150-54	16'-0"	15'-5"	11'-9"	10'-0"	8'-8"	7'-9"	6'-10"	6'-2"	5'-7"	5'-2"
2-600L150-68	16'-0"	16'-0"	13'-8"	11'-8"	10'-1"	9'-0"	7'-11"	7'-2"	6'-6"	6'-0"
2-800L150-43	16'-0"	16'-0"	12'-8"	10'-9"	9'-4"	8'-3"	7'-4"	6'-7"	6'-0"	5'-7"
2-800L150-54	16'-0"	16'-0"	14'-10"	12'-7"	10'-11"	9'-9"	8'-7"	7'-9"	7'-1"	6'-6"
2-800L150-68	16'-0"	16'-0"	16'-0"	14'-7"	12'-8"	11'-3"	10'-0"	9'-0"	8'-2"	7'-6"
2-1000L150-43	16'-0"	16'-0"	13'-2"	11'-3"	9'-9"	8'-8"	7'-8"	6'-11"	6'-4"	5'-10"
2-1000L150-54	16'-0"	16'-0"	15'-2"	12'-11"	11'-2"	9'-11"	8'-10"	7'-11"	7'-3"	6'-8"
2-1000L150-68	16'-0"	16'-0"	16'-0"	15'-3"	13'-2"	11'-9"	10'-5"	9'-4"	8'-6"	7'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

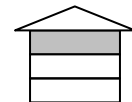
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-43b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	16'-0"	12'-5"	10'-7"	9'-2"	8'-2"	7'-3"	6'-6"	5'-11"	5'-5"
2-600L150-54	16'-0"	16'-0"	14'-5"	12'-3"	10'-8"	9'-5"	8'-5"	7'-7"	6'-11"	6'-4"
2-600L150-68	16'-0"	16'-0"	16'-0"	14'-4"	12'-5"	11'-0"	9'-9"	8'-9"	8'-0"	7'-4"
2-800L150-43	16'-0"	16'-0"	15'-6"	13'-2"	11'-5"	10'-2"	9'-0"	8'-1"	7'-5"	6'-10"
2-800L150-54	16'-0"	16'-0"	16'-0"	15'-6"	13'-5"	11'-11"	10'-7"	9'-6"	8'-8"	8'-0"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	15'-6"	13'-10"	12'-3"	11'-0"	10'-0"	9'-3"
2-1000L150-43	16'-0"	16'-0"	16'-0"	13'-10"	12'-0"	10'-7"	9'-5"	8'-6"	7'-9"	7'-1"
2-1000L150-54	16'-0"	16'-0"	16'-0"	15'-10"	13'-9"	12'-2"	10'-10"	9'-9"	8'-10"	8'-2"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	16'-0"	14'-5"	12'-9"	11'-6"	10'-6"	9'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

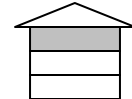
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-44a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



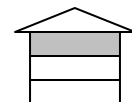
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	14'-9"	12'-9"	9'-8"	8'-3"	7'-2"	6'-4"	5'-7"	5'-1"	4'-7"	4'-3"
2-600L150-54	16'-0"	14'-9"	11'-3"	9'-7"	8'-3"	7'-4"	6'-6"	5'-11"	5'-4"	4'-11"
2-600L150-68	16'-0"	16'-0"	13'-1"	11'-1"	9'-8"	8'-7"	7'-7"	6'-10"	6'-3"	5'-9"
2-800L150-43	16'-0"	15'-10"	12'-1"	10'-3"	8'-11"	7'-11"	7'-0"	6'-4"	5'-9"	5'-3"
2-800L150-54	16'-0"	16'-0"	14'-2"	12'-1"	10'-5"	9'-3"	8'-3"	7'-5"	6'-9"	6'-3"
2-800L150-68	16'-0"	16'-0"	16'-0"	13'-11"	12'-1"	10'-9"	9'-6"	8'-7"	7'-10"	7'-2"
2-1000L150-43	16'-0"	16'-0"	12'-7"	10'-9"	9'-4"	8'-3"	7'-4"	6'-7"	6'-0"	5'-6"
2-1000L150-54	16'-0"	16'-0"	14'-6"	12'-4"	10'-8"	9'-6"	8'-5"	7'-7"	6'-11"	6'-4"
2-1000L150-68	16'-0"	16'-0"	16'-0"	14'-6"	12'-7"	11'-2"	9'-11"	8'-11"	8'-2"	7'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-44b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



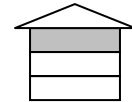
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	15'-8"	11'-11"	10'-1"	8'-9"	7'-9"	6'-10"	6'-2"	5'-8"	5'-2"
2-600L150-54	16'-0"	16'-0"	13'-10"	11'-9"	10'-2"	9'-0"	8'-0"	7'-2"	6'-7"	6'-0"
2-600L150-68	16'-0"	16'-0"	16'-0"	13'-8"	11'-10"	10'-6"	9'-3"	8'-4"	7'-8"	7'-0"
2-800L150-43	16'-0"	16'-0"	14'-10"	12'-7"	10'-11"	9'-8"	8'-7"	7'-9"	7'-0"	6'-6"
2-800L150-54	16'-0"	16'-0"	16'-0"	14'-10"	12'-10"	11'-5"	10'-1"	9'-1"	8'-3"	7'-7"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	14'-10"	13'-2"	11'-8"	10'-6"	9'-7"	8'-10"
2-1000L150-43	16'-0"	16'-0"	15'-6"	13'-2"	11'-5"	10'-2"	9'-0"	8'-1"	7'-4"	6'-9"
2-1000L150-54	16'-0"	16'-0"	16'-0"	15'-1"	13'-1"	11'-8"	10'-4"	9'-3"	8'-5"	7'-9"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	15'-6"	13'-9"	12'-2"	10'-11"	10'-0"	9'-2"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-45a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



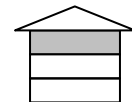
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	14'-3"	12'-3"	9'-3"	7'-11"	6'-10"	6'-1"	5'-5"	4'-10"	4'-5"	4'-1"
2-600L150-54	16'-0"	14'-3"	10'-9"	9'-2"	7'-11"	7'-1"	6'-3"	5'-7"	5'-2"	4'-9"
2-600L150-68	16'-0"	16'-0"	12'-7"	10'-8"	9'-3"	8'-2"	7'-3"	6'-6"	6'-0"	5'-6"
2-800L150-43	16'-0"	15'-3"	11'-7"	9'-10"	8'-6"	7'-7"	6'-8"	6'-0"	5'-6"	5'-1"
2-800L150-54	16'-0"	16'-0"	13'-7"	11'-7"	10'-0"	8'-11"	7'-10"	7'-1"	6'-6"	5'-11"
2-800L150-68	16'-0"	16'-0"	15'-9"	13'-4"	11'-7"	10'-3"	9'-1"	8'-2"	7'-6"	6'-11"
2-1000L150-43	16'-0"	15'-11"	12'-1"	10'-3"	8'-11"	7'-11"	7'-0"	6'-4"	5'-9"	5'-4"
2-1000L150-54	16'-0"	16'-0"	13'-11"	11'-10"	10'-3"	9'-1"	8'-0"	7'-3"	6'-7"	6'-1"
2-1000L150-68	16'-0"	16'-0"	16'-0"	13'-11"	12'-1"	10'-9"	9'-6"	8'-7"	7'-9"	7'-2"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-45b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



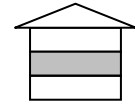
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	16'-0"	15'-0"	11'-5"	9'-8"	8'-5"	7'-5"	6'-7"	5'-11"	5'-5"	5'-0"
2-600L150-54	16'-0"	16'-0"	13'-3"	11'-3"	9'-9"	8'-8"	7'-8"	6'-11"	6'-3"	5'-9"
2-600L150-68	16'-0"	16'-0"	15'-5"	13'-1"	11'-4"	10'-1"	8'-11"	8'-0"	7'-4"	6'-9"
2-800L150-43	16'-0"	16'-0"	14'-3"	12'-1"	10'-5"	9'-3"	8'-2"	7'-5"	6'-9"	6'-2"
2-800L150-54	16'-0"	16'-0"	16'-0"	14'-2"	12'-3"	10'-11"	9'-8"	8'-8"	7'-11"	7'-3"
2-800L150-68	16'-0"	16'-0"	16'-0"	16'-0"	14'-2"	12'-7"	11'-2"	10'-1"	9'-2"	8'-5"
2-1000L150-43	16'-0"	16'-0"	14'-10"	12'-7"	10'-11"	9'-8"	8'-7"	7'-9"	7'-1"	6'-6"
2-1000L150-54	16'-0"	16'-0"	16'-0"	14'-6"	12'-7"	11'-2"	9'-10"	8'-11"	8'-1"	7'-5"
2-1000L150-68	16'-0"	16'-0"	16'-0"	16'-0"	14'-10"	13'-2"	11'-8"	10'-6"	9'-7"	8'-9"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
 KSI

Table E7-46a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	13'-6"	10'-4"	8'-5"	7'-2"	6'-4"	5'-8"
2-600L150-54	N/U	N/U	N/U	16'-0"	15'-8"	12'-0"	9'-9"	8'-4"	7'-4"	6'-7"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	14'-0"	11'-4"	9'-8"	8'-6"	7'-7"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	12'-11"	10'-5"	8'-11"	7'-10"	7'-1"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	15'-2"	12'-3"	10'-6"	9'-3"	8'-3"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-2"	12'-1"	10'-8"	9'-7"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	13'-6"	10'-11"	9'-4"	8'-2"	7'-4"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	15'-6"	12'-6"	10'-9"	9'-5"	8'-5"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-9"	12'-8"	11'-1"	10'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

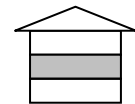
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
 KSI

Table E7-46b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	16'-0"	12'-9"	10'-3"	8'-9"	7'-9"	6'-11"
2-600L150-54	N/U	N/U	N/U	16'-0"	16'-0"	14'-9"	11'-11"	10'-2"	9'-0"	8'-0"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-11"	11'-10"	10'-5"	9'-4"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	15'-10"	12'-10"	10'-11"	9'-7"	8'-7"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-1"	12'-10"	11'-4"	10'-2"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	14'-10"	13'-1"	11'-9"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-5"	11'-5"	10'-1"	9'-0"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-5"	13'-2"	11'-7"	10'-4"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	15'-6"	13'-8"	12'-3"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

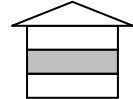
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-47a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



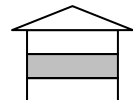
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	12'-6"	9'-8"	7'-10"	6'-9"	5'-11"	5'-4"
2-600L150-54	N/U	N/U	N/U	16'-0"	14'-7"	11'-3"	9'-1"	7'-10"	6'-10"	6'-2"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	13'-1"	10'-7"	9'-1"	8'-0"	7'-2"
2-800L150-43	N/U	N/U	N/U	16'-0"	15'-7"	12'-1"	9'-9"	8'-4"	7'-4"	6'-7"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	14'-2"	11'-6"	9'-10"	8'-8"	7'-9"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-3"	11'-4"	10'-0"	9'-0"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	12'-7"	10'-3"	8'-9"	7'-8"	6'-11"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	14'-6"	11'-9"	10'-1"	8'-10"	7'-11"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-10"	11'-10"	10'-5"	9'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-47b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



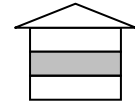
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	15'-5"	11'-11"	9'-8"	8'-3"	7'-3"	6'-6"
2-600L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-10"	11'-2"	9'-7"	8'-5"	7'-7"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-0"	11'-1"	9'-9"	8'-9"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	14'-10"	12'-0"	10'-3"	9'-0"	8'-1"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-1"	12'-1"	10'-7"	9'-6"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	13'-11"	12'-3"	11'-0"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	15'-6"	12'-7"	10'-8"	9'-5"	8'-6"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-5"	12'-4"	10'-10"	9'-9"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	14'-7"	12'-10"	11'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
 KSI

Table E7-48a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	11'-9"	9'-1"	7'-5"	6'-4"	5'-7"	5'-0"
2-600L150-54	N/U	N/U	N/U	16'-0"	13'-8"	10'-7"	8'-7"	7'-4"	6'-6"	5'-10"
2-600L150-68	N/U	N/U	N/U	16'-0"	15'-10"	12'-4"	10'-0"	8'-7"	7'-6"	6'-9"
2-800L150-43	N/U	N/U	N/U	16'-0"	14'-8"	11'-4"	9'-3"	7'-11"	6'-11"	6'-3"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-4"	10'-10"	9'-3"	8'-2"	7'-6"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	15'-5"	12'-6"	10'-9"	9'-5"	8'-6"
2-1000L150-43	N/U	N/U	N/U	16'-0"	15'-4"	11'-11"	9'-8"	8'-3"	7'-3"	6'-6"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-8"	11'-1"	9'-6"	8'-4"	7'-6"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-1"	11'-2"	9'-10"	8'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

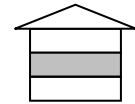
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
 KSI

Table E7-48b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	14'-5"	11'-2"	9'-1"	7'-9"	6'-10"	6'-2"
2-600L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-0"	10'-7"	9'-0"	7'-11"	7'-2"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	15'-1"	12'-3"	10'-6"	9'-3"	8'-4"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	13'-11"	11'-4"	9'-8"	8'-6"	7'-8"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-4"	11'-5"	10'-0"	9'-0"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-5"	13'-2"	11'-7"	10'-5"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	14'-7"	11'-10"	10'-2"	8'-11"	8'-0"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-7"	11'-8"	10'-3"	9'-2"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	13'-9"	12'-1"	10'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

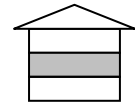
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-49a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



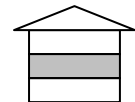
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	11'-10"	9'-0"	7'-3"	6'-2"	5'-5"	4'-10"
2-600L150-54	N/U	N/U	N/U	16'-0"	13'-9"	10'-5"	8'-4"	7'-1"	6'-3"	5'-7"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	12'-1"	9'-9"	8'-3"	7'-3"	6'-6"
2-800L150-43	N/U	N/U	N/U	16'-0"	14'-9"	11'-2"	9'-0"	7'-8"	6'-8"	6'-0"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-2"	10'-7"	9'-0"	7'-11"	7'-1"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	15'-2"	12'-2"	10'-5"	9'-1"	8'-2"
2-1000L150-43	N/U	N/U	N/U	16'-0"	15'-5"	11'-8"	9'-5"	8'-0"	7'-0"	6'-3"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	13'-5"	10'-9"	9'-2"	8'-1"	7'-3"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	15'-10"	12'-9"	10'-10"	9'-6"	8'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-49b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



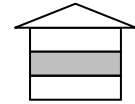
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	14'-7"	11'-0"	8'-10"	7'-6"	6'-7"	5'-11"
2-600L150-54	N/U	N/U	N/U	16'-0"	16'-0"	12'-10"	10'-3"	8'-9"	7'-8"	6'-10"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	14'-11"	11'-11"	10'-2"	8'-11"	8'-0"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	13'-9"	11'-0"	9'-4"	8'-3"	7'-4"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	12'-11"	11'-0"	9'-8"	8'-8"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-0"	12'-9"	11'-2"	10'-0"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	14'-4"	11'-6"	9'-10"	8'-7"	7'-8"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-3"	11'-3"	9'-10"	8'-10"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-7"	13'-3"	11'-8"	10'-5"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-50a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	10'-7"	8'-3"	6'-9"	5'-9"	5'-1"	4'-7"
2-600L150-54	N/U	N/U	N/U	16'-0"	12'-3"	9'-7"	7'-10"	6'-8"	5'-11"	5'-3"
2-600L150-68	N/U	N/U	N/U	16'-0"	14'-3"	11'-1"	9'-1"	7'-9"	6'-10"	6'-2"
2-800L150-43	N/U	N/U	N/U	16'-0"	13'-2"	10'-3"	8'-4"	7'-2"	6'-4"	5'-8"
2-800L150-54	N/U	N/U	N/U	16'-0"	15'-5"	12'-1"	9'-10"	8'-5"	7'-5"	6'-8"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	13'-11"	11'-4"	9'-9"	8'-7"	7'-9"
2-1000L150-43	N/U	N/U	N/U	16'-0"	13'-9"	10'-9"	8'-9"	7'-6"	6'-8"	5'-11"
2-1000L150-54	N/U	N/U	N/U	16'-0"	15'-9"	12'-4"	10'-0"	8'-7"	7'-7"	6'-10"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	14'-6"	11'-10"	10'-2"	8'-11"	8'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

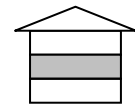
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-50b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	16'-0"	12'-11"	10'-1"	8'-3"	7'-1"	6'-2"	5'-7"
2-600L150-54	N/U	N/U	N/U	16'-0"	15'-1"	11'-9"	9'-7"	8'-2"	7'-2"	6'-6"
2-600L150-68	N/U	N/U	N/U	16'-0"	16'-0"	13'-8"	11'-1"	9'-6"	8'-5"	7'-6"
2-800L150-43	N/U	N/U	N/U	16'-0"	16'-0"	12'-7"	10'-3"	8'-9"	7'-9"	6'-11"
2-800L150-54	N/U	N/U	N/U	16'-0"	16'-0"	14'-10"	12'-1"	10'-4"	9'-1"	8'-2"
2-800L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-11"	11'-11"	10'-6"	9'-5"
2-1000L150-43	N/U	N/U	N/U	16'-0"	16'-0"	13'-2"	10'-9"	9'-2"	8'-1"	7'-3"
2-1000L150-54	N/U	N/U	N/U	16'-0"	16'-0"	15'-1"	12'-4"	10'-7"	9'-4"	8'-4"
2-1000L150-68	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-6"	12'-6"	11'-0"	9'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

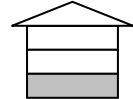
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-51a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



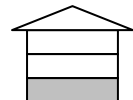
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-8"	9'-8"	7'-10"	6'-8"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-10"	11'-3"	9'-1"	7'-9"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-1"	10'-7"	9'-0"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-1"	9'-9"	8'-4"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-2"	11'-5"	9'-9"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-3"	11'-3"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-8"	10'-2"	8'-8"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-6"	11'-8"	10'-0"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-9"	11'-9"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-51b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



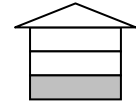
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	11'-11"	9'-7"	8'-2"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-10"	11'-2"	9'-6"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	12'-11"	11'-1"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-10"	11'-11"	10'-2"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-1"	12'-0"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	13'-10"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-6"	12'-6"	10'-8"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-4"	12'-3"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	16'-0"	14'-5"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-52a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-5"	9'-0"	7'-3"	6'-3"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-5"	10'-5"	8'-5"	7'-3"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-1"	9'-10"	8'-5"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-6"	11'-2"	9'-1"	7'-9"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-2"	10'-8"	9'-1"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-2"	12'-4"	10'-6"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	11'-8"	9'-6"	8'-1"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-5"	10'-11"	9'-4"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-10"	12'-10"	11'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

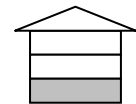
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-52b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-3"	11'-0"	8'-11"	7'-8"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-9"	10'-4"	8'-10"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-10"	12'-1"	10'-4"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-9"	11'-1"	9'-6"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-1"	11'-2"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-1"	12'-11"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-4"	11'-8"	9'-11"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-4"	11'-5"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	15'-9"	13'-6"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

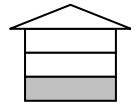
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-53a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	11'-6"	8'-5"	6'-10"	5'-10"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-4"	9'-9"	7'-11"	6'-10"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-6"	11'-4"	9'-3"	7'-11"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-4"	10'-5"	8'-6"	7'-4"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-3"	10'-0"	8'-7"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-2"	11'-7"	9'-11"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-0"	10'-11"	8'-11"	7'-8"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-6"	10'-3"	8'-9"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-10"	12'-1"	10'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

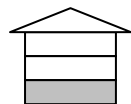
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-53b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-1"	10'-3"	8'-4"	7'-2"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	11'-11"	9'-9"	8'-4"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-11"	11'-4"	9'-8"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-10"	10'-5"	8'-11"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-1"	12'-3"	10'-6"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-2"	12'-2"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-5"	10'-11"	9'-4"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-5"	12'-6"	10'-9"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-10"	12'-8"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

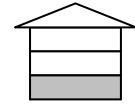
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-54a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-9"	7'-11"	6'-6"	5'-7"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-5"	9'-2"	7'-6"	6'-5"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-6"	10'-8"	8'-9"	7'-6"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-4"	9'-10"	8'-1"	6'-11"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-8"	11'-7"	9'-5"	8'-2"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-4"	10'-11"	9'-5"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-0"	10'-4"	8'-5"	7'-3"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	11'-10"	9'-8"	8'-4"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-11"	11'-5"	9'-10"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

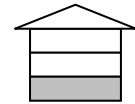
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

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KSI

Table E7-54b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-2"	9'-8"	7'-11"	6'-10"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-4"	11'-3"	9'-2"	7'-11"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-1"	10'-8"	9'-2"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-1"	9'-10"	8'-6"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-2"	11'-7"	10'-0"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-5"	11'-6"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-8"	10'-4"	8'-10"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	14'-6"	11'-10"	10'-2"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	14'-0"	12'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

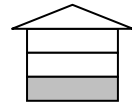
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-55a
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



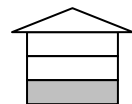
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	10'-1"	7'-6"	6'-2"	5'-3"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	11'-9"	8'-8"	7'-2"	6'-2"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-8"	10'-1"	8'-3"	7'-2"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-7"	9'-4"	7'-8"	6'-7"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-9"	11'-0"	9'-0"	7'-9"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-8"	10'-5"	8'-11"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	13'-2"	9'-9"	8'-0"	6'-11"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-1"	11'-3"	9'-2"	7'-11"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-3"	10'-10"	9'-4"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-55b
Inverted Double L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



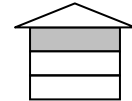
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Double L-Header Designation										
2-600L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	12'-5"	9'-2"	7'-6"	6'-6"
2-600L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	14'-5"	10'-8"	8'-9"	7'-6"
2-600L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-5"	10'-2"	8'-9"
2-800L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	15'-5"	11'-5"	9'-5"	8'-1"
2-800L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-6"	11'-0"	9'-6"
2-800L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	15'-7"	12'-9"	11'-0"
2-1000L150-43	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	12'-0"	9'-10"	8'-5"
2-1000L150-54	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	13'-9"	11'-3"	9'-8"
2-1000L150-68	N/U	N/U	N/U	N/U	N/U	16'-0"	16'-0"	16'-0"	13'-4"	11'-5"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-56a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph										
	85	90	100	110	120	130	140	150			
EXPOSURE C			85	90	100	110	120	130	140	150	
Single L-Header Designation											
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	3'-6"	3'-2"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-8"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

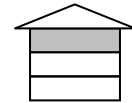
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-56b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
24-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph										
	85	90	100	110	120	130	140	150			
EXPOSURE C			85	90	100	110	120	130	140	150	
Single L-Header Designation											
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

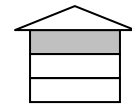
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot roof overhang (0.61 m)

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-57a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"	3'-3"	3'-0"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-6"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-7"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

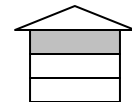
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-57b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
28-Foot Wide Building^{1,2}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-8"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

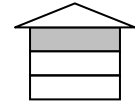
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-58a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-5"	3'-1"	2'-10"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-7"	3'-4"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-5"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

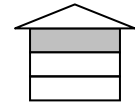
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-58b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	3'-6"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

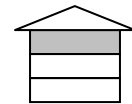
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-59a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"	3'-3"	3'-11"	3'-9"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-5"	3'-2"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-8"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-7"	3'-4"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

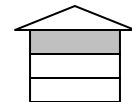
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-59b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-8"	3'-4"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

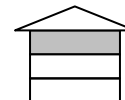
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-60a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-5"	3'-1"	2'-10"	2'-7"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"	3'-3"	3'-0"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	3'-6"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-5"	3'-2"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-7"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

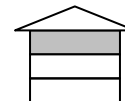
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-60b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Roof and Ceiling Only
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"	3'-6"	3'-2"
600L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"
600L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
800L150-54	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

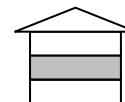
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²), 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-61a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



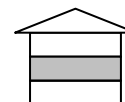
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-61b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



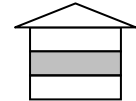
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- ¹ Building width is measured in the direction of horizontal framing members supported by the header.
- ² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- ³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-62a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-5"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

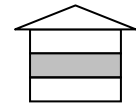
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-62b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

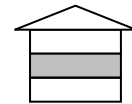
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-63a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



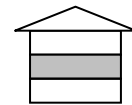
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"	3'-2"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-63b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



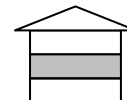
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-64a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-5"	3'-1"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the *header*.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on *header*.

50
KSI

Table E7-64b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-10"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

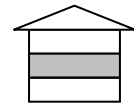
¹ Building width is measured in the direction of horizontal framing members supported by the *header*.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on *header*.

33
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Table E7-65a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



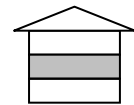
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	3'-8"	3'-3"	2'-11"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"	3'-4"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"	3'-6"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-65b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



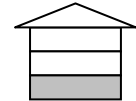
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"
600L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-66a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

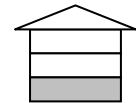
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

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KSI

Table E7-66b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
24-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

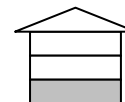
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-67a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 33 ksi



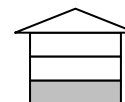
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-67b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
28-Foot Wide Building^{1,2,3}
F_y = 50 ksi



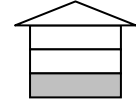
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-68a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	3'-9"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

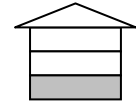
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-68b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
32-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

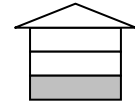
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-69a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 33 ksi



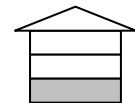
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	3'-7"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-69b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting One Floor, Roof and Ceiling
36-Foot Wide Building^{1,2,3}
F_y = 50 ksi



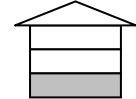
EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

- Building width is measured in the direction of horizontal framing members supported by the header.
- Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
 Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang
- N/U indicates no net uplift loads acting on header.

33
KSI

Table E7-70a
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 33 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	3'-11"	3'-5"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	3'-11"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

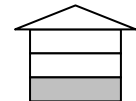
¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

50
KSI

Table E7-70b
Inverted Single L-Header Assembly Spans – Uplift Loading
Headers Supporting Two Floors, Roof and Ceiling
40-Foot Wide Building^{1,2,3}
F_y = 50 ksi



EXPOSURE B	Wind Speed, mph									
	85	90	100	110	120	130	140	150		
EXPOSURE C			85	90	100	110	120	130	140	150
Single L-Header Designation										
600L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
600L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-43	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-54	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
800L150-68	N/U	N/U	N/U	N/U	N/U	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr = 0.447 m/sec, 1 foot = 0.305 m

¹ Building width is measured in the direction of horizontal framing members supported by the header.

² Design assumptions: Roof and ceiling dead load = 12 psf (0.58 kN/m²) Floor live load = 30 psf (1.44 kN/m²)
Floor dead load = 10 psf (0.48 kN/m²) 2 foot (0.61 m) roof overhang

³ N/U indicates no net uplift loads acting on header.

Table E7-71
Jack and King Studs Required at Each End of an Opening

Size of Opening	24 inch o.c. Stud Spacing		16 inch o.c. Stud Spacing	
	No. of Jack Studs	No. of King Studs	No. of Jack Studs	No. of King Studs
Up to 3'-6"	1	1	1	1
> 3'-6" to 5'-0"	1	2	1	2
> 5'-0" to 5'-6"	1	2	2	2
> 5'-6" to 8'-0"	1	2	2	2
> 8'-0" to 10'-6"	2	2	2	3
> 10'-6" to 12'-0"	2	2	3	3
> 12'-0" to 13'-0"	2	3	3	3
> 13'-0" to 14'-0"	2	3	3	4
> 14'-0" to 16'-0"	2	3	3	4
> 16'-0" to 18'-0"	3	3	4	4

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m

33
KSI

Table E7-72
Head and Sill Track Span
F_y = 33 ksi

Basic Wind Speed (mph)		Allowable Head and Sill Track Span ^{1,2,3} (ft-in.)					
Exposure		Track Designation					
B	C	350T125-33	350T125-43	350T125-54	550T125-33	550T125-43	550T125-54
85		5'-0"	5'-7"	6'-2"	5'-10"	6'-8"	7'-0"
90		4'-10"	5'-5"	6'-0"	5'-8"	6'-3"	6'-10"
100	85	4'-6"	5'-1"	5'-8"	5'-4"	5'-11"	6'-5"
110	90	4'-2"	4'-9"	5'-4"	5'-1"	5'-7"	6'-1"
120	100	3'-11"	4'-6"	5'-0"	4'-10"	5'-4"	5'-10"
130	110	3'-8"	4'-2"	4'-9"	4'-1"	5'-1"	5'-7"
140	120	3'-7"	4'-1"	4'-7"	3'-6"	4'-11"	5'-5"
150	130	3'-5"	3'-10"	4'-4"	2'-11"	4'-7"	5'-2"
	140	3'-1"	3'-6"	4'-1"	2'-3"	4'-0"	4'-10"
	150	2'-9"	3'-4"	3'-10"	2'-0"	3'-7"	4'-7"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m

¹ Deflection Limit: L/240

² Head and sill *track spans* are based on components and cladding wind speeds and 48 inch (1.22 m) tributary *span*.

³ For openings less than 4 feet (1.22 m) in height that have both a head *track* and a sill *track*, the above *spans* are permitted to be multiplied by 1.75. For openings less than or equal to 6 feet (1.83 m) in height that have both a head *track* and a sill *track*, the above *spans* are permitted to be multiplied by a factor of 1.5.

Table E8-1
Minimum Percentage of Full Height
Structural Sheathing on Braced Wall Line

Wall Supporting	Roof Slope	Basic wind Speed (mph) and Exposure					
		85 B	90 B	100 B	<110 B	100 C	<110 C
				85 C	90 C		
Roof & Ceiling Only (One Story or Top Floor of Two or Three Story Building)	3:12	8	9	9	12	16	20
	6:12	12	13	15	20	26	35
	9:12	21	23	25	30	50	58
	12:12	30	33	35	40	66	75
One Story, Roof & Ceiling (First Floor of a Two-Story Building or Second Floor of a Three Story Building)	3:12	24	27	30	35	50	66
	6:12	25	28	30	40	58	74
	9:12	35	38	40	55	74	91
	12:12	40	45	50	65	100	115
Two Story, Roof & Ceiling (First Floor of a Three Story Building)	3:12	40	45	51	58	84	112
	6:12	38	43	45	60	90	113
	9:12	49	53	55	80	98	124
	12:12	50	57	65	90	134	155

For SI: 1 mph = 0.447 m/sec, 1 inch = 25.4 mm, 1 foot = 0.305 m

¹ Linear interpolation shall be permitted.

² For hip roofed homes the minimum percentage of full height sheathing, based upon wind, is permitted to be multiplied by a factor of 0.95 for roof slopes not exceeding 7:12 and a factor of 0.9 for roof slopes greater than 7:12.

Table E8-2
Minimum Percentage of Full Height
Structural Sheathing on Braced Wall Line

Wall Supporting	Seismic Design Category A	Seismic Design Category B	Seismic Design Category C
Roof & Ceiling Only (One Story or Second-Floor of Two-Story)	6	6	19
One Story, Roof & Ceiling (First Floor of a Two-Story Building)	13	13	40

Table E8-3
Minimum Percentage of Full Height
Structural Sheathing on Braced Wall Line

Wall Supporting	Seismic Design Category A	Seismic Design Category B	Seismic Design Category C
Roof & Ceiling Only	7	7	22
One Story, Roof & Ceiling	16	16	50
Two Stories, Roof & Ceiling	23	23	70

Table E8-4
Full Height Sheathing Length Adjustment Factors

Plan Aspect Ratio	Length Adjustment Factors	
	Short Wall	Long Wall
1:1	1.0	1.0
1.5:1	1.5	0.67
2:1	2.0	0.50
3:1	3.0	0.33

Table E8-5
Full Height Sheathing Length Adjustment Factors

Plan Aspect Ratio	Length Adjustment Factors	
	Short Wall	Long Wall
1:1	1.0	1.0
1.5:1	1.5	1.0
2:1	2.0	1.0
3:1	3.0	1.0

Table E11-1
Full Height Sheathing Length Adjustment Factors Based Upon Edge Screw Spacing

Bracing Material	Length Adjustment Factors							
	Type I Braced Wall				Type II Braced Wall			
	Shearwall Edge Screw Spacing (in.)				Shearwall Edge Screw Spacing (in.)			
	6	4	3	2	6	4	3	2
Wood structural panels	1.00	0.80	0.55	0.50	1.00	0.80	0.80	0.80
Steel sheet panels	NA	0.70	0.65	0.60	NA	0.70	0.70	0.70

For SI: 1inch =25.4 mm

Table E11-2
Type II Braced Wall Full Height Sheathing Length Adjustment Factors

Percent Fully Sheathed Wall ¹	Length Adjustment Factors					
	Maximum Unrestrained Opening Height					
	H/3	H/2	2H/3	3H/4	5H/6	H
0	1.00	1.50	2.00	2.22	2.50	3.00
20	1.00	1.36	1.67	1.79	1.92	2.14
40	1.00	1.25	1.43	1.49	1.56	1.67
60	1.00	1.15	1.25	1.28	1.32	1.36
80	1.00	1.07	1.11	1.12	1.14	1.15
100	1.00	1.00	1.00	1.00	1.00	1.00

¹ Percent fully sheathed wall is the percent of wall by length, measured between hold down anchors, that is sheathed full-height.

Table E12-1
SDC D₀ Type I Sidewall Sheathing for Top of One or Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	12	13	17	20	24	28
0.50	12	14	18	21	25	28
0.75	13	15	19	22	26	29
1.00	14	16	20	23	27	30
1.25	-	17	21	24	28	31
1.50	-	-	21	25	29	32
1.75	-	-	22	26	29	33
2.00	-	-	23	27	30	34
2.25	-	-	-	28	31	35
2.50	-	-	-	29	32	36
2.75	-	-	-	30	33	37
3.00	-	-	-	-	34	38
3.25	-	-	-	-	35	38
3.50	-	-	-	-	-	39
3.75	-	-	-	-	-	40
4.00	-	-	-	-	-	41

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-2
SDC D₀ Type I Sidewall Sheathing for Bottom of Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	16	18	23	28	33	38
0.50	18	20	25	30	35	39
0.75	19	22	27	31	36	41
1.00	21	24	28	33	38	43
1.25	-	25	30	35	40	44
1.50	-	-	32	37	41	46
1.75	-	-	33	38	43	48
2.00	-	-	35	40	45	49
2.25	-	-	-	42	46	51
2.50	-	-	-	43	48	53
2.75	-	-	-	45	50	55
3.00	-	-	-	-	51	56
3.25	-	-	-	-	53	58
3.50	-	-	-	-	-	60
3.75	-	-	-	-	-	61
4.00	-	-	-	-	-	63

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-3
SDC D₀ Type I Sidewall Sheathing for Top of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	13	15	19	24	28	32
0.50	14	16	20	25	29	33
0.75	15	17	22	26	30	34
1.00	16	18	23	27	31	35
1.25	-	20	24	28	32	36
1.50	-	-	25	29	33	37
1.75	-	-	26	30	34	38
2.00	-	-	27	31	35	39
2.25	-	-	-	32	36	40
2.50	-	-	-	33	37	41
2.75	-	-	-	34	38	42
3.00	-	-	-	-	39	43
3.25	-	-	-	-	40	44
3.50	-	-	-	-	-	45
3.75	-	-	-	-	-	46
4.00	-	-	-	-	-	47

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-4
SDC D₀ Type I Sidewall Sheathing for Middle of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	20	23	29	35	41	47
0.50	22	25	31	37	43	49
0.75	24	27	33	39	45	51
1.00	26	29	35	41	47	53
1.25	-	32	38	44	50	55
1.50	-	-	40	46	52	58
1.75	-	-	42	48	54	60
2.00	-	-	44	50	56	62
2.25	-	-	-	52	58	64
2.50	-	-	-	54	60	66
2.75	-	-	-	56	62	68
3.00	-	-	-	-	64	70
3.25	-	-	-	-	66	72
3.50	-	-	-	-	-	75
3.75	-	-	-	-	-	77
4.00	-	-	-	-	-	79

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-5
SDC D₀ Type I Sidewall Sheathing for Bottom of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	24	27	34	41	48	55
0.50	27	30	37	44	51	58
0.75	29	33	40	47	54	61
1.00	32	36	43	50	56	63
1.25	-	39	45	52	59	66
1.50	-	-	48	55	62	69
1.75	-	-	51	58	65	72
2.00	-	-	54	61	68	75
2.25	-	-	-	64	71	78
2.50	-	-	-	67	74	81
2.75	-	-	-	70	76	83
3.00	-	-	-	-	79	86
3.25	-	-	-	-	82	89
3.50	-	-	-	-	-	92
3.75	-	-	-	-	-	95
4.00	-	-	-	-	-	98

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-6
SDC D₁ Type I Sidewall Sheathing for Top of One or Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	14	17	21	25	30	34
0.50	15	18	22	26	31	35
0.75	17	19	23	28	32	36
1.00	18	20	24	29	33	38
1.25	-	21	25	30	34	39
1.50	-	-	27	31	35	40
1.75	-	-	28	32	36	41
2.00	-	-	29	33	38	42
2.25	-	-	-	34	39	43
2.50	-	-	-	35	40	44
2.75	-	-	-	37	41	45
3.00	-	-	-	-	42	47
3.25	-	-	-	-	43	48
3.50	-	-	-	-	-	49
3.75	-	-	-	-	-	50
4.00	-	-	-	-	-	51

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-7
SDC D₁ Type I Sidewall Sheathing for Bottom of Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	20	23	29	35	41	47
0.50	22	25	31	37	43	49
0.75	24	27	33	39	45	51
1.00	26	29	35	41	47	53
1.25	-	31	37	43	49	55
1.50	-	-	39	45	51	57
1.75	-	-	41	47	53	59
2.00	-	-	44	49	55	61
2.25	-	-	-	52	57	63
2.50	-	-	-	54	60	66
2.75	-	-	-	56	62	68
3.00	-	-	-	-	64	70
3.25	-	-	-	-	66	72
3.50	-	-	-	-	-	74
3.75	-	-	-	-	-	76
4.00	-	-	-	-	-	78

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-8
SDC D₁ Type I Sidewall Sheathing for Top of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	16	19	24	29	34	39
0.50	18	20	25	30	35	41
0.75	19	22	27	32	37	42
1.00	20	23	28	33	38	43
1.25	-	24	29	34	39	44
1.50	-	-	31	36	41	46
1.75	-	-	32	37	42	47
2.00	-	-	33	38	43	48
2.25	-	-	-	39	45	50
2.50	-	-	-	41	46	51
2.75	-	-	-	42	47	52
3.00	-	-	-	-	48	53
3.25	-	-	-	-	50	55
3.50	-	-	-	-	-	56
3.75	-	-	-	-	-	57
4.00	-	-	-	-	-	59

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-9
SDC D₁ Type I Sidewall Sheathing for Middle of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	25	29	36	43	51	58
0.50	28	31	39	46	53	61
0.75	30	34	41	49	56	64
1.00	33	36	44	51	59	66
1.25	-	39	47	54	61	69
1.50	-	-	49	57	64	71
1.75	-	-	52	59	67	74
2.00	-	-	54	62	69	77
2.25	-	-	-	64	72	79
2.50	-	-	-	67	74	82
2.75	-	-	-	70	77	85
3.00	-	-	-	-	80	87
3.25	-	-	-	-	82	90
3.50	-	-	-	-	-	92
3.75	-	-	-	-	-	95
4.00	-	-	-	-	-	98

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-10
SDC D₁ Type I Sidewall Sheathing for Bottom of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	29	34	42	51	59	68
0.50	33	37	46	54	63	71
0.75	36	41	49	58	66	75
1.00	40	44	53	61	70	79
1.25	-	48	56	65	73	82
1.50	-	-	60	68	77	86
1.75	-	-	63	72	81	89
2.00	-	-	67	76	84	93
2.25	-	-	-	79	88	96
2.50	-	-	-	83	91	100
2.75	-	-	-	86	95	103
3.00	-	-	-	-	98	107
3.25	-	-	-	-	102	110
3.50	-	-	-	-	-	114
3.75	-	-	-	-	-	117
4.00	-	-	-	-	-	121

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-11
SDC D₂ Type I Sidewall Sheathing for Top of One or Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	20	23	29	36	42	48
0.50	22	25	31	37	43	50
0.75	23	26	33	39	45	51
1.00	25	28	34	40	47	53
1.25	-	30	36	42	48	54
1.50	-	-	37	44	50	56
1.75	-	-	39	45	51	58
2.00	-	-	41	47	53	59
2.25	-	-	-	48	55	61
2.50	-	-	-	50	56	62
2.75	-	-	-	52	58	64
3.00	-	-	-	-	59	66
3.25	-	-	-	-	61	67
3.50	-	-	-	-	-	69
3.75	-	-	-	-	-	70
4.00	-	-	-	-	-	72

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-12
SDC D₂ Type I Sidewall Sheathing for Bottom of Two Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	28	32	41	49	57	66
0.50	31	35	44	52	60	69
0.75	34	38	47	55	63	72
1.00	37	41	49	58	66	75
1.25	-	44	52	61	69	78
1.50	-	-	55	64	72	80
1.75	-	-	58	67	75	83
2.00	-	-	61	70	78	86
2.25	-	-	-	73	81	89
2.50	-	-	-	76	84	92
2.75	-	-	-	79	87	95
3.00	-	-	-	-	90	98
3.25	-	-	-	-	93	101
3.50	-	-	-	-	-	104
3.75	-	-	-	-	-	107
4.00	-	-	-	-	-	110

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-13
SDC D₂ Type I Sidewall Sheathing for Top of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	23	27	34	41	48	55
0.50	25	29	36	43	50	57
0.75	27	30	38	45	52	59
1.00	29	32	39	47	54	61
1.25	-	34	41	48	55	63
1.50	-	-	43	50	57	64
1.75	-	-	45	52	59	66
2.00	-	-	47	54	61	68
2.25	-	-	-	56	63	70
2.50	-	-	-	57	65	72
2.75	-	-	-	59	66	74
3.00	-	-	-	-	68	75
3.25	-	-	-	-	70	77
3.50	-	-	-	-	-	79
3.75	-	-	-	-	-	81
4.00	-	-	-	-	-	83

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-14
SDC D₂ Type I Sidewall Sheathing for Middle of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	35	40	51	61	72	82
0.50	39	44	54	65	75	86
0.75	42	48	58	69	79	90
1.00	46	51	62	72	83	93
1.25	-	55	66	76	86	97
1.50	-	-	69	80	90	101
1.75	-	-	73	83	94	104
2.00	-	-	77	87	98	108
2.25	-	-	-	91	101	112
2.50	-	-	-	95	105	115
2.75	-	-	-	98	109	119
3.00	-	-	-	-	112	123
3.25	-	-	-	-	116	127
3.50	-	-	-	-	-	130
3.75	-	-	-	-	-	134
4.00	-	-	-	-	-	138

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-15
SDC D₂ Type I Sidewall Sheathing for Bottom of Three Story Building
(Normal Roof and Heavy Wall Systems)

Type I Percent Full Height Sidewall Sheathing ¹						
Aspect Ratio	Diaphragm Span (feet) ²					
	15	20	30	40	50	60
0.25	41	47	59	72	84	96
0.50	46	52	64	77	89	101
0.75	51	57	69	82	94	106
1.00	56	62	74	87	99	111
1.25	-	67	79	91	104	116
1.50	-	-	84	96	109	121
1.75	-	-	89	101	114	126
2.00	-	-	94	106	119	131
2.25	-	-	-	111	124	136
2.50	-	-	-	116	129	141
2.75	-	-	-	121	134	146
3.00	-	-	-	-	138	151
3.25	-	-	-	-	143	156
3.50	-	-	-	-	-	161
3.75	-	-	-	-	-	166
4.00	-	-	-	-	-	171

¹ Interpolation is permitted for intermediate values of diaphragm span and aspect ratio.

² Diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration.

Table E12-16
Braced Wall Full Height Sheathing Length Adjustment Factors
for Roof and Exterior Wall System Weights ¹

Braced Wall Supporting	Light weight Roof/ ceiling Assembly	Light weight exterior walls.	Buildings having both light weight walls and roofs	Light weight exterior walls and heavy roof/ceiling assembly	Heavy weight roof/ceiling assembly
Roof/Ceiling Only	0.91	0.90	0.78	1.25	1.35
One Floor and Roof/Ceiling	0.95	0.86	0.78	1.10	1.25

For SI: 1 psf = 0.0479 kN/m²

¹ Factors are based on the baseline configuration of a *normal weight roof* and a *heavy weight exterior wall*. See Table A1-1 for roof and wall system weights.

Table E12-17
Required Hold Down Anchor¹ and Chord Stud Strengths - Seismic

Required Hold Down Anchor and Chord Stud Strengths (lbs)				
Wall Height (ft)	Panel Edge Screw Spacing (in.)			
	6	4	3	2
8	3150	4130	5770	7365
9	3535	4635	6470	8255
10	3920	5135	7170	9150

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N

¹ Required strengths are permitted to be divided by 1.4 when comparing requirements with published strengths expressed as allowable loads.

Table E12-18
Required Shear Anchorage For Braced Walls

Required Anchor Bolt Spacing (ft-in.)				
Anchor Bolt Diameter (in.)	Panel Edge Screw Spacing (in.)			
	6	4	3	2
1/2"	5'- 0"	3'- 6"	2'- 6"	2'- 0"
5/8"	6'- 0"	4'- 6"	3'- 3"	2'- 6"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m

Table E12-19
Chord Stud Strength ¹

Chord Stud Strength (lbs)			
(2) Back-to-Back	Wall Height (ft)		
	8	9	10
350S162 -33	5665	4945	4065
350S162 -43	7655	6535	5405
550S162 -33	5050	4175	3480
550S162 -43	6990	5790	4835

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N

¹ *Chord stud* strengths given are for (2) back-to-back studs connected with a minimum of (2) No.8 screws at 12 inches on center vertically.

Table E12-20
Top Track Thickness and Splice Screw Requirements^{1,2,3}

Total Number of No.8 Screws On Each Side of Track Splice																				
Diaph. Span	Aspect Ratio		Seismic Design Category																	
			D ₀						D ₁						D ₂					
			NR/ HW	LR/ HW	NR/ LW	LR/ LW	HR/ LW	HR/ HW	NR/ HW	LR/ HW	NR/ LW	LR/ LW	HR/ LW	HR/ HW	NR/ HW	LR/ HW	NR/ LW	LR/ LW	HR/ LW	HR/ HW
60'	≥3	Roof	23	20	19	16	18	20	28	25	23	20	22	25	27	24	22	29	31	NA ³
		1st	17	17	12	12	12	17	21	21	15	15	15	21	30	30	22	22	22	NA ³
	<3	Roof	19	17	16	15	15	18	23	21	20	18	19	22	22	20	19	25	27	30
		1st	14	14	11	11	11	14	17	17	13	13	13	17	23	23	18	18	17	23
50'	≥2.5	Roof	16	14	13	11	19	15	20	17	16	14	23	18	28	25	23	20	22	25
		1st	12	12	9	9	9	12	15	15	11	11	11	15	21	21	15	15	15	21
	<2.5	Roof	13	11	11	10	16	12	16	14	14	12	20	15	23	20	20	18	19	21
		1st	9	9	7	7	7	9	11	11	9	9	9	11	16	16	13	13	13	16
40'	≥2.67	Roof	11	9	8	7	12	14	13	11	10	9	15	17	18	16	15	13	21	24
		1st	7	7	6	6	6	7	9	9	7	7	7	9	13	13	10	10	10	13
	<2.67	Roof	9	8	8	6	11	12	11	10	10	8	14	15	16	14	14	12	19	22
		1st	6	6	5	5	5	6	8	8	6	6	6	8	11	11	9	9	9	11
30'	All	Roof	6	5	5	4	6	8	7	6	6	5	8	10	10	9	9	7	12	14
		1st	4	4	3	3	3	4	5	5	4	4	4	5	8	8	5	5	5	8
<20'	All	Roof	2	2	2	2	3	4	3	3	3	2	4	5	5	4	4	3	6	6
		1st	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	2	3

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m

¹ Minimum top track thickness is 33 mil (0.84 mm), except where indicated by shading. In locations indicated by shading, minimum top track thickness is 43 mils (1.09 mm).

² NR = Normal Weight Roof; LR = Light Weight Roof; HR = Heavy Weight Roof

³ HW = Heavy Weight Exterior Wall; LW = Light Weight Exterior Wall

Table E13-1
Range of Allowable Sidewall Lengths
(One Story Slab on Grade)

		Basic Wind Speed (mph)									
EXPOSURE B		130		140		150					
EXPOSURE C		110		120		130		140		150	
Foundation Supporting	Building Endwall Width (ft)	Allowable Building Sidewall Length (ft)									
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
One Story Slab on Grade	12	10	38	10	32	10	27	10	23	10	20
	16	10	50	10	42	10	36	10	31	11	27
	20	10	63	10	53	10	45	12	39	13	34
	24	10	74	10	63	12	54	14	46	16	40
	28	10	80	12	74	14	63	16	54	19	47
	32	11	80	14	80	16	72	19	62	21	54
	36	13	80	15	80	18	80	21	70	24	61
	40	14	80	17	80	20	80	23	77	27	67

For SI: 1 foot = 0.305 m, 1 mph = 1.61 km/hr

Table E13-2
Range of Allowable Sidewall Lengths
(All Other Cases)

		Basic Wind Speed (mph)									
EXPOSURE B		130		140		150					
EXPOSURE C		110		120		130		140		150	
Foundation Supporting	Building Endwall Width (ft)	Allowable Building Sidewall Length (ft)									
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1-3 Stories	12	10	27	10	22	10	19	10	16	10	14
	16	10	36	10	30	10	25	11	22	12	19
	20	10	45	10	37	11	32	13	27	15	24
	24	10	53	12	45	14	38	16	33	18	29
	28	11	62	14	52	16	45	18	38	21	34
	32	13	71	15	60	18	51	21	44	24	38
	36	15	80	17	67	20	57	24	49	27	43
	40	16	80	19	75	23	64	26	55	30	48

For SI: 1 foot = 0.305 m, 1 mph = 1.61 km/hr

Table E13-3
Type I Braced Wall Panel
Sidewall Sheathing Length Requirements

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Braced Wall Supporting	Building Endwall Length, W (ft)	Minimum Length of Full Height Sheathing on Building Sidewall, L ^{1,2,3} (ft)				
Roof/Ceiling Only ⁴	12	5	5	5	5	5
	16	5	5	5	5	6
	20	5	5	6	7	7
	24	5	6	7	8	9
	28	6	7	8	9	10
	32	6	8	9	10	12
	36	7	9	10	12	13
	40	8	10	11	13	15
One Floor and Roof/Ceiling ⁵	20	8	10	11	13	15
	24	10	12	14	16	18
	28	11	14	16	18	21
	32	13	15	18	21	24
	36	15	17	20	24	27
	40	16	19	23	26	30
Two Floors and Roof/Ceiling ⁶	20	12	15	17	20	23
	24	15	17	20	24	27
	28	17	20	24	28	32
	32	20	23	27	32	36
	36	22	26	31	36	41
	40	24	29	34	40	45

For SI: 1 foot = 0.305 m, 1 mph = 1.61 km/hr

¹ Tabulated sheathing lengths are based on 8 feet (2.44 m) wall heights. For 9 feet (2.74 m) wall heights the tabulated values are to be multiplied by 1.13. For 10 feet (3.05 m) wall heights the tabulated values are to be multiplied by 1.25.

² Tabulated sheathing lengths assume a *mean roof height* of 33 feet (10.8 m). For *mean roof heights* of 15 feet (4.92 m) or less, the tabulated values are permitted to be multiplied by 0.8.

³ Tabulated sheathing lengths assume a 6 inch (152 mm) edge screw spacing. Required lengths are permitted to be multiplied by the adjustment factors in Table E11-1 for edge screw spacing other than 6 inch (152 mm), but the resulting sheathing length shall not be less than 5 feet (1.64 m).

⁴ Applies to a one story building or the top story of a two or three story building.

⁵ Applies to the lower story of a two story building and the middle story of a three story building.

⁶ Applies to the lower story of a three story building.

Table E13-4
Type I Braced Wall Panel
Endwall Sheathing Length Requirements

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Braced Wall Supporting	Building Sidewall Length, W (ft)	Minimum Length of Full Height Sheathing on Building Endwall, L ^{1,2,3} (ft)				
Roof/Ceiling Only ⁴	12	5	5	5	5	5
	16	5	5	5	5	5
	20	5	5	5	6	7
	24	5	5	6	7	8
	28	5	6	7	8	9
	32	6	7	8	9	11
	36	6	8	9	10	12
	40	7	9	10	12	13
	50	9	11	12	14	17
One Floor and Roof/Ceiling ⁵	20	9	11	13	15	17
	24	11	13	15	17	20
	28	13	15	18	20	23
	32	14	17	20	23	27
	36	16	19	23	26	30
	40	18	21	25	29	33
	50	22	27	31	36	42
	60	27	32	38	44	50
Two Floors and Roof/Ceiling ⁶	20	15	18	21	24	27
	24	18	21	25	29	33
	28	21	25	29	33	38
	32	24	28	33	38	44
	36	27	32	37	43	49
	40	30	35	41	48	55
	50	37	44	52	60	69
60	44	53	62	72	82	

For SI: 1 foot = 0.305 m, .1 mph = 1.61 km/hr

- ¹ Tabulated sheathing lengths are based on 8 feet (2.44 m) wall heights. For 9 feet (2.74 m) wall heights the tabulated values are to be multiplied by 1.13. For 10 feet (3.05 m) wall heights, the tabulated values are to be multiplied by 1.25.
- ² Tabulated sheathing lengths are based on a *mean roof height* of 33 (10.8 m) feet. For *mean roof heights* of 15 feet (4.92 m) or less, the tabulated values are permitted to be multiplied by 0.8.
- ³ Tabulated sheathing lengths are based on a 6 inch (152 mm) edge screw spacing. Required lengths are permitted to be multiplied by the adjustment factors in Table E11-1 for edge screw spacing other than 6 inch (152 mm), but the resulting sheathing length shall not be less than 5 feet (1.64 m).
- ⁴ Applies to a one story building or the top story of a two story building.
- ⁵ Applies to the lower story of a two story building and the middle story of a three story building.
- ⁶ Applies to the lower story of a three story building.

Table E13-5
Required Uplift Strength
Wall Assembly to Wall Assembly

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Framing Spacing ⁴ (in.)	Roof Span (ft)	Required Connection Strength ^{1,2,3} (lbs)				
12	24	157	227	302	386	475
	28	187	268	356	450	552
	32	217	308	407	514	629
	36	247	351	460	579	706
	40	281	391	511	643	783
16	24	209	302	402	514	632
	28	249	356	473	599	734
	32	289	410	541	684	836
	36	329	467	612	770	939
	40	374	520	680	855	1041
19.2	24	251	363	483	618	760
	28	299	429	570	720	883
	32	347	493	651	823	1006
	36	395	562	736	926	1129
	40	450	626	818	1028	1252
24	24	314	454	604	772	950
	28	374	536	712	901	1104
	32	434	616	814	1029	1258
	36	494	702	920	1157	1411
	40	562	782	1022	1286	1565

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N, 1 mph = 1.61 km/hr

¹ Uplift requirements assume a roof/ceiling dead load of 12 psf (0.58 kN/m²).

² Required strengths are permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners.

³ Required strengths are permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

⁴ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

Table E13-6
Uplift Strap Connection Requirements
Wall Assembly to Wall Assembly

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	140
Framing Spacing ¹ (in.)	Roof Span (ft)	Number of No.8 Screws in Each End of Steel Uplift Strap				
12	24	2	2	2	2	3
	28	2	2	3	3	4
	32	2	2	3	4	4
	36	2	3	3	4	5
	40	2	3	4	4	5
16	24	2	2	3	4	4
	28	2	3	3	4	5
	32	2	3	4	5	6
	36	2	3	4	5	6
	40	3	4	5	6	7
19.2	24	2	3	3	4	5
	28	2	3	4	5	6
	32	3	3	4	5	7
	36	3	4	5	6	7
	40	3	4	5	7	8
24	24	2	3	4	5	6
	28	3	4	5	6	7
	32	3	4	5	7	8
	36	3	5	6	8	9
	40	4	5	7	8	10

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 mph = 1.61 km/hr

¹ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

Table E13-7
Required Uplift Strength
Roof Rafter or Roof Truss to Wall

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Framing Spacing ⁴ (in.)	Roof Span (ft)	Required Connection Strength ^{1,2,3} (lbs)				
12	24	229	299	374	458	547
	28	259	340	428	522	624
	32	289	380	479	586	701
	36	319	423	532	651	778
	40	353	463	583	715	855
16	24	305	398	497	609	728
	28	344	452	569	695	830
	32	384	505	637	780	932
	36	424	563	708	865	1034
	40	469	616	775	951	1136
19.2	24	366	478	598	733	875
	28	414	544	685	836	998
	32	462	608	766	938	1121
	36	510	677	851	1041	1244
	40	565	741	933	1144	1367
24	24	458	598	748	916	1094
	28	518	680	856	1045	1248
	32	578	760	958	1173	1402
	36	638	846	1064	1301	1555
	40	706	926	1166	1430	1709

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N, 1 mph = 1.61 km/hr

¹ Uplift requirements assume a roof/ceiling dead load of 12 psf (0.58 kN/m²).

² Required strengths are permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners.

³ Required strengths are permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

⁴ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the in-line framing requirement of Section E.

**Table E13-8
 Uplift Strap Connection Requirements
 Roof Rafter or Roof Truss to Wall**

		Basic Wind Speed (mph)				
Exposure B		130	140	150		
Exposure C		110	120	130	140	150
Framing Spacing ¹ (in.)	Roof Span (ft)	Number of No.8 Screws in Each End of Steel Uplift Strap				
12	24	2	2	3	3	4
	28	2	3	3	4	4
	32	2	3	3	4	5
	36	2	3	4	4	5
	40	3	3	4	5	6
16	24	2	3	4	4	5
	28	3	3	4	5	6
	32	3	4	4	5	6
	36	3	4	5	6	7
	40	3	4	5	6	7
19.2	24	3	3	4	5	6
	28	3	4	5	6	7
	32	3	4	5	6	7
	36	4	5	6	7	8
	40	4	5	6	7	9
24	24	3	4	5	6	7
	28	4	5	6	7	8
	32	4	5	6	8	9
	36	4	6	7	8	10
	40	5	6	8	9	11

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 mph = 1.61 km/hr

¹ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

Table E13-9
Minimum Size of Steel Uplift Strap

Strap Width (in.)	Minimum Thickness of Strap (mils)									
	Required Number of Screws ¹									
	4 OR LESS	5	6	7	8	9	10	11	12	13
1.25	33	43	54	54	68	68	97	97	97	97
1.50	33	43	43	54	54	68	68	97	97	97
1.75	33	33	33	43	54	54	54	68	68	97
2.00	33	33	33	43	43	54	54	68	68	68

For SI: 1 inch = 25.4 mm

¹ Required number of screws per Table E13-6 or E13-8 in each end of the steel uplift strap.

Table E13-10
Required Hold Down Anchor¹ and Chord Stud Strengths - Wind

Required Hold Down Anchor and Chord Stud Strengths (lbs) ²				
Wall Height (ft)	Panel Edge Screw Spacing (in.)			
	6	4	3	2
8	3938	5163	7213	9206
9	4419	5794	8088	10,319
10	4900	6419	8963	11,438

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N

¹ Required strengths are permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

² Required strengths are permitted to be multiplied by a factor equal to the required full height sheathing length divided by the actual full height sheathing length that is provided.

F. ROOF FRAMING

F1 Roof Construction

Roof framing shall consist of *ceiling joists*, *roof rafters*, and other structural elements as required by this section. Alternatively, roof *trusses* shall be permitted subject to the requirements in Section F6.

F2 Ceiling Joists

F2.1 Minimum Ceiling Joist Size

Ceiling joist size and thickness shall be determined in accordance with the limits set forth in Tables F2-1 through F2-8. When determining the size of *ceiling joists*, the lateral support of the top *flange* shall be classified as unbraced, braced at mid-*span*, or braced at third points in accordance with Section F2.4. Where sheathing material is attached to the top *flange* of *ceiling joists* or where the *bracing* is spaced closer than third point of the joists, the "third point" values from Tables F2-1 through F2-8 shall be used.

When continuous joists are framed across interior bearing supports, the interior bearing supports shall be located within 2 feet (0.610 m) of mid-*span* of the *ceiling joist*, and the individual *spans* shall not exceed the applicable *spans* in Tables F2-1 through F2-8.

Ceiling joists shall have a bearing support length of not less than 1.5 inches (38 mm) and shall be connected to *roof rafters* (heel joint) with No.10 screws in accordance with Figures F2-1, F2-2 and F2-3 and Table F2-9.

When the attic is to be used as an occupied space, the *ceiling joists* shall be designed in accordance with Section D.

F2.2 Ceiling Joist Bearing Stiffeners

Where required in Tables F2-1 through F2-8, *bearing stiffeners* shall be installed at each bearing support in accordance with Section B2 and Figure F2-3.

F2.3 Ceiling Joist Bottom Flange Bracing

The bottom *flanges* of *ceiling joists* shall be laterally braced by the application of gypsum board or continuous steel *straps* installed perpendicular to the joist run, in accordance with one of the following:

- (a) Gypsum board shall be fastened with No.6 screws in accordance with Table F2-10.
- (b) Steel *straps* with a minimum size of 1-1/2 inch x 33 mil (38 mm x 0.84 mm) shall be installed at a maximum spacing of 4 feet (1.2 m). *Straps* shall be fastened to the bottom *flange* at each joist with one No.8 screw and shall be fastened to *blocking* with two No.8 screws. *Blocking* shall be installed between joists at a maximum spacing of 12 feet (3.7 m) measured along a line of continuous *strapping* (perpendicular to the joist run). *Blocking* shall also be located at the termination of all *straps*.

F2.4 Ceiling Joist Top Flange Bracing

The top *flanges* of *ceiling joists* shall be laterally braced as required by Tables F2-1 through F2-8, in accordance with one of the following:

- (a) Minimum 33 mil (0.84 mm) *C-shaped* member in accordance with Figure F2-5.
- (b) Minimum 33 mil (0.84 mm) *track* section in accordance with Figure F2-5.

- (c) Minimum 33 mil (0.84 mm) hat section in accordance with Figure F2-5.
- (d) Minimum 54 mil (1.37 mm) 1- 1/2" cold-rolled channel section in accordance with Figure F2-5.
- (e) Minimum 1-1/2 inch x 33 mil (38 mm x 0.84 mm) continuous steel *strap* in accordance with Figure F2-6.

Lateral *bracing* shall be installed perpendicular to the *ceiling joists* and shall be fastened to the top *flange* of each joist with one No.8 screw. *Blocking* shall be installed between joists in-line with *bracing* at a maximum spacing of 12 feet (3.66 m) measured perpendicular to the joists. Ends of lateral *bracing* shall be attached to *blocking* or anchored to a stable building component with two No.8 screws.

Exception: When *strap bracing* and 3.5" (88.9 mm) *ceiling joists* are used, *strap bracing* shall be fastened to *blocking* with three No.8 screws and ends of the *strap bracing* shall be attached to *blocking* or anchored to a stable building component with three No.8 screws.

F2.5 Ceiling Joist Splicing

Splices in *ceiling joists* shall be permitted, provided that *ceiling joist* splices are supported at interior bearing points and are constructed in accordance with Figure F2-4. The number of screws on each side of the splice shall be the same as required for the heel joint connection in Table F2-9.

F3 Roof Rafters

F3.1 Minimum Roof Rafter Sizes

Roof rafter size and thickness shall be determined in accordance with the limits set forth in Tables F3-1a and F3-1b based upon the horizontal projection of the *roof rafter span*. For determination of *roof rafter* sizes, *roof spans* shall be permitted to be reduced when a *roof rafter* support brace is installed in accordance with Section F3.2. The reduced *roof rafter span* shall be taken as the larger of the distance from the *roof rafter* support brace to the *ridge* or to the heel measured horizontally.

For the purpose of determining *roof rafter* sizes in Tables F3-1a and F3-1b, wind speeds shall be converted to equivalent ground snow load in accordance with Table F3-2. *Roof rafter* sizes shall be based on the higher of the ground snow load or the equivalent snow load converted from the wind speed.

F3.1.1 Eave Overhang

Eave overhangs shall not exceed 24 inches (610 mm) measured horizontally.

F3.1.2 Rake Overhang

Rake overhangs shall not exceed 12 inches (305 mm) measured horizontally. Outlookers at gable endwalls shall be installed in accordance with Figure F3-1.

F3.2 Roof Rafter Support Brace

When used to reduce *roof rafter spans* in determining *roof rafter* sizes, a *roof rafter* support brace shall meet all of the following conditions:

- (1) Minimum 350S162-33 *C-shaped* brace member with maximum length of 8 feet (2.44 m).
- (2) Minimum brace member slope of 45 degrees to the horizontal.

- (3) Minimum connection of brace to a *roof rafter* and *ceiling joist* with 4 No.10 screws at each end.
- (4) Maximum 6 inches (152 mm) between brace/*ceiling joist* connection and structural wall below.
- (5) Each *roof rafter* support brace greater than 4 feet (1.22 m) in length, shall be braced with a supplemental brace having a minimum size of 350S162-33 or 350T162-33 such that the maximum unsupported length of the *roof rafter* support brace is 4 foot (1.22 m). The supplemental brace shall be continuous and shall be connected to each *roof rafter* support brace using 2 No.8 screws.

F3.3 Roof Rafter Splice

Roof rafters shall not be spliced without an *approved* design. Splicing of *tracks* used as a fascia connected to the ends of rafters shall conform to Figure D6-1.

F3.4 Roof Rafter to Ceiling Joist and Ridge Member Connection

Roof rafters shall be connected to a parallel *ceiling joist* to form a continuous tie between exterior walls in accordance with Figures F2-2 or F2-3 and Table F2-9. *Ceiling joists* shall be connected to the top *track* of the structural wall in accordance with Table F2-10, either with the required number of No.10 screws applied through the *flange* of the *ceiling joist* or by using a 54 mil (1.37 mm) *clip angle* with the required number of No.10 screws in each leg. *Roof rafters* shall be connected to a *ridge* member with a minimum 2 inch x 2 inch (51x51 mm) *clip angle* fastened with No.10 screws to the *ridge* member in accordance with Figure F3-2 and Table F3-3. The *clip angle* shall have a steel thickness equivalent to or greater than the *roof rafter* thickness and shall extend the depth of the *roof rafter* member to the extent possible. The *ridge* member shall be fabricated from a *C-shaped* member and a *track* section, which shall have a minimum size and steel thickness equivalent to or greater than that of adjacent *roof rafters* and shall be installed in accordance with Figure F3-2. The *ridge* member shall extend the full depth of the sloped *roof rafter* cut.

F3.5 Roof Rafter Bottom Flange Bracing

The bottom *flanges* of *roof rafters* shall be continuously braced, at a maximum spacing of 8 feet (2.44 m) as measured parallel to the *roof rafters*, with one of the following members:

- (a) Minimum 33 mil (0.84 mm) *C-shaped member*.
- (b) Minimum 33 mil (0.84 mm) *track* section.
- (c) Minimum 1-1/2 inch x 33 mil (38 x 0.84 mm) steel *strap*.

The *bracing* element shall be fastened to the bottom *flange* of each *roof rafter* with one No.8 screw and shall be fastened to *blocking* with two No.8 screws. *Blocking* shall be installed between *roof rafters* in-line with the continuous *bracing* at a maximum spacing of 12 feet (3.66 m) measured perpendicular to the *roof rafters*. The ends of continuous *bracing* shall be fastened to *blocking* or anchored to a stable building component with two No.8 screws.

F4 Hip Framing

Hip framing shall consist of jack rafters, hip members, hip support columns and connections in accordance with this section or shall be in accordance with an *approved* design.

The provisions of this section for hip members and hip support columns shall only apply where the jack rafter slope is greater than or equal to the roof slope.

For the purpose of determining member sizes in this Section, wind speeds shall be

converted to equivalent ground snow load in accordance with Table F3-2. Member sizes shall be based on the higher of the ground snow load or the equivalent snow load converted from the wind speed.

F4.1 Jack Rafters

Jack rafters shall meet the requirements for *roof rafters* in accordance with Section F3, except the requirements in Section F3.4 shall not apply.

F4.2 Hip Members

Hip members shall be fabricated from a *C-shape* member and a *track* section, which shall have minimum sizes determined in accordance with Table F4-1. The *C-shaped* member and *track* section shall be connected at a maximum spacing of 24 inches using No.10 screws through top and bottom *flanges*, as shown in Figure F3-2.

The depth of the hip member shall match that of the *roof rafters* and jack rafters, unless an *approved* beam pocket is provided at the corner of the supporting wall.

F4.3 Hip Support Columns

Hip support columns shall be used to support hip members at the *ridge*. A hip support column shall consist of a pair of *C-shapes*, with a minimum size determined in accordance with Table F4-2. The *C-shapes* shall be connected at a maximum spacing of 24 inches to form a box using minimum 3" x 33-mil strap connected to each of the *flanges* of the *C-shapes* with 3 No.10 screws.

Hip support columns shall have a continuous load path to the foundation and shall be supported at the ceiling line by an interior wall or by an *approved* supporting element.

F4.4 Hip Framing Connections

Jack rafters shall be connected at the eave to a parallel *C-shape* blocking member in accordance with Figure F4-1. In other than *high wind areas*, the *C-shape* blocking member shall be attached to the supporting wall *track* with minimum 2-No.10 screws. In *high wind areas*, the *C-shape* blocking member shall be attached to the supporting wall in accordance with Section F7.2.

Jack rafters shall be connected to a hip member with a minimum 2 inch x 2 inch (51x51 mm) clip angle fastened with No.10 screws to the hip member in accordance with Figure F3-2 and Table F3-3. The clip angle shall have a steel thickness equivalent to or greater than the jack rafter thickness and shall extend the depth of the jack rafter member to the extent possible.

The connection of hip support columns at the ceiling line shall be in accordance with Figure F4-2, with an uplift strap sized in accordance with Table F4-3.

The connection of hip members, *ridge* members and hip support columns at the *ridge* shall be in accordance with Figures F4-3 and F4-4 and Table F4-4.

The connection of hip members to the wall corner shall be in accordance with Figure F4-5 and Table F4-5.

F5 Framing of Openings in Roofs and Ceilings

Openings in roofs and ceilings shall be framed with *header* and trimmer joists. *Header* joist *spans* shall not exceed 4 feet (1.2 m) in length. *Header* and trimmer joists shall be fabricated from joist and *track* members having a minimum size and thickness at least equivalent to the adjacent *ceiling joists* or *roof rafters* and shall be installed in accordance with Figures F5-1 and F5-2. Each

header joist shall be connected to trimmer joists with a minimum of four 2 inch x 2 inch (51x51 mm) *clip angles*. Each *clip angle* shall be fastened to both the *header* and trimmer joists with four No.8 screws, evenly spaced, through each leg of the *clip angle*. The *clip angles* shall have a steel thickness not less than that of the *ceiling joist* or *roof rafter*. Each *track* section for a built-up *header* or trimmer joist shall extend the full length of the joist (continuous).

F6 Roof Trusses

Trusses shall be designed and installed in accordance with the *Standard for Cold-Formed Steel Framing – Truss Design*.

Trusses shall be connected to the top *track* of the structural wall in accordance with Table F2-10, either with the required number of No.10 screws applied through the *flange* of the *truss* or by using a 54 mil (1.37 mm) *clip angle* with the required number of No.10 screws in each leg.

F7 Ceiling and Roof Diaphragms

At gable endwalls a ceiling *diaphragm* shall be provided by attaching a minimum 1/2-inch (13 mm) gypsum board in accordance with Tables F7-1 and F7-2 or a minimum 3/8-inch (9.5 mm) wood structural panel sheathing, which complies with DOC PS 1, DOC PS 2, CSA O437, or CSA O325, in accordance with Table F7-3 and F7-4 to the bottom of *ceiling joists* or *roof trusses* and connected to wall framing in accordance with Figures F7-1 and F7-2, unless *studs* are designed as full height without bracing at the ceiling. Flat *blocking* shall consist of *C-shape* or *track* section with a minimum thickness of 33 mils (0.84 mm).

The ceiling *diaphragm* shall be secured with screws spaced at a maximum 6" o.c. at panel edges and a maximum 12" o.c. in the field. The required lengths in Table F7-1 and F7-2 for gypsum board sheathed ceiling *diaphragms* shall be permitted to be multiplied by 0.35 if all panel edges are blocked. The required lengths in Table F7-1 and Table F7-2 for gypsum board sheathed ceiling *diaphragms* shall be permitted to be multiplied by 0.9 if all panel edges are secured with screws spaced at 4" o.c.

A roof *diaphragm* shall be provided by attaching a minimum of 3/8 inch (9.5 mm) wood structural panel, which complies with DOC PS 1, DOC PS 2, CSA O437 or CSA O325 to *roof rafters* or *truss* top chords in accordance with Table F2-10. Buildings with 3-1 or larger *plan aspect ratio* and with *roof rafters* slope (pitch) of 9:12 or larger shall have the *roof rafters* and *ceiling joists* blocked in accordance with Figure F7-3.

F7.1 Roof Diaphragms in High Seismic Areas

Roof *diaphragms* in *high seismic areas* shall be constructed with the provisions of this section.

Roof *diaphragms* shall be constructed of minimum 3/8 inch (9.5 mm) C-D or C-C Sheathing with screws at 6 inch (152 mm) spacing on panel edges and in the field. The *diaphragms* shall be permitted to be unblocked, and shall be permitted to be constructed in any panel configuration except in the case of a building in *Seismic Design Category D₂*, where a heavy roof system is used and the *diaphragm span* is greater than or equal to 40 feet (12.2 m).

In *Seismic Design Category D₂*, where a heavy roof system is used on a building with a *diaphragm span* greater than or equal to 40 feet (12.2 m), the roof *diaphragm* shall be constructed of 15/32 inch (12 mm) Structural I Plywood, unblocked, and in any configuration, with screws at 6 inch (152 mm) spacing on panel edges and at maximum 12

inch (305 mm) spacing in the field. Alternatively it shall be permitted to use 3/8 inch (9.5 mm) C-D or C-C Sheathing with screws at 6 inch (152 mm) spacing on panel edges and in the field, with all unblocked edges and continuous panel joints parallel to the longer *diaphragm span*.

F7.2 Roof Diaphragms in High Wind Areas

In *high wind areas*, roof *diaphragms* shall be constructed of minimum 3/8 inch (9.5 mm) C-D or C-C Sheathing with screws at 6 inch (152 mm) spacing on panel edges and in the field. The *diaphragms* shall be permitted to be unblocked, and shall be permitted to be constructed in any panel configuration.

F8 Roof Framing Connections in High Wind Areas

F8.1 General

In *high wind areas* connection of the roof framing members shall be provided, in accordance with this section, to ensure a continuous load path capable of transferring shear and uplift loads from floors, *studs*, and roof framing to the foundation.

F8.2 Uplift Connection - Roof Rafter or Truss to Wall

Roof rafters and *trusses* shall be attached to their supporting wall assemblies by connections capable of resisting the uplift loads listed in Table F8-1. Alternatively, a steel uplift *strap* sized in accordance with Table F8-5 connecting the *roof rafter* or *truss* to the *in-line framing stud* below shall be permitted. Each end of the uplift *strap* shall be fastened with minimum No.8 screws as required by Table F8-2.

Required strengths in Table F8-1 shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners. Required strengths shall be permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

F8.3 Ridge Strap Connection

Roof rafters shall be provided with a connection at the *ridge* line to transfer tension loads. The *ridge* connection shall be capable of resisting the unit loads listed in Table F8-3 multiplied by the appropriate spacing multiplier listed in Table F8-4. Alternatively, a steel *ridge strap* sized in accordance with Table F8-5 shall be provided with minimum No.8 screws on each end of the *strap* as required in Table F8-3. The number of screws shall be increased to account for the spacing multipliers shown in Table F8-4.

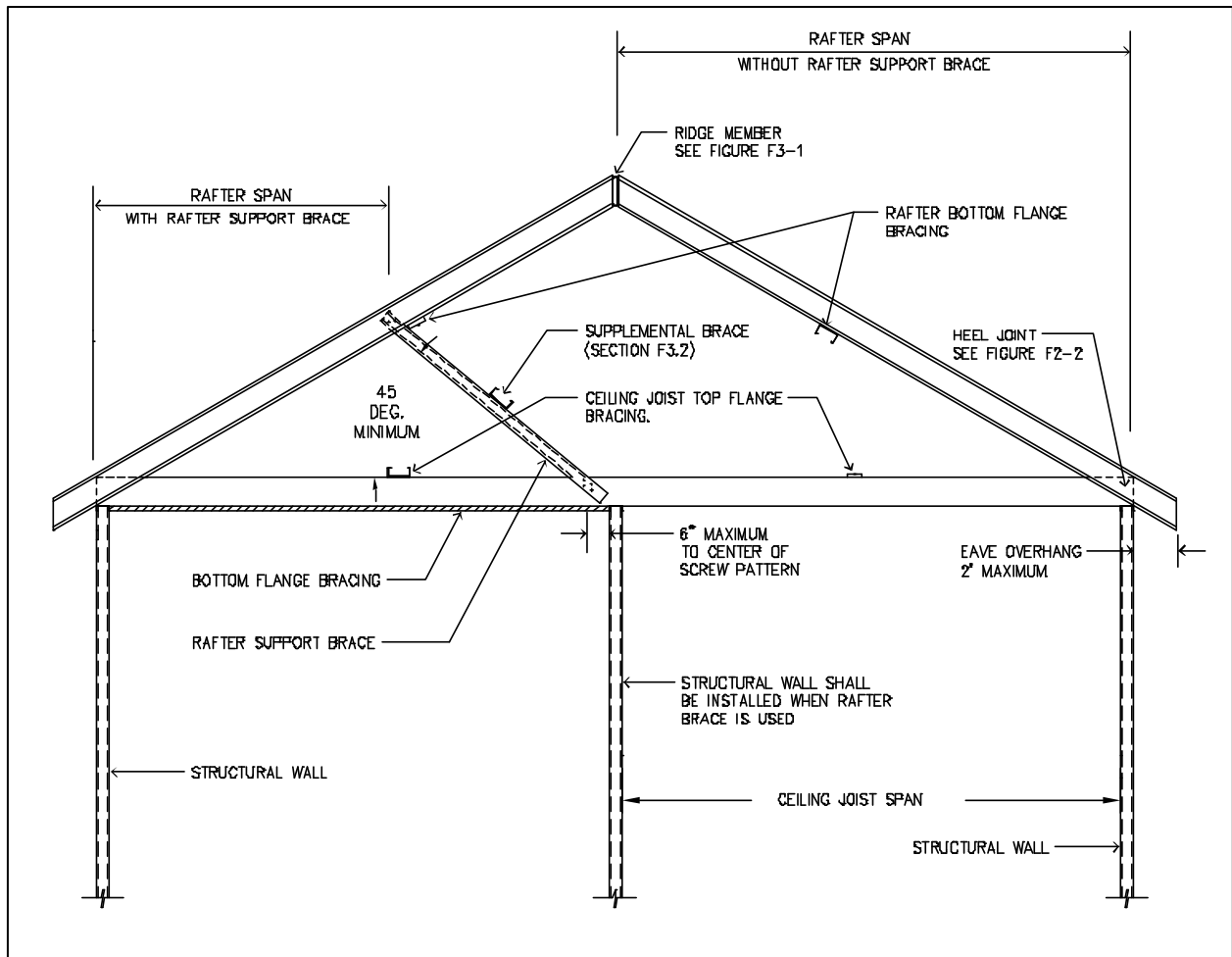


Figure F2-1 Roof Construction

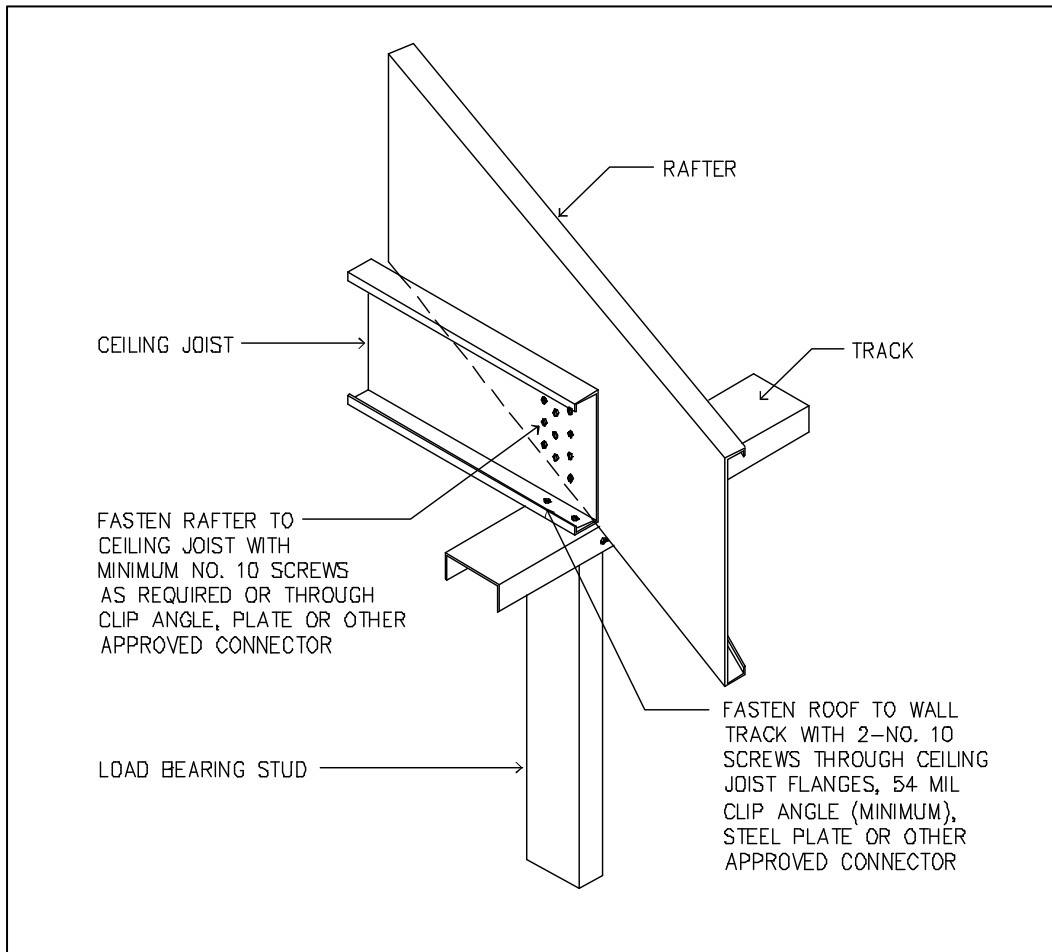


Figure F2-2 Heel Joint Connection

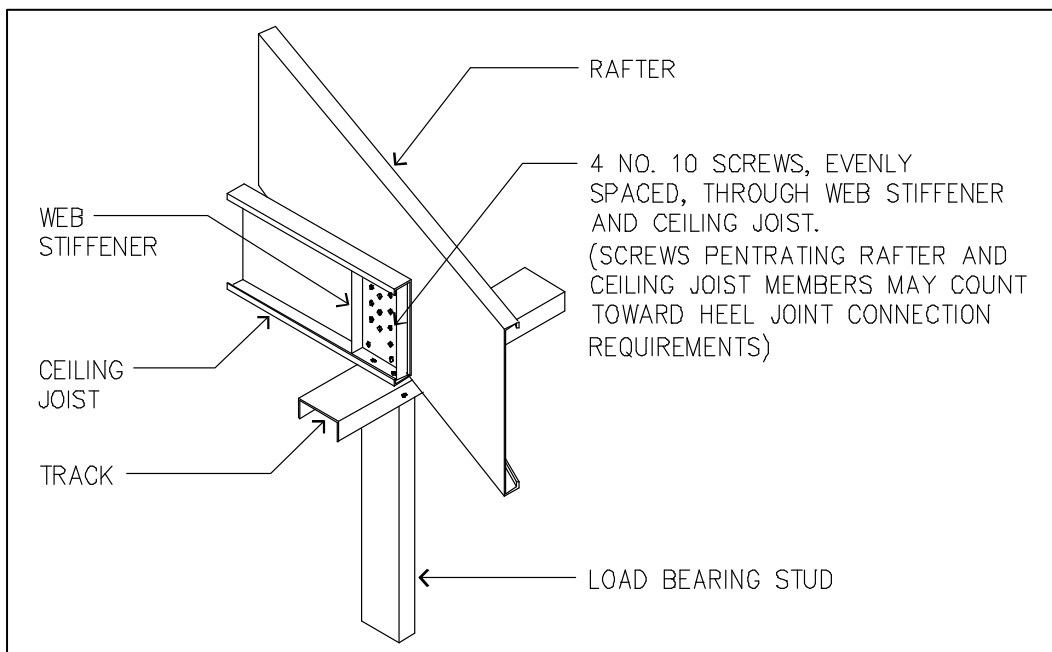


Figure F2-3 Bearing Stiffener at the Heel Joint Connection

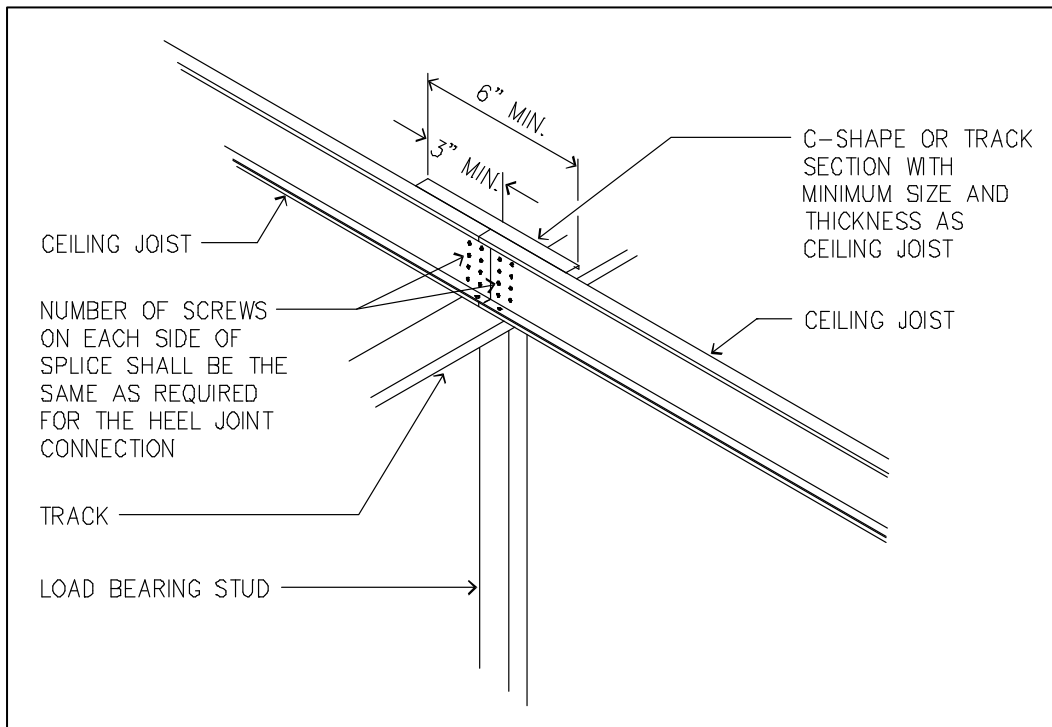


Figure F2-4 Spliced Ceiling Joists

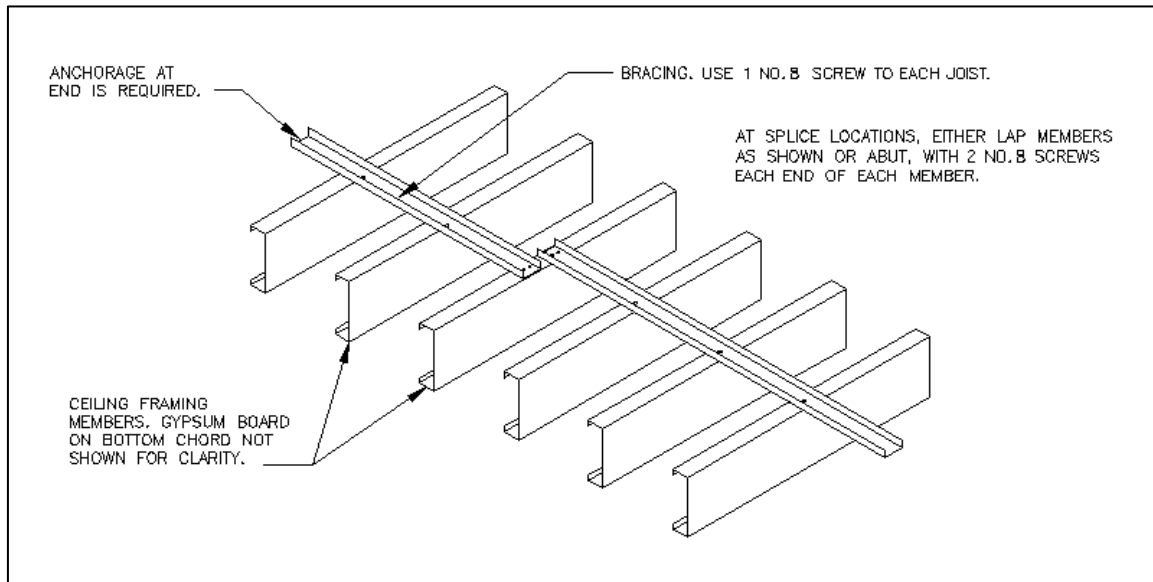


Figure F2-5 Ceiling Joist Top Flange Bracing with C-Shape, Track or Cold-Rolled Channel

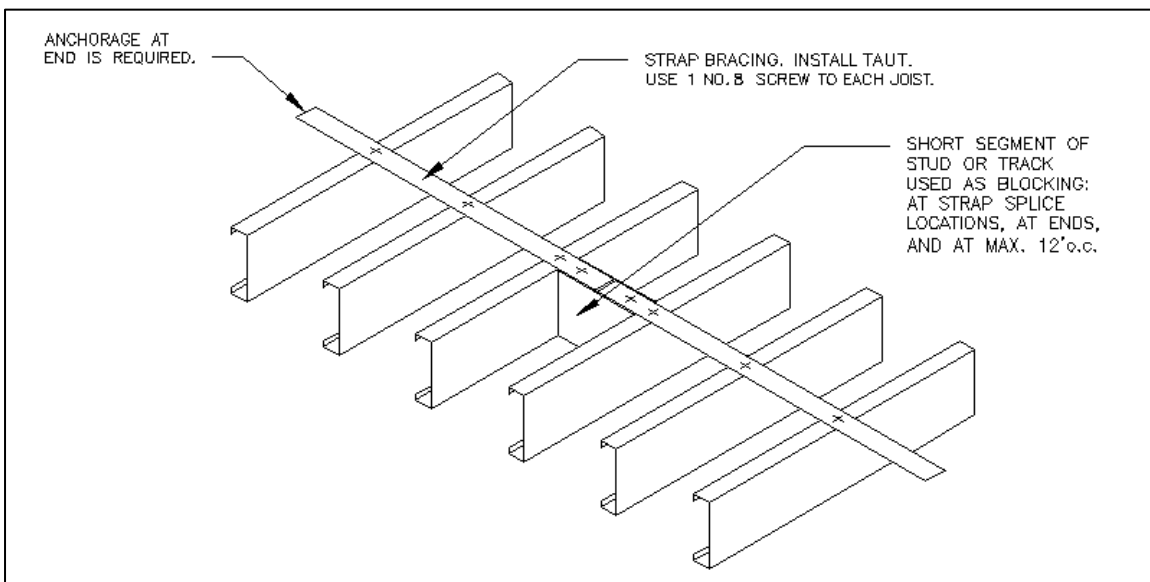


Figure F2-6 Ceiling Joist Top Flange Bracing with Continuous Steel Strap and Blocking

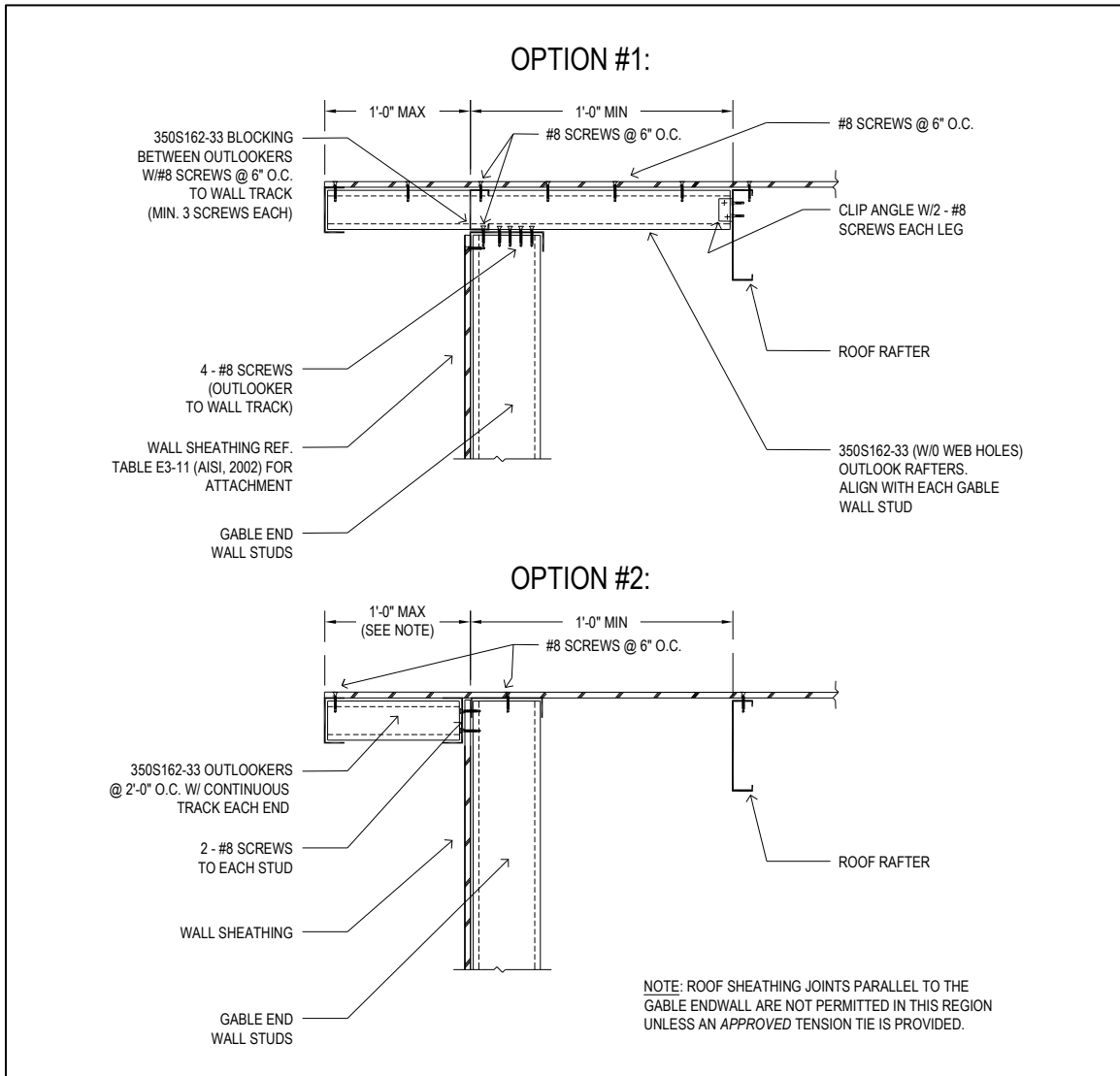


Figure F3-1 Gable Endwall Overhang Details

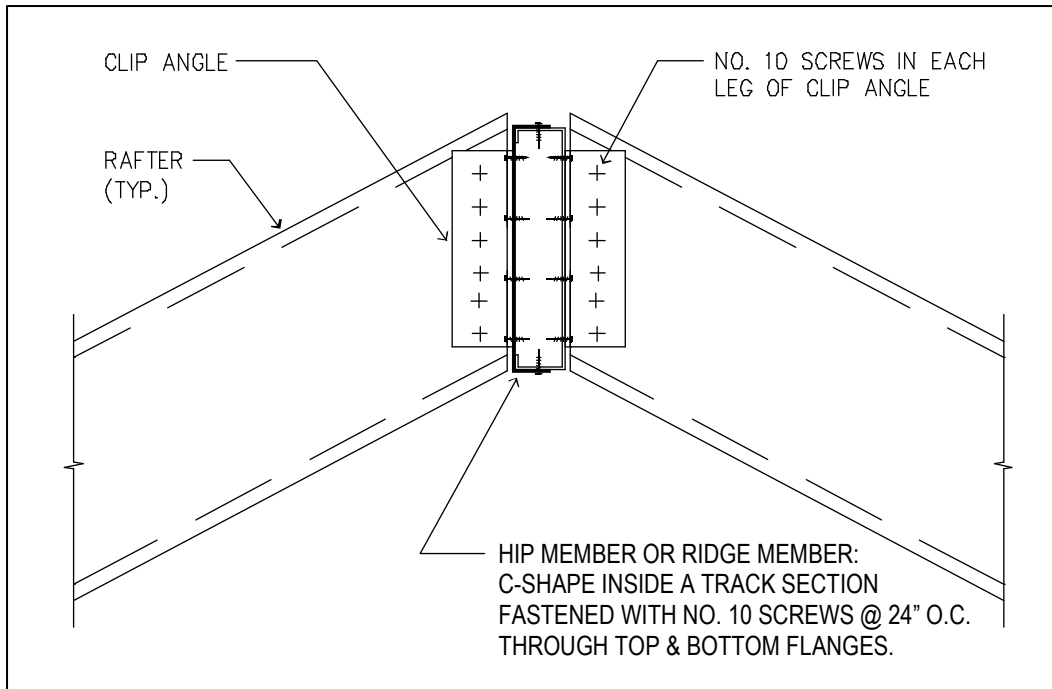


Figure F3-2 Hip Member or Ridge Member Connection

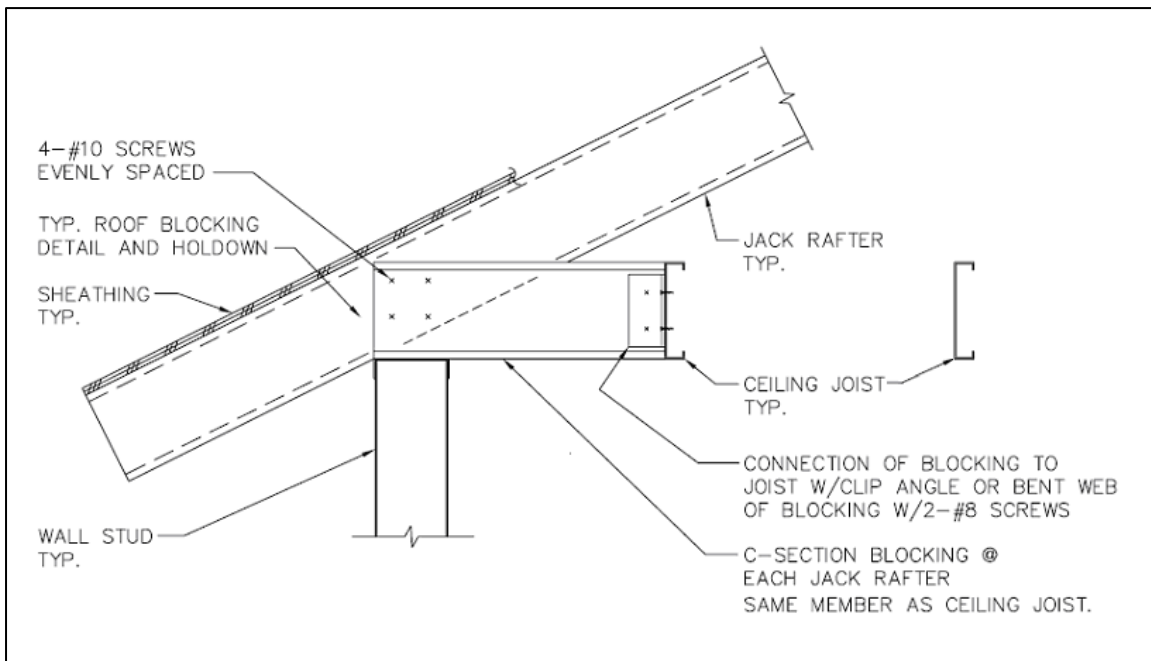


Figure F4-1 Jack Rafter Connection at Eave

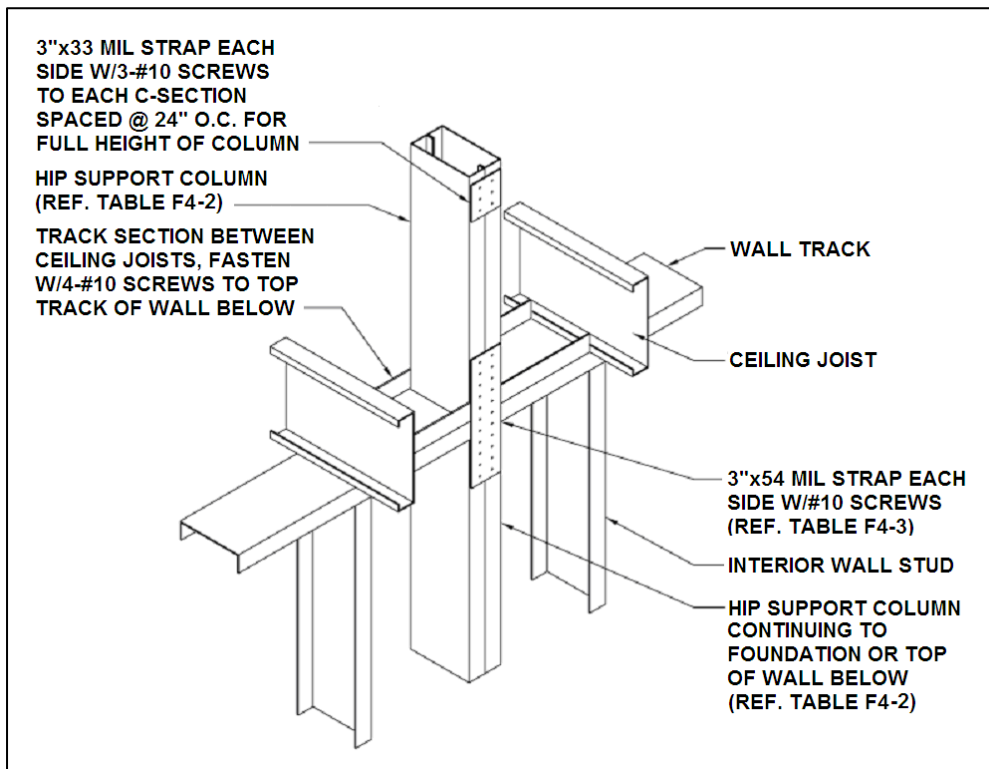


Figure F4-2 Hip Support Column

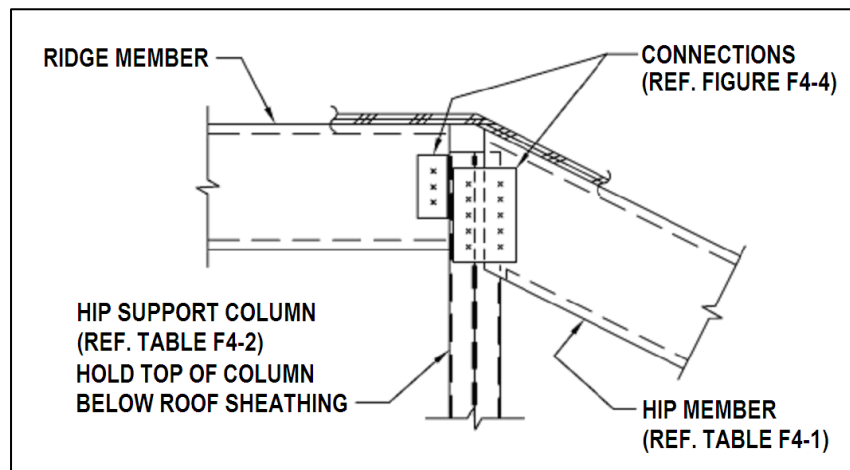


Figure F4-3 Hip Connections at Ridge

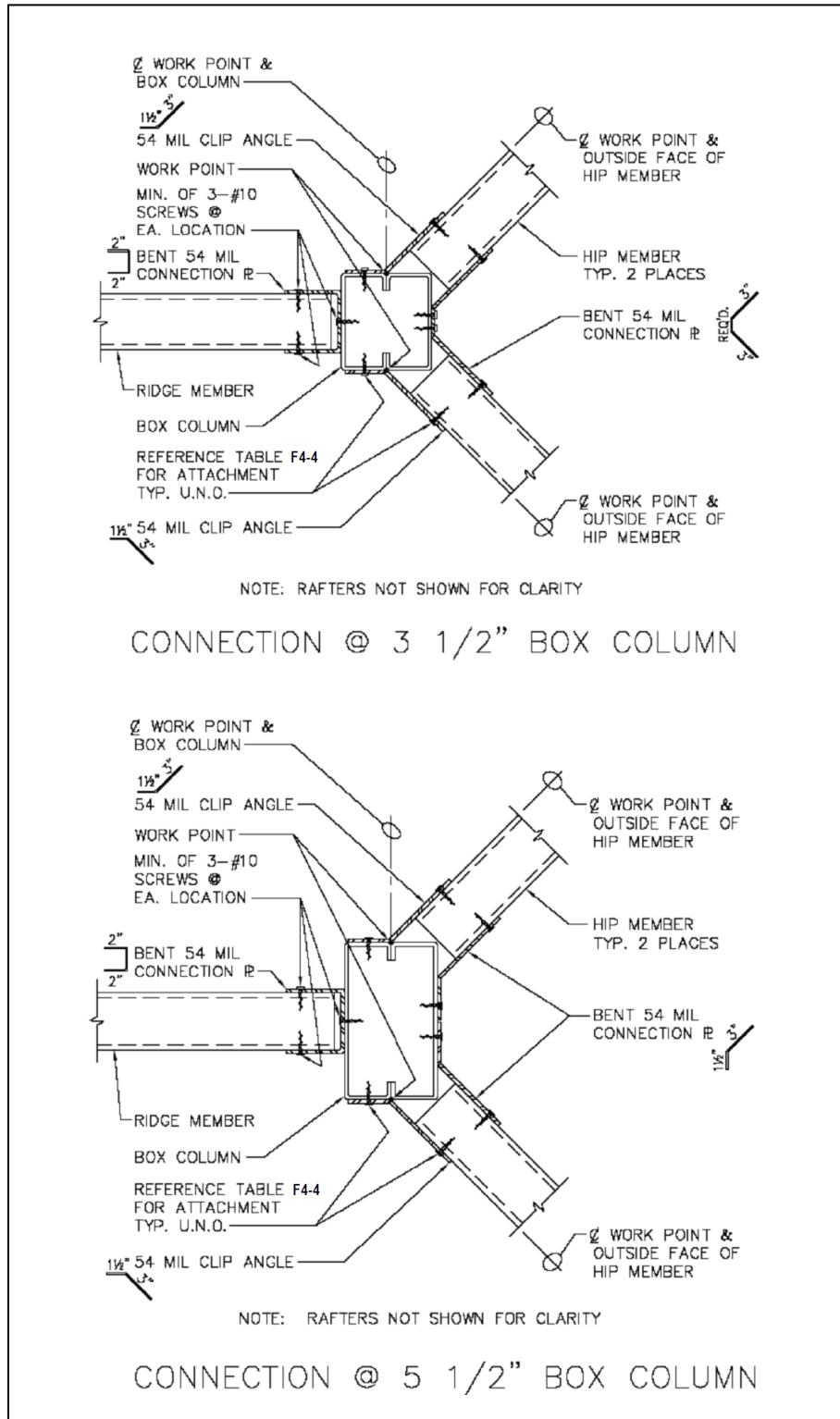


Figure F4-4 Hip Connections at Ridge and Box Column

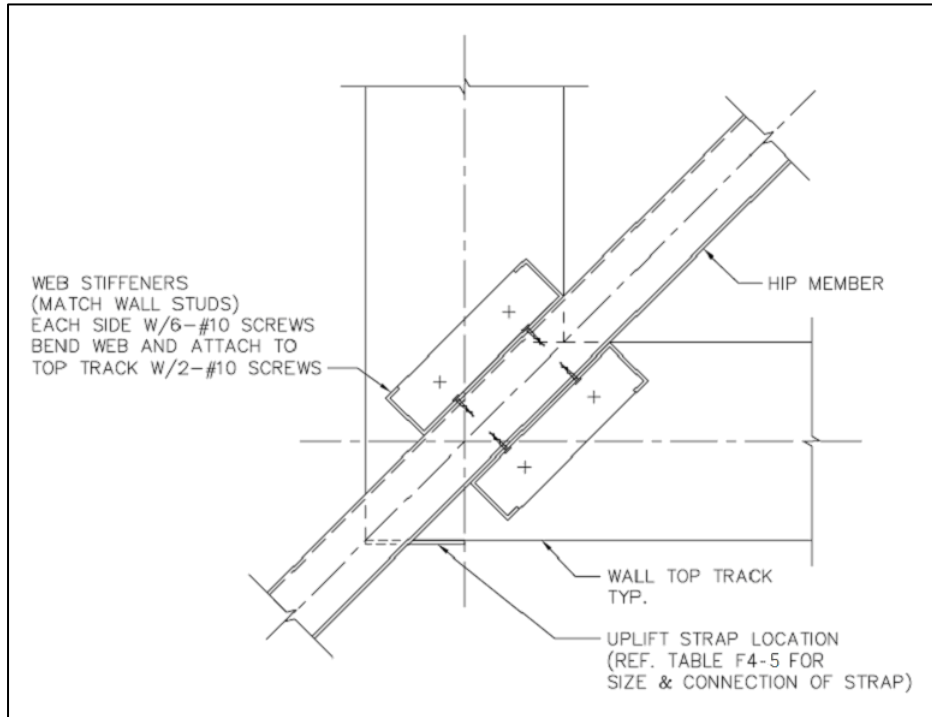


Figure F4-5 Hip Member Connection at Wall Corner

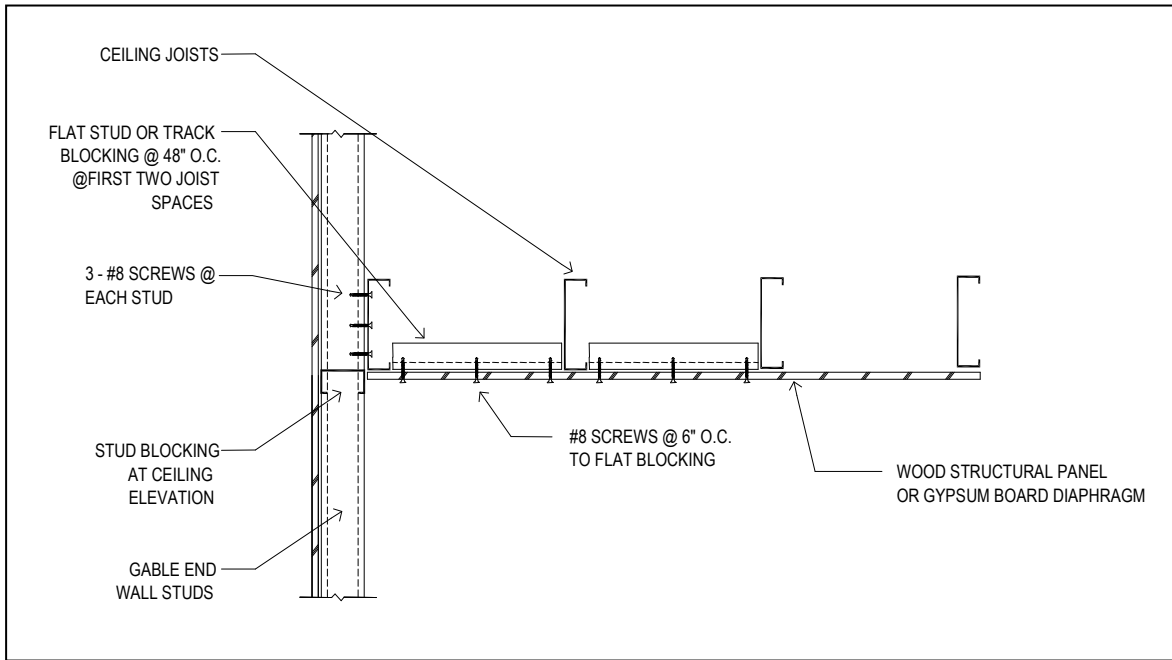


Figure F7-1 Ceiling Diaphragm to Gable Endwall Detail

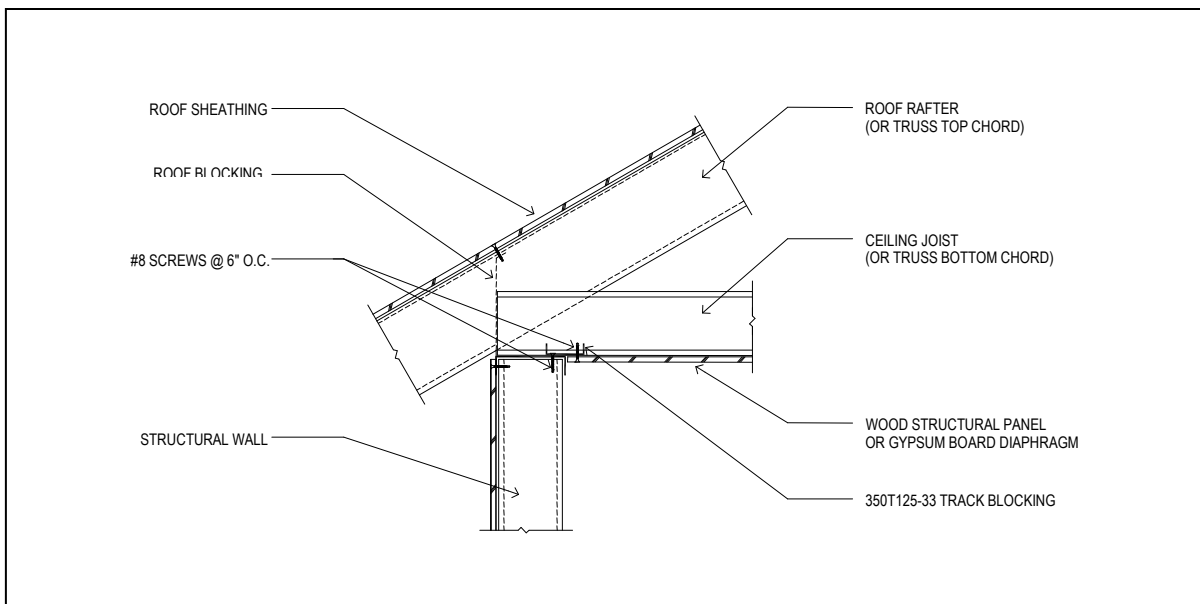


Figure F7-2 Ceiling Diaphragm to Sidewall Detail

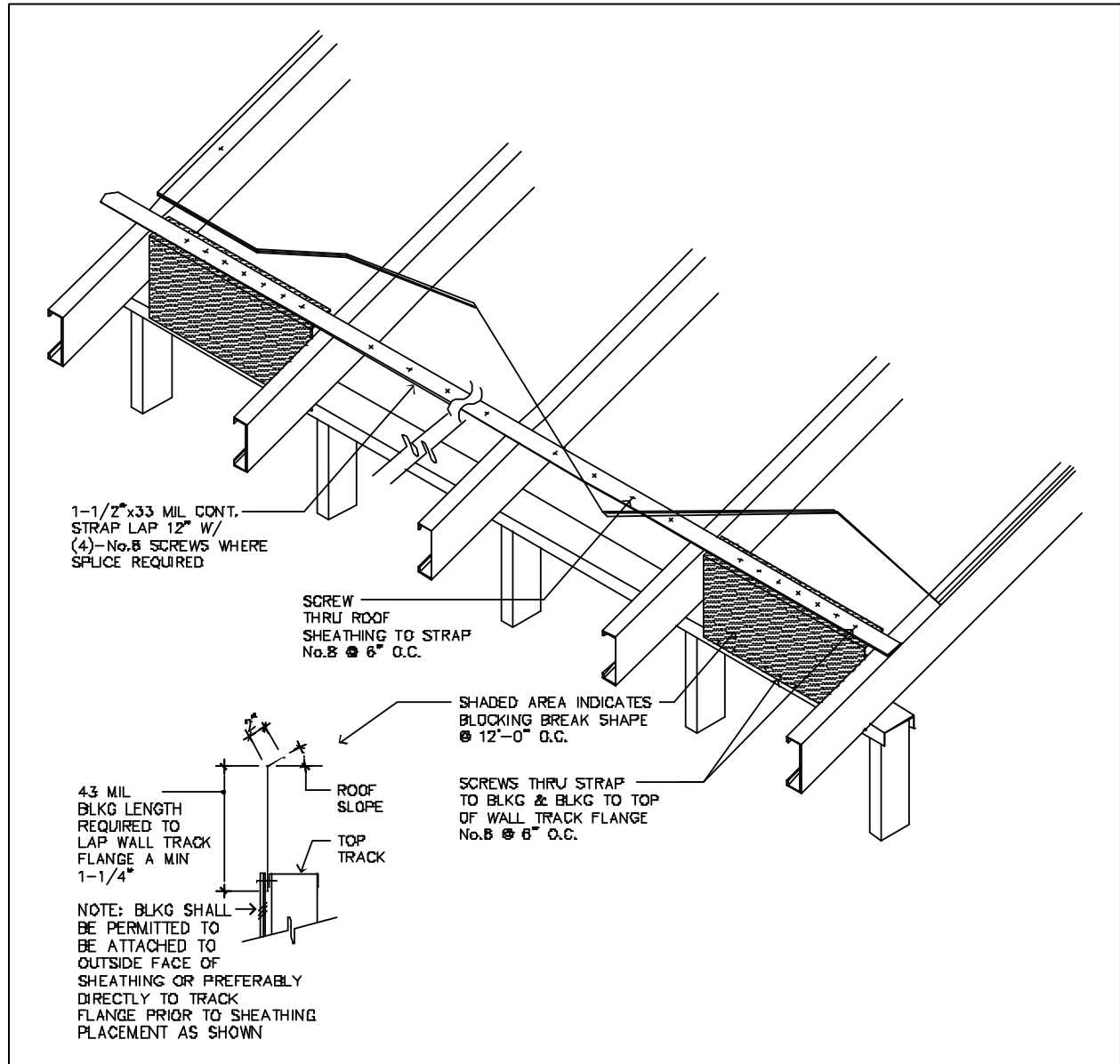


Figure F7-3 Roof Blocking Detail

33
KSI

Table F2-1
Ceiling Joist Spans
Single Spans with Bearing Stiffeners
10 Lbs per Sq. Ft. Live Load (No Attic Storage) ^{1,2,3}
F_y = 33 ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	9'-5"	8'-6"	12'-2"	10'-4"	12'-2"	10'-7"
350S162-43	10'-3"	9'-2"	12'-10"	11'-2"	12'-10"	11'-2"
350S162-54	11'-1"	9'-11"	13'-9"	12'-0"	13'-9"	12'-0"
350S162-68	12'-1"	10'-9"	14'-8"	12'-10"	14'-8"	12'-10"
350S162-97	14'-4"	12'-7"	16'-4"	14'-3"	16'-4"	14'-3"
550S162-33	10'-7"	9'-6"	14'-10"	12'-10"	15'-11"	13'-4"
550S162-43	11'-8"	10'-6"	16'-4"	14'-3"	17'-10"	15'-3"
550S162-54	12'-6"	11'-2"	17'-7"	15'-7"	19'-5"	16'-10"
550S162-68	13'-6"	12'-1"	19'-2"	17'-1"	21'-0"	18'-4"
550S162-97	15'-9"	13'-11"	21'-8"	19'-3"	23'-5"	20'-5"
800S162-33	12'-2"	10'-11"	17'-8"	15'-10"	19'-10"	17'-1"
800S162-43	13'-0"	11'-9"	18'-10"	17'-0"	21'-6"	19'-1"
800S162-54	13'-10"	12'-5"	20'-0"	18'-0"	22'-9"	20'-4"
800S162-68	14'-11"	13'-4"	21'-3"	19'-1"	24'-1"	21'-8"
800S162-97	17'-1"	15'-2"	23'-10"	21'-3"	26'-7"	23'-10"
1000S162-43	13'-11"	12'-6"	20'-2"	18'-3"	23'-1"	20'-9"
1000S162-54	14'-9"	13'-3"	21'-4"	19'-3"	24'-4"	22'-0"
1000S162-68	15'-10"	14'-2"	22'-8"	20'-5"	25'-9"	23'-2"
1000S162-97	18'-0"	16'-0"	25'-3"	22'-7"	28'-3"	25'-4"
1200S162-43	14'-8"	13'-3"	21'-4"	19'-3"	24'-5"	21'-8"
1200S162-54	15'-7"	14'-0"	22'-6"	20'-4"	25'-9"	23'-2"
1200S162-68	16'-8"	14'-11"	23'-11"	21'-6"	27'-2"	24'-6"
1200S162-97	18'-9"	16'-9"	26'-6"	23'-8"	29'-9"	26'-9"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Bearing stiffeners are to be installed at all bearing and concentrated load locations.

² Deflection criteria: L/240 for total loads

³ Ceiling dead load = 5 psf (0.24 kN/m²)

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KSI

Table F2-2
Ceiling Joist Spans
Two Equal Spans with Bearing Stiffeners
10 Lbs per Sq. Ft. Live Load (No Attic Storage) ^{1,2,3,4,5}
 $F_y = 33$ ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	12'-11"	10'-11"	13'-5"	10'-11"	13'-5"	10'-11"
350S162-43	14'-2"	12'-8"	15'-10"	12'-11"	15'-10"	12'-11"
350S162-54	15'-6"	13'-10"	17'-1"	14'-6"	17'-9"	14'-6"
350S162-68	17'-3"	15'-3"	18'-6"	16'-1"	19'-8"	16'-1"
350S162-97	20'-10"	18'-4"	21'-5"	18'-10"	21'-11"	18'-10"
550S162-33	14'-4"	12'-11"	16'-7"	14'-1"	17'-3"	14'-1"
550S162-43	16'-0"	14'-1"	17'-11"	16'-1"	20'-7"	16'-10"
550S162-54	17'-4"	15'-6"	19'-5"	17'-6"	23'-2"	19'-0"
550S162-68	19'-1"	16'-11"	20'-10"	18'-8"	25'-2"	21'-5"
550S162-97	22'-8"	19'-9"	23'-6"	20'-11"	27'-11"	25'-1"
800S162-33	16'-5"	14'-10"	19'-2"	17'-3"	23'-1"	18'-3"
800S162-43	17'-9"	15'-11"	20'-6"	18'-5"	25'-0"	22'-6"
800S162-54	19'-1"	17'-1"	21'-8"	19'-6"	26'-4"	23'-9"
800S162-68	20'-9"	18'-6"	23'-1"	20'-9"	28'-0"	25'-2"
800S162-97	24'-5"	21'-6"	26'-0"	23'-2"	31'-1"	27'-9"
1000S162-43	18'-11"	17'-0"	21'-11"	19'-9"	26'-8"	24'-1"
1000S162-54	20'-3"	18'-2"	23'-2"	20'-10"	28'-2"	25'-5"
1000S162-68	21'-11"	19'-7"	24'-7"	22'-2"	29'-10"	26'-11"
1000S162-97	25'-7"	22'-7"	27'-6"	24'-6"	33'-0"	29'-7"
1200S162-43	19'-11"	17'-11"	23'-1"	20'-10"	28'-3"	25'-6"
1200S162-54	21'-3"	19'-1"	24'-5"	22'-0"	29'-9"	26'-10"
1200S162-68	23'-0"	20'-7"	25'-11"	23'-4"	31'-6"	28'-4"
1200S162-97	26'-7"	23'-6"	28'-9"	25'-10"	34'-8"	31'-1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

- ¹ Table provides the maximum *ceiling joist span* in feet and inches to either side of the interior support.
- ² *Bearing stiffeners* are to be installed at all bearing and concentrated load locations.
- ³ Deflection criteria: L/240 for total loads
- ⁴ Ceiling dead load = 5 psf (0.24 kN/m²)
- ⁵ Interior supports for *multiple span* joists consist of structural walls or beams. Interior supports are to be located within 2 feet (0.610 m) of mid *span* provided that each of the resulting *spans* does not exceed the maximum applicable *span* shown in the table above.

33
KSI

Table F2-3
Ceiling Joist Spans
Single Spans with Bearing Stiffeners
20 Lbs per Sq. Ft. Live Load (Limited Attic Storage) ^{1,2,3}
F_y = 33 ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	8'-2"	7'-2"	9'-9"	8'-1"	9'-11"	8'-1"
350S162-43	8'-10"	7'-10"	11'-0"	9'-5"	11'-0"	9'-7"
350S162-54	9'-6"	8'-6"	11'-9"	10'-3"	11'-9"	10'-3"
350S162-68	10'-4"	9'-2"	12'-7"	11'-0"	12'-7"	11'-0"
350S162-97	12'-1"	10'-8"	14'-0"	12'-0"	14'-0"	12'-0"
550S162-33	9'-2"	8'-3"	12'-2"	10'-2"	12'-6"	10'-5"
550S162-43	10'-1"	9'-1"	13'-7"	11'-7"	14'-5"	12'-2"
550S162-54	10'-9"	9'-8"	14'-10"	12'-10"	15'-11"	13'-6"
550S162-68	11'-7"	10'-4"	16'-4"	14'-0"	17'-5"	14'-11"
550S162-97	13'-4"	11'-10"	18'-5"	16'-2"	20'-1"	17'-1"
800S162-33	10'-7"	9'-6"	15'-1"	13'-0"	16'-2"	13'-7"
800S162-43	11'-4"	10'-2"	16'-5"	14'-6"	18'-2"	15'-9"
800S162-54	12'-0"	10'-9"	17'-4"	15'-6"	19'-6"	17'-0"
800S162-68	12'-10"	11'-6"	18'-5"	16'-6"	20'-10"	18'-3"
800S162-97	14'-7"	12'-11"	20'-5"	18'-3"	22'-11"	20'-5"
1000S162-43	12'-1"	10'-11"	17'-7"	15'-10"	19'-11"	17'-3"
1000S162-54	12'-10"	11'-6"	18'-7"	16'-9"	21'-2"	18'-10"
1000S162-68	13'-8"	12'-3"	19'-8"	17'-8"	22'-4"	20'-1"
1000S162-97	15'-4"	13'-8"	21'-8"	19'-5"	24'-5"	21'-11"
1200S162-43	12'-9"	11'-6"	18'-7"	16'-6"	20'-9"	18'-2"
1200S162-54	13'-6"	12'-2"	19'-7"	17'-8"	22'-5"	20'-2"
1200S162-68	14'-4"	12'-11"	20'-9"	18'-8"	23'-7"	21'-3"
1200S162-97	16'-1"	14'-4"	22'-10"	20'-6"	25'-9"	23'-2"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Bearing stiffeners are to be installed at all bearing and concentrated load locations.

² Deflection criteria: L/240 for total loads

³ Ceiling dead load = 5 psf (0.24 kN/m²)

Table F2-4
Ceiling Joist Spans
Two Equal Spans with Bearing Stiffeners
20 Lbs per Sq. Ft. Live Load (Limited Attic Storage) ^{1,2,3,4,5}
 $F_y = 33$ ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	10'-2"	8'-4"	10'-2"	8'-4"	10'-2"	8'-4"
350S162-43	12'-1"	9'-10"	12'-1"	9'-10"	12'-1"	9'-10"
350S162-54	13'-3"	11'-0"	13'-6"	11'-0"	13'-6"	11'-0"
350S162-68	14'-7"	12'-3"	15'-0"	12'-3"	15'-0"	12'-3"
350S162-97	17'-6"	14'-3"	17'-6"	14'-3"	17'-6"	14'-3"
550S162-33	12'-5"	10'-9"	13'-2"	10'-9"	13'-2"	10'-9"
550S162-43	13'-7"	12'-1"	15'-6"	12'-9"	15'-8"	12'-9"
550S162-54	14'-11"	13'-4"	16'-10"	14'-5"	17'-9"	14'-5"
550S162-68	16'-3"	14'-5"	18'-0"	16'-1"	20'-0"	16'-4"
550S162-97	19'-1"	16'-10"	20'-3"	18'-0"	23'-10"	19'-5"
800S162-33	14'-3"	12'-4"	16'-7"	12'-4"	16'-7"	12'-4"
800S162-43	15'-4"	13'-10"	17'-9"	16'-0"	21'-8"	17'-9"
800S162-54	16'-5"	14'-9"	18'-10"	16'-11"	22'-11"	20'-6"
800S162-68	17'-9"	15'-11"	20'-0"	18'-0"	24'-3"	21'-10"
800S162-97	20'-8"	18'-3"	22'-3"	19'-11"	26'-9"	24'-0"
1000S162-43	16'-5"	14'-9"	19'-0"	17'-2"	23'-3"	18'-11"
1000S162-54	17'-6"	15'-8"	20'-1"	18'-1"	24'-6"	22'-1"
1000S162-68	18'-10"	16'-10"	21'-4"	19'-2"	25'-11"	23'-4"
1000S162-97	21'-8"	19'-3"	23'-7"	21'-2"	28'-5"	25'-6"
1200S162-43	17'-3"	15'-7"	20'-1"	18'-2"	24'-6"	18'-3"
1200S162-54	18'-5"	16'-6"	21'-3"	19'-2"	25'-11"	23'-5"
1200S162-68	19'-9"	17'-8"	22'-6"	20'-3"	27'-4"	24'-8"
1200S162-97	22'-7"	20'-1"	24'-10"	22'-3"	29'-11"	26'-11"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

- ¹ Table provides the maximum *ceiling joist span* in feet and inches to either side of the interior support.
- ² *Bearing stiffeners* are to be installed at all bearing and concentrated load locations.
- ³ Deflection criteria: $L/240$ for total loads
- ⁴ Ceiling dead load = 5 psf (0.24 kN/m²)
- ⁵ Interior supports for *multiple span* joists consist of structural walls or beams. Interior supports are to be located within 2 feet (0.610 m) of *mid span* provided that each of the resulting *spans* does not exceed the maximum applicable *span* shown in the table above.

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Table F2-5
Ceiling Joist Spans
Single Spans without Bearing Stiffeners
10 Lbs per Sq. Ft. Live Load (No Attic Storage) ^{1,2}
F_y = 33 ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	9'-5"	8'-6"	12'-2"	10'-4"	12'-2"	10'-7"
350S162-43	10'-3"	9'-12"	13'-2"	11'-6"	13'-2"	11'-6"
350S162-54	11'-1"	9'-11"	13'-9"	12'-0"	13'-9"	12'-0"
350S162-68	12'-1"	10'-9"	14'-8"	12'-10"	14'-8"	12'-10"
350S162-97	14'-4"	12'-7"	16'-10"	14'-3"	16'-4"	14'-3"
550S162-33	10'-7"	9'-6"	14'-10"	12'-10"	15'-11"	13'-4"
550S162-43	11'-8"	10'-6"	16'-4"	14'-3"	17'-10"	15'-3"
550S162-54	12'-6"	11'-2"	17'-7"	15'-7"	19'-5"	16'-10"
550S162-68	13'-6"	12'-1"	19'-2"	17'-0"	21'-0"	18'-4"
550S162-97	15'-9"	13'-11"	21'-8"	19'-3"	23'-5"	20'-5"
800S162-33	-	-	-	-	-	-
800S162-43	13'-0"	11'-9"	18'-10"	17'-0"	21'-6"	19'-0"
800S162-54	13'-10"	12'-5"	20'-0"	18'-0"	22'-9"	20'-4"
800S162-68	14'-11"	13'-4"	21'-3"	19'-1"	24'-1"	21'-8"
800S162-97	17'-1"	15'-2"	23'-10"	21'-3"	26'-7"	23'-10"
1000S162-43	-	-	-	-	-	-
1000S162-54	14'-9"	13'-3"	21'-4"	19'-3"	24'-4"	22'-0"
1000S162-68	15'-10"	14'-2"	22'-8"	20'-5"	25'-9"	23'-2"
1000S162-97	18'-0"	16'-0"	25'-3"	22'-7"	28'-3"	25'-4"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	16'-8"	14'-11"	23'-11"	21'-6"	27'-2"	24'-6"
1200S162-97	18'-9"	16'-9"	26'-6"	23'-8"	29'-9"	26'-9"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Ceiling dead load = 5 psf (0.24 kN/m²)

² Deflection criteria: L/240 for total loads

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Table F2-6
Ceiling Joist Spans
Two Equal Spans without Bearing Stiffeners
10 Lbs per Sq. Ft. Live Load (No Attic Storage) ^{1,2,3,4,5}
 $F_y = 33$ ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	11'-9"	8'-11"	11'-9"	8'-11"	11'-9"	8'-11"
350S162-43	14'-2"	11'-7"	14'-11"	11'-7"	14'-11"	11'-7"
350S162-54	15'-6"	13'-10"	17'-1"	13'-10"	17'-7"	13'-10"
350S162-68	17'-3"	15'-3"	18'-6"	16'-1"	19'-8"	16'-1"
350S162-97	20'-10"	18'-4"	21'-5"	18'-9"	21'-11"	18'-9"
550S162-33	13'-4"	9'-11"	13'-4"	9'-11"	13'-4"	9'-11"
550S162-43	16'-0"	13'-6"	17'-9"	13'-6"	17'-9"	13'-6"
550S162-54	17'-4"	15'-6"	19'-5"	16'-10"	21'-9"	16'-10"
550S162-68	19'-1"	16'-11"	20'-10"	18'-8"	24'-11"	20'-6"
550S162-97	22'-8"	20'-0"	23'-9"	21'-1"	28'-2"	25'-1"
800S162-33	-	-	-	-	-	-
800S162-43	17'-9"	15'-7"	20'-6"	15'-7"	21'-0"	15'-7"
800S162-54	19'-1"	17'-1"	21'-8"	19'-6"	26'-4"	23'-10"
800S162-68	20'-9"	18'-6"	23'-1"	20'-9"	28'-0"	25'-2"
800S162-97	24'-5"	21'-6"	26'-0"	23'-2"	31'-1"	27'-9"
1000S162-43	-	-	-	-	-	-
1000S162-54	20'-3"	18'-2"	23'-2"	20'-10"	28'-2"	21'-2"
1000S162-68	21'-11"	19'-7"	24'-7"	22'-2"	29'-10"	26'-11"
1000S162-97	25'-7"	22'-7"	27'-6"	24'-6"	33'-0"	29'-7"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	23'-0"	20'-7"	25'-11"	23'-4"	31'-6"	28'-4"
1200S162-97	26'-7"	23'-6"	28'-9"	25'-10"	34'-8"	31'-1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Table provides the maximum *ceiling joist span* in feet and inches to either side of the interior support.

² Deflection criteria: L/240 for total loads

³ Ceiling dead load = 5 psf (0.24 kN/m²)

⁴ Interior supports for *multiple span* joists consist of structural walls or beams. Interior supports are to be located within 2 feet (0.610 m) of *mid span* provided that each of the resulting *spans* does not exceed the maximum applicable *span* shown in the table above.

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Table F2-7
Ceiling Joist Spans
Single Spans without Bearing Stiffeners
20 Lbs per Sq. Ft. Live Load (Limited Attic Storage) ^{1,2}
 $F_y = 33$ ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced	Mid-Span Bracing		Third-Point Bracing		
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	8'-2"	6'-10"	9'-9"	6'-10"	9'-11"	6'-10"
350S162-43	8'-10"	7'-10"	11'-0"	9'-5"	11'-0"	9'-7"
350S162-54	9'-6"	8'-6"	11'-9"	10'-3"	11'-9"	10'-3"
350S162-68	10'-4"	9'-2"	12'-7"	11'-0"	12'-7"	11'-0"
350S162-97	12'-10"	10'-8"	13'-9"	12'-0"	13'-9"	12'-0"
550S162-33	9'-2"	8'-3"	12'-2"	8'-5"	12'-6"	8'-5"
550S162-43	10'-1"	9'-1"	13'-7"	11'-8"	14'-5"	12'-2"
550S162-54	10'-9"	9'-8"	14'-10"	12'-10"	15'-11"	13'-6"
550S162-68	11'-7"	10'-4"	16'-4"	14'-0"	17'-5"	14'-11"
550S162-97	13'-4"	11'-10"	18'-5"	16'-2"	20'-1"	17'-4"
800S162-33	-	-	-	-	-	-
800S162-43	11'-4"	10'-1"	16'-5"	13'-6"	18'-1"	13'-6"
800S162-54	12'-0"	10'-9"	17'-4"	15'-6"	19'-6"	17'-0"
800S162-68	12'-10"	11'-6"	18'-5"	16'-6"	20'-10"	18'-3"
800S162-97	14'-7"	12'-11"	20'-5"	18'-3"	22'-11"	20'-5"
1000S162-43	-	-	-	-	-	-
1000S162-54	12'-10"	11'-6"	18'-7"	16'-9"	21'-2"	15'-5"
1000S162-68	13'-8"	12'-3"	19'-8"	17'-8"	22'-4"	20'-1"
1000S162-97	15'-4"	13'-8"	21'-8"	19'-5"	24'-5"	21'-11"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	14'-4"	12'-11"	20'-9"	18'-8"	23'-7"	21'-3"
1200S162-97	16'-1"	14'-4"	22'-10"	20'-6"	25'-9"	23'-2"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Ceiling dead load = 5 psf (0.24 kN/m²)

² Deflection criteria: L/240 for total loads

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KSI

Table F2-8
Ceiling Joist Spans
Two Equal Spans without Bearing Stiffeners
20 Lbs per Sq. Ft. Live Load (Limited Attic Storage) ^{1,2,3,4}
 $F_y = 33$ ksi

Member Designation	Allowable Span (Feet-Inches)					
	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Ceiling Joist Spacing (inches)					
	16	24	16	24	16	24
350S162-33	8'-1"	6'-1"	8'-1"	6'-1"	8'-1"	6'-1"
350S162-43	10'-7"	8'-1"	10'-7"	8'-1"	10'-7"	8'-1"
350S162-54	12'-8"	9'-10"	12'-8"	9'-10"	12'-8"	9'-10"
350S162-68	14'-7"	11'-10"	14'-11"	11'-10"	14'-11"	11'-10"
350S162-97	17'-6"	14'-3"	17'-6"	14'-3"	17'-6"	14'-3"
550S162-33	8'-11"	6'-8"	8'-11"	6'-8"	8'-11"	6'-8"
550S162-43	12'-3"	9'-2"	12'-3"	9'-2"	12'-3"	9'-2"
550S162-54	14'-11"	11'-8"	15'-4"	11'-8"	15'-4"	11'-8"
550S162-68	16'-3"	14'-5"	18'-0"	15'-8"	18'-10"	14'-7"
550S162-97	19'-1"	16'-10"	20'-3"	18'-0"	23'-9"	19'-5"
800S162-33	-	-	-	-	-	-
800S162-43	13'-11"	9'-10"	13'-11"	9'-10"	13'-11"	9'-10"
800S162-54	16'-5"	13'-9"	18'-8"	13'-9"	18'-8"	13'-9"
800S162-68	17'-9"	15'-11"	20'-0"	18'-0"	24'-1"	18'-3"
800S162-97	20'-8"	18'-3"	22'-3"	19'-11"	26'-9"	24'-0"
1000S162-43	-	-	-	-	-	-
1000S162-54	17'-6"	13'-11"	19'-1"	13'-11"	19'-1"	13'-11"
1000S162-68	18'-10"	16'-10"	21'-4"	19'-2"	25'-11"	19'-7"
1000S162-97	21'-8"	19'-3"	23'-7"	21'-2"	28'-5"	25'-6"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	19'-9"	17'-8"	22'-6"	19'-8"	26'-8"	19'-8"
1200S162-97	22'-7"	20'-1"	24'-10"	22'-3"	29'-11"	26'-11"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Table provides the maximum *ceiling joist span* in feet and inches to either side of the interior support.

² Deflection criteria: L/240 for total loads.

³ Ceiling dead load = 5 psf (0.24 kN/m²)

⁴ Interior supports for *multiple span* joists consist of structural walls or beams. Interior supports are to be located within 2 feet (0.610 m) of mid *span* provided that each of the resulting *spans* does not exceed the maximum applicable *span* shown in the table above.

**Table F2-9
 Screws Required For Ceiling Joist to Roof Rafter Connections ¹**

Roof Slope	Number of Screws																			
	Building Width (feet)																			
	24'					28'				32'				36'				40'		
	Ground Snow Load (psf)																			
	20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
3/12	5	6	9	11	5	7	10	13	6	8	11	15	7	8	13	17	8	9	14	19
4/12	4	5	7	9	4	5	8	10	5	6	9	12	5	7	10	13	6	7	11	14
5/12	3	4	6	7	4	4	6	8	4	5	7	10	5	5	8	11	5	6	9	12
6/12	3	3	5	6	3	4	6	7	4	4	6	8	4	5	7	9	4	5	8	10
7/12	3	3	4	6	3	3	5	7	3	4	6	7	4	4	6	8	4	5	7	9
8/12	2	3	4	5	3	3	5	6	3	4	5	7	3	4	6	8	4	4	6	8
9/12	2	3	4	5	3	3	4	6	3	3	5	6	3	4	5	7	3	4	6	8
10/12	2	2	4	5	2	3	4	5	3	3	5	6	3	3	5	7	3	4	6	7
11/12	2	2	3	4	2	3	4	5	3	3	4	6	3	3	5	6	3	4	5	7
12/12	2	2	3	4	2	3	4	5	2	3	4	5	3	3	5	6	3	4	5	7

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Screws are minimum No.10.

Table F2-10
Roof Framing Fastening Schedule

Description of Building Elements		Number and Size of Fasteners ¹				Number and Spacing of Fasteners	
Roof sheathing (oriented strand board or plywood) to <i>roof rafter</i> or <i>truss</i>		No.8 screws				6" o.c. on edges and 12" o.c. at interior supports. (6" o.c. at gable end <i>truss</i>)	
Gypsum board to <i>ceiling joists</i>		No.6 screws				12" on center	
Gable end <i>truss</i> to endwall top <i>track</i>		No.10 screws				12" o.c.	
<i>Roof rafter</i> to <i>ceiling joist</i> and to <i>ridge member</i>		No.10 screws				See Tables F2-9 and F3-3	
Ceiling joist or roof truss to top track of structural wall ²	Ceiling Joist or Truss Spacing (in)	Roof Span (ft)	Wind Speed (mph), Exposure				Each ceiling joist or roof truss
			100 B 85 C	110 B 90 C	100 C	< 110 C	
	16	24	2	2	2	3	
		28	2	2	3	3	
		32	2	2	3	4	
		36	2	2	3	4	
		40	2	2	3	4	
	24	24	2	2	3	4	
		28	2	2	4	5	
		32	2	3	4	5	
		36	2	3	4	6	
40		2	3	5	6		

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Screws are minimum No. 10 unless noted otherwise.

² Screws are to be applied through the *flanges* of the *truss* or *ceiling joist* or a 54 mil (1.37 mm) *clip angle* is to be used with 2 No.10 screws in each leg.

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KSI

Table F3-1a
Roof Rafter Spans^{1,2,3}
F_y = 33 ksi

Member Designation	Allowable Span Measured Horizontally (Feet-Inches)							
	Equivalent Ground Snow Load							
	20 psf		30 psf		50 psf		70 psf	
	Roof Rafter Spacing (in.)							
	16	24	16	24	16	24	16	24
550S162-33	14'-0"	11'-6"	11'-11"	9'-7"	9'-6"	7'-9"	8'-2"	6'-8"
550S162-43	16'-8"	13'-11"	14'-5"	11'-9"	11'-6"	9'-5"	9'-10"	8'-0"
550S162-54	17'-11"	15'-7"	15'-7"	13'-3"	12'-11"	10'-7"	11'-1"	9'-1"
550S162-68	19'-2"	16'-9"	16'-9"	14'-7"	14'-1"	11'-10"	12'-6"	10'-2"
550S162-97	21'-3"	18'-6"	18'-6"	16'-2"	15'-8"	13'-8"	14'-0"	12'-2"
800S162-33	16'-5"	13'-5"	13'-11"	11'-4"	11'-1"	8'-2"	9'-0"	6'-0"
800S162-43	19'-9"	16'-1"	16'-8"	13'-7"	13'-4"	10'-10"	11'-5"	9'-4"
800S162-54	22'-8"	18'-6"	19'-2"	15'-8"	15'-4"	12'-6"	13'-1"	10'-8"
800S162-68	25'-10"	21'-2"	21'-11"	17'-10"	17'-6"	14'-4"	15'-0"	12'-3"
800S162-97	21'-3"	18'-6"	18'-6"	16'-2"	15'-8"	13'-8"	14'-0"	12'-2"
1000S162-43	22'-3"	18'-2"	18'-9"	15'-8"	15'-0"	12'-3"	12'-10"	10'-6"
1000S162-54	25'-8"	20'-11"	21'-8"	17'-9"	17'-4"	14'-2"	14'-10"	12'-1"
1000S162-68	29'-7"	24'-2"	25'-0"	20'-5"	20'-0"	16'-4"	17'-2"	14'-0"
1000S162-97	34'-8"	30'-4"	30'-4"	25'-10"	25'-3"	20'-8"	21'-8"	17'-8"
1200S162-54	28'-3"	23'-1"	23'-11"	19'-7"	19'-2"	15'-7"	16'-5"	13'-5"
1200S162-68	32'-10"	26'-10"	27'-9"	22'-8"	22'-2"	18'-1"	19'-0"	15'-6"
1200S162-97	40'-6"	33'-5"	34'-6"	28'-3"	27'-8"	22'-7"	23'-8"	19'-4"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Table provides maximum horizontal *roof rafter spans* in feet & inches for slopes between 3:12 & 12:12

² Deflection criteria: L/240 for live loads and L/180 for total loads

³ Roof dead load = 12 psf (0.58 kN/m²)

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KSI

Table F3-1b
Roof Rafter Spans^{1,2,3}
F_y = 50 ksi

Member Designation	Allowable Span Measured Horizontally (Feet-Inches)							
	Equivalent Ground Snow Load							
	20 psf		30 psf		50 psf		70 psf	
	Roof Rafter Spacing (in.)							
	16	24	16	24	16	24	16	24
550S162-33	15'-4"	12'-11"	13'-4"	10'-11"	10'-9"	8'-9"	9'-2"	7'-6"
550S162-43	16'-8"	14'-7"	14'-7"	12'-9"	12'-3"	10'-6"	11'-0"	9'-0"
550S162-54	17'-11"	15'-7"	15'-7"	13'-8"	13'-2"	11'-6"	11'-9"	10'-3"
550S162-68	19'-2"	16'-9"	16'-9"	14'-7"	14'-1"	12'-4"	12'-7"	11'-0"
550S162-97	21'-3"	18'-6"	18'-6"	16'-2"	15'-8"	13'-8"	14'-0"	12'-3"
800S162-33	18'-10"	15'-5"	15'-11"	12'-9"	12'-3"	8'-2"	9'-0"	6'-0"
800S162-43	22'-3"	18'-2"	18'-10"	15'-5"	15'-1"	12'-3"	12'-11"	10'-6"
800S162-54	24'-2"	21'-1"	21'-1"	18'-5"	17'-10"	14'-8"	15'-5"	12'-7"
800S162-68	25'-11"	22'-8"	22'-8"	19'-9"	19'-1"	16'-8"	17'-1"	14'-9"
800S162-97	28'-10"	25'-2"	25'-2"	22'-0"	21'-2"	18'-6"	19'-0"	16'-7"
1000S162-43	25'-2"	20'-7"	21'-4"	17'-5"	17'-0"	13'-11"	14'-7"	10'-7"
1000S162-54	29'-0"	24'-6"	25'-4"	20'-9"	20'-3"	16'-7"	17'-5"	14'-2"
1000S162-68	31'-2"	27'-3"	27'-3"	23'-9"	23'-0"	19'-6"	20'-6"	16'-8"
1000S162-97	34'-8"	30'-4"	30'-4"	26'-5"	25'-7"	22'-4"	22'-10"	20'-0"
1200S162-54	33'-2"	27'-1"	28'-1"	22'-11"	22'-5"	18'-4"	19'-3"	15'-8"
1200S162-68	36'-4"	31'-9"	31'-9"	27'-0"	26'-5"	21'-6"	22'-6"	18'-6"
1200S162-97	40'-6"	35'-4"	35'-4"	30'-11"	29'-10"	26'-1"	26'-8"	23'-1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Table provides maximum horizontal *roof rafter spans* in feet & inches for slopes between 3:12 & 12:12

² Deflection criteria: L/240 for live loads and L/180 for total loads

³ Roof dead load = 12 psf (0.58 kN/m²)

Table F3-2
Conversion of Basic Wind Speed to Equivalent Snow Load ^{1,2}

Basic Wind Speed And Exposure		Equivalent Ground Snow Load (psf)									
		Roof Slope									
Exposure	Wind Speed	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
B	85 mph	20	20	20	20	20	20	30	30	30	30
	90 mph	20	20	20	20	30	30	30	30	30	50
	100 mph	20	20	20	20	30	30	30	30	50	50
	110 mph	20	20	20	20	30	50	50	50	50	50
	120 mph	30	30	30	50	50	50	70	70	70	-
	130 mph	30	50	50	50	70	70	70	-	-	-
	140 mph	50	50	50	70	70	70	-	-	-	-
	150 mph	50	50	70	70	70	-	-	-	-	-
C	85 mph	20	20	20	20	30	30	30	30	50	50
	90 mph	20	20	20	20	30	30	30	50	50	50
	100 mph	20	20	20	20	30	50	50	50	50	50
	110 mph	30	30	30	50	50	50	70	70	70	-
	120 mph	30	50	50	50	70	70	70	-	-	-
	130 mph	50	50	50	70	70	-	-	-	-	-
	140 mph	50	50	70	70	-	-	-	-	-	-
	150 mph	50	70	70	-	-	-	-	-	-	-

For SI: 1 mph = 1.61 km/hr, 1 psf = 0.0479 kN/m²

¹ In areas where the *basic wind speed* equals or exceeds 90 mph (144.8 km/h) the equivalent snow load is to be used only to determine the size of members.

² Connections of *roof rafters* to the *ridge* and the roof members to walls are to comply with Section F3.4 and Section F7.

Table F3-3
Screws Required at Each Leg of Clip Angle
For Hip Rafter to Hip Member or Roof Rafter to Ridge Member Connection ¹

Building Width (feet)	Number of Screws			
	Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	2	2	3	4
28	2	3	4	5
32	2	3	4	5
36	3	3	5	6
40	3	4	5	7

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Screws are minimum No.10.

33
KSI

Table F4-1
Hip Member Sizes
F_y = 33 ksi

Building Width (feet)	Hip Member Designation ¹			
	Equivalent Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	800S162-68 800T150-68	800S162-68 800T150-68	800S162-97 800T150-97	1000S162-97 1000T150-97
28	1000S162-68 1000T150-68	1000S162-68 1000T150-68	1000S162-97 1000T150-97	1200S162-97 1200T150-97
32	1000S162-97 1000T150-97	1000S162-97 1000T150-97	1200S162-97 1200T150-97	-
36	1200S162-97 1200T150-97	-	-	-
40	-	-	-	-

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ It is generally desirable that the web depth of the roof rafters and jack rafters match the hip member selected.

Table F4-2
Hip Support Column Sizes

Building Width (feet)	Hip Support Column Designation ^{1, 2}			
	Equivalent Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	2-350S162-33	2-350S162-33	2-350S162-43	2-350S162-54
28	2-350S162-54	2-550S162-54	2-550S162-68	2-550S162-68
32	2-550S162-68	2-550S162-68	2-550S162-97	-
36	2-550S162-97	-	-	-
40	-	-	-	-

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Box shape column only. Refer to Figure F4-2.

² F_y = 33 ksi for 33 and 43 mil material and F_y = 50 ksi for thicker material.

Table F4-3
Uplift Strap Connection Requirements
Hip Support Column at Ceiling Line

Basic Wind Speed (mph)										
Exposure B	85	90	100	110	120	130	140	150		
Exposure C			85	90	100	110	120	130	140	150
Building Width (feet)	Number of No.10 Screws in Each End of Each 3" x 54-mil Steel Strap ^{1, 2, 3}									
24	3	3	4	4	6	7	8	10	12	14
28	4	4	6	6	8	10	12	14	16	19
32	5	6	8	8	11	13	16	18	22	25
36	7	8	10	11	14	17	20	24	27	-
40	-	-	-	-	-	-	-	-	-	-

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Two straps are required, one on each side of the column.

² Space screws at 3/4" on center and provide a minimum of 3/4" end distance.

³ F_y = 50 ksi for the strap.

Table F4-4
Connection Requirements
Hip Member to Hip Support Column

Building Width (feet)	Number of No.10 Screws in Each Framing Angle ^{1, 2, 3}			
	Equivalent Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	10	10	10	12
28	10	10	14	18
32	10	12		-
36	14	-	-	-
40	-	-	-	-

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Screws are to be divided equally between the connection to the hip member and the column. Refer to Figures F4-3 and F4-4.

² The number of screws required in each framing angle is not to be less than shown in Table F4-3.

³ F_y = 50 ksi for the framing angle.

**Table F4-5
Uplift Strap Connection Requirements
Hip Member to Wall**

Basic Wind Speed (mph)										
Exposure B	85	90	100	110	120	130	140	150		
Exposure C			85	90	100	110	120	130	140	150
Building Width (feet)	Number of No.10 Screws in Each End of 1-1/2" x 54-mil Steel Strap ^{1, 2, 3, 4}									
24	2	2	2	3	3	4	5	6	7	8
28	2	3	3	3	4	5	6	8	9	10
32	3	4	4	4	6	7	8	10	11	13
36	3	5	5	5	7	8	10	12	14	17
40	-	-	-	-	-	-	-	-	-	-

For SI: 1 foot = 0.305 m, 1 psf = 0.0479 kN/m²

¹ Connections in the unshaded area require a single strap located on either side of the hip member.

² Connections in the shaded area require two straps with half the number of screws shown in each end of the strap.

³ Space screws at 3/4" on center and provide a minimum of 3/4" end distance.

⁴ F_y = 50 ksi for the strap.

Table F7-1
Required Lengths for Ceiling Diaphragms at Gable Endwalls
Gypsum Board Sheathed
Ceiling Height = 8 ft^{1,2,3,4,5,6}

		Basic Wind Speed (mph)									
Exposure B		85	90	100	110	120	130	140	150		
Exposure C				85	90	100	110	120	130	140	150
Roof Pitch	Building Endwall Width (ft)	Minimum Diaphragm Length (ft)									
3:12 to 6:12	24 - 28	14	16	20	22	28	32	38	44	50	58
	28 - 32	16	18	22	28	32	38	44	52	60	70
	32 - 36	20	22	26	32	38	44	52	62	70	80
	36 - 40	22	24	30	36	44	50	60	70	82	94
6:12 to 9:12	24 - 28	16	18	22	26	32	36	44	50	58	66
	28 - 32	20	22	26	32	38	44	52	60	70	80
	32 - 36	22	26	32	38	44	52	62	72	84	96
	36 - 40	26	30	36	44	52	60	72	84	96	110
9:12 to 12:12	24 - 28	18	20	26	30	36	42	48	58	66	76
	28 - 32	22	24	30	36	42	50	60	70	80	92
	32 - 36	26	28	36	42	50	60	70	82	96	110
	36 - 40	30	34	42	50	60	70	82	96	112	128

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Ceiling *diaphragm* is composed of 1/2" gypsum board (min. thickness) secured with screws spaced at 6" o.c. at panel edges and 12" o.c. in field. Use No. 8 screws (min.) when framing members have a *designation thickness* of 54 mils or less and No. 10 screws (min.) when framing members have a *designation thickness* greater than 54 mils.

² Maximum aspect ratio (length/width) of *diaphragms* is 2:1.

³ Building width is in the direction of horizontal framing members supported by the wall *studs*.

⁴ Required *diaphragm* lengths are to be provided at each end of the structure.

⁵ Required *diaphragm* lengths are permitted to be multiplied by 0.35 if all panel edges are blocked.

⁶ Required *diaphragm* lengths are permitted to be multiplied by 0.9 if all panel edges are secured with screws spaced at 4" o.c.

Table F7-2
Required Lengths for Ceiling Diaphragms at Gable Endwalls
Gypsum Board Sheathed
Ceiling Height = 9 or 10 ft^{1,2,3,4,5,6}

		Basic Wind Speed (mph)									
Exposure B		85	90	100	110	120	130	140	150		
Exposure C				85	90	100	110	120	130	140	150
Roof Pitch	Building Endwall Width (ft)	Minimum Diaphragm Length (ft)									
3:12 to 6:12	24 - 28	16	18	22	26	32	38	44	52	60	68
	28 - 32	20	22	26	32	38	44	52	60	70	80
	32 - 36	22	24	30	36	44	50	60	70	82	94
	36 - 40	26	28	36	42	50	58	70	82	94	108
6:12 to 9:12	24 - 28	18	20	26	30	36	42	50	58	68	76
	28 - 32	22	24	30	36	42	50	60	70	80	92
	32 - 36	26	28	36	42	50	58	70	82	94	108
	36 - 40	30	32	42	48	58	68	80	94	110	126
9:12 to 12:12	24 - 28	20	22	28	34	40	46	56	64	74	86
	28 - 32	24	28	34	40	48	56	66	78	90	104
	32 - 36	28	32	40	48	56	66	78	92	106	122
	36 - 40	34	38	46	56	66	78	92	106	124	142

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Ceiling *diaphragm* is composed of 1/2" gypsum board (min. thickness) secured with screws spaced at 6" o.c. at panel edges and 12" o.c. in field. Use No. 8 screws (min.) when framing members have a *designation thickness* of 54 mils or less and No. 10 screws (min.) when framing members have a *designation thickness* greater than 54 mils.

² Maximum aspect ratio (length/width) of *diaphragms* is 2:1.

³ Building width is in the direction of horizontal framing members supported by the wall *studs*.

⁴ Required *diaphragm* lengths are to be provided at each end of the structure.

⁵ Required *diaphragm* lengths are permitted to be multiplied by 0.35 if all panel edges are blocked.

⁶ Required *diaphragm* lengths are permitted to be multiplied by 0.9 if all panel edges are secured with screws spaced at 4" o.c.

Table F7-3
Required Lengths for Ceiling Diaphragms at Gable Endwalls
Wood Structural Panel Sheathed
Ceiling Height = 8 ft^{1,2,3,4}

		Basic Wind Speed (mph)									
Exposure B		85	90	100	110	120	130	140	150		
Exposure C				85	90	100	110	120	130	140	150
Roof Pitch	Building Endwall Width (ft)	Minimum Diaphragm Length (ft)									
3:12 to 6:12	24 - 28	10	10	10	10	10	10	10	10	10	10
	28 - 32	12	12	12	12	12	12	12	12	12	12
	32 - 36	12	12	12	12	12	12	12	12	12	12
	36 - 40	14	14	14	14	14	14	14	14	14	14
6:12 to 9:12	24 - 28	10	10	10	10	10	10	10	10	10	10
	28 - 32	12	12	12	12	12	12	12	12	12	12
	32 - 36	12	12	12	12	12	12	12	12	14	14
	36 - 40	14	14	14	14	14	14	14	14	16	16
9:12 to 12:12	24 - 28	10	10	10	10	10	10	10	10	10	12
	28 - 32	12	12	12	12	12	12	12	12	12	14
	32 - 36	12	12	12	12	12	12	12	14	16	18
	36 - 40	14	14	14	14	14	14	14	16	18	20

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Ceiling *diaphragm* is composed of 3/8" wood structural panel sheathing (min. thickness) secured with screws spaced at 6" o.c. at panel edges and in field. Use No. 8 screws (min.) when framing members have a *designation thickness* of 54 mils or less and No. 10 screws (min.) when framing members have a *designation thickness* greater than 54 mils.

² Maximum aspect ratio (length/width) of *diaphragms* is 3:1.

³ Building width is in the direction of horizontal framing members supported by the wall *studs*.

⁴ Required *diaphragm* lengths are to be provided at each end of the structure.

Table F7-4
Required Lengths for Ceiling Diaphragms at Gable Endwalls
Wood Structural Panel Sheathed
Ceiling Height = 9 or 10 ft^{1,2,3,4}

		Basic Wind Speed (mph)									
Exposure B		85	90	100	110	120	130	140	150		
Exposure C				85	90	100	110	120	130	140	150
Roof Pitch	Building Endwall Width (ft)	Minimum Diaphragm Length (ft)									
3:12 to 6:12	24 - 28	10	10	10	10	10	10	10	10	10	12
	28 - 32	12	12	12	12	12	12	12	12	12	12
	32 - 36	12	12	12	12	12	12	12	12	12	14
	36 - 40	14	14	14	14	14	14	14	14	14	16
6:12 to 9:12	24 - 28	10	10	10	10	10	10	10	10	10	12
	28 - 32	12	12	12	12	12	12	12	12	12	14
	32 - 36	12	12	12	12	12	12	12	12	12	16
	36 - 40	14	14	14	14	14	14	14	14	14	20
9:12 to 12:12	24 - 28	10	10	10	10	10	10	10	10	10	14
	28 - 32	12	12	12	12	12	12	12	12	12	16
	32 - 36	12	12	12	12	12	12	12	12	14	20
	36 - 40	14	14	14	14	14	14	14	14	16	22

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.305 m

¹ Ceiling *diaphragm* is composed of 3/8" wood structural panel sheathing (min. thickness) secured with screws spaced at 6" o.c. at panel edges and in field. Use No. 8 screws (min.) when framing members have a *designation thickness* of 54 mils or less and No. 10 screws (min.) when framing members have a *designation thickness* greater than 54 mils.

² Maximum aspect ratio (length/width) of *diaphragms* is 3:1.

³ Building width is in the direction of horizontal framing members supported by the wall *studs*.

⁴ Required *diaphragm* lengths are to be provided at each end of the structure.

**Table F8-1
 Required Uplift Strength
 Roof Rafter or Roof Truss to Wall**

		Basic Wind Speed (mph)				
EXPOSURE B		130	140	150		
EXPOSURE C		110	120	130	140	150
Framing Spacing ⁴ (in.)	Roof Span (ft)	Required Connection Strength ^{1,2,3} (lbs)				
12	24	229	299	374	458	547
	28	259	340	428	522	624
	32	289	380	479	586	701
	36	319	423	532	651	778
	40	353	463	583	715	855
16	24	305	398	497	609	728
	28	344	452	569	695	830
	32	384	505	637	780	932
	36	424	563	708	865	1034
	40	469	616	775	951	1136
19.2	24	366	478	598	733	875
	28	414	544	685	836	998
	32	462	608	766	938	1121
	36	510	677	851	1041	1244
	40	565	741	933	1144	1367
24	24	458	598	748	916	1094
	28	518	680	856	1045	1248
	32	578	760	958	1173	1402
	36	638	846	1064	1301	1555
	40	706	926	1166	1430	1709

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N, 1 mph = 1.61 km/hr

¹ Uplift requirements assume a roof/ceiling dead load of 12 psf (0.58 kN/m²).

² Required strengths are permitted to be multiplied by 0.70 for framing not located within 8 feet (2.44 m) of building corners.

³ Required strengths are permitted to be divided by 1.3 when comparing requirements with published strengths expressed as allowable loads.

⁴ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the in-line framing requirement of Section E.

Table F8-2
Uplift Strap Connection Requirements
Roof Rafter or Roof Truss to Wall

		Basic Wind Speed (mph)				
Exposure B		130	140	150		
Exposure C		110	120	130	140	150
Framing Spacing ¹ (in.)	Roof Span (ft)	Number of No.8 Screws in Each End of Steel Uplift Strap				
12	24	2	2	3	3	4
	28	2	3	3	4	4
	32	2	3	3	4	5
	36	2	3	4	4	5
	40	3	3	4	5	6
16	24	2	3	4	4	5
	28	3	3	4	5	6
	32	3	4	4	5	6
	36	3	4	5	6	7
	40	3	4	5	6	7
19.2	24	3	3	4	5	6
	28	3	4	5	6	7
	32	3	4	5	6	7
	36	4	5	6	7	8
	40	4	5	6	7	9
24	24	3	4	5	6	7
	28	4	5	6	7	8
	32	4	5	6	8	9
	36	4	6	7	8	10
	40	5	6	8	9	11

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 mph = 1.61 km/hr

¹ The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but do not negate the *in-line framing* requirement of Section E.

Table F8-3
Ridge Tension Strap Connection Requirements Per Foot of Ridge Span ³

		Basic Wind Speed (mph)					Basic Wind Speed (mph)				
EXPOSURE B		130	140	150			130	140	150		
EXPOSURE C		110	120	130	140	150	110	120	130	140	140
Roof Pitch	Roof Span (ft)	Number of No.8 Screws in Each End of a Steel Ridge Strap ²					Required Ridge Connection Strength ¹ (plf)				
3:12	24	4	5	6	7	8	614	759	916	106	122
	28	5	6	7	8	9	709	877	106	122	141
	32	5	7	8	9	10	823	101	122	142	163
	36	6	7	9	10	12	927	114	138	160	183
	40	7	8	10	11	13	103	127	153	178	204
4:12	24	3	4	5	6	6	489	606	727	843	968
	28	4	5	6	6	7	567	703	844	979	112
	32	4	5	6	7	8	653	806	972	112	129
	36	5	6	7	8	9	736	908	109	127	145
	40	5	7	8	9	10	818	100	121	141	162
5:12	24	3	3	4	5	5	383	474	570	661	759
	28	3	4	5	5	6	445	551	663	769	883
	32	4	4	5	6	7	511	633	761	883	101
	36	4	5	6	7	7	575	711	858	995	114
	40	4	5	6	7	8	640	793	953	110	126
6:12	24	3	3	4	4	5	339	420	505	586	672
	28	3	3	4	5	5	394	488	587	681	782
	32	3	4	5	5	6	452	560	673	781	896
	36	4	4	5	6	7	509	631	758	879	100
	40	4	5	6	6	7	565	700	841	975	112
7:12	24	2	3	3	4	4	310	384	462	536	615
	28	3	3	4	4	5	361	447	538	624	716
	32	3	4	4	5	5	414	513	616	714	820
	36	3	4	5	5	6	466	577	694	805	924
	40	4	4	5	6	7	518	642	771	894	102
8:12-12:12	24	2	3	3	4	4	291	360	434	503	578
	28	3	3	4	4	5	339	420	505	586	672
	32	3	3	4	5	5	389	482	579	672	771
	36	3	4	4	5	6	437	541	651	755	867
	40	3	4	5	6	6	486	602	724	840	964

Table F8-4

Framing Spacing	12 in.	16 in.	19.2 in.	24 in.
Multiplier	1.00	1.33	1.60	2.00

For SI: 1 inch = 25.4 mm, 1 foot = 0.305 m, 1 lb = 4.45 N, 1 mph = 1.61 km/hr

¹ Connection requirements are based on a roof assembly dead load of 7 psf (0.34 kN/m²).

² Connection strengths shown in Table F8-3 are based on a 12 inch (305 mm) *ridge strap* spacing. For spacing greater than 12 inches (305 mm), strength values are to be increased using the multipliers in Table F8-4.

³ The required number of screws shown in Table F8-3 are based on a 12 inch (305 mm) *strap* spacing. For spacing other than 12 inches (305 mm), the appropriate connection strength in the table is to be increased using the multipliers in Table F8-4 and dividing by the screw shear value of 165 lb/screw. Screw substitutions factors from Table B1-1 can be used for screws larger than No.8.

Table F8-5
Minimum Size of Steel Uplift Strap or Ridge Strap

Strap Width (in.)	Minimum Thickness of Strap (mils)									
	Required Number of Screws ¹									
	4 OR LESS	5	6	7	8	9	10	11	12	13
1.25	33	43	54	54	68	68	97	97	97	97
1.50	33	43	43	54	54	68	68	97	97	97
1.75	33	33	33	43	54	54	54	68	68	97
2.00	33	33	33	43	43	54	54	68	68	68

For SI: 1 inch = 25.4 mm

¹ Required number of screws per Table F8-2 or F8-3 in each end of the steel uplift strap or ridge strap.



AISI STANDARD

Commentary on Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings

**2007 Edition with
Supplements 2 and 3**

**Revision of:
AISI/COFS/PM-2006**

Endorsed by



DISCLAIMER

The material contained herein has been developed by the American Iron and Steel Institute (AISI) Committee on Framing Standards. The Committee has made a diligent effort to present accurate, reliable, and useful information on cold-formed steel framing design and installation. The Committee acknowledges and is grateful for the contributions of the numerous researchers, engineers, and others who have contributed to the body of knowledge on the subject. Specific references are included in this *Commentary*.

With anticipated improvements in understanding of the behavior of cold-formed steel framing and the continuing development of new technology, this material will become dated. It is anticipated that AISI will publish updates of this material as new information becomes available, but this cannot be guaranteed.

The materials set forth herein are for general purposes only. They are not a substitute for competent professional advice. Application of this information to a specific project should be reviewed by a *design professional*. Indeed, in many jurisdictions, such review is required by law. Anyone making use of the information set forth herein does so at their own risk and assumes any and all liability arising therefrom.

The user is advised to check the availability of specific framing material in the region in which the dwelling is being constructed.

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PREFACE

The American Iron and Steel Institute (AISI) Committee on Framing Standards (COFS) has developed this *Commentary on the Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings [Commentary]* to provide the background, supplemental information, engineering assumptions and methods, and detailed calculations for the provisions of the *AISI 230 Prescriptive Method (AISI S230-07 w/S2-08)*.

The loads, load combinations, and other design parameters used to develop the provisions in the *AISI S230* were based on the *International Residential Code (ICC, 2006b)*, the *International Building Code (ICC, 2006a)* (where no provisions are included in the IRC) and *ASCE 7 (ASCE, 2005)*.

Commentary is provided only for those sections of the *AISI S230* where background or supplemental information is of benefit to the user. Sections thought to need no explanation are left blank.

This document is divided into two sections. Section 1, *Commentary*, contains the background, supplemental information and engineering assumptions. Section 2, *Design Examples*, contains detailed calculations that demonstrate how the values in the *AISI S230* were derived.

Terms within the body of this *Commentary* that are shown in *italics* indicate that the italicized word is a defined term by the *AISI S230* or by the *General Provisions (AISI S200-07)*.

The Committee acknowledges and is grateful for the contributions of the numerous engineers, researchers, producers and others who have contributed to the body of knowledge on the subjects. The Committee wishes to also express their appreciation for the support and encouragement of the Steel Framing Alliance.

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PART 1 – COMMENTARY
ON THE STANDARD FOR COLD-FORMED STEEL FRAMING –
PRESCRIPTIVE METHOD FOR ONE- AND TWO-FAMILY DWELLINGS

A. GENERAL

A1 Scope

AISI S230 consists of prescriptive requirements for cold-formed steel floor, wall, and roof framing to be used in the construction of one- and two-family dwellings, townhouses, and other attached and detached single-family dwellings not more than three stories in height using *repetitive in-line framing* practices.

A1.1 Limits of Applicability

AISI S230 is not applicable to all possible conditions of use and is subject to the applicability limits set forth in Section A1.1 and A1.2. The applicability limits are necessary to define reasonable boundaries to the conditions that must be considered in developing prescriptive construction requirements. The applicability limits should be carefully understood as they define important constraints on the use of *AISI S230*.

The applicability limits strike a reasonable balance between engineering theory, available test data, and proven field practices for typical residential construction applications. The applicability limits are intended to prevent misapplication while addressing a reasonably large percentage of new housing conditions. Special consideration is directed toward the following items related to the applicability limits.

Building Geometry: The provisions in *AISI S230* apply to detached one- and two-family dwellings, townhouses, and other attached single-family dwellings not more than three stories in height. Its application to homes with complex architectural configurations is subject to careful interpretation by the user and therefore, engineering design support may be required. The most common building widths (or depths) range from 24 feet to 40 feet (7.3 to 12.2 m), with axially load bearing wall heights up to 10 feet (3.1 m). The building width as used in *AISI S230* is the dimension measured along the length of the *joists* (floor or ceiling) between the outmost structural walls. The maximum length of building is limited to 60 feet (18.3 m) where the length is measured in the direction parallel to the roof ridge or perpendicular to the *floor joists* or roof *trusses*. In 2006, the maximum *mean roof height* was explicitly defined as 33 feet (9.14 m) above *average grade*, since this is what was actually used in the development of the standard.

Site Conditions: Conditions for each site must be established by the user. Local conditions include ground snow loads, basic wind speeds, and the *Seismic Design Category*.

Snow Loads: Snow load values are typically given in a ground snow load map such as provided in the building code, ASCE 7 (ASCE, 2005) or by local practice. The national model building codes in the U.S. either adopt the ASCE 7 snow map and load requirements or have a similar map published in the code. The 0 to 70 psf (0 to 3.35 kN/m²) ground snow load used in *AISI S230* covers approximately 90 percent of the United States, which was deemed to include the majority of the buildings that are expected to utilize this document. Buildings in areas with greater snow loads than 70 psf (3.35 kN/m²) should not use this document without consulting a design professional.

Basic Wind Speed: In 2006, in recognition of that all areas of the U.S. fall within the 90 to 150 mph (3-sec gust) (145 to 241 km/hr) range of design wind speeds, per ASCE 7 (ASCE, 2005) the maximum *basic wind speed* in the standard was increased from 130 mph (209 km/hr) to 150 mph (241 km/hr). Also per ASCE 7, the three-second-gust wind speeds were used in the development of *AISI S230*. The *wind exposure* category in *AISI S230* is limited to Exposures A, B, and C. Wind speed and exposure are defined in *AISI S230*. *Wind exposure* is a critical determinant of the wind loads to be expected at a given site, and it should be determined by good judgment on a case-by-case basis. Buildings built along the immediate coastline (i.e. beach front property) are classified as Exposure D and therefore, cannot use this document without consulting a design professional.

Seismic Design Category: *AISI S230* covers all residential constructions in *Seismic Design Categories A, B, C, D₀, D₁, D₂* and E (within the limits of applicability of Tables A1-1 and A1-2).

Loads: Consistent values were established for design loads in accordance with a review of the major building codes and standards. The results of this load review are embodied in the applicability limits table in *AISI S230*. Loads and load combinations requiring calculations to analyze the structural components and assemblies of a home are presented in the design examples shown throughout this document. The load and resistance factor design (LRFD) load combinations as shown in ASCE 7 were used to develop the tables and other provisions in *AISI S230*.

AISI S230, however, does not limit the application of alternative methods or materials through engineering design.

A1.2 Limitations in High Seismic and High Wind Areas

A1.2.1 Irregular Buildings in High Seismic and High Wind Areas

In *high wind* and *high seismic areas* additional limitations were considered to be necessary. Plan and vertical offsets are not permitted in this edition of the *AISI S230* for simplicity. Where the user wishes to exceed the irregularity limits a design professional should be consulted.

A2 Definitions

Many of the terms in *AISI S230* are self-explanatory. Only definitions of terms not self-explanatory or not defined in the referenced documents are provided in *AISI S230*.

A3 Referenced Documents

The design tables contained in *AISI S230* were generated at different times and, consequently, using different editions of the *AISI Specification*. For example, the floor joist, ceiling joist and screw connection tables were developed using the 1996 edition with the 1999 Supplement whereas the wall stud, back-to-back header, box header, L-header, roof rafter and gable end wall tables were developed using the 2001 edition with the 2004 Supplement. Every effort was made in this *Commentary* to cite the applicable edition of the *Specification* and where appropriate *AISI S230* cites the latest edition of the *AISI Specification* as a referenced document because the documents would be compatible. The only major change in the 2007 *Specification* that might create a change of any significance to the tabulated values would be the new distortional buckling provisions for *studs* and *joists*. It is anticipated that *AISI S230* will

incorporate these provisions once the design standards; e.g., *AISI S210* and *S211*, have been updated to recognize the rotational restraint provided by sheathing.

A4 Limitations of Framing Members

A4.1 General

The *structural members* used in *AISI S230* are standard *C-shapes* produced by roll forming hot-dipped metallic coated sheet steel conforming to the *Standard for Cold-Formed Steel Framing – Product Data* (*AISI, S201-07*).

Because ASTM A1003 was a derivative of ASTM A653, in 2007, *AISI S230* recognized that steel sheet ~~steel~~ that is in compliance with the requirements of ASTM A653 Type SS or ASTM A792 Type SS complies with the material specification requirements *Product Data* (*AISI S201, 2007*). In 2010, as part of an exercise to synchronize all relevant codes and specifications, provisions that were considered duplicative of the requirements already in *AISI S200* and *AISI S201* were eliminated. However, it should be noted that it is still the intention of the standard that steel sheet that is in compliance with the requirements of ASTM A653 Type SS or ASTM A792 Type SS be deemed to comply with the material specification requirements of *AISI S201* and *AISI S230*, and that ASTM A1003 Type H steels be used in the construction of braced walls in high seismic areas.

A4.2 Physical Dimensions

Member section designations, in accordance with the *North American Standard for Cold-Formed Steel Framing – General Provisions* (*AISI, S200-07*) and the *North American Standard for Cold-Formed Steel Framing – Product Data* (*AISI, S201-07*), are used throughout *AISI S230*. The designation system was developed in 1996 in order to standardize the identification of cold-formed steel framing based on specific shapes and material thickness. The designator consists of four parts, the first value represents the *web* depth, the second value represents the type of steel framing member, the third value represents the *flange* width, and the fourth value represents the minimum base steel thickness.

Web Depth: The actual *web* depths chosen for *AISI S230* are 3-1/2 inches, 5-1/2 inches, 8 inches, 10 inches, and 12 inches (89, 140, 203, 254 and 305 mm). The 3-1/2 and 5-1/2 inch (89 and 140 mm) *web* depths were chosen to accommodate current framing dimensions utilized in the residential building industry (i.e. to accommodate window and door jambs). These sizes can be used directly with conventional building materials and practices; however, the substitution of a slightly larger size member, such as using a 3-5/8 inch (92 mm) or 4 inch (102 mm) stud instead of a 3-1/2 inch (89 mm) stud are acceptable. The depth of the *web* for 8, 10, and 12-inch (203, 254, and 305 mm) members, versus traditional lumber sizes, are not of great significance because they are typically used for horizontal framing members (i.e. headers and joists).

Flange Width: *AISI S230* requires that the standard *C-shape* have a minimum of 1-5/8 inch (41 mm) *flange* with a maximum *flange* dimension of 2 inches (51 mm).

Lip Size: *AISI S230* also provides a minimum size for the stiffening *lip* of 1/2 inch (12.7 mm). This dimension is also common in the industry. Decreasing the *lip* size may have a detrimental effect on the structural capacity of structural members in many circumstances.

AISI S230 requires steel *tracks* to have a minimum *flange* dimension of 1-1/4 inches (32 mm). This dimension ensures a sufficient *flange* width to allow fastening of the *track* to the framing members and finish materials. Steel *track webs* are measured from inside to inside of

flanges and thus have wider overall *web* depths than the associated standard *C-shapes*. This difference in size allows the *C-shape* to be properly nested into the *track* sections. In *AISI S230*, *tracks* are always required to have a minimum steel thickness equal to or greater than the *structural members* to which they are attached.

The steel thickness indicated by *AISI S230* is the minimum uncoated steel thickness (excluding the thickness of the metallic coating) and is given in mils (1/1000 of an inch). This unit is a deviation from the historic practice, which uses a gauge designation for thickness. The “gauge” is an outdated reference that represents a range of thickness and is, therefore, a vague unit of measure when specifying minimums. The practice of using “gauge” as a basis for measurement has been discontinued in the industry. In order to achieve consistency, the *mil* designation was adopted. For example, the 33 mils (i.e., 0.033 inches or 0.84 mm), 43 mils (i.e., 0.043 inches or 1.09 mm), 54 mils (i.e., 0.054 inches or 1.37 mm), 68 mils (i.e., 0.068 inches or 1.73 mm), and 97 mils (i.e., 0.097 inches or 2.46 mm) are specified for the thickness.

The minimum thickness is the minimum delivered thickness that cannot be less than the *design thickness* multiplied by 0.95, which is permitted by the *AISI Specification* (AISI, 2004). The *design thickness* of the flat steel stock, exclusive of coatings, is used in the structural calculations.

The corner bend radius is measured on the inside of bends in cold-formed steel members. Strength increases are realized in the regions of bends due to a phenomenon known as cold working which locally increases the yield strength of the steel.

A4.3 Material Properties

AISI S230 applies to steel with minimum *yield strength* of 33 ksi (230 MPa) or 50 ksi (345 MPa). The 33 ksi (230 MPa) steels are the minimum required for all steel floors, roofs, and *header* components. Steel multiple span *floor joist*, *wall stud*, *header* and *roof rafter* tables are provided for both 33 ksi (230 MPa) and 50 ksi (345 MPa) minimum *yield strength*. The 50 ksi (345 MPa) *yield strength* steel was included because of the structural benefits.

The user is advised to check the availability of specific framing material in the region in which the dwelling is being constructed. Not all material specified in *AISI S230* is expected to be available in all locations.

Strength increase from the cold work of forming (as permitted by the *AISI Specification*) is utilized for the design of *C-shaped* members in *AISI S230* used as flexural members, concentrically loaded compression members, and members with combined axial and bending loads. The reader is referred to Part 2 of this document for engineering calculations illustrating the application of the strength increase due to cold work of forming.

A4.3.1 Material Properties in High Wind and High Seismic Areas

Further limitations on material properties are imposed for the use of *AISI S230* in high wind and high seismic areas. These limitations were imposed to reflect the material properties used in the available *shear wall* test data.

A4.4 Web Holes

All *structural members* (i.e., *floor* and *ceiling joists*, *wall studs* and *headers*), except cantilevered portions of framing members, used in *AISI S230* are designed assuming maximum web hole dimensions as shown in Figure A4-1 and A4-2 of *AISI S230*. The maximum web hole dimensions are consistent with the *North American Standard for Cold-*

Formed Steel Framing – Product Data (AISI, S201-07). The design procedure follows the *AISI Specification* (AISI, 2004).

A4.5 Hole Reinforcing

This section provides reinforcing options for web holes violating the requirements of S230 Section A4.4 and is based on engineering judgment and research at McMaster University (Siva, 2007).

A4.6 Hole Patching

In 2004, the limitations “that the depth of the hole does not exceed 70% of the flat width of the *web* and the length of the hole measured along the *web* does not exceed 10 inches (254 mm) or the depth of the *web*, whichever is greater” were added along with other editorial changes to better differentiate the permitted use of a patch versus when member replacement or engineering analysis would be required.

B. CONNECTIONS

B1 Fastening Requirements

Self-drilling screws conforming to the requirements of the *North American Standard for Cold-Formed Steel Framing – General Provisions* (AISI S200-07) are specified as the fastener for cold-formed steel framing members in *AISI S230*. Requirements for sharp point screws connecting gypsum board and sheathing to steel *studs* are found in ASTM C1002 (ASTM, 2007) and ASTM C954 (ASTM, 2007). The edge distance and center-to-center spacing of these screws follow industry recommendations and the *AISI Specification* (AISI, 2004). Although *AISI S230* specifies the use of screws other fastening methods are permitted to be used, provided that the connection capacity can be shown to equal or exceed the connection capacity implied in *AISI S230*.

For practical purposes and added capacity in certain applications, No. 10 screws are specified in *AISI S230*. Because the point style of the screw may affect constructability, for example, a sharp point screw may be efficiently used to connect gypsum board and other panel products to steel framing members that are no thicker than 33 mils (0.84 mm), screw manufacturer recommendations should be consulted.

Screw capacities were calculated based on the design equations given in the *AISI Specification* (AISI, 2004). The *Specification* provides the equations necessary to calculate the shear, pullover, and pullout capacity of a connection based on the thicknesses of the steel, tensile strength of the steel and diameter of the screw.

AISI S230 also provides a screw substitution factor where larger screws can be used in lieu of the No. 8 screws or when one of the sheets of steel being connected is thicker than 33 mils (0.84 mm). This may result in a reduced number of screws.

B2 Bearing Stiffeners

Webs of cold-formed steel members may cripple or buckle locally at locations of a concentrated load or a bearing support. The allowable reactions and concentrated loads for beams having single un-reinforced *webs* depend on *web* depth, bend radius, *web* thickness, *yield strength*, and actual bearing length.

The *floor joist* spans in *AISI S230* were derived assuming *bearing stiffeners* (also called *web stiffeners*) are located at all support or bearing point locations. *Ceiling joist* span tables were developed for two cases, 1) assuming *bearing stiffeners* are located at all support or bearing point locations and 2) no *bearing stiffeners*. Where specified, *bearing stiffeners* are to be a minimum of 43 mil (1.09 mm) clip angle or *track* section or 33 mil (0.84 mm) *C-shaped* member.

Three types of *bearing stiffeners* are permitted in *AISI S230*, *C-shaped*, *track*, and clip angle. The requirements for the *C-shaped* and *track bearing stiffeners* are based on engineering judgment. The clip angle *bearing stiffener* requirements are stipulated in the *North American Standard for Cold-Formed Steel Framing – Floor and Roof System Design* (AISI, S210-07).

B3 Clip Angles

All *clip angle* dimensions prescribed are shown as minimums. *Clip angles* that are of a greater base steel thickness or have greater overall dimensions, or both, are permitted to be

used up to a maximum thickness of 68 mils.

B4 Anchor Bolts

In the *high wind areas* and *high seismic areas*, the requirement for a minimum steel plate washer is based on engineering judgment.

D. FLOOR FRAMING

D1 Floor Construction

Floor *trusses* are not prescriptively addressed in *AISI S230*, but are permitted, in accordance with Section D8, and must be designed by a *design professional*. Also floor girders are also not addressed in *AISI S230*.

D2 Floor to Foundation or Structural Wall Connection

AISI S230 provides several details for connecting floor assemblies to foundations or structural walls. The details reflect common industry practice. In areas where wind speeds exceed 110 mph (177 km/hr) (exposure C) or in *Seismic Design Category D₁, D₂ or E*, additional requirements for hold-downs and anchors are specified in Sections E11, E12 and E13.

D3 Minimum Floor Joist Sizes

AISI S230 provides *floor joist* tables with maximum allowable spans for two live load conditions: 30 psf and 40 psf (1.44 and 1.92 kN/m²). The two live load conditions are specified in the *International Building Code (ICC, 2006a)* and the *IRC (ICC, 2006b)*. The 30 psf (1.44 kN/m²) is typically specified for sleeping areas, while the 40 psf (1.92 kN/m²) is specified for living areas. The spans shown in *AISI S230* assume *bearing stiffeners* are installed at each bearing point. *Bearing stiffener* requirements are provided in Section B2 of *AISI S230*.

For the design of *floor joists*, the following design considerations were evaluated:

- Flexural yielding
- Flexural buckling
- Web crippling
- Shear
- Vertical deflection
- Combined bending and shear (for multiple spans only)

All *joists* are considered to have *web* holes (a.k.a. “penetrations”, “utility holes”, “punchouts”), in accordance with Section A4.4. The compression *flange* (top *flange*) of a *floor joist* is assumed to be continuously braced by the sub-flooring, thus providing lateral bracing for the top *flanges*.

The *joist* span tables are calculated for a deflection limit of L/480 for live load and L/240 for total loads, where L is the clear horizontal distance between supports. The L/480 limit may be more stringent than the minimum deflection limits established by building codes but was selected to achieve a satisfactory floor design for serviceability.

Multiple span *joists* are commonly used in the residential steel building market. With multiple spans, certain measures are necessary to address the responses of the loaded members. The magnitude of the reaction at the middle support will be greater than the end reactions, and may cause a web crippling failure at this location, which is controlled by requiring *bearing stiffeners* at all bearing points. The second issue with multiple span *joists* is the presence of negative moments (i.e. reversed bending) near the middle support resulting in the compression flange to be at the bottom rather than the top of the joists. If left unbraced, this could cause lateral instability and may cause premature failure of the joists under maximum loading

conditions. Furthermore, due to the presence of high shear and bending stresses at the middle reactions, shear and bending interaction was checked for multiple spans *joists*.

Bottom *flange bracing* at interior supports is provided by ceiling finishes (when present) and by positive connection to the interior bearing wall.

Since multiple spans are often limited by strength considerations instead of deflection, steels with higher *yield strengths* can result in longer spans. Therefore, an additional table for 50 ksi (345 MPa) steel is provided for multiple span *joists*. The 50 ksi (345 MPa) steel is not used for single spans because most of the entries in the single span tables are controlled by deflection rather than strength.

D3.1 Floor Cantilevers

Cantilevers supporting structural walls may create special loading conditions that require an engineering analysis. In *AISI S230*, floor cantilevers are limited to a maximum of 24 inches (610 mm) for floors supporting one wall and roof only (one story). This limitation is imposed to minimize the impact of the added load on the *floor joists*. To fully utilize the strength of the *joist*, *web* holes are not permitted in cantilevered portions of a *joist*. *AISI S230* provides details for cantilevered floors. It is essential that *blocking* be installed between cantilevered *joists* at the bearing locations to adequately transfer floor *diaphragm* or *shear wall* loads (refer to Section D5.4).

D4 Bearing Stiffeners

The *floor joist* spans in the *AISI S230* were calculated assuming *bearing stiffeners* (also called *web stiffeners*) are located at all support or bearing point locations. The *bearing stiffeners* are specified to be *C-shaped*, *track* or *clip angle bearing stiffeners* installed in accordance with Section B4. In 2006, language was added to clarify the requirements for *bearing stiffeners* when *floor joists* are lapped over interior bearing supports and to explicitly require that *floor joists* supporting *jamb studs* with multiple members have two *bearing stiffeners*.

D5 Joist Bracing and Blocking

D5.1 Joist Top Flange Bracing

For typical residential floors, it has been assumed that the function of the floor sheathing is to transfer the loads to the *joists*, and to provide continuous lateral *bracing* to the compression *flanges*. Testing has indicated that using a single *joist* for strength calculation agrees with actual behavior when uniform loads are applied (WJE, 1977).

D5.2 Joist Bottom Flange Bracing/Blocking

Bracing the bottom *flanges* of *joists* as specified in *AISI S230* is based on industry practice and engineering judgment. Steel *strapping* and finished ceilings (e.g. application of gypsum board) are considered to be adequate *bracing* for the tension *flanges*. It is necessary, however, for steel *strapping* to have *blocking* installed at a maximum spacing of 12 feet (3.7 m) and at the termination ends of all *straps*. Alternatively, the ends of steel *straps* may be fastened to a stable component of the building in lieu of blocking (i.e. to a bearing wall or foundation).

D5.3 Blocking at Interior Bearing Supports

Single span *floor joists* that are lapped over interior supports do not require *blocking* as the lapped sections provide adequate stiffness to prevent lateral movements. Continuous *joists* over interior supports, on the other hand, require *blocking* at every other joist to provide adequate stiffness to prevent lateral movement.

D5.4 Blocking at Cantilevers

Blocking is required for cantilevered supports to transfer shear loads from the floor *diaphragm* or *shear wall*.

D6 Splicing

Splicing of *structural members* is not permitted by *AISI S230*, however, there may be some situations where splicing would be useful. Applications may include repair of damaged *joists*, and simplified details for dropped floors. In these situations a design professional must be consulted.

The *floor joist* spans provided in *AISI S230* are based on the assumption that the *joists* are continuous, with no splices. Therefore, splicing of *joist* members in *AISI S230* requires an *approved* design except when lapped *joists* occur at interior bearing points.

D7 Framing of Floor Openings

Openings in floors are needed for several reasons (such as at stairs, chases, chimneys). *AISI S230* limits the maximum width of the floor opening to 8 feet (2.4 m) and provides a provision for reinforcing the members around floor openings. All members around floor openings (i.e. *header* and *trimmer joists*) are required to be box-type members made by nesting *C-shaped joists* into a *track* and fastening them together along the top and bottom *flanges*. These built-up members are required to be equal to or a greater in size and steel thickness than the *floor joists*, which they are connecting to. Each *header joist* is required to be connected to the *trimmer joist* with a *clip angle* on each side of each connection. The *clip angle* is required to be of a thickness equivalent to the *floor joists*. The members around an opening are designed to support joists that have been displaced by the opening. The perimeter members given in *AISI S230* do not consider additional stair loads.

D8 Floor Trusses

AISI S230 does not contain provisions for floor *trusses*, which must have an *approved* design. This section is included so that pre-engineered floor *trusses* may be used in conjunction with this document. The *North American Standard for Cold-Formed Steel Framing – Truss Design* (*AISI S214-07*) should be consulted for the *truss* design.

D9 Diaphragms

Floor *diaphragms* are required to adequately transfer shear loads to the foundation. In steel framed floors, the shear load transfer is typically accomplished by sheathing the top *flanges* of the *joists* with wood *structural sheathing* (such as OSB or plywood). Shear strength values used in verifying the adequacy of the floor *diaphragms* were taken from *North American Standard for Cold-Formed Steel Framing – Lateral Design* (*AISI S213-07*) for oriented-strand-board (OSB) panels

fastened to steel members with No. 8 screws at 6 inch (152 mm) on center spacing at panel edges and 12 inch (305 mm) on center spacing at intermediate supports. Additional requirements for steel floors constructed in *high wind* (110 mph (177 km/hr) or greater) or *high seismic areas* (*Seismic Design Category* D₀, D₁, D₂ and E) are specified in Section D9.1.

D9.1 Floor Diaphragms in High Seismic and High Wind Areas

Shear strength values used in verifying the adequacy of the floor *diaphragms* were taken from *North American Standard for Cold-Formed Steel Framing – Lateral Design* (AISI S213-07) for oriented-strand-board (OSB) panels fastened to steel members with No. 8 screws at 6 inch (152 mm) on center spacing at panel edges and 6 inch (152 mm) on center spacing at intermediate supports. The reduced fastener spacing from 12 inches (305 mm) to 6 inches (152 mm) is to ensure that the diaphragm adequately transfers shear loads to the foundation.

E. WALL FRAMING

E2 Wall to Foundation or Floor Connection

Historically the wall *track* was required to be connected through the floor sheathing to a steel member, i.e. the *floor joist* or *track* below. In 2004, Table E2-1 was revised to enable connection of the wall *track* to the floor sheathing alone (Figure E2-4). This revision was based on research by the NAHB Research Center (NAHBRC, 2003) in which five shear tests and six withdrawal tests were conducted where 33-mil (0.84 mm) *track* was connected to 23/32-inch-thick (18 mm) OSB sheathing using #8 screws. The average ultimate shear capacity was 412 lb (187 kg) and the average ultimate pullout capacity was 350 lb (159 kg). Considering that the minimum allowable fastener capacities for steel-to-steel connections for #8 screws and 33 mil (0.84 mm) material of 164 lb (74 kg) for shear and 72 lb (32.6 kg) for pullout were used to calculate the requirements for *AISI S230*, the Committee deemed that it would not be necessary to require that every fastener connect to a *floor joist* or *track* member. In 2007 *AISI S230* was expanded to include gable endwall to floor connection requirements for *studs* with heights greater than 10 feet, based on a study at the University of Missouri-Rolla (Downey et al., 2005).

E3 Minimum Stud Sizes

This section dictates the minimum required thickness of steel *studs* for different wind speeds, *wind exposure* categories, wall heights, building widths, live loads, and ground snow loads. *Stud* selection tables are limited to buildings not greater than three stories with *structural wall* heights up to 10 feet (3.05 m). In 2007 *AISI S230* was expanded to include gable endwall *studs* with heights greater than 10 feet, based on a study at the University of Missouri-Rolla (Downey et al., 2005).

The 8-foot (2.44 m) wall height is widely used in residential construction; however, the higher strength of cold-formed steel wall studs enable light-steel framed construction to provide for higher ceilings such as 9- and 10-foot (2.74 and 3.05 m) walls. The 50 ksi (345 MPa) *yield strength stud* tables were developed to take advantage of the higher *yield strength*, which allows thinner *studs* in many cases. The user should verify the availability of steel member sizes and thickness in 33 or 50 ksi (230 and 345 MPa) *yield strengths* as many steel manufacturers do not produce certain studs in both 33 or 50 ksi (230 and 345 MPa) *yield strength*.

The wall *studs* are grouped in three categories:

- *Studs* for one-story or second floor of two-story building or third floor of a three-story building (supporting roof only)
- *Studs* for first story of a two-story building or second story of a three-story building (supporting roof + one floor)
- *Studs* for first story of a three-story building (supporting roof + two floors)

For walls sheathed on both faces with wood structural panels (minimum 7/16 inch (11.1 mm) OSB or minimum 15/32 inch (11.9 mm) plywood), a reduction in thickness of the *stud* is allowed. All *studs* in exterior walls are treated as *structural* members in *AISI S230*. The following design assumptions were made in developing the wall *stud* selection tables.

- *Studs* are simply supported beam - columns
- The exterior *flanges* of the *studs* are braced by *structural sheathing* and the interior flanges are braced by mechanical *bracing* (mechanical bracing at mid-height for 8-

foot studs (2.4 m), 1/3 point for 9-foot (2.74 m) and 10-foot (3.05 m) and 11'-4" (3.45 m) studs)

- Maximum roof overhang of 24 inches (610 mm)
- Roof slopes limited to a range of 3:12 to 12:12
- Deflection limit of $L/240$
- Ceilings, roofs, attics, and floors span the full width of the house (no interior bearing walls)
- Permitted attic live load is limited to 10 psf (0.48 kN/m²)
- Second floor of a two-story building and third floor of a three-story building live load is 30 psf (1.44 kN/m²). Second floor of a three-story building floor live load is 40 psf.
- Unbalanced snow loads in accordance with ASCE 7

Stud Design

The design of the *studs* was based on the following design checks as stipulated by the *North American Standard for Cold-Formed Steel Framing – Wall Stud Design* (AISI S211-07):

- Combined bending and axial strength using Main Wind Force Resisting System (MWFRS) wind loads and the bracing as defined by Section E4.
- Bending strength based on Components and Cladding (C&C) loads and the bracing as defined by Section E4.
- Web crippling strength based on Components and Cladding (C&C) loads. Because bending alone was considered, Equation B2.2-1 was used for the development of the stud tables.
- Deflection limit based upon 70% of Components and Cladding (C&C) loads.

Wind Design Loads

Both the Components and Cladding (C&C) and the Main Wind Force Resisting System (MWFRS) loads at the ends and corners of walls can be significantly higher than in the middle, or field, of the wall. However, historically for residential construction rather than design the entire wall for these increased corner loads, the loads in the middle of the wall were used to design the studs. Thus, the tables in *AISI S230* were developed for field of the wall wind loads.

E4 Stud Bracing

Studs in *structural walls* are laterally braced on each *flange* by either a continuous 1-1/2 inch x 33 mil (38.1 x 0.84 mm) (minimum) *strap* at mid-height (or third points for 9-foot (2.74 m), 10-foot (3.05 m) and 11'-4" (3.45 m) studs) or by direct attachment of *structural sheathing* or rigid wall finishes (i.e. structural panels such as plywood, OSB or gypsum board) according to the requirements of the *AISI S230*. Therefore, for the evaluation of both the bending strength and axial strength all *studs* were considered to be braced at mid-height (or third points for 9-foot (2.74 m), 10-foot (3.05 m) and 11'-4" (3.45 m) studs) for the engineering analysis of the stud tables. As previously noted, the benefit achieved from *structurally sheathed* walls (both wall faces) on the required *stud* thickness and the composite wall strength are recognized in the allowance in dropping down a *stud* thickness.

Temporary *bracing* may be necessary to facilitate safe construction practices and to ensure that the structural integrity of the wall assembly is maintained. Prior to the installation of cladding or bridging, a wall *stud* is free to twist, thus making the *stud* potentially subject to

premature failure under heavy construction loads (i.e. stack of gypsum wallboard or roof shingles). In such cases, temporary *bracing* must be provided.

E5 Splicing

The *stud* tables provided in *AISI S230* are based on an assumption that the *studs* are continuous, with no splices. Therefore, *structural studs* shall not be spliced without an *approved* design. *Tracks* are permitted to be spliced according to the requirements and details in the *AISI S230*.

E6 Corner Framing

AISI S230 utilizes a traditional three-stud practice for framing corners. The corner cavity should be insulated before the exterior sheathing is applied.

E7 Headers

Headers are horizontal members used to transfer loads around openings in *structural walls*. *Headers* specified in *AISI S230* are allowed only above the opening immediately below the wall top *track* (i.e. high *headers*) In 2007, an exception to this requirement was included in *AISI S230* along with an alternative detail for box and back-to-back *headers* in gable endwalls, based on a study at the University of Missouri-Rolla (Downey et al., 2005). Historically, the two traditional ways of constructing *headers* was to put two *C-shaped* members back-to-back or in a box shape. However, recent testing of single and double L-shaped *headers* has proven that they as well as inverted L-headers may be an economical alternative to traditional *headers* in lightly loaded situations.

The following general design assumptions were made in determining *header* spans:

- *Headers* are simply supported beams
- Maximum roof overhang of 24 inches (610 mm)
- Roof slopes limited to a range of 3:12 to 12:12
- Ceilings, roofs, attics, and floors span the full width of the house, no interior load bearing walls, except as noted
- Deflection limit of $L/240$

The design of *headers* is based on the *North American Standard for Cold-Formed Steel Framing – Header Design* (AISI S212-07).

E7.1 Box Headers

Box headers are formed from two equal sized *C-shaped* members placed toe-to-toe in a box type configuration and fastened to both the wall top *track* and a *track below*. *Tracks* used to frame around openings are required have a steel thickness equivalent to or greater than the wall *studs*. The orientation of the lower *track* is not critical to the structural performance of the box-header. Thus the lower track can be oriented to face either the top or the bottom of the wall. The following design assumptions were used when developing the header selection tables:

- Bending capacity is based on two C-sections alone, the track is not considered composite with the C-sections.
- Shear capacity is based on two C-sections alone.

- Interior-one-flange loading web crippling capacity is based on the *Header Design Standard* (AISI S212-07) with a bearing length, $N = 1$.
- End-one-flange loading web crippling capacity is not evaluated because the typical end detail precludes web crippling.
- Bending and web crippling capacity is based on the *North American Header Design Standard* (AISI S212-07).
- Deflection is based on two C-sections alone, the track is not considered composite with the C-sections.

E7.2 Back-to-Back Headers

Back-to-back *headers* are formed from two equal sized *C-shaped* members in a back-to-back configuration creating an I-section. These *C-shaped* sections are fastened to the wall top *track* and a lower *track* spanning the width of the opening. *Tracks* used to frame around openings are required to have a steel thickness equal to or greater than the wall *studs*. The lower *track* can be oriented to face either towards the top or the bottom of the wall. It is more difficult to install *strapping* around back-to-back *headers* in *high wind areas*. The following design assumptions were made in developing the header selection tables:

- Bending capacity is based on two C-sections alone, the track is not considered composite with the C-sections.
- Shear capacity is based on two C-sections alone.
- Interior-one-flange loading web crippling capacity is based on the *Specification* (AISI, 1996) with a bearing length, $N = 1$.
- End-one-flange loading web crippling capacity is not evaluated because the typical end detail precludes web crippling.
- Bending and web crippling capacity is based on the *Specification* (AISI, 1996).
- Deflection is based on two C-sections alone, the track is not considered composite with the C-sections.

E7.3 L-Headers

E7.3.1 Double L-Headers

A double L-header is shown in Figure E7-5 of the *AISI S230*. Tables for gravity and uplift loads are provided for double L-headers. Double L-headers are easy to install. They can be installed during or after the wall has been framed. They do not require pre-insulation and provide a large surface to apply finishing materials. They also require less material (steel and screws) than back-to-back or box *headers*. Double L-headers do not need to be cut to exact lengths; however, they need to lap over a minimum of one *king stud* at each end. The design of the L-header is based on the *North American Standard for Cold-Formed Steel Framing – Header Design Standard* (AISI S212-07) which stipulates that the bending capacity be based on the angles alone. The *Header Design Standard* also stipulates that shear and web crippling alone, as well as combinations of shear, bending or web crippling, need not be checked.

E7.3.2 Single L-Headers

A single L-header is shown in Figure E7-6 of *AISI S230*. Tables for gravity loads only are provided for single L-headers. They can be installed during or after the wall has been framed. They do not require pre-insulation and provide a large surface to apply finishing materials. They also require less material (steel and screws) than back-to-back or

box *headers*. Single L-headers do not need to be cut to exact lengths; however, they need to lap over the required *king studs*. The design of the L-header is based on the *North American Standard for Cold-Formed Steel Framing – Header Design Standard* (AISI S212-07) which stipulates that the bending capacity be based on the angle alone. The *Header Design* standard also stipulates that shear and web crippling alone, as well as combinations of shear, bending or web crippling, need not be checked.

E7.3.3 Inverted L-Headers

An inverted L-header is shown in Figures E7-7 of *AISI S230*. Tables for gravity and uplift loads are provided for inverted L-headers. They can be installed during or after the wall has been framed. They do not require pre-insulation and provide a large surface to apply finishing materials. They also require less material (steel and screws) than back-to-back or box *headers*. Inverted L-headers need to be cut to exact lengths. The design of the L-header is based on the *Header Design Standard* (AISI S212-07). The *North American Standard for Cold-Formed Steel Framing – Header Standard* stipulates that for double inverted L-headers the bending capacity is determined by summing the gravity and uplift nominal moment capacities for the respective gravity and uplift capacities of the double L-header. For the single inverted L-header, the *Header Design* standard states that the gravity capacity for the single L-header is used when evaluating either gravity or uplift capacity for the inverted single L-header. The *Header Design* standard also stipulates that shear and web crippling alone, as well as combinations of shear, bending or web crippling, need not be checked.

E7.4 Jack and King Studs

The required number of *jack* and *king studs* was calculated based on the size of the opening. The number was determined by taking the width of the opening, divided by the *stud* spacing, and rounding to the next higher whole number. The resulting number is further divided into *jack* and *king studs* based on the required axial capacity being provided by the *jack studs* only. *King* and *jack studs* are required to be the same size and thickness as the adjacent wall *studs*. *Jack* and *king studs* are interconnected by *structural sheathing* (plywood or OSB) to transfer lateral loads (when multiple *king* and *jack studs* are required).

E7.5 Head and Sill Track

Head and sill *tracks* are those located at top (i.e., head) or bottom (i.e., sill) of window or door openings. Head and sill *tracks* span the full width of the opening and were designed to resist lateral wind loads only. The allowable head and sill *track* spans were calculated using C&C wind loads for a 48 inch (1.22 m) tributary span (i.e., assuming the opening covers the entire height of the 8-foot (2.44 m) wall.) As the tributary span decreases the head and sill *track* will have to resist less wind loads. Therefore, for a 4-foot (1.22 m) opening, the tributary opening width is 2 feet (0.61 m) and hence the allowable head and sill *track* span increases by a factor of 1.75. Similarly, for a 6-foot (1.83 m) opening, the tributary opening is 3 feet (0.92 m) and hence the allowable head and sill *track* span increases by a factor of 1.50.

E8 Wall Bracing

The wall bracing provisions of this section are applicable to buildings classified as *Seismic Design Category A, B and C* and for buildings located where the *basic wind speed* is 90 mph (145 km/hr) or less.

Three different *bracing* methods are recognized in *AISI S230*:

- Steel *strap bracing* (diagonal X-bracing)
- *Structural sheathing* (plywood or OSB)
- Sheet steel (in *high wind* and *high seismic* regions)

E8.1 Strap Bracing (X-brace)

The wall *bracing* in *AISI S230* was conservatively limited to the use of continuously sheathed walls with limitations on loading conditions and building geometry. The use of sheet steel diagonal strap bracing must be designed in accordance with *approved* engineering practices.

E8.2 Structural Sheathing

The wall *bracing* requirements in *AISI S230* are based on an engineered approach that utilized available technical knowledge. The available shear strength for plywood and oriented-strand-board (OSB) sheathing are based on Table C2.1-1 of the *North American Standard for Cold-Formed Steel Framing – Lateral Design* (*AISI S213-07*). The shear strength for assemblies relevant to this document is summarized in Table C-E8.1.

**Table C-E8.1
 Cold-Formed Steel Framed Walls Shear Strength (*AISI S213-07*)**

Assembly Description	Nominal Shear Strength (plf)	Available Shear Strength (plf)
15/32" Plywood APA rated sheathing w/ panels on one side	1065	426
7/16" OSB APA rated sheathing w/ panels on one side	910	364

The intent in *AISI S230* is to have the entire building fully sheathed (except for door and window openings, as limited by the minimum length of full height sheathing).

The lateral wind loads were calculated for a range of building surfaces using the orthogonal wind loading approach of ASCE 7 (ASCE, 2005). Tributary areas consisting of the leeward and windward wall surfaces were assigned to each exterior *shear wall* (i.e. sidewalls and endwalls) to determine the in-plane shear loads to be resisted by the walls,

No interior walls or alternative shear pathways were considered.

Using the more conservative available shear strength from C-E8.1 of 364 plf (5.39 kN/m) *AISI S230* wall *bracing* requirements were determined. The length of full-height sheathing required was then tabulated as a percentage of wall length for sidewalls and endwalls over the range of building geometries defined in *AISI S230* applicability limits. The length of wall with full-height sheathing is defined as the sum of wall segments that have sheathing extending from the bottom track to the top track, without interruption due to openings (i.e., the total of lengths of wall between window and door openings). Further, the individual wall segments must be 48 inches (1.22 m) in length or greater to contribute to the required length of full-height sheathing for a given wall line, unless permitted otherwise.

As a final step necessary for a basic prescriptive approach, the requirements were conservatively reduced to the minimum percent lengths of full-height sheathed wall shown in the wall-bracing table of the *AISI S230*. The only building geometry parameter retained was roof slope due to a significant impact on the wind loads transferred to the *shear walls*. Footnotes to the *shear wall* table provide additional information related to the proper applications of the requirements.

E8.3 Structural Sheathing Fastening

Fastening of *structural sheathing* is typically done at 6 inch (152 mm) spacing at the perimeters and 12 inch spacing (305 mm) in the field. When this spacing is reduced to 4 inches (102 mm) (perimeter spacing only), the percentage of full-height sheathing is permitted to be multiplied by 0.72.

E8.4 Hold-down Requirements

A *hold-down anchor* shall consist of an approved *strap* or bracket adequately attached to the *stud* and anchored to the foundation, floor, or wall below to form a continuous load path to the foundation. In wind conditions greater than 100 mph (161 km/hr) exposure C, *hold-down anchors* in accordance with Table E2-1 are required to stabilize the *shear walls*. *Hold-down anchors* may also be added to reduce the amount of full-height sheathing required, or to increase the shear (racking) strength of the wall.

E9 Exterior Wall Covering

It is required that exterior coverings be installed in accordance with the recommendations of the manufacturer. *AISI S230* limits the total exterior envelope dead load (total load = stud framing plus wall coverings) to 10 psf (0.48 kN/m²). If the total exterior envelope dead load exceeds that value, then the walls must be engineered for that load (see Table A1-2 for maximum wall dead loads in high seismic areas).

E11 Braced Walls in High Wind Areas and High Seismic Areas

E11.1 General

This section provides additional *shear wall* requirements for buildings located in *high seismic areas* (i.e., *Seismic Design Categories* D₀, D₁, D₂ and E) or *high wind areas* (i.e., wind speed between 100 to 130 mph (161 to 209 km/hr)). In *high seismic areas*, buildings are required to comply with Sections E11 and E12; and in *high wind areas*, buildings are required to comply with the requirements in Sections E11 and E13.

The following general assumptions and building configurations were used in developing the high seismic tables and high wind provisions:

- Provisions and tables are limited to buildings no more than two-stories.
- Provisions and tables are limited to buildings on slab-on-grade or spread footing with stemwall foundation system with a single top of slab/top of stemwall elevation.
- Wall clear heights are limited to 8, 9, and 10 feet (2.44, 2.74 and 3.05 m).
- Maximum roof slope is limited to 6.9:12.
- All ceilings are considered leveled (i.e., no offsets or cathedral ceilings).

- Buildings are considered regular (rectangular shape).
- First and second story walls are assumed vertically stacked (no offset).

Weights used in calculating the entries of the tables in the *high seismic areas* are as follows:

- Roof/ceiling dead load = 25 psf (1.2 kN/m²) for heavy weight roofs
 = 15 psf (0.72 kN/m²) for normal weight roofs
 = 12 psf (0.57 kN/m²) for light weight roof systems
- Wall dead load = 14 psf (0.67 kN/m²) for heavy walls
 = 7 psf (0.34 kN/m²) for light walls
- Floor/ceiling dead load = 10 psf (0.48 kN/m²)
- Interior wall dead load = 5 psf (0.24 kN/m²) (based on 10 foot (3.04 m) wall)
- Ground snow load = 30 psf (1.44 kN/m²) for normal or light weight roofs
 = 70 psf (3.35 kN/m²) for heavy weight roof systems
- Roof weight includes a 2-foot (610 mm) overhang

The dead loads that were used in determining the seismic mass are given below:

Wall Element	Weight (psf)	
	Light Weight Walls	Heavy Weight Walls
Wallboard	1.8	1.8
Steel Framing	0.6	0.6
½" Plywood Sheathing	1.6	1.6
Insulation	1.0	1.0
7/8" Stucco	0	9.0
Exterior Siding	1.5	0
Total	6.5	14.0

For SI: 1 psf = 0.0479 kN/m².

Roof Element	Weight (psf)	
	Flat Roofs	Sloped Roofs (6:12)
Sheathing	1.6	1.63
Roof Framing or Trusses	2.5	2.5
Insulation	1.0	1.0
Miscellaneous	0.6	0.84
Ceiling Covering	1.8	1.8
Subtotal	7.5	7.8
Total with Roof 3.7 psf Covering	11.5	12
Total with Roof 6.4 psf Covering	14.2	15
Total with Roof 15.3 psf Covering	23.5	25

For SI: 1 psf = 0.0479 kN/m².

Roof Category	Roof/Ceiling Weight (psf)
Light-Weight Roof	12
Normal-Weight Roof	15
Heavy-Weight Roof	25

For SI: 1 psf = 0.0479 kN/m².

Design assumptions that are used in developing the shear wall and other tables in the high seismic areas are as follow:

- Nominal shear values are taken from Table 2211.1(3) of the *International Building Code* (IBC) (ICC, 2006a).
- *Seismic Design Category* (SDC) assignments in accordance with Table R301.2.2.1.1 of the *International Residential Code* (ICC, 2006b).
- Seismic base shears were calculated in accordance with the IBC (ICC, 2006a) using an $R = 5.5$ and $\Omega_0 = 2.5$. Upper end S_{DS} values are used for each SDC.
- *Diaphragms* are considered to be flexible rather than rigid. No requirement for inclusion of accidental torsion and reduction of Ω_0 from 3 to 2.5 in accordance with the IBC (ICC, 2006a) was used.
- $F_u = 45$ ksi (310 MPa) and $F_y = 33$ ksi (230 MPa) were used in lieu of the IRC (ICC, 2006b) allowed 1.08 tensile/yield ratio in determining screw capacities. *Shear wall* test values are based on the 33 ksi/45 ksi (230/310 MPa) steels.
- ϕ factor was used in combination with the Ω_0 , the over-strength factor, to determine screw requirements for chord splices. Chord splice screw requirements are based on the lesser of Ω_0 times $T_{seismic}$ or T_n , divided by ϕV_n . Both the 3-1/2 inch (88.9 mm) and the 5-1/2 inch (140 mm) members were considered, as well as both the 33 mil (0.84 mm) and the 43 mil (1.09 mm) thickness.
- ASCE 7 requires the use of 20% of the uniform design snow load if the flat roof snow load, P_f , exceeds 30 psf (1.44 kN/m²). Where the ground snow load is 70 psf (3.35 kN/m²), the heavy roof system criteria applies.

Example: Load due to 70 psf ground snow load for normal weight roofs =
 $15 \text{ psf} + 0.2 \times 0.7 \times 70 \text{ psf} = 24.8 \text{ psf}$ (1.19 kN/ m²) (equals the heavy weight roof systems)

E11.2 Braced Wall Lines

Two types of *braced wall lines* are presented in this section: *Type I* and *Type II Braced Walls*. *Type I braced walls* are traditional *shear walls* that have a *hold down anchor* at each end and have no openings between anchors. *Type II braced walls*, also known as perforated *shear walls*, are *shear walls* that have openings between anchors and there is no design for shear transfer around the openings.

E11.3 Type I (Solid Sheathed) Braced Wall Panels

This section describes the traditional method of sheathing a steel-framed wall where continuous panels have hold down anchors at each end. The aspect ratio (height to width) used in the development of these provisions for this wall type is 2:1.

E11.4 Type II (Perforated) Braced Wall Lines

The *Type II Braced Wall*, or perforated *shear wall* method, requires *hold down anchors* at each end of each wall rather than at each end of continuous panels. The aspect ratio (height to width) is also 2:1 for this wall type. For a defined *Type II* (perforated *shear wall*), the adjustment factors given in Table E11-2 define the magnitude by which the strength of an otherwise solid wall must be divided to get the strength of the *Type II* (perforated) wall. The tabulated values, adopted from wood frame construction, were justified on the basis of a series of full-scale reversed cyclic tests by Vagh, Dolan and Easterling (2000) in which it was demonstrated that the tested wall capacities were greater than the reductions that are required by Table E11-2.

E12 Braced Wall Design in High Seismic Areas

E12.2 Braced Wall Anchorage and Chord Stud Requirements

AISI S230 permits the tabulated values to be divided by 1.4 when comparing requirements with manufacturer's published strengths expressed as allowable loads. The derivation of this adjustment factor is: $\phi \times \Omega = 0.55 \times 2.5 = 1.4$. In earlier editions of cold-formed steel lateral design provisions, the resistance factor was set at 0.55 to reflect the 1.4 value used in the UBC to compute allowable seismic loads (1.4 approx. = 0.55×2.5).

E13 Braced Wall Design in High Wind Areas

E13.3 Connections of Walls in High Wind Areas

E13.3.2 Uplift Connection – Wall Assembly to Wall Assembly

AISI S230 permits the tabulated values to be divided by 1.3 when comparing requirements with manufacturers' published strengths expressed as allowable loads. The derivation of this adjustment factor is: $\phi \times \Omega = 0.60 \times 2.0 = 1.3$.

E13.3.3 Header Uplift Connections

For back-to-back *headers* supporting roof and ceiling only, these provisions require that uplift straps be installed on both sides of the *header* beam (inside and outside of the wall) in order to minimize any effect of torsion. This requirement is based on engineering judgment and recognizes that the back-to-back *header* lacks sufficient torsional strength and stiffness. For back-to-back *headers* supporting loads from one floor, roof and ceiling, and for any box and double L-headers, a single uplift strap is permitted and may be installed on either side of the *header* beam.

F. ROOF FRAMING

F1 Roof Construction

Roof *trusses* are not prescriptively addressed in *AISI S230*, but are permitted, in accordance with Section F6, and must be designed by a *design professional*. Also roof girders are also not addressed in *AISI S230*.

F2 Ceiling Joists

F2.1 Minimum Ceiling Joist Size

Ceiling joist tables in *AISI S230* provide the maximum allowable *ceiling joist* spans for two loading conditions: 10 psf (0.48 kN/m²) and 20 psf (0.96 kN/m²) attic live loads.

For the design of *ceiling joists*, for the following design considerations were evaluated:

- Flexural yielding
- Flexural buckling
- Web crippling (not required if *bearing stiffeners* are specified)
- Shear
- Vertical deflection

The engineering approach used to develop *ceiling joist* span tables for *AISI S230* is similar to that used for *floor joists* with the exception of the magnitude of dead and live loads.

F2.2 Ceiling Joist Bearing Stiffeners

AISI S230 enables the selection of *ceiling joists* based on the use of *bearing stiffeners*.

F2.3 Ceiling Joist Bottom Flange Bracing

Gypsum board (i.e. finished ceilings) is considered to be adequate *bracing* for the bottom (tension) *flanges* of the *ceiling joists*. Steel *strapping* can also be used as bottom *flange bracing* for *ceiling joists*.

F2.4 Ceiling Joist Top Flange Bracing

For braced top (compression) *flanges* it is necessary for steel *strapping* to have *blocking* (or bridging) installed at a maximum spacing of 12 feet (3.66 m) and at the termination of all *straps*. Moreover, the ends of steel *straps* are to be fastened to a stable component of the building if end *blocking* is not installed. *Ceiling joist* tables provide spans for braced, as well as unbraced, top *flanges*.

F2.5 Ceiling Joist Splicing

Splicing of *ceiling joists* in *AISI S230* requires an *approved* design except when lapped *ceiling joists* occur at an interior bearing wall.

F3 Roof Rafters

F3.1 Minimum Roof Rafter Sizes

The *roof rafter* span table was designed based primarily on gravity loads, hence the *roof rafter* spans are based on the horizontal projection of the *roof rafter*, regardless of the slope. The gravity loads consist of a 7 psf (0.34 kN/m²) dead load and the greater of a 16 psf (0.77 kN/m²) live load or the applied roof snow load. Unbalanced snow loads in accordance with ASCE 7 were considered.

Wind load effects are developed by a procedure that equates the wind loads to equivalent snow loads as shown in Table F3.2 of *AISI S230*. Wind pressures were calculated using the ASCE 7 (ASCE, 2005) Components and Cladding coefficients. Wind loads acting perpendicular to the plane of the *roof rafter* were adjusted to represent loads acting orthogonal to the horizontal projection of the *roof rafter*. Wind loads were examined for both uplift and downward loads and the worst case was correlated to a corresponding snow load.

Permissible roof slopes range between 3:12 through 12:12 and more importantly, the roof system must consist of both *ceiling joists* (i.e. acting as rafter ties) and *roof rafters*. *AISI S230* does not currently address cathedral ceilings because a prescriptive ridge beam and post design is not provided.

Lapped *ceiling joists* must be connected with the same screw size and number (or more) as the heel joint connection to ensure adequate transfer of tension loads across the spliced joint. The splice must occur over an interior bearing wall.

F3.1.1 Eave Overhang

A 24 inch (610 mm) eave overhang was used when calculating the *roof rafter* spans in *AISI S230*.

F3.1.1 Rake Overhang

In 2007, limitations and details were added to *AISI S230* to clarify the installation requirements at gable endwalls, based on a study at University of Missouri-Rolla (Downey et al., 2005).

F3.2 Roof Rafter Support Brace

The support brace is used to increase the span of a particular member. When the brace is used, the *roof rafter* span is determined from the heel joint to the brace point or from the ridge member to the brace point (horizontal projection), whichever is greater.

F3.3 Roof Rafter Splice

The *roof rafter* spans provided in *AISI S230* are based on the assumption that the members are continuous, with no splices. Therefore, *roof rafters* are not to be spliced without an *approved* design.

F3.5 Roof Rafter Bottom Flange Bracing

The *bracing* requirements provided in *AISI S230* are commonly used in residential steel construction and are based on engineering judgment.

F4 Hip Framing

Prior to the 2007 edition of this standard, roof framing was limited to *roof rafters* and *ceiling joists*. Hip and valley framing options were added in 2007, based on research at the University of Missouri -Rolla (Waldo et al., 2006).

F5 Framing of Openings in Roofs and Ceilings

The requirements of this section are based on engineering judgment.

F6 Roof Trusses

AISI S230 does not contain provisions for *roof trusses*, which must have an *approved* design. This section is included so that pre-engineered *roof trusses* may be used in conjunction with this document. The *North American Standard for Cold-Formed Steel Framing – Truss Design* (AISI S214-07) should be consulted for the *truss* design.

F7 Ceiling and Roof Diaphragms

Roof *diaphragms* are required to adequately transfer shear loads to the *braced wall lines* in a structure. The load transfer typically accomplished by sheathing the roof-framing members with wood structural panels. Shear values used in the design of roof *diaphragms* were taken from the *North American Standard for Cold-Formed Steel Framing – Lateral Design* (AISI S213-07). Additional requirements for steel roof *diaphragms* in *high wind areas* (i.e., 110 mph (177 km/hr) or greater wind speed) or *high seismic areas* (i.e., *Seismic Design Category* D₀, D₁, D₂ and E) are specified in Section F6.1 and F6.2.

Ceiling *diaphragms* are also required to adequately transfer shear loads to the *braced wall lines* in a structure. The load transfer typically accomplished by sheathing the ceiling-framing members with gypsum board or wood structural panels. Shear values used in the design of ceiling *diaphragms* were taken from the *North American Standard for Cold-Formed Steel Framing – Lateral Design* (AISI S213-07).

PART 2 – DESIGN EXAMPLES

FOR THE STANDARD FOR COLD-FORMED STEEL FRAMING – PRESCRIPTIVE METHOD FOR ONE AND TWO FAMILY DWELLINGS

A. INTRODUCTION

Part 2 illustrates the basis for the development of the prescriptive requirements for cold-formed steel framing. Part 2 validates tabulated values through the use of design examples for *AISI S230* (AISI S230, 2007d). These design examples are based primarily on existing available reference standards such as the American Iron and Steel Institute *North American Specification for the Design of Cold-Formed Steel Structural Members* (AISI, 2007), the American Society of Civil Engineers standard *ASCE-7 Minimum Design Loads for Buildings and Other Structures* (ASCE, 2005) and the American Iron and Steel Institute *North American Standard for Cold-Formed Steel Framing – Header Design* (AISI, 2007c).

These design examples are shown in U.S. customary units. For appropriate conversions to the International System of Units (SI), refer to Appendix A.

A1 Member Properties

All section properties and member capacities were calculated using either the 1996 *Specification* (AISI, 1996) or the 2001 *Specification* (AISI, 2001). Refer to Section A3 in Part 1 for a discussion of referenced documents. Floor and ceiling joist members were assumed to have holes with 2½" depth x 4 ½" length located along the centerline of the web. This is the maximum hole size permitted by *AISI S100*. Studs and other structural elements were assumed to have holes with 1½" wide x 4" long along the centerline of the web.

Minimum $F_y = 33$ ksi → Minimum $F_u = 45$ ksi
Minimum $F_y = 50$ ksi → Minimum $F_u = 65$ ksi

The design thickness (minimum thickness divided by 0.95) used in calculating member capacity and section properties was based on the Specification Section A2.4.

A2 Design Loads

The following loads were used in designing the various steel-framing members:

Ceiling dead load	= 5 psf
Roof dead load	= 7 psf
Floor dead load	= 10 psf
First floor live load	= 40 psf
Second floor live load	= 30 psf
Wall dead load	= 10 psf
Attic live load	= 10 psf for attics with no storage
Attic live load	= 20 psf for attics with storage
Wind load	= Varies by wind speed and exposure (3-sec. Gust)
Seismic Load	= Varies by Seismic Design Category: A, B, C, D ₀ , D ₁ , D ₂ , or E
Roof snow load	= 0.7 x Ground snow load (unbalanced snow loads were considered)

Roof live load = greater of 16 psf live load or the applied snow load

A2.1 Roof Snow Loads

Applied roof snow loads were calculated by multiplying the ground snow load by a 0.7 conversion factor in accordance with ASCE 7 (ASCE, 2005). No further reductions were made for special cases.

The sloped roof snow load, $P_s = (C_s) (P_f)$, where P_f is the flat roof snow load.

$$P_f = 0.7 C_e C_t I P_g$$

C_s C_s is the roof slope factor ranging from approximately 0.1 to 1.0. A slope factor of 1.0 was judged to be conservative for houses with roof slopes from 3:12 to 12:12.

C_e C_e is the exposure factor depending on the location of the house. C_e varies from 0.8 for windy, unsheltered areas, to 1.2 for heavily sheltered areas. A factor of 1.0 was deemed reasonable for residential buildings that are partially exposed (ASCE 7, Table 7-2).

C_t C_t is a thermal factor that varies from 1.0 for heated structures to 1.2 for unheated structures. The thermal factor should be used based on the thermal condition that is likely to exist during the life of the structure. Houses are typically considered heated structures with $C_t = 1.0$ (ASCE 7, Table 7-3).

I I is the importance factor based on building classification. Houses are typically Category II structures, with an importance factor of 1.0 (ASCE 7, Table 7-4).

P_g P_g is the ground snow load from the ASCE 7 estimated ground snow map (psf).

Unbalanced snow loads were considered but sliding snow loads, and snow drifts on lower roofs were not considered. Rain-on-snow surcharge load was also not considered in the calculations because the roof slopes in this document exceed the 1/2-inch per foot requirement by ASCE 7 for rain-on-snow surcharge to be considered. Therefore, the flat roof snow load was computed as: $(1.0)(0.7)(1.0)(1.0)(P_g) = 0.7 P_g$.

A2.2 Wind Loads

The design tables contained in *AISI S230* were generated at different times and, consequently, using different editions of ASCE 7. For example, tables for the lateral provisions were developed using the 1998 edition whereas the wall stud tables were updated using the 2005 edition of ASCE 7. Every effort was made in this *Commentary* to cite the applicable edition of ASCE 7.

As an example, wind loads developed for floor and roof diaphragms and braced walls for wind were based on 3-second gust wind speeds ranging from 85 to 130 mph, Exposure A, B, or C in accordance with ASCE 7-98.

$$q = 0.00256K_z(GC_p + GC_{pi})(V^2 \times I)$$

where

K_z = 0.87 at 20 feet, for Exposure C

GC_p = 0 for Zone 1, Tributary area = 75 ft²,

GC_{pi} = ± 0.25 for Components and Cladding, interior pressure, enclosed buildings

I = 1.0 for residential buildings in areas with wind speed < 100 mph

Tables A2.1 and A2.2 provide a summary of wind loads that were calculated in accordance with ASCE 7-98 (refer to Figure A2-1 for building surface).

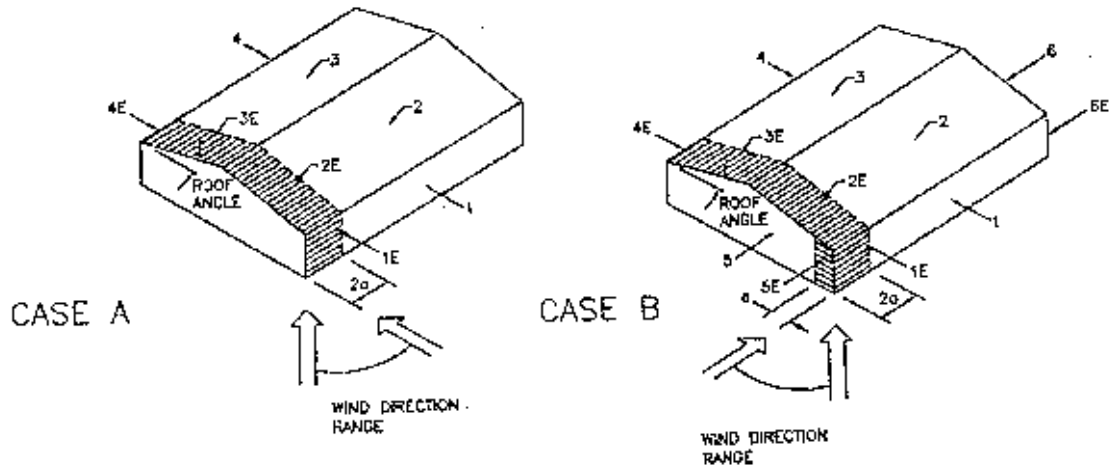


Figure A2-1 ASCE 7 Building Surfaces

Table A2.1
ASCE 7-98 Main Wind Force Resisting System Design Pressures (psf)^{1,2,3,4,5,6,7}

ROOF PITCH	BUILDING SURFACE (Fig. 6-4)	LOADED REGION	3-sec WIND SPEED (mph) and EXPOSURE							
			85		90		100		110	
			A/B	C	A/B	C	A/B	C	A/B	C
3:12	2r+3r	Roof	10	10	10	10	10	10	10	10
	2Er+3Er	Roof Corner	10	10	10	10	10	10	10	10
	1+4	Building	10	13.2	10.5	14.8	13	18.2	15.7	22.1
	1E+4E	Building Corner	14.1	19.8	15.8	22.2	19.5	27.4	23.6	33.1
	-	Stud Design	10	10.2	10	11.4	10	14.1	12.6	17
	-	Stud Design Corner	10	14	11.2	15.7	13.8	19.3	16.7	23.4
6:12	2r+3r	Roof	1.7	2.4	1.9	2.7	2.4	3.3	2.9	4
	2Er+3Er	Roof Corner	1.9	2.7	2.2	3.1	2.7	3.8	3.3	4.6
	1+4	Building	10.4	14.5	11.6	16.3	14.3	20.1	17.3	24.3
	1E+4E	Building Corner	13.9	19.5	15.6	21.9	19.3	27	23.3	32.7
	-	Stud Design	10	11.3	10	12.6	11.1	15.6	13.5	18.9
	-	Stud Design Corner	10	14	11.2	15.7	13.8	19.4	16.7	23.5
9:12	2r+3r	Roof	4.2	5.9	4.7	6.6	5.9	8.2	7.1	9.9
	2Er+3Er	Roof Corner	5.3	7.4	5.9	8.3	7.3	10.3	8.9	12.4
	1+4	Building	10.2	14.4	11.5	16.1	14.2	19.9	17.2	24.1
	1E+4E	Building Corner	12.9	18.1	14.4	20.3	17.8	25	21.6	30.3
	-	Stud Design	10	11.4	10	12.8	11.3	15.8	13.7	19.1
	-	Stud Design Corner	10	13.4	10.7	15.1	13.3	18.6	16	22.5
12:12	2r+3r	Roof	5	7	5.6	7.8	6.9	9.7	8.3	11.7
	2Er+3Er	Roof Corner	6.2	8.7	7	9.8	8.6	12.1	10.4	14.6
	1+4	Building	10.2	14.4	11.5	16.1	14.2	19.9	17.2	24.1
	1E+4E	Building Corner	12.9	18.1	14.4	20.3	17.8	25	21.6	30.3
	-	Stud Design	10	11.4	10	12.8	11.3	15.8	13.7	19.1
	-	Stud Design Corner	10	13.4	10.7	15.1	13.3	18.6	16	22.5
ALL	5+6	Bldg Gable End	10	10.7	10	11.9	10.5	14.7	12.7	17.8
	5E+6E	Gable End Corner	11.5	16.1	12.8	18	15.9	22.2	19.2	26.9

¹ Values based on Figure 6-4, Main Wind Force Resisting System, h<60 ft Walls and Gable Roof.

² Design pressures are based on a 30-ft mean roof height.

³ (r = resultant horizontal component) The roof pressure is the total horizontal resultant pressure (windward & leeward) and should be applied to the vertical projected surface of the roof.

⁴ $K_D = 0.85$, load combinations in Section 2 shall be used.

⁵ Stud design pressures are for combined axial and bending load combinations. Load indicated is greater of cases a and b wind directions (side & end walls) with internal & external pressure applied.

⁶ Gable end building pressure is for wind parallel to ridge of a gable roof (case b).

⁷ Corner loads applied to a distance of a or 2a per Fig. 6-4, a = 10% of least width or 0.4h (whichever is smaller) but not less than either 4% of least width or 3 ft.

Table A2.2
ASCE 7-98 Components and Cladding Wall Design Pressures (psf)^{1,2,3,4}

PRESSURE DIRECTION	LOADED REGION	3-sec WIND SPEED (mph) and EXPOSURE											
		85		90		100		110		120		130	
		A/B	C	A/B	C	A/B	C	A/B	C	A/B	C	A/B	C
Windward	Stud Design Typical	12.4	17.4	13.9	19.5	17.2	24.1	20.8	29.1				
	Stud Design Corner	12.4	17.4	13.9	19.5	17.2	24.1	20.8	29.1				
Leeward	Stud Design Typical	-13.5	-18.9	-15.1	-21.1	-18.7	-26.2	-22.6	-31.6	-26.9	-37.7	-31.6	-44.2
	Stud Design Corner	-16.2	-22.7	-18.2	-25.5	-22.5	-31.5	-24.6	-34.4				

¹ Values based on Figure 6-5A, Components and Cladding, h<60 ft Walls.

² Design pressures are based on a 30-ft mean roof height.

³ $K_d = 0.85$, load combinations in Section 2 shall be used.

⁴ Exposure C wind pressures are calculated by multiplying Exposure B pressures by 1.40.

The above two tables were further narrowed down to a smaller table, Table A2.3, to reduce the number of wall stud tables generated. The values for the stud design pressures rather than the stud design corner pressures were used because the corner pressures are only applicable to small areas around the building corners. If the corner pressures were to be used, the majority of the wall studs in the building will be over designed resulting in an uneconomic design. Furthermore, *AISI S230* requires a minimum of three studs at building corners thus compensating for the slightly increased pressures used in that region of the building.

Table A2.3
Design Pressures Used for Wall Stud Tables (psf)^{1,2}

LOAD CASE	3-sec WIND SPEED (mph) and EXPOSURE											
	85		90		100		110		120		130	
	A/B	C	A/B	C	A/B	C	A/B	C	A/B	C	A/B	C
MWFRS	10	11.4	10	12.8	11.3	16.8	13.7	19.1				
C&C	13.5	18.9	15.1	21.1	18.7	26.2	22.6	31.6	26.9	37.7	31.6	44.2

¹ Values based on ASCE 7-98 Figure 6-5A, Components and Cladding (C&C), h<60 ft Walls.

² Design pressures are based on a 30-ft mean roof height.

Exposures A/B and C were also compared and tabulated in Table A2.4. The resulting comparison was used in developing the wall stud tables.

Table A2.4
Design Pressure Comparison Chart¹

Wind Speed (mph)		MWFRS (psf)		C&C (psf)	
		Exposure A/B	Exposure C	Exposure A/B	Exposure C
85		10		13.5	
90		10		15.1	
100	85	11.3	11.4	18.7	18.9
110	90	13.7	12.8	22.6	21.1
	100		16.8		26.2
	110		19.1	22.6	31.6
	120			26.9	37.7
	130			31.6	44.2

¹ Values based on ASCE 7-98

The following tables summarize the design wind pressures used for the tables that were updated in the 2007 edition of *AISI S230*.

Table A2.5
Main Wind Force Resisting System^{1,2}

EXPOSURE	BASIC WIND SPEED (mph)							
	85	90	100	110	120	130	140	150
B	10.0	10.0	11.3	13.6	16.2	19.0	22.1	25.4
C	11.4	12.8	15.8	19.1	22.7	26.7	30.9	35.5

¹ Values based on ASCE 7-05.

² Design pressures are based on a 30-ft mean roof height.

Table A2.5
Components & Cladding^{1,2}

EXPOSURE	BASIC WIND SPEED (mph)							
	85	90	100	110	120	130	140	150
B	14.1	15.8	19.5	23.6	28.1	32.9	38.2	43.9
C	19.7	22.1	27.3	33.0	39.3	46.1	53.5	61.4

¹ Values based on ASCE 7-05.

² Design pressures are based on a 30-ft mean roof height.

A3 Load Combinations

The load and resistance factor design (LRFD) load combinations as shown in ASCE 7 (ASCE, 2005) were used. These load combinations are summarized in the Table A3.1.

Table A3.1
Summary of Load Combinations

Framing Component	Load² Combinations
Floor Joists	1.4D 1.2D + 1.6L
Ceiling Joists	1.4D 1.2D + 1.6L
Headers	1.4D 1.2D + 1.6L + 0.5(L _r or S) 1.2D + 0.5L + 1.6(L _r or S)
Header Uplift ¹	0.9D - 1.6W 1.2D + 0.5(L _r or S) + 0.5L - 1.6W 1.2D + 1.6(L _r or S) - 0.8W
Wall Studs	1.4D 1.2D + 1.6L + 0.5(L _r or S) 1.2D + 0.5L + 1.6(L _r or S) 1.2D + 0.8W + 1.6(L _r or S) 1.2D + 1.6W + 0.5L + 0.5(L _r or S) 1.6W
Roof Rafters	1.4D 1.2D + 1.6L + 0.5(L _r or S) 1.2D + 0.5L + 1.6(L _r or S) Wind loads will be converted to equivalent snow loads
Sheathed Shear Walls	1.6W (MWFRS Walls and Roofs)

¹ Uplift loads were checked for L-headers only. The uplift loads do not control the design of back-to-back or box-beam headers.

² Load Definitions:

D = Dead Load

W = Wind Load

L_r = Roof Live Load

L = Live Load

S = Snow Load

A4 Deflection Limits

Table A4.1
Deflection Limits

Framing Component	Deflection Due to Live Load¹	Deflection Due to Total Load¹
Floor Joists	L/480	L/240
Headers	L/360	L/240
Wall Studs ²	L/240	-
Ceiling Joists	L/360	L/240
Roof Rafters	L/240	L/180

¹ Unfactored loads were used to calculate deflections.

² A factor of 0.7 was applied to the deflection limit of load combinations including components and cladding wind loads in accordance with the AISI, S211-07.

A5 Design Checks and Assumptions

Summarized in Table A5.1 are the design checks for each framing component.

Table A5.1
Design Checks

Framing Component	Bending	Shear	Web Crippling	Bending & Shear	Bending & Web Crippling	Axial	Axial & Bending	Deflection
Floor Joists ^{1,2}	√	√		√				√
Headers ³	√	√		√	√			√
Wall Studs	√	√	√			√	√	√
Ceiling Joists	√	√	√	√	√ ⁴			√
Roof Rafters	√	√						√

¹ All joists must have *bearing stiffeners* at support locations.

² Combined bending and shear was checked for double spans.

³ The clip angle at the header connection to the stud was considered a *bearing stiffener*.

⁴ For two (continuous) ceiling joist spans without *bearing stiffener*.

General Assumptions

- All members, except studs, are assumed to have 2-1/2" x 4" (1-1/2" x 4" for studs) web holes along the centerline of the web. Holes are not less than 24 inches on center, and are not within 10 inches from the end of the member or bearing condition.
- Steel may be provided in either a 33 ksi or 50 ksi yield stress.
- ASCE 7 (ASCE, 2005) wind load provisions are used.
- Design limited to Seismic Design Category A, B, C, D₀, D₁, D₂ and E, in accordance with the IBC (ICC, 2006a).
- LRFD load combinations are used.
- Increase in yield strength due to cold work of forming is used where allowed.
- Design thickness is minimum thickness divided by 0.95.
- House widths of 24', 28', 32', 36' and 40'.

Floor Joists

- Joist Spacing: 12", 16", 19.2" and 24" oc
- Live Loads: 30 psf and 40 psf
- Span: Single (simply-supported span) and Two-equal spans with stiffeners at bearing locations (uniform load over the entire two-spans; i.e., no alternate loading is considered)
- Joist Size Range: 550S162-33 to 1200S162-97
- Yield Stress: 33 ksi steel for single spans and 33 and 50 ksi steel for multiple spans
- Floor Dead Load: 10 psf
- Design Checks: Bending, and shear for single and two spans and combined bending and shear for two-spans only
- Deflection Criteria: L/480 for live loads and L/240 for total loads
- Bracing: Joists are considered to be continuously braced at the top flange by floor sheathing

- Bearing Stiffeners: All floor joists are assumed to have stiffeners at bearing support locations
- Bearing Length: Minimum bearing length of 1½" at end supports and 3½" at interior supports

Structural Wall Studs

- Stud Spacing: 16" and 24" on center
- Wind Speed: 85 through 130 mph Exposures A/B (3-sec. gust wind speeds) with adjustments for Exposure C (enclosed buildings)
- Seismic Design Category: A, B, C, D₀, D₁, D₂ and E
- Stud Heights: 8', 9', and 10'
- Stud Size Range: 350S162 and 550S162 for 33 to 97 mil thickness
- Ground Snow Loads: 20 psf, 30 psf, 50 psf, and 70 psf
- Attic Live Load: No attic live load acting on the studs. Tables are footnoted to allow attics with storage by using to the next snow load value
- Snow Load: 0.7xGround Snow Load (16 psf minimum). Unbalanced snow loads were computed in accordance with ASCE 7-05.
- Stud Bracing: Bracing of the interior and exterior flanges of the studs by sheathing or mechanical bracing (mechanical bracing at mid-height for 8' studs, 1/3 point for 9' and 10' studs)
- Yield Stress: 33 and 50 ksi
- 2nd Floor Dead Load: 10 psf
- 2nd Floor Live Load: 30 psf
- 2nd Floor Wall Dead Load: 10 psf
- Roof Dead Load: 7 psf
- Ceiling Dead Load: 5 psf
- Design Checks: Bending only: C&C loads per ASCE 7-05
Combined axial and bending: MWFRS loads
- Deflection Criteria: L/240 for C&C ASCE 7 wind loads with 0.7 reduction factor
- Other Assumptions:
 - Studs are simply supported beams.
 - Maximum roof overhang is 24" on either side of roof.
 - Roof slopes limited to a range of 3:12 to 12:12.
 - Ceilings, roofs, and floors span full width of the house; no interior load bearing walls.

Headers

- Headers Supporting: Roof and ceiling and one floor, roof and ceiling, roof and ceiling with center beam supporting first floor
- Header Types: Back-to-Back, Box Beam and L-Header
- Header Size Range: 350S162-33 through 1200S162-97
- L-Header Size Range: 600L150-43 through 1000L150-68
- Ground Snow Loads: 20 psf, 30 psf, 50 psf, and 70 psf

- Attic Live Load: No attic live load is considered in the header design. Tables are footnoted to allow for attics with storage by using the next snow load value.
- Snow Load: 0.7xGround Snow Load (16 psf minimum). Unbalanced snow loads were computed in accordance with ASCE 7-05.
- 2nd Floor Dead Load: 10 psf
- 2nd Floor Live Load: 30 psf
- 2nd Floor Wall Dead Load: 10 psf (for 8 feet)
- Roof Dead Load: 7 psf
- Ceiling dead Load: 5 psf
- Yield Strength: 33 ksi steel
- Design Checks: All headers designed in accordance with *Standard for Cold-Formed Steel Framing – Header Design* (AISI S212-07, 2007c).
- Deflection Criteria: L/240 for total load
- Other Assumptions:
 - Headers are simply supported beams.
 - Maximum roof overhang is 24" .
 - Roof slopes limited to a range of 3:12 to 12:12.
 - Ceilings, roofs, and floors span the full width of the house with no interior load bearing walls, except as noted.
 - The allowable capacity of each header is calculated in accordance with AISI S212.
 - The number of king and jack studs was determined by as the width of the opening and divided by the stud spacing. The results were rounded to the next stud.

Ceiling Joists

- Joist Spacing: 16" and 24"
- Live Loads: 10 psf and 20 psf
- Spans: Single and two-equal spans, with and without web stiffeners (uniform load over the entire two-spans; no alternate span loading was considered)
- Joist Size Range: 350S162 through 1200S162 with 33 to 97 mil thickness
- Ceiling Dead Load: 5 psf
- Yield Stress: 33 ksi
- Bracing: Unbraced, mid-span, or third point bracing
- Deflection Criteria: L/240 for total load
- Basic Load Combinations: LRFD loads and load combinations
- Design Checks: Bending, shear, combined bending and shear, and combined bending and web crippling
- Bearing Width: 3-1/2" at ends and at interior supports

Rafters

- Rafter Spacing: 16" and 24"
- Ground Snow Loads: 20 psf, 30 psf, 50 psf, and 70 psf
- Wind Speeds: Same as wall studs wind speeds
- Seismic Design Categories: A, B, and C
- Spans: Single and two-equal spans
- Joist Size Range: 550S162-33 through 1200S162-97

- Roof Dead Load: 12 psf
- Yield Stress: 33 ksi
- Roof Pitch: 3:12 to 12:12
- Deflection Criteria: L/240 for live load and L/180 for total load
- Snow Load = 0.7 x ground snow load (16 psf minimum). Unbalanced snow loads were computed in accordance with ASCE 7-05.
- Basic Load Combinations: LRFD loads and load combinations
- Bracing: Bottom flange bracing located at mid-span
- Other Assumptions:
 - Rafter spans are designed based on gravity loads; hence the rafter spans are reported on the horizontal projection of the rafter, regardless of the slope. The gravity loads consist of a roof dead load and the greater of a minimum 16 psf live load or the applied roof snow load.
 - Wind load effects are correlated to equivalent snow loads. Wind pressures were calculated using the ASCE 7-05 Components and Cladding pressure coefficients. Wind loads acting perpendicular to the plane of the rafter were adjusted to represent loads acting orthogonal to the horizontal projection of the rafter. Wind loads were examined for both uplift and downward loads and the worst case was correlated to a corresponding snow load.
 - The roof system must consist of both ceiling joists (i.e. acting as rafter ties) and rafters.
 - Rafters are assumed to be simply supported beams.

Summarized in Table A5.2 are the loads and other design assumptions used in developing *AISI S230*.

Table A5.2
Summary of Loads and Design Assumptions

	Floor Joists	Wall Studs	Headers			Ceiling Joists	Rafters	Shear Walls
			B-to-B	Box	L			
Member Size	550S162 800S162 1000S162 1200S162	350S162 550S162	350S162 550S162 800S162 1000S162 1200S162		600L150 800L150 1000L150	550S162 800S162 1000S162 1200S162	350S162 550S162 800S162 1000S162 1200S162	OSB Plywood Sheet Steel
Member Thickness	33 mil to 97 mil				43 mil to 68 mil	33 mil to 97 mil		27 mil (see note 1)
Member Height	N/A	8', 9' and 10'	N/A					
Yield Stress (ksi)	33 & 50		33					
Snow Load (psf)	N/A	20 to 70						
Wall DL (psf)	N/A	10				N/A		10
Floor DL (psf)	10				N/A		10	
1st Floor LL (psf)	40	N/A						40
2nd Floor LL (psf)	30				N/A		30	
Roof LL (psf)	N/A	16				N/A		16
Roof DL (psf)	N/A	7				N/A		7
Ceiling DL (psf)	N/A	5				N/A		5
Attic LL (psf)	N/A	N/A				10 and 20		N/A
SDC	A, B, C, D ₀ , D ₁ , D ₂ , E							
Wind Speed (mph)	85, 90, 100, 110, 120, 130 (3-sec. gust, Exposure A, B and C)							
Deflection Limit	L/480 and L/240	L/240				L/180		N/A

¹ Minimum 7/16" thickness for OSB and plywood.

D. FLOOR FRAMING DESIGN EXAMPLES

D1 Floor Joist Design

Calculate the allowable span for a 1000S162-54, $F_y = 33$ ksi, single span joist spaced at 24" (2') on center, supporting a live load of 40 psf and a dead load of 10 psf. using the provisions of the *AISI Specification* (AISI,1996). The compression flange of the joist is laterally restrained by floor sheathing. For deflection checks, $\Delta = L/480$ for live load only and $\Delta = L/240$ for total loads (dead load + live load).

The maximum allowable joist span is the minimum span calculated based on shear, moment, and deflection.

D1.1 Shear Capacity

In accordance with Section C3.2 of *AISI Specification*, the nominal shear strength, V_n , is calculated to be 2,673 lb for a joist with 2 1/2" deep web holes.

Use the design shear strength, ϕV_n , to calculate the maximum unsupported span length.

$$\phi V_n = \frac{wL}{2} \quad \rightarrow \quad L = \frac{2\phi V_n}{w}$$

where w = factored uniform load (plf) = $(1.2 \times 10 + 1.6 \times 40)(2) = 152$ plf

$$L = \frac{2 \times 0.9 \times 2673}{152} = L = 31.66' = 31'-8''$$

D1.2 Moment Capacity

The nominal flexural strength, M_n , is 5,461 ft-lb, as calculated in accordance with Section C3.1.1 of the *AISI Specification* for a joist with 2-1/2" deep web hole.

For a simply supported span with the top flanges laterally supported:

$$\phi M_n = \frac{wL^2}{8} \quad \rightarrow \quad L = \sqrt{\frac{8\phi M_n}{w}}$$

$$L = \sqrt{\frac{8 \times 0.95 \times 5461}{152}}$$

$$L = 16.52 \text{ feet} = 16'-6''$$

D1.3 Deflection Limit

The deflection equation for a simply supported span with distributed load is:

$$\Delta = \frac{5wL^4}{384EI} \quad \rightarrow \quad L = \sqrt[4]{\frac{385EI_x}{5w}} \text{ (Deflection Limit)}$$

where

- L = Single span length (inches)
- I_x = Effective moment of inertia for deflection = 9.8815 in⁴
- w = 50 psf (24/12) for total load deflection check and 40 psf (24/12) for live load deflection check

$E =$ Modulus of elasticity = 29,500,000 psi
 Deflection Limit = $L/240$ for total loads and $L/480$ for live loads,
 inches

The maximum span for the deflection limits for total and live loads:

$L_{TL} = 18'-8''$ (for total loads)

$L_{LL} = 15'-11''$ (for live load only)

D1.4 Web Crippling Capacity

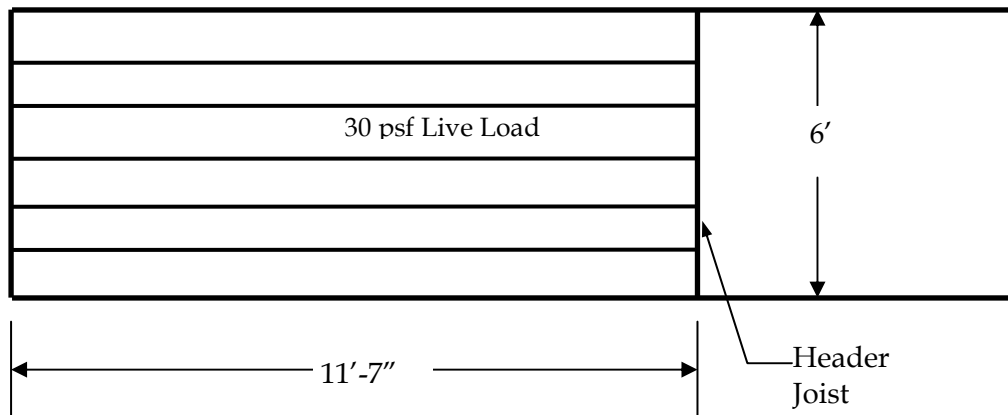
Floor joists are required to have web stiffeners at both ends and at concentrated load locations hence, there is no need to check the web crippling strength.

D1.5 Maximum Allowable Joist Span

The maximum allowable joist span is the minimum span calculated based on shear, moment, and deflection for a single span. The resulting span is 15'-11'' (controlled by the live load deflection). This result confirms the value published in *AISI S230*, Table D3-1.

D2 Header Joist Design

Check the adequacy of a 550S162-33, $F_y = 33$ ksi, header joist for a 6-foot floor opening. The header joist is fabricated using a C-section nested in a track (550T125-33, $F_y = 33$ ksi) in accordance with Detail D7-1 of *AISI S230*. The joists are spaced at 12'' on center. The floor live load is 30 psf and the dead load is 10 psf.



The maximum joist span for a 550S162-33, $F_y = 33$ ksi joists from Table D3.1 of *AISI S230* is 11'-7" (11.6').

The load on the header joist is as follows:

$$W_T = \frac{[1.2(10) + 1.6(30)](11.6')}{2} = 348 \text{ plf}$$

$$M = \frac{348(6)^2}{8} = 1,566 \text{ ft-lb}$$

The design flexural strength of the header joist is calculated in accordance with Section C3.1.1 of the *AISI Specification* (AISI, 1996).

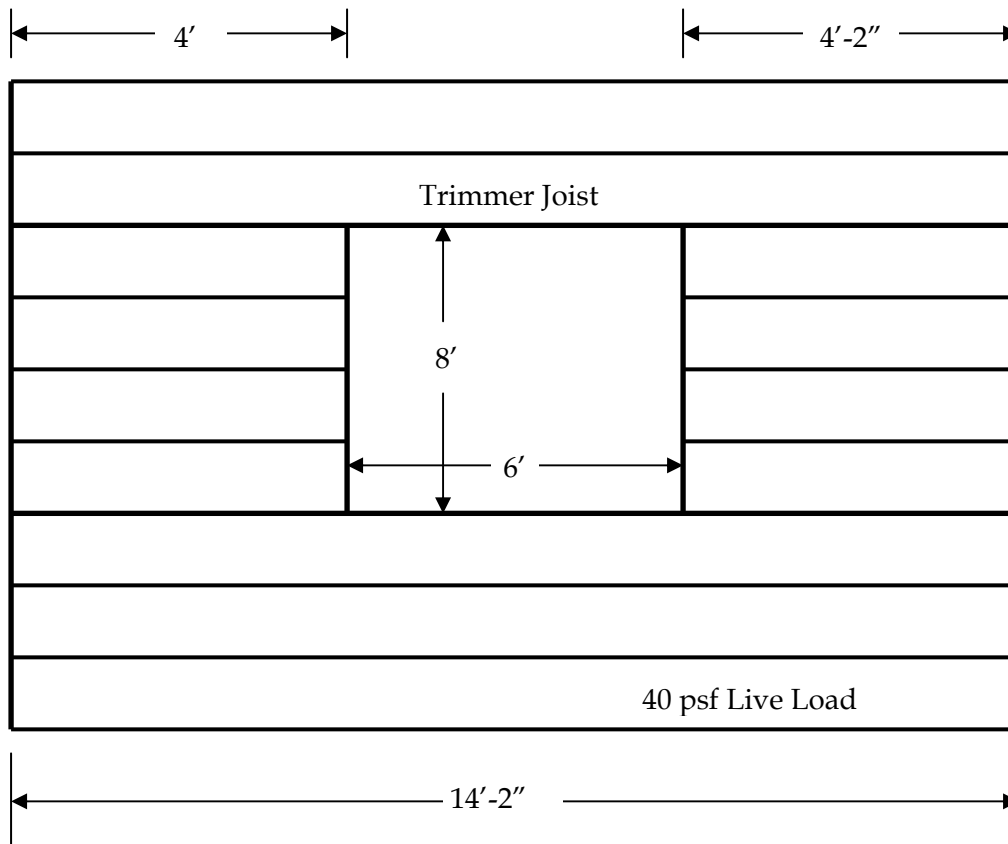
$$\begin{aligned}\phi M_1 &= 783.65 \text{ ft-lb} && \text{(for 550T125-33)} \\ \phi M_2 &= 1,099.57 \text{ ft-lb} && \text{(for 550S162-33)} \\ \phi M_T &= 783.65 \text{ ft-lb} + 1,099.57 \text{ ft-lb} = 1,883.22 \text{ ft-lb}\end{aligned}$$

$$M < \phi M_T = 1,566 \text{ ft-lb} < 1,883.22 \text{ ft-lb} \quad \text{ok}$$

This verifies the header joist design as defined by Section D7 of *AISI S230* is adequate.

D3 Trimmer Joist Design

Check the adequacy of an 800S162-68 trimmer joist for an 8-foot wide by 6-foot long opening. The joists are spaced at 24" on center. The floor live load is 40 psf and the dead load is 10 psf.



The maximum joist span from Table D3-1 of *AISI S230* is 14'-2''.

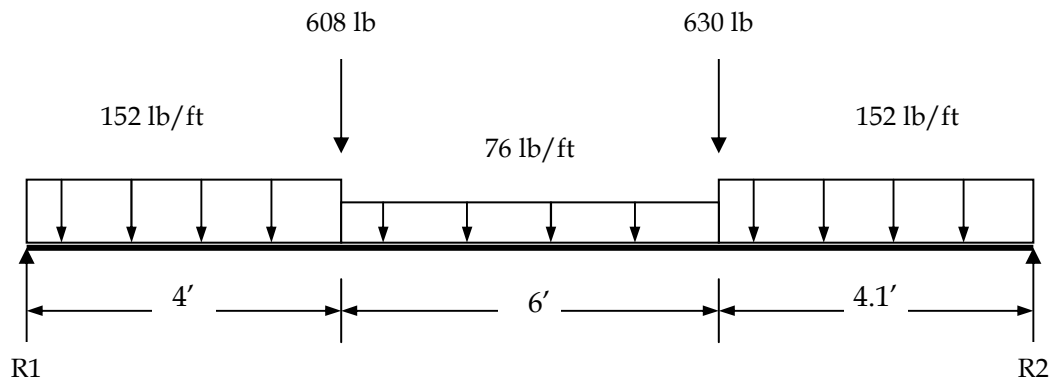
The design flexural strength for the trimmer joist is calculated in accordance with Section C3.1.1 of the *AISI Specification* (AISI, 1996):

$$\begin{aligned}\phi M_1 &= 3,501 \text{ ft-lb} && \text{(for 800T125-68)} \\ \phi M_2 &= 5,332 \text{ ft-lb} && \text{(for 800S162-68)}\end{aligned}$$

Because the opening width is 8 feet, Section D-7 and Figure D7-2 of *AISI S230* require the trimmer joist to be fabricated from two C-section joists and a track. Thus, the design strength for the trimmer joist is the sum of the strengths of the two C-sections and the track.

$$\phi M_T = 2(5,332) + 3,501 = 14,165 \text{ ft-lb}$$

The loading on the trimmer joist is as shown below. All loads are factored loads.



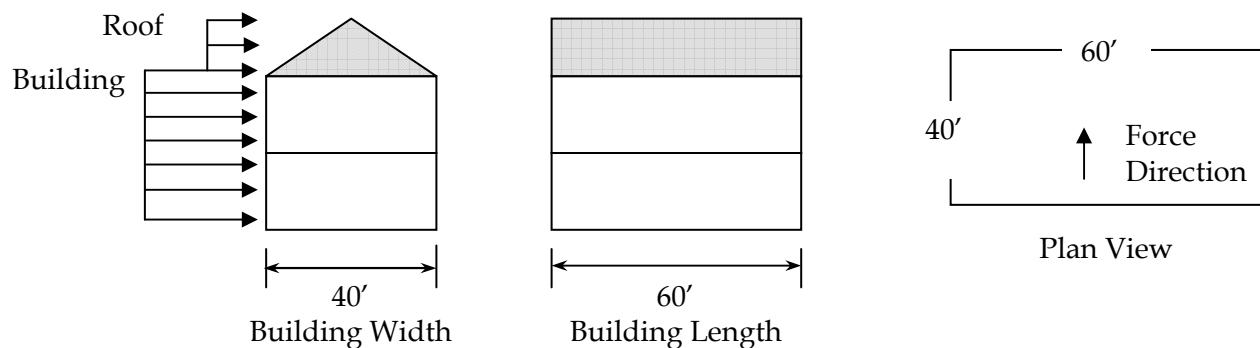
Based on the above loading, the maximum moment is 5,080 ft-lb

$$M < \phi M_T \quad \Rightarrow \quad 5,080 \text{ ft-lb} < 14,165 \text{ ft-lb} \quad \underline{ok}$$

This verifies the trimmer joist design as defined by Section D7 of *AISI S230* is adequate.

D4 Floor Diaphragm Design

Check the adequacy of a 19/32" OSB unblocked floor diaphragm for a 40x60 ft, two-story building subjected to 110 mph wind speed. The building has a roof slope of 12:12, mean roof height of 30 ft, and 8' wall studs at each floor. The building is located in Exposure Category C. The OSB floor sheathing is fastened to the floor joists with No. 8 screws spaced at 6" o.c. at panel edges and at 12" o.c. at intermediate supports.



From Table C2.1 of the *AISI S230*, the following wind pressures were obtained for the given wind speed, exposure and roof slope:

Roof pressure	= 11.7 psf
Roof corner pressure	= 14.6 psf
Main building pressure	= 24.1 psf
Main building corner pressure	= 30.3 psf

The corner area width is $2a$, where " a " is 10% of the least horizontal dimension (i.e.,

building width or building length) or 0.4 times the mean roof height, h which ever is smaller, but not less than either 4% of least horizontal dimension or 3 feet.

$$a = 0.10(40) = 4'$$

$$a = 0.4(30) = 12'$$

$$\text{Therefore } a = 4' > 0.04(40) = 1.6' \text{ or } 3'$$

$$\text{Use } a = 4'$$

$$\text{Corner area} = 2a = 8'$$

$$\text{Shear} = (60' - 16')(8')(24.1 \text{ psf}) + 16'(8')(30.3 \text{ psf}) = 12,361 \text{ lbs}$$

$$\text{Floor level diaphragm load} = (12,361/2)/40 = 155 \text{ plf}$$

$$\text{Factored diaphragm shear load} = 155 \times 1.6 = 248 \text{ plf}$$

The *North American Standard for Cold-Formed Steel Framing – Lateral Standard* (AISI S213-07) does not stipulate the design shear strength for an unblocked 19/32" diaphragm. However S213-07 does stipulate a value of 442 plf for 7/16" OSB with No. 8 screws spaced at 6".

The diaphragm in this example is therefore adequate ($442 \text{ plf} > 248 \text{ plf}$).

E. WALL FRAMING DESIGN EXAMPLES

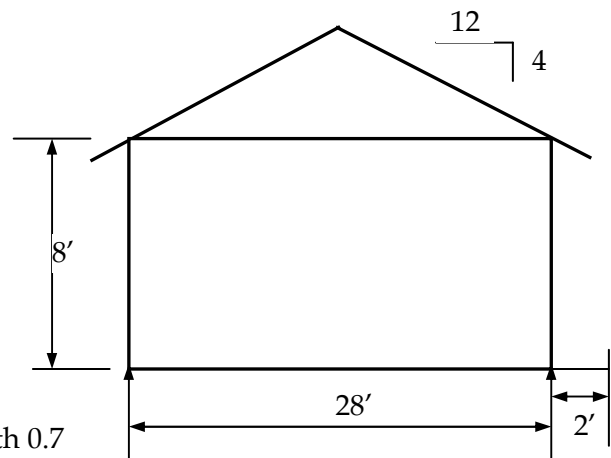
E1 Wall Stud Design

Calculate the minimum size and thickness for an 8-foot wall stud located at the upper story of a 28-foot wide two-story house that is subjected to a 90 mph, Exposure Category B wind. The studs are spaced at 24" on center. The maximum ground snow load is 30 psf. The wall studs are laterally restrained at mid-height.

All referenced equations and sections are to the *AISI Specification* (AISI, 2001) unless noted.

E1.1 Design Assumptions

28'	Building Width
2'	Roof Overhang
2'	Stud Spacing
33 ksi	Yield Stress
4:12	Roof Pitch
30 psf	Ground Snow Load
16 psf	Minimum Roof Live Load
7 psf	Roof Dead Load
5 psf	Ceiling Dead Load
45'	Building Length
8'	Wall Height
L/240	C&C ASCE 7 wind loads with 0.7 factor



E1.2 Design Loads

Dead Load:

$$\begin{aligned} \text{Ceiling Dead Load} &= 5(28)/2 &&= 70 \text{ plf} \\ \text{Roof Dead Load} &= 7(32)/2 &&= 112 \text{ plf} \\ \text{Total Dead Load (D)} &&&= 182 \text{ plf} \end{aligned}$$

Live Loads:

$$\begin{aligned} \text{Roof Live Load (L}_r\text{)} &= 16(2 + 28/2) &&= 256 \text{ plf} \\ \text{Balanced Roof Snow Load (S)} &= (0.7 \times 30)(2 + 28/2) &&= 336 \text{ plf} \\ \text{Unbalanced Roof Snow Load (S)} &= (30)(2 + 28/2)(0.75 \times 28 + 2/2)/28 &&= 377 \text{ plf} \quad \leftarrow \text{controls} \end{aligned}$$

Wind Loads:

Wind loads were calculated in accordance with ASCE 7 (ASCE, 2005) equations using MWFRS and components and cladding.

MWFRS:

MWFRS wind pressure for this design example is 10 psf.

Components and Cladding:

The C&C wind pressure for this design example is 15.1 psf.

E1.3 Load Combinations

1. 1.4D
2. 1.2D + 1.6L + 0.5(L_r or S)
3. 1.2D + 0.5L + 1.6(L_r or S)
4. 1.2D + 0.8W + 1.6(L_r or S) (using MWFRS for W)
5. 1.2D + 1.6W + 0.5L + 0.5(L_r or S) (using MWFRS for W)
6. 1.6W (C&C wind coefficients used to check bending)
7. 0.7W (C&C wind coefficients used to check deflections)

The load combinations listed below will be checked:

- | | | |
|----|---|--------------------------------|
| 1. | 1.4D = 255 plf, | No lateral load |
| 2. | 1.2D + 1.6L + 0.5(L _r or S) = 407 plf, | No lateral load |
| 3. | 1.2D + 0.5L + 1.6(L _r or S) = 822 plf, | No lateral load |
| 4. | 1.2D + 1.6(L _r or S) = 822 plf, | 0.8W = 0.8(10 x 2) = 16 plf |
| 5. | 1.2D + 0.5(L _r or S) = 407 plf, | 1.6W = 1.6(10 x 2) = 32 plf |
| 6. | | 1.6W = 1.6(15.1x 2) = 48.3 plf |

Therefore, the controlling load combinations to be checked are:

- | | | | |
|----|-------------------------------|-----|-----------------------|
| 3. | 822 x 2 = 1,643 lb axial load | and | 0 lateral load |
| 4. | 822 x 2 = 1,643 lb axial load | and | 16 plf lateral load |
| 5. | 407 x 2 = 814 lb axial load | and | 32 plf lateral load |
| 6. | 0 axial load | and | 48.3 plf lateral load |

E1.4 Member Properties

Try a 350S162-33 member and check its adequacy. The calculated design flexure strength and section properties for this member in accordance with the *AISI Specification* are:

ϕM_n	= 664.5 ft-lb
Effective section modulus, S_{xx}	= 0.2543 in ³
Effective moment of inertia, I_{xx}	= 0.5051 in ⁴
Radius of gyration, r_x	= 1.403"
Radius of gyration, r_y	= 0.616"

E1.5 Combined Axial and Bending Capacity

Check combined axial and bending in accordance with the *AISI Specification*, Section C5.2, as applicable for wall stud design.

$$\frac{P_u}{\phi_c P_n} + \frac{C_{mx} M_{ux}}{\phi_b M_{nx} \alpha_x} \leq 1.0 \quad (\text{Eq. C5.2.2-1})$$

$$\frac{P_u}{\phi_c P_{no}} + \frac{M_{ux}}{\phi_b M_{nx}} \leq 1.0 \quad (\text{Eq. C5.2.2-2})$$

$$\text{When } \frac{P_u}{\phi_c P_n} \leq 0.15 \rightarrow \frac{P_u}{\phi_c P_n} + \frac{M_{ux}}{\phi_b M_{nx}} \leq 1.0 \quad (\text{Eq. C5.2.2-3})$$

$C_{mx} = 1$ conservatively taken as unity in accordance with Section C5.2 of the *AISI Specification*

$$\alpha_x = [1 - P_u/P_{Ex}] \quad (\text{Eq. C5.2.2-4})$$

P_u = Required axial strength (LFRD)

M_{ux} = Required bending strength (LFRD)

$M_{nx} = (664.5/0.95) = 699$ ft-lb (Previously calculated)

P_n = Nominal axial strength determined in accordance with Section C4.

P_{no} = Nominal axial strength determined in accordance with Section C4, with $F_n = F_y$

ϕ_c = Factor of safety = 0.85

ϕ_b = Factor of safety = 0.95

$$P_{Ex} = \pi^2 EI_x / (K_x L_x)^2 \quad (\text{Eq. C5.2.2-6})$$

I_x = Effective moment of inertia about the x-axis at unfactored total load = 0.5051 in⁴

L_x = Actual unbraced length for bending about the x-axis = 96"

L_y = Actual unbraced length for bending about the y-axis = 48"

K_x = Effective length factor for buckling about the x-axis = 1.0

K_y = Effective length factor for buckling about the y-axis = 1.0

The nominal axial strength, P_n and P_{no} for the stud as calculated in accordance with Section C4 of the *AISI Specification* (AISI, 2001):

$P_n = 3,267$ lbs

$P_{no} = 5,631$ lbs

Load Combination 3: 1,643 lb axial load and 0 plf lateral load

$$\frac{1,643}{0.85(3,267)} = 0.59 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-1})$$

$$\frac{1,643}{0.85(5,631)} = 0.34 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-2})$$

Load Combination 4: 1,643 lb axial load and 16 plf lateral load

$$M_x = wL^2 / 8 = (16)(8)^2 / 8 = 128 \text{ ft-lb}$$

$$\frac{1,643}{0.85(3,267)} + \frac{1(128)}{0.95(699)(0.9052)} = 0.80 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-1})$$

$$\frac{1,643}{0.85(5,631)} + \frac{1(128)}{0.95(699)} = 0.54 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-2})$$

Load Combination 5: 822 lb axial load and 32 plf lateral load

$$M_x = wL^2 / 8 = (32)(8)^2 / 8 = 256 \text{ ft-lb}$$

$$\frac{822}{0.85(3,267)} + \frac{1(256)}{0.95(699)(0.9516)} = 0.70 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-1})$$

$$\frac{822}{0.85(5,631)} + \frac{1(256)}{0.95(699)} = 0.56 < 1.0 \quad \underline{ok} \quad (\text{Eq. C5.2.2-2})$$

Load Combination 6: 0 axial load and 48.3 plf lateral load

$$M_x = wL^2 / 8 = (48.3)(8)^2 / 8 = 386.4 \text{ ft-lb}$$

$$\frac{386.4}{0.95(699)} = 0.58 < 1.0 \quad (\text{since } P_u / \phi P_n < 0.15) \quad \underline{ok} \quad (\text{Eq. C5.2.2-3})$$

E1.6 Deflection Limit

Check the stud deflection using the components and cladding wind pressure with a 0.7 factor in accordance with the *North American Standard for Cold-Formed Steel Framing – Wall Stud Design* (AISI S211-07):

$$\delta = \frac{5wL^4}{384EI} \quad \text{where } w = 15.1 \text{ psf} \times 2' \times 0.7 = 21.14 \text{ plf}$$

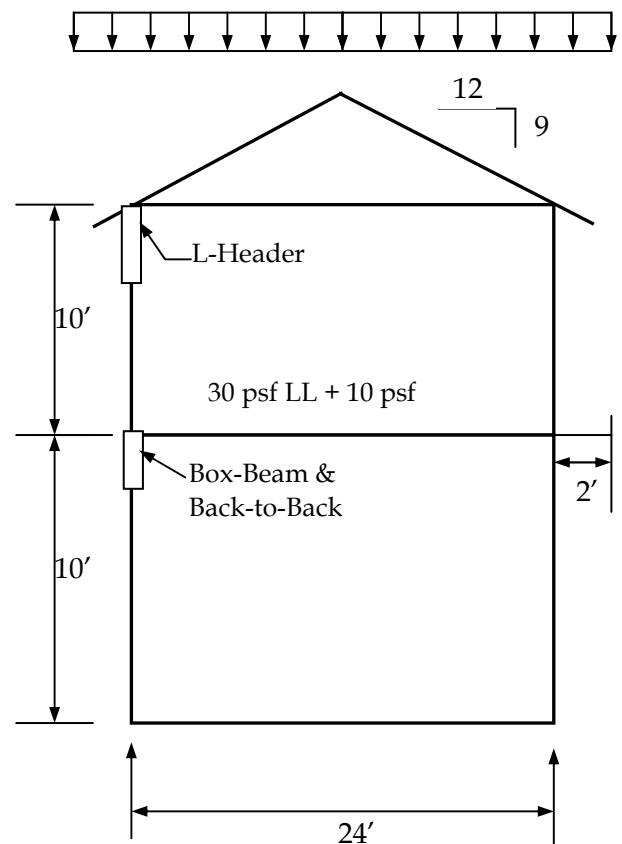
$$\delta = \frac{5(21.14/12)(96)^4}{(384)(29,500,000)(0.5051)} = 0.131'' < L/240 = 0.40'' \quad \underline{ok}$$

Therefore, 350S162-33 studs spaced at 24" on center are adequate. This verifies the wall stud selection from Table E3.2a of *AISI S230*.

E2 Box Header Design

Calculate the maximum allowable span for a 2-800S162-43 box header supporting an opening located on the first floor of the two-story, 24-foot wide building described below. Headers are designed in accordance with the *North American Standard for Cold-Formed Steel Framing Header Design* (AISI S212-07) and the *AISI Specification* (AISI, 2001). All referenced equations and sections are to the *AISI Specification* unless noted.

24'	Building Width
2'	Eave Overhang
24"	Joist/Truss/Rafter Spacing
10'	Wall Height
1.625"	Joist/Truss/Rafter Bearing Length
33 ksi	Yield Stress
50 psf	Ground Snow Load
16 psf	Minimum Roof Live Load
7 psf	Roof Dead Load
5 psf	Ceiling Dead Load
30 psf	Top Floor Live Load



10 psf	Top Floor Dead Load
L/240	Total Load Deflection Limit
L/360	Live Load Deflection Limit
10 psf	Wall Dead Load

E2.1 Design Loads

Dead Loads:

Ceiling Dead Load = $5(24/2)$	= 60 plf
Roof Dead Load = $7(28/2)$	= 98 plf
Wall Dead Load = $10(10)$	= 100 plf
Top Floor Dead Load = $10(24/2)$	= 120 plf
Total Dead Load	= 378 plf

Live Loads:

Roof Live Load = $16(28/2)$	= 224 plf
Balanced Snow Load = $0.7(50)(28/2)$	= 490 plf
Unbalanced Snow Load = $(50)(2 + 24/2)(0.75 \times 24 + 2/2)/24$	= 554 plf ← controls
Top Floor Live Load = $30(24/2)$	= 360 plf

E2.2 Load Combinations

- $1.4D = 1.4(378) = 529$ plf
- $1.2D + 1.6L + 0.5(L_r \text{ or } S) = 1.2(378) + 1.6(360) + 0.5(554) = 1,306$ plf
- $1.2D + 0.5L + 1.6(L_r \text{ or } S) = 1.2(378) + 0.5(360) + 1.6(554) = 1,520$ plf ← controls

E2.3 Member Properties

$d = 8.0''$	Depth of section
$t = 0.0451''$	Design thickness
$R = 0.09375''$	Inside bend radius
$I_{xx} = 9.00 \text{ in}^4$	Moment of inertia for deflection

E2.4 Bending Capacity

$M_n = 5,606 \text{ ft-lb}$	Nominal flexural strength (calculated per <i>Specification</i>)
$\phi_b = 0.95$	Resistance factor for flexural strength (per <i>Specification</i>)
$\phi_b M_n = 5,326 \text{ ft-lb}$	(Design strength for two sections with punched webs)

$$M = \frac{wL^2}{8} \rightarrow L = \sqrt{\frac{8M}{w}} = \sqrt{\frac{8(5,326)}{1,520}}$$

$$L = 5.29 \text{ ft} = 5'-3''$$

E2.5 Deflection Limit

$$\Delta = L/240 \text{ (total loads)}$$

The deflection equation for a simply supported span with distributed load is:

$$\Delta = \frac{5wL^4}{384EI} = L/240$$

$$L = \sqrt[4]{\frac{384EI_x(L/240)}{5w}} = \sqrt[3]{\frac{384(29,500,000)(9.00)}{5(1,292/12)(240)}} = 7'-8''$$

where: L = Single span length (inches)
 I_x = Effective moment of inertia for deflection= 9.00 in⁴
 w = 1292 plf
 E = Modulus of elasticity = 29,500,000 psi
 Deflection Limit = L/240 for total loads and L/360 for live loads,
 inches

$\Delta = L/360$ (live loads)

$$\Delta = \frac{5wL^4}{384EI} = L/360 \rightarrow L = \sqrt[3]{\frac{384(29,500,000)(9.00)}{5(360/12)360}} = 10'-3''$$

where: w = 360 plf

E2.6 Shear Capacity

In accordance with Section C3.2 of the AISI S100 the nominal shear strength, V_n , is calculated to be 5144 lb for the box header.

Use the design shear strength, ϕV_n , to calculate the maximum unsupported span length.

$$\phi V_n = \frac{wL}{2} \rightarrow L = \frac{2\phi V_n}{w}$$

where: w = required strength (factored uniform load) = 1,520 plf

$$L = \frac{2(0.95)(5,144)}{1,520} \rightarrow L = 6.43' = 6'-5''$$

E2.7 Combined Bending and Web Crippling Capacity

In accordance with Section C3.4.1 of the AISI *Specification*, the nominal web crippling strength, P_n , is calculated to be 1983 lb for the box header assuming flanges are unfastened to the support and no reduction is required for the presence of web holes.

P_n should be adjusted for presence of web holes in each of the C-section members in accordance with Section C3.4.2 of the AISI *Specification* (AISI, 2001).

Check applicability of AISI *Specification* Section C3.4.2:

$$d_0/h = 1.5/7.722 = 0.19 < 0.7$$

$$h/t = 7.722/0.0451 = 171.2 < 200$$

Holes centered at mid-depth of the web

Clear distance between holes $\geq 18''$

Circular hole diameter $\leq 6''$

Non-circular holes, hole depth (d_0) = $1.5'' \leq 2.5''$ and $b = 4'' \leq 4.5''$

$d_0 > 9/16''$

$$R_c = 0.90 - 0.047d_0/h + 0.053x/h \leq 1.0$$

(Eq. C3.4.2-2)

$$R_c = 0.90 - 0.047(1.5)/7.722 + 0.053(10)/7.722 = 0.96$$

P_n may also be adjusted using the parameter α to account for the increased strength due to the track in accordance with Section B2.3 in the *North American Standard for Cold-Formed Steel Framing – Header Design Standard* (AISI S212-07).

$$\alpha = 2.3(t_t/t_c)$$

where: $t_t = 0.0346$ in
 $t_c =$ Design thickness of the C-shape section

$$\alpha = 2.3 \left(\frac{0.0346}{0.0451} \right) = 1.765$$

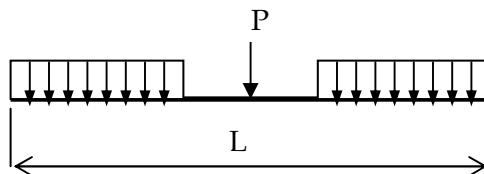
The nominal web crippling strength of the box-beam header is therefore:

$$P_n = 1,983(0.96)(1.765) = 3,360 \text{ lb} \quad (\text{for 2 webs with holes})$$

For combined bending and web crippling using the *North American Standard for Cold-Formed Steel Framing – Header Design Standard* (AISI S212-07):

$$\left(\frac{P_u}{P_n} \right) + \left(\frac{M_u}{M_{nxo}} \right) \leq 1.5\phi \quad (\text{Eq. B2.5-2})$$

The following load model is used in checking the combined bending and web crippling equation. The concentrated load is located at mid-span of the beam. The distributed load is located one foot away from the concentrated load on each side for a 2-foot joist and rafter spacing.



$$\text{Maximum moment, } M = \frac{PL}{4} + w \left(\frac{L-2}{2} \right) \left(\frac{L}{2} \right) - w \left(\frac{L-2}{2} \right) \left[\left(\frac{L}{2} \right) - \left(\frac{L-2}{4} \right) \right]$$

Substitute for all the variables in Eq. B2.5-2 and solve for L.

where: $M_{nxo} = 5,505$ ft-lb
 $\phi = 0.85$
 $w = 1,520$ plf (Section E2.2)
 $P = 2(w) = 3,040$ lbs

$$\left(\frac{3,040}{3,360} \right) + \left(\frac{M_u}{5,505} \right) \leq 1.5(0.85) \rightarrow M_u = 2,038 \text{ ft-lb}$$

$$\text{Set } M_u = M = \frac{PL}{4} + w \left(\frac{L-2}{2} \right) \left(\frac{L}{2} \right) - w \left(\frac{L-2}{2} \right) \left[\left(\frac{L}{2} \right) - \left(\frac{L-2}{4} \right) \right]$$

Solving the above equation for L gives:

$$L = 2.594 \text{ ft} = 2'-7''$$

Therefore, the maximum span for a 2-800S162-43 header for the conditions in this example is 2'-7". This confirms the maximum span given in Table E7.4a of *AISI S230*.

E3 Back-to-Back Header Design

Calculate the maximum allowable spans for a 2-800S162-43 back-to-back header supporting an opening located on the first floor of the two-story building described for the example in Section E2. All referenced equations and sections are to the *Specification* unless noted.

E3.1 Design Loads

Dead Loads:

Ceiling Dead Load = 5(24/2)	= 60 plf
Roof Dead Load = 7(28/2)	= 98 plf
Wall Dead Load = 10(10)	= 100 plf
Top Floor Dead Load = 10(24/2)	= 120 plf
Total Dead Load	= 378 plf

Live Loads:

Roof Live Load = 16(28/2)	= 224 plf
Balanced Snow Load = 0.7(50)(28/2)	= 490 plf
Unbalanced Snow Load = (50)(2 + 24/2)(0.75x24+2/2)/24 = 554 plf	← controls
Top Floor Live Load = 30(24/2)	= 360 plf

E3.2 Load Combinations

1. 1.4D = 1.4(358) = 501 plf
2. 1.2D + 1.6L + 0.5(L_r or S) = 1.2(358) + 1.6(360) + 0.5(490) = 1,251 plf
3. 1.2D + 0.5L + 1.6(L_r or S) = 1.2(358) + 0.5(360) + 1.6(490) = 1,394 plf ← controls

E3.3 Member Properties

Same as previous example in E2.3

E3.4 Bending Capacity

Same as previous example in E2.4

E3.5 Deflection Limit

Same as previous example in E2.5

E3.6 Shear Capacity

Same as previous example in E2.6

E3.7 Combined Bending and Web Crippling Capacity

In accordance with Section C3.4.1 and Table C3.4.1-1 of the *AISI Specification*, the nominal web crippling strength, P_n , is calculated to be 3,546 lb for the back-to-back header assuming flanges are unfastened to the support and no reduction is required for the presence of web holes. According to the *North American Standard for Cold-Formed Steel Framing – Header Design Standard* (AISI S212-07), back-to-back C-section headers can be treated as built-up sections for web crippling.

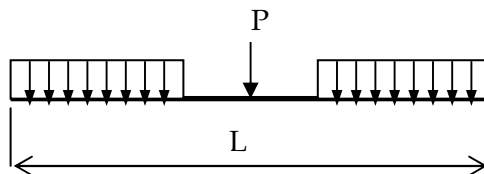
P_n should be adjusted for presence of web holes in each of the C-section members in accordance with Section C3.4.2 of the *Specification* (AISI, 2001).

$R_c = 0.96$ (Same as previous example in E2).

$P_n = 3,546 \times 0.96 = 3,404$ lb (for two webs with holes)

$$0.82 \left(\frac{P_u}{\phi_w P_n} \right) + \left(\frac{M_u}{\phi_b M_{nxo}} \right) \leq 1.32 \quad (\text{Eq. C3.5.2-2})$$

The following load model is used in checking the combined bending and web crippling equation. The concentrated load is located at mid-span of the beam. The distributed load is located one foot away from the concentrated load on each side for a 2-foot joist and rafter spacing.



$$\text{Maximum moment, } M = \frac{PL}{4} + w \left(\frac{L-2}{2} \right) \left(\frac{L}{2} \right) - w \left(\frac{L-2}{2} \right) \left[\left(\frac{L}{2} \right) - \left(\frac{L-2}{4} \right) \right]$$

Substitute for all the variables in Eq. C3.5.2-2 and solve for L.

where $M_{nxo} = 5,505$ ft-lb (Nominal flexural strength)
 $\phi_w = 0.85$ for back-to-back headers
 $\phi_b = 0.95$
 $w = 1,520$ plf (Section E2.2)
 $P = 2(w) = 3,040$ lbs

$$0.82 \left(\frac{3,040}{0.85(3,404)} \right) + \left(\frac{M_u}{0.95(5,505)} \right) \leq 1.32 \quad \rightarrow \quad M_u = 2,398 \text{ ft-lb}$$

$$\text{Set } M_u = M = \frac{PL}{4} + w \left(\frac{L-2}{2} \right) \left(\frac{L}{2} \right) - w \left(\frac{L-2}{2} \right) \left[\left(\frac{L}{2} \right) - \left(\frac{L-2}{4} \right) \right]$$

Solve the above equation for L gives:

$$L = 2.936 \text{ ft} = 2'-11''$$

Therefore, the maximum span for a 2-800S162-43 back-to-back header for the conditions in this example is 2'-11". This confirms the maximum span given in Table E7-10a of *AISI S230*.

E4 Double L-Header Design (Gravity Loading)

Calculate the maximum allowable span for a 2-800L150-54 double L-header supporting an opening located at the roof level of the two-story building described in Section E2.

E4.1 Design Loads

Dead Loads:

$$\begin{aligned} \text{Ceiling Dead Load} &= 5(24/2) &&= 60 \text{ plf} \\ \text{Roof Dead Load} &= 7(28/2) &&= 98 \text{ plf} \\ \text{Total Dead Load} &&&= 158 \text{ plf} \end{aligned}$$

Live Loads:

$$\begin{aligned} \text{Roof Live Load} &= 16(28/2) &&= 224 \text{ plf} \\ \text{Balanced Snow Load} &= 0.7(50)(28/2) &&= 490 \text{ plf} \\ \text{Unbalanced Snow Load} &= (50)(2 + 24/2)(0.75 \times 24 + 2/2)/24 = 554 \text{ plf} &&\leftarrow \text{controls} \end{aligned}$$

E4.2 Load Combinations

$$\begin{aligned} 1. \quad 1.4D &= 1.4(158) = 221 \text{ plf} \\ 2. \quad 1.2D + 0.5L + 1.6(L_r \text{ or } S) &= 1.2(158) + 1.6(554) = 1,076 \text{ plf} \quad \leftarrow \text{controls} \end{aligned}$$

E4.3 Member Properties

$$\begin{aligned} L_1 &= 8.0'' &&\text{Long leg of angle} \\ L_2 &= 1.5'' &&\text{Short leg of angle} \\ t &= 0.0566'' &&\text{Design thickness} \end{aligned}$$

E4.4 Bending Capacity

$$M_{ng} = 4,950 \text{ ft-lb} \quad \text{Nominal flexural strength (calculated in accordance with AISI S212 Section B3.1.1) calculated for two angles.}$$

The design flexural strength is determined from Section B3.1.3 of AISI S212 as follows:

$$\begin{aligned} \phi M_{ng} &= (0.90) 4,950 = 4,455 \text{ ft-lb} \\ \phi M_{ng} &= \frac{wL^2}{8} \quad \rightarrow \quad L = \sqrt{\frac{8\phi M_{ng}}{w}} \\ L &= \sqrt{\frac{8(4,455)}{1,076}} = 5.755 \text{ ft} = 5'-9'' \end{aligned}$$

Therefore, the maximum span for a 2-800L150-54 double L-header for the conditions in this example is 5'-9". This confirms the maximum span given in Table E7-15a of *AISI S230*.

E5 Double L-Header Design (Uplift Loading Case 1)

Calculate the maximum span for uplift for an L800S150-54 ($F_y = 33 \text{ ksi}$) double L-header supporting an opening located at the roof level of the two-story building described in Section

E2. The fastest-mile wind speed is 100 mph, Exposure Category C. Use Section B3 of AISI S212 *North American Standard for Cold-Formed Steel Framing – Header Design*.

E5.1 Design Loads

Dead Loads:

$$\begin{aligned} \text{Ceiling Dead Load} &= 5(24/2) &&= 60 \text{ plf} \\ \text{Roof Dead Load} &= 7(28/2) &&= \underline{98 \text{ plf}} \\ \text{Total Dead Load} &= &&= 158 \text{ plf} \end{aligned}$$

Wind Uplift Load:

Wind pressures are taken from Figure 6-2 using Method 1 from ASCE 7 (ASCE, 2005) for roof corner MWFRS wind pressures for a 20 degree roof slope, 100 mph Exposure Category C (same as 120 mph, Exposure B). The calculated pressures are perpendicular to the vertical projection of the roof and a 20 degree slope was used as it produces the greatest uplift force for the range of slopes allowed in AISI S230. The uplift pressure on the header is calculated as follows:

$$\begin{aligned} \text{Wind pressure on overhang} &= -30.1 \text{ psf} \\ \text{Wind pressure on windward slope} &= -19.1 \text{ psf} \\ \text{Wind pressure on leeward slope} &= -14.5 \text{ psf} \end{aligned}$$

Summing moments about the leeward bearing wall gives the following calculation for the reaction at the windward bearing wall (uniform uplift load on the header):

$$W = \frac{(-30.1)(2)(24+1) + (-19.1)(24/2)(3 \times 24/4) + (-14.5)(24/2)(24/4)}{24} = -278 \text{ plf}$$

E5.2 Load Combinations:

$$1. \quad 0.9D + 1.6W = 0.9(158) + 1.6(-278) = -303 \text{ plf}$$

E5.3 Member Properties

$$\begin{aligned} L_1 &= 8.0'' && \text{Long leg of angle} \\ L_2 &= 1.5'' && \text{Short leg of angle} \\ t &= 0.0566'' && \text{Design thickness} \end{aligned}$$

E5.4 Bending Capacity

$$M_{nu} = R M_{ng} \tag{Eq. B3.1.2-1}$$

where

$$\begin{aligned} M_{ng} &= 4950 \text{ ft-lbs} && \text{(from example E4).} \\ R &= \text{uplift reduction factor} \\ &= 0.25 \text{ for } L_h/t \leq 150 \\ &= 0.20 \text{ for } L_h/t \geq 170 \\ &= \text{use linear interpolation for } 150 < L_h/t < 170 \\ L_h &= \text{vertical leg dimension of the angle} \\ t &= \text{design thickness} \end{aligned}$$

For LRFD, calculate the design flexural strength for uplift:

$$L_h/t = 8.0/0.0566 = 141.3 \leq 150, \text{ Therefore, } R = 0.25$$

$$M_{nu} = 0.25(4,950) = 1,238 \text{ ft-lb}$$

$$M_u \leq \phi M_{nu} \tag{Eq. B3.1.3-4}$$

Calculate the maximum span for uplift:

$$\phi = 0.80$$

$$\phi M_{nu} = \frac{wL^2}{8} \rightarrow L = \sqrt{\frac{8\phi M_{nu}}{w}}$$

$$L = \sqrt{\frac{8(0.8)(1,238)}{303}} = 5.114' = 5'-2''$$

Therefore, the maximum span for a 2-800L150-54 double L-header for the conditions in this example is 5'-2". This confirms the maximum span given in Table E7-20a of *AISI S230*.

E6 Double L-Header Design (Uplift Loading Case 2)

Calculate the maximum span for a 2-L800S150-54 L-header located in the first story of a the two-story building described in Section F1, subjected to 110 mph Exposure Category C wind speed.

E6.1 Design Loads

Dead Loads:

Ceiling Dead Load = 5(24/2)	= 60 plf
Roof Dead Load = 7(28)/2	= 98 plf
Floor Dead Load = 10(24/2)	= 120 plf
Wall Dead Load = 10(10)	= <u>100* plf</u>
Total Dead Load	= 378 plf

* Note: Use 10' high wall which is the maximum allowed by *AISI S230*

Wind Uplift Load:

Wind pressures are taken from Figure 6-2 using Method 1 from ASCE 7 (ASCE, 2005) for roof corner MWFRS wind pressures for a 20 degree roof slope, 110 mph Exposure Category C (same as 130 mph, Exposure B). The calculated pressures are perpendicular to the vertical projection of the roof and a 20 degree slope was used as it produces the greatest uplift force for the range of slopes allowed in *AISI S230*. The uplift pressure on the header is calculated as follows:

Wind pressure on overhang:	= -35.4 psf
Wind pressure on windward slope	= -22.4 psf
Wind pressure on leeward slope	= -17.1 psf

Summing moments about the leeward bearing wall gives the following calculation for the reaction at the windward bearing wall (uniform uplift load on the header):

$$W = \frac{(-34.4)(2)(24+1) + (-22.4)(24/2)(3 \times 24/4) + (-17.1)(24/2)(24/4)}{24} = -325 \text{ plf}$$

E6.2 Load Combinations

$$1. \quad 0.9D + 1.6W = 0.9(378) + 1.6(-325) = -180 \text{ plf}$$

E6.3 Member Properties

$L_1 = 8.0''$	Long leg of angle
$L_2 = 1.5''$	Short leg of angle
$t = 0.0566''$	Design thickness

E6.4 Bending Capacity

$$M_{nu} = R M_{ng} \quad (\text{Eq. B3.1.2-1})$$

where:

$M_{ng} = 4950 \text{ ft-lbs}$	(from example E4)
R	= uplift reduction factor
	= 0.25 for $L_h/t \leq 150$
	= 0.20 for $L_h/t \geq 170$
	= use linear interpolation for $150 < L_h/t < 170$
L_h	= vertical leg dimension of the angle
t	= design thickness

For LRFD, calculate the design moment capacity for uplift:

$$L_h/t = 8.0/0.0566 = 141.34 \leq 150, \text{ Therefore, } R = 0.25$$

$$M_{nu} = 0.25(4,950) = 1,238 \text{ ft-lb}$$

Calculate the maximum span for uplift:

$$\phi = 0.80$$

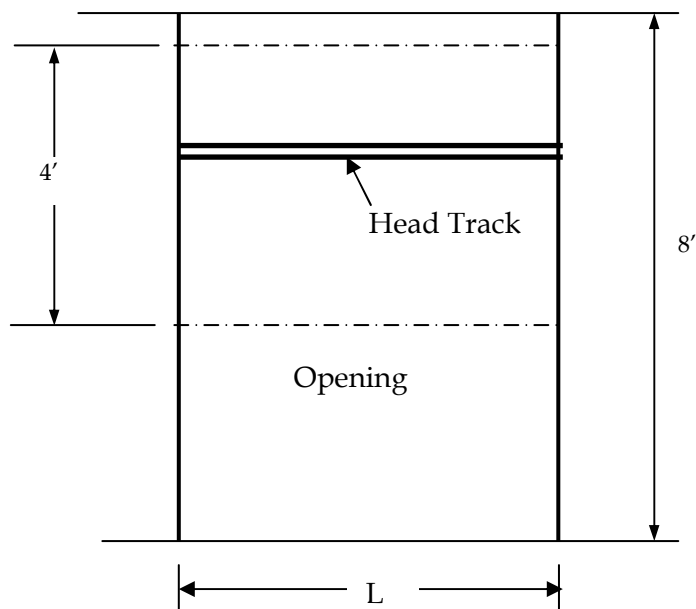
$$\phi M_{nu} = \frac{wL^2}{8} \rightarrow L = \sqrt{\frac{8\phi M_{nu}}{w}}$$

$$L = \sqrt{\frac{8(0.8)(1,238)}{180}} = 6.63' = 6'-8''$$

Therefore, the maximum span for a 2-800L150-54 double L-header for the conditions in this example is 6'-8". This confirms the maximum span given in Table E7-25a of *AISI S230*.

E7 Head Track Design

Calculate the maximum allowable span for a 350T125-33 head track for an opening in a building subjected to 120 mph Exposure Category C wind speed.



E7.1 Design Loads and Assumptions

Wind Load = 37.7 psf (Table A2.2, 120 mph Exposure Category C wind speed)

Deflection Limit = $L/240$

End Bearing Length = 6" (so bearing does not control)

8' high walls

E9 Shear Wall Design (One Story Building)

The segmented shear wall line has the following dimensions:

Wall construction:

Building Width = 30'

Building Length = 45'

Wall Height = 8'

Roof Slope = 6:12

Exterior sheathing is 7/16-inch-thick OSB with No. 8 screws spaced 6 inches on center on panel edges and 12 inches on center in panel field

Interior sheathing is 1/2-inch-thick gypsum wall board with No. 6 screws at 12 inches on center

Framing studs are 350S162-33 spaced at 24 inches on center

Calculate the sheathing requirements for the side and end walls. The building is subjected to a wind speed of 100 mph, Exposure Category C.

E9.1 Design Loads

Calculated in accordance with ASCE 7:

MWRFS building corner wind pressure = 27 psf

MWRFS building wind pressure	= 20.1 psf
Roof corner wind pressure	= 3.8 psf
Roof wind pressure	= 3.3 psf
Building gable end	= 14.7 psf
Building gable end corner	= 22.2 psf

Nominal shear value per foot of shear wall for 7/16 inch thick OSB at the stated fastening and a 2:1 aspect ratio is 910 plf (Table 2211.1(3) of IBC 2000 (ICC, 2000a)). The IBC provides shear values for GWB with 7 inch o.c. fastener spacing. It provides no shear values for 12 inch o.c. fastener spacing.

Where LRFD is used, the IBC 2000 requires the factored design shear value to be determined by multiplying the ultimate shear value by a resistance factor (ϕ) of 0.55.

$$\text{Area End} = 6/12(15')(15') + 1/2(8')(30') = 233 \text{ ft}^2$$

$$\text{Area Side} = (8'/2)(45') = 180 \text{ ft}^2$$

$$\text{Building aspect ratio} = 45/30 = 1.50$$

$$\text{Actual shear at each side wall} = (20.1 \text{ psf})(1.6)(180 \text{ ft}^2)/2 = 2,894 \text{ lb}$$

$$\text{Actual shear at each end wall} = (20.1 \text{ psf})(1.6)(233 \text{ ft}^2)/2 = 3,747 \text{ lb}$$

$$a = 10\%(30) = 3'$$

$$a = 0.4(15.5) = 6.2' \quad (\text{building height} = 8' + 7.5' = 15.5')$$

$$\text{Use } a = 3'$$

$$2a = 6'$$

$$\text{End wall corner area} = 1/2(8)(2 \times 3) = 24 \text{ ft}^2$$

$$\text{End wall area} = 1/2(8')(30') - 24 = 968 \text{ ft}^2$$

$$\text{End wall roof corner area} = 1/2(7.5)(3) = 11.25 \text{ ft}^2$$

$$\text{End wall roof area} = (6/12)(15')(15') - 11.25 = 101.25 \text{ ft}^2$$

$$\text{Side wall corner area} = 1/2(8)(6) = 24 \text{ ft}^2$$

$$\text{Side wall area} = 1/2(8')(45') - 24 = 156 \text{ ft}^2$$

$$\text{Side wall roof corner area} = (7.5)(6) = 45 \text{ ft}^2$$

$$\text{Side wall roof area} = (7.5')(45') - 45 = 292.5 \text{ ft}^2$$

$$\text{Building aspect ratio} = 45/30 = 1.50$$

Design shear at each side wall

$$= [24 \text{ ft}^2 (22.2 \text{ psf}) + 96 \text{ ft}^2 (14.7 \text{ psf}) + 11.25 \text{ ft}^2 (22.2) + 101 \text{ ft}^2 (14.7)](1.6)/2 = 2,943 \text{ lb}$$

Design shear at each end wall

$$= [24 \text{ ft}^2 (27 \text{ psf}) + (156 \text{ ft}^2 (20.1 \text{ psf}) + 45 \text{ ft}^2 (3.8 \text{ psf}) + 292.5 \text{ psf ft}^2 (3.3)](1.6)/2 = 3,936 \text{ lb}$$

E9.2 Required Sheathing

$$\text{Each end wall: } \frac{3,936}{910(0.55)} = 7.86 \text{ ft} \quad \text{This equates to 26\% length of sheathed wall}$$

required for an engineered design. Using Tables E8-1 and E8-4, 39% of sheathed wall length must be provided.

$$\text{Each side wall: } \frac{2,943}{910(0.55)} = 5.88 \text{ ft} \quad \text{This equates to 13\% length of sheathed wall}$$

required for an engineered design. Using Tables E8-1 and E8-4, 20% of sheathed wall length must be provided.

E10 Shear Wall Design (Two Story Building)

The segmented shear wall line has the following dimensions:

Wall construction:

Building width = 30'

Building length = 50'

Wall Height = 8'

Roof slope = 6:12

Exterior sheathing is 7/16-inch-thick OSB with No. 8 screws spaced 6 inches on center on panel edges and 12 inches on center in panel field.

Interior sheathing is 1/2-inch-thick gypsum wall board with No. 6 screws at 12 inches on center.

Framing studs are 350S162-33 spaced at 24 inches on center.

Calculate the sheathing requirements for the side and end walls. The building is subjected to a wind speed of 100 mph, Exposure Category C.

E10.1 Design Loads

Calculated in accordance with ASCE 7 (ASCE, 1998):

MWRFS building corner	
wind pressure	= 27 psf
MWRFS building wind pressure	= 20.1 psf
Roof corner wind pressure	= 3.8 psf
Roof wind pressure	= 3.3 psf
Building gable end	= 14.7 psf
Building gable end corner	= 22.2 psf

Nominal shear value per foot of shear wall for 7/16 inch thick OSB at the stated fastening and a 2:1 aspect ratio is 910 plf (Table 2211.1(3) of IBC 2000 (ICC, 2000a)). The IBC provides shear values for GWB with 7 inch o.c. fastener spacing. It provides no shear values for 12 inch o.c. fastener spacing.

Where LRFD is used, the IBC 2000 (ICC, 2000a) requires the factored design shear value to be determined by multiplying the ultimate shear value by a resistance factor (Φ) of 0.55.

Calculate corner area width (2a), where "a" equals 10% of least width or 0.4h (whichever is smaller) but not less than either 4% of least width or 3 feet.

$$\begin{aligned}a &= 10\%(30) = 3' \\a &= 0.4(30) = 12' \\ \text{Use } a &= 3' \\ 2a &= 6'\end{aligned}$$

$$\text{End wall corner area} = (4'+8')(6') = 72 \text{ ft}^2$$

$$\text{End wall area} = (4'+8')(30') - 72 = 288 \text{ ft}^2$$

$$\text{End wall roof corner area} = (1/2)(7.5)(3') = 11.25 \text{ ft}^2$$

$$\text{End wall roof area} = (6/12)(15')(15') - 11.25 = 101 \text{ ft}^2$$

$$\text{Side wall corner area} = (4'+8')(6') = 72 \text{ ft}^2$$

$$\text{Side wall area} = (4'+8')(50') - 72 = 528 \text{ ft}^2$$

$$\text{Side wall roof corner area} = (1/2)(7.5)(6)(2) = 45 \text{ ft}^2$$

$$\text{Side wall roof area} = (7.5')(50') - 45 = 330 \text{ ft}^2$$

$$\text{Building aspect ratio} = 50/30 = 1.67$$

Design shear at each side wall

$$= [72 \text{ ft}^2 (22.2 \text{ psf}) + 288 \text{ ft}^2 (14.7 \text{ psf}) + 11.25 \text{ ft}^2 (22.2 \text{ psf}) + 101 \text{ ft}^2 (14.7 \text{ psf})](1.6)/2 = 5,954 \text{ lb}$$

Design shear at each end wall

$$= [72 \text{ ft}^2 (27 \text{ psf}) + (528 \text{ ft}^2 (20.1 \text{ psf}) + 22.5 \text{ ft}^2 (3.8 \text{ psf}) + 330 \text{ ft}^2 (3.3 \text{ psf}))](1.6)/2 = 10,985 \text{ lb}$$

E10.2 Required Sheathing (First Floor Walls)

$$\text{Each end wall: } \frac{10,985}{910(0.55)} = 21.95 \text{ ft} \quad \text{This equates to 73\% of length of sheathed wall}$$

required for an engineered design. Using Tables E8-1 and E8-4, 97% of sheathed wall length must be provided.

$$\text{Each side wall: } \frac{5,954}{910(0.55)} = 11.90 \text{ ft} \quad \text{This equates to 24\% of side wall length of sheathed}$$

wall required for an engineered design. Using Tables E8-1 and E8-4, 35% of sheathed wall length must be provided.

E11 Shear Wall Design (High Seismic Area)

Design the lateral force resisting system for the example building shown below. Use Type I braced wall for the side walls and Type II braced walls for the end walls.

E11.1 Design Assumptions

Building Width = 30'

Building Length = 50'

Roof Slope = 6:12

Seismic Design Category = D2

Roof Dead Load = 15 psf

Exterior Wall Dead Load = 7 psf

Ground Snow Load = 25 psf

Slab-on-grade foundation

Interior Wall Dead Load = 5 psf

Overhang = 2 ft

Studs: 350S162-33

Stud Spacing = 16" on center

E11.2 Design Loads

Roof Dead Load = 15 psf

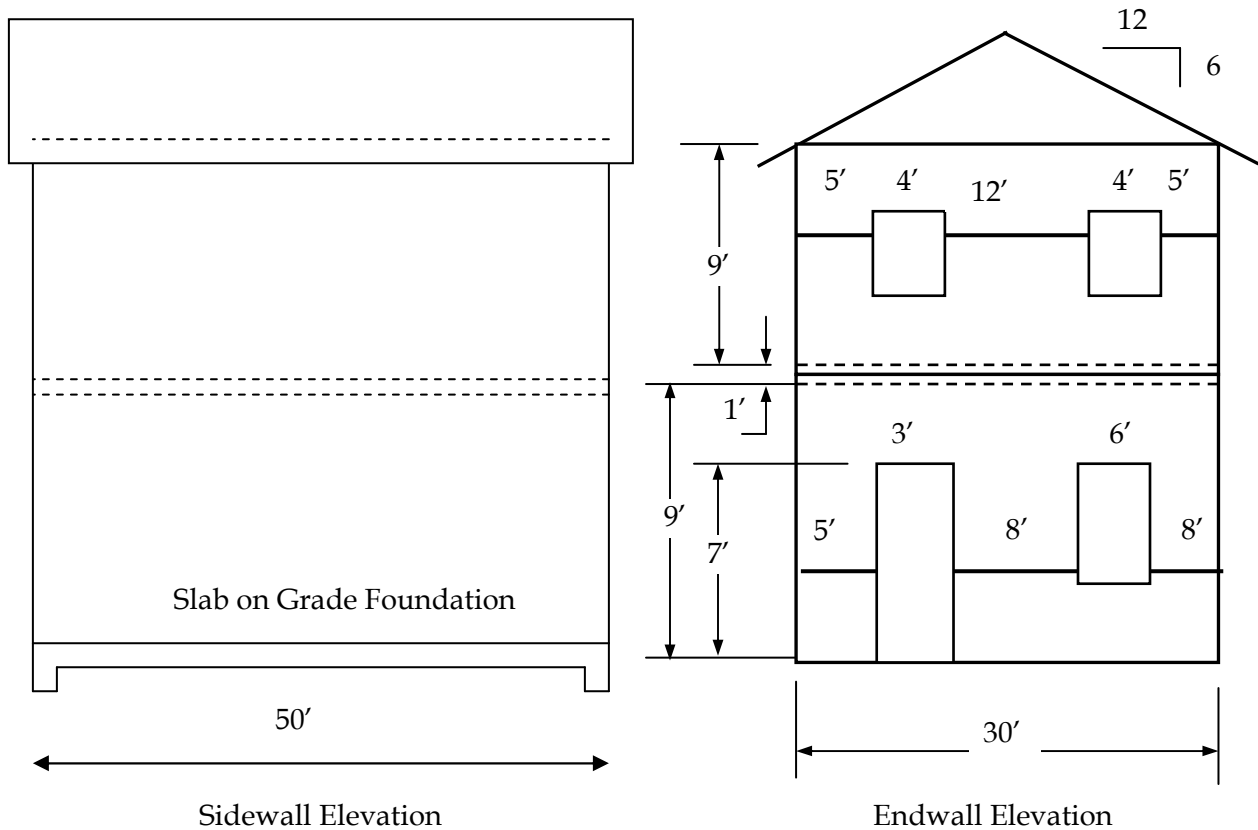
Floor Dead Load = 10 psf

Exterior Wall Dead Loads = 7 psf

Interior Walls Dead Load = 5 psf

Floor area = $(50')(30') = 1500 \text{ ft}^2$

Roof area = $[50' + 2(2)][30' + 4'] = 1836 \text{ ft}^2$. (2' overhangs)



Interior wall weight per square foot of floor area =

@ Roof = $\frac{1}{2}(5 \text{ psf}) = 2.5 \text{ psf}$

@ Floor = $\frac{1}{2}(2)(5 \text{ psf}) = 5 \text{ psf}$

Roof weight	=	15 psf(1,836 ft ²)	=	2,7540 lb	
Floor weight	=	10 psf(1,500 ft ²)	=	1,5000 lb	
Interior walls weight	=	5 psf(1,500 ft ²)	=	7,500 lb	@ Second floor
	=	2.5 psf(1,500 ft ²)	=	3,750 lb	@ Roof

Exterior Walls (Long Walls)

To Roof = $(2)(50)(9)(1/2)(7) = 3,150 \text{ lb}$

To 2nd Floor = $(2)(3,150) = 6,300 \text{ lb}$

Exterior Walls (Short Walls)

To Roof = $(2)(30)(9)(1/2)(7) = 1,890 \text{ lb}$

To 2nd Floor = $(2)(1890) = 3,780 \text{ lb}$

$$\begin{aligned} \text{Total Load at Roof} &= 3,150 + 1,890 = 5,040 \text{ lb} \\ \text{Total Load at 2nd Floor} &= 6,300 + 3,780 = 10,080 \text{ lb} \end{aligned}$$

Sum of Weights

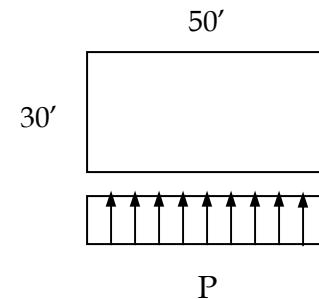
For Base Shear, Vertical Distribution and Shear Wall Design:

$$\begin{aligned} \text{At Roof:} & 27,540 + 3,750 + 5,040 = 36,330 \text{ lb} \\ \text{At 2nd Floor:} & 15,000 + 7,500 + 10,080 = \underline{32,580 \text{ lb}} \\ \text{Sum:} & 36,330 + 32,580 = 68,910 \text{ lb} \end{aligned}$$



For Diaphragm Design

$$\begin{aligned} P_{\text{Roof}} &= 36,330 - 3,150 = 33,180 \text{ lb} \\ P_{\text{2nd Floor}} &= 32,580 - 6,300 = 26,280 \text{ lb} \end{aligned}$$



$$\begin{aligned} P_{\text{Roof}} &= 36,330 - 1,890 = 34,440 \text{ lb} \\ P_{\text{2nd Floor}} &= 32,580 - 3,780 = 28,800 \text{ lb} \end{aligned}$$

Determine Base Shear - SDC D₂

Base Shear, $V = C_s W$ (IBC Eq. 16-34)

$$C_s = S_{DS}/R$$

$$S_{DS} = 1.17$$

$$R = 6$$

$$C_s = 1.17/6 = 0.195$$

$$V = (0.195)(68,910) = 13,437 \text{ lb}$$

(IRC Table R301.2.2.1.1)
(IBC Table 1617.6, System 1-K)

Vertical Distribution

$$F_x = C_{vx} V$$

(IBC Eq. 16-41)

$$C_{vx} = \frac{W_x H_x}{\sum_{i=1}^n W_i H_i}$$

(IBC Eq. 16-42 with $K = 1$)

$$V_x = \sum_{i=1}^n F_i$$

(IBC Eq. 16-43)

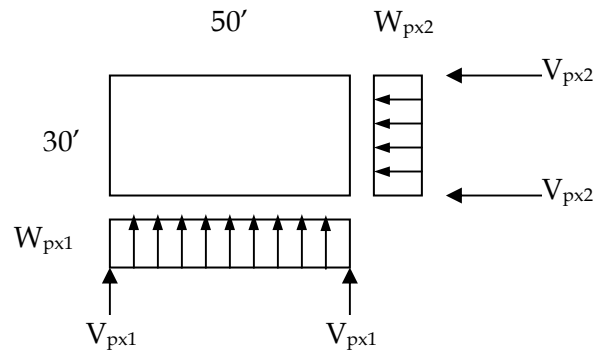
$$\text{Height}_{\text{2nd}} = 9' + 1' = 10 \text{ ft}$$

$$\text{Height}_{\text{Roof}} = (2)(9) + 1 + \frac{1}{2}(7.5') = 22.75 \text{ ft}$$

Diaphragm	Weight (lb)	Height (ft)	Weight x Height	C _{vx}	F _x (lb)	V _x (lb)
Roof	36,330	22.75'	826,508	0.7173	9,638	9,638
2nd Floor	32,580	10'	325,800	0.2827	3,799	13,437
Total	68,910		1,152,308			

Diaphragm Loads

$$F_{px} = \frac{\sum_{i=x}^n F_x}{\sum_{i=x}^n W_i} W_{px}$$



Diaphragm	F _x (lb)	W _x (lb)	W _{px} (lb)	ΣF _i (lb)	ΣW _i (lb)	F _{px} (lb)	V _{px} (lb/ft)
Roof	9,638	36,330	W _{px1} =34,440	9,638	36,330	9,137	152
			W _{px2} =33,180			8,802	88
2nd Floor	3,799	32,580	W _{px1} =28,800	13,437	68,910	5,616	94
			W _{px2} =26,280			5,124	51

Compare with 0.15(S_{DS} I_EW_{px}) and 0.3 (S_{DS} I_EW_{px}) (IBC Eq. 1620.3.3)

S_{DS} = 1.17; I_E = 1.0

Roof 6,044 lb < 9,137 lb < 12,088 lb ok

2nd 5,054 lb < 5,616 lb < 10,109 lb ok

Diaphragm Chord Splice Requirements

Determine Chord Force and Splice Requirements with Amplified Chord Force

Diaphragm	W _p (lb/ft)	L (ft)	C=T (lb)	Ω ₀	Ω ₀ T	Required No. 8 Screws @ Splice
Roof	183	50	1,906	2.5	4,765	20
	293	30	659		1,648	7
2nd Floor	113	50	1,177	2.5	2,943	12
	171	30	385		963	4

where W_p = F_{px}/L; C=T= W_pL²/8L²

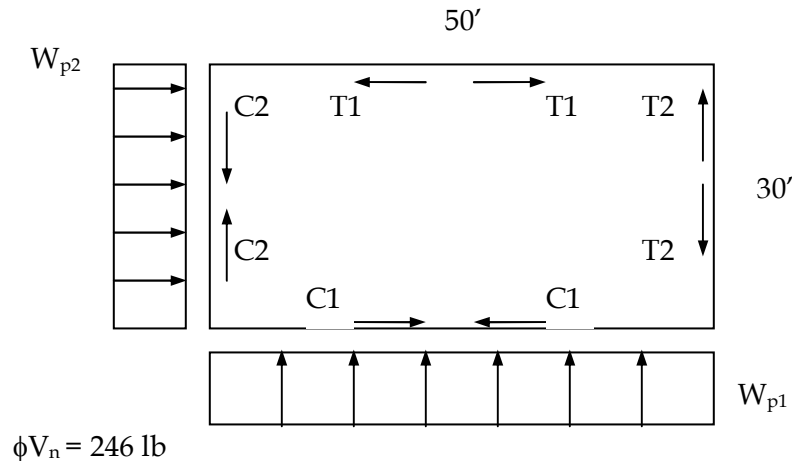
These are the required number of screws for an engineered design. From Table E12-20, in AISI S230, 23, 9, 15 and 5 screws respectively must be provided.

Note: Ω₀ = 2.5 based on system 1.K from Table 1617.6 of the IBC 2000 with 0.5 reduction for flexible diaphragm (3.0 - 0.5 = 2.5)

Note: For No. 8 screws, assuming 33 mil top track:

$$\phi = 0.5 \text{ for screws in shear}$$

$$V_n = 492 \text{ lb}$$



E11.3 Required Sheathing (Side Walls)

Per Table 2211.1(3) and Section 2211.6 of the 2000 IBC:

$V_n = 700 \text{ plf}$ (7/16" OSB w/6" screw spacing at panel edges and 12" at interior supports)

$$\phi = 0.55$$

$$\phi V_n = 385 \text{ lb/ft}$$

Wall Level	V_x (lb)	V_{wall} ($V_x/2$) (lb)	L_{Required} ($V_{\text{wall}}/\phi V_n$) (ft)
2 nd	9,638	4,819	12.60
1 st	13,437	6,719	17.45

Provide (1) shear wall at each corner of each side and end walls (2 shear walls per wall)

Second Floor: $L = 12.52 \text{ ft}$ Use 7 feet each end

First Floor: $L = 17.45 \text{ ft}$ Use 9 feet each end

These are the required lengths for an engineered design. Using Tables E12-3 and E12-4 in *AISI S230*, 9 ft for the second floor and 13 ft for the first floor must be provided at each end.

E11.4 Hold Downs and Multiple Stud Posts (Side Walls)

Second Floor: $V = 346 \text{ plf}$ $T/C = 3,120 \text{ lb}$

First Floor: $V = 373 \text{ plf}$ $T/C = 3,730 \text{ lb}$

Multiple Studs Required at Shear Wall Ends

Second Floor:	$P_u = 3,120$ lb	
First Floor:	$P_u = 6,850$ lb	(when chords align)
First Floor:	$P_u = 3,730$ lb	(when chords do not align)

Allowable loads:

(2) 350S162-33:	$\phi P_n = 4,945$ lb	$\phi P_n = 4,945$ lb > 3,730 lb
(2) 350S162-54:	$\phi P_n = 8,102$ lb	$\phi P_n = 8,102$ lb > 6,850 lb

These are the multiple studs for an engineered design. Using Table E12-19, 54 mil studs are not an option, therefore the *AISI 230* would not apply for this design.

Hold Downs Required at Shear Wall Ends

Single Shear Wall:	$T_u = 3,730$ lbs	$T_{ASD} = 2,710$ lb
Aligning Shear Walls:	$T_u = 6,850$ lbs	$T_{ASD} = 4,893$ lb

Using a Hold Down with 5/8" diameter bolt for single shear wall:

$T_{allowable} = 5,260$ lbs
$T_{allowable} = 3,950$ lbs (without 1/3 increase for wind/seismic)
$T_{allowable} > T_{ASD} = 2,710$ lb

Using Hold Down with 5/8" diameter bolt for aligning shear wall:

$T_{allowable} = 7,920$ lbs
$T_{allowable} = 5,940$ lbs (without 1/3 increase for wind/seismic)
$T_{allowable} > T_{ASD} = 4,940$ lb

E11.5 Required Sheathing (End Walls)

End wall shear walls use 7/16" OSB fastened with No. 8 screws at 6" at panel edges and 12" at intermediate supports. Per previous calculations, $L_{Required}$ at 2nd floor = 12.6'; and $L_{Required}$ at 1st floor = 17.45'.

Try Type II walls (perforated shear wall):

Determine percentage of fully sheathed wall	@ 2 nd floor = $(5+12+5)/30 = 0.73 = 73.3\%$
	@ 1 st floor = $(5+8+8)/30 = 0.70 = 70\%$

Maximum unrestrained opening at 1st and 2nd floor = 7', with wall fully sheathed above and below.

Interpolate for length adjustment factor from Table E11-2 for both "Percent Fully Sheathed Wall" and "Maximum Unrestrained Opening Height":

At 2nd Floor:

% Fully Sheathed	6.75'	7'	7.5'
60	1.28		1.32
73.3	1.176	1.182	1.203
80	1.12		1.14

Therefore, the required length of fully sheathed (Type II) wall = $(1.182)(12.60') = 14.89'$
 $14.89' < 22'$ provided by the full height sheathing for the upper wall. ok

At 1st Floor:

% Fully Sheathed	6.75'	7'	7.5'
60	1.28	1.293	1.32
70	1.2	1.21	1.23
80	1.12	1.127	1.14

Therefore, the required length of fully sheathed (Type II) wall = $(1.21)(17.45') = 21.11'$
 $21.11'$ is close to $21'$ provided by the full height sheathing for the lower wall. ok

E11.6 Hold Downs and Multiple Stud Posts (End Walls)

Second Floor: $V = 162$ plf $T/C = 1,460$ lb (when chords do not align)
 First Floor: $V = 228$ plf $T/C = 3,730$ lb (when chords align)

Allowable loads:

(2) 350S162-33: $\phi P_n = 4,945$ lb $\phi P_n = 4,945 > 3,730$ lb ok

Hold Downs Required at Shear Wall Ends

Single Shear Wall: $T_u = 1,460$ lbs $T_{ASD} = 1,040$ lb
 Aligning Shear Walls: $T_u = 3,730$ lbs $T_{ASD} = 2,670$ lb

Using a Hold Down with 5/8" diameter bolt. For single shear walls:

$T_{allowable} = 5,260$ lbs
 $T_{allowable} = 3,950$ lbs (without 1/3 increase for wind/seismic)
 $T_{allowable} > T_{ASD} = 1,040$ lb

These are the multiple studs and hold down requirements for an engineered design. Use Table E12-17 to determine the chord strength and hold down strength required for this design.

Determination of Top Track Requirements to Accommodate Diaphragm Chord Forces

From the above, @Roof $C_{max} = 1,906$ lb
 @2nd Floor $C_{max} = 1,177$ lb

Using computer software, the maximum axial capacity of a 350T125-33 (top track) is 2,882 lbs (concentric load with no weak axis bracing and a maximum track length of 1.33 ft).

For $L = 16''$ with track considered fully braced, $\phi P_n = 2,882 \text{ lb} > 1,906 \text{ lb}$

Note: The diaphragm chord forces were tabulated for the various roof and wall height combinations at various diaphragm spans with some breakdown of diaphragm aspect ratios where warranted.

Establish Shear Anchor Requirements Based on Shear Wall Edge Screw Spacing

Use shear wall capacity, based on shear wall edge screw spacing (6" o.c. at panel edges) to determine required shear anchor capacity:

$$\phi V_n = 385 \text{ plf @ } 6'' \text{ panel edge screw spacing}$$

Check 350T125-33 bottom track with nested 350S162-33 stud:

$$\phi P_{n(\text{Track})} = 2,420 \text{ lb bearing capacity of track plus stud} \quad (\text{Table E3.3-2})$$

where:

$$\begin{aligned} F_u &= 45 \text{ ksi} \\ t &= 0.0346'' \\ d &= 0.5'' \\ \phi &= 0.7 \end{aligned} \quad (\text{Table E3.3-2})$$

$$\phi P_n = 3,444 \text{ lb shear capacity of } \frac{1}{2}'' \text{ diameter bolt} \quad (\text{Eq. E3.4-1})$$

where:

$$\begin{aligned} A_b &= 0.196 \text{ in}^2 \\ F_{nv} &= 27 \text{ ksi} \\ \phi &= 0.65 \end{aligned} \quad \begin{aligned} &(\text{Table E3.4-1}) \\ &(\text{Table E3.4-1}) \end{aligned}$$

$$\text{Required Fastener Spacing} = 2,420/385 = 6.28 \text{ feet}$$

This is the fastener spacing for an engineered design. Using Table E12-18, the required spacing is 5.0 feet.

E11.7 Continuous Strap for Drag Force

A. Tensile Capacity of 2.5" x 43-mil Strap

$$\phi T_n = (0.95)(33 \text{ ksi})(2.5'')(0.0451'') = 3.535 \text{ kips}$$

Where:

$$\begin{aligned} F_y &= 33 \text{ ksi} \\ A_n &= 0.113 \text{ in}^2 \\ \phi &= 0.95 \end{aligned}$$

B. Screw Shear Capacity for Strap End Connections:

Screw Size	$V_a^*(\text{lb})$	Ω	ϕ	ϕV_n	No. Required**
No. 8 Screw	244	3	0.5	366	11
No. 10 Screw	263	3	0.5	395	10

*Values for screw shear capacity was obtained from Section 1, Table C-B1.

**No. 8 screw: $\phi V_n = (244)(\Omega\phi) = 244(3)(0.5) = 366 \text{ lb/screw}$

No. 10 screw: $\phi V_n = (263)(\Omega\phi) = 263(3)(0.5) = 395 \text{ lb/screw}$

$3,535/366 = 9.66$ Use (10) No. 8 screws, or,

$3,535/395 = 8.95$ Use (9) No. 10 screws

Maximum diaphragm shear = 346 plf (at roof level)

C. Maximum Blocking Spacing Based on Tensile Capacity of Strap

$$\text{Spacing} = 3,535/346 = 10.22 \text{ feet}$$

D. Maximum Blocking Spacing Based on Capacity of Blocking

Block properties: $h = 7.5 \text{ in}$
 $t = 0.0566 \text{ in}$
 $h/t = 132.51$
 $k_v = 5.34$ (assume unreinforced web)
 $F_y = 33 \text{ ksi}$
 $[E k_v / F_y]^{1/2} = 68.5$

$$0.96(68.5) = 65.76 < 132.51$$

$$1.415(68.5) = 96.93 < 132.51$$

$$V_n = 0.905 E k_v t^3 / h$$

$$V_n = 3,388 \text{ lb}$$

$$\phi V_n = 0.90(3,388) = 3,049 \text{ lb}$$

(Eq. C3.2-3)

$$\text{Clip Spacing} = 3,049/346 = 8.81 \text{ feet}$$

Space blocking at 8-foot maximum and at each end.

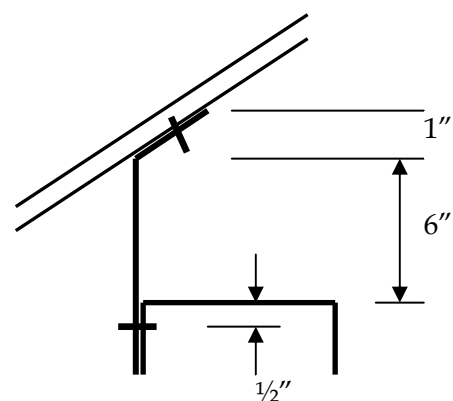
This spacing is for an engineered design. Using Figure E11-6 of *AISI S230*, blocking is required at 4-foot maximum spacing and 13 No. 8 screws from strap to blocking panel.

E11.8 Stabilizing Clip at Eave Block

Use calculated value for $\phi V_n = 3,049 \text{ lb}$

$V_{\max} = \phi V_n$ for the block

Assume 6" blocking depth + 2" to connection:

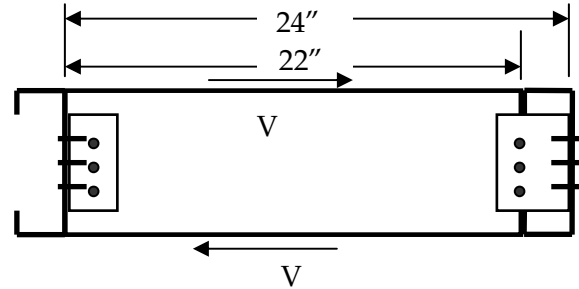


$$M_{\text{Block}} = (8'')(3.049) = 24.4 \text{ in-k}$$

$$V_{\text{clip}} = 24.4/22 = 1.11 \text{ k}$$

$$\text{No. of Screws Required} = 1,110 / [(0.5)(3)(244)] = 3.03 \quad (\text{assume } 43 \text{ mil rafters})$$

Use (4) No. 8 screws. This is for an engineered design. Using Figure E11-6 of *AISI S230*, blocking is required the clip requires 4 No. 8 screws for blocking spaced at 4'-0" o.c.



E11.9 Connection of Shear Wall to Floor Diaphragm to Shear Wall Below

Sheathing Screw Spacing	6"
Sheathing Shear capacity, ϕV_n (plf)	385 lbs
No. 8 Screw Capacity	246 lbs
Number of No. 8 Screws Required Per Foot	2

This validates the note "Use No. 8 screws to match edge screw spacing for braced wall above" as stipulated by Figure E11-8.

E12 Shear Wall Design (High Wind Area)

Design the lateral force resisting system for the example building shown below. Use Type I braced wall for the side walls and Type II braced walls for the end walls.

E12.1 Design Assumptions

- Building Width = 32'
- Building Length = 50'
- Roof Slope = 3:12
- Design Wind Speed = 120 mph Exposure Category B
- Roof Dead Load = 15 psf
- Wall Dead Load = 7 psf
- Ground Snow Load = 25 psf
- Slab-on-Grade Foundation
- Framing Studs: 350S162-33
- Stud Spacing = 16" on center

Calculate Wind Load

In accordance with ASCE 7 (ASCE, 1998):

Directionality Factor (K_d) = 0.85 (Table 6-6)

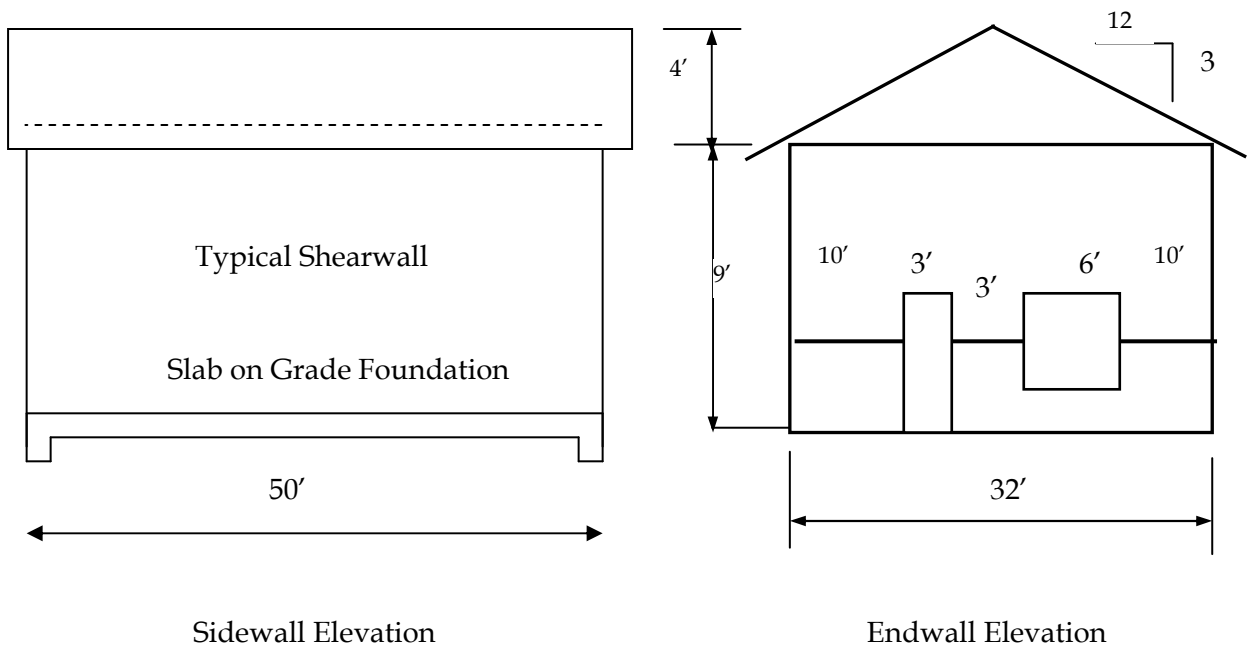
Importance Factor = 1.0 (Section 6.5.5)

Topographic Factor (K_{zt}) = 1.0 (Figure 6-2)

Velocity Exposure (K_z) = 0.70 (Table 6-5)

Velocity Pressure = $q_z = 0.00256 \times K_z \times K_{zt} \times K_d (V^2 \times I) = 21.934$ (Eq. 6-13)

Pressure = $p = q_z[(GC_{pf}) - (GC_{pi})]$ (Eq. 6-16)



GC_{pf} (ASCE Figure 6-4) CASE A

Roof Slope = 14.03 degrees

Area 1	Area 2	Area 3	Area 4	Area 1E	Area 2E	Area 3E	Area 4E
0.478	-0.690	-0.436	-0.374	0.724	-1.070	-0.626	-0.556

GC_{pi} (ASCE Figure 6-4) CASE A

Enclosed Buildings

+0.18	-0.18
-------	-------

GC_{pf} (ASCE Figure 6-4) CASE B

Roof Slope = 14.03 degrees

Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 1E	Area 2E	Area 3E	Area 4E	Area 5E	Area 6E
-0.45	-0.69	-0.37	-0.45	0.4	-0.29	-0.48	-1.07	-0.53	-0.48	0.61	-0.43

p (psf) - CASE A
 Roof Slope = 14.03 degrees

Area 1	Area 2	Area 3	Area 4	Area 1E	Area 2E	Area 3E	Area 4E
14.43	-19.08	-13.51	-12.15	19.83	-27.42	-17.68	-16.14

p (psf) - CASE B
 Roof Slope = 14.03 degrees

Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 1E	Area 2E	Area 3E	Area 4E	Area 5E	Area 6E
-13.82	-19.08	-12.06	-13.82	12.72	-10.31	-14.48	-27.42	-15.57	-14.48	17.33	-13.38

The above are based on corner length as follows:

$$\begin{aligned}
 0.4 \times \text{Building Height} &= 5.20 \text{ ft} && (\text{height} = 13.00 \text{ ft}) \\
 0.1 \times \text{min. Width} &= 3.20 \text{ ft} \\
 \text{Not less than } 3' &= 3.00 \text{ ft} \\
 a &= 3.20 \text{ ft} \\
 \text{Corner Length} = 2a &= 6.40 \text{ ft}
 \end{aligned}$$

Roof Area 2 Factored Wind Load = 19.08 (1.6) = 30.52 psf

Roof Area 3 Factored Wind Load = 13.51 (1.6) = 21.62 psf

Factored Roof Dead Load = 0.9(15 psf) = 13.5 psf

Determine Forces in Walls

Side Walls

$$\begin{aligned}
 P &= 12.72 + 10.31 = 23.03 \text{ psf (interior)} \\
 P &= 17.33 + 13.38 = 30.71 \text{ psf (exterior, corner)}
 \end{aligned}$$

Force/Wall

$$\begin{aligned}
 &= \left[23.03 \text{ psf} \left(\frac{1}{2} \right) (9') \frac{32' - 6.4'}{2 \text{ walls}} \right] + \left[23.03 \text{ psf} \frac{(1/2)(32')(4')}{2 \text{ walls}} \right] - \left[\frac{23.03 \text{ psf} (3.2')(0.8)}{2} \right] \\
 &+ \left[\frac{30.71 \text{ psf} (3.2')(9')}{2} \right] + \left[\frac{(30.71 \text{ psf})(3.2')(0.8)}{2} \right]
 \end{aligned}$$

Force/Wall = 2515 lb/side wall

End Walls

$$\begin{aligned}
 P &= 14.43 + 12.15 = 26.58 \text{ psf (interior)} \\
 P &= 19.82 + 16.14 = 35.96 \text{ psf (corner)}
 \end{aligned}$$

Roof: $P_1 = -19.08 \text{ psf (Area 2)}$, $P_2 = -13.51 \text{ psf (Area 1)}$
 $[\text{Sin}(14.03)][-19.08] = -4.62 \text{ psf}$ $[\text{Sin}(14.03)][13.51] = 3.27 \text{ psf}$
 $P_1 = -27.41 \text{ psf (Area 2E)}$, $P_2 = -17.67 \text{ psf (Area 1E)}$

Total load from roof = $4.62 - 3.27 = 1.35$ psf. (typ.)

Total load from roof = 2.36 psf (corner)

$$\begin{aligned} \text{Force/Wall} &= (26.58 \text{ psf})(9' \times 1/2)(50' - 12.8')/2 \text{ walls} + (35.96 \text{ psf})(1/2)(9')(6.4') \\ &+ (-4.35 \text{ psf})(4')[(50' - 12.8')/2] + (-2.36 \text{ psf})(4')(6.4') = 3,099 \text{ lb/end wall} \end{aligned}$$

However, in accordance with ASCE 7 the total horizontal shear shall not be less than that determined by neglecting wind roof surfaces. Therefore,

$$\begin{aligned} \text{Force/wall} &= (26.58 \text{ psf})(9'/2)(37.2') + (35.96 \text{ psf})(9'/2)(12.8') \\ &= 6,520 \text{ lb}/2 \text{ sides} \\ &= 3,260 \text{ lb} \end{aligned}$$

Chords

$v = 1,258 \text{ lb Side wall} / 4' \text{ long} = 315 \text{ plf}$

$v = 1,630 \text{ lb End wall} / 5' \text{ long} = 326 \text{ plf}$

Wall height = 9 feet

Maximum chord force = $326(9) = 2,934 \text{ lb}$

This force is for an engineered design. Using Table E13-10 a maximum chord strength of 4419 lb is required.

Post: Use (2) 350S162-33 studs braced at 4' ($P_{\text{all}} = 4,945 \text{ lb}$)

Hold Downs

$P = 2,934 \text{ lb}$

Attach hold down to each end of each shear wall panel. Use hold-downs with 5/8" diameter bolt ($P_{\text{all}} = 3,295 \text{ lb}$).

The 3,295 lb hold down capacity is calculated as follows:

$P_{\text{all}} = 4,385 \text{ lb}$ for 54 mil member with 14 No. 10 screws.

$P_{\text{all}} = (177 \text{ lb/screw})(14)(1.33) = 3,295 \text{ lb}$ for 33 mil member.

E12.2 Length of Shear Panel (Side Walls)

$P = 2,515/2 \text{ panels} = 1,258 \text{ lb per shear wall}$

In accordance with Table 2211.1(1) of IBC 2000: $V_n = 910/2.5 = 364 \text{ lb}$

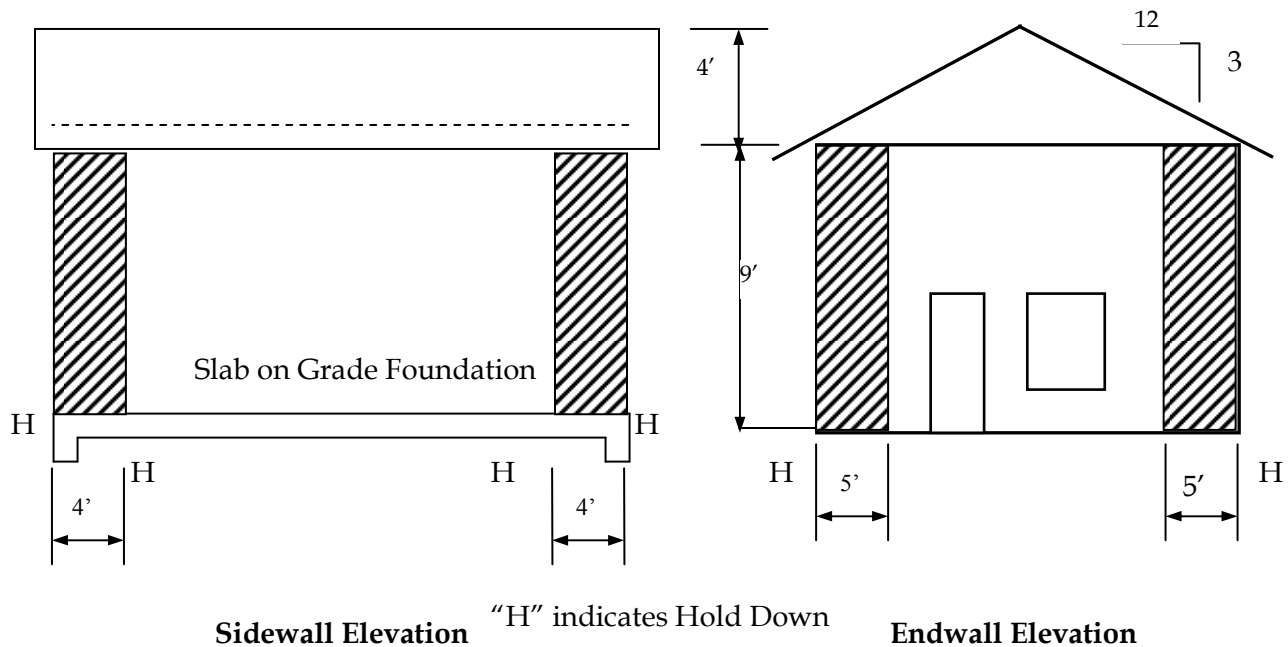
Length of shear panel required = $1,258/364 = 3.46 \text{ ft/shear wall}$

E12.3 Length of Shear Panel (End Walls)

$P = 3,260/2 \text{ panels} = 1,630 \text{ lb per shear wall}$

In accordance with Table 2211.1(1) of IBC 2000: $V_n = 910/2.5 = 364$ lb with 6" fastener spacing.

Length of shear panel required = $1,630/364 = 4.48$ ft/shear wall



Verify the above design with the requirements of AISI S230:

Range of allowable side wall lengths of one-story slab-on-grade (Table E13-1)

Minimum = 14 feet/1.21 = 11.57' (adjusted for Exposure Category B)

Maximum = 60 feet/1.21 = 66.11 feet (adjusted for Exposure Category B)

Required minimum length of full height sheathing on side walls (Type I):

Minimum = $7'(1.13) = 7.91$ feet (6" fastener spacing) (Table E13-3)

Required minimum length of full height sheathing on side walls (Type I):

Minimum sheathing length = $8'(1.13)(1/1.21)(0.8) = 5.23$ feet (6" fastener spacing) (Table E13-4)

(1.21 adjustment factor for Exp. B; 1.13 adjustment factor for 9' walls; 0.8 adjustment factor for mean roof height < 15')

Use (2) 4' long shear walls with 7/16" OSB fastened with No. 8 screws at 6" o.c. at edges.

Required minimum length of full height sheathing on end walls (Type I):

Minimum sheathing length = $8'(1.13)(0.8)(1/1.21) = 5.97$ feet

(1.21 adjustment factor for Exp. B; 1.13 adjustment factor for 9' walls; 0.8 adjustment factor for mean roof height < 15')

Since this is a Type II shear wall, check the applicability of any factors:

The length of full height sheathing cannot be multiplied by any factor from Table E12.1 because the roof dead load is greater than 11 psf and the wall dead load is not less than 7 psf.

$L = 5.97$ feet. (6" o.c. edge fastener spacing)

Use (2) 5' long shear walls with 7/16" OSB fastened with No. 8 screws at 6" o.c. at edges.

E12.4 Braced Wall Hold Down Anchorage

Required hold down anchor force from Table E12.2 = 3,535 lbs. (9-foot walls and 6" screw spacing).

$F = 3,535/1.4 = 2,525$ lb (The 1.4 factor is from Table E12-2 of *AISI S230*)

F. ROOF FRAMING DESIGN EXAMPLES

F1 Ceiling Joist Design

Calculate the maximum allowable single span for a 550S162-33 ceiling joist (attics with limited storage) with bearing stiffeners at each support. The deflection limit is $L/240$ (total loads). The joists are spaced at 24 inches on center and laterally braced (on compression flange) at mid-span.

F1.1 Design Assumptions

Joist Spacing = 24"
 Steel Yield Strength = 33 ksi
 Ceiling Dead Load = 5 psf
 Attic Live Load for Attics with Limited Storage = 20 psf
 Live Load + Dead Load Deflection Limit = $L/240$
 Punchouts: 2-1/2" wide x 4" long along centerline of joist

F1.2 Design Loads

Dead Load:
 Ceiling Dead Load (D) = 5 psf
Live Loads:
 Attic Live Load (L) = 20 psf

F1.3 Load Combinations

1. $1.4D = 14$ plf
2. $1.2D + 1.6L = 76$ plf

Therefore, the controlling factored uniform design load, w_u , is 76 plf

F1.4 Member Properties

Select a 550S162-33 member and check its adequacy. The calculated design flexure strength and section properties for this member in accordance with the *Specification* are:

ϕM_n	= 969 ft-lb
ϕV_n	= 744.1 lb
Effective Moment of Inertia, I_{xx}	= 1.4506 in ⁴
Effective Section Modulus, S_{xx}	= 0.4209 in ³

F1.5 Bending Capacity

$$\phi_b M_n = 969 \text{ ft-lb}$$

$$M = \frac{wL^2}{8} \quad \rightarrow \quad L = \sqrt{\frac{8M}{w}} = \sqrt{\frac{8(969)}{76}}$$

$$L = 10.10 \text{ ft} = 10'-2''$$

F1.6 Shear Capacity

$\phi V_n = 744$ lbs Nominal shear strength (calculated per AISI *Specification*)

Use the design shear strength to calculate the maximum span.

$$V = \frac{wL}{2} \rightarrow L = \frac{2V}{w} = \frac{2(744.13)}{76} = 19'-7''$$

F1.7 Deflection Limit

$$\Delta = L/240 \text{ (total loads)}$$

The deflection equation for a simply supported span with distributed load is:

$$\Delta = \frac{5wL^4}{384EI} = L/240$$

$$L = \sqrt[4]{\frac{384EI_x(L/240)}{5w}} = \sqrt[3]{\frac{384(29,500,000)(1.4506)}{5(50/12)(240)}} = 12'-5''$$

where:

L =	Single span length (inches)
I _x =	Effective moment of inertia for deflection= 1.4506 in ⁴
w =	50 plf
E =	Modulus of elasticity = 29,500,000 psi

Therefore, the maximum span for a 550S162-33 ceiling joist for the conditions in this example is 10'-2" (controlled by bending). This confirms the maximum span given in Table F2-3 of the *AISI S230*.

F2 Rafter Design

Determine if an 1000S162-54 steel rafter (6:12 slope) without a supplemental brace (Figure F2-1) is adequate for a 32-foot building subjected to 90 mph (Exposure Category B) wind speed and 30 psf ground snow load. Assume ceiling joist is 43 mil thick.

F2.1 Design Assumptions

24"	Rafter Spacing
3.5"	Ceiling Joist Bearing Length
33 ksi	Steel Yield Strength
7 psf	Roof Dead Load
5 psf	Ceiling Dead Load
L/180	Total Load Deflection Limit
L/240	Live Load Deflection Limit

F2.2 Design Methodology

The rafter span table was designed based primarily on gravity loads, hence the rafter spans are reported on the horizontal projection of the rafter, regardless of the slope. The gravity loads consist of a 7 psf dead load and the greater of a minimum 16 psf live load or the applied unbalanced roof snow load (unbalanced snow load is calculated by multiplying the ground snow load by 1.0 and no further reductions or increases are made for special cases).

Wind load effects are correlated to equivalent snow loads wind pressures were calculated using the ASCE 7 (ASCE 2005) components and cladding coefficients. Wind loads acting perpendicular to the plane of the rafter were adjusted to represent loads acting orthogonal to the horizontal projection of the rafter (as shown in Figure F2-1. Wind loads were examined for both uplift and downward loads and the worst case was correlated to a corresponding snow load.

F2.3 Design Loads

Dead Load:

$$\text{Roof dead load} = (7 \text{ psf} / \cos 26.56^\circ)(2') = 15.65 \text{ psf}$$

Live Load:

$$\text{Unbalanced Roof Snow Load (S)} = (30 \text{ psf})(2') = 60 \text{ plf} \quad \leftarrow \text{controls}$$

$$\text{Roof Live Load (L}_r\text{)} = 16 \text{ psf} (2') = 32 \text{ plf}$$

Both uplift and inward acting wind loads must be examined and the worst case converted to an equivalent snow load effect. ASCE 7 (ASCE, 1998) components and cladding pressure coefficients are used to calculate the wind load.

$$\rho = q_h[(GC_p) - (GC_{pi})] \text{ lb/ft}^2 \quad (\text{Eq. 6-18})$$

$$q_h = 0.00256K_zK_{zt}K_dV^2I \quad (\text{Eq. 6-13})$$

$$K_z = 0.70 \text{ for exposure B} \quad (\text{Table 6-5})$$

$$K_{zt} = 0.72 \text{ (maximum value used)} \quad (\text{Figure 6-2})$$

$$K_d = 0.85 \quad (\text{Table 6-6})$$

$$GC_p = -1.4 \text{ (Tributary area} = 100 \text{ ft}^2\text{)} \quad (\text{Figure 6-5B})$$

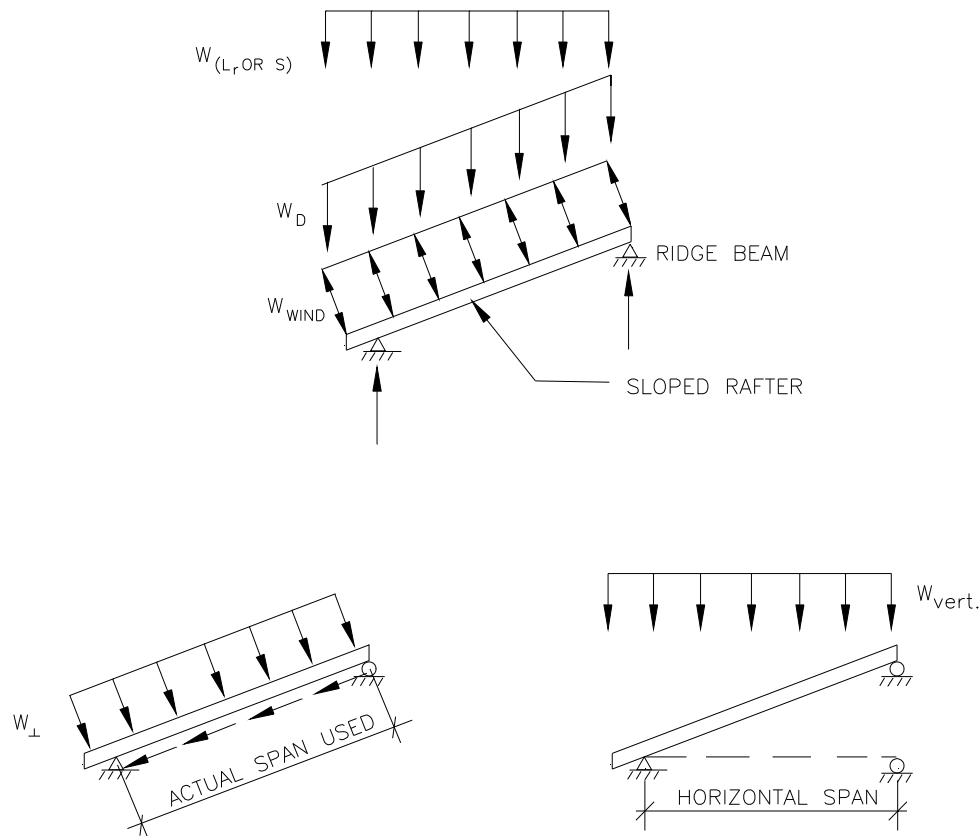
$$GC_p = +0.3 \text{ (Tributary area} = 100 \text{ ft}^2\text{)} \quad (\text{Figure 6-5B})$$

$$GC_{pi} = \pm 0.18 \quad (\text{Table 6-7})$$

$$\text{Downward load (inward): } q = 0.00256(0.70)(0.72)(0.85)(90)^2[0.3 - (-0.18)] = 4.26 \text{ psf}$$

$$\text{Upward load (uplift or outward): } q = 0.00256(0.70)(0.72)(0.85)(90)^2[-1.4 - (0.18)] = -14 \text{ psf}$$

Determine rafter transverse bending and shear loads (using Method B of Figure F2.1).



METHOD A: RESOLVE LOADS TO COMPONENT PERPENDICULAR TO SLOPED RAFTER (THEORETICALLY CORRECT APPROACH)

METHOD B: RESOLVE LOADS TO VERTICAL COMPONENTS AND APPLY TO HORIZONTAL SPAN (COMMON PRACTICE)

NOTE: SNOW AND LIVE LOADS IN CODES ARE GENERALLY CONSIDERED RELATIVE TO THE HORIZONTAL AREA. WIND LOADS ACT PERPENDICULAR TO THE BUILDING SURFACE. DEAD LOAD IS A VERTICAL LOAD AND APPLIES TO THE ACTUAL AREA/LENGTH OF THE MEMBER AND SUPPORTED COMPONENTS.

Figure F2.1 Design Method for a Sloped Rafter

The wind load acts transverse (i.e., perpendicular) to the rafter; and must be resolved to its components. Generally, the axial component of the gravity load along the rafter (which varies unknowingly depending on end connectivity) is ignored and has negligible impact considering the roof system effects that are also ignored. Also, given the limited overhang length, this too will have a negligible impact on the design of the rafter itself. Thus, the rafter can be reasonably analyzed as a sloped, simply supported bending member. In analyzing wind uplift connection forces at the outside bearing of the rafter, the designer should consider the additional uplift created by the small overhang, though for the stated condition it would amount only to small percentage of the uplift load.

$$\begin{aligned} W_{D, \text{vertical}} &= 15.65 \text{ plf} \\ W_{\text{snow}} &= 60 \text{ plf} \end{aligned}$$

$$\begin{aligned} W_{y(\text{upward})} &= -14(\cos 26.56^\circ)^2(2') = -25 \text{ psf} \\ W_{y(\text{downward})} &= 4.26(\cos 26.56^\circ)^2(2') = 7.62 \text{ psf} \end{aligned}$$

F2.4 Load Combinations

1. $1.4D = 1.4(15.65) = 21.91 \text{ plf}$ (downward)
2. $1.2D + 1.6S = 1.2(15.65) + 1.6(60) = 114.8 \text{ plf}$ (downward)
- 3a. $0.9D + 1.6W = 0.9(15.65) + 1.6(-25) = -25.9 \text{ plf}$ (upward)
- 3b. $0.9D + 1.6W = 0.9(15.65) + 1.6(7.62) = 26.3 \text{ plf}$ (downward)

Load combination 2 controls rafter design in inward-bending direction (compression side of rafter laterally supported). Load combination 3a would also need to be checked, as it may control rafter design in outward-bending direction since the compression side now has no lateral bracing unless specified; also important to rafter connections at the bearing wall and ridge member. In this case, load combination 3a was not found to control.

$$M_u = \frac{wL^2}{8} = \frac{114.8(16)^2}{8} = 3,674 \text{ ft-lb}$$

F2.5 Member Properties

The calculated design flexure strength, design shear strength and section properties for an 1000S162-54 in accordance with the *Specification* are:

$$\begin{aligned} \phi M_n &= 4,499 \text{ ft-lb} \\ \phi V_n &= 2,524 \text{ lb} \\ \text{Effective section modulus, } S_{xx} &= 1.6936 \text{ in}^3 \\ \text{Effective moment of inertia, } I_{xx} &= 9.2502 \text{ in}^4 \end{aligned}$$

F2.6 Bending Capacity

Specification Section C3.1.1 nominal section strength applies

$$\begin{aligned} \phi_b M_n &= 4,499 \text{ ft-lb} \\ M &= \frac{wL^2}{8} \rightarrow L = \sqrt{\frac{8M}{w}} = \sqrt{\frac{8(4,423)}{114.8}} \\ L &= 17.71 \text{ ft} = 17'-9'' \end{aligned}$$

F2.7 Shear Capacity

$$\phi V_n = 2,524 \text{ lb (punched section)}$$

Use the design shear strength to calculate the maximum span.

$$V = \frac{wL}{2} \rightarrow L = \frac{2V}{w} = \frac{2(2,524)}{114.8} = 44'-0''$$

F2.8 Deflection Limit

$$\Delta = L/180 \text{ (total loads)}$$

The deflection equation for a simply supported span with distributed load is:

$$\Delta = \frac{5wL^4}{384EI} = L/180$$

$$L = \sqrt[4]{\frac{384EI_x(L/180)}{5w}} = L = \sqrt[3]{\frac{384(29,500,000)(9.2502)}{5(75.65/12)(180)}} = 22'-0''$$

where: L = Single span length (inches)
 I_x = Effective moment of inertia for deflection = 9.2502 in⁴
 w = 15.65 + 60 = 75.65 plf
 E = Modulus of elasticity = 29,500,000 psi

$$\Delta = L/240 \text{ (live loads)}$$

$$\Delta = \frac{5wL^4}{384EI} = L/240$$

$$L = \sqrt[4]{\frac{384EI_x(L/240)}{5w}} = L = \sqrt[3]{\frac{384(29,500,000)(9.2502)}{5(60/12)(240)}} = 21'-7''$$

where: L = Single span length (inches)
 I_x = Effective moment of inertia for deflection = 9.2502 in⁴
 w = 60 plf
 E = Modulus of elasticity = 29,500,000 psi

Therefore, the maximum span for a 1000S162-54 roof rafter for the conditions in this example is 17'-9" (controlled by bending). This confirms the maximum span given in Table F3-1a of the AISI S230.

F3 Ridge Member Shear Connection

Consider the horizontal projection of a simply supported rafter.

$$V_{\max} = wL/2 \quad (L=16 \text{ ft}, w = 115 \text{ plf})$$

$$V_{\max} = 115 \times 16/2 = 920 \text{ lb}$$

Screw Shear Capacity (calculated per Section E4.3 of the *Specification* (AISI, 2001)).

Screw diameter, $d = 0.19$ inches for a # 10 screw as given in the *AISI Commentary to Specification* Table C-E4-1).

Ultimate capacity of steel = 45 ksi (tensile)

Steel design thickness = 0.0451" (43 mils minimum thickness)

$$\phi = 0.50$$

$t_2/t_1 \leq 1.0$, the nominal shear strength per screw, P_{ns} , is the smallest of:

$$P_{ns} = 4.2\left(\sqrt{t_2^3 d}\right)F_{u2} \quad (\text{Eq. E4.3.1-1})$$

$$P_{ns} = 2.7t_1dF_{u1} \quad (\text{Eq. E4.3.1-2})$$

$$P_{ns} = 2.7t_2dF_{u2} \quad (\text{Eq. E4.3.1-3})$$

where: $t_1 = t_2 = 0.0451''$ and $F_{u1} = F_{u2} = 45 \text{ ksi}$

$$P_{ns} = 789 \text{ lbs.}$$

Screw Pull-Out Capacity (calculated in accordance with Section E4.4 of the AISI Specification (AISI, 2001).

$$P_{not} = 0.85(t_c)(d)F_{u2} \quad (\text{Eq. E4.4.1.1})$$

$$P_{not} = 327 \text{ lbs}$$

Therefore the design strength for screw shear, $\phi P_{ns} = 789(0.5) = 394.5 \text{ lbs}$

Number of screws required = $920/394.5 = 2.33$ screws, Use 3 screws. This confirms the Table F3-3 requirement in AISI S230 of 3 screws.

F4 Ceiling Joist to Rafter Connection

Snow load = 21 psf (30 x 0.7)

House width = 32 ft

Roof dead load = 7.83 psf

Ceiling dead load = 5 psf

Spacing = 24 in o.c.

No. 10 screw nominal shear capacity = 395 lb (from F3 above)

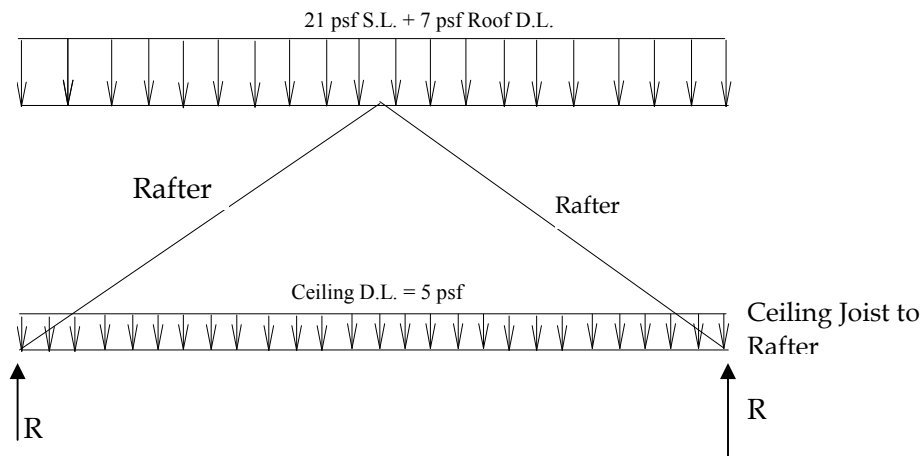


Figure F4.1 - Roof Loading Diagram

Find the reactions (from Figure F4.1).

$$R = wL/2$$

$$R = [(21 \times 1.6 + 7.83 \times 1.2 + 5 \times 1.2) \times 2] \times 32' / 2 = 1,536 \text{ lb}$$

A distributed load of $[(21 \times 1.6 + 7.83 \times 1.2) \times 2]$ psf or 86 plf is spread across the length of the building. One fourth of this load will be concentrated at the end walls, joints 1 and 2 (86

plf x 8 or 688 lb), and $\frac{1}{2}$ the load will be concentrated at the ridge member connection, joint 3 (refer to Figure F4.2). Similarly, a distributed load of 12 plf (5 psf x 1.2x2) is spread along the length of the ceiling joist. This load will be divided equally at each end of the wall (i.e. at joints 1 and 2).

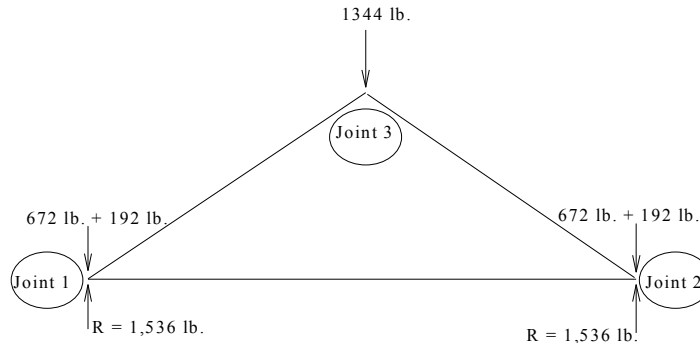


Figure F4.2 - Free Body Diagram

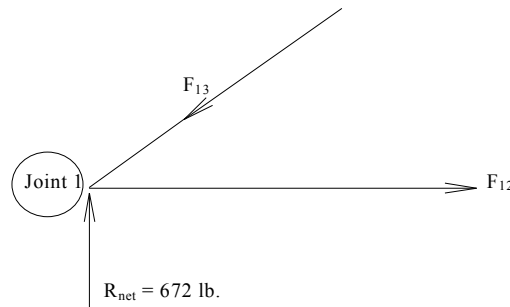


Figure F4.3 - Joint 1

$$\theta = \tan^{-1} (6/12) = 26.565 \text{ degrees}$$

$$F_{13} = 688 / \sin (26.565) = 1538 \text{ lb}$$

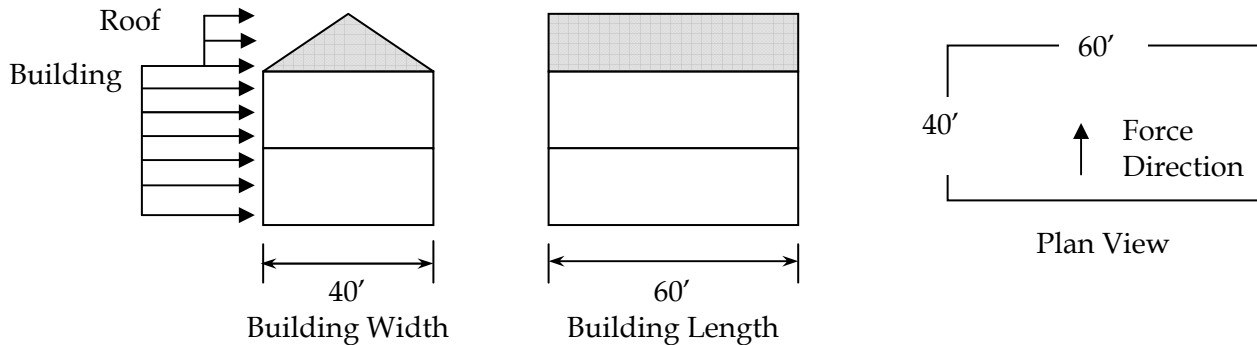
$$F_{12} = 688 \times \cot (26.565) = 1376 \text{ lb}$$

Heel joint connection shall be designed from the compression in F_{13} since it represents the worst case.

$$\text{Number of screws} = 1538 / 395 = 3.89 \text{ screws} \quad \text{Use 4 screws}$$

This confirms the Table F2-9 requirement in *AISI S230* of 4 screws.

F5 Roof Diaphragm Design (First Example)



Check the adequacy of the roof diaphragm for a 40x60 ft, two-story building with 12:12 roof slope and 8' wall studs, subjected to 110 mph wind speed, Exposure Category C.

Based on ASCE 7 the following wind pressures were obtained for the given wind speed, exposure and roof slope:

Roof pressure	= 11.7 psf
Roof corner pressure	= 14.6 psf
Main building pressure	= 24.1 psf
Main building corner pressure	= 30.3 psf

Calculate corner area width (2a), where "a" equals 10% of least width or 0.4h (whichever is smaller) but not less than either 4% of least width or 3 feet.

$$\begin{aligned}
 a &= 10\%(40) = 4' \\
 a &= 0.4(30) = 12' \\
 a &= 3'
 \end{aligned}
 \quad \rightarrow \quad
 \begin{aligned}
 \text{Use } a &= 4' \\
 2a &= 8'
 \end{aligned}$$

$$\begin{aligned}
 \text{Shear} &= (60' - 8')(8'/2)(24.1 \text{ psf}) + 8'(8'/2)(30.3 \text{ psf}) + (60' - 8')(20')(11.7 \text{ psf}) + 20'(8')(14.6 \text{ psf}) \\
 &= 20,486 \text{ lbs.}
 \end{aligned}$$

$$\text{Roof diaphragm load} = \frac{(20,486/2)}{40} = 256 \text{ plf}$$

IBC Table 2306.3.1 (ICC, 2000a) provides recommended shear values for wood structural shear panel diaphragms. For 7/16" OSB with 8d-nail spacing, the unblocked shear value is 230 plf (multiplied by wood species reduction factor). The allowable shear values for unblocked diaphragms for 7/16" OSB with No. 8 screws spaced at 6 inches the unblocked shear value is 252 plf (AISI S213-07).

Using the AISI S213 diaphragm value, the diaphragm in this example would be adequate.

F6 Roof Diaphragm Design (Second Example)

Check the adequacy of the roof diaphragm in Section F5 for a 30x60 ft two-story building.

Calculate corner area width (2a), where “a” equals 10% of least width or 0.4h (whichever is smaller) but not less than either 4% of least width or 3 feet.

$$\begin{aligned} a &= 10\%(30) = 3' \\ a &= 0.4(30) = 12' \\ a &= 3' \end{aligned} \quad \rightarrow \quad \begin{aligned} \text{Use } a &= 3' \\ 2a &= 6' \end{aligned}$$

$$\text{Shear} = (60' - 6')(8'/2)(24.1\text{psf}) + 6'(8'/2)(30.3\text{psf}) + (60' - 6')(20')(11.7\text{psf}) + 20'(6')(14.6\text{psf}) = 20,321 \text{ lb}$$

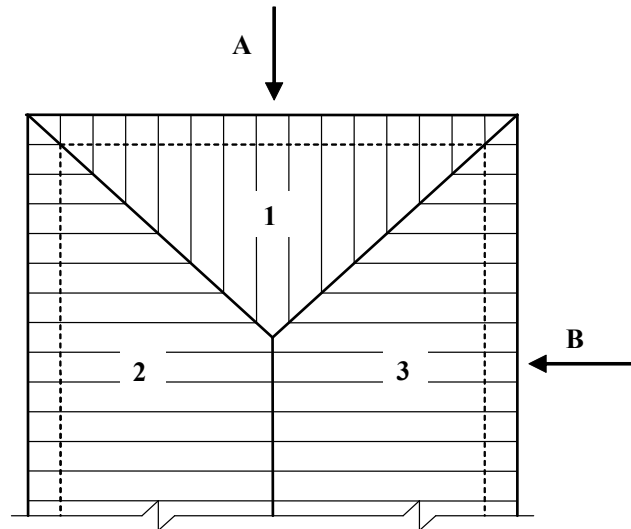
Roof diaphragm load = $(20,321/2)/30 = 339 \text{ plf} > 252 \text{ plf}$ This is not acceptable and therefore the roof diaphragm must be blocked (380 plf) and therefore an engineered design is required.

F7 Hip Member Design

Determine if a hip member built-up from a 1000S162-97 and a 1000T150-97 is adequate for the design assumptions listed below. The member is to be checked for all appropriate LRFD load combinations. Bending moment will be calculated based on the horizontal projected span. All references are to the *North American Specification for the Design of Cold-Formed Steel Structural Members* (AISI, 2001), unless otherwise noted.

F7.1 Design Assumptions

Rafter Spacing = 24 in
 Roof Pitch = 3:12
 Roof Slope = $\tan^{-1}(3:12) = 14.04^\circ$
 Building Width = 32 ft
 Building Length = 60 ft
 Building Eave Height = 21 ft (2-story)
 Wall height = 10 ft
 Roof Dead Load = 7 psf
 Wind Speed = 110 mph
 Wind Exposure Category = C
 Ground Snow Load = 30 psf



F7.2 Design Loads:

Dead Load:

Uniform Roof Dead Load = 7 psf
 Total roof dead load on the horizontal projected area of each hip:

$$D = \frac{(16 \text{ ft})^2}{2} \cdot \frac{7 \text{ psf}}{\cos \theta} = 924 \text{ lbs}$$

Roof Live Load:

Minimum roof live load = 16 psf
 Total roof live load on the horizontal projected area:

$$L_r = \frac{(16\text{ft})^2}{2} (16\text{psf}) = 2048\text{lbs}$$

Roof Snow Load:

Roof snow load = 0.7(30 psf) = 21 psf (Governs)

Total snow load on the horizontal projected area:

$$S = \frac{(16\text{ft})^2}{2} (21\text{psf}) = 2688\text{lbs}$$

Wind Loads:

Wind loads are calculated in accordance with ASCE 7 Method 2 - Analytical Procedure for MWFRS (ASCE, 2005).

Equation:

$$p = qGC_p - q_iGC_{pi}$$

Comments:

Rigid Building of All Hts.

ASCE 7 Reference:

6.5.12.2, Eq. 6-17

$$q = q_i = q_h = 0.00256K_zK_{zt}K_dV^2I$$

6.5.10, Eq. 6-15

Where:

$$K_z = 0.924$$

Exp. C, Case 1, z = 23 ft

Table 6-3

$$K_{zt} = 1.0$$

No Topographic Factor

$$K_d = 0.85$$

Table 6-4

$$V = 110\text{ mph}$$

3-Second Gust Wind Speed

$$I = 1.0$$

Residential Building (Cat I)

Table 1-1, Table 6-1

$$q_h = 0.00256(0.924)(1.0)(0.85)(110)^2(1.0) = 24.3\text{ lb/ft}^2$$

$$G = 0.85$$

Rigid Structure

Section 6.5.8.1

$$GC_{pi} = -0.18\text{ or }+0.18$$

Enclosed Buildings

Figure 6-5

Wind pressures for wind direction A (h/L = 23/60 = 0.38):

$$\text{Surface 1: } C_p = -0.6, -0.09$$

Figure 6-6

$$\text{Surface 2: } C_p = -0.9, -0.18$$

Figure 6-6

$$\text{Surface 3: } C_p = -0.9, -0.18$$

Figure 6-6

$$p_1 = 24.3(0.85)(-0.6) - 24.3(\pm 0.18) = \underline{-16.8\text{ psf}}, -8.0\text{ psf}$$

Uplift

or

$$p_1 = 24.3(0.85)(-0.09) - 24.3(\pm 0.18) = -6.2\text{ psf}, \underline{+2.5\text{ psf}}$$

Downward

$$p_2 = p_3 = 24.3(0.85)(-0.9) - 24.3(\pm 0.18) = \underline{-23.0\text{ psf}}, -14.2\text{ psf}$$

Uplift

or

$$p_2 = p_3 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1\text{ psf}, \underline{+0.7\text{ psf}}$$

Downward

Wind pressures for wind direction B (h/L = 23/32 = 0.72):

$$\text{Surface 1: } C_p = -1.08, -0.18$$

Figure 6-6

$$\text{Surface 2: } C_p = -0.54$$

Figure 6-6

$$\text{Surface 3: } C_p = -0.83, -0.18$$

Figure 6-6

$$p_1 = 24.3(0.85)(-1.08) - 24.3(\pm 0.18) = \underline{-26.7 \text{ psf}}, -17.9 \text{ psf} \quad \text{Uplift}$$

or

$$p_1 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1 \text{ psf}, \underline{+0.7 \text{ psf}} \quad \text{Downward}$$

$$p_2 = 24.3(0.85)(-0.54) - 24.3(\pm 0.18) = \underline{-15.5 \text{ psf}}, -6.8 \text{ psf} \quad \text{Uplift}$$

$$p_3 = 24.3(0.85)(-0.83) - 24.3(\pm 0.18) = \underline{-21.5 \text{ psf}}, -12.8 \text{ psf} \quad \text{Uplift}$$

or

$$p_3 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1 \text{ psf}, \underline{+0.7 \text{ psf}} \quad \text{Downward}$$

Wind direction A governs for downward pressure with $P_1 = +2.5 \text{ psf}$ and $P_2 = P_3 = +0.7 \text{ psf}$
Vertical component of downward wind load:

$$P_1 = 2.5 \text{ psf} \times \cos \theta = 2.4 \text{ psf}$$

$$P_2 = P_3 = 0.7 \text{ psf} \times \cos \theta = 0.7 \text{ psf}$$

Total downward wind load on the horizontal projected area:

$$W_{\text{down}} = \frac{(16 \text{ ft})^2}{4 \times \cos \theta} [2.4 \text{ psf} + (0.7 \text{ psf})] = 205 \text{ lbs}$$

Wind direction B governs for uplift with $P_1 = -26.7 \text{ psf}$ and $P_3 = -21.5 \text{ psf}$

Vertical component of uplift wind load:

$$P_1 = -26.7 \text{ psf} \times \cos \theta = -25.9 \text{ psf}$$

$$P_3 = -21.5 \text{ psf} \times \cos \theta = -20.9 \text{ psf}$$

Total uplift wind load on the horizontal projected area:

$$W_{\text{uplift}} = \frac{16^2}{4 \times \cos \theta} [-25.9 \text{ psf} + (-20.9 \text{ psf})] = -3087 \text{ lbs}$$

F7.3 Load Combinations

The load combinations listed below will be checked:

1. $1.2D + 1.6(L_r \text{ or } S) + 0.8W_{\text{down}}$
2. $1.2D + 1.6W_{\text{down}} + 0.5(L_r \text{ or } S)$
3. $0.9D + 1.6W_{\text{uplift}}$

Uplift check

Controlling design loads:

$$\text{Max. Downward (load case 1), } W_u = 1.2(924 \text{ lbs}) + 1.6(2688 \text{ lbs}) + 0.8(205 \text{ lbs}) = 5573 \text{ lbs}$$

$$\text{Max. Uplift (load case 3), } W_u = 0.9(924 \text{ lbs}) + 1.6(-3087 \text{ lbs}) = -4107 \text{ lbs}$$

F7.4 Material and Section Properties

The calculated design flexure strength, design shear strength and section properties for a 1000S162-97 and a 1000T150-97 in accordance with the *Specification* are:

$$F_y \text{ (track and C-section)} = 50 \text{ ksi}$$

$$S_x = 6.4479 \text{ in}^3$$

$$I_x = 33.387 \text{ in}^4$$

$$\phi M_n = 271.39 \text{ k-in}$$

$$\phi V_n = 9.542 \text{ k}$$

F7.5 Bending Check

Maximum downward load governs for bending. Unsupported length of the compression flange for both positive and negative moment is the same. The jack rafters connected to the hip member resists lateral torsional buckling for both gravity loads and uplift.

Total triangular load supported by the hip member: $W_u = 5573 \text{ lbs}$

Applied bending moment:

$$M_u = 0.128W_uL = 0.128(5573 \text{ lbs})(16 \text{ ft})\sqrt{2} \left(\frac{12}{1000} \right) = 194 \text{ k-in}$$

$$M_u = 194 \text{ k-in} \leq \phi M_n = 271 \text{ k-in} \quad \text{ok}$$

Therefore, the hip member composed of 1000S167-97 and 1000T1500-97 is adequate for bending.

F7.6 Shear Check

Maximum downward load governs for bending. Unsupported length of the compression flange for both positive and negative moment is the same. The jack rafters connected to the hip member resists lateral torsional buckling for both gravity loads and uplift.

Total triangular load supported by the hip member: $W_u = 5573 \text{ lbs}$

Applied shear:

$$V_u = \frac{2}{3}W_u = \frac{2}{3}(5573 \text{ lbs}) = 3715 \text{ lbs}$$

$$V_u = \frac{3715 \text{ lbs}}{1000} = 3.715 \text{ k} \leq \phi V_n = 9.54 \text{ k} \quad \text{ok}$$

Therefore, the hip member composed of 1000S167-97 and 1000T1500-97 is adequate for shear.

F7.7 Deflection Check

Total load deflection limit is $L/180$ and is based on service dead load plus roof snow.

Total service load supported by the hip member: $W = 924 \text{ lbs} + 2688 \text{ lbs} = 3612 \text{ lbs}$

$$\Delta_{allow} = \frac{L}{180} = \frac{22.63 \text{ ft} \times 12}{180} = 1.51 \text{ in}$$

$$\Delta_{tot} = \frac{0.01304WL^3}{EI_x} = \frac{0.01304(3612 \text{ lbs})(22.63 \text{ ft})^3(1728)}{29,500,000 \text{ psi}(33.387 \text{ in}^4)} = 0.96 \text{ in}$$

$$\Delta_{tot} = 0.96 \text{ inches} < \Delta_{allow} = 1.51 \text{ inches} \quad \text{ok}$$

Therefore, hip member composed of 1000S162-97 and 1000T150-97 is adequate for deflection.

Therefore, a hip member composed of 1000S162-97 and 1000T150-97 is adequate for the conditions of this hip roof. This confirms the maximum span given in Table F4-1 of *AISI S230*.

F8 Hip Member Support Column above Ceiling

Determine if a hip member support column built-up from 2-550S162-68 is adequate for the design assumptions from example F7. The member is to be checked for all appropriate LRFD load combinations. All references are to the *North American Specification for the Design of Cold-Formed Steel Structural Members* (AISI, 2001), unless otherwise noted.

F8.1 Design Assumptions

All design assumptions will be the same as used in example F7.

F8.2 Design Loads

Dead Load:

Uniform Roof Dead Load = 7 psf

Total roof dead load on the horizontal projected area:

$$D = \frac{16^2}{\cos \theta} \cdot \frac{2}{3} (7 \text{ psf}) = 1231 \text{ lbs}$$

Roof Live Load:

Minimum roof live load = 16 psf

Total roof live load on the horizontal projected area:

$$L_r = 16^2 \cdot \frac{2}{3} (16 \text{ psf}) = 2730 \text{ lbs}$$

Roof Snow Load:

Roof snow load = $0.7(30 \text{ psf}) = 21 \text{ psf}$ (Governs)

Total snow load on the horizontal projected area:

$$S = 16^2 \cdot \frac{2}{3} (21 \text{ psf}) = 3584 \text{ lbs}$$

Wind Loads:

Wind loads are calculated in accordance with ASCE 7-2005 Method 2 - Analytical Procedure for MWFRS (ASCE 7, 2005).

Wind pressures for wind direction A ($h/L = 23/60 = 0.38$):

Surface 1: $C_p = -0.6, -0.09$

Figure 6-6

Surface 2: $C_p = -0.9, -0.18$

Figure 6-6

Surface 3: $C_p = -0.9, -0.18$

Figure 6-6

$$p_1 = 24.3(0.85)(-0.6) - 24.3(\pm 0.18) = \underline{-16.8 \text{ psf}}, -8.0 \text{ psf}$$

Uplift

or

$$p_1 = 24.3(0.85)(-0.09) - 24.3(\pm 0.18) = \underline{-6.2 \text{ psf}}, +2.5 \text{ psf}$$

Downward

$$p_2 = p_3 = 24.3(0.85)(-0.9) - 24.3(\pm 0.18) = \underline{-23.0 \text{ psf}}, -14.2 \text{ psf} \quad \text{Uplift}$$

or

$$p_2 = p_3 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1 \text{ psf}, \underline{+0.7 \text{ psf}} \quad \text{Downward}$$

Wind pressures for wind direction B ($h/L = 23/32 = 0.72$):

Surface 1: $C_p = -1.08, -0.18$ Figure 6-6

Surface 2: $C_p = -0.54$ Figure 6-6

Surface 3: $C_p = -0.83, -0.18$ Figure 6-6

$$p_1 = 24.3(0.85)(-1.08) - 24.3(\pm 0.18) = \underline{-26.7 \text{ psf}}, -17.9 \text{ psf} \quad \text{Uplift}$$

or

$$p_1 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1 \text{ psf}, \underline{+0.7 \text{ psf}} \quad \text{Downward}$$

$$p_2 = 24.3(0.85)(-0.54) - 24.3(\pm 0.18) = \underline{-15.5 \text{ psf}}, -6.8 \text{ psf} \quad \text{Uplift}$$

$$p_3 = 24.3(0.85)(-0.83) - 24.3(\pm 0.18) = \underline{-21.5 \text{ psf}}, -12.8 \text{ psf} \quad \text{Uplift}$$

or

$$p_3 = 24.3(0.85)(-0.18) - 24.3(\pm 0.18) = -8.1 \text{ psf}, \underline{+0.7 \text{ psf}} \quad \text{Downward}$$

Wind direction A governs for downward pressure with $P_1 = +2.5 \text{ psf}$ and $P_2 = P_3 = +0.7 \text{ psf}$

Vertical component of downward wind load:

$$P_1 = 2.5 \text{ psf} \times \cos \theta = 2.4 \text{ psf}$$

$$P_2 = P_3 = 0.7 \text{ psf} \times \cos \theta = 0.7 \text{ psf}$$

Total downward wind load on the horizontal projected area:

$$W_{\text{down}} = \frac{(16 \text{ ft})^2}{4 \times \cos \theta} \cdot 2 \cdot \frac{2}{3} [2.4 \text{ psf} + (0.7 \text{ psf})] = 273 \text{ lbs}$$

Wind direction B governs for uplift with $P_1 = -26.7 \text{ psf}$, $P_2 = -15.5$ and $P_3 = -21.5 \text{ psf}$

Vertical component of uplift wind load:

$$P_1 = -26.7 \text{ psf} \times \cos \theta = -25.9 \text{ psf}$$

$$P_2 = -15.5 \text{ psf} \times \cos \theta = -15.0 \text{ psf}$$

$$P_3 = -21.5 \text{ psf} \times \cos \theta = -20.9 \text{ psf}$$

Total uplift wind load on the horizontal projected area:

$$W_{\text{uplift}} = \frac{(16 \text{ ft})^2}{4 \times \cos \theta} \cdot 2 \cdot \frac{2}{3} \left[-25.9 \text{ psf} + \frac{(-15.0 \text{ psf} - 20.9 \text{ psf})}{2} \right] = -3857 \text{ lbs}$$

F8.3 Load Combinations

The load combinations listed below will be checked:

1. $1.2D + 1.6(L_r \text{ or } S) + 0.8W_{\text{down}}$
2. $1.2D + 1.6W_{\text{down}} + 0.5(L_r \text{ or } S)$
3. $0.9D + 1.6W_{\text{uplift}}$

Uplift check

Controlling design loads:

Max. Downward (load case 1), $W_u = 1.2(1231 \text{ lbs}) + 1.6(3584 \text{ lbs}) + 0.8(273 \text{ lbs}) = 7430 \text{ lbs}$

Max. Uplift (load case 3), $W_u = 0.9(1231 \text{ lbs}) + 1.6(-3857 \text{ lbs}) = -5063 \text{ lbs}$

F8.4 Material Properties

The calculated design flexure strength, design shear strength and section properties for a 2-550S162-68 column in accordance with the *Specification* are:

$$F_y = 50 \text{ ksi}$$

$$A = 1.3148 \text{ in}^2$$

$$A_{\text{net}} = 0.95826 \text{ in}^2$$

$$r_x = 2.0865 \text{ in}$$

$$r_y = 1.3148 \text{ in}$$

$$\phi P_n = 32.594 \text{ k compression}$$

$$\phi P_n = 46.715 \text{ k tension}$$

Unsupported column height: $h = 16 \text{ ft} \times 3/12 = 4 \text{ ft}$

F8.5 Axial Compression

$\phi P_n = 32.594 \text{ k}$ for axial compression.

$$\phi P_n = 32.594 \text{ k} > P_u = 7.430 \text{ k} \quad \underline{ok}$$

F8.6 Axial Tension

$\phi P_n = 46.715 \text{ k}$ for axial tension.

$$\phi P_n = 46.715 \text{ k} > P_u = 5.063 \text{ k} \quad \underline{ok}$$

Therefore, a hip member support column composed of 2-550S162-68 is adequate for the conditions of this hip roof. This confirms the maximum span given in Table F4-2 of *AISI S230*.

F9 Roof Rafter or Truss to Wall Connection

Calculate the number of screws required for the uplift strap connection between a roof rafter and a wall for a 24-foot roof span, with roof and wall framing at 24" on center and two-story building subjected to 120 mph wind speed, Exposure Category C. The roof pitch is 9:12.

Based on ASCE 7, 9:12 roof pitch and roof corner pressures, wind load = 12.4 psf for 110 mph exposure C. To calculate the vertical component from this force used for uplift the following conversion is made:

$$\text{Wind Load} = 12.4 \text{ psf} (12/9) = 16.54 \text{ psf} \quad \text{at 110 mph}$$

$$\text{Wind Load} = 16.54 \left(\frac{120^2}{110^2} \right) = 19.68 \text{ psf} \quad \text{at 120 mph}$$

Wind Load	Building Width (ft)				
	24'	28'	32'	36'	40'
	Horizontal Length of Member Affected ⁽¹⁾				
	14'	16'	18'	20'	22'
Load Along Length of Affected Member (lb/ft)					
16.54 psf (for 110 mph)	-232	-265	-298	-331	-364
19.68 psf (for 120 mph)	-276	-315	-354	-394	-433

⁽¹⁾ Half the width of the building plus a 2-ft overhang

Roof Dead Loads:

Ceiling Dead Load = 5 psf (24/2) = 60 lb/ft (for 24' wide building)

Roof Dead Load = $7 \text{ psf} \left(\frac{15}{12} \right) \left(\frac{24 + 4}{2} \right) = 123 \text{ lb/ft}$ (for 24' wide building)

Total Dead Load = 183 lb/ft

Building Width (ft)				
24'	28'	32'	36'	40'
Roof Dead Load (lb/ft)				
183	211	238	266	293

Load Combination: 0.9D - 1.6W

Uplift Load = 0.9(183) - 1.6(276) = 165 - 442 = -277 lb/ft (uplift)

At 24" framing spacing: Uplift Load, P = 277(2) = 553 lb

V_{all} per No. 8 screw = 165 lb

No. of screws required = 553/165 = 3.36 screws, Use 4-No. 8 screws. This confirms the 4 screws required from *AISI S230* Table F8-2

F10 Ridge Tension Strap Connection Requirement

Calculate the number of screws required for the ridge tension strap for a 24-foot span, 6:12 pitched roof subjected to 120 mph wind speed, Exposure Category C and rafter spacing of 12 in o.c.

Calculate Wind Load

In accordance with ASCE 7 (ASCE, 1998):

Directionality Factor (K_d) = 0.85 (Table 6-6)

Importance Factor = 1.0 (Section 6.5.5)

Topographic Factor (K_{zt}) = 1.0 (Figure 6-2)

Velocity Exposure (K_z) = 0.98 (Table 6-5)

Velocity Pressure = $q_z = 0.00256 \times K_z \times K_{zt} \times K_d (V^2 \times I) = 30.7077$ (Eq. 6.5.10)

$$\text{Pressure} = p = q_z[(GC_{pf}) - (GC_{pi})] \quad (\text{Eq. 6.5.12.2.1})$$

GC_{pf} (Figure 6-4) CASE A

Roof Slope = 26.56 degrees

Area 1	Area 2	Area 3	Area 4	Area 1E	Area 2E	Area 3E	Area 4E
0.550	-0.103	-0.447	-0.391	0.727	-0.196	-0.586	-0.536

GC_{pi} (Figure 6-4) CASE A

Enclosed Buildings	
+0.18	-0.18

GC_{pf} (Figure 6-4) CASE B

Roof Slope = 26.56 degrees

Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 1E	Area 2E	Area 3E	Area 4E	Area 5E	Area 6E
-0.45	-0.69	-0.37	-0.45	0.4	-0.29	-0.48	-1.07	-0.53	-0.48	0.61	-0.43

p (psf) - CASE A

Roof Slope = 26.56 degrees

Area 1	Area 2	Area 3	Area 4	Area 1E	Area 2E	Area 3E	Area 4E
22.42	-8.70	-19.25	-17.53	27.85	-11.55	-23.52	-21.99

p (psf) - CASE B

Roof Slope = 26.56 degrees

Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 1E	Area 2E	Area 3E	Area 4E	Area 5E	Area 6E
-19.35	-26.72	-16.89	-19.35	17.81	-14.43	-20.27	-38.39	-21.80	-20.27	24.26	-18.73

The above are based on corner length as follows:

$$\begin{aligned}
 0.4 \times \text{Building Height} &= 12.00 \text{ ft} && (\text{height} = 30.00 \text{ ft}) \\
 0.1 \times \text{min. Width} &= 2.40 \text{ ft} \\
 \text{Not less than } 3' &= 3.00 \text{ ft} \\
 a &= 3.00 \text{ ft} \\
 \text{Corner Length} = 2a &= 6.00 \text{ ft}
 \end{aligned}$$

Roof Area 2 Factored Wind Load = -26.72 (1.6) = -42.75 psf

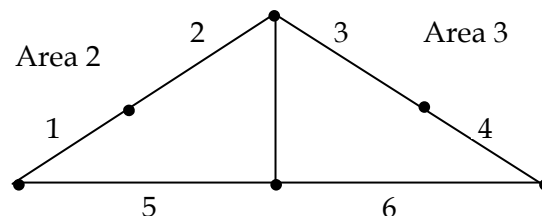
Roof Area 3 Factored Wind Load = -16.89 (1.6) = -27.02 psf

Factored Roof Dead Load = 0.9(7 psf) = 6.3 psf

A plane frame truss analysis yields the following axial loads in the members labeled in the truss model shown.

Member 1	-327.07 lb
Member 2	-345.97 lb
Member 3	-417.63 lb
Member 4	-398.72 lb
Member 5	275.58 lb
Member 6	-1.06 lb

Maximum load is in member 3, P = 417.63 lb



V_{all} per No. 8 screw = 165 lb

No. of screws required = $417.63 = 2.54$ screws, Use 3-No. 8 screws at each end of strap.
This confirms the 3 screws required from *AISI S230* Table F8-3.

F11 Ridge Tension Strap Design

Calculate the minimum thickness of 1.25" steel strap with 3-No. 8 screws.

$$T = A (0.6F_y)$$

$$T = 3(165) = 495 \text{ lb}$$

$$495 = [1.25(t)][33,000(0.6)(1.33)]$$

$$t = 0.015 \text{ in}$$

Use 33-mil strap.

This confirms a 33-mil strap required from *AISI S230* Table F8-5.

REFERENCES

- (AFPA, 2001), *Wood Frame Construction Manual*, American Forest and Paper Association, Washington DC, 2001.
- (AISC, 1991), *Structural Performance Requirements For Domestic Steel Framing*, Australian Institute of Steel Construction, Milsons Point, Australia, 1991.
- (AISI, 1996), *Specification for the Design of Cold-Formed Steel Structural Members, 1996 Edition with 1999 Supplement*, American Iron and Steel Institute, Washington, DC, 1999.
- (AISI, 2001), *North American Specification for the Design of Cold-Formed Steel Structural Members, 2001 Edition with 2004 Supplement*, American Iron and Steel Institute, Washington, DC, 2004.
- (AISI S200-07), *North American Standard for Cold-Formed Steel Framing – General Provisions*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S201-07), *North American Standard for Cold-Formed Steel Framing – Product Data*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S210-07), *North American Standard for Cold-Formed Steel Framing – Roof and Floor System Design*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S211-07), *North American Standard for Cold-Formed Steel Framing – Wall Stud Design*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S212-07), *North American Standard for Cold-Formed Steel Framing – Header Design*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S213-07), *North American Standard for Cold-Formed Steel Framing – Lateral Design*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S214-07), *North American Standard for Cold-Formed Steel Framing – Truss Design*, American Iron and Steel Institute, Washington, DC, 2007.
- (AISI S230-07), *North American Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings*, American Iron and Steel Institute, Washington, DC, 2007.
- (ASCE, 1998), *ASCE 7, Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers, Reston VA, 1998.
- (ASCE, 2005), *ASCE 7, Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers, Reston VA, 2005.
- (ASTM, 2007), *ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness*, ASTM International, West Conshohocken PA, 2000.
- (ASTM, 2007), *ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs*, ASTM International, West Conshohocken PA, 2001.
- (ICC, 2006a), *International Building Code*, International Code Council Falls Church, VA, 2006.
- (ICC, 2006b), *International Residential Code*, International Code Council Falls Church, VA, 2006.
- Downey, B.W, Stephens, S.F., and LaBoube, R.A., (2005) "Cold-Formed Steel Gable End Wall Design for the Prescriptive Method for One and Two Family Dwellings," Final Report, Department of Civil Engineering, Wei-Wen Yu Center for Cold-Formed Steel Structures, University of Missouri-Rolla, Rolla, MO.

(NAHBRC, 2003), *Hybrid Wood and Steel Sole Plate Connection Walls to Floors Testing Report*, National Association of Home Builders' Research Center, Upper Marlboro, MD, 2003.

Sivakumaran, K.S. (2007), *Reinforcement Schemes for Cold-Formed Steel Joists Having Web Openings*, Final Report, McMaster University, Hamilton, Ontario, Canada, 2007.

Vagh, Dolan and Easterling (2000), *Effect of Anchorage and Sheathing Configuration on the Cyclic Response of Long Steel-Frame Shear Walls*, Report No. TE-2000-002, Virginia Polytechnic Institute and State University, Blacksburg, VA, 2000.

Waldo, L., Stephens, S.F., and LaBoube, R.A., (2006), "Residential Hip Roof Framing Using Cold-Formed Steel Members," Final Report, Department of Civil Engineering, Wei-Wen Yu Center for Cold-Formed Steel Structures, University of Missouri-Rolla, Rolla, MO.

Wiss, Janney, Elstner Associates (1977), Report Number 73345, *Report of Laboratory Tests and Analytical Studies of Structural Characteristics of Cold-Formed Steel-Joists Floor Systems*, San Francisco, CA, 1977.

APPENDIX A METRIC CONVERSION

The following list provides the conversion relationship between U.S. customary units and the International System (SI) units. A complete guide to the SI system and its use can be found in ASTM E 380, Metric Practice.

To convert from	to	multiply by
Length:		
inch (in)	millimeter (mm)	25.4
inch (in)	centimeter (cm)	2.54
inch (in)	meter (m)	0.0254
foot (ft)	meter (m)	0.3048
Area:		
square foot (sq. ft)	square meter (sq. m)	0.0929
square inch (sq. in)	square centimeter (sq. cm)	6.452
Force:		
kip (1000 lb)	Newton (N)	4,448.222
pound (lb)	Newton (N)	4.448222
Stress or Pressure:		
kip/sq. inch (ksi)	megapascal (MPa)	6.894757
pound/sq. inch (psi)	pascal (Pa) **	6,894.757
pound/sq. inch (psi)	megapascal (MPa)	0.00689476
pound/sq. foot (psf)	pascal (Pa)	47.88
Moment:		
1 foot-pound (ft-lb)	Newton-meter (N-m)	1.356

** A pascal equals 1000 Newton per square meter

The prefixes and symbols below are commonly used to form names and symbols of the decimal multiples and sub-multiples of the SI units.

Multiplication Factor	Prefix	Symbol
1,000,000,000 = 10^9	giga	G
1,000,000 = 10^6	mega	M
1,000 = 10^3	kilo	k
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000001 = 10^{-6}	micro	μ
0.000000001 = 10^{-9}	nano	n



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