

Prescriptive Method

For Residential Cold-Formed Steel Framing *Year 2000 Edition*

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North American Steel Framing Alliance

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Acknowledgments

This publication was developed by Nader R. Elhajj, P.E. and Kevin Bielat for the North American Steel Framing Alliance (NASFA) and is based on the second edition which was developed by a steering committee representing the interests and expertise of the steel industry. It is intended to provide prescriptive provisions for the construction of one- and two-family residential dwellings using cold-formed steel framing. This publication expands on the two previous editions by providing a complete prescriptive approach to build typical homes with cold-formed steel framing. This document is based on standardized basic cold-formed steel members, provides labeling guidelines, and gives minimum corrosion protection recommendations. It also includes floor joist span tables, ceiling joist span tables, rafter span tables, wall stud tables, wall bracing requirements, header span tables, and connection requirements. In the production of this publication, due diligence has been exercised in consulting a wide range of pertinent authorities and experiences. Efforts have been made to present accurate, reliable, and useful information.

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Note to Reader

References made to other publications are in brackets [x] throughout the body of this document. All references can be found in Chapter 13 beginning on page 179.

Forward

For centuries, home builders in the United States have made wood their material of choice because of its satisfactory performance, abundant supply, and relatively low cost. However, recent increases and unpredictable fluctuations in the price of framing lumber, as well as concerns with its quality, are causing builders and other providers of affordable housing to seek alternative building products.

Use of cold-formed steel framing in the residential market has increased over the past several years. Its price stability, consistent quality, similarity to conventional framing, success in the commercial market, and resistance to fire, rot, and termites have attracted the attention of many builders and designers. But lack of prescriptive construction requirements has prevented this alternative material from gaining wider acceptance among homebuilders and code officials.

The year 2000 edition of the *Prescriptive Method for Residential Cold-Formed Steel Framing* expands on the two previous editions which were a result of a four-year research and development program sponsored by the U.S. Department of Housing and Urban Development (HUD) through a cooperative agreement with the National Association of Home Builders (NAHB) and the American Iron and Steel Institute (AISI). The program was conducted by the NAHB Research Center with assistance from steering, advisory, and engineering committees. These committees represented the interests and expertise of steel manufacturers, steel producers, code officials, academics, researchers, professional engineers, and builders experienced in cold-formed steel framing.

This new edition brings in newer details, L-header tables, braced walls and diaphragms for high seismic and high wind regions, curtain walls, and a how-to-use the *Prescriptive Method* section. With a fresh new format and new illustrations, this edition contains the latest steel framing information available as of this printing.

By facilitating the construction of steel-framed housing, this document expands housing affordability through competition from new methods and materials. It also provides cold-formed steel suppliers and consumers with standardized requirements for steel framing materials that will enhance market acceptance and promote consistent user application. Finally, this document provides code officials and inspectors with the guidance necessary to perform their duties in the home construction process when cold-formed steel is utilized.

Donald R. Moody, P.E.
President
North American Steel Framing Alliance

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Summary

The year 2000 edition of the *Prescriptive Method for Residential Cold-Formed Steel Framing (Prescriptive Method)* was developed as a guideline for the construction of one- and two-family residential dwellings using cold-formed steel framing. It provides a complete prescriptive approach to build typical homes with cold-formed steel framing. This document is based on standardized basic cold-formed steel members, provides labeling guidelines, and gives minimum corrosion protection recommendations. It also includes floor joist span tables, ceiling joist span tables, rafter span tables, wall stud tables, header span tables, wall bracing requirements, and connection requirements. The requirements are supplemented with construction details where required.

The year 2000 edition includes improvements upon the second edition in the following areas:

- Enhanced wall bracing requirements for high wind and seismic conditions
- Floor joist tables for 19.2" spacing and tables for joists not requiring web stiffeners
- Header tables for bottom story of a two-story building with center load bearing beam
- L-Header tables and details
- Floor and wall anchoring details
- Added tables and details for non-load bearing walls
- Curtain wall tables
- Ceiling joist tables not requiring web stiffeners
- Expanded thermal, mechanical, electrical, and HVAC guidelines
- New section on "How to Use the *Prescriptive Method*"

Introduction

The *Prescriptive Method for Residential Cold-Formed Steel Framing (Prescriptive Method)* is provided as a guideline to facilitate the use of cold-formed steel framing in the construction of one- and two-family residential dwellings. The year 2000 edition of the *Prescriptive Method* expands on and enhances the requirements of the provisions of the previous two editions. It provides a complete prescriptive approach to build typical homes with cold-formed steel framing; therefore, engineering will not be necessary for most applications. The provisions in this document were developed by applying accepted engineering practices. It is intended to be compatible with building code provisions, but it is not written as a regulatory instrument. However, users of this document should verify its compliance with local code requirements. The user is advised to refer to the applicable building code requirements where the provisions of this document are not applicable or where engineered design is called out.

1

GENERAL

Purpose

The purpose of this document is to provide a prescriptive method for the construction of residential buildings framed with cold-formed steel. These provisions include definitions, span tables, fastener schedules, and other related information appropriate for use by homebuilders, design professionals, and building code officials.

Approach

These requirements are based primarily on the American Iron and Steel Institute's (AISI) *Specification for the Design of Cold-Formed Steel Structural Members* [1] for member strength, the provisions for building loads from the American Society of Civil Engineers' (ASCE) *Minimum Design Loads for Buildings and Other Structures* [2], the *Standard Building Code* [3], the *Uniform Building Code* [4], *The BOCA National Building Code* [5], and the *International Residential Code (IRC)* [6].

These provisions are intended to represent sound engineering and construction practice. This document is not intended to restrict the use of good judgment or exact engineering analysis of specific applications. The *Commentary on the Prescriptive Method for Residential Cold-Formed Steel Framing*, second edition [7] documents the rationale for and the derivation of most of the requirements contained in this document.

Scope

These provisions apply to the construction of detached one- or two-family dwellings, townhouses, attached multi-family dwellings, and other attached single-family dwellings not more than two stories in height using in-line framing practices. Steel-framed construction in accordance with this document shall be limited by the weights and applicability limits set forth in Tables 1.1 and 1.2. The limitations are intended to define an appropriate use of this document for a majority of one- and two-family dwellings. Intermixing of these provisions with other construction materials, such as wood, in a single structure shall be in accordance with the applicable building code requirements for that material and the applicability limits set forth in Table 1.2. Dead loads for walls above grade shall not exceed the values in Table 1.1.

Table 1.1
Weights of Materials

Building Component	Maximum Dead Load (psf)
Exterior light-frame wood walls ¹	10 and 15
Exterior light frame cold-formed steel walls ¹	10 and 14
Interior light-frame wood walls	10
Interior light-frame cold-formed steel walls	5
8-inch (203 mm) thick masonry walls	80
6-inch (152 mm) thick concrete walls	85

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

¹The higher load is used for seismic category D.

Table 1.2
Applicability Limits

ATTRIBUTE	LIMITATION
General	
Building dimension	Maximum width ¹ is 36 feet (11 m) Maximum length ² is 60 feet (18 m)
Number of stories	2 story with a basement maximum
Design wind speed	110 mph maximum (177 km/sec) fastest-mile wind speed ³
Wind Exposure	Exposures A/B (suburban/wooded) Exposures C (open terrain)
Ground snow load	70 psf (3.35 kN/m ²) maximum ground snow load
Seismic Zone or Category	Zone 0, 1, 2, 3 and 4 or Category A, B, C and D
Floors	
Floor dead load	10 psf (0.48 kN/m ²) maximum
Floor live load	
First floor	40 psf (1.92 kN/m ²) maximum
Second floor (sleeping rooms)	30 psf (1.44 kN/m ²) maximum
Cantilever	24 inches (610 mm) maximum
Walls	
Wall dead load	10 psf (0.48 kN/m ²) maximum
Load bearing wall height	10 feet (3 m) maximum
Roofs	
Roof dead load	15 psf (0.72 kN/m ²) maximum total load [7 psf (0.34 kN/m ²) maximum for roof covering only] [9 psf (0.43 kN/m ²) maximum roof covering dead load for buildings in seismic zone 4]
Roof live load (roof live or roof snow load)	70 psf (3.35 kN/m ²) maximum ground snow load
Ceiling dead load	5 psf (0.24 kN/m ²) maximum
Roof slope	3:12 to 12:12
Rake overhang	12 inches (305 mm) maximum
Soffit overhang	24 inches (610 mm) maximum
Attic live load (for attics with storage)	20 psf (0.96 kN/m ²) maximum
Attic live load (for 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 = 0.3048 m.

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

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

³To convert fastest-mile wind speeds to 3-second gust wind speeds refer to Table 1.3.

Table 1.3
Wind Speed Conversion¹

Fastest mile, mph	70	75	80	85	90	100	105	110
3-second gust, mph	85	90	100	105	110	120	125	130

For SI: 1 mph = 1.609 km/hr = 0.447 m/sec

¹Linear interpolation is permitted.

Definitions

Accepted Engineering Practice:	An engineering approach that conforms with accepted principles, tests, technical standards, and sound judgment.
Approved:	Approval by a code official or design professional.
Attic:	The enclosed space between the ceiling joists of the top floor and the roof rafters of a building not intended for occupancy, but sometimes used for storage.
Axial Load:	The longitudinal force acting on a member. Examples are the gravity loads carried by columns or studs.
Blocking:	Solid block or piece of material placed between structural members to provide lateral bracing as in bridging and/or edge support for sheathing.
Braced Wall Line:	A series of braced wall panels to resist racking (shear) from seismic and wind forces.
Braced Wall Panel:	A section of braced wall line that extends the full height of the wall.
Bridging:	Bracing or blocking placed between joists to provide lateral support.
Buckling:	A kink, wrinkle, bulge, or otherwise loss of the original shape of a member due to compressive, bending, bearing, or shear loads.
Ceiling Joist:	A horizontal structural framing member that supports a ceiling and attic loads.
C-Shape:	A basic cold-formed steel shape used for structural framing members (such as studs, joists, headers, beams, girders, and rafters). The name comes from the member's "C" shaped cross-sectional configuration consisting of a web, flange, and lip. It is also called a "C-section." Figure 1.1 shows this cross-section and defines the different parts of the C-Shape. Web depth measurements are taken to the outside of the flanges. Flange width measurements also use outside dimensions.
Clip Angle:	An L-shaped short piece of metal (normally with a 90-degree bend). It is typically used for connections.

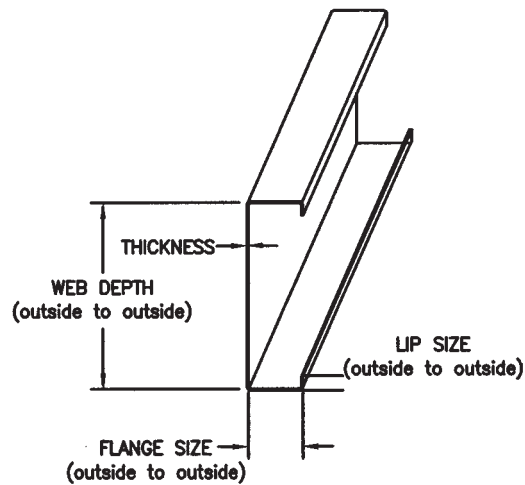


Figure 1.1
C-Shaped Member Configuration

Cold-Forming:	A process where light-gauge steel members are manufactured by (1) press-braking blanks sheared from sheets or cut length of coils or plates, or by (2) continuous roll forming of cold- or hot-rolled coils of sheet steel; both forming operations are performed at ambient room temperature, that is, without any addition of heat such as would be required for hot forming.
Cripple Stud:	A stud that is placed between a header and a windowsill (or jamb) or a windowsill and a bottom track to provide a backing to attach finishing and sheathing material.
Curtain Wall:	Exterior wall of a building that is supported by the structure and carries no part of the vertical load except its own. Curtain walls are designed to withstand and transfer wind loads to the structure.
Design Professional:	An architect or engineer, registered or licensed to practice professional architecture or engineering, as defined by the statutory requirements of the laws of the state in which a project is to be constructed.
Endwall:	The exterior wall of a building which is perpendicular to the roof ridge and parallel to floor framing, roof rafters, or trusses. It is normally the shorter dimension of a rectangular building's footprint.
Facia:	A member applied to the rafter ends as an edge member for attachment of roof sheathing, exterior finishes, or gutter.
Flange:	The part of a C-shape or track that is perpendicular to the web.

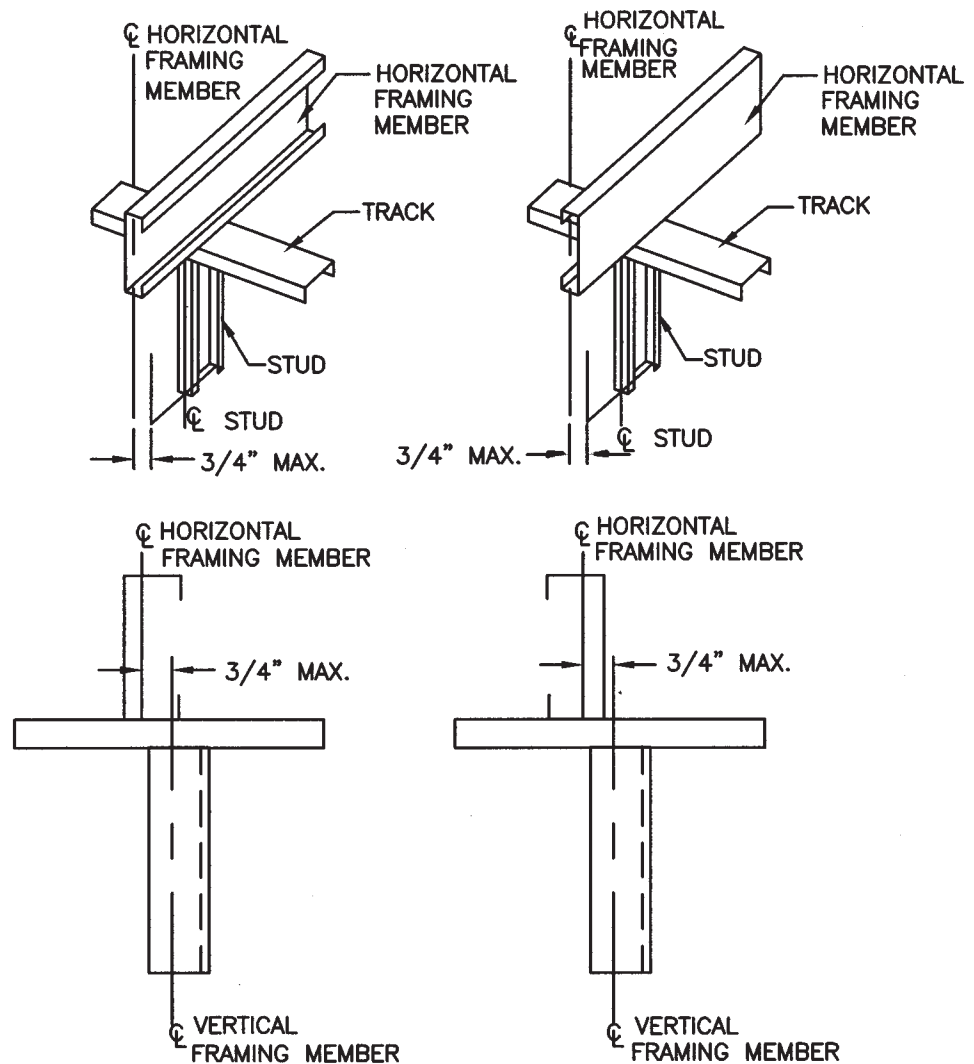


Figure 1.2
In-Line Framing Detail

Flat Strap:	Sheet steel cut to a specified width without any bends. Typically used for bracing and transfer of loads by tension.
Floor Joist:	A horizontal structural framing member that supports floor loads.
Header:	A horizontal built-up structural framing member used over wall or roof openings to transfer loads above the opening to adjacent vertical framing members.
In-Line Framing:	A framing method where all vertical and horizontal load carrying members are aligned. Refer to Figure 1.2.

Jack Stud:	A vertical structural member that does not span the full height of the wall and provides bearing for headers. Sometimes referred to as a trimmer stud.
King Stud:	A vertical structural member that spans the full height of the wall and supports vertical loads and lateral loads. Usually located at both ends of a header adjacent to the jack studs.
Lip:	The part of a C-shape that extends from the flange at the open end. The lip increases the strength characteristics of the member by acting as a stiffener to the flange.
Loads, Live and Dead:	Dead loads are the weight of the walls, partitions, framing, floors, ceilings, roofs, and all other permanent construction entering into and becoming a part of a building. Live loads are transient and sustained loads usually created by people and furnishings, respectively.
Material Properties (Steel):	The chemical, mechanical, and physical properties of steel before or after the cold-forming process.
Material Thickness (Steel):	The base metal thickness excluding any protective coatings. Thickness is now commonly expressed in mils (1/1000 of an inch).
Metallic Coated Steel:	Steel that has a metallic coating for protection against corrosion. The level of protection provided is measured by the weight of the metallic coating applied to the surface area of the steel. Typical metallic coatings are galvanizing, galvalume, or galfan which are zinc based.
Mil:	A unit of measurement used in measuring the thickness of thin steel elements. One mil equals 1/1000 of an inch (e.g., 33 mil = 0.033 inch).
Multiple Span:	The span made by a continuous member having intermediate supports.
Non-Load Bearing Walls (Non-Structural Walls):	Refer to Walls.
Punchout (or Hole):	An opening in the web of a steel framing member allowing for the installation of plumbing, electrical, and utilities. A punchout or hole may be made during the manufacturing process or in the field with a hand punch, hole saw, or other suitable tool.
Rafter:	A structural framing member (usually sloped) that supports roof loads.
Rake Overhang:	The horizontal projection of the roof measured from the outside face of a gable endwall to the outside edge of the roof.
Ridge:	The horizontal line formed by the joining of the top edges of two sloping roof surfaces.

Seismic Zone:	Seismic zones designate areas with varying degrees of seismic risk and associated seismic design parameters (i.e., effective peak ground acceleration). Seismic Zones 0, 1, 2, 3, and 4 correspond to effective peak ground acceleration of 0g, 0.1g, 0.2g, 0.3g, and 0.4g, respectively (1g is the acceleration of the earth's gravity at sea level).
Seismic Design Category:	A classification assigned to a structure based on its Seismic Group and the severity of the design earthquake ground motion at the site. Seismic categories designate areas with varying degrees of seismic risk and associated seismic design parameters.
Shearwall:	A vertical wall assembly capable of resisting lateral forces to prevent racking from wind or seismic loads acting parallel to the plane of the wall.
Sidewall:	The exterior wall of a building parallel to the roof ridge, which supports roof rafters or trusses.
Single Span:	The span made by one continuous structural member without any intermediate supports.
Span:	The clear distance between bearing supports.
Structural Sheathing:	The covering (e.g., plywood or oriented strand board) used directly over structural members (e.g., studs or joists) to distribute loads, brace walls, and generally strengthen the assembly.
Stud:	Vertical structural element of a wall assembly, which supports vertical loads and/or transfers lateral loads.
Track:	Used for applications such as top and bottom plate for walls and band or rim joists for flooring systems. A track has a web and two flanges but no lips. Track web depth measurements are taken to the inside of the flanges. Refer to Figure 1.3.

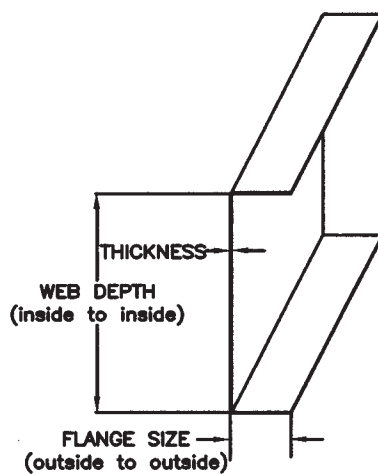


Figure 1.3
Track Section Configuration

Truss:	An engineered structural component designed to efficiently carry its own weight and superimposed design loads. The truss members form a triangular structural framework.
Walls:	<i>Structural or Load Bearing:</i> Wall systems subject to loads that exceed the limits for a non-structural system (e.g., wall studs). <i>Non-Structural or Non-Load Bearing:</i> Wall systems that are limited to 10 psf (0.479 kN/m ²) maximum lateral (transverse) load and/or limited, exclusive of sheathing materials, to 100 pounds (450 N) per lineal foot (0.3 m) or 200 pounds (900 N) maximum superimposed vertical load per member (e.g., interior partitions).
Web:	The part of a C-shape or track section that connects the two flanges.
Web Crippling:	The localized permanent (inelastic) deformation of the web member subjected to concentrated load or reaction at bearing supports.
Web Stiffener:	Additional material that is attached to the web to strengthen the member against web crippling. Also called a bearing stiffener.
Wind Exposure:	Wind exposure is determined by site conditions that affect the actual wind speeds experienced at a given site. For the purpose of this document, exposures A/B represent urban or suburban areas or wooded terrain and exposure C represents open terrain with scattered obstructions.
Wind Speed:	Wind speed is the design wind speed related to winds that are expected to be exceeded once every 50 years at a given site (i.e., 50 year-return period). Wind speeds in this document are given in units of miles per hour (mph) by “fastest-mile” measurements.
Yield Strength:	A characteristic of the basic strength of the steel material. It is the highest unit stress that the material can endure before permanent deformation occurs as measured by a tensile test in accordance with ASTM A370 [8].

Figure 1.4 is provided as an overall view of residential steel framing and the basic components.

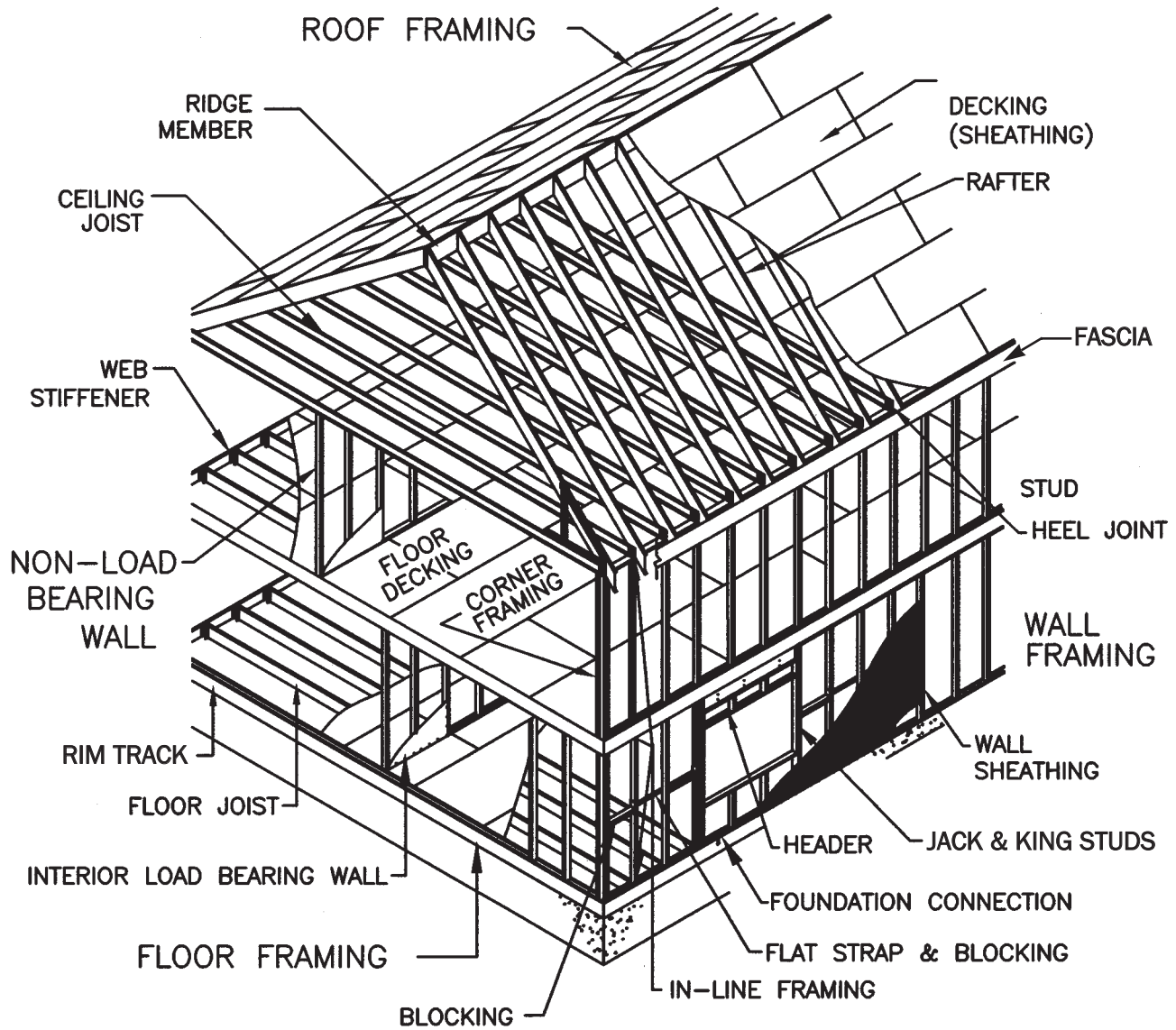


Figure 1.4
Schematic of Typical Steel Framed Building

2

MATERIALS, SHAPES, AND STANDARD SIZES

Types of Cold-Formed Steel

Structural Members

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

1. ASTM A653 [9]: Grades 33, 37, 40, & 50 (Class 1 and 3); or
2. ASTM A792 [10]: Grades 33, 37, 40, & 50A; or
3. ASTM A875 [11]: Grades 33, 37, 40, & 50 (Class 1 and 3); or
4. Steels that comply with ASTM A653 [9], except for tensile and elongation requirements, shall be permitted provided the ratio of tensile strength to yield point is at least 1.08 and the total elongation is at least 10 percent for a two-inch gauge length or 7 percent for an eight-inch gauge length.

Non-Structural Members

Non-structural members shall comply with ASTM C-645 [12].

Member Designation

The universal designator system shall be used for all cold-formed steel (CFS) members. The “STUFL” identifies any common CFS member using:

- Web Depth (D), taken in 1/100th inches (e.g., 6" = 600 x 1/100 inches)
- Flange width (B), taken in 1/100th inches (e.g., 1 5/8" = 162 x 1/100 inches)
- Minimum Base Metal Thickness (t), expressed in mils (1/1000th inch), (e.g., 0.054 in. = 54 mils) and the following designators:

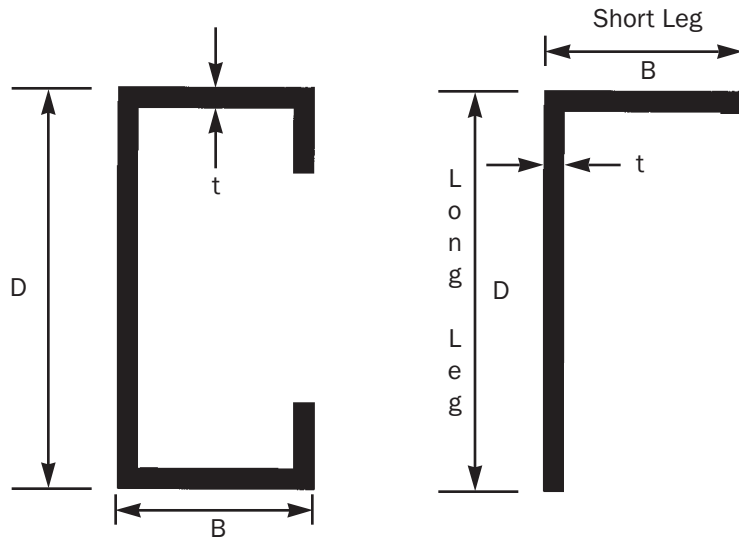
S = Stud or Joist Sections with Flange Stiffeners (C-Shapes)

T = Track Sections

U = Cold-Formed Channel or Channel Studs (w/o Flange Stiffeners)

F = Furring Channel

L = Angle or L-Header



Example: Designation for a 5 1/2"-16 gauge C-shape with 1 5/8" flanges:
550S162-54

550	S	162	-54
Minimum base metal thickness in mils (0.054 in. = 54 mils)			
1 5/8" flange width in 1/100th inches			
Stud or joist with flange stiffeners			
5 1/2" member depth in 1/100th inches (outside-to-outside dimension)			

Example: Designation for an 8"-18 gauge L-Header with 1 1/2" short leg:
2-800L150-43

800	L	150	-43
Minimum base metal thickness in mils (0.043 in. = 43 mils)			
1 1/2" width of short leg of angle in 1/100th inches			
Angle or L-header			
8" long leg of angle depth in 1/100th inches (outside-to-outside dimension)			

Physical Dimensions

Cold-formed structural steel members shall comply with Figure 2.1 and the dimensional requirements specified in Table 2.1. Tracks shall comply with Figure 2.2 and shall have a minimum of 1 1/4 inch (32 mm) flanges. Members with different geometrical shapes shall not be used with these provisions without the approval of a design professional. Dimensional tolerances shall be in accordance with ASTM C955 [13] for load bearing members and ASTM C645 [12] for non-load bearing members.

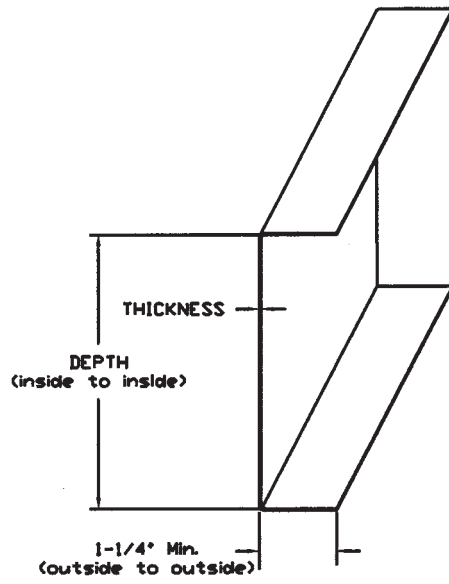


Figure 2.1
Track Section Dimensions

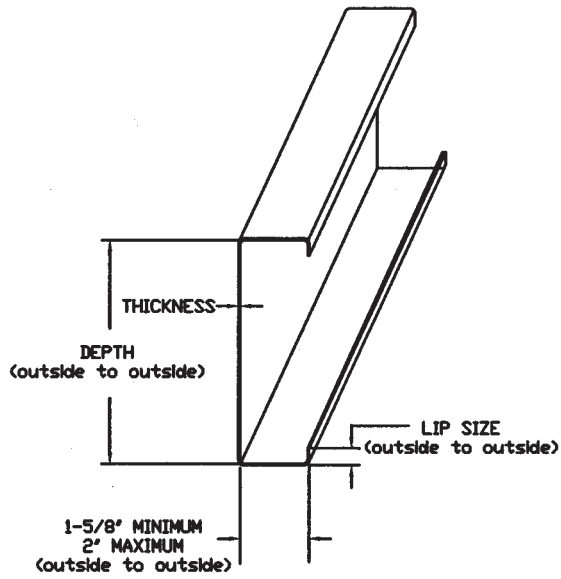


Figure 2.2
C-Shape Section Dimensions

Table 2.1
Cold-Formed Steel Member Sizes

Member Designation ¹	Web Depth ² (inches)	Minimum Flange Width ^{2,3} (inches)
350S162-t	3.5	1.625
550S162-t	5.5	1.625
800S162-t	8	1.625
1000S162-t	10	1.625
1200S162-t	12	1.625
350T125-t	3.5	1.25
550T125-t	5.5	1.25
800T125-t	8	1.25
1000T125-t	10	1.25
1200T125-t	12	1.25
600L150-t	6	1.50
800L150-t	8	1.50
1000L150-t	10	1.50

For SI: 1 inch = 25.4 mm.

¹"t" indicates the bare metal thickness of the steel, expressed in mils.

²Web represents long leg size and flange represents short leg size for L-header angles.

³Maximum flange width is 2 inches; minimum lip size is 0.5 inches.

Uncoated Material Thickness

The material thickness of steel framing members in their end-use shall meet or exceed the minimum (uncoated) thickness values given in Table 2.2.

Table 2.2
Minimum Thickness of Cold-Formed Steel Members

Designation (mils)	Minimum Steel Thickness (inches)	Reference Gauge Number	ASTM Color Code ¹
18	0.018	25	
27	0.027	22	
33	0.033	20	White
43	0.043	18	Yellow
54	0.054	16	Green
68	0.068	14	Orange
97	0.097	12	Red

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

¹Reference ASTM C 955 [13].

Bend Radius

The maximum bend radius shall be the greater of the following:

- 3/32 inch (2.4 mm), or
- two times the material thickness (2t) but not greater than 1/8 inch (3.2 mm).

Yield Strength

The yield strength of steel members shall be determined in accordance with ASTM A370 [8]. Unless otherwise specified as 50 ksi (345 MPa), the minimum yield strength (or yield point) of cold-formed steel C-shapes, tracks, flat straps, and other members shall be 33 ksi (228 MPa).

Corrosion Protection

Steel sheets, before being roll-formed into a shape, are generally sent through a hot-dip process that applies a metallic coating to protect the steel from rust. Metallic coated steel, therefore, is designed not to rust while on the construction job site, during construction, or after construction. The protective barrier on the surface does not allow moisture to contact the steel and prevents corrosion of steel framing members. Zinc coatings further protect the steel by acting as a sacrificial coating and provide long-term integrity against rusting. If steel gets scratched, dented, cut, or punched, the coating will continue to protect the exposed area sacrificially. This galvanic reaction causes the zinc to protect the steel for a few millimeters across the bare metal and reseal the protective barrier. The hot-dip process can apply a number of different coatings that vary in appearance and coating thickness.

Types of Protective Coating

Structural and non-structural members utilized in steel construction shall have a minimum metallic coating complying with the requirements of ASTM A1003/A1003M [27]. The most common types of coatings that are commercially available for cold-formed steel framing are:

Zinc-Coated—This is the standard process of continuous coating with pure zinc. The finished coating provides good corrosion resistance and excellent sacrificial protection.

Zinc 5% Aluminum Alloy—This type of coating contains aluminum in addition to zinc. It has an improved corrosion resistance compared to galvanized coatings.

55% Aluminum Alloy-Zinc—This type of coating contains higher percentage of aluminum and added silicone to zinc. It provides a superior corrosion resistance compared to galvanized coatings.

The degree of corrosion protection is measured by the coating weight (ounces per square foot) or by thickness (mils or microns) of the coating. A G60 coating for example, has a total weight of 0.60 oz/ft² (both sides) and a 0.51 mils nominal thickness per side.

Minimum Coating Requirement

Cold-formed structural steel framing members identified in accordance with this document shall have a minimum metallic coating complying with Table 2.3.

Table 2.3
Minimum Coating Requirements

Steel Component	Reference ASTM Standard		
	A653/A 653M (Zinc Coated) [9]	A792/A792M (Al-Zinc) [10]	A875/A 875M (Zinc-5% Al) [11]
Structural	G60/Z180	AZ50/AZ150	GF30/ZGF180
Non- Structural	G40/Z120	AZ50/AZ150	GF30/ZGF135

Other approved metallic coatings shall be permitted, provided the alternate coatings can be demonstrated to have a corrosion resistance that is equal to or greater than the corresponding hot-dipped galvanized coatings (i.e., G40 and G60) and provides protection at cut edges, scratches, etc.

The minimum coating designations shown in Table 2.3 assumes normal exposure conditions and construction practices. Cold-formed steel members used in buildings located in harsh environments (e.g., coastal areas) may require greater corrosion protection (e.g., G90).

Steel framing members shall be located within the building envelope and adequately shielded from direct contact with moisture from the ground or the outdoor climate.

Performance of Steel in Residential Homes

Steel-framing members located in an indoor atmosphere (such as wall and floor framing) have a very low rate of corrosion. Studies showed that the corrosion of zinc is lower than 0.1 μm per 3-year period in houses located in different rural, urban, marine, and industrial atmospheres. It can be concluded that a typical G40 zinc coated steel (10 μm = 0.39 mils) should outlast the life expectancy of a residential building [22].

Galvanized Steel in Contact With Building Materials

Contact With Other Metals

An electrochemical reaction occurs between dissimilar metals or alloys that can cause corrosion of one metal and protection of the other when they are in contact. This reaction will only occur when the dissimilar metals are connected in an electrolyte medium (such as moisture). In normal indoor environments, moisture levels are usually very low, and consequently, the galvanic action between dissimilar metals is much lower than those occurring in outdoor environments. Steel framing members are generally coated with zinc or aluminum alloy. Both zinc and steel will react adversely with brass and copper used for plumbing installations—this is known as a “galvanic reaction” or “galvanic corrosion” and can lead to durability problems just like other forms of corrosion. NASFA publication NT16-97, *Durability of Cold-Formed Steel Framing*

Members, [14] provides detailed information on galvanized coatings in contact with building materials. Steel framing members can be easily isolated from other metals by plastic insulators or grommets.

Contact With Mortar and Plaster

Fresh mortar and plaster may attack zinc and zinc alloy coating when damp, but corrosion ceases when the materials dry.

Contact With Wood

Metallic coated steel does not react with dry wood. Dry pressure-treated lumber is also not corrosive to zinc, and no special requirements are needed to fasten steel to wood framing. Galvanized nails and screws have been successfully used to join wood and steel materials for years.

Contact With Drywall and Insulation Products

Drywall, mineral wool, cellulose, and rigid foam insulating products do not react with galvanized steel.

Contact With Concrete

Good quality chloride-free concrete is not corrosive to zinc once it has cured.

Un-Reinforced Web Holes

Un-reinforced holes in webs (also referred to as punchouts or perforations) of structural members (such as joists, studs, or headers) shall comply with the requirements of Figures 2.3 and 2.4. Holes shall be permitted only along the centerline of the web of the framing member.

Un-reinforced holes violating the above requirements shall be patched in accordance with this section, reinforced, or designed in accordance with accepted engineering practices.

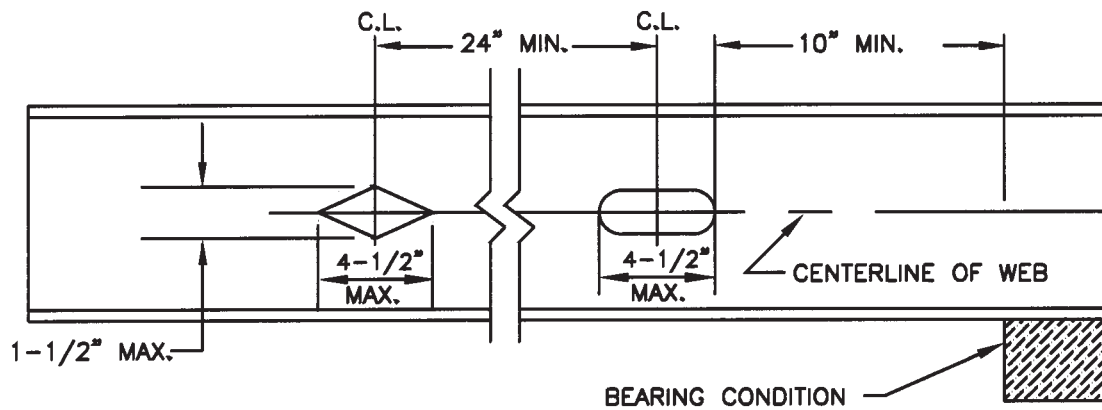


Figure 2.3
Un-Reinforced Floor and Ceiling Joist Web Holes

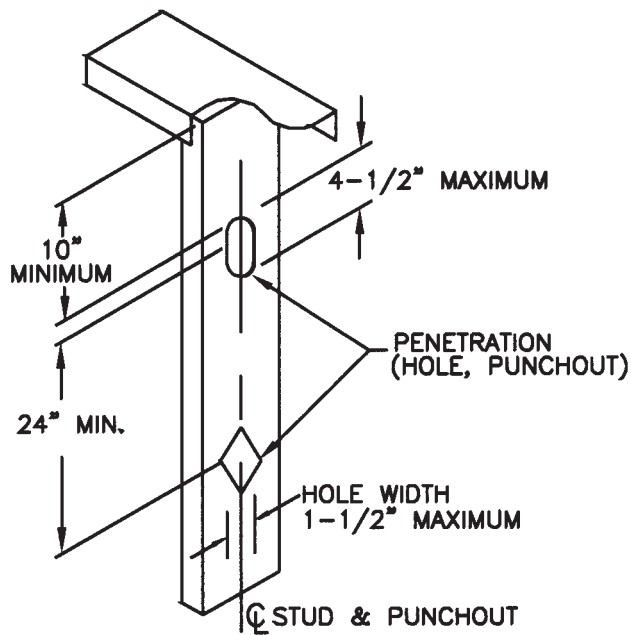


Figure 2.4
Un-Reinforced Holes in Webs of Studs and Other Structural Members

Cutting, Notching, and Hole Patching

Flanges and lips of joists, studs, headers, rafters, ceiling joists, and other structural members shall not be cut or notched. Web holes violating any of the requirements set forth in the above section shall be patched with a solid steel plate, stud section, or track section in accordance with Figures 2.5 or 2.6. The steel patch shall be of a thickness equivalent to or greater than the receiving member and shall extend a minimum of 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with minimum No. 8 screws spaced no greater than 2 inches (51 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (13 mm).

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

1. The depth of the hole, measured across the web, exceeds 75 percent of the depth of the web; and/or,
2. The length of the hole, measured along the web, exceeds 6 inches (152 mm) or the depth of the web, whichever is greater.

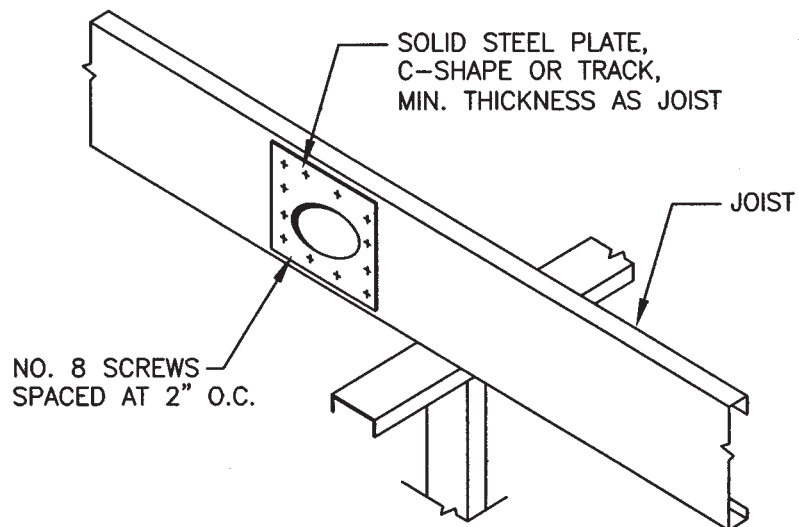


Figure 2.5
Joist Web Hole Patch

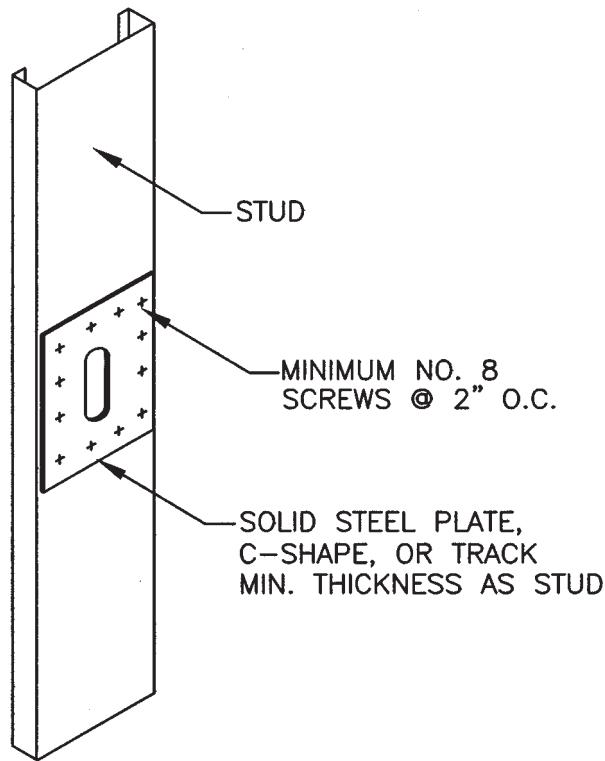


Figure 2.6
Stud Web Hole Patch

Bearing Stiffeners

A bearing stiffener (also referred to as web stiffener) shall be fabricated from a minimum 33 mil (0.84 mm) C-shaped member or 43 mil (1.09 mm) track member. Each stiffener shall be fastened to the web of the member it is stiffening with a minimum of four No. 8 screws equally spaced as shown in Figure 2.7. Bearing stiffeners shall extend across the depth of the web and shall be installed on either side of the member.

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), unless otherwise noted. All clip angle materials shall comply with the following sections: "Structural Members," "Yield Strength," and "Corrosion Protection."

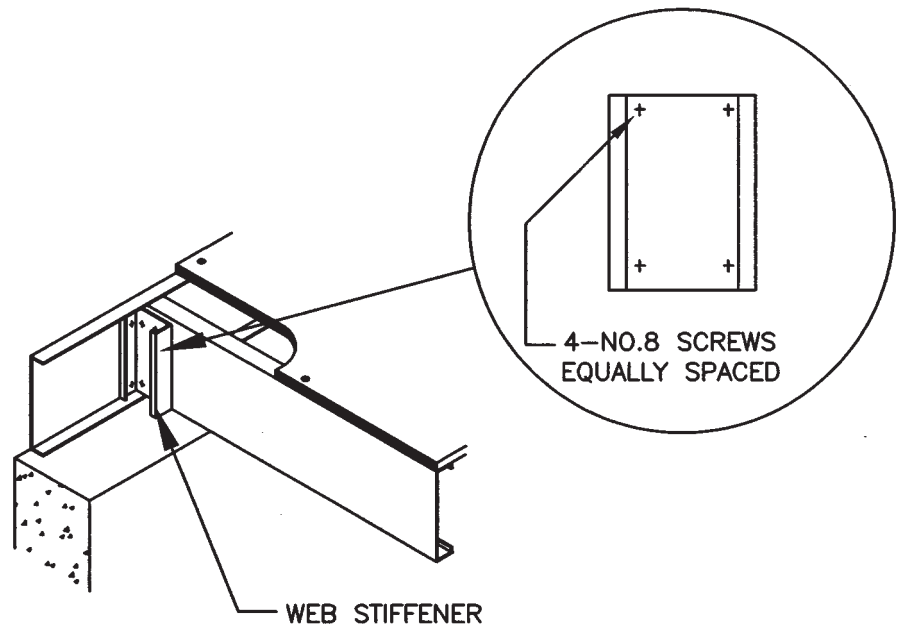


Figure 2.7
Bearing Stiffener

Fasteners

Fastening cold-formed steel framing members can be accomplished using different methods and techniques. The most common methods of fastening steel to steel are accomplished by screwing, welding, clinching, and nailing. Self-drilling, tapping screws are the most prevalent fasteners. Other fastening techniques, such as the use of pneumatically driven fasteners, powder-actuated fasteners, crimping, clinching, or welding, shall be permitted when approved. Screws are typically applied with a positive-clutch electric screw gun.

Screws

Holes are not typically drilled in steel framing before installing the screws. Therefore, self-drilling self-tapping screws are the most common fasteners used to frame steel members. Screws are available in diameters ranging from No. 6 to No. 14, with No. 6 to No. 10 being the most common. Lengths typically vary from 1/2 inch (12 mm) to as much as 3 inches (76 mm) depending on the application. Screws are generally 3/8 inch (9.5 mm) to 1/2 inch (12.7 mm) longer than the thickness of the connected materials so that a minimum of three threads shall extend beyond the connected material. It is important that the drill point be as long as the material thickness being fastened to drill effectively. The correct fastener type and length for each application should be selected by consulting the screw manufacturer's specifications and catalogs.

Point Types

Two specific point types are commonly used, as shown in Figure 2.8:

- Self-Drilling Screws: Externally threaded fasteners with the ability to drill their own hole and form, or “tap,” their own internal threads without deforming their own thread and without breaking during assembly. These screws are used with 33 mil (0.84 mm) steel or thicker.
- Self-Piercing Screws (sharp point): Externally threaded fasteners with the ability to pierce relatively thin steel material. They are commonly used to attach rigid materials, such as gypsum wallboard, to 33 mil (0.84 mm) or thinner steel.

For drill point screws, the total thickness of steel determines the point style of the screw to use. The larger the point style number and the larger the screw diameter, the more material the screw is capable of penetrating. Screw sizes should be selected based on the total thickness of the steel layers. While point styles 1, 4, and 5 are available, the most common are point styles 2 and 3.



Figure 2.8
Screw Point Type

Body Diameter

The body diameter of a screw is related to the nominal screw size as shown in Table 2.4. All connections shall be made with minimum of a No. 8 screw, except when attaching gypsum wallboard using a No. 6 screw.

Table 2.4
Screw Body Diameter

Screw Nominal Size	Nominal Screw Diameter, d, in.
No. 6	0.1380
No. 8	0.1640
No. 10	0.1900
No. 12	0.2160
1/4"	0.2500

For SI: 1 inch = 25.4 mm.



Length

The length of a screw is measured from the bearing surface of the head to the end of the point as shown in Figure 2.9. For example, the length of a flat or countersunk head is measured from the top of the head to the end of the point. A pan head screw length is measured from under the head (bearing surface) to the end of the point.

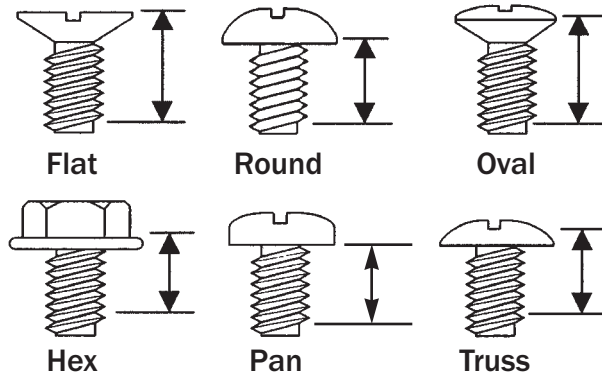


Figure 2.9
Screw Length Measurement

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The length of self-drilling screws may require special consideration since some designs have an unthreaded pilot section or reamer with wings between the threads and the drill point as shown in Figure 2.10. These features may be necessary for certain applications, such as applying wood sheathing to a steel floor joist. The long pilot point or reamer (see Figure 2.9) is required to allow the screw to drill through the material before engaging the threads. If the threads engage before the pilot hole is drilled completely, a gap may result in the connection. This can result in a squeaky connection or “screw-pops” through certain finish materials.

Thread

Self-piercing and self-drilling screws intended for cold formed steel applications generally have a coarse thread (e.g., 10-16 x 5/8 HWH SD indicates a 10 diameter, 16 threads per inch, 5/8" length, hex washer head, self-drilling screw). Self-drilling screws with fine threads are permitted. Manufacturer recommendations should be followed.

Corrosion Resistance

Common platings for corrosion resistance include zinc (mechanical galvanizing), phosphate and oil, and zinc with a yellow dichromate finish (gold color appearance). Self-drilling screws are typically zinc plated.

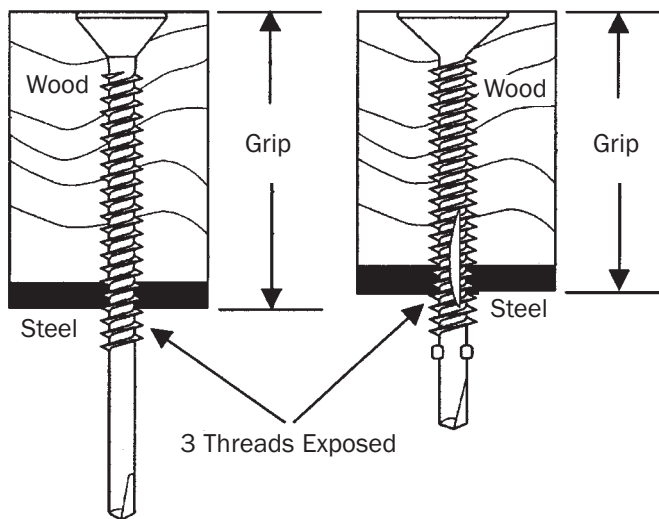


Figure 2.10
Screw Grip Range

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Head Styles

The screw head locks the screw in place and prevents it from sinking into the fastened material, and it draws the fastened material together. Common head styles include flat, oval, wafer, truss, modified truss, hex washer, pan, round washer, and pancake. See Figure 2.11. The specified style shall be determined by the application, preference, and availability. However, hex head screws are typically used for heavier structural connections. Round washer screws are typically used for general framing connections. Low profile heads are used on surfaces to be finished with gypsum board. And bugle head screws are typically used to attach sheathing products.

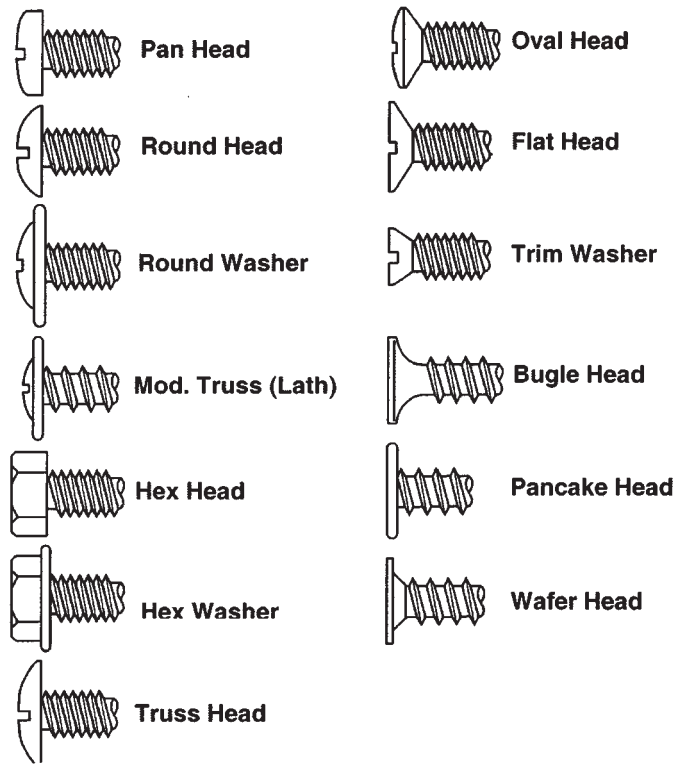


Figure 2.11
Screw Head Types

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Drive Types

Availability and preference determines drive types. Common drive types are shown in Figure 2.12.

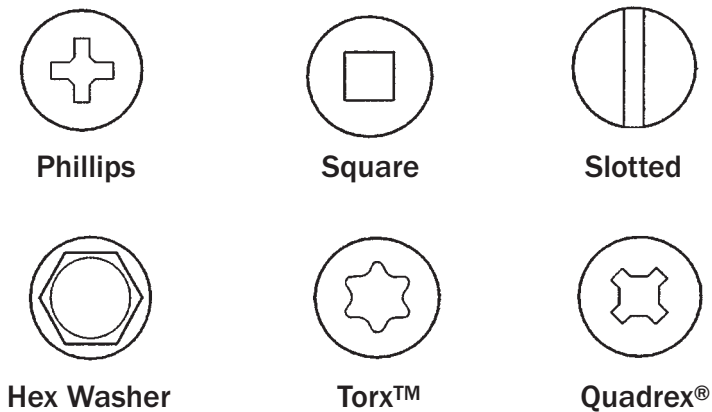


Figure 2.12
Screw Drive Types

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Screw Requirements

For all connections, screws shall extend through the steel a minimum of three exposed threads as shown in Figures 2.13 through 2.15. Screws shall penetrate individual components of a connection without causing permanent separation between the components. Screws shall be installed in a manner such that the threads and holes are not stripped. Self-drilling tapping screws shall have a coating of 3 microns of zinc, or satisfy a 24-hour salt spray test (ASTM F1941) [16] or equivalent corrosion protection. Where No. 8 screws are specified in a steel-to-steel connection, the required number of screws in the connection is permitted to be reduced in accordance with the reduction factors in Table 2.5 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.

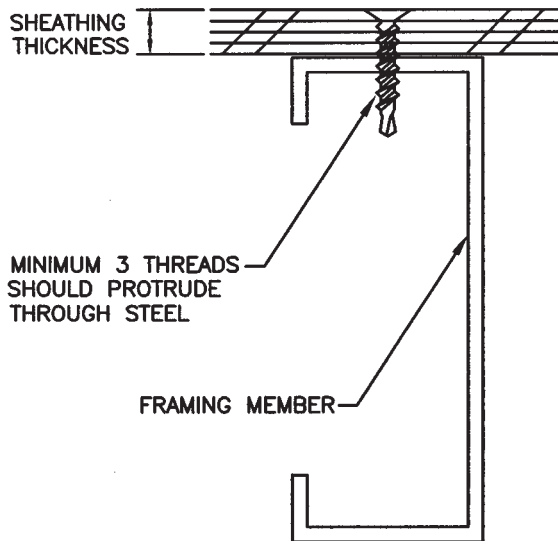


Figure 2.13
Sheathing-to-Screw Attachment

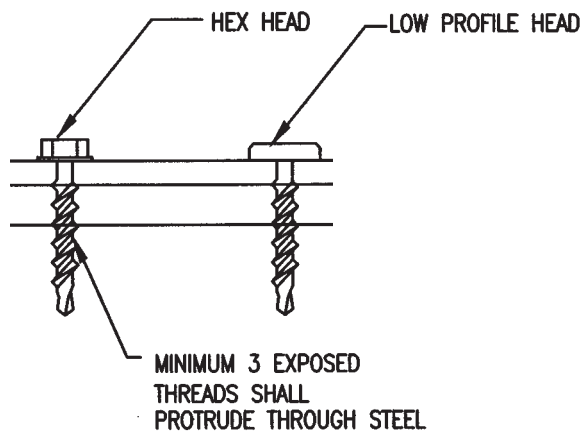


Figure 2.14
Screw Attachment

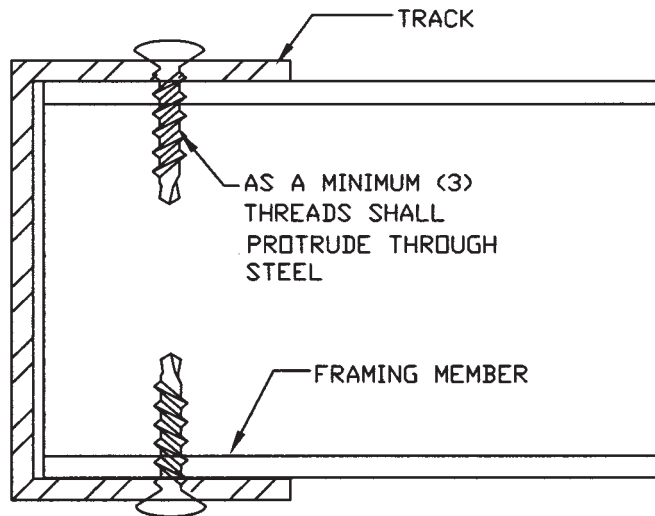


Figure 2.15
Steel-to-Steel Connection

Steel-to-Steel Connections

Screws for steel-to-steel connections shall be installed with a minimum edge distance and center to center spacing of 1/2 inch (13 mm), and shall be self-drilling tapping in compliance with SAE J-78 [15].

Structural Sheathing to Steel Connections

Structural sheathing shall be attached to steel framing (i.e., studs and joists) with minimum No. 8 self-drilling tapping screws in compliance with SAE J-78 [15]. Screws attaching structural sheathing to steel joists and wall framing shall have a minimum head diameter of 0.292 inch (7 mm) with countersunk heads and shall be installed with a minimum edge distance of 3/8 inch (9 mm).

Gypsum Board to Steel Connections

Gypsum board shall be attached to steel framing with minimum No. 6 screws conforming to ASTM C954 [17] and shall be installed in accordance with the applicable building code requirements for interior wall and ceiling finishes.

Table 2.5
Screw Substitution Factor

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

For SI: 1 inch = 25.4 mm.

Drive Pins and Nails

Pneumatic pins and nails are specifically designed with spiral grooves or knurls on the nail shaft to penetrate the steel. Drive pins and nails are typically used with airguns. Drive pins and nails are primarily used in attaching wood sheathing to wall and roof framing. Care should be taken and manufacturer's recommendations should be followed carefully when fastening subflooring to joists using drive pins and nails, to avoid squeaky floors.

Bolts

Bolts are not commonly used in cold-formed steel framing, except when required to anchor a floor or a wall to foundations. The most common anchors used in steel construction are anchor bolts, mudsill anchors, anchor straps, mushroom spikes, and powder-actuated anchors. Bolts shall meet or exceed the requirements of ASTM A307 [18]. Washers and nuts shall be properly installed and tightened. Bolts connecting steel framing to concrete shall have bolt holes spaced no closer than three bolt diameters on center. The distance from the center of the bolt hole to the edge of the connecting member shall not be less than one and one-half bolt diameters.

3

LABELING

Load-bearing steel framing members shall have a legible label, stamp, stencil, or embossment, spaced at a minimum of 48 inches on center along the length of the member, with the following minimum information:

- Manufacturer's identification;
- Minimum uncoated steel thickness in decimal inches (example 0.043 in.);
- Minimum coating designation (example G60); and
- Minimum yield strength in kips per square inch, ksi (example 33 ksi).

An example of an acceptable label: XYZ 0.043 G60 33 ksi

4

FOUNDATION

The building foundation shall comply with the applicable building code. Steel framing shall be attached to the foundation structure according to the requirements of Chapters 5 and 6 of this document. Foundation anchor bolts shall be located not more than 12 inches (0.3048 m) from corners or the termination of bottom tracks (e.g., at door openings or corners).

5

STEEL FLOOR FRAMING

Floor Construction

Cold-formed steel framing members shall comply with the provisions of Chapter 2. Steel floors shall be constructed in accordance with this section and Figure 5.1.

Applicability Limits

The applicability limits of the “Scope” section in Chapter 1 and Table 1.1 shall apply.

In-Line Framing

Load bearing steel floor framing shall be aligned vertically with load bearing framing members below. A maximum tolerance of 3/4 inch (19 mm) between the centerlines of the in-line members shall be permitted in accordance with Figure 1.2.

Floor to Foundation or Bearing Wall Connection

Cold-formed steel floor framing shall be anchored to foundations, wood sills, or load bearing walls in accordance with Table 5.1 and Figures 5.1 through 5.10. Fastening of steel joists to other framing members shall be in accordance with Table 5.2.

Allowable Joist Spans

The clear span of cold-formed steel floor joists shall not exceed the limits set forth in Tables 5.3 and 5.5 for single spans, and Tables 5.4 and 5.6 for multiple spans. When continuous joist members are used for multiple spans, the interior bearing supports shall be located within two feet (0.6 m) of mid-span of the steel joists, and the individual spans shall not exceed the applicable spans in the table. 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. Joists selected from Tables 5.3 and 5.4 shall have bearing stiffeners installed at each joist bearing location in accordance with the “Bearing Stiffeners” section in Chapter 2. Joists selected from Tables 5.4 or 5.6 shall only be used when the joists do not support any vertical load (from top) at bearing locations. 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 the “Framing of Floor Openings” section in Chapter 5.

Joist 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 Table 5.2. Floor joists with spans that exceed 12 feet (3.7 m) shall have the bottom flanges laterally braced in accordance with one of the following:

1. Gypsum board installed with minimum No. 6 screws in accordance with the applicable building code.
2. Continuous steel strapping installed in accordance with Figures 5.1 and 5.2. Steel straps shall be at least 1 1/2 inches (38 mm) in width and 33 mils (0.84 mm) in thickness. Flat straps shall be fastened to the bottom flange of each joist with at least one No. 8 screw and shall be fastened to blocking with at least two No. 8 screws. Blocking or bridging (X-bracing) shall be installed between joists at a maximum spacing of 12 feet (3.7 m) measured along the continuous strapping (perpendicular to the joist run). Blocking or bridging shall also be located at the termination of all straps.

Floor Cantilevers

Floor cantilevers for the second floor of a two-story building or the first floor of a one-story building shall not exceed 24 inches (610 mm) as illustrated in Figure 5.1. Cantilevered floor joists shall support interior floor loading only (in addition to roof loads). 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 (1,829 mm) 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 members). Approved design is required for cantilevered areas supporting uniform live loads greater than 40 psf (1.92 kN/m²).

Splicing

Joists and other structural members shall not be spliced without an approved design. Splicing of tracks shall conform to Figure 5.11.

Framing of Floor Openings

Openings in floors shall be framed with header and trimmer joists. Header joist spans shall not exceed 8 feet (2.4 m) in length. Header and trimmer joists shall be fabricated from joist and track sections, which shall be of a minimum size and thickness as the adjacent floor joists and shall be installed in accordance with Figures 5.1, 5.12, and 5.13. Each header joist shall be connected to trimmer joists with a minimum of 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 on each leg of the clip angle. The clip angles shall have a thickness not less than that of the floor joist.

Floor Trusses

Cold-formed steel floor trusses shall be designed, braced, and installed in accordance with an approved design. Truss members shall not be notched, cut, or altered in any manner without an approved design. All trusses shall be aligned with load carrying members (i.e., studs) in the wall unless designed otherwise. Refer to NASFA publication NT13-95 [19] *Design Guide For Cold-Formed Steel Trusses* for additional guidance.

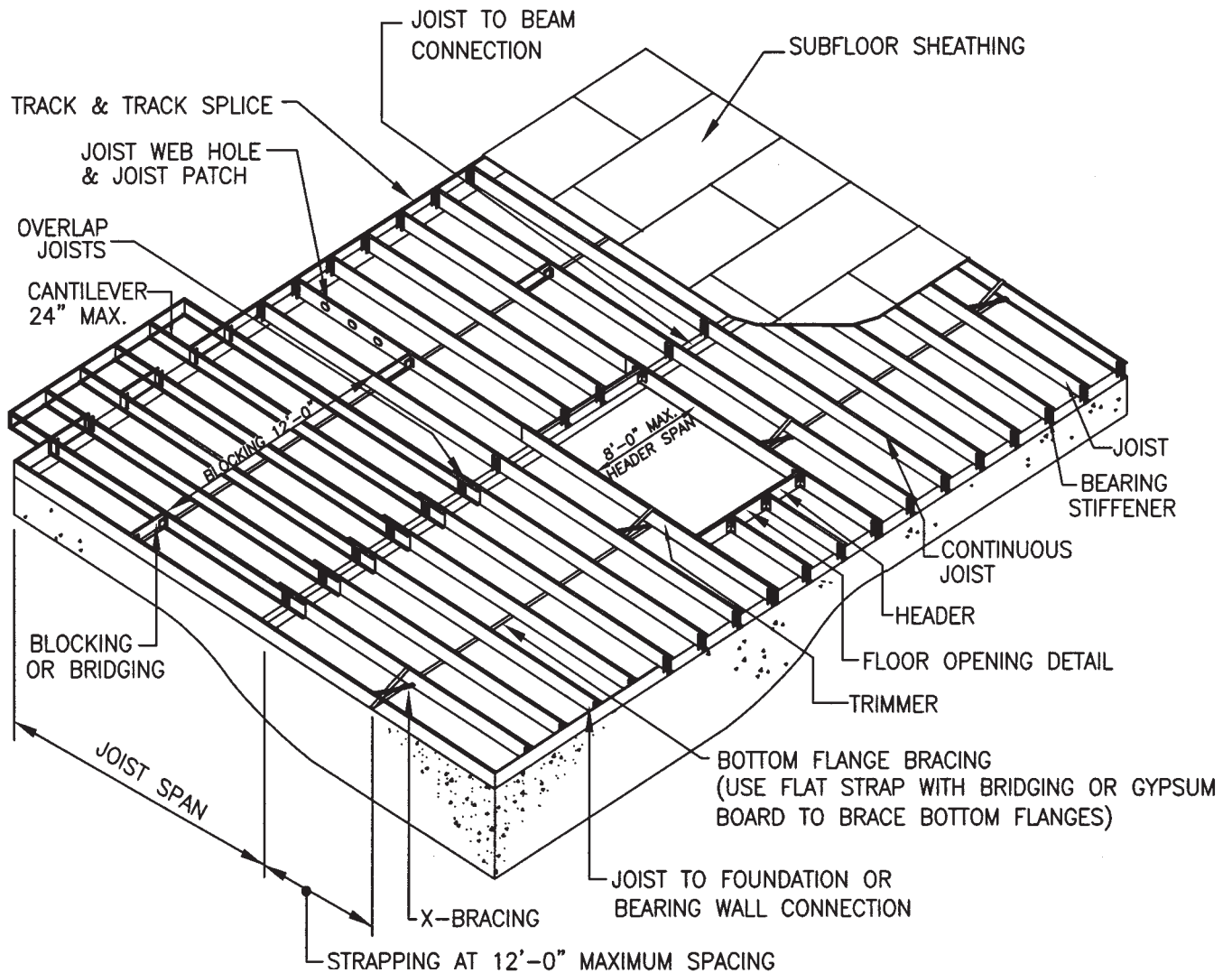


Figure 5.1
Steel Floor Construction

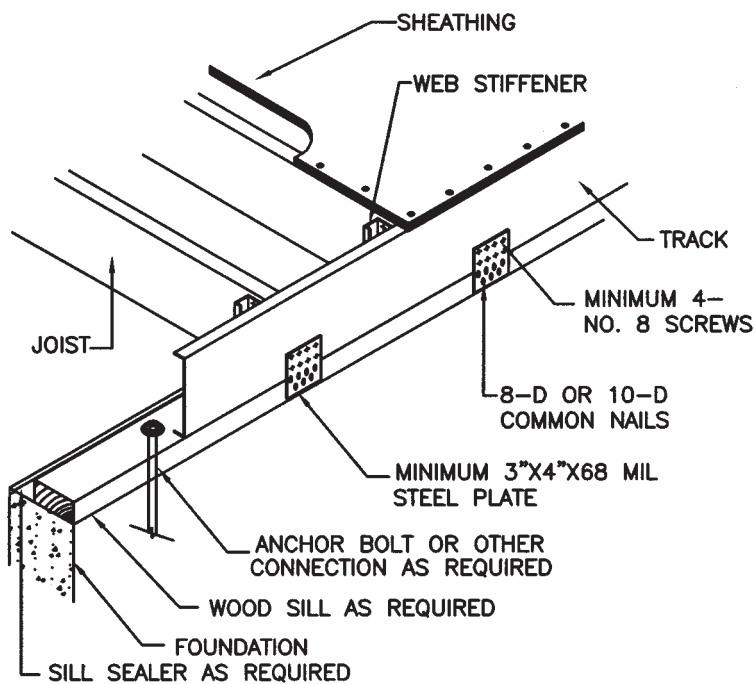


Figure 5.2
Floor to Wood Sill Connection

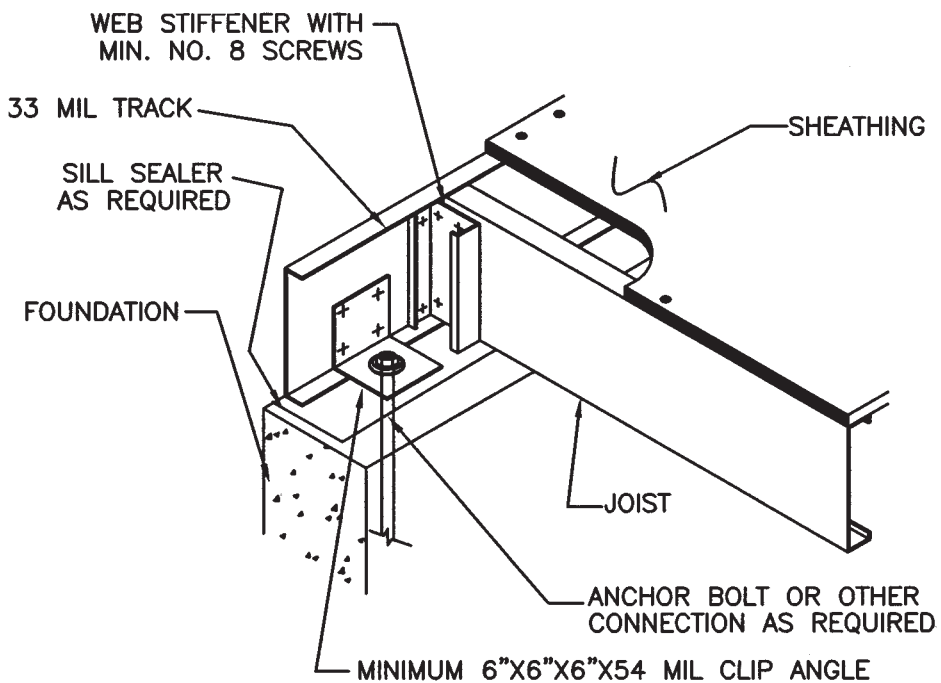


Figure 5.3
Floor to Foundation Connection

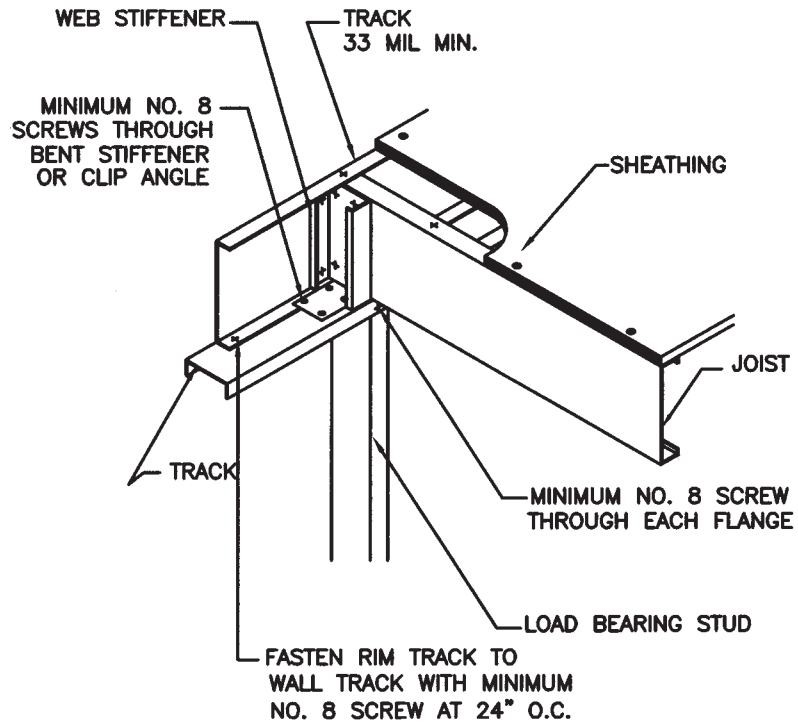


Figure 5.4
Floor to Exterior Load Bearing Wall Connection

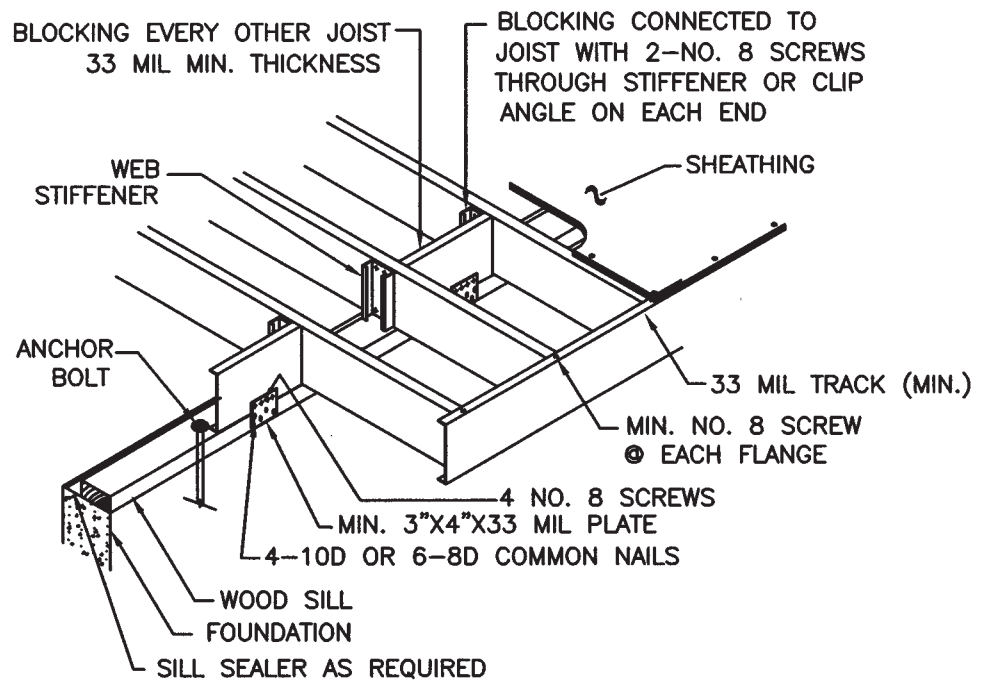


Figure 5.5
Cantilevered Floor to Wood Sill Connection

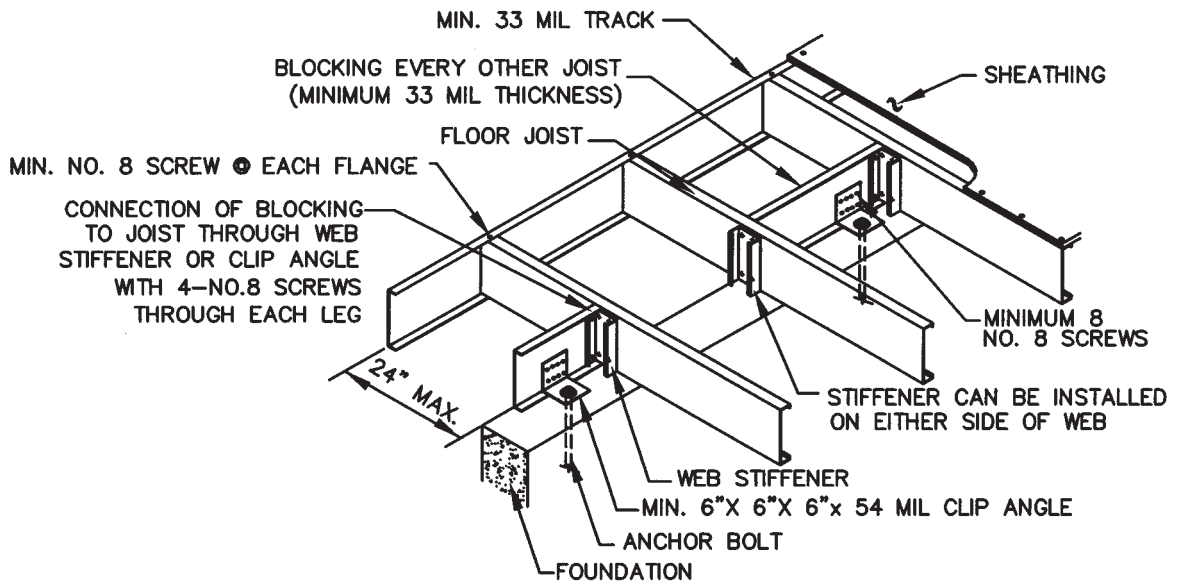


Figure 5.6
Cantilevered Floor to Foundation Connection

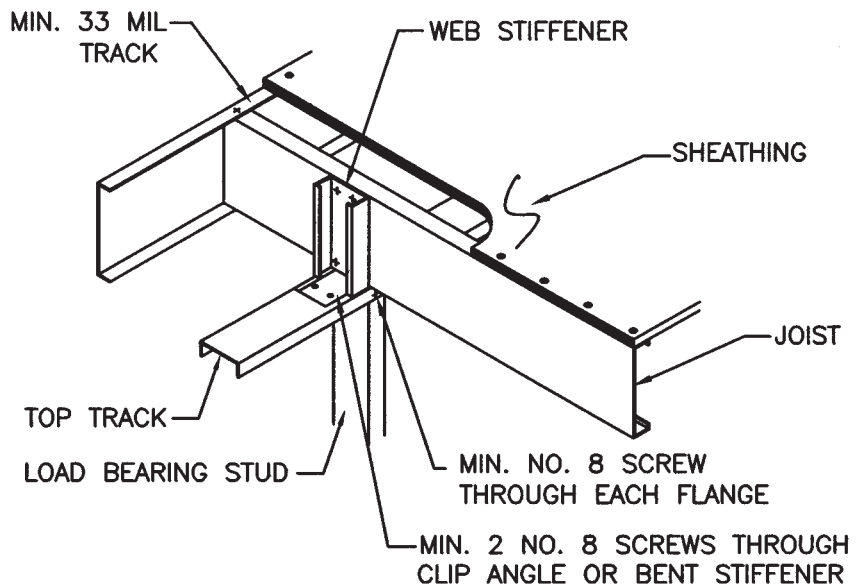


Figure 5.7
Cantilevered Floor to Exterior Load Bearing Wall Connection

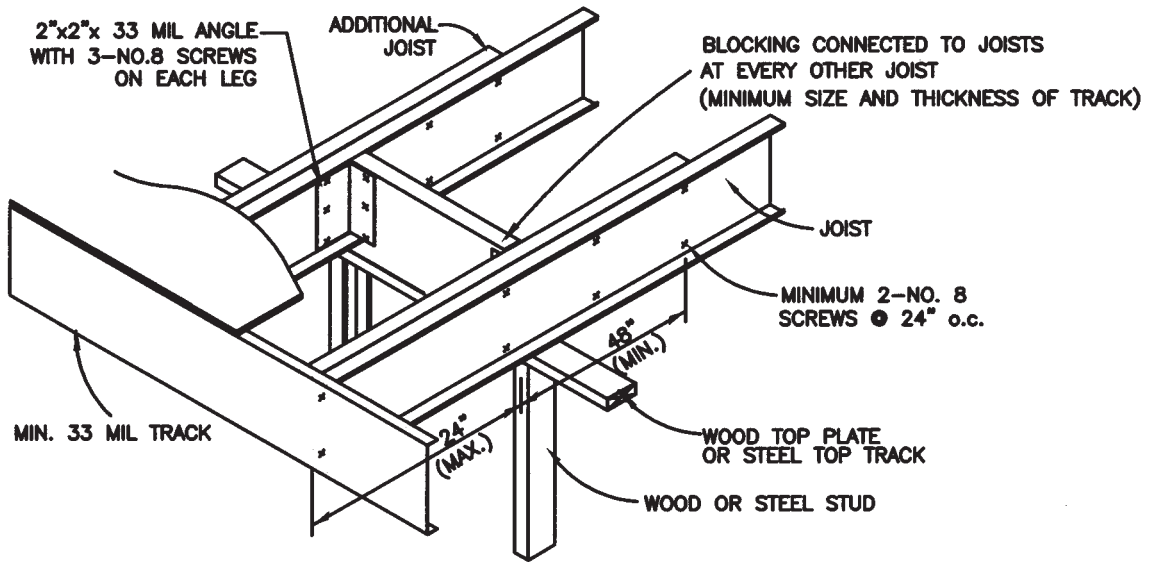


Figure 5.8
First Floor Cantilever Connection Detail

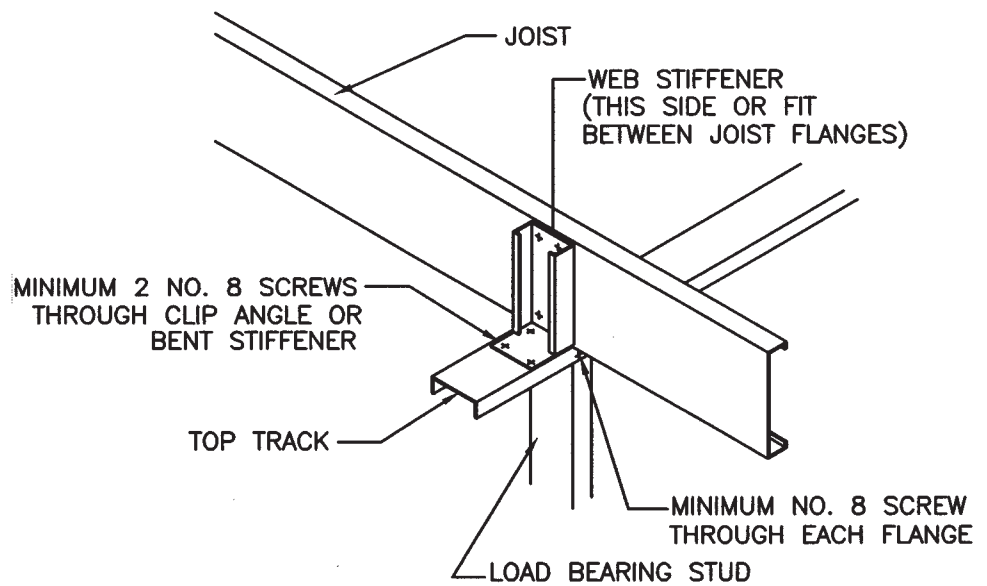


Figure 5.9
Continuous Span Joist Supported on an Interior Load Bearing Wall

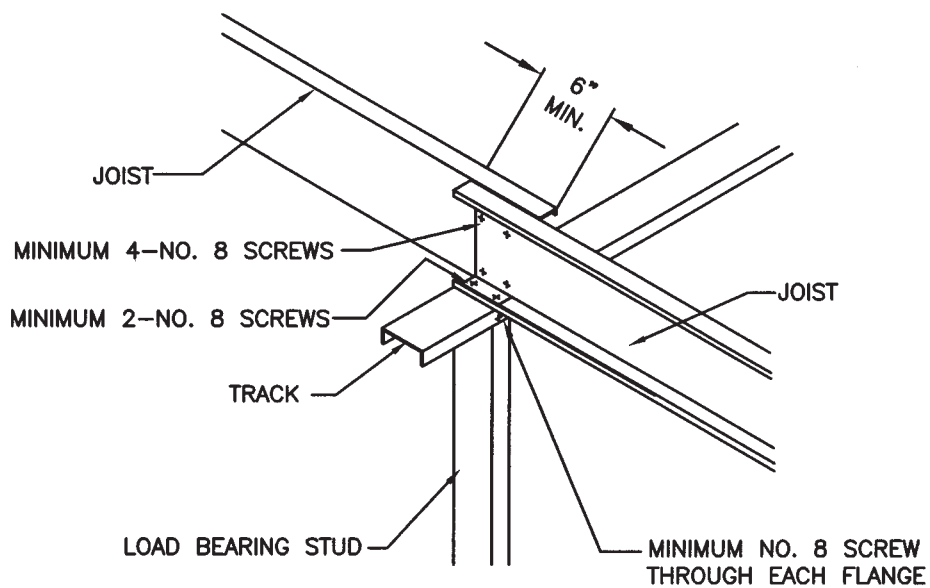


Figure 5.10
Lapped Joist Supported on Interior Load Bearing Wall

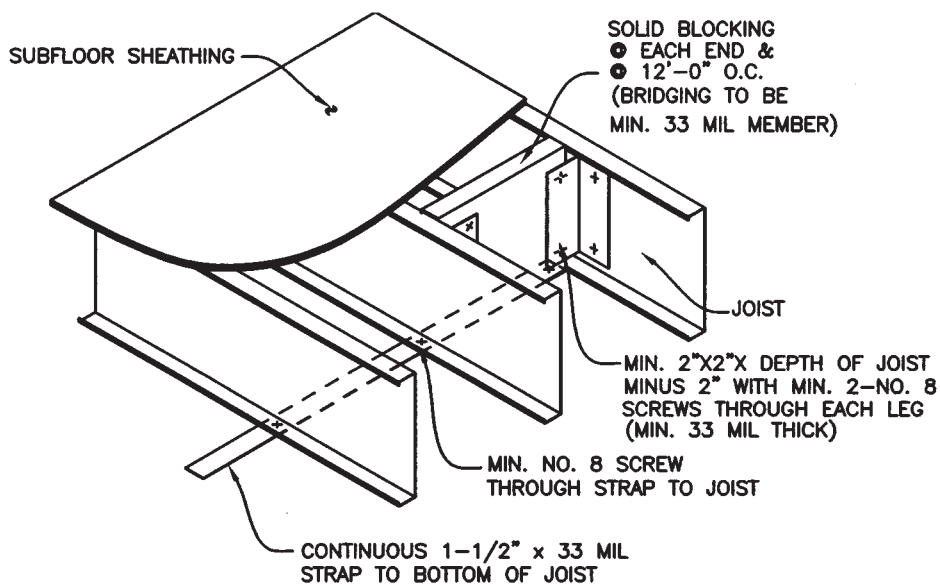


Figure 5.11
Steel Floor Bracing Detail

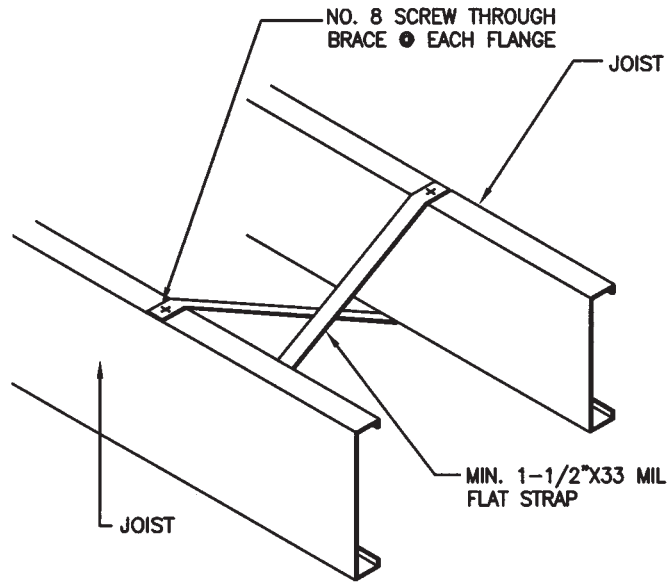


Figure 5.12
X-Bracing Detail

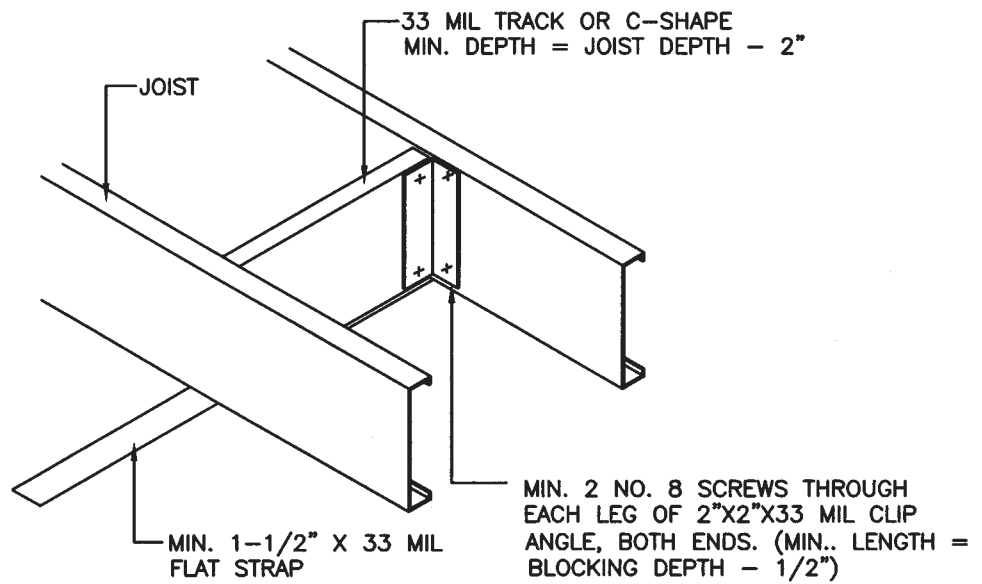


Figure 5.13
Blocking Detail

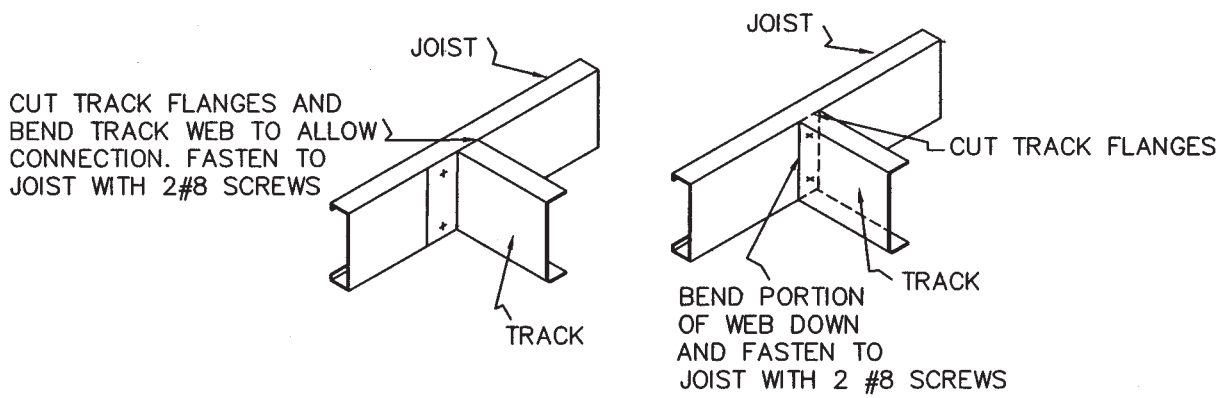


Figure 5.14
Alternate Blocking Details

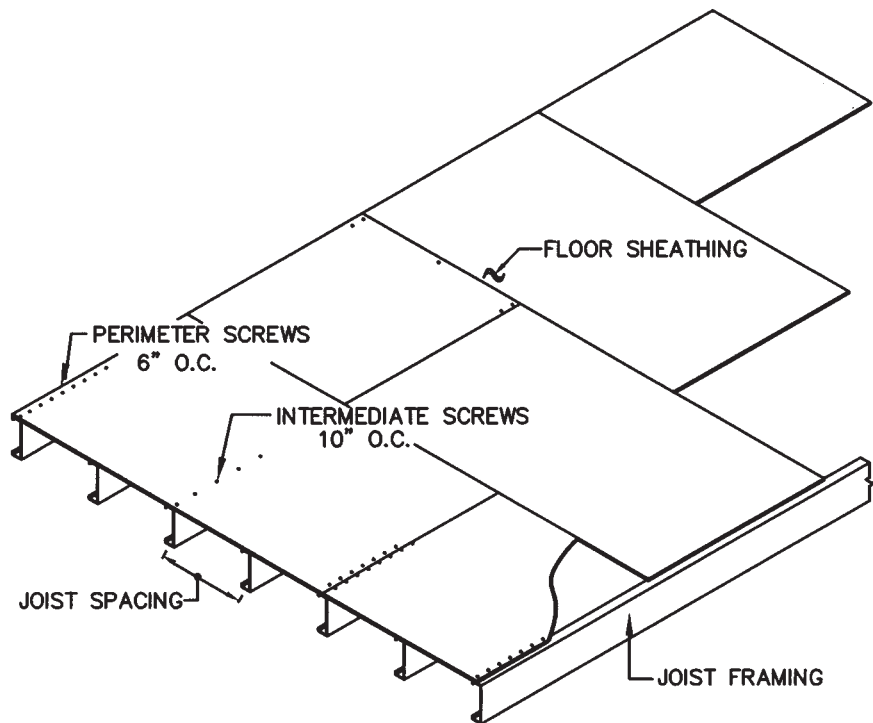


Figure 5.15
Sheathing Installation Detail

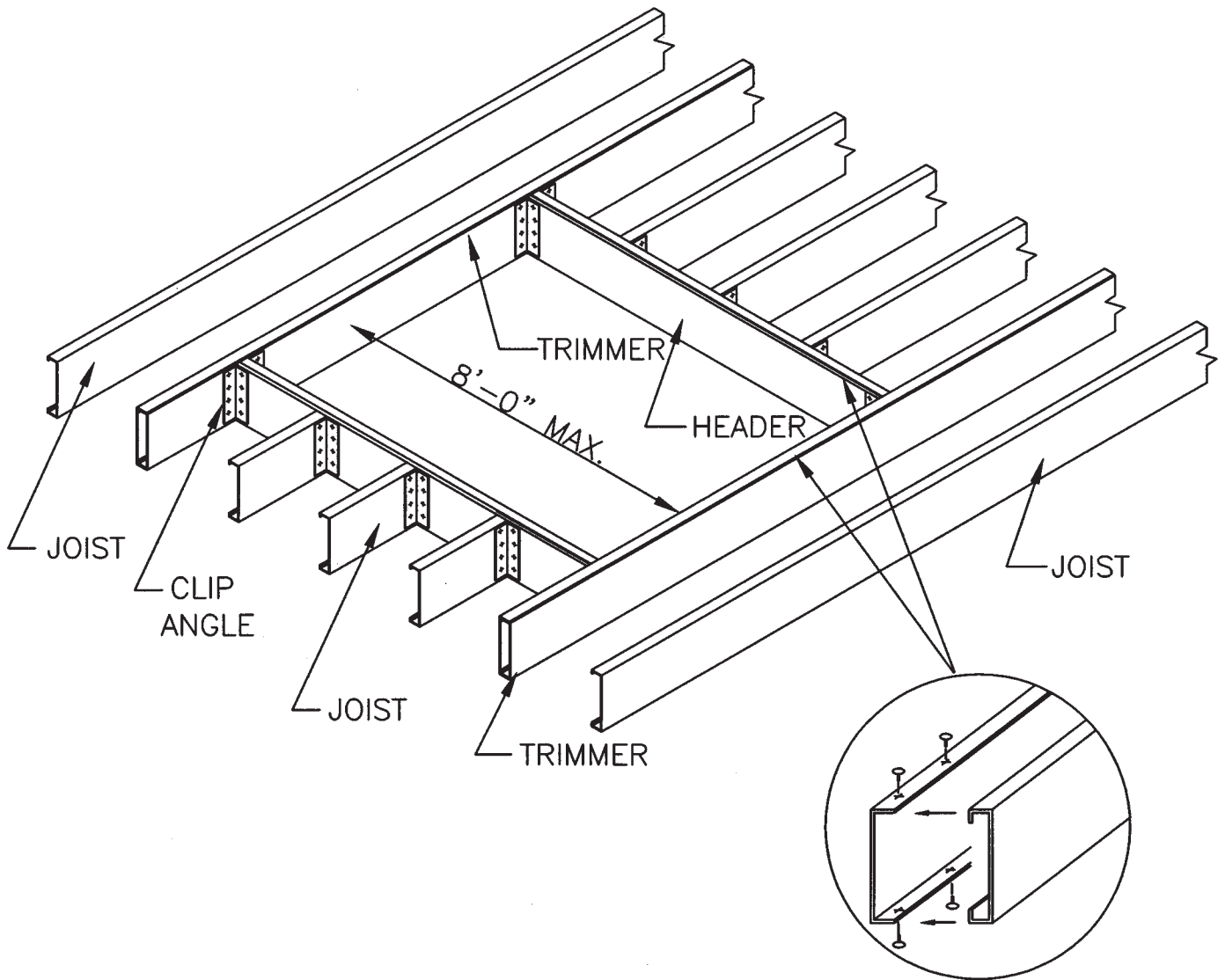


Figure 5.16
Floor Opening Detail

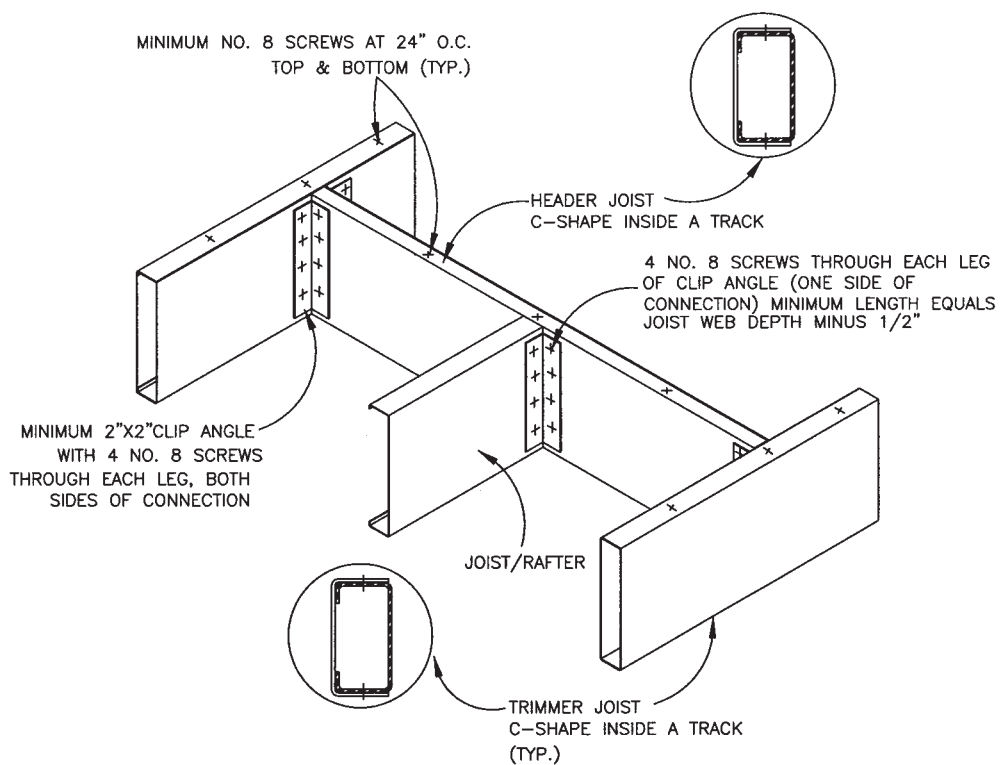


Figure 5.17
Floor Header to Trimmer Connection Detail

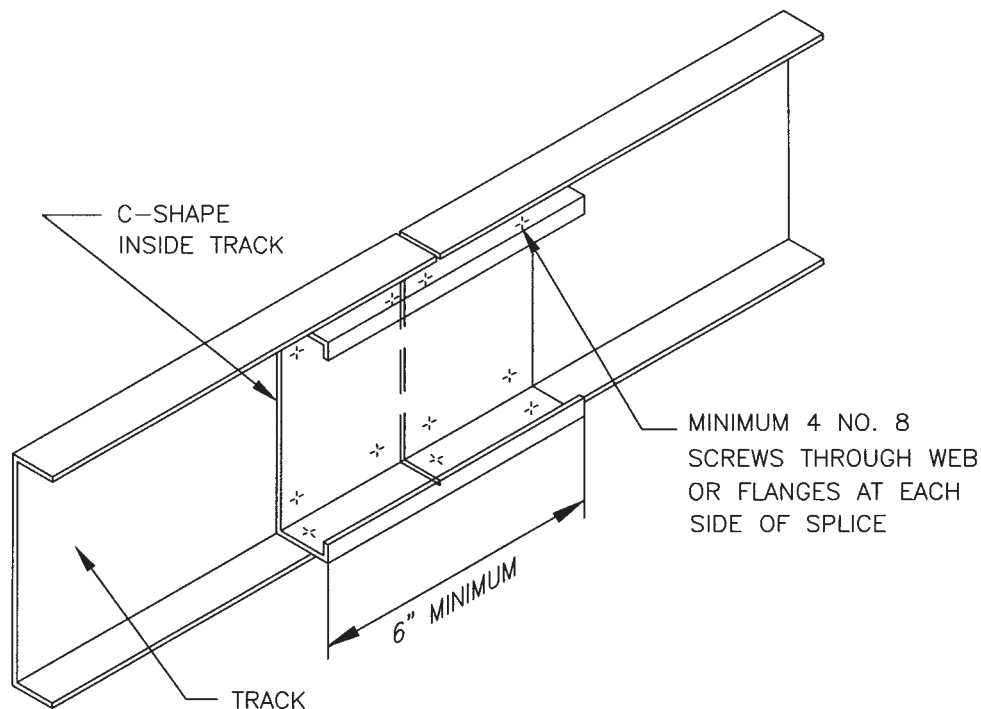


Figure 5.18
Track Splice Detail

Table 5.1
Floor to Foundation or Bearing Wall Connection Minimum Requirements

Framing Condition	Wind Speed (mph), Exposure, and Seismic Zones ^{1,2,3,4}	
	Up to 90 A/B or 70 C or Seismic Design Category A, B and C	Less Than 90 C
Floor joist track or end joist to wood sill per Figure 5.2	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
Floor joist track or end joist to foundation per Figure 5.3	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8 No. 8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8 No. 8 screws
Floor joist to wall track of exterior steel load bearing wall per Figure 5.4	2 No. 8 screws	3 No. 8 screws
Joist track or end joist to bearing wall top track per Figure 5.4	1 No. 8 screw at 24" o.c.	1 No. 8 screw at 24" o.c.
Cantilevered joist to wood sill per Figure 5.5	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
Cantilevered joist to foundation per Figure 5.6	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8 No. 8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8 No. 8 screws
Cantilevered joist to wall track per Figure 5.7	2 No. 8 screws per stiffener or bent plate	3 No. 8 screws per stiffener or bent plate

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1mph = 1.61 km/hr, 1 foot = 0.3048 m.

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

²All screw sizes shown are minimum.

³Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks (e.g., at door openings or corners).

⁴In Seismic Design Category D₁ and D₂ or where the basic wind speed equals or exceeds 90 mph (145 KM/HR) connection shall comply with the requirements in the "Braced Walls and Diaphragms in High Seismic and High Wind Regions" section in Chapter 6 but shall be no less than the minimum required herein.

Table 5.2
Floor Fastening Schedule

Description of Building Elements	Number and Size of Fasteners ¹	Spacing of Fasteners
Floor joist to track of an interior load bearing wall per Figures 5.9 and 5.10	2 No. 8 screws	Each joist
Floor joist to track at end of joist	2 No. 8 screws	One per flange or two per bearing stiffener
Subfloor sheathing to floor joists	No. 8 screws ²	6 inches on center on edges and 10 inches on center at intermediate supports

For SI: 1 inch = 25.4 mm

¹All screw sizes shown are minimum.

²Head styles shall be bugle-head, flat-head, or similar with a minimum head diameter of 0.29 inch (7 mm).

Table 5.3
Allowable Spans for Cold-Formed Steel Floor Joists^{1,2,3,4}
Single Span With Web Stiffeners

Joist Designation	30 psf Live Load Spacing (inches)				40 psf Live Load Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	11' 7"	10' 7"	9' 11"	9' 1"	10' 7"	9' 7"	9' 0"	8' 1"
550S162-43	12' 8"	11' 6"	10' 10"	10' 0"	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' 5"	11' 6"	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' 5"	12' 3"	11' 0"	14' 0"	12' 0"	11' 0"	9' 2"
800S162-43	17' 1"	15' 6"	14' 7"	13' 7"	15' 6"	14' 1"	13' 3"	12' 3"
800S162-54	18' 4"	16' 8"	15' 9"	14' 7"	16' 8"	15' 2"	14' 3"	13' 3"
800S162-68	19' 8"	17' 11"	16' 10"	15' 7"	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' 0"	15' 3"	18' 8"	16' 8"	15' 3"	13' 7"
1000S162-54	22' 1"	20' 1"	18' 10"	17' 6"	20' 1"	18' 3"	17' 2"	15' 11"
1000S162-68	23' 8"	21' 6"	20' 3"	18' 10"	21' 6"	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' 5"	20' 3"	18' 6"	16' 7"	20' 11"	18' 2"	16' 7"	13' 4"
1200S162-54	25' 9"	23' 4"	23' 8"	19' 7"	23' 4"	21' 3"	21' 6"	17' 6"
1200S162-68	27' 8"	25' 1"	23' 8"	21' 11"	25' 1"	22' 10"	21' 6"	19' 11"
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 = 0.3048 m.

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

²Bearing stiffeners shall be installed at all support points and concentrated loads.

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

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

Table 5.4
Allowable Spans for Cold Formed Steel Floor Joists^{1,2,3,4,5,6}
Multiple Spans With Web Stiffeners

Joist Designation	30 psf Live Load Spacing (inches)				40 psf Live Load Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	12' 10"	11' 2"	10' 2"	9' 1"	11' 6"	9' 11"	9' 1"	7' 11"
550S162-43	15' 8"	13' 6"	12' 4"	11' 0"	14' 0"	12' 1"	11' 0"	9' 10"
550S162-54	17' 7"	15' 3"	13' 11"	12' 5"	15' 9"	13' 8"	12' 5"	11' 2"
550S162-68	19' 6"	17' 2"	15' 8"	14' 0"	17' 8"	15' 4"	14' 0"	12' 6"
550S162-97	21' 9"	19' 9"	18' 7"	16' 8"	19' 9"	17' 11"	16' 10"	15' 0"
800S162-33	14' 5"	11' 8"	10' 2"	8' 7"	12' 3"	9' 10"	8' 7"	7' 2"
800S162-43	19' 5"	16' 8"	15' 4"	12' 6"	17' 5"	14' 3"	13' 9"	10' 8"
800S162-54	23' 0"	19' 11"	18' 2"	16' 3"	20' 6"	17' 9"	16' 3"	14' 6"
800S162-68	25' 10"	22' 5"	20' 5"	18' 3"	23' 2"	20' 0"	18' 3"	16' 4"
800S162-97	29' 6"	26' 10"	24' 8"	22' 0"	26' 10"	24' 2"	22' 0"	19' 8"
1000S162-43	21' 6"	17' 11"	15' 9"	13' 5"	18' 9"	15' 4"	13' 5"	11' 4"
1000S162-54	25' 6"	22' 1"	20' 2"	18' 0"	22' 10"	19' 9"	18' 0"	15' 6"
1000S162-68	30' 6"	26' 5"	24' 2"	21' 7"	27' 4"	23' 8"	18' 5"	19' 3"
1000S162-97	35' 6"	31' 11"	29' 1"	26' 0"	32' 3"	28' 6"	26' 0"	23' 3"
1200S162-43	21' 4"	17' 3"	15' 1"	12' 8"	18' 2"	14' 7"	12' 8"	10' 7"
1200S162-54	27' 8"	23' 9"	21' 10"	17' 10"	24' 9"	20' 4"	19' 2"	15' 2"
1200S162-68	32' 7"	28' 3"	25' 9"	23' 0"	29' 2"	25' 3"	23' 1"	20' 7"
1200S162-97	41' 3"	36' 8"	33' 6"	30' 0"	37' 8"	32' 10"	30' 0"	26' 10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Interior bearing supports for multiple span joists shall consist of structural (bearing) walls or beams.

³Bearing stiffeners shall be installed at all support points and concentrated loads.

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

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

⁶Interior supports shall be located within two feet (610 mm) of mid span, provided that each of the resulting spans does not exceed the appropriate maximum span shown in the table above.

Table 5.5
Allowable Spans for Cold Formed Steel Floor Joists^{1,2,3}
Single Span Without Web Stiffeners

Joist Designation	30 psf Live Load Spacing (inches)				40 psf Live Load Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	8' 2"	6' 2"	5' 1"	4' 1"	6' 6"	4' 11"	4' 1"	3' 3"
550S162-43	12' 8"	11' 6"	10' 10"	7' 11"	11' 6"	9' 7"	7' 11"	6' 4"
550S162-54	13' 7"	12' 4"	10' 9"	11' 7"	12' 4"	11' 2"	10' 6"	9' 9"
550S162-68	14' 7"	13' 3"	12' 5"	11' 6"	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
800S162-43	13' 10"	10' 5"	8' 8"	6' 11"	11' 1"	8' 4"	6' 11"	5' 6"
800S162-54	18' 4"	16' 8"	14' 8"	11' 8"	16' 8"	14' 8"	12' 2"	9' 9"
800S162-68	19' 8"	17' 11"	16' 10"	15' 7"	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1000S162-54	21' 5"	16' 1"	13' 4"	10' 8"	17' 1"	12' 10"	10' 8"	8' 6"
1000S162-68	23' 9"	21' 6"	20' 3"	18' 4"	21' 6"	19' 7"	18' 5"	14' 8"
1000S162-97	26' 6"	24' 1"	22' 8"	21' 0"	24' 1"	21' 10"	20' 7"	19' 1"
1200S162-43	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1200S162-54	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1200S162-68	27' 8"	25' 1"	21' 4"	17' 1"	25' 1"	20' 6"	17' 1"	13' 8"
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 = 0.3048 m.

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

²Deflection criteria: L/480 for live loads, L/240 for total loads.

³Floor dead load = 10 psf (0.479 kN/m²)

Table 5.6
Allowable Spans for Cold Formed Steel Floor Joists^{1,2,3,4,5}
Multiple Spans Without Web Stiffeners

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Interior bearing supports for multiple span joists shall consist of structural (bearing) walls or beams.

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

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

⁵Interior supports shall be located within two feet (610 mm) of mid span, provided that each of the resulting spans does not exceed the appropriate maximum span shown in the table above.

6

STRUCTURAL STEEL WALL FRAMING

Wall Construction

Cold-formed steel structural walls shall be constructed in accordance with this section and Figure 6.1. Cold-formed steel framing members shall comply with the provisions of Chapter 2.

Applicability Limits

The applicability limits of the “Scope” section in Chapter 1 and Table 1.1 shall apply.

In-Line Framing

Load bearing steel stud walls (interior and exterior) shall be located directly in-line with joists, trusses, or rafters supported above with a maximum tolerance of 3/4 inch (19 mm) between their centerlines in accordance with Figure 1.2. Interior load bearing steel walls shall be supported on foundations or shall be located directly above a load bearing wall or beam girder.

Wall to Foundation or Floor Connection

Steel-framed walls shall be anchored to foundations or floors in accordance with Table 6.1 and Figures 6.2 and 6.3. Anchorage to floors shall be in accordance with Table 6.1. Structural walls in regions with basic wind speed greater than or equal to 90 mph (144.8 km/hr) or in Seismic Design Category D₁ or greater shall meet the additional limits in the “Braced Walls and Diaphragms in High Seismic and High Wind Regions” section.

Structural Walls (Load Bearing Walls)

Load bearing walls shall be constructed in accordance with Figure 6.1. Steel stud size and thickness shall be selected from Tables 6.2 through 6.7 for steels with minimum yield strength of 33 ksi (228 MPa) or Tables 6.8 through 6.13 for steels with minimum yield strength of 50 ksi (345 MPa). Fastening requirements shall be in accordance with the “Fasteners” section of Chapter 2 and Table 6.14. Wall tracks (top and bottom tracks) shall have a minimum steel thickness equivalent to or greater than the wall studs. Exterior walls with a minimum of 1/2 inch (13 mm) gypsum wall board installed in accordance with Table 6.14 on the interior surface and wood structural sheathing panels of minimum 7/16 inch (11 mm) thick oriented strand board or 15/32 inch (12 mm) thick plywood installed in accordance with the “Structural Sheathing” section on the outside surface shall be permitted to use the next thinner stud size, from Tables 6.2 through 6.7, but not less than 33 mils (0.84 mm). Interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board installed in accordance with Table 6.14 on both sides of the wall shall be permitted to use

the next thinner stud from Tables 6.2 through 6.7, but not less than 33 mils (0.84 mm). Stud thickness for walls supporting one floor, roof, and ceiling are based on a second floor live load of 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 6.2 through 6.13.

Stud Bracing

The flanges of load bearing steel studs shall be laterally braced in accordance with one of the following methods:

1. Gypsum wall board or structural sheathing on both sides of load bearing walls installed in accordance with Table 6.14 and Figure 6.4.
2. Horizontal steel strapping installed in accordance with Figure 6.5 on both sides at mid-height for 8-foot (2,438 mm) walls, and third-heights for 9- and 10-foot (2,743 and 3,048 mm) walls. Horizontal steel straps shall be at least 1 1/2 inches in width and 33 mils in thickness (38 mm x 0.84 mm). Straps shall be attached to the flanges of studs with at least one No. 8 (minimum) screw. In-line blocking shall be installed between studs at the termination of all straps and at 12-foot (3,658 mm) intervals along the strap; straps shall be fastened to the blocking with at least two No. 8 (minimum) screws.
3. Gypsum wall board or structural sheathing on one side and horizontal steel strapping (per item 2 above) on the other side of load bearing walls as shown in Figure 6.5.

Adequate temporary or permanent stud bracing shall be provided to resist loads during construction.

Splicing

Studs and other structural members shall not be spliced without an approved design. Splicing of tracks shall conform to Figure 6.7.

Corner Framing

Corner studs and the top track shall be installed in accordance with Figure 6.8. Other approved corner framing details shall be permitted.

Headers

Headers shall be installed above wall openings in all exterior and interior load-bearing walls in accordance with the “Box Beam Headers,” “Back-to-Back Headers,” “L-Shaped Headers,” and “Jack and King Studs” sections. Headers are not required for openings in interior non-load bearing walls.

Box Beam Headers

Box beam headers shall be constructed in accordance with Figure 6.9 and Tables 6.15 through 6.17. Header spans for house widths between those tabulated may be determined by interpolation. Headers shall be formed from two equal sized C-shaped members in a box type configuration. Steel tracks used to form the headers shall be of a minimum thickness of 33 mils (0.84 mm). Headers shall be connected to king studs in accordance with Table 6.19. One-half of the total number of 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 6.9. 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.

Back-to-Back Headers

Back-to-back headers shall be constructed in accordance with Figure 6.10 and Tables 6.15 through 6.17. Header spans for house widths between those tabulated may be determined by interpolation. Headers shall be formed from two, equal sized C-shaped members in a back-to-back configuration. Steel tracks used to form the headers shall be of a minimum thickness of 33 mils (0.84 mm). Headers shall be connected to king studs in accordance with Table 6.19. 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 inch x 2 inch (51 mm x 51 mm) clip angle in accordance with Figure 6.10. 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.

L-Shaped Headers

L-shaped headers shall be constructed in accordance with Figures 6.11 and 6.12 and Tables 6.20 through 6.35 [26]. An L-header consists of a cold-formed steel angle with one short leg lapping over the top track of the wall and one long leg extending down the side of the wall above window or door openings as shown in Figures 6.11 and 6.12. Each angle is fastened to top track above an opening with minimum No. 8 screws spaced at 12 inches on center. The "L" angle is 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 king and cripple stud(s) with a minimum of one No. 8 screw at top and bottom.

Jack and King Studs

The number of jack and king studs, installed on each side of the header shall comply with Table 6.18. Jack, king, and cripple studs shall be of the same size and thickness as the adjacent wall studs. Jack and king studs shall be interconnected with structural sheathing in accordance with Figures 6.9 and 6.10.

Wall Bracing (Shearwall Bracing)

Exterior steel-framed walls subjected to wind speeds less than 90 mph (145 km/hr) or located in seismic category A, B, or C shall be braced with diagonal steel straps or structural sheathing in accordance with the “Strap Bracing (X-Brace)” or “Structural Sheathing” sections. Braced wall lines and diaphragms in regions with basic wind speed greater than or equal to 90 mph (144.8 km/hr) or in Seismic Design Category D₁ or greater shall meet the additional limits in the “Braced Walls and Diaphragms in High Seismic and High Wind Regions” section.

Strap Bracing (X-Brace)

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

Structural Sheathing

In areas where the basic wind speed is less than 90 mph (144.8 km/h), wood structural sheathing shall be installed on all exterior walls of buildings, in accordance with this section. Wood structural sheathing panels shall consist of minimum 7/16 inch (11 mm) thick oriented strand board or 15/32 inch (12 mm) thick plywood and shall be installed on all exterior wall surfaces in accordance with the “Structural Sheathing Fastening” section and Figure 6.1. The minimum length of full height sheathing on exterior walls shall be determined in accordance with Table 6.21 but shall not be less than 20 percent of the braced wall length in any case. The minimum percentage of full height sheathing in Table 6.36 shall include only those sheathed wall sections, uninterrupted by openings, which are a minimum of 48 inches (1,120 mm) wide. The minimum percentage of full-height structural sheathing shall be multiplied by 1.10 for 9-foot (2,743 mm) high walls and multiplied by 1.20 for 10-foot (3,048 mm) high walls. In addition, structural sheathing shall:

1. be installed with the long dimension parallel to the stud framing (i.e., vertical orientation) and shall cover the full vertical height of the stud; and
2. be applied to each end (corners) of each of the exterior walls with a minimum 48 inch (1,120 mm) wide panel.

Structural Sheathing Fastening

All edges and interior areas of structural sheathing panels shall be fastened to framing members and tracks in accordance with Figure 6.13 and Table 6.14. The panels shall be installed with the long dimension parallel to the stud framing and shall extend the full vertical height of the wall.

Hold-Down Requirements

The percent of full height sheathing required in Table 6.36 is permitted to be multiplied by 0.6 where a hold down anchor, with a capacity of 4,300 pounds (1,952 kg), is provided at each end of exterior walls. A single hold down anchor is permitted to be installed at wall corners per Figure 6.17.

Braced Walls and Diaphragms in High Seismic and High Wind Regions

General

Braced wall lines and diaphragms in buildings in Seismic Design Category D_1 and D_2 and buildings in areas where the basic fastest-mile wind speed equals or exceeds 90 mph (145 km/h) shall be constructed in accordance with the additional requirements of this section. Where a building, or portion thereof, does not comply with the provisions of this section, those portions shall be designed and constructed in accordance with accepted engineering practice.

Building Configuration

Floor and roof diaphragm plan aspect ratios shall not exceed 4:1. The diaphragm aspect ratio shall be determined by dividing the length of the diaphragm between braced wall lines by the width of the diaphragm between braced wall lines. Braced wall lines shall be placed on all exterior walls and on interior walls as required. Floor and roof diaphragm plan offsets shall not exceed 4 feet (1,220 mm). When offsets exceed 4 feet (1,220 mm), the wall to either side shall be considered as a separate braced wall line with bracing amounts in accordance with Figure 6.15.

Where a braced wall line separates different 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.

Vertical offsets in floor and roof diaphragms shall be supported by braced wall lines. Braced wall lines shall be in a single vertical plane from the foundation to the uppermost story in which they are required.

Braced Wall Lines

Braced wall lines shall be composed of either Type I braced wall panels or Type II (perforated) braced walls as shown in Figure 6.16. The required length of bracing shall be determined in accordance with the greater requirement for seismic or wind. Each braced wall line shall have not less than two full height braced wall panels, each meeting the minimum height to width aspect ratios in the “Curtain Walls” or “Exterior Wall Covering” sections. Braced wall panels shall begin not more than 8 feet (2,438 mm) from each end of a braced wall.

Type I and Type II braced walls shall have wood structural sheathing panels on one side and 1/2 inch (12 mm) gypsum wallboard on the other. Wood structural sheathing panels shall be as specified in the “Wall Bracing (Shearwall Bracing)” section and shall be attached to framing members with minimum No. 8 screws spaced as required by Table 6.37 on all edges and 12 inches (12 mm) in the field. Gypsum wallboard shall be attached as required by the local building requirements. In braced wall lines, all edges of wood structural sheathing panels shall be attached to framing members or 2 inch (51 mm) by 33 mil (0.84 mm) horizontal steel strapping. Where horizontal strapping is used to attach adjacent sheets of sheathing material, solid blocking shown in Figure 6.1 shall not be required.

Type I 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 the “Braced Walls Hold-Down Anchorage and Support” section. The required length of Type I braced wall panels shall be determined by the “Seismic Design Category D_1 and D_2 ” section for seismic applications and the “Exterior Wall Covering” section for wind applications. The required length is permitted to be adjusted by the edge screw spacing adjustment factors in Table 6.37. 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 minimum height to width aspect ratio herein.

Type II Braced Wall Panels

Type II braced walls are fully sheathed and are permitted to have openings. Where sheathing does not extend above and below window openings and above door openings, the height of unrestrained opening shall be defined as the full height of the wall.

The required length of full height sheathing panels in Type II braced wall lines shall be determined by multiplying the required length of Type I braced wall panels, including adjustments permitted by Tables 6.37 and 6.42, by the length adjustment factors in Table 6.38. The length adjustment factors in Table 6.38 are permitted only in seismic applications. For a segment to count toward the required length it shall have a height to width ratio of two to one (2:1). Type II braced wall lines shall have hold down anchors as required by the “Braced Walls Hold-Down Anchorage and Support” section at each end, attached to wall segments meeting the minimum height-to-width ratio.

Braced Walls Hold-Down Anchorage and Support

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. The required hold down force shall be determined by Table 6.39. Hold down anchors shall be attached to the foundation or to framing members below. Where hold down anchors are attached 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 in the lower story, the required lower story anchor force shall be determined by summing the upper story anchor force and the lower story anchor force. Hold down anchors are permitted to be attached to blocking members provided the required hold-down forces are transferred to structural framing members. Hold down anchors shall be attached to a minimum of two back-to-back, 33 mil (0.84 mm) studs in accordance with the anchor manufacturer’s instructions. A single hold down anchor installed in accordance with Figure 6.17 is permitted at the corners of buildings.

Hold down anchors shall be fastened to studs that have the required sheathing edge fastening. A minimum of two studs shall support end studs of Type I braced wall panel above. These supporting studs shall be in addition to load bearing studs required at the level below.

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 6.18 or shall have blocking, installed in accordance with Figure 6.19, connecting the top track to the roof sheathing at locations specified herein. Blocking shall be installed at each end of braced walls. Continuous blocking shall be installed above all Type I braced wall panels and above full height sheathing panels in Type II braced wall lines. Where the roof diaphragm spans more than 40 feet (12,192 mm) between braced wall lines, continuous blocking shall also be installed in the middle one-third of the braced wall lines.

Splices in top tracks in braced walls shall comply with Figure 5.11 except the number of screws in the splice shall be as shown in Table 6.40. Screws used to attach blocking to the top track are 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 6.20. Splices in the floor track shall not occur in the same bay as splices in wall track immediately above or below the floor track splice.

The bottom track of braced walls supported on foundations shall have anchor bolts installed in accordance with Figure 6.3. Floor track or rim joists supporting braced wall lines shall be attached to foundations in accordance with Figure 5.3. The maximum spacing between anchor bolts shall be as shown in Table 6.41. 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 or the termination of bottom track sections.

In regions where the basic wind speed equals or exceeds 90 mph, the bottom track in exterior walls shall also comply with the provisions of the “Wall Bottom Track to Foundation” section for uplift.

Seismic Design Category D_1 and D_2

The construction of buildings in Seismic Design Category D_1 and D_2 shall comply with the provisions of this section. Buildings shall be limited to slab on grade or continuous concrete or masonry foundations. The weight of floors, roofs or walls shall not exceed the limits set forth in the “Scope” section of Chapter 1.

Required Length of Type I Braced Wall Panels

For the purposes of this section, the diaphragm aspect ratio shall be taken as the dimension of the diaphragm perpendicular to the walls under consideration divided by the dimension of the diaphragm parallel to the walls under consideration and shall be not less than one-quarter to one (0.25:1) nor more than four-to one (4:1). The required length of Type I braced wall panels shall be determined from Figures 6.21 through 6.24 where the diaphragm span is the dimension of the diaphragm perpendicular to the walls under consideration. Interpolation shall be permitted for determining diaphragm span values.

The required length of Type I braced wall panels is permitted to be adjusted by length adjustment factors in Table 6.42 where the dead weights of roof/ceiling assembly and exterior walls are less than or equal to the unit weights specified therein. The required length of Type I braced wall panels shall be increased by length adjustment factors in Table 6.43 where the dead weights of roof/ceiling assembly are greater than 15 psf (0.72 kN/m²). The length adjustment factors in Tables 6.42 and 6.43 are permitted to be compounded with those in Table 6.37.

The height to width aspect ratio of Type I braced wall panels and full height sheathing segments in Type II braced walls shall be limited to two-to-one (2:1).

Exception: Type I braced wall panels on either side of garage openings, that support roofs only, are permitted to have an aspect ratio of four-to-one (4:1).

High Wind Requirements

Buildings in areas where the basic wind speed is 90 mph (145 km/h) or greater shall have braced wall lines complying with this section.

Braced Wall Design

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 7 in 12 or greater.

The minimum and maximum allowable sidewall lengths shall be determined from Tables 6.44 and 6.45. The required length of Type I braced wall panels shall be determined from Tables 6.46 and 6.47.

Braced wall hold down anchors shall comply with the “Braced Walls Hold-Down Anchorage and Support” section. The height to width aspect ratio of Type I braced wall panels shall be limited to four-to-one (4:1). The height to width aspect ratio of full height sheathing segments in Type II braced walls shall be limited to two-to-one (2:1).

Exterior walls shall be sheathed with wood structural sheathing panels or other approved materials. Wood structural sheathing panels, and their attachments, shall comply with the “Seismic Design Category D₁ and D₂” section, except in regions where the basic wind speed exceeds 90 mph (145 km/h) wood structural sheathing panels attached to framing spaced 24 inches (610 mm) on center shall be a minimum of 19/32 inch (15 mm). Attachment of wall sheathing materials other than wood structural sheathing panels shall comply with the manufacturers’ instructions.

High Wind Connections

Connections, as required in this section, shall be provided to ensure a continuous load path capable of transferring shear and uplift loads from floors, studs, and roof framing to the foundation.

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 6.48. Alternatively, a 1 1/4 inch (32 mm) by minimum 33 mil (0.84 mm) steel uplift strap connecting the 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 6.49.

Uplift Connection—Wall Assembly to Wall Assembly Exterior wall studs in the upper story wall of a two-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 6.48. Alternatively, a 1 1/4 inch (32 mm) by 33 mil (0.84 mm) steel uplift strap shall be permitted with minimum No. 8 screws attached to each stud, as required by Table 6.49.

Uplift Connection—Wall Assembly to Foundation or Floor Assembly 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 6.50. Alternatively, a continuous 1 1/4 inch (32 mm) by 33 mil (0.84 mm) steel uplift strap is permitted when placed under the wood sill and attached to both flanges of the exterior stud as shown in Figure 6.25. The uplift strap shall be fastened to each flange with minimum No. 8 screws as required by Table 6.50.

Ridge Strap Connection

Roof rafters shall be provided with a connection at the ridgeline to transfer tension loads. The ridge connection shall be capable of resisting the unit loads listed in Table 8.14 multiplied by the appropriate spacing multiplier. Alternatively, steel ridge strap, shall be provided with minimum No. 8 screws on each end of the strap as required in Table 8.14. The number of screws shall be increased to account for the spacing multipliers shown in the table. The width and thickness of the steel ridge strap shall be as shown in Table 8.15 based upon the required number of screws on one side of the strap.

Header Uplift Connections

Single Story or Top Story of a Two Story Building Uplift connections shall be provided to fasten the rafter or roof trusses to the header by connectors capable of resisting the uplift loads listed in Table 6.48.

Uplift connections shall be provided to fasten the header to the jack studs by connectors capable of resisting the uplift loads listed in Table 6.48 multiplied by the number of framing members displaced, divided by two. An additional uplift strap shall be provided to fasten rafters or roof trusses to king studs that provide in-line framing support in accordance with Table 6.48.

Uplift connections shall be provided to fasten the jack studs to the foundation by connectors capable of resisting the uplift loads listed in Table 6.48, multiplied by the number of framing members displaced, divided by two.

Bottom Story of a Two Story Building Uplift connections shall be provided to fasten the exterior wall studs in the upper story wall of a two story building to the header below by connections capable of resisting the uplift loads listed in Table 6.48.

Uplift connections shall be provided to fasten the header to the jack studs by connectors capable of resisting the uplift loads listed in Table 6.48, 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 6.48.

Uplift connections shall be provided to fasten the jack studs to the foundation by connectors capable of resisting the uplift loads listed in Table 6.48, multiplied by the number of framing members displaced, divided by two.

Wall Bottom Track to Foundation

Bottom track of exterior walls shall be connected to a wood sill plate as shown in Figure 6.4. The track shall be attached with steel plates spaced at 2 feet (610 mm) on center and fastened with 4 No. 8 screws with 4-10d or 6-8d common nails. Bottom track of interior braced walls shall be connected to supporting floors or foundations as required by the “Attachment of Braced Walls to Foundations and Floor and Roof Diaphragms” section.

The bottom track shall be connected to the foundation with 1/2 inch (12 mm) anchor bolts extending 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 or the termination of bottom track sections. Anchor bolts shall be spaced in accordance with Table 6.41 but shall be a maximum of 3 feet on center.

Exception: In regions with a wind speed of 100 mph or greater, anchor bolts located within the 8 feet (2,438 mm) end zone shall be spaced a maximum of 2 feet (610 mm) on center.

Curtain Walls

Tables 6.22 and 6.23 provide the maximum allowable height of curtain wall studs (i.e., gable end wall studs) for different wind speeds and exposures.

Exterior Wall Covering

Exterior wall covering material shall be attached to cold-formed steel framing in accordance with manufacturer’s installation instructions.

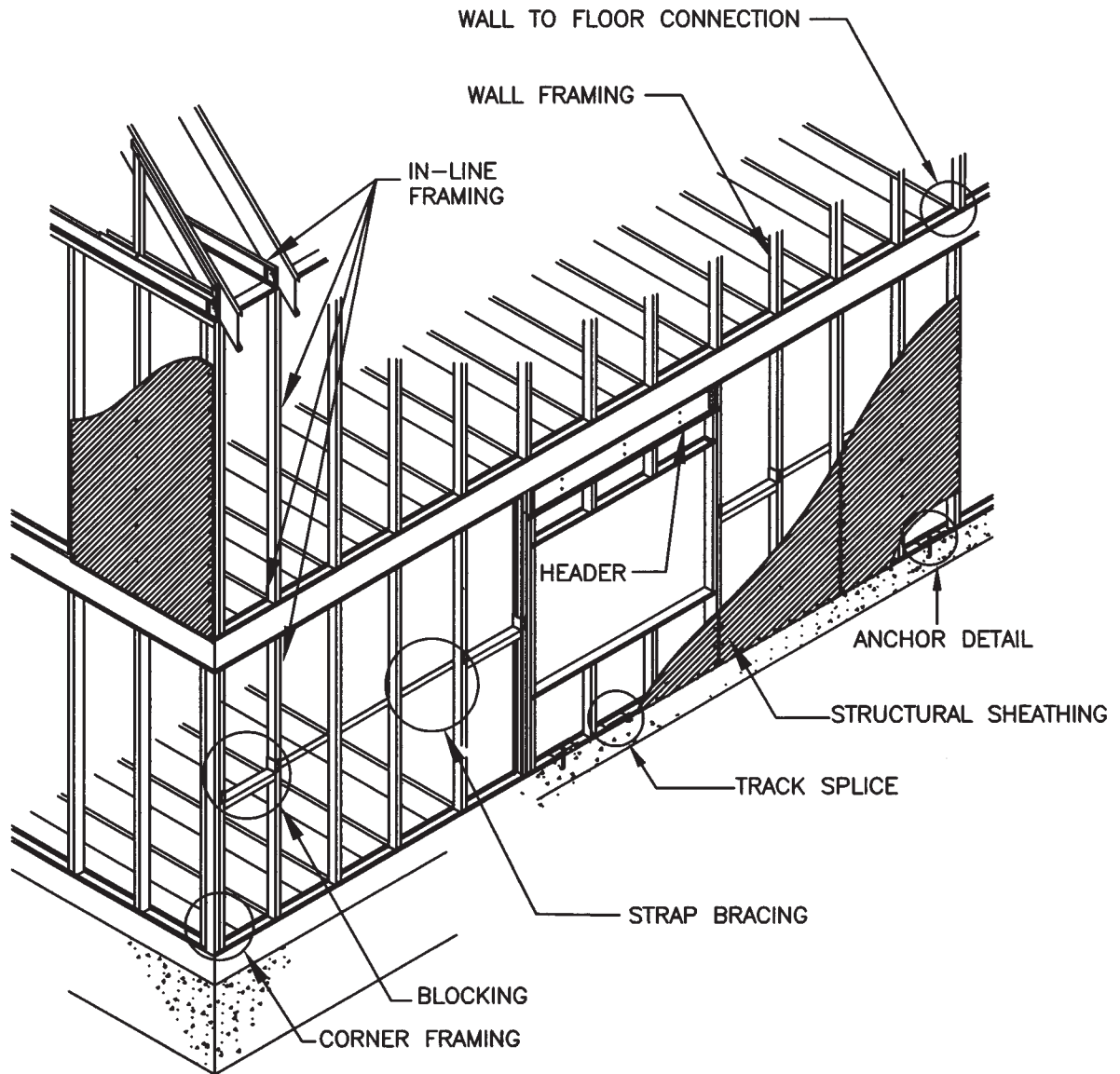


Figure 6.1
Steel Wall Construction

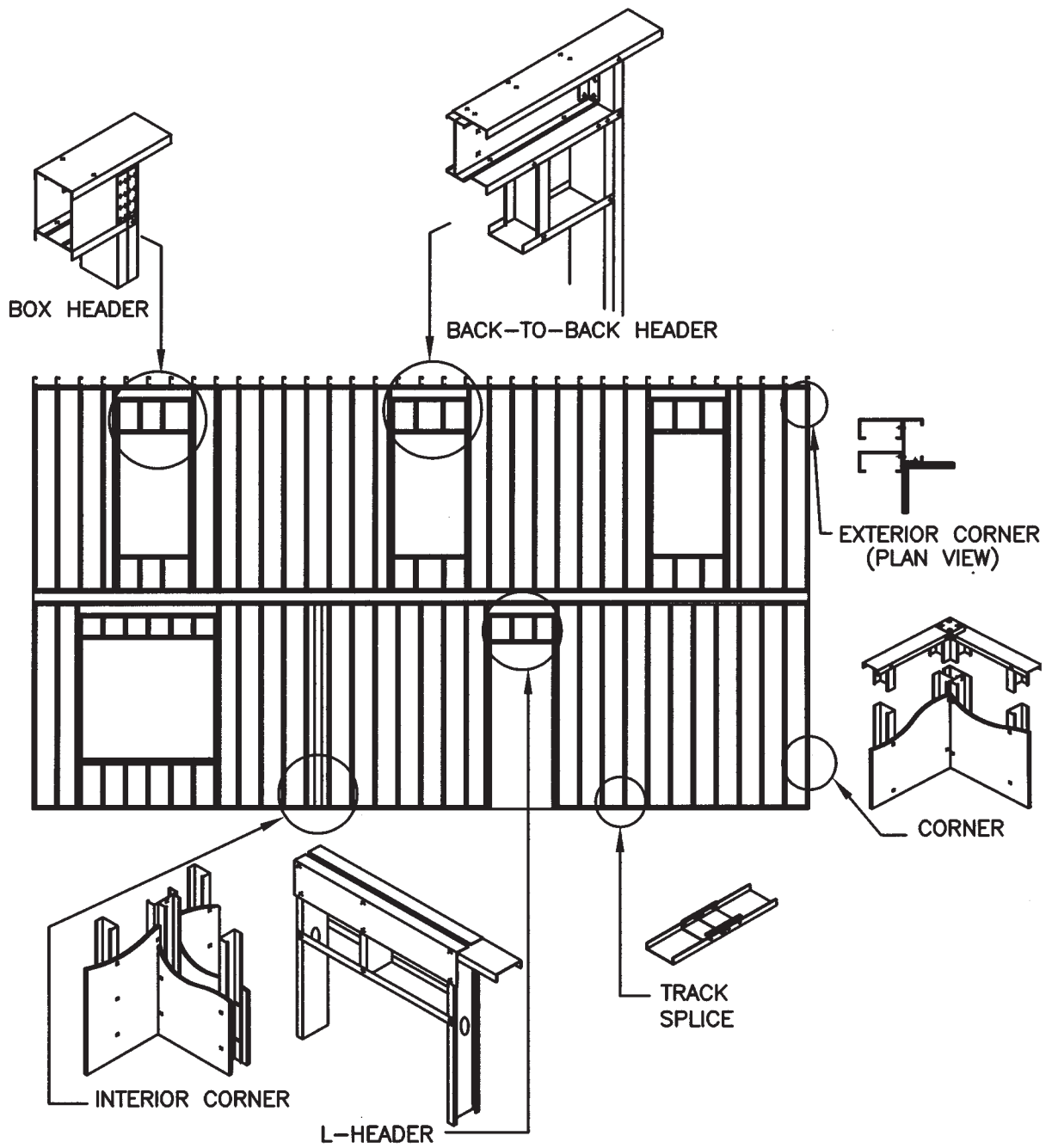


Figure 6.2
Typical Load-Bearing Wall Detail

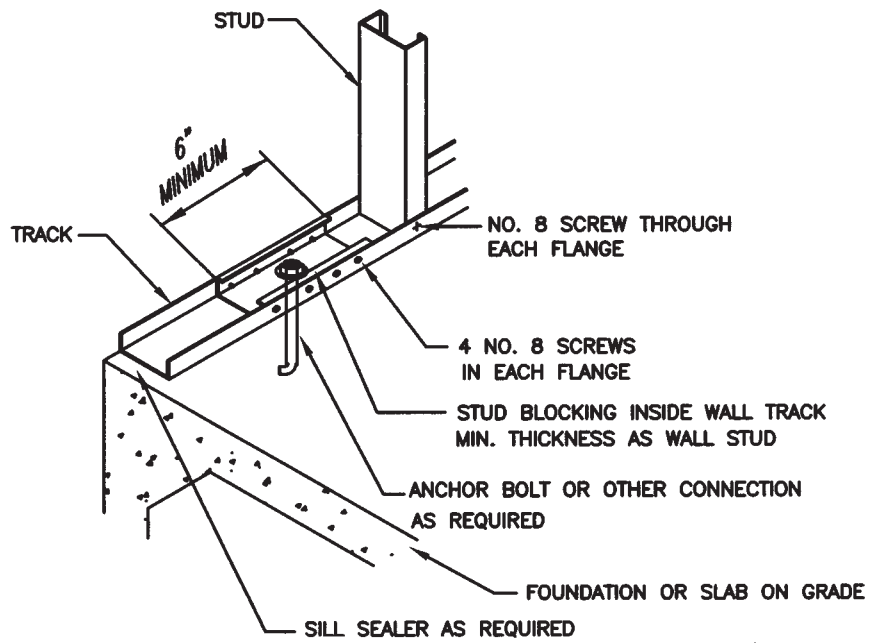


Figure 6.3
Wall to Foundation Connection

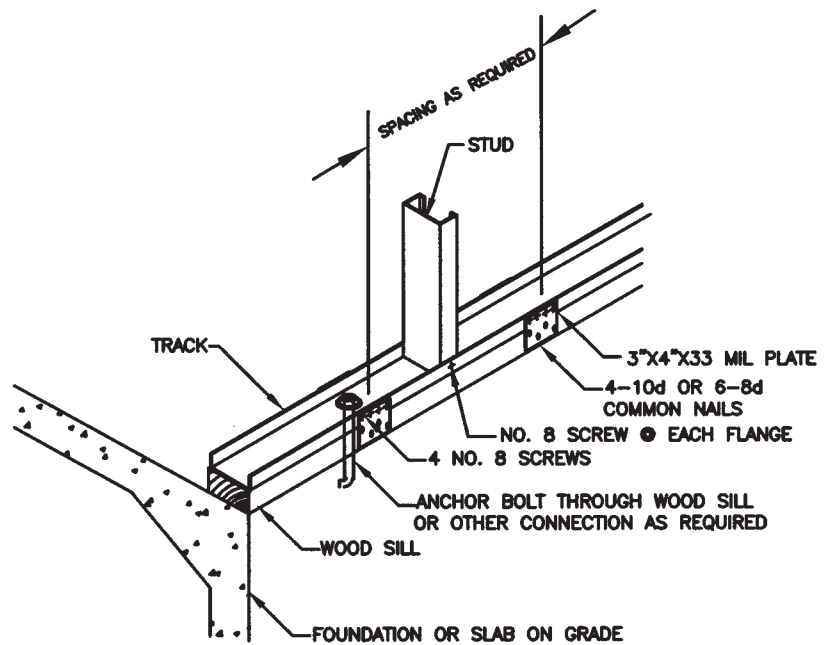


Figure 6.4
Wall to Wood Sill Connection

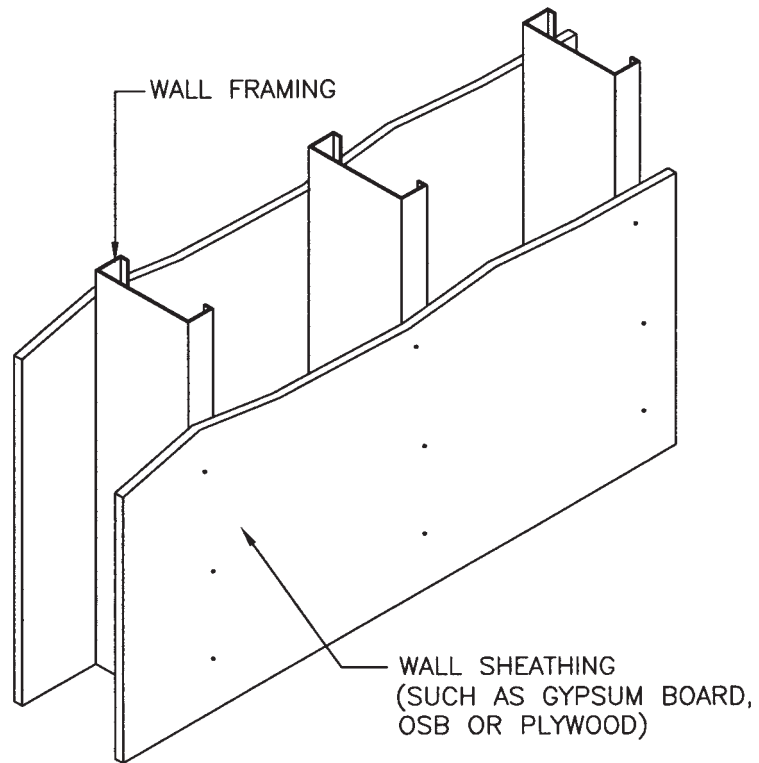


Figure 6.5
Stud Bracing with Sheathing Material Only

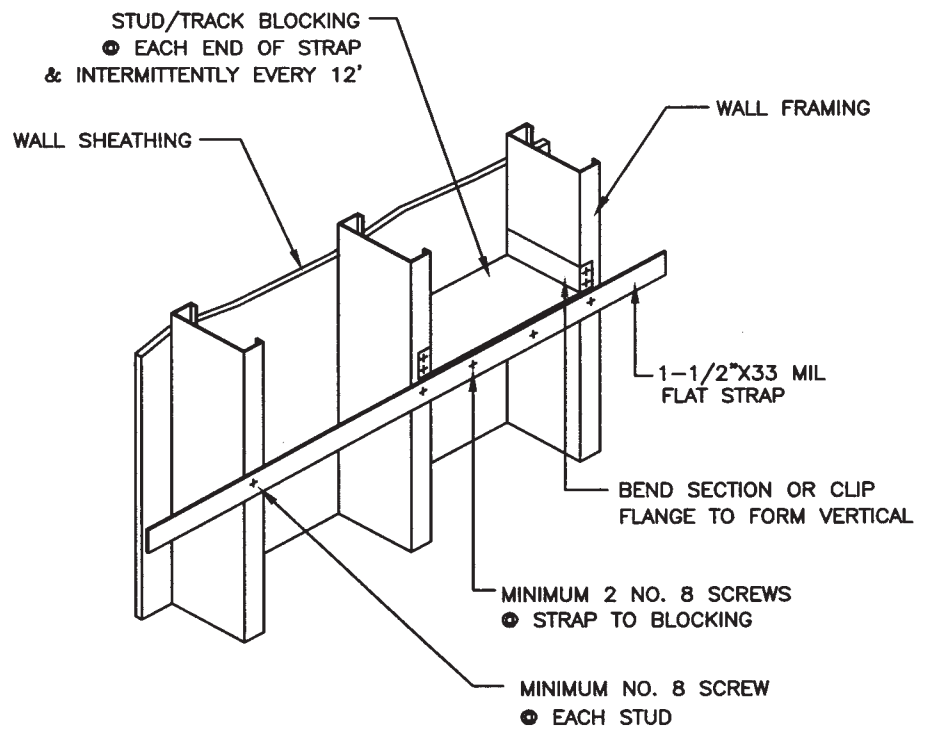


Figure 6.6
Stud Bracing with Strapping and Sheathing Material

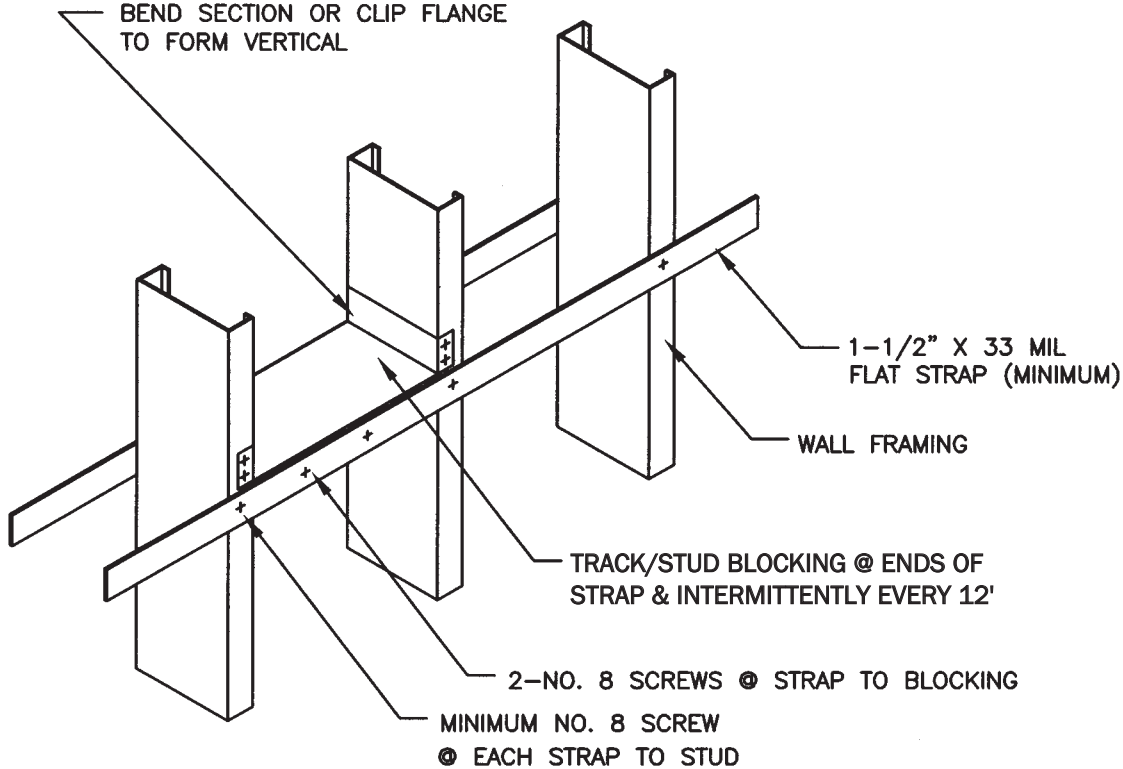


Figure 6.7
Stud Bracing with Strapping Only

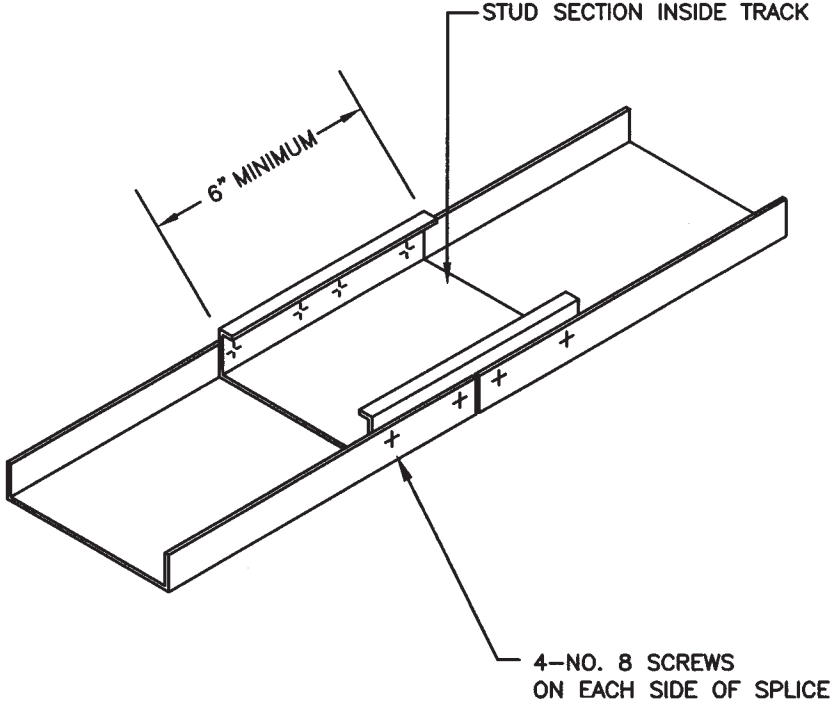


Figure 6.8
Track Splice

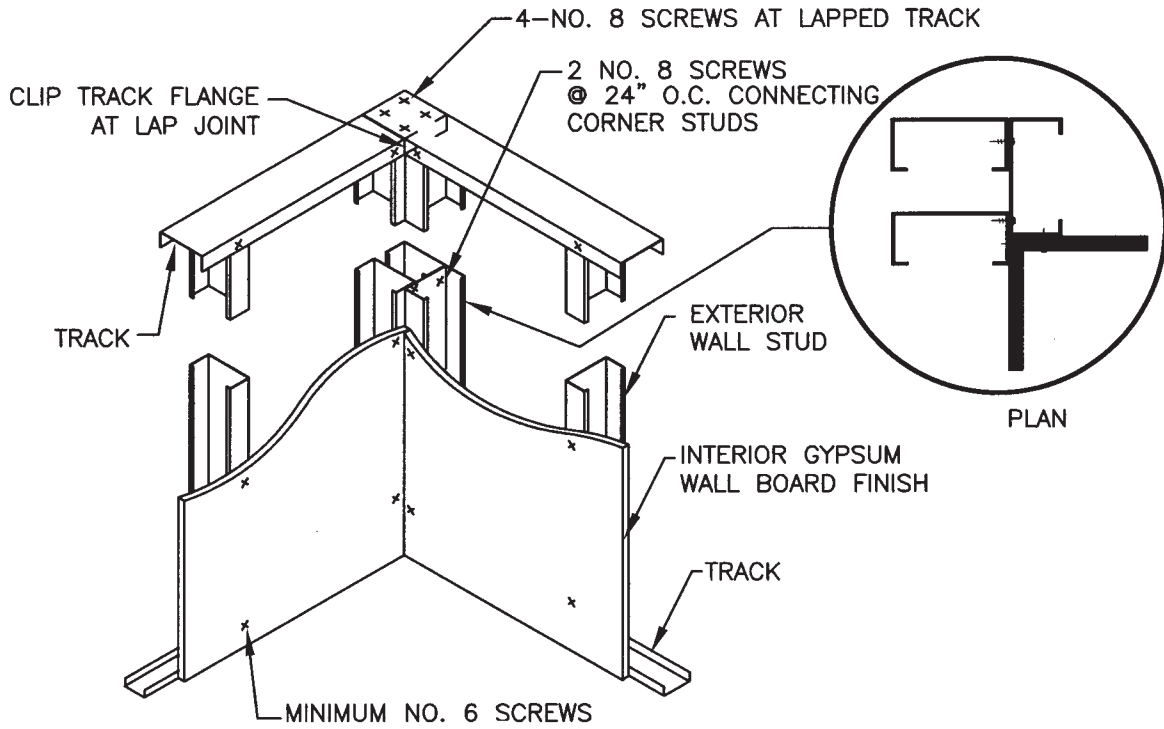


Figure 6.9
Corner Framing

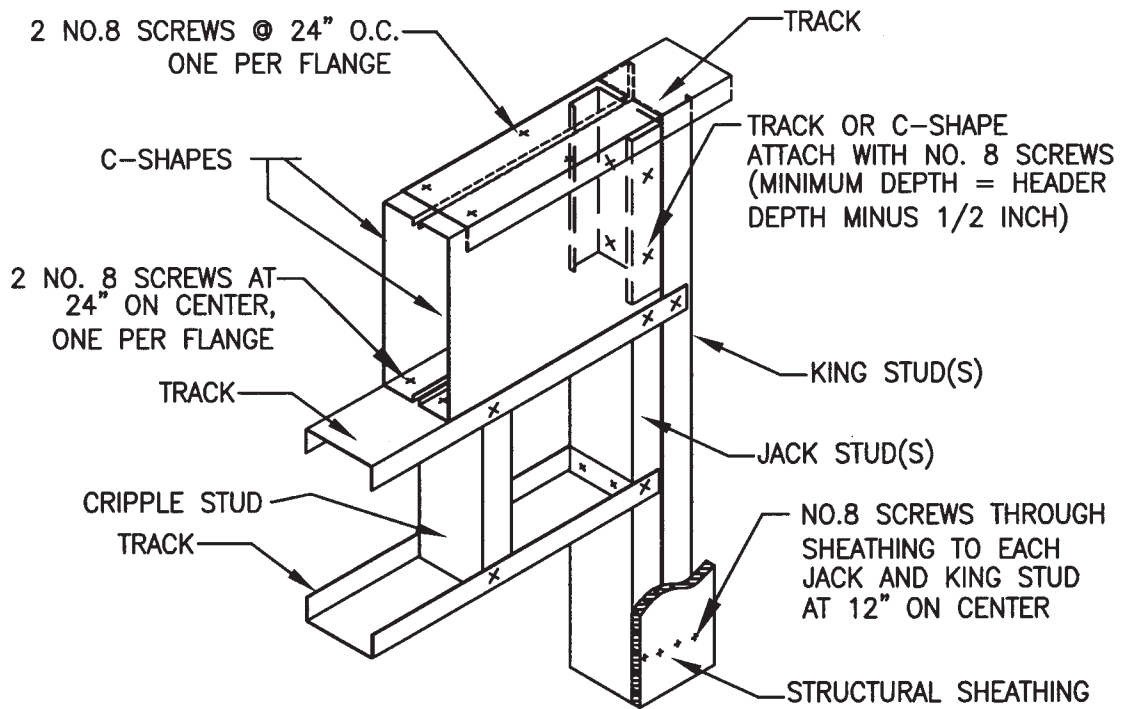


Figure 6.10
Box-Beam Header Detail

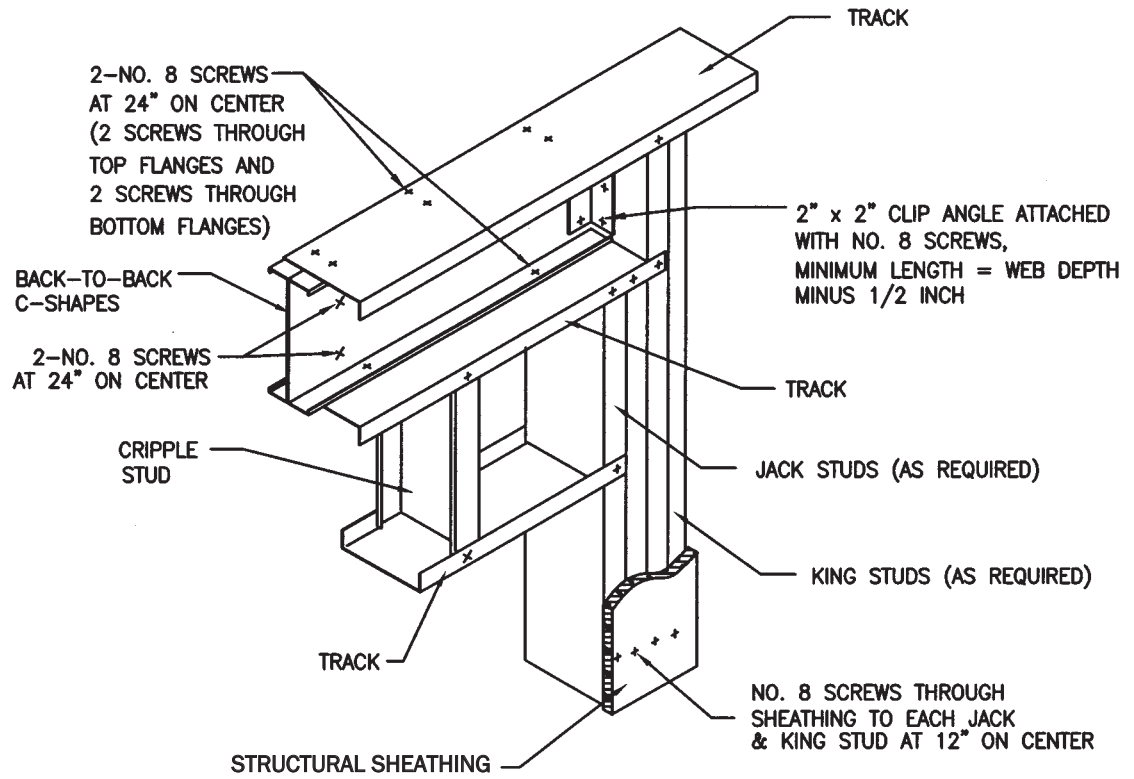


Figure 6.11
Back-to-Back Header Detail

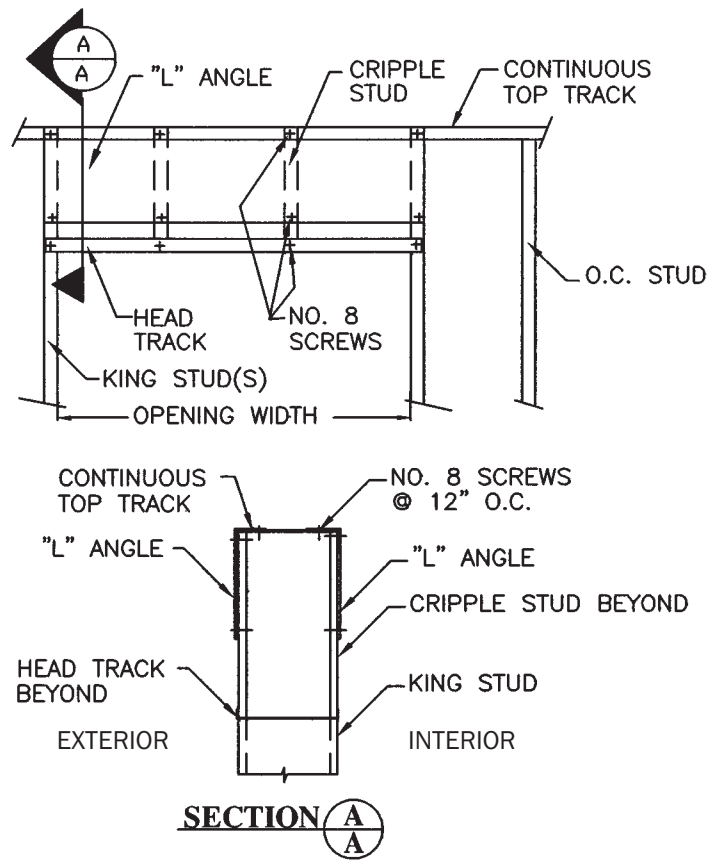


Figure 6.12
L-Shaped Header

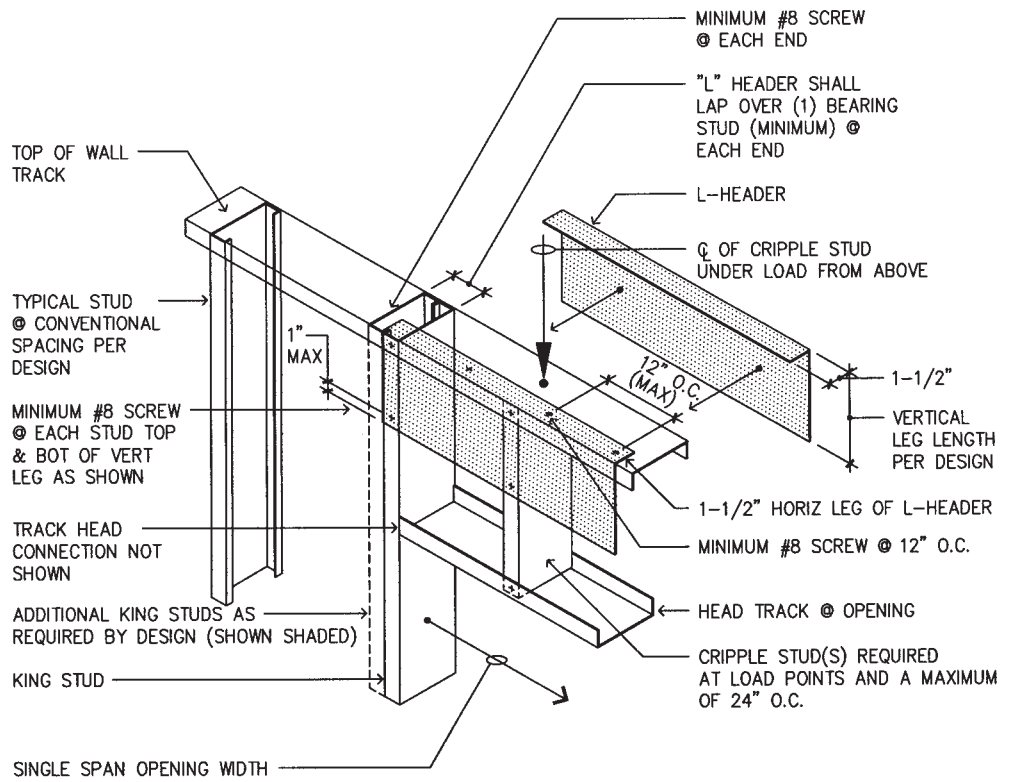


Figure 6.13
L-Shaped Header (Isometric View)

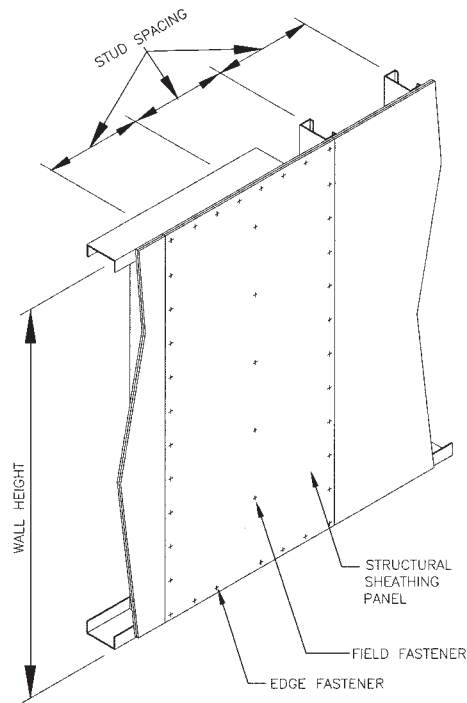
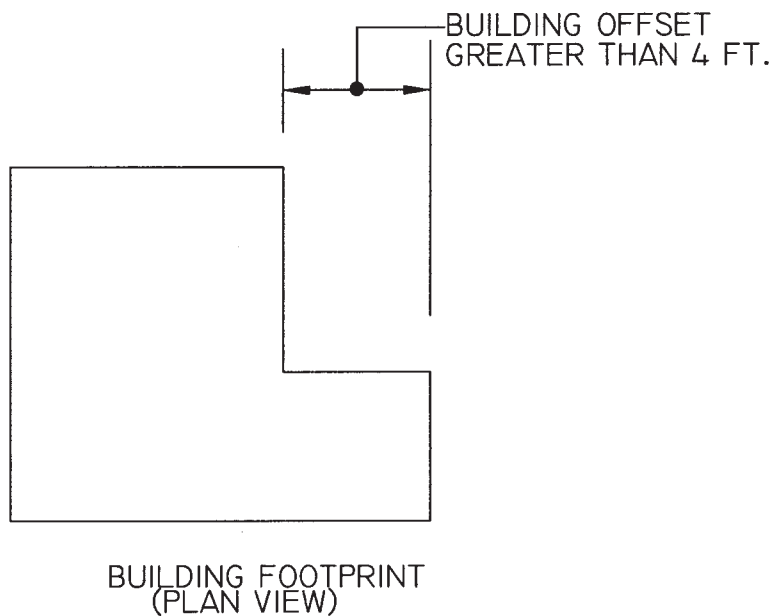


Figure 6.14
Structural Sheathing Fastening Pattern



WHERE PLAN OFFSET IS GREATER THAN 4 FEET, BUILDING SHALL BE ANALYZED AS SEPARATE STRUCTURES.

PARTS (A) & (B) AS SHOWN BELOW

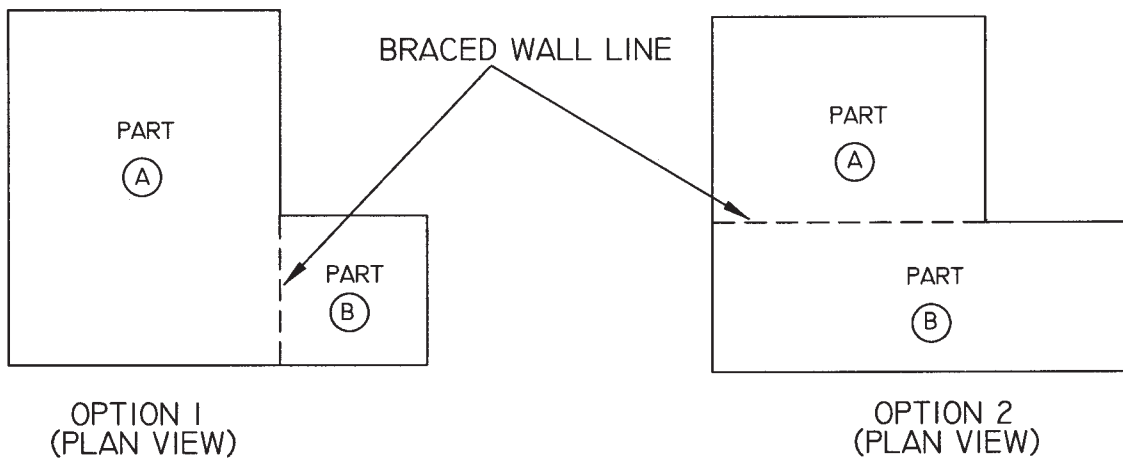


Figure 6.15
Building Configuration

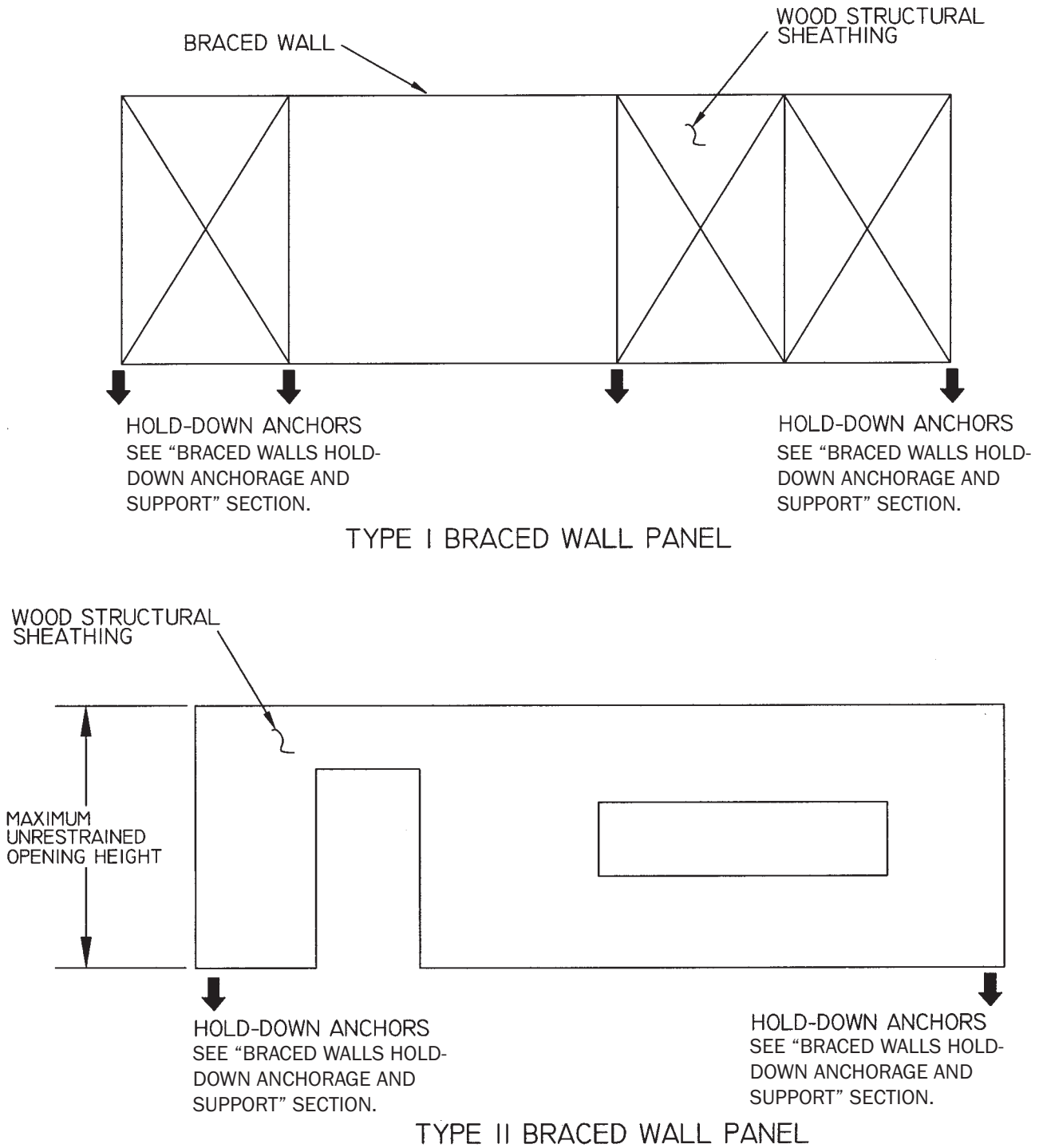


Figure 6.16
Type I and Type II Braced Walls

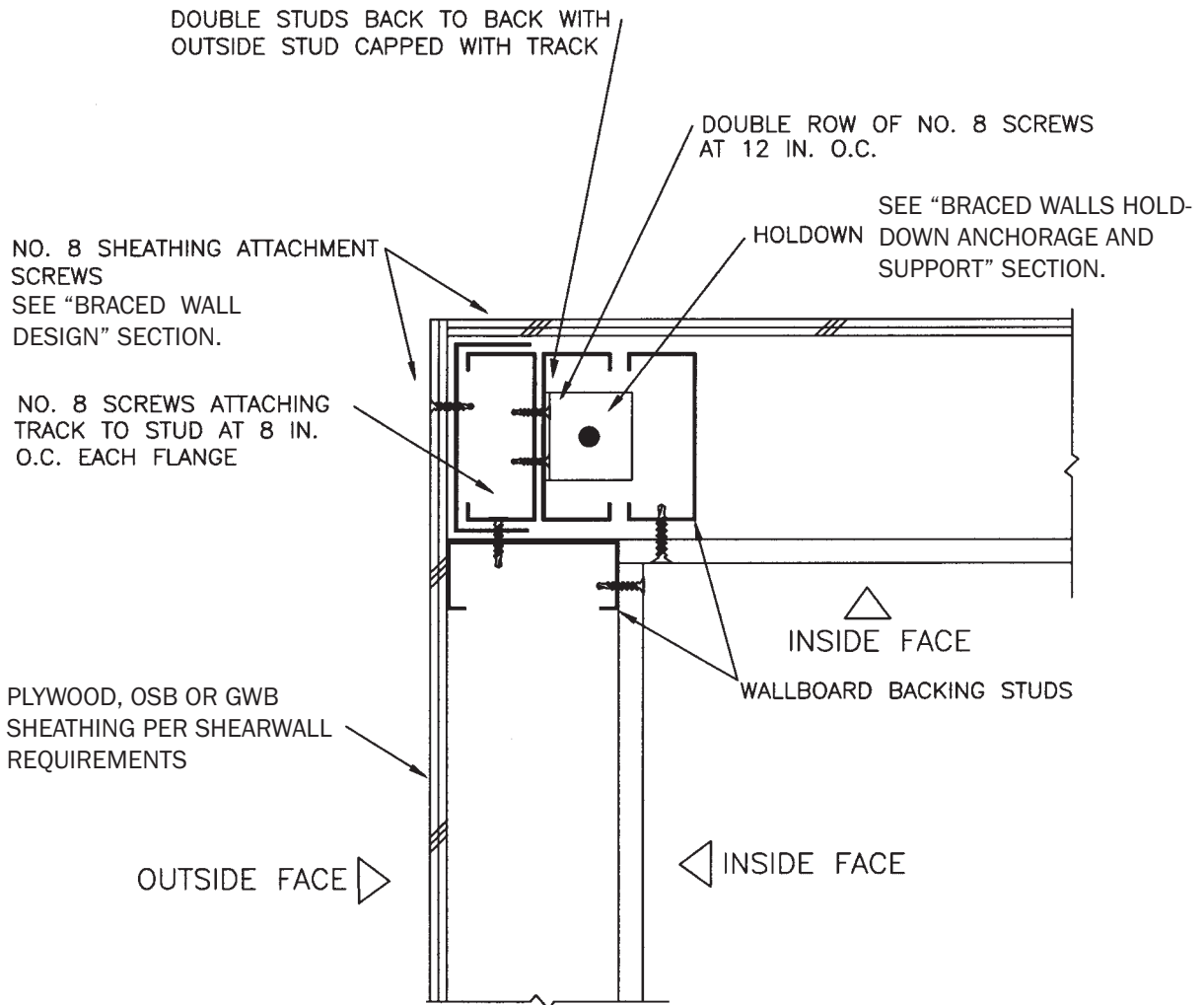


Figure 6.17
Corner Stud Hold-Down Detail

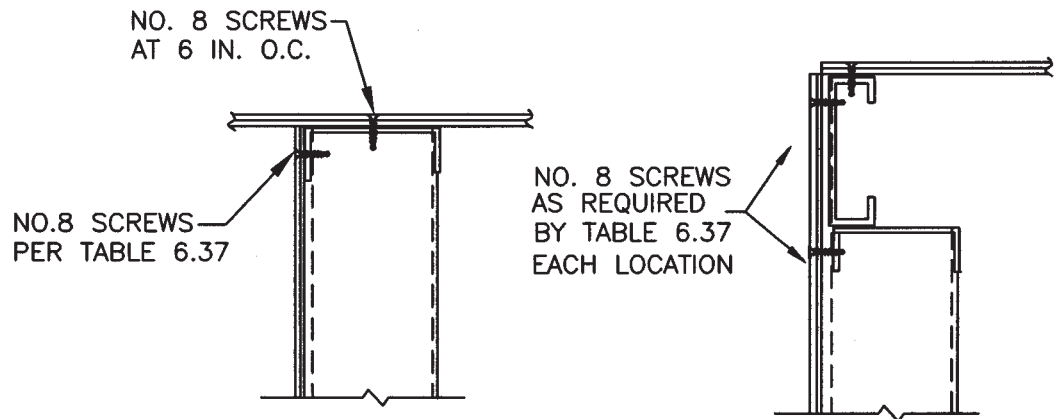


Figure 6.18
Gable Roof Sheathing Attachment to Braced Walls

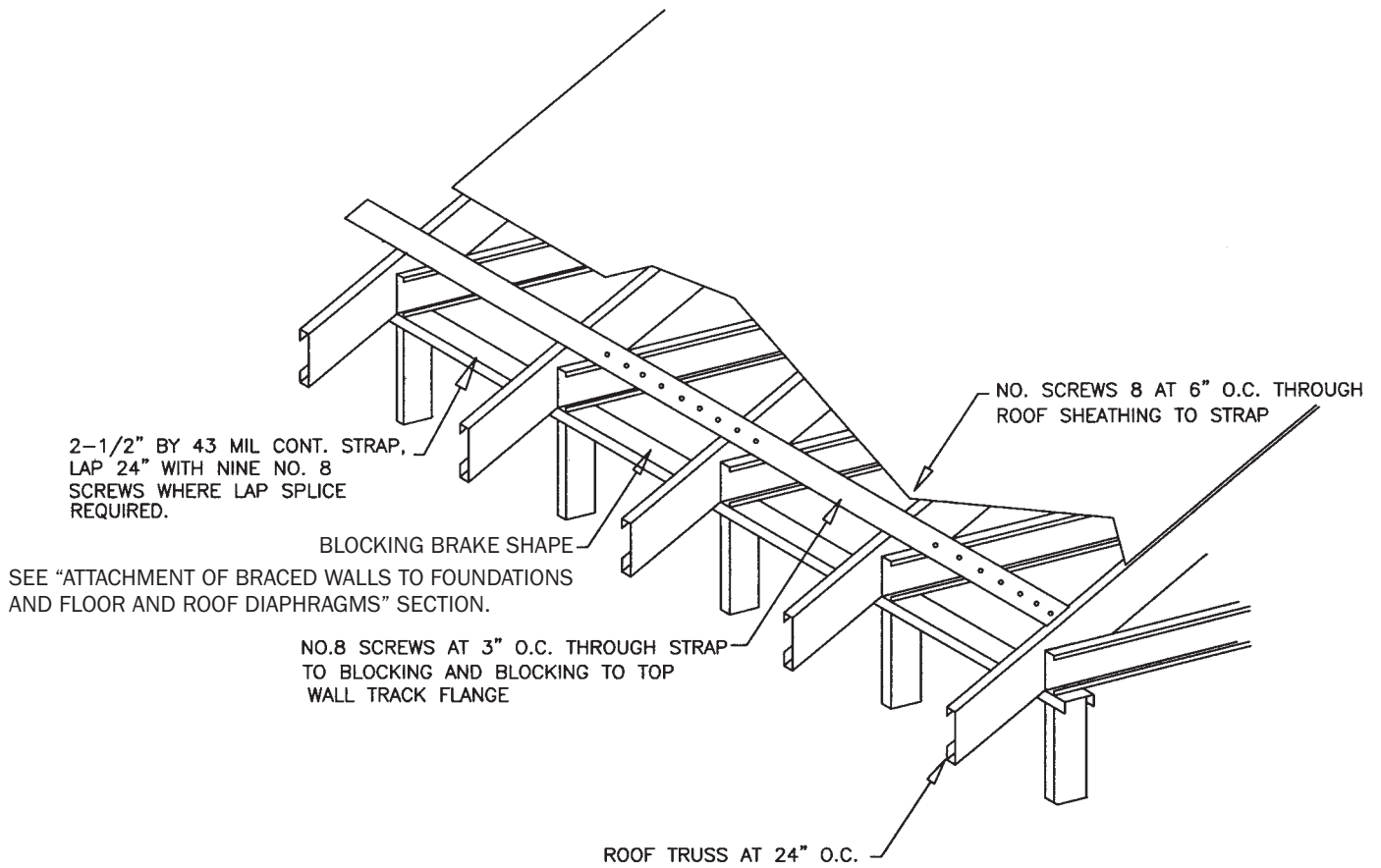


Figure 6.19
Strap and Blocking Diaphragm Load Transfer at Roof Eave

SHEATHING SCREW SPACING IN WALL			
6 IN. O.C.	4 IN. O.C	3 IN. O.C	2 IN. O.C.
SCREW SPACING – WALL TRACK TO FRAMING BELOW			
4 NO. 8 AT 24 IN. O.C.	5 NO. 8 AT 24 IN. O.C.	7 NO. 8 AT 24 IN. O.C.	8 NO. 8 AT 24 IN. O.C.

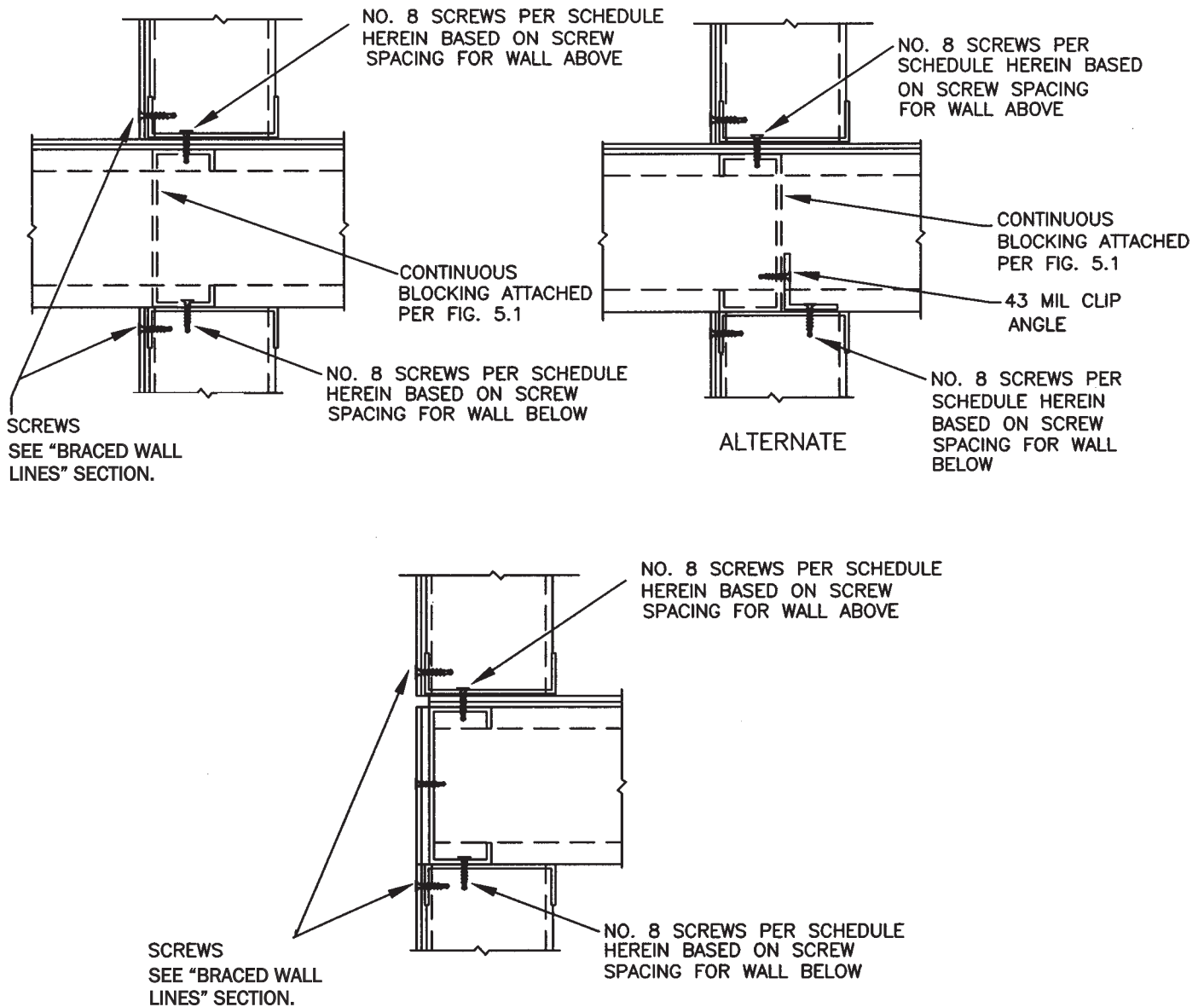


Figure 6.20
Floor Diaphragm Attachment to Braced Walls

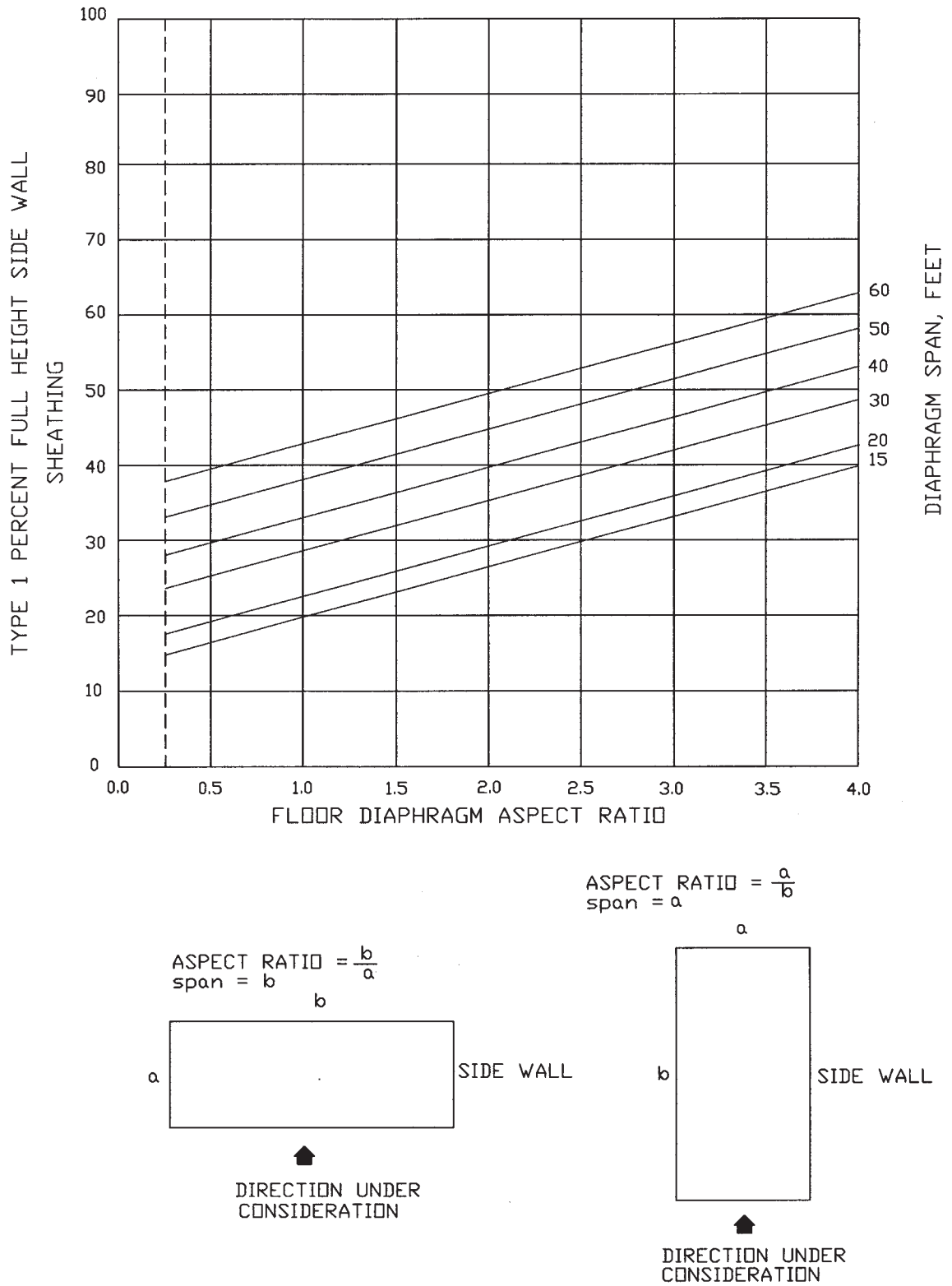
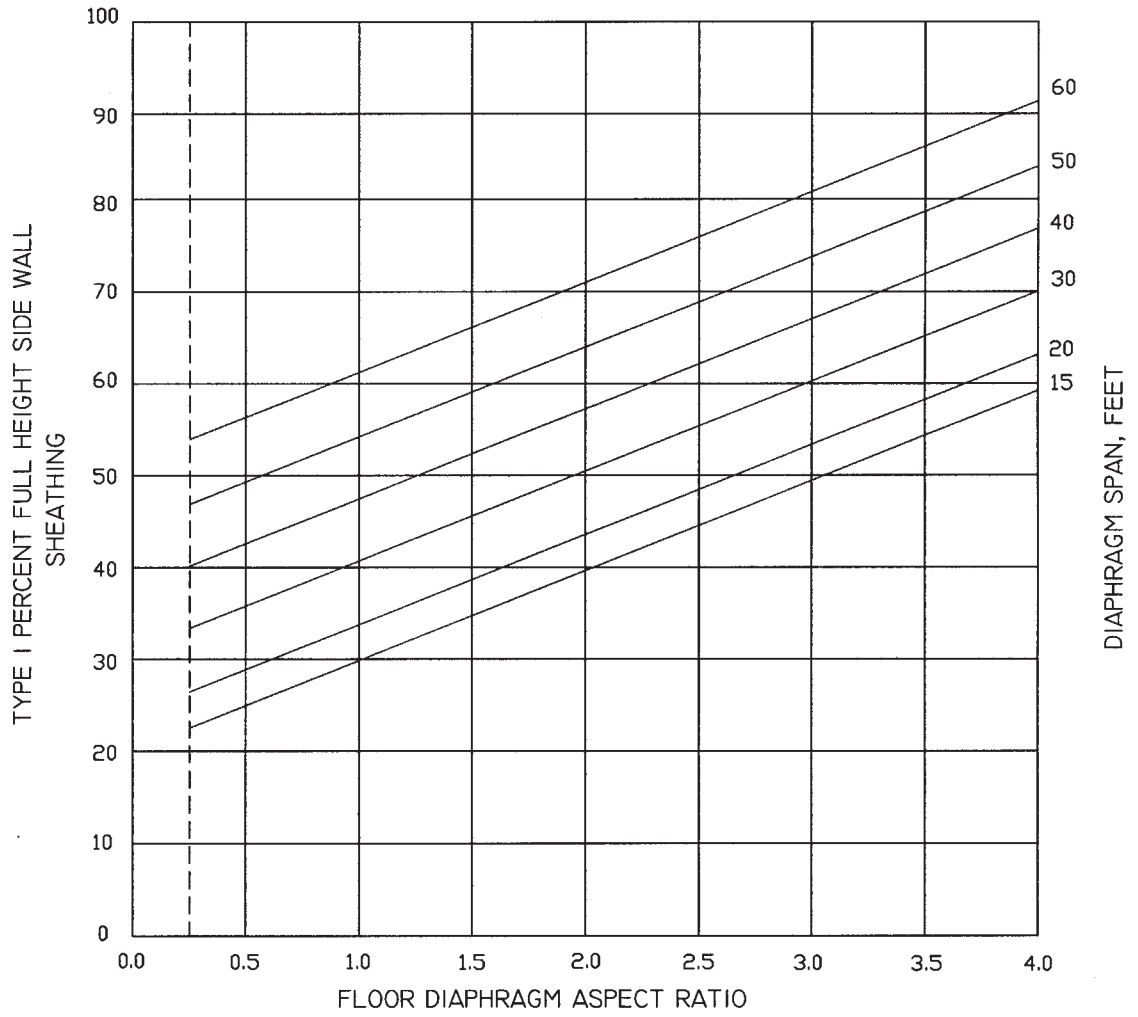
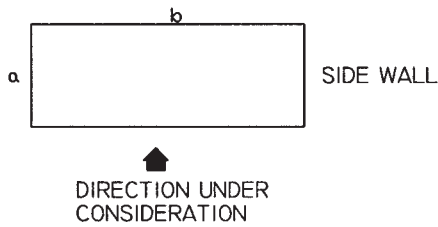


Figure 6.21
SDC D1 Single Story or Top of Two Story Building



ASPECT RATIO = $\frac{b}{a}$
SPAN = b



ASPECT RATIO = $\frac{a}{b}$
SPAN = a

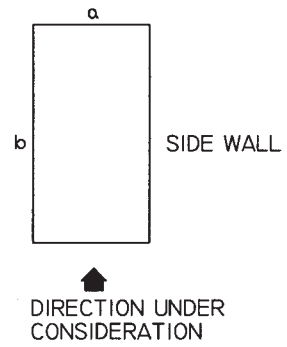
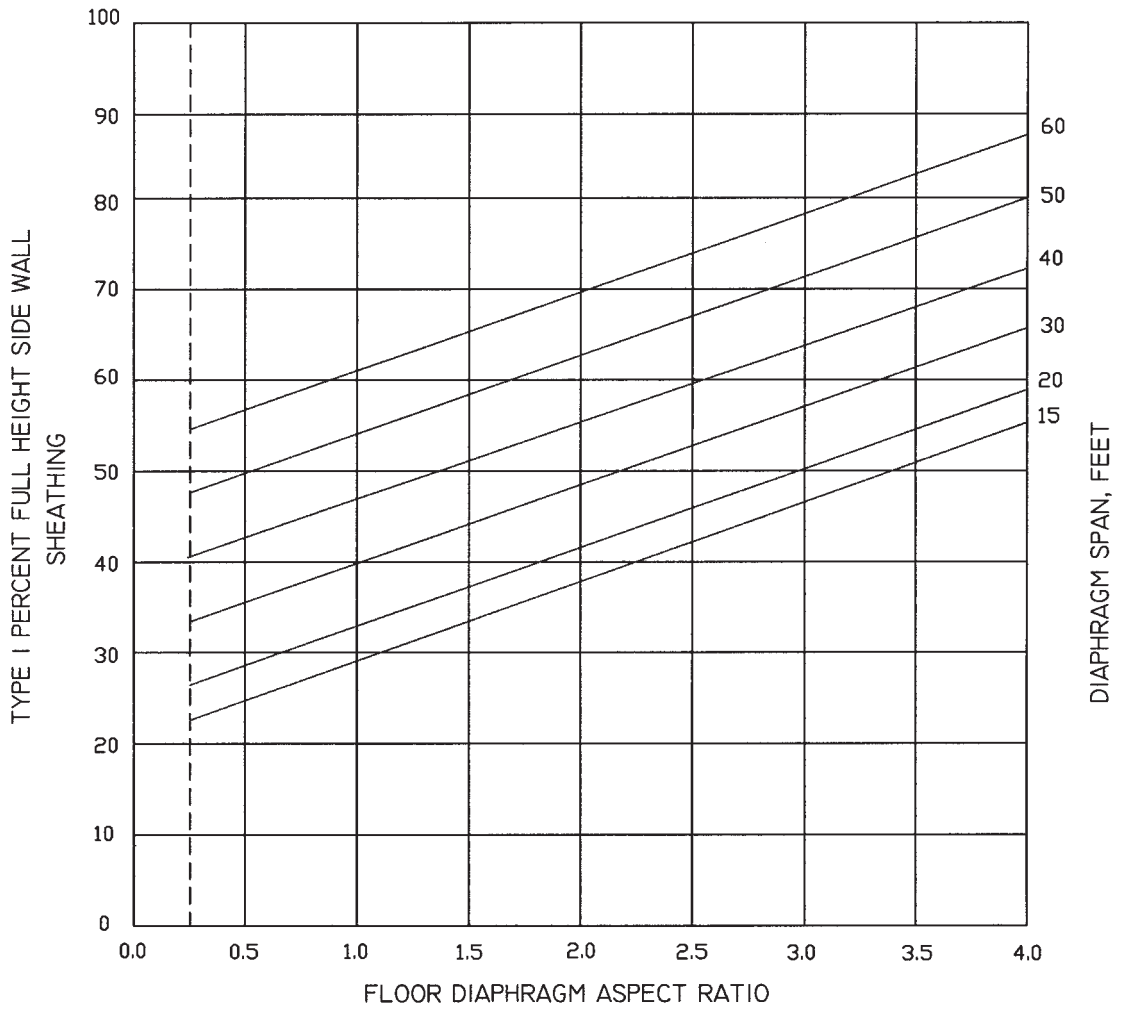
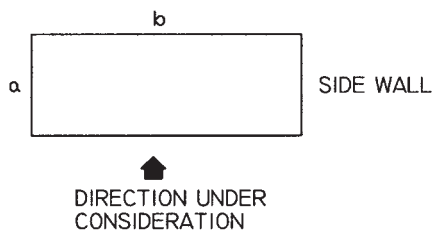


Figure 6.22
SDC D1 Bottom Story of a Two Story Building



ASPECT RATIO = $\frac{b}{a}$
SPAN = b



ASPECT RATIO = $\frac{a}{b}$
SPAN = a

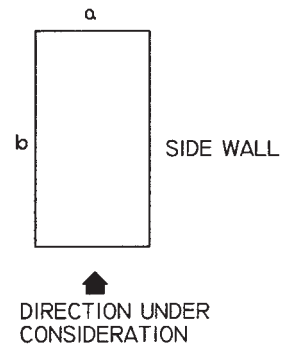
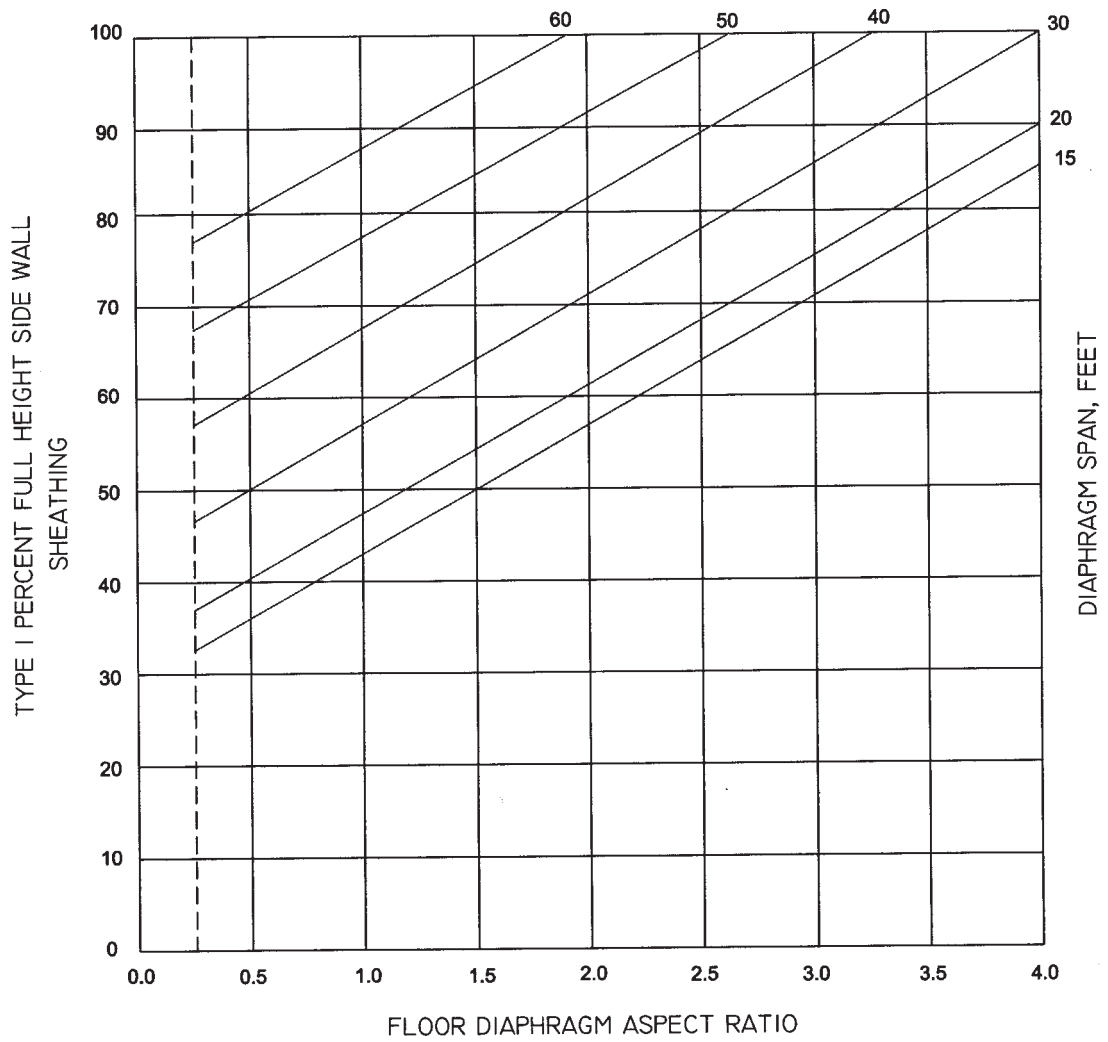
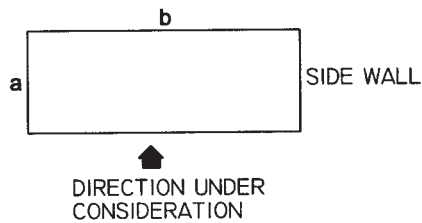


Figure 6.23
SDC D2 Single Story or Top of Two Story Building



ASPECT RATIO = $\frac{b}{a}$
SPAN = b



ASPECT RATIO = $\frac{a}{b}$
SPAN = a

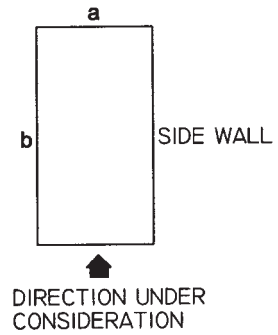


Figure 6.24
SDC D2 Bottom Story of a Two Story Building

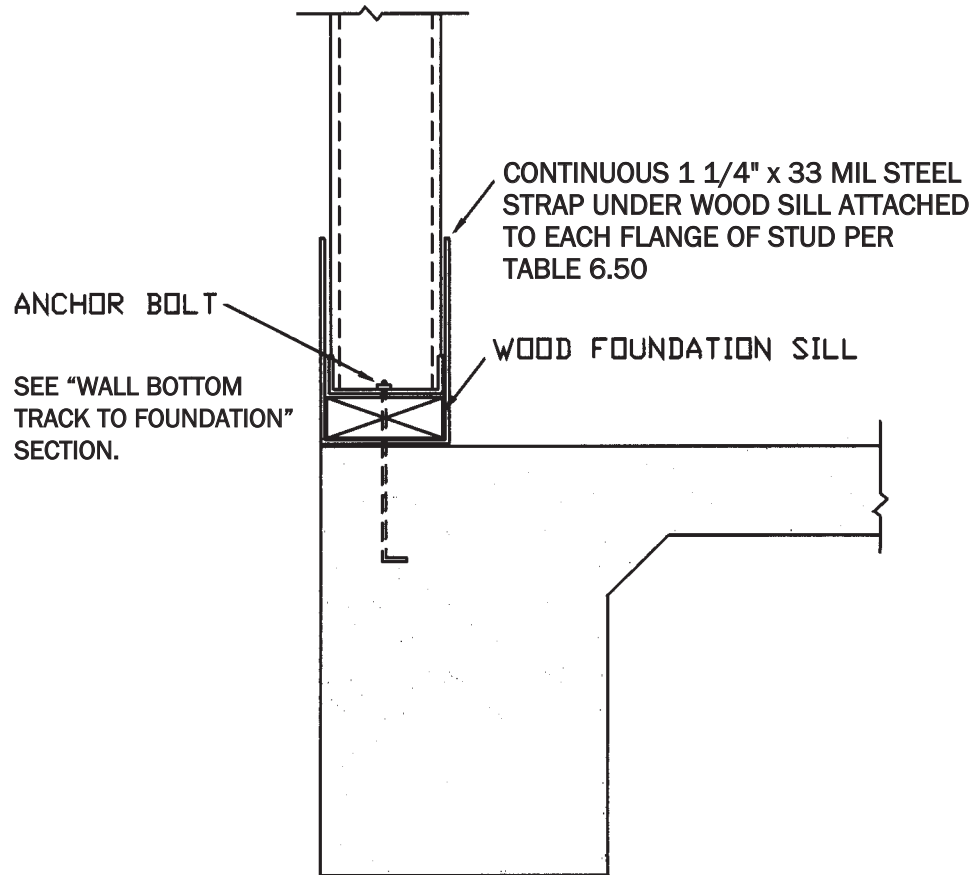


Figure 6.25
Wind Uplift Connector

**Table 6.1
Wall to Foundation or Floor Connection Requirements**

Framing Condition	Basic Wind Speed (mph), Exposure, & Seismic Zones ^{1,2,3,4,5}		
	Up to 70 A/B or Seismic Zones 0, 1, and 2	Up to 90 A/B or 70 C	Up to 90 C
Wall bottom track to floor joist or track	1 No. 8 screw at 12" oc	1 No. 8 screw at 12" oc	2 No. 8 screws at 12" oc
Wall bottom track to foundation per Figure 6.2	1/2" minimum diameter anchor bolt at 6' oc	1/2" minimum diameter anchor bolt at 6' oc	1/2" minimum diameter anchor bolt at 4' oc
Wall bottom track to wood sill per Figure 6.3	Steel plate spaced at 4' oc, with 4 No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3' oc, with 4 No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' oc, with 4 No. 8 screws and 4-10d or 6-8d common nails
Wind uplift connector capacity for 16" stud spacing ³	N/R	N/R	65 lbs. per foot of wall length
Wind uplift connector capacity for 24" stud spacing ³	N/R	N/R	100 lbs. per foot of wall length

For SI: 1 inch = 25.4 mm, 1 mph = 1.61 km/hr, 1 foot = 0.3048 m, 1 lb. = 4.4 N.

¹Use the greater of the wind speed and exposure or the seismic zone for a given site.

²All screw sizes shown are minimums.

³N/R = uplift connector not required. Uplift connectors are in addition to other connection requirements.

⁴Anchor bolts shall 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 shall extend a minimum of 15 inches (381 mm) into masonry or 7 inches (178 mm) into concrete.

⁵In seismic zones 3 and 4 or where the basic wind speed equals or exceeds 90 mph (145 km/hr) connection shall comply with the requirements in the "Braced Walls and Diaphragms in High Seismic and High Wind Regions" section but shall be no less than the minimum required herein.

Table 6.2
Steel Stud Thickness for 8-Foot Walls Supporting Roof and
Ceiling Only
(One Story or Second-Floor of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}																		
				Building Width (feet) ^{3,4}																		
Exp. A/B	Exp. C			24				28				32				36						
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)						
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70			
70 mph		350S162	16	33	33	33	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	33	33	33	43	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
80 mph	70 mph	350S162	16	33	33	33	33	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	43	33	33	43	43	43	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
90 mph	80 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	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	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	43	43	43	43	43	43	43	54	43	43	54	54	43	43	54	54	54	54	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
110 mph	100 mph	350S162	16	33	33	43	43	33	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	54	54	54	54	68	54	54	68	68	54	54	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	43	33	33	33	43	33	33	43	33	43	43
	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	43	43	43	43	54		
			24	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	43	43	43	43	43	43	43	43	43	43	43	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

Table 6.3
Steel Stud Thickness for 8-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2,5}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	33	43
			24	43	43	43	43	43	43	43	43	43	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	33	33	33	33	33	43	33	33	43	43	33	43	43	54
80 mph	70 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	54	54	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	43
			24	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43	54
90 mph	80 mph	350S162	16	33	33	33	33	33	33	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68	54	54	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	43	43	43	43	43	43	43	43	43	54
100 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	68	68	68	68	68	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	43	43	43	43	43	43	43	43	43	43	43	43	43	43	54
110 mph	100 mph	350S162	16	43	43	43	54	43	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	43	43	43	43	43	43	43	54	43	43	54	54	54	54	54	54
	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	68	54	54	68	68
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43	43
			24	43	43	54	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)

Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

⁵For second story floors with 40 psf live load, select the stud size from the next higher ground snow load column.

Table 6.4
Steel Stud Thickness for 9-Foot Walls Supporting Roof and
Ceiling Only
(One Story or Second-Floor of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}																		
				Building Width (feet) ^{3,4}																		
Exp. A/B	Exp. C			24				28				32				36						
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)						
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70			
70 mph		350S162	16	33	33	33	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	33	33	33	43	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
80 mph	70 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	43	43	33	33	43	43	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	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	80 mph	350S162	16	33	33	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	54	43	43	43	43	54	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
100 mph	90 mph	350S162	16	33	33	33	33	33	33	33	43	33	33	43	43	33	33	43	43	43	43	
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
110 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	54	43	43	43	43	54	
			24	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	97	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	
		550S162	16	33	33	33	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	54	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

Table 6.5
Steel Stud Thickness for 9-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2,5}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	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	54	43	43	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	33	33	33	33	33	43	33	33	43	43	33	33	43	43
80 mph	70 mph	350S162	16	33	33	33	33	33	33	33	43	33	43	43	43	43	43	43	43
			24	43	54	54	54	54	54	54	54	54	54	54	54	54	54	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43	43
90 mph	80 mph	350S162	16	43	43	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	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	54
100 mph	90 mph	350S162	16	43	43	43	43	43	43	43	54	43	43	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	97	68	68	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	54	43	43	54	54
110 mph	100 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	68	54	54	68	68
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	33	43	33	33	43	43	33	43	43	43
			24	43	43	54	54	54	54	54	54	54	54	54	54	54	54	54	54
	110 mph	350S162	16	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
			24	97	97	97	97	97	97	97	-	97	97	-	-	-	-	-	-
		550S162	16	33	33	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	54	54	68	68

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)

Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

⁵For second story floors with 40 psf live load select the stud size from the next higher ground snow load column.

Table 6.6
Steel Stud Thickness for 10-Foot Walls Supporting Roof and
Ceiling Only
(One Story or Second-Floor of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	43	33	33	43	43	33	43	43	43
		550S162	16	33	33	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	33	33
80 mph	70 mph	350S162	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	54	43	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	33	33	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	80 mph	350S162	16	33	33	33	43	33	33	43	43	33	33	43	43	33	33	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
100 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	54
			24	68	68	68	68	68	68	68	68	68	68	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	33	33	43	43	33	43	43	43	43	43	43	43
110 mph	100 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	68
			24	97	97	97	97	97	97	97	97	97	97	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	54	43	43	54	54	43	43	54	54
	110 mph	350S162	16	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
			24	97	97	97	-	97	97	-	-	97	97	-	-	97	-	-	-
		550S162	16	33	33	33	43	33	33	43	43	33	33	43	43	33	43	43	43
			24	54	54	54	54	54	54	54	54	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

Table 6.7
Steel Stud Thickness for 10-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2,5}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	43	33	33	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68	54	54	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43	54
80 mph	70 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	68	68	68	68	68	68	68	68	68	68	68	68	68	97
		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	54
90 mph	80 mph	350S162	16	43	43	43	43	43	43	54	54	43	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	97	68	68	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	54	43	43	43	54
100 mph	90 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	54	54	54	54	54	54	54	54	54	54	54
110 mph	100 mph	350S162	16	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	97
			24	97	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	68	54	68	68	68	68	68	68	68
	110 mph	350S162	16	68	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
			24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	97

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)

Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴Exterior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on the inside and 7/16 inch (11 mm) OSB or plywood on the outside, and interior load bearing walls with a minimum of 1/2 inch (13 mm) gypsum wall board on both sides may use the next thinner stud but not less than 33 mils (0.84 mm).

⁵For second story floors with 40 psf live load, select the stud size from the next higher ground snow load column.

Table 6.8
Steel Stud Thickness for 8-Foot Walls Supporting Roof and Ceiling Only
(One Story or Second-Floor of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}																	
				Building Width (feet) ³																	
Exp. A/B	Exp. C			24				28				32				36					
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)					
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70		
70 mph		350S162	16	33	33	33	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	33	33	33	33
		550S162	16	33	33	33	33	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	33	33	33	33
80 mph	70 mph	350S162	16	33	33	33	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	33	33	33	
		550S162	16	33	33	33	33	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	33	33	33	33
90 mph	80 mph	350S162	16	33	33	33	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	33	33	43	
		550S162	16	33	33	33	33	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	33	33	33	33
100 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
			24	33	33	33	43	33	33	43	43	33	33	43	43	33	43	43	43	43	
		550S162	16	33	33	33	33	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	33	33	33	33
110 mph	100 mph	350S162	16	33	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	54	43	43	43	54	
		550S162	16	33	33	33	33	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	33	33	33	33
	110 mph	350S162	16	33	33	33	33	33	33	33	43	33	33	43	43	33	33	43	43		
			24	43	54	54	54	54	54	54	54	54	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	33	
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

Table 6.9
Steel Stud Thickness for 8-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	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	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
80 mph	70 mph	350S162	16	33	33	33	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	43	33	33	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
90 mph	80 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	43	43	43	43	43	43	43	43	43	43	54	54	43	54	54	54
		550S162	16	33	33	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	43	33	33	43	43
100 mph	90 mph	350S162	16	33	33	33	33	33	33	33	43	33	33	43	43	33	43	43	43
			24	43	43	43	54	43	54	54	54	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	33	33	33	33	33	33	33	33	33	43	33	33	43	43
110 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	68	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	43
			24	33	33	33	43	33	43	43	43	43	43	43	43	43	43	43	43
	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	43	43	54	54
			24	54	68	68	68	68	68	68	68	68	68	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	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)

Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴For second story floors with 40 psf live load, select the stud size from the next higher ground snow load column.

Table 6.10
Steel Stud Thickness for 9-Foot Walls Supporting Roof and
Ceiling Only
(One Story or Second-Floor of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
				Building Width (feet) ³															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	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	33	33
		550S162	16	33	33	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	33	33
80 mph	70 mph	350S162	16	33	33	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	33	33
		550S162	16	33	33	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	33	33
90 mph	80 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	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	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	90 mph	350S162	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
		550S162	16	33	33	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	33	33
110 mph	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	54	54	54	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	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	110 mph	350S162	16	43	43	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	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	43	33	33	43	43	33	33	43	43

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

Table 6.11
Steel Stud Thickness for 9-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	43	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	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
80 mph	70 mph	350S162	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	54	54
		550S162	16	33	33	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	33	43
90 mph	80 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	33	43
			24	43	43	43	43	43	43	43	54	43	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	33	33	33	33	33	33	33	33	33	33	33	33	33	43
100 mph	90 mph	350S162	16	33	33	33	43	33	33	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	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43
110 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	68	68	68	68	68	68	68	68	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	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
	110 mph	350S162	16	43	43	43	54	43	43	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	97	97	68	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	54

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)
 Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴For second story floors with 40 psf live load, select the stud size from the next higher ground snow load column.

Table 6.12
Steel Stud Thickness for 10-Foot Walls Supporting Roof and
Ceiling Only
(One Story or Second-Floor of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}																		
				Building Width (feet) ³																		
Exp. A/B	Exp. C			24				28				32				36						
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)						
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70			
70 mph		350S162	16	33	33	33	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	33	33	33	43	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
80 mph	70 mph	350S162	16	33	33	33	33	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	33	33	43	43	33	43	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
90 mph	80 mph	350S162	16	33	33	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	43	54	
		550S162	16	33	33	33	33	33	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	33	33	33	33	33
100 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33	43	33	33	33	33	43	
			24	43	43	54	54	43	43	54	54	43	54	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	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	
			24	54	54	54	68	54	54	68	68	54	54	68	68	54	68	68	68	68	68	
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	43	43	33	33	43	43	33	43	43	33	43	43	43
	110 mph	350S162	16	43	43	54	54	43	43	54	54	43	54	54	54	54	54	54	54	54	54	
			24	68	68	68	68	68	68	68	97	68	68	68	97	68	68	97	68	97	97	
		550S162	16	33	33	33	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	43	43	43

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

Table 6.13
Steel Stud Thickness for 10-Foot Walls Supporting One Floor,
Roof, and Ceiling
(First Story of a Two Story Building)
50 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
				Building Width (feet) ^{3,4}															
Exp. A/B	Exp. C			24				28				32				36			
				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	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	54	54	43	54	54	54
		550S162	16	33	33	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	43	33	33	33	43
80 mph	70 mph	350S162	16	33	33	33	33	33	33	33	43	33	33	43	43	43	43	43	43
			24	43	43	54	54	54	54	54	54	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	33	33	33	33	33	33	33	33	33	43	33	33	43	43
90 mph	80 mph	350S162	16	33	33	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	68	68	54	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	43	33	43	43	43	43	43	43	43
100 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54	43	43	54	54
			24	54	54	68	68	68	68	68	68	68	68	68	68	68	68	68	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
110 mph	100 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	97	97	97	97	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	43
			24	43	43	43	43	43	43	43	43	43	43	43	54	43	43	54	54
	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	68	68	54	68	68	68
			24	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
		550S162	16	33	33	33	33	33	33	43	43	33	43	43	43	43	43	43	43
			24	43	43	54	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 = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Second floor dead load is 10 psf (0.48 kN/m²); attic live load is 10 psf (0.48kN/m²)

Second floor live load is 30 psf (1.44 kN/m²); roof dead load is 12 psf (0.58 kN/m²)

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

⁴For second story floors with 40 psf live load, select the stud size from the next higher ground snow load column.

Table 6.14
Wall Fastening Schedule

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

For SI: 1 inch = 25.4 mm.

¹Head styles shall be bugle-head, flathead, or similar head with a minimum head diameter of 0.29 inches (8 mm).

Table 6.15a
Allowable Header Spans for Headers Supporting Roof and Ceiling Only^{1,2}
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

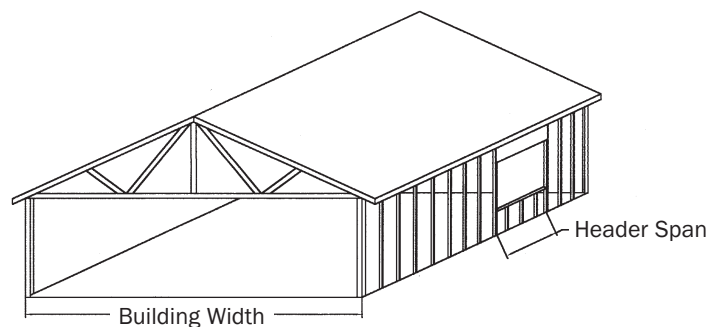


Table 6.15b
Allowable Header Spans for Headers Supporting Roof and
Ceiling Only^{1,2}
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

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

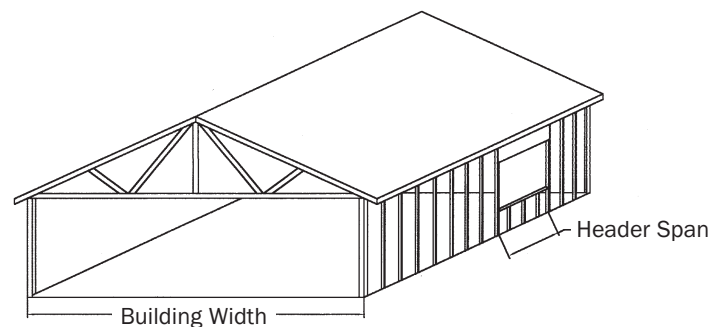


Table 6.16a
Allowable Header Spans for Headers Supporting One Floor,
Roof, and Ceiling^{1,2}
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

Second floor live load is 30 psf (1.437 kN/m²)

Second floor dead load is 10 psf (0.479 kN/m²)

Second floor wall dead load is 10 psf (0.479 kN/m²)

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

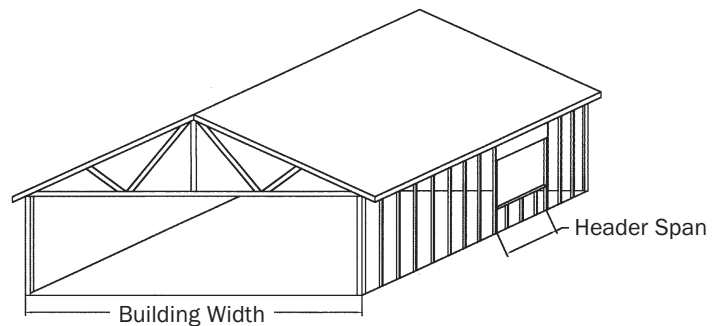


Table 6.16b
Allowable Header Spans for Headers Supporting One Floor,
Roof, and Ceiling^{1,2}
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

Second floor live load is 30 psf (1.437 kN/m²)

Second floor dead load is 10 psf (0.479 kN/m²)

Second floor wall dead load is 10 psf (0.479 kN/m²)

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

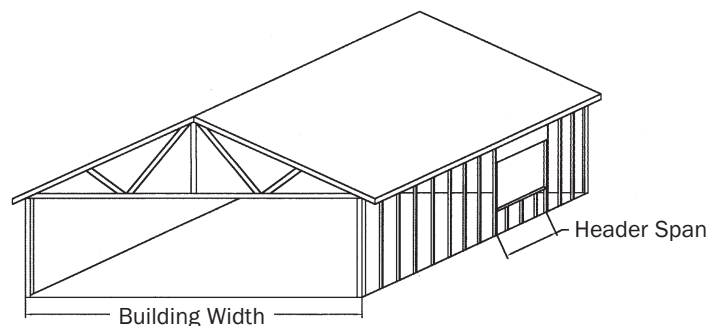


Table 6.17a
Allowable Header Spans for Headers Supporting One Floor,
Roof, and Ceiling^{1,2}
(First Story of a Two-Story Building With Center Load Bearing
Beam)
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

Second floor live load is 30 psf (1.437 kN/m²)

Second floor dead load is 10 psf (0.479 kN/m²)

Second floor wall dead load is 10 psf (0.479 kN/m²)

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

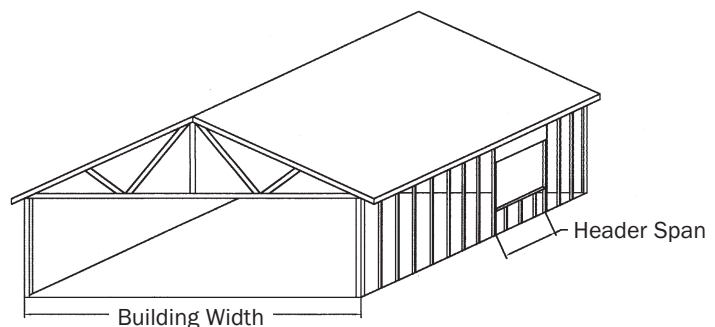


Table 6.17b
Allowable Header Spans for Headers Supporting One Floor,
Roof, and Ceiling^{1,2}
(First Story of a Two-Story Building With Center Load Bearing
Beam)
33 ksi

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

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

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

²Design load assumptions: Roof dead load is 7 psf (0.335 kN/m²)

Ceiling dead load is 5 psf (0.24 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

Second floor live load is 30 psf (1.437 kN/m²)

Second floor dead load is 10 psf (0.479 kN/m²)

Second floor wall dead load is 10 psf (0.479 kN/m²)

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

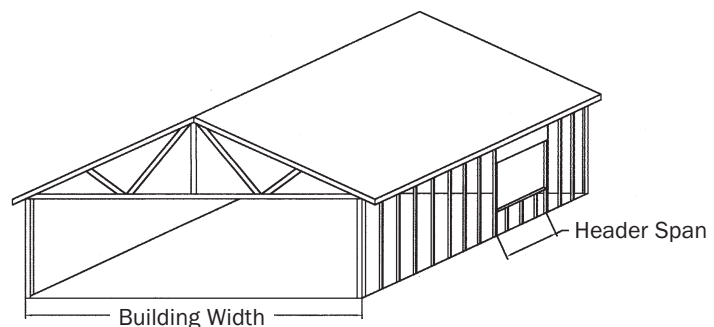


Table 6.18
Total Number of Jack and King Studs Required at Each End of an Opening

Size of Opening	24" o.c. Stud Spacing		16" o.c. Stud Spacing	
	No. of Jack Studs	No. of King Studs	No. of Jack Studs	No. of King Studs
Up to 3' 6"	1	1	1	1
> 3' 6" to 5' 0"	1	2	1	2
> 5' 0" to 5' 6"	1	2	2	2
> 5' 6" to 8' 0"	1	2	2	2
> 8' 0" to 10' 6"	2	2	2	3
> 10' 6" to 12' 0"	2	2	3	3
> 12' 0" to 13' 0"	2	3	3	3
> 13' 0" to 14' 0"	2	3	3	4
> 14' 0" to 16' 0"	2	3	3	4
> 16' 0" to 18' 0"	3	3	4	4

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m.

Table 6.19
Header to King Stud Connection Requirement

Header Span	Basic Wind Speed (mph), Exposure, and Seismic Zones ^{1,2,3,4,5}		
	Up to 70 A/B or Zones 0, 1, and 2	Up to 90 A/B or 70 C	Up 90 C
≤ 4'	4 No. 8 screws	4 No. 8 screws	6 No. 8 screws
> 4' to 8'	4 No. 8 screws	4 No. 8 screws	8 No. 8 screws
> 8' to 12'	4 No. 8 screws	6 No. 8 screws	10 No. 8 screws
> 12' to 16'	4 No. 8 screws	8 No. 8 screws	12 No. 8 screws

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 mph = 1.61 km/hr.

¹All screw sizes shown are minimum.

²For headers located on the first floor of a two-story building, the total number of screws may be reduced by 2 screws, but the total number of screws shall be no less than 4.

³For roof slopes of 6:12 or greater, the required number of screws may be reduced by 1/2, but the total number of screws shall be no less than 4.

⁴Screws can be replaced by an up-lift connector, which has a capacity of the number of screws multiplied by 164 lbs. (e.g., 12 No. 8 screws can be replaced by an up-lift connector whose capacity exceeds 12 x 164 lbs. = 1,968 lbs.)

⁵In Seismic Zones 3 and 4 (or Seismic Design Category D₁ and D₂) or where the basic wind speed equals or exceeds 90 mph (145 km/hr), connection shall comply with the requirements in the "Braced Walls and Diaphragms in High Seismic and High Wind Regions" section but shall be no less than the minimum required herein.

Table 6.20
Double L-Header Supporting Roof and Ceiling Only
24-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 10"	4' 8"	4' 4"	4' 0"	3' 8"	3' 5"	3' 2"
2-600L150-54	5' 6"	5' 4"	4' 10"	4' 6"	4' 2"	3' 10"	3' 8"
2-600L150-68	6' 3"	6' 1"	5' 7"	5' 1"	4' 9"	4' 5"	4' 2"
2-800L150-43	6' 4"	6' 2"	5' 4"	5' 2"	4' 9"	4' 5"	4' 2"
2-800L150-54	7' 3"	6' 11"	6' 8"	5' 11"	5' 5"	5' 1"	4' 9"
2-800L150-68	8' 2"	7' 11"	7' 3"	6' 8"	6' 2"	5' 9"	5' 5"
2-1000L150-43	7' 0"	6' 9"	6' 2"	5' 9"	5' 3"	4' 11"	4' 7"
2-1000L150-54	8' 11"	8' 7"	7' 0"	6' 6"	6' 0"	5' 7"	5' 3"
2-1000L150-68	10' 1"	9' 8"	8' 11"	7' 4"	6' 9"	6' 4"	5' 11"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

Table 6.21
Double L-Header Supporting Roof and Ceiling Only
28-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 6"	4' 4"	4' 0"	3' 9"	3' 5"	3' 2"	3' 0"
2-600L150-54	5' 2"	4' 11"	4' 6"	4' 2"	3' 10"	3' 7"	3' 5"
2-600L150-68	5' 10"	5' 8"	5' 2"	4' 9"	4' 5"	4' 1"	3' 10"
2-800L150-43	5' 11"	5' 8"	5' 3"	4' 10"	4' 6"	4' 2"	3' 11"
2-800L150-54	6' 9"	6' 6"	5' 11"	5' 6"	5' 1"	4' 9"	4' 5"
2-800L150-68	7' 8"	7' 4"	6' 9"	6' 3"	5' 9"	5' 4"	5' 0"
2-1000L150-43	6' 7"	6' 4"	5' 9"	5' 4"	4' 11"	4' 7"	4' 4"
2-1000L150-54	7' 5"	7' 2"	6' 7"	6' 1"	5' 7"	5' 2"	4' 11"
2-1000L150-68	9' 5"	9' 0"	7' 5"	6' 10"	6' 4"	5' 11"	5' 7"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

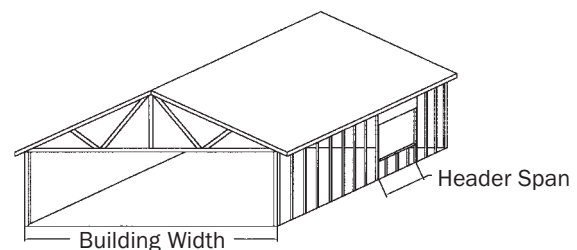


Table 6.22
Double L-Header Supporting Roof and Ceiling Only
30-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 5"	4' 9"	3' 11"	3' 7"	3' 4"	3' 1"	2' 11"
2-600L150-54	5' 0"	4' 11"	4' 5"	4' 1"	3' 9"	3' 6"	3' 3"
2-600L150-68	5' 8"	5' 1"	5' 0"	4' 8"	4' 3"	4' 0"	3' 9"
2-800L150-43	5' 9"	5' 1"	5' 1"	4' 8"	4' 4"	4' 0"	3' 10"
2-800L150-54	6' 6"	6' 3"	5' 9"	5' 4"	4' 11"	4' 7"	4' 4"
2-800L150-68	7' 5"	7' 6"	6' 6"	6' 1"	5' 7"	5' 2"	4' 11"
2-1000L150-43	6' 4"	6' 5"	5' 7"	5' 2"	4' 9"	4' 5"	4' 2"
2-1000L150-54	7' 2"	6' 9"	6' 4"	5' 10"	5' 5"	5' 1"	4' 9"
2-1000L150-68	9' 1"	8' 3"	7' 2"	6' 8"	6' 2"	5' 9"	5' 5"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

Table 6.23
Double L-Header Supporting Roof and Ceiling Only
32-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 3"	4' 1"	3' 9"	3' 6"	3' 3"	3' 0"	2' 10"
2-600L150-54	4' 10"	4' 8"	4' 3"	3' 11"	3' 8"	3' 5"	3' 2"
2-600L150-68	5' 6"	5' 4"	4' 10"	4' 6"	4' 2"	3' 10"	3' 8"
2-800L150-43	5' 7"	5' 4"	4' 11"	4' 7"	4' 3"	3' 11"	3' 8"
2-800L150-54	6' 4"	6' 1"	5' 7"	5' 2"	4' 9"	4' 5"	4' 2"
2-800L150-68	7' 2"	6' 11"	6' 4"	5' 11"	5' 5"	5' 1"	4' 9"
2-1000L150-43	6' 2"	5' 11"	5' 5"	5' 1"	4' 8"	4' 4"	4' 1"
2-1000L150-54	7' 0"	6' 8"	6' 2"	5' 8"	5' 3"	4' 11"	4' 7"
2-1000L150-68	8' 10"	8' 6"	7' 0"	6' 6"	6' 0"	5' 7"	5' 3"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

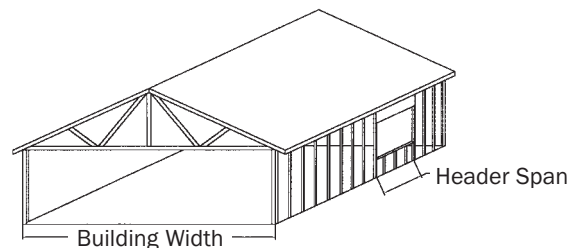


Table 6.24
Double L-Header Supporting Roof and Ceiling Only
34-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 2"	4' 0"	3' 8"	3' 5"	3' 2"	2' 11"	2' 9"
2-600L150-54	4' 8"	4' 6"	4' 2"	3' 10"	3' 7"	3' 4"	3' 1"
2-600L150-68	5' 4"	5' 2"	4' 9"	4' 5"	4' 1"	3' 9"	3' 7"
2-800L150-43	5' 5"	5' 3"	4' 10"	4' 5"	4' 1"	3' 10"	3' 7"
2-800L150-54	6' 2"	5' 11"	5' 5"	5' 0"	4' 8"	4' 4"	4' 1"
2-800L150-68	7' 0"	6' 9"	6' 2"	5' 9"	5' 3"	5' 11"	4' 7"
2-1000L150-43	6' 0"	5' 9"	5' 3"	4' 11"	4' 6"	4' 3"	4' 0"
2-1000L150-54	6' 9"	6' 6"	6' 0"	5' 7"	5' 1"	4' 9"	4' 6"
2-1000L150-68	8' 7"	7' 5"	6' 9"	6' 4"	5' 10"	5' 5"	5' 1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

Table 6.25
Double L-Header Supporting Roof and Ceiling Only
36-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 0"	3' 11"	3' 7"	3' 4"	3' 1"	2' 10"	2' 8"
2-600L150-54	4' 7"	4' 5"	4' 0"	3' 9"	3' 5"	3' 3"	3' 0"
2-600L150-68	5' 2"	5' 0"	4' 7"	4' 3"	3' 11"	3' 8"	3' 5"
2-800L150-43	5' 3"	5' 1"	4' 8"	4' 4"	4' 0"	3' 9"	3' 6"
2-800L150-54	6' 0"	5' 9"	5' 3"	4' 11"	4' 6"	4' 3"	4' 0"
2-800L150-68	6' 9"	6' 6"	6' 0"	5' 7"	5' 2"	4' 9"	4' 6"
2-1000L150-43	5' 10"	5' 7"	5' 2"	4' 9"	4' 5"	4' 1"	3' 10"
2-1000L150-54	6' 7"	6' 4"	5' 10"	5' 5"	5' 0"	4' 8"	4' 4"
2-1000L150-68	8' 4"	7' 2"	6' 7"	6' 2"	5' 8"	5' 3"	4' 11"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

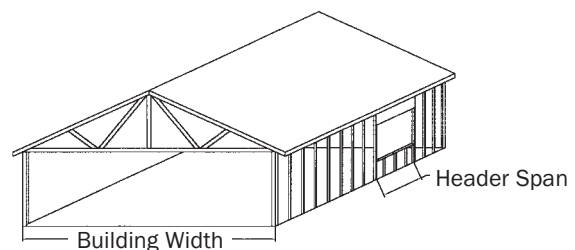


Table 6.26
Double L-Header Supporting One Floor, Roof, and Ceiling
24-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	3' 3"	3' 2"	3' 0"	2' 11"	2' 10"	2' 9"	2' 8"
2-600L150-54	3' 8"	3' 7"	3' 5"	3' 4"	3' 2"	3' 1"	3' 0"
2-600L150-68	4' 2"	4' 1"	3' 11"	3' 9"	3' 8"	3' 6"	3' 5"
2-800L150-43	4' 3"	4' 2"	4' 0"	3' 10"	3' 8"	3' 7"	3' 6"
2-800L150-54	4' 9"	4' 8"	4' 6"	4' 4"	4' 2"	4' 1"	3' 11"
2-800L150-68	5' 5"	5' 4"	5' 1"	4' 11"	4' 9"	4' 7"	4' 6"
2-1000L150-43	4' 8"	4' 7"	4' 5"	4' 3"	4' 1"	3' 11"	3' 10"
2-1000L150-54	5' 3"	5' 2"	5' 0"	4' 9"	4' 7"	4' 6"	4' 4"
2-1000L150-68	6' 0"	5' 10"	5' 8"	5' 5"	5' 3"	5' 1"	4' 11"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

Table 6.27
Double L-Header Supporting One Floor, Roof, and Ceiling
28-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	3' 0"	3' 0"	2' 10"	2' 9"	2' 8"	2' 7"	2' 6"
2-600L150-54	3' 5"	3' 4"	3' 3"	3' 1"	3' 0"	2' 11"	2' 10"
2-600L150-68	3' 11"	3' 10"	3' 8"	3' 6"	3' 5"	3' 4"	3' 2"
2-800L150-43	3' 11"	3' 10"	3' 9"	3' 7"	3' 5"	3' 4"	3' 3"
2-800L150-54	4' 6"	4' 5"	4' 3"	4' 1"	3' 11"	3' 9"	3' 8"
2-800L150-68	5' 1"	5' 0"	4' 9"	4' 7"	4' 5"	4' 4"	4' 2"
2-1000L150-43	4' 4"	4' 3"	4' 1"	3' 11"	3' 10"	3' 8"	3' 7"
2-1000L150-54	4' 11"	4' 10"	4' 8"	4' 6"	4' 4"	4' 2"	4' 1"
2-1000L150-68	5' 7"	5' 6"	5' 3"	5' 1"	4' 11"	4' 9"	4' 7"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

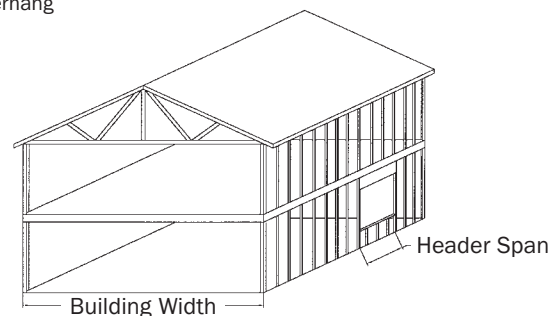


Table 6.28
Double L-Header Supporting One Floor, Roof, and Ceiling
30-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	2' 11"	2' 10"	2' 9"	2' 8"	2' 7"	2' 6"	2' 5"
2-600L150-54	3' 4"	3' 3"	3' 1"	3' 0"	2' 11"	2' 10"	2' 9"
2-600L150-68	3' 9"	3' 8"	3' 7"	3' 5"	3' 4"	3' 2"	3' 1"
2-800L150-43	3' 10"	3' 9"	3' 7"	3' 6"	3' 4"	3' 3"	3' 2"
2-800L150-54	4' 4"	4' 3"	4' 1"	3' 11"	3' 10"	3' 8"	3' 7"
2-800L150-68	4' 11"	4' 10"	4' 8"	4' 6"	4' 4"	4' 2"	4' 1"
2-1000L150-43	4' 3"	4' 2"	4' 0"	3' 10"	3' 8"	3' 7"	3' 6"
2-1000L150-54	4' 9"	4' 8"	4' 6"	4' 4"	4' 2"	4' 1"	3' 11"
2-1000L150-68	5' 5"	5' 4"	5' 1"	4' 11"	4' 9"	4' 7"	4' 5"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

Table 6.29
Double L-Header Supporting One Floor, Roof, and Ceiling
32-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	2' 10"	2' 9"	2' 8"	2' 7"	2' 6"	2' 5"	2' 4"
2-600L150-54	3' 3"	3' 2"	3' 0"	2' 11"	2' 10"	2' 9"	2' 8"
2-600L150-68	3' 8"	3' 7"	3' 5"	3' 4"	3' 3"	3' 1"	3' 0"
2-800L150-43	3' 9"	3' 8"	3' 6"	3' 4"	3' 3"	3' 2"	3' 1"
2-800L150-54	4' 2"	4' 2"	4' 0"	3' 10"	3' 8"	3' 7"	3' 6"
2-800L150-68	4' 9"	4' 8"	4' 6"	4' 4"	4' 2"	4' 1"	3' 11"
2-1000L150-43	4' 1"	4' 0"	3' 10"	3' 9"	3' 7"	3' 6"	3' 4"
2-1000L150-54	4' 8"	4' 7"	4' 4"	4' 3"	4' 1"	3' 11"	3' 10"
2-1000L150-68	5' 3"	5' 2"	4' 11"	4' 9"	4' 7"	4' 6"	4' 4"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

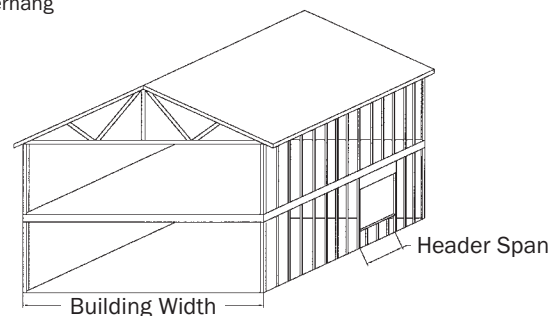


Table 6.30
Double L-Header Supporting One Floor, Roof, and Ceiling
34-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	2' 9"	2' 9"	2' 7"	2' 6"	2' 5"	2' 4"	2' 3"
2-600L150-54	3' 1"	3' 1"	2' 11"	2' 10"	2' 9"	2' 8"	2' 7"
2-600L150-68	3' 7"	3' 6"	3' 4"	3' 3"	3' 2"	3' 0"	2' 11"
2-800L150-43	3' 7"	3' 7"	3' 5"	3' 3"	3' 2"	3' 1"	3' 0"
2-800L150-54	4' 1"	4' 0"	3' 10"	3' 9"	3' 7"	3' 6"	3' 4"
2-800L150-68	4' 8"	4' 7"	4' 5"	4' 3"	4' 1"	3' 11"	3' 10"
2-1000L150-43	4' 0"	3' 11"	3' 9"	3' 7"	3' 6"	3' 5"	3' 3"
2-1000L150-54	4' 6"	4' 5"	4' 3"	4' 1"	3' 11"	3' 10"	3' 9"
2-1000L150-68	5' 1"	5' 0"	4' 10"	4' 8"	4' 6"	4' 4"	4' 3"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

Table 6.31
Double L-Header Supporting One Floor, Roof, and Ceiling
36-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	2' 8"	2' 8"	2' 6"	2' 5"	2' 4"	2' 3"	2' 3"
2-600L150-54	3' 1"	3' 0"	2' 10"	2' 9"	2' 8"	2' 7"	2' 6"
2-600L150-68	3' 6"	3' 5"	3' 3"	3' 2"	3' 1"	2' 11"	2' 10"
2-800L150-43	3' 6"	3' 5"	3' 4"	3' 2"	3' 1"	3' 0"	2' 11"
2-800L150-54	4' 0"	3' 11"	3' 9"	3' 7"	3' 6"	3' 5"	3' 3"
2-800L150-68	4' 6"	4' 5"	4' 3"	4' 1"	4' 0"	3' 10"	3' 9"
2-1000L150-43	3' 11"	3' 10"	3' 8"	3' 6"	3' 5"	3' 4"	3' 2"
2-1000L150-54	4' 5"	4' 4"	4' 2"	4' 0"	3' 10"	3' 9"	3' 7"
2-1000L150-68	5' 0"	4' 11"	4' 8"	4' 6"	4' 4"	4' 3"	4' 1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²); Attic live load = 10 psf (0.479 kN/m²); Floor live load = 30 psf (1.437 kN/m²); Floor dead load = 10 psf (0.479 kN/m²); 2-foot (610 mm) roof overhang

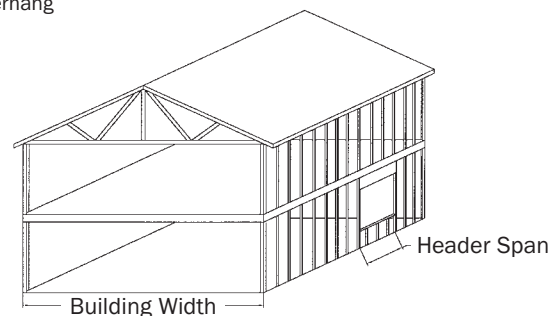


Table 6.32
Double L-Header Supporting Roof and Ceiling Uplift Span Table
24-Foot-Wide Building^{1,2}

Double L-Header Designation	Wind Speed ⁴ (mph) and Exposure			
	80 A/B ³	90 A/B	100 A/B	110 A/B
	Seismic Zones 0, 1 & 2	70 C	80 C	90 C
2-600L150-43	No Uplift	7' 3"	4' 11"	3' 9"
2-600L150-54	No Uplift	8' 3"	5' 7"	4' 3"
2-600L150-68	No Uplift	9' 5"	6' 4"	4' 10"
2-800L150-43	No Uplift	8' 6"	5' 9"	4' 4"
2-800L150-54	No Uplift	10' 9"	7' 3"	5' 6"
2-800L150-68	No Uplift	12' 3"	8' 3"	6' 3"
2-1000L150-43	No Uplift	10' 6"	7' 1"	5' 5"
2-1000L150-54	No Uplift	10' 3"	6' 11"	5' 3"
2-1000L150-68	No Uplift	15' 1"	10' 2"	7' 9"

For SI: 1 mph = 1.61 km/hr = 49 m/sec, 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

³No uplift loads acting on building for wind speeds up to 80 mph (129 km/hr), exposure A/B.

⁴Wind speeds are based on fastest-mile measurements. Wind speed conversion Table 1.2 shall be used for wind speed maps based on 3-second gust wind speeds.

Table 6.33
Double L-Header Supporting Roof and Ceiling Uplift Span Table
28-Foot-Wide Building^{1,2}

Double L-Header Designation	Wind Speed ⁴ (mph) and Exposure			
	80 A/B ³	90 A/B	100 A/B	110 A/B
	Seismic Zones 0, 1 & 2	70 C	80 C	90 C
2-600L150-43	No Uplift	6' 10"	4' 8"	3' 6"
2-600L150-54	No Uplift	7' 9"	5' 3"	4' 0"
2-600L150-68	No Uplift	8' 10"	6' 0"	4' 6"
2-800L150-43	No Uplift	9' 0"	6' 1"	4' 7"
2-800L150-54	No Uplift	10' 2"	6' 11"	5' 3"
2-800L150-68	No Uplift	11' 7"	7' 10"	5' 11"
2-1000L150-43	No Uplift	11' 1"	7' 6"	5' 8"
2-1000L150-54	No Uplift	9' 8"	6' 7"	5' 0"
2-1000L150-68	No Uplift	14' 2"	9' 8"	7' 3"

For SI: 1 mph = 1.61 km/hr = 49 m/sec, 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

³No uplift loads acting on building for wind speeds up to 80 mph (129 km/hr), exposure A/B.

⁴Wind speeds are based on fastest-mile measurements. Wind speed conversion Table 1.2 shall be used for wind speed maps based on 3-second gust wind speeds.

Table 6.34
Double L-Header Supporting Roof and Ceiling Uplift Span Table
32-Foot-Wide Building^{1,2}

Double L-Header Designation	Wind Speed ⁴ (mph) and Exposure			
	80 A/B ³	90 A/B	100 A/B	110 A/B
	Seismic Zones 0, 1 & 2	70 C	80 C	90 C
2-600L150-43	No Uplift	6' 6"	4' 5"	3' 4"
2-600L150-54	No Uplift	7' 5"	5' 0"	3' 10"
2-600L150-68	No Uplift	8' 5"	5' 9"	4' 4"
2-800L150-43	No Uplift	8' 6"	5' 10"	4' 5"
2-800L150-54	No Uplift	9' 8"	6' 7"	5' 0"
2-800L150-68	No Uplift	11' 0"	7' 6"	5' 8"
2-1000L150-43	No Uplift	10' 6"	7' 2"	5' 5"
2-1000L150-54	No Uplift	9' 3"	6' 3"	4' 9"
2-1000L150-68	No Uplift	13' 6"	9' 2"	6' 11"

For SI: 1 mph = 1.61 km/hr = 49 m/sec, 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

³No uplift loads acting on building for wind speeds up to 80 mph (129 km/hr), exposure A/B.

⁴Wind speeds are based on fastest-mile measurements. Wind speed conversion Table 1.2 shall be used for wind speed maps based on 3-second gust wind speeds.

Table 6.35
Double L-Header Supporting Roof and Ceiling Uplift Span Table
36-Foot-Wide Building^{1,2}

Double L-Header Designation	Wind Speed ⁴ (mph) and Exposure			
	80 A/B ³	90 A/B	100 A/B	110 A/B
	Seismic Zones 0, 1 & 2	70 C	80 C	90 C
2-600L150-43	No Uplift	6' 3"	4' 2"	3' 3"
2-600L150-54	No Uplift	7' 0"	4' 9"	3' 8"
2-600L150-68	No Uplift	8' 0"	5' 4"	4' 2"
2-800L150-43	No Uplift	8' 2"	5' 5"	4' 3"
2-800L150-54	No Uplift	9' 3"	6' 2"	4' 10"
2-800L150-68	No Uplift	10' 6"	7' 0"	5' 6"
2-1000L150-43	No Uplift	10' 0"	6' 9"	5' 3"
2-1000L150-54	No Uplift	8' 10"	5' 11"	4' 7"
2-1000L150-68	No Uplift	12' 11"	8' 7"	6' 9"

For SI: 1 mph = 1.61 km/hr = 49 m/sec, 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Design assumptions: Roof and ceiling dead load = 12 psf (0.575 kN/m²)
 Attic live load = 10 psf (0.479 kN/m²)
 2-foot (610 mm) roof overhang

³No uplift loads acting on building for wind speeds up to 80 mph (129 km/hr), exposure A/B.

⁴Wind speeds are based on fastest-mile measurements. Wind speed conversion Table 1.2 shall be used for wind speed maps based on 3-second gust wind speeds.

Table 6.36
Minimum Percentage of Full Height Structural Sheathing on
Exterior Wall^{1,2,3,4,5,6}

Wall Supporting:	Roof Slope	Basic Wind Speed (mph) and Exposure				
		70 A/B	80 A/B	<90 A/B		
				70 C	80 C	<90 C
Roof and Ceiling Only (One Story or Second-Floor of Two-Story)	3:12	8	9	12	16	20
	6:12	12	15	20	26	35
	9:12	21	25	30	50	58
	12:12	30	35	40	66	75
One Story, Roof, and Ceiling (First Floor of a Two-Story Building)	3:12	24	30	35	50	66
	6:12	25	30	40	58	74
	9:12	35	40	55	74	91
	12:12	40	50	65	100	115
Wall Supporting:	Seismic Zone 0	Seismic Zone 1	Seismic Zone 2			
Roof and Ceiling Only	6	6	19			
One Story, Roof, and Ceiling	13	13	40			

For SI: 1 mph = 1.61 km/hr = 49 m/sec, 1 inch = 25.4 mm, 1 foot = 0.3048 m.

¹Bracing amount shall not be less than 20 percent of the wall length after all applicable adjustments are made.

²Linear interpolation shall be permitted.

³Minimum percentages are based on a building aspect ratio of 1:1. Minimum percentages for the shorter walls of a building shall be multiplied by a factor of 1.5 and 2.0 for building aspect ratios of 1.5:1 and 2:1 respectively.

⁴For hip roofed homes with continuous structural sheathing, the amount of bracing 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.

⁵Sheathing percentages are permitted to be reduced for the 4 inch (102 mm) edge screw spacing only, in accordance with Table 6.37.

⁶Sheathing percentages are permitted to be reduced in accordance with the "Hold-Down Requirements" section.

Table 6.37
Edge Screw Spacing for Shearwall Length Adjustment Factors

Edge Screw Spacing (inches)			
6	4	3	2
Shearwall Percentage Adjustment Factors			
1.00	0.72	0.60	0.56

For SI: 1 inch = 25.4 mm.

Table 6.38
Type II Braced Wall Line Length Adjustment Factors

Wall Height "H" (ft)	Maximum Unrestrained Opening Height (ft.)					
	H/3	H/2	2H/3	3H/4	5H/6	H
8	2.67	4.00	5.33	5.93	6.67	8.00
9	3.00	4.50	6.00	6.67	7.50	9.00
10	3.33	5.00	6.67	7.41	8.33	10.00
Percent (%) Fully Sheathed Wall	Type II Braced Wall Line Length Adjustment Factors					
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

For SI: 1 foot = 0.3048 m.

Table 6.39
Required Hold-Down Anchor Force

Wall Height (feet)	Required Hold Down Anchor Force (lbs.)			
	Panel Edge Screw Spacing (in.)			
	6	4	3	2
8	3440	4760	5720	6120
9	3870	5355	6435	6885
10	4300	5950	7150	7650

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 lb. = 4.4 N.

Table 6.40
Top Track Splice Screw Schedule

Up to 100 mph or Seismic Design Category D ₁	Up to 110 mph or Seismic Design Category D ₂
6 No. 8 screws each side of splice	11 No. 8 screws each side of splice

For SI: 1 mph = 1.61 km/hr = 49 m/sec.

Table 6.41
Required Shear Anchorage for Braced Walls

Anchor Bolt Diameter (inches)	Required Anchor Bolt Spacing (feet on center)			
	Panel Edge Screw Spacing, inches			
	6	4	3	2
1/2"	4.5'	3'	3'	2.5'
5/8"	5.5'	4'	3'	3'

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m.

Table 6.42
Lightweight Roof and Lightweight Exterior Wall Type I Length Adjustment Factors

Braced Wall Supporting	Lightweight Roof/Ceiling Assembly- Unit Weight Less Than or Equal to 11 psf	Lightweight Exterior Walls-Unit Weight Less Than or Equal to 7 psf	Buildings Having Both Lightweight Walls and Roofs
Roof/Ceiling Only	0.80	0.95	0.70
One Floor and Roof/Ceiling	0.90	0.90	0.75

For SI: 1 psf = 0.0479 kN/m².

Table 6.43
Heavy Roof Type I Length Adjustment Factors

Braced Wall Supporting	Roof/Ceiling Assemblies Weights (psf)	
	Less Than or Equal to 15	Greater Than 15 and Less Than 25
Roof/Ceiling Only	1.0	1.2
One Floor and Roof/Ceiling	1.0	1.1

For SI: 1 psf = 0.0479 kN/m².

Table 6.44
Range of Allowable Sidewall Lengths One Story Slab on Grade

Foundation Supporting	Building Endwall Width (ft)	Basic Wind Speed (mph)					
		90		100		110	
		Allowable Building Sidewall Length (ft)					
One Story Slab on Grade	12	Min	Max	Min	Max	Min	Max
		10	48	10	48	10	43
		10	60	10	60	10	58
		10	60	10	60	11	60
		10	60	11	60	13	60
		10	60	12	60	15	60
		11	60	14	60	17	60
	13	60	16	60	19	60	

For SI: 1 foot = 0.3048 m, 1 mph = 1.61 km/hr = 49 m/sec.

Table 6.45
Range of Allowable Sidewall Lengths All Other Cases

Foundation Supporting	Building Endwall Width (ft)	Basic Wind speed (mph)					
		90		100		110	
		Allowable Building Sidewall Length (ft)					
1-2 Stories	12	Min	Max	Min	Max	Min	Max
		10	29	10	23	10	19
		10	38	10	31	10	26
		10	48	10	39	12	32
		10	58	12	47	14	39
		11	60	14	55	17	45
		13	60	16	60	19	51
	15	60	18	60	22	58	

For SI: 1 foot = 0.3048 m, 1 mph = 1.61 km/hr = 49 m/sec.

Table 6.46
Type I Braced Wall Panel Sidewall Sheathing Length
Requirements

Braced Wall Supporting	Building Endwall Length, W (ft)	Basic Wind Speed (mph)		
		90	100	110
		Minimum Length of Full Height Sheathing on Building Sidewall, L ^{1,2,3} (ft)		
Roof/Ceiling Only ⁴	12	5	5	5
	16	5	5	5
	20	5	5	6
	24	5	6	7
	28	5	6	8
	32	6	7	9
	36	7	8	10
One Floor and Roof/Ceiling ⁵	20	8	10	11
	24	9	11	14
	28	11	13	16
	32	12	15	18
	36	14	17	20

For SI: 1 foot = 0.3048 m, 1 mph = 1.61 km/hr = 49 m/sec.

¹Tabulated sheathing lengths are based on 8 feet (2438 mm) wall heights. For 9 feet (2743 mm) wall heights, the tabulated values shall be multiplied by 1.13. For 10 feet (3048 mm) wall heights, the tabulated values shall be multiplied by 1.25.

²Tabulated sheathing lengths assume a mean roof height of 33 feet. For mean roof heights of 15 feet (4572 mm) or less, the tabulated values can be multiplied by 0.8.

³Tabulated sheathing lengths assume a 6 inch (152 mm) edge screw spacing. Required lengths shall be permitted to be multiplied by the adjustment factors in Table 6.37 for edge screw spacing other than 6 inch (152 mm), but the resulting sheathing length shall not be less than 5 feet (1524 mm).

⁴Applies to a one story building or the top story of a two story building.

⁵Applies to the lower story of a two story building.

Table 6.47
Type I Braced Wall Panel Endwall Sheathing Length
Requirements

Braced Wall Supporting	Building Endwall Length, W (ft)	Basic Wind speed (mph)		
		90	100	110
		Minimum Length of Full Height Sheathing on Building Endwall, L ^{1,2,3} (ft)		
Roof/Ceiling Only ⁴	12	5	5	5
	16	5	5	5
	20	5	5	5
	24	5	5	5
	28	5	5	5
	32	5	5	6
	36	5	6	7
	40	5	6	8
	50	6	8	9
60	8	9	11	
One Floor and Roof/Ceiling ⁵	20	8	10	12
	24	10	12	14
	28	11	14	17
	32	13	16	19
	36	14	18	21
	40	16	20	24
	50	20	24	29
60	24	29	35	

For SI: 1 foot = 0.3048 m, 1 mph = 1.61 km/hr.

¹Tabulated sheathing lengths are based on 8 feet (2438 mm) wall heights. For 9 feet (2743 mm) wall heights, the tabulated values shall be multiplied by 1.13. For 10 feet (3,048 mm) wall heights, the tabulated values shall be multiplied by 1.25.

²Tabulated sheathing lengths assume a mean roof height of 33 feet. For mean roof heights of 15 feet or less, the tabulated values can be multiplied by 0.8.

³Tabulated sheathing lengths assume a 6 inch (152 mm) edge screw spacing. Required lengths shall be permitted to be multiplied by the adjustment factors in Table 6.37 for edge screw spacing other than 6 inch (152 mm), but the resulting sheathing length shall not be less than 5 feet (1,524 mm).

⁴Applies to a one story building or the top story of a two story building.

⁵Applies to the lower story of a two story building.

Table 6.48
Roof to Wall or Wall to Wall Uplift Connection Capacity

Framing Spacing ³ (in)	Roof Span (ft)	Basic Wind Speed (mph)			
		90	100	110	
		Roof Truss or Rafter to Wall Required Connection Capacity ^{1,2} (lbs.)			
12	24	245	336	435	
	28	279	382	495	
	32	312	428	555	
	36	346	474	615	
16	24	327	447	580	
	28	371	509	660	
	32	416	570	740	
19.2	24	392	536	696	
	28	446	610	792	
	32	499	684	888	
24	24	490	671	868	
	28	557	763	990	
	32	624	855	1110	
24	36	691	947	1230	
	Framing Spacing ³ (in)	Roof Span (ft)	Wall Assembly to Wall Assembly Required Connection Capacity ^{1,2} (lbs.)		
	12	24	185	276	375
28		219	322	435	
32		252	368	495	
36		286	414	555	
16	24	242	362	495	
	28	286	424	575	
	32	331	485	655	
19.2	24	376	547	735	
	24	287	431	591	
	28	341	505	687	
24	32	394	579	784	
	36	448	653	879	
	24	355	536	733	
24	28	422	628	855	
	32	489	720	975	
	36	556	812	1095	

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 lb. = 4.4 N, 1 mph = 1.61 km/hr.

¹Uplift requirements assume a roof/ceiling dead load of 10 psf (2/3x15psf) (0.479kN/m²).

²Uplift connection requirements shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2,438 mm) of building corners.

³The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but shall not negate the in-line framing requirement of the "In-Line Framing" section.

Table 6.49
Roof to Wall or Wall to Wall Uplift Strap Connection
Requirement

Framing Spacing ¹ (in)	Roof Span (ft)	Basic Wind Speed (mph)		
		90	100	110
		Number of No. 8 Screws in Each End of a 1 1/4 inch by 33 mil Steel Strap—Roof Rafter or Truss to Wall Connection		
12	24	2	2	2
	28	2	2	3
	32	2	2	3
	36	2	3	3
16	24	2	3	3
	28	2	3	3
	32	2	3	4
	36	3	3	4
19.2	24	2	3	4
	28	3	3	4
	32	3	4	5
	36	3	4	5
24	24	3	4	4
	28	3	4	5
	32	3	4	6 ²
	36	4	5	6 ²
Framing Spacing ¹ (in)	Roof Span (ft)	Number of No. 8 Screws in Each End of a 1 1/4 inch by 33 mil Steel Strap—Wall Assembly to Wall Assembly Connection		
12	24	2	2	2
	28	2	2	2
	32	2	2	3
	36	2	2	3
16	24	2	2	3
	28	2	2	3
	32	2	3	3
	36	2	3	4
19.2	24	2	2	3
	28	2	3	4
	32	2	3	4
	36	3	3	4
24	24	2	3	4
	28	2	3	4
	32	3	4	5
	36	3	4	5

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 mph = 1.61 km/hr.

¹The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but shall not negate the in-line framing requirement of the “Applicability Limits” section.

²Strap width shall be a minimum of 1.5 inches (38 mm) or thickness shall be a minimum of 0.043 inches (1.1 mm).

Table 6.50
Wall to Foundation or Floor and Roof to Wall Uplift Connection
Requirements

Framing Spacing ³ (in)	Roof Span (ft)	Basic Wind Speed (mph)		
		90	100	110
		Wall Assembly to Foundation or Floor Assembly Required Connection Capacity ^{1,2} (lbs.)		
12	24	170	261	360
	28	204	307	420
	32	237	353	480
	36	271	399	540
16	24	227	347	480
	28	271	409	560
	32	316	470	640
19.2	24	272	416	576
	28	326	490	672
	32	379	564	768
24	24	433	638	864
	28	340	521	718
	32	407	613	840
24	32	474	705	960
	36	541	797	1080
Framing Spacing ³ (in)	Roof Span (ft)	Number of No. 8 Screws in Each End of a 1 1/4 inch by 33 mil Steel Strap—Roof Rafter or Truss to Wall Connection		
12	24	1	1	1
	28	1	1	1
	32	1	1	2
	36	1	1	2
16	24	1	1	2
	28	1	1	2
	32	1	2	2
19.2	24	1	2	2
	28	1	2	2
	32	1	2	2
24	24	1	2	2
	28	1	2	2
	32	2	2	3
24	36	2	2	3

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 mph = 1.61 km/hr.

¹Uplift requirements assume a roof/ceiling dead load of 10 psf (2/3x15psf) (0.479 kN/m²).

²Uplift connection requirements shall be permitted to be multiplied by 0.70 for framing not located within 8 feet (2,438 mm) of building corners.

³The 12 inch (305 mm) and 19.2 inch (488 mm) framing spacing provide options for design, but shall not negate the in-line framing requirement of the "In-Line Framing" section.

Table 6.51
Maximum Allowable Heights for 350S162 Curtain Wall Studs
Mechanical Bracing Every 48 Inches or Fully Sheathed
Wall^{1,2,3}

Wind Speed		Member Spacing (inches)	Allowable Height (feet-inches)						
Exp. A/B	Exp. C		Stud Thickness						
			33 mil	43 mil	54 mil	68 mil	97 mil		
			Single Stud						
70 mph		16	11' 9"	12' 10"	13' 9"	14' 8"	16' 2"		
		24	10' 4"	11' 2"	12' 0"	12' 10"	14' 1"		
80 mph	70 mph	16	10' 8"	11' 8"	12' 6"	13' 4"	14' 8"		
		24	9' 4"	10' 2"	10' 11"	11' 8"	12' 10"		
90 mph	80 mph	16	9' 11"	10' 10"	11' 7"	12' 5"	13' 7"		
		24	8' 8"	9' 5"	10' 1"	10' 10"	11' 11"		
100 mph	90 mph	16	9' 2"	9' 11"	10' 8"	11' 5"	12' 7"		
		24	7' 0"	8' 8"	9' 4"	9' 11"	10' 11"		
110 mph	100 mph	16	7' 10"	9' 0"	9' 8"	10' 4"	11' 4"		
		24	5' 3"	7' 10"	8' 5"	9' 0"	9' 11"		
	110 mph	16	6' 6"	8' 5"	9' 1"	9' 8"	10' 8"		
		24	4' 4"	7' 5"	7' 11"	8' 5"	9' 4"		
Wind Speed		Member Spacing (inches)	Back-to-Back Studs						
Exp. A/B	Exp. C								
			70 mph	16	14' 10"	16' 2"	17' 4"	18' 6"	20' 4"
			24	13' 0"	14' 1"	15' 1"	16' 2"	17' 10"	
80 mph	70 mph	16	13' 6"	14' 8"	15' 9"	16' 10"	18' 6"		
		24	11' 9"	12' 10"	13' 9"	14' 8"	16' 2"		
90 mph	80 mph	16	12' 6"	13' 8"	14' 7"	15' 7"	17' 2"		
		24	10' 11"	11' 11"	12' 9"	13' 8"	15' 0"		
100 mph	90 mph	16	11' 6"	12' 7"	13' 5"	14' 4"	15' 10"		
		24	12' 4"	15' 7"	16' 9"	17' 11"	19' 10"		
110 mph	100 mph	16	10' 5"	11' 4"	12' 2"	13' 0"	14' 4"		
		24	9' 1"	9' 11"	10' 8"	11' 4"	12' 6"		
	110 mph	16	9' 10"	10' 8"	11' 5"	12' 3"	13' 5"		
		24	8' 7"	9' 4"	10' 0"	10' 8"	11' 9"		

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

³Table values are valid for steels with minimum yield strength of 33 ksi (228 Mpa).

Table 6.52
Maximum Allowable Heights for 550S162 Curtain Wall Studs
Mechanical Bracing Every 48 Inches or Fully Sheathed
Wall^{1,2,3}

Wind Speed		Member Spacing (inches)	Allowable Height (feet-inches)				
Exp. A/B	Exp. C		Stud Thickness				
			33 mil	43 mil	54 mil	68 mil	97 mil
			Single Stud				
70 mph		16	16' 9"	18' 3"	19' 7"	21' 0"	23' 2"
		24	13' 1"	15' 11'	17' 1"	18' 4"	20' 3"
80 mph	70 mph	16	14' 9"	16' 7"	17' 10"	19' 1"	21' 1"
		24	9' 10"	14' 6"	15' 6"	16' 8"	18' 5"
90 mph	80 mph	16	11' 10"	15' 5"	16' 6"	17' 8"	19' 7"
		24	7' 10'	13' 5"	14' 5"	15' 5"	17' 1"
100 mph	90 mph	16	9' 3"	14' 2"	15' 2"	16' 3"	18' 0"
		24	6' 2"	12' 2"	13' 3"	14' 3"	15' 9"
110 mph	100 mph	16	6' 10"	12' 10"	13' 9"	14' 9"	16' 4"
		24	4' 7"	9' 1"	12' 0"	12' 11"	14' 3"
	110 mph	16	5' 8"	11' 3"	12' 11"	13' 10"	15' 4"
		24	3' 9"	7' 6"	11' 1"	12' 1"	13' 4"
Wind Speed		Member Spacing (inches)	Back-to-Back Studs				
Exp. A/B	Exp. C						
			70 mph	21' 2"	23' 0"	24' 8"	26' 5"
80 mph	70 mph	16	19' 2"	20' 11"	22' 5"	24' 0"	26' 7"
		24	16' 9"	18' 3"	19' 7"	21' 0"	23' 2"
90 mph	80 mph	16	17' 10"	19' 5"	20' 10"	22' 4"	24' 8"
		24	15' 7'	16' 11"	18' 2"	19' 6"	21' 6"
100 mph	90 mph	16	16' 5"	17' 10"	19' 2'	20' 6"	22' 8"
		24	12' 4"	15' 7"	16' 9"	17' 11"	19' 10"
110 mph	100 mph	16	13' 9"	16' 2"	17' 4"	18' 7"	20' 7"
		24	9' 2"	14' 2"	15' 2"	16' 3'	18' 0"
	110 mph	16	11' 4"	15' 2"	16' 4"	17' 6"	19' 4"
		24	7' 7"	13' 3"	14' 3'	15' 3"	16' 10"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/hr, 1 foot = 0.3048 m.

¹Deflection criteria: L/240

²Design load assumptions: Roof dead load is 12 psf (0.575 kN/m²)

Attic live load is 10 psf (0.479 kN/m²)

³Table values are valid for steels with minimum yield strength of 33 ksi (228 Mpa).

7

NON-STRUCTURAL WALLS

Non-Load Bearing Studs

Non-load bearing steel framing shall comply with ASTM C645 [12] and shall have a minimum base metal thickness of 18 mils (0.45 mm). Tables 7.1 and 7.2 provide limiting heights for selected non-load bearing studs subjected to a lateral load of 5 psf (0.24 kN/m²). These tables are provided for information only and should only be used where manufacturers' data are not available.

Table 7.1
Maximum Allowable Clear Non-Load Bearing Stud Height^{1,2,3,4}
Mid-Height Bracing

Stud Designation ⁵	Stud Spacing (inches)	
	16" oc	24" oc
350S125-18	10' 8"	7' 8"
350S125-27	12' 4"	10' 11"
350S125-33	13' 0"	11' 8"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

¹Stud height based on stud capacity alone (i.e., no composite action).

²Maximum lateral load is 5 psf (0.24 kN/m²).

³Minimum yield strength is 33 ksi (228 kPa).

⁴Deflection limit $\leq L/240$.

⁵All sections have a minimum lip size of 3/16 inch (5 mm).

Table 7.2
Maximum Allowable Clear Non-Load Bearing Stud Height^{1,2,3}
Fully Braced Walls

Stud Designation ⁴	Stud Spacing (inches) and Deflection Criteria					
	16" oc L/120	24" oc L/120	16" oc L/180	24" oc L/180	16" oc L/240	24" oc L/240
350S125-18	11' 6"	7' 8"	11' 6"	7' 8"	11' 6"	7' 8"
350S125-27	16' 11"	13' 10"	15' 10"	13' 10"	14' 5"	12' 7"
350S125-33	19' 4"	15' 9"	17' 0"	14' 10"	15' 6"	13' 6"

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1 foot = 0.3048 m.

¹Stud height based on stud capacity fully braced (continuously supported by gypsum wallboard).

²Maximum lateral load is 5 psf (0.24 kN/m²).

³Minimum yield strength is 33 ksi (228 kPa).

⁴All sections have a minimum lip size of 3/16 inch (5 mm).

Construction Details

Figures 7.1 through 7.6 are provided for informational purposes only. Alternate framing details may be used when appropriate.

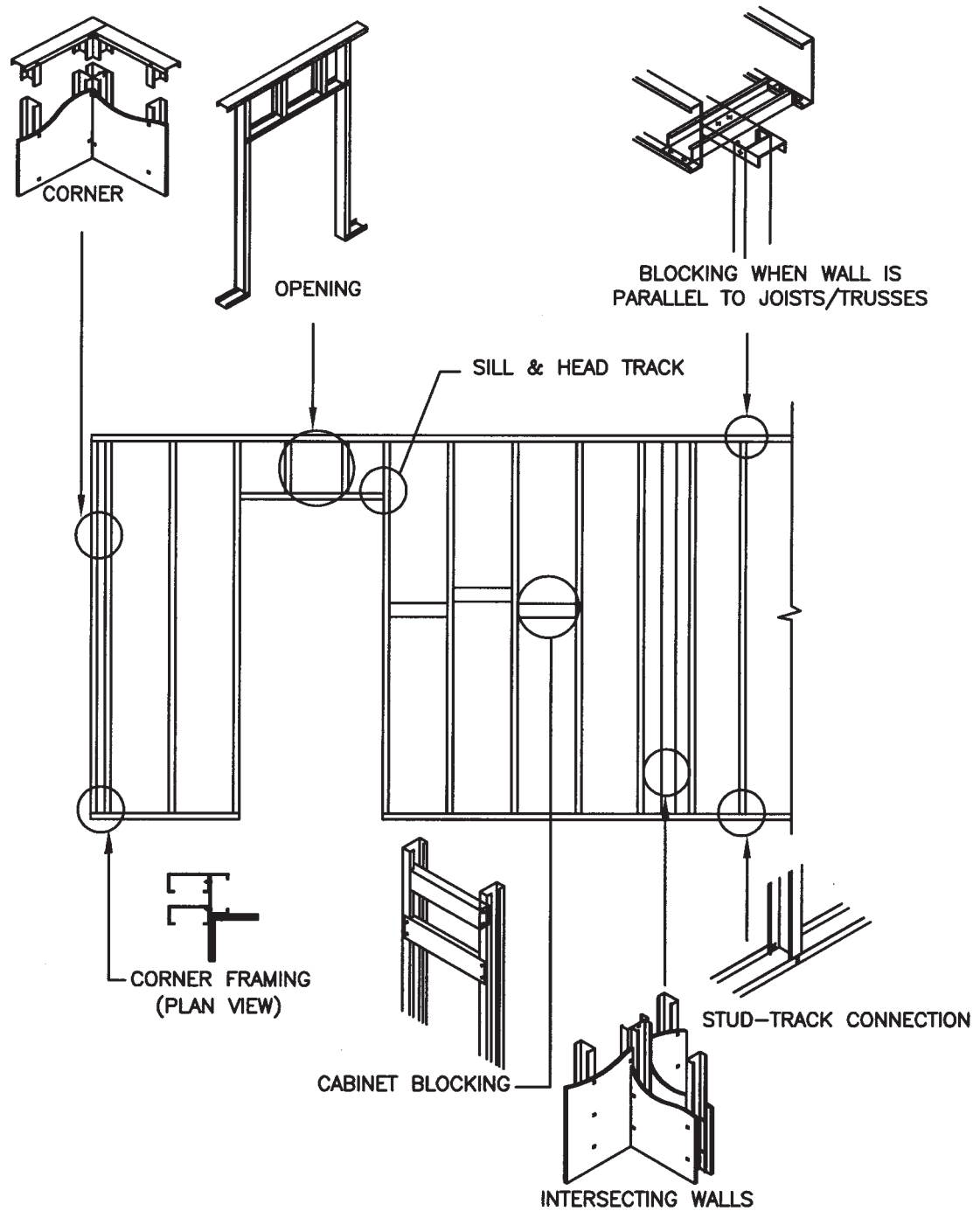


Figure 7.1
Typical Interior Non-Load Bearing Wall Detail

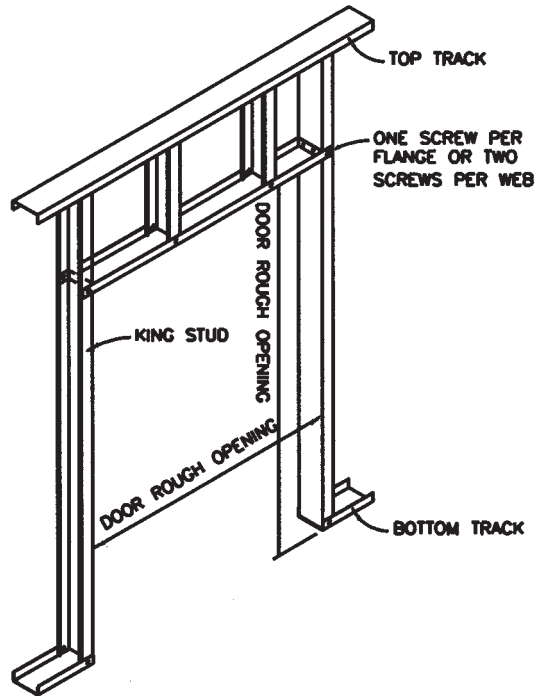


Figure 7.2
Typical Door Framing Detail

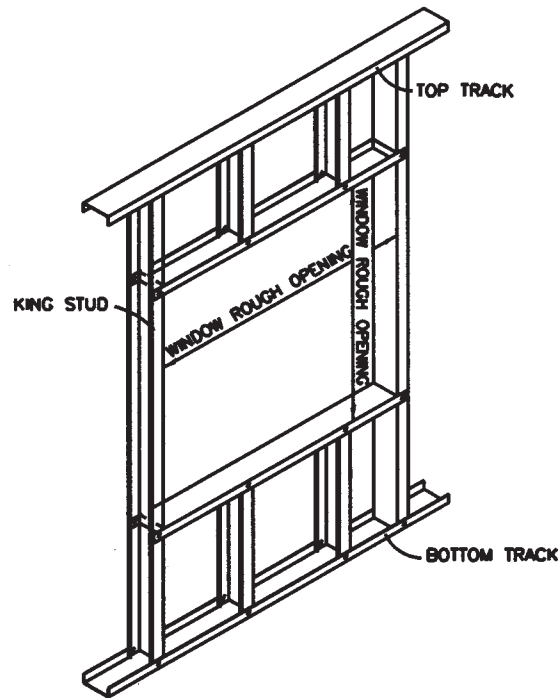


Figure 7.3
Typical Window Framing Detail

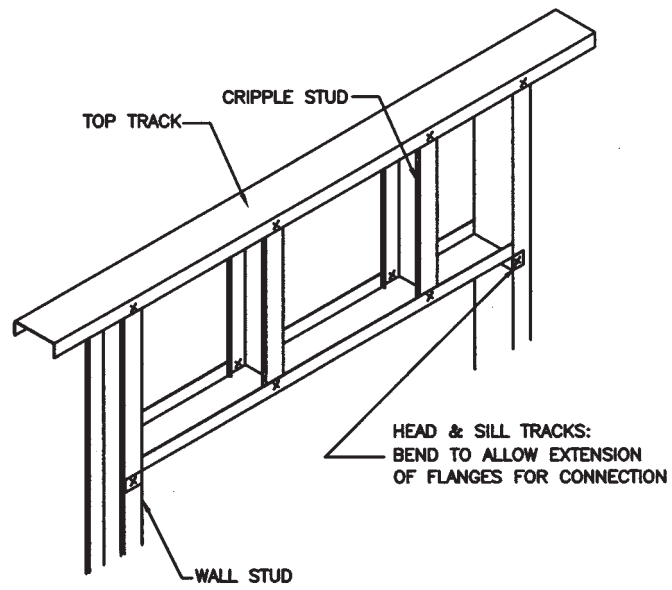


Figure 7.4
Non-Load Bearing Header Detail

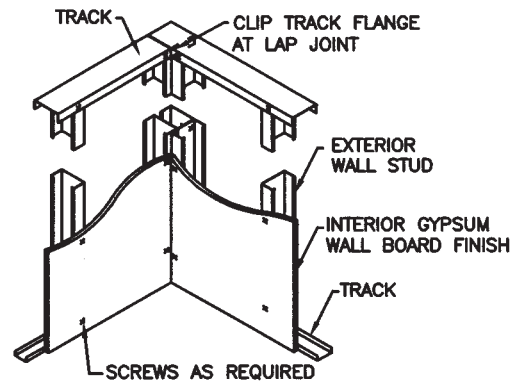


Figure 7.5
Typical Corner Framing Detail

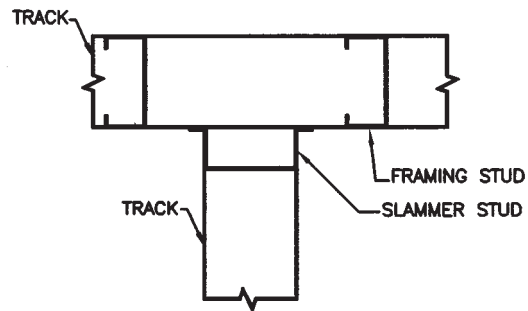


Figure 7.6
Typical Slammer Stud Detail

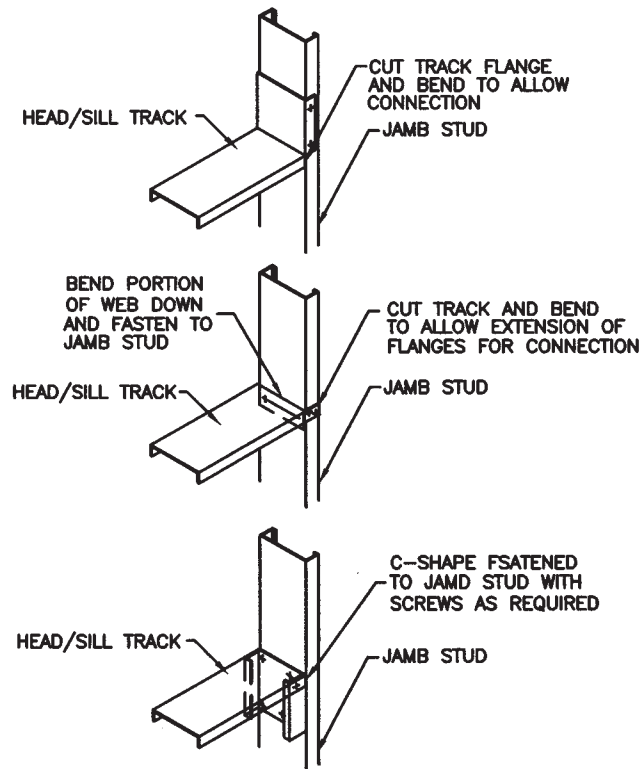


Figure 7.7
Typical Head and Sill Track Detail

8

STEEL ROOF FRAMING

Roof Construction

Steel roof systems constructed in accordance with this section shall consist of both ceiling joists and rafters in accordance with Figures 8.1 through 8.7 or trusses in accordance with the “Roof Trusses” section. Steel roof framing materials shall comply with the provisions of Chapter 2. Connections shall comply with Tables 8.1 through 8.3 and with other requirements in this section.

Applicability Limits

The applicability limits of the “Scope” section in Chapter 1 and Tables 1.1 and 1.2 shall apply.

In-Line Framing

Ceiling joists shall be located directly in-line with load bearing studs below with a maximum tolerance of 3/4 inch (19 mm) between the centerlines of the stud and the ceiling joist.

Allowable Ceiling Joist Spans

The maximum clear span of cold-formed steel ceiling joists shall be determined in accordance with Figure 8.1 and Tables 8.4 through 8.11. Ceiling joists shall have a minimum bearing length of 1 1/2 inch (38 mm) and shall be connected to rafters (heel joint) in accordance with Figure 8.2 and Table 8.2. When continuous joists are used across interior bearing supports, the interior bearing supports shall be located within 2 feet (610 mm) of mid-span of the ceiling joist, and the individual spans shall not exceed the applicable spans in Tables 8.4 through 8.11. Where required in Tables 8.4 through 8.11, bearing stiffeners shall be installed at each bearing and concentrated load location in accordance with the “Bearing Stiffeners” section in Chapter 2 and Figure 8.4. When the attic is to be used as an occupied space, the ceiling joists shall be designed in accordance with Chapter 5.

Ceiling Joist Bracing

Bottom Flange Bracing

The bottom flanges of steel ceiling joists shall be laterally braced by the application of gypsum board or continuous steel strapping installed perpendicular to the joist run. When used, gypsum board shall be fastened with minimum No. 6 screws in accordance with applicable building code requirements. When used, 1 1/2 inch x 33 mil (38 mm x 0.84 mm) steel strapping 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 at least one No. 8 screw and shall be fastened to blocking with at least two No. 8 screws. Blocking or bridging (X-bracing) 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 or bridging shall also be located at the termination of all straps.

Top Flange Bracing

The top flanges of steel ceiling joists shall be laterally braced with a minimum 33 mil (0.84 mm) C-shaped member, 33 mil (0.84 mm) track section, or 1 1/2 inch x 33 mil (38 mm x 0.84 mm) continuous steel strapping as required in Tables 8.4 through 8.11. Lateral bracing shall be installed perpendicular to the ceiling joist run in accordance with Figure 8.1. C-shaped members (i.e., studs), tracks, or straps shall be fastened to the top flange at each joist with at least one No. 8 screw and shall be fastened to blocking with at least two No. 8 screws. Blocking or bridging (X-bracing) shall be installed between joists in-line with strap bracing at a maximum spacing of 12 feet (3.7 m) measured perpendicular to the joists, and at the termination of all straps. The third point bracing span values from Tables 8.4 through 8.11 shall be used for straps installed at closer spacing than third point bracing, or when sheathing is applied to the top of the ceiling joists.

Allowable Rafter Spans

The horizontal projection of the rafter span, as shown in Figure 8.1, shall not exceed the limits set forth in Table 8.12. Wind speeds shall be converted to equivalent ground snow load in accordance with Table 8.13. Rafter spans shall be selected based on the higher of the ground snow load or the equivalent snow load converted from the wind speed. When required, a rafter support brace shall be a minimum of 350S162-33 C-shape member with maximum length of 8 feet (2438 mm) and shall be connected to a ceiling joist and rafter with minimum 4 No. 10 screws at each end.

Rafter Framing

Rafters shall be connected to a parallel ceiling joist to form a continuous tie between exterior walls in accordance with Figures 8.1 and 8.2 and Table 8.2. Rafters shall be connected to a ridge member with a minimum 2 inch x 2 inch (51 mm x 51 mm) clip angle fastened with minimum No. 10 screws to the ridge member in accordance with Figure 8.3 and Table 8.3. The clip angle shall have a minimum steel thickness as the rafter member and shall extend the depth of the rafter member. The ridge member shall be fabricated from a C-shape member and a track section, which shall be of a minimum size and steel thickness as the adjacent rafters and shall be installed in accordance with Figure 8.3. The rafter member shall extend the full depth of the sloped rafter cut.

High Wind Ridge Tension Connections

In regions where the fastest-mile wind speed is 90 mph (145 km/hr) or greater, roof rafters shall be provided with a connection at the ridgeline to transfer tension loads as required in the “Ridge Tension Connections” section.

Roof Cantilevers

Roof cantilevers (overhangs) shall not exceed 24 inches (610 mm) in accordance with Figure 8.1.

Rafter Bottom Flange Bracing

The bottom flanges of steel rafters shall be continuously braced with a minimum 33 mil (0.84 mm) C-shaped member, 33 mil (0.84 mm) track section, or 1 1/2 inch x 33 mil (38 mm x 0.836 mm) steel strapping at a maximum spacing of 8 feet (2.4 m) as measured parallel to the rafters. Bracing shall be installed in accordance with Figure 8.1. The C-shape, track section, or straps shall be fastened to the bottom flange of each rafter with at least two No. 8 screws and shall be fastened to blocking with at least two No. 8 screws. Blocking or bridging (X-bracing) shall be installed between rafters in-line with the continuous bracing at a maximum spacing of 12 feet (3658 mm) measured perpendicular to the rafters and at the termination of all straps. The ends of continuous bracing shall be fastened to blocking with at least two No. 8 screws.

Splicing

Rafters and other structural members, except ceiling joists, shall not be spliced without an approved design. Splices in ceiling joists shall only be permitted at interior bearing points and shall be constructed in accordance with Figure 8.5. Spliced ceiling joists shall be connected with the same number and size of screws on each side of the splice as required for the ceiling joist to rafter connection (Table 8.2). Splicing of tracks shall conform to Figure 5.11.

Roof/Ceiling Openings

Headers

Roof ceiling framing above wall openings shall be supported on headers. The allowable spans for headers in bearing walls shall not exceed the values set forth in Chapter 6.

Framing of Openings

Openings in roof and ceiling framing shall be framed with headers and trimmers between ceiling joists or rafters. Header joist spans shall not exceed 4 feet (1219 mm). Header and trimmer joists shall be fabricated from joist and track members having a minimum size and thickness of the adjacent ceiling joists or rafters and shall be installed in accordance with Figures 8.6 and 8.7. Each header joist shall be connected to a trimmer joist 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 rafter.

High Wind Requirements

In areas where the basic wind speed is 90 mph (145 km/h) or greater, roof rafter to ridge connections and roof tie-downs shall be provided in accordance with the “Ridge Tension Connections” and the “Roof Tie-Down” sections.

Ridge Tension Connections

Roof rafters shall be provided with a connection at the ridgeline to adequately transfer tension loads. The ridge connection shall be capable of resisting the unit loads listed in Table 8.14 multiplied by the appropriate spacing multiplier. Alternatively, steel ridge strap shall be provided with minimum No. 8 screws on each end of the strap as required in Table 8.14. The number of screws shall be increased to account for the spacing multipliers shown in Table 8.14. The width and thickness of the steel ridge strap shall be as shown in Table 8.15, based upon the required number of screws on one side of the strap.

Roof Tie-Down

Roof rafters or trusses shall be attached to their supporting wall assemblies by connections capable of resisting the uplift loads listed in Table 6.48. Alternatively, a minimum 1 1/4 inch by 33 mil (32 mm x 0.84 mm) steel uplift strap connecting the 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 6.48.

Roof Trusses

Trusses shall be engineered and installed in accordance with applicable building code requirements and good practices. Roof bracing shall be installed in accordance with the truss design. All trusses shall be aligned with load carrying members (i.e., studs) in the wall unless designed otherwise. Refer to NASFA publication NT13-95, *Design Guide for Cold-Formed Steel Trusses*, [19] for additional guidance.

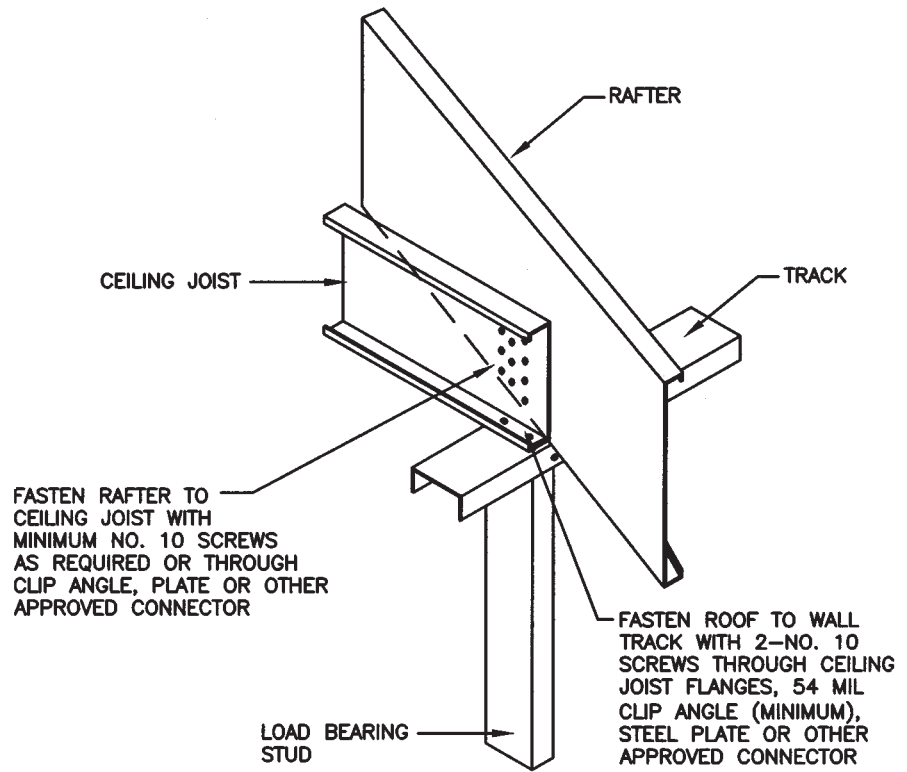


Figure 8.2
Heel Joint Connection

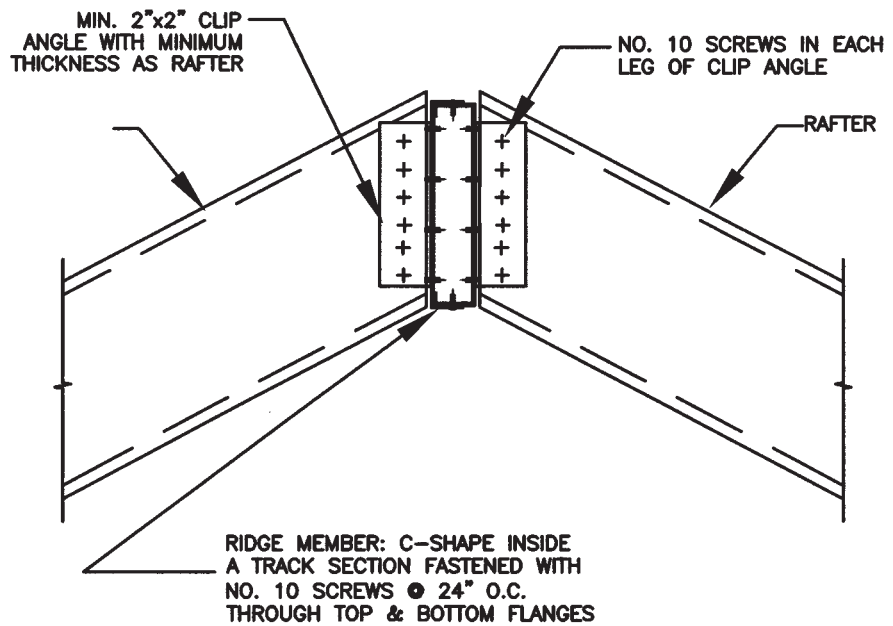


Figure 8.3
Ridge Member Connection

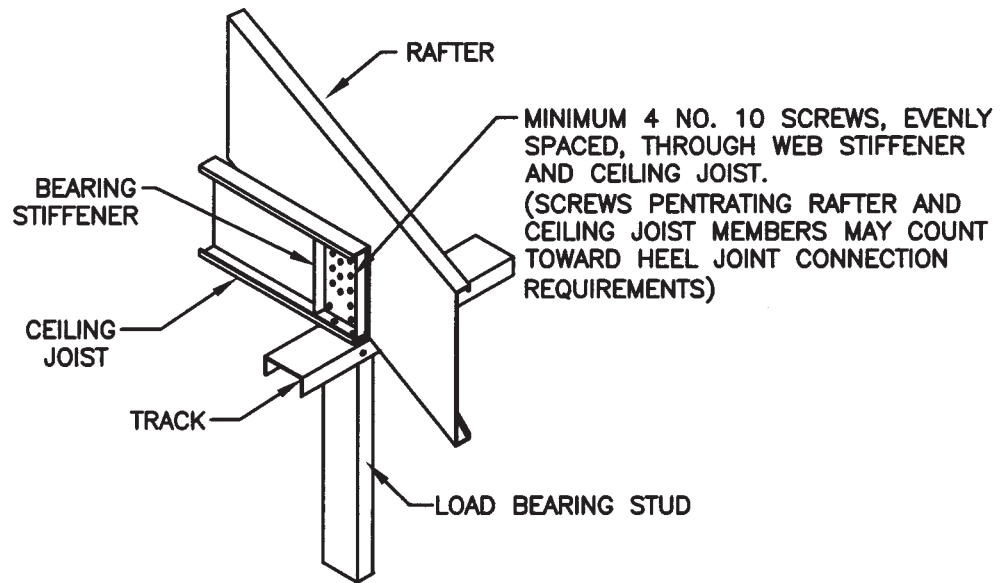


Figure 8.4
Bearing Stiffener

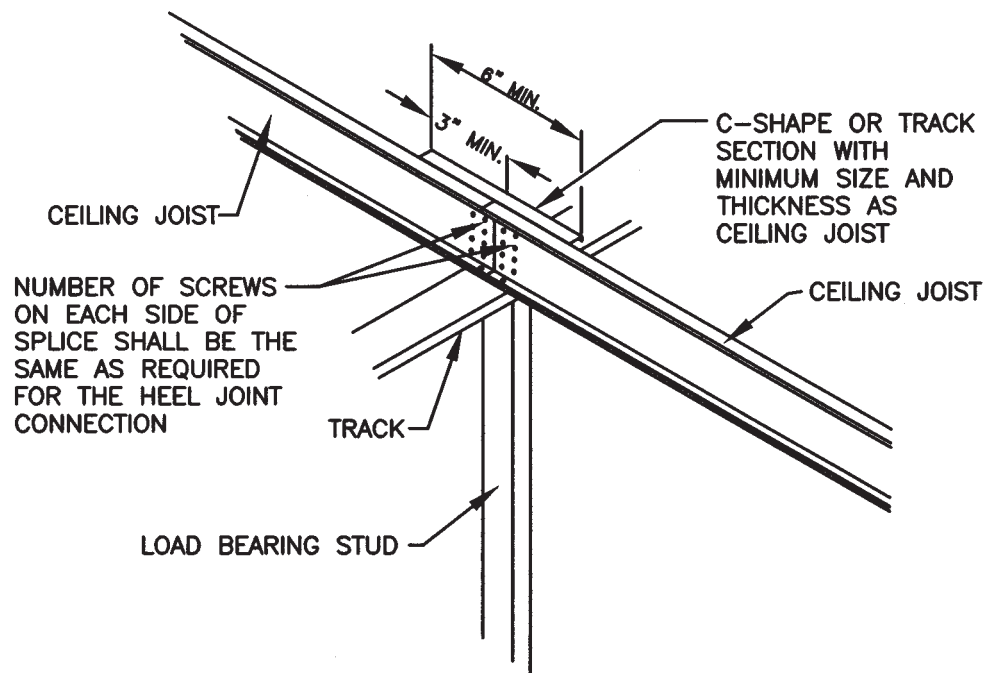


Figure 8.5
Spliced Ceiling Joists

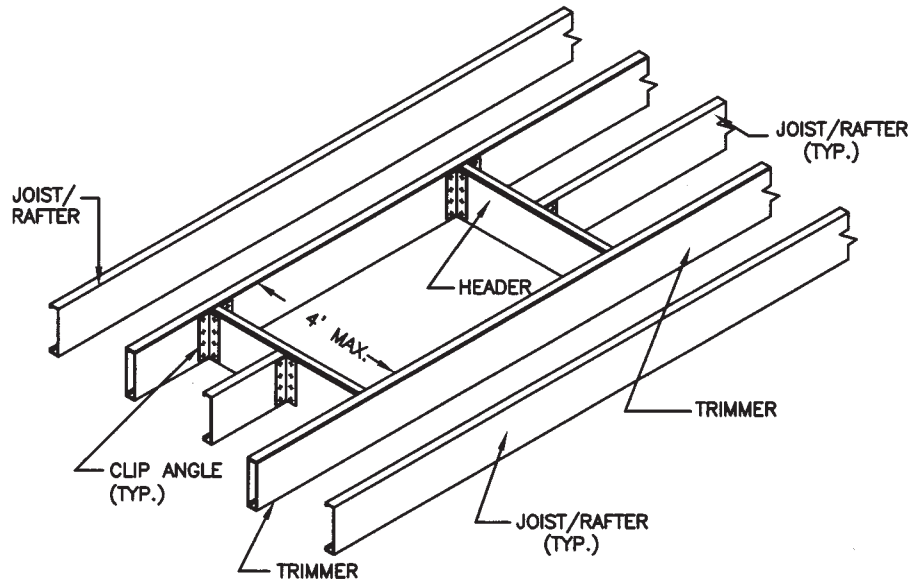


Figure 8.6
Roof or Ceiling Opening

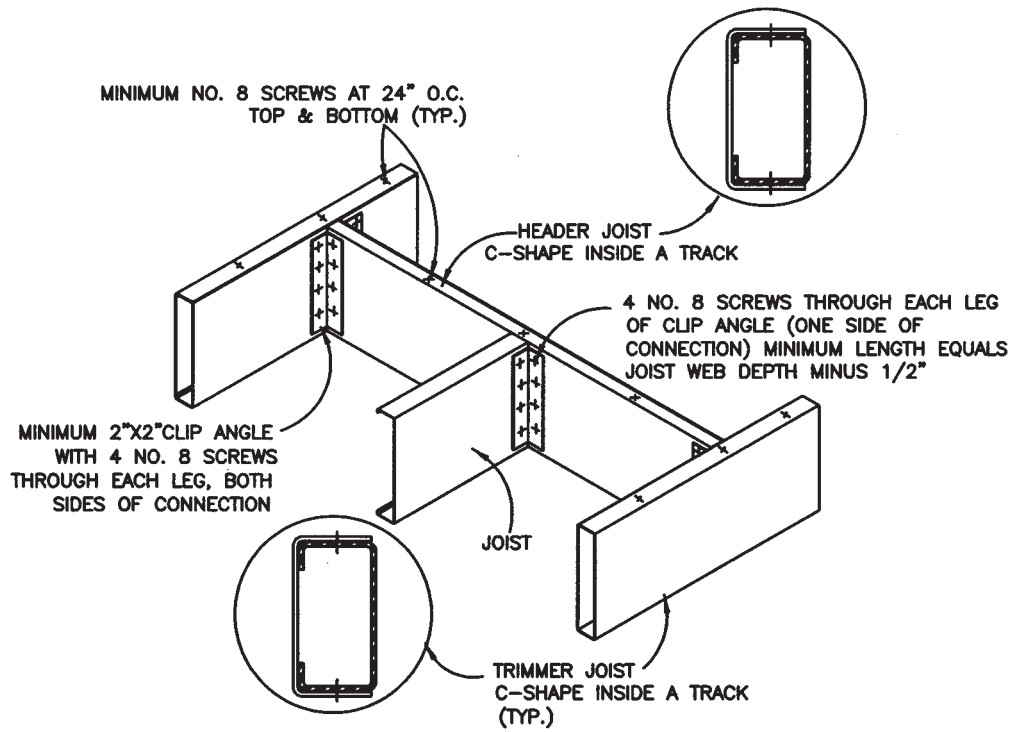


Figure 8.7
Header to Trimmer Detail

**Table 8.1
Roof Framing Fastening Schedule**

Description of Building Elements	Number and Size of Fasteners	Spacing of Fasteners
Ceiling joist to top track of load bearing wall ¹	2 No. 10 screws	Each joist
Roof sheathing (oriented strand board or plywood) to rafters ²	No. 8 screws	6" o.c. on edges and 12" o.c. at interior supports. 6" o.c. at gable end truss.
Truss to bearing wall ¹	2 No. 10 screws	Each truss
Gable end truss to endwall top track	No. 10 screws	12" oc
Rafter to ceiling joist or ridge member	Minimum No. 10 screws per Table 8.2	Evenly spaced. Less than 1/2" from all edges. See Tables 8.2 and 8.3.

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Screws shall be applied through the flanges of the truss or ceiling joist or a 54 mil clip angle shall be used with 2 No. 10 screws in each leg. See the "High Wind Connections" section in Chapter 6 and the "Roof Tie-Down" section for additional requirements to resist uplift forces.

²Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and at all roof plane perimeters. Blocking of roof sheathing panel edges perpendicular to the framing members shall not be required except at the intersection of adjacent roof planes. Framing members or cold-formed blocking of the same depth and thickness as the floor members shall support roof perimeter.

Table 8.2
Number of Screws Required for Ceiling Joist to Rafter
Connections¹

Roof Slope	Building Width (feet)															
	24'				28'				32'				36'			
	Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
	20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
3/12	5	6	9	12	6	7	10	13	7	8	12	15	8	9	13	17
4/12	4	5	7	9	5	6	8	10	6	6	9	12	6	7	10	13
5/12	4	4	6	7	4	5	7	9	5	5	8	10	5	6	9	11
6/12	3	4	5	7	4	4	6	8	4	5	7	9	4	5	7	10
7/12	3	3	5	6	3	4	5	7	4	4	6	8	4	5	7	9
8/12	3	3	4	5	3	3	5	6	3	4	5	7	4	4	6	8
9/12	2	3	4	5	3	3	4	6	3	4	5	6	3	4	6	7
10/12	2	3	4	5	3	3	4	5	3	3	5	6	3	4	5	7
11/12	2	3	4	4	3	3	4	5	3	3	5	6	3	4	5	6
12/12	2	3	3	4	2	3	4	5	3	3	4	6	3	4	5	6

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Screws shall be No. 10 minimum.

Table 8.3
Number of Screws Required at Each Leg of Clip Angle for
Rafter to Ridge Member Connection¹

Building Width (feet)	Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	2	3	4	4
28	2	3	4	5
32	3	3	4	5
36	3	4	5	6

For SI: 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Screws shall be No. 10 minimum.

Table 8.4
Allowable Spans for Cold-Formed Steel Ceiling Joists
Single Spans With Bearing Stiffeners
10 Lbs. Per Sq. Ft. Live Load (No Attic Storage)^{1,2,3}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	9' 2"	8' 3"	11' 9"	10' 1"	11' 9"	10' 4"
350S162-43	9' 11"	8' 10"	12' 10"	11' 2"	12' 10"	11' 2"
350S162-54	10' 8"	9' 6"	13' 9"	12' 0"	13' 9"	12' 0"
350S162-68	11' 7"	10' 4"	14' 8"	12' 10"	14' 8"	12' 10"
350S162-97	13' 7"	12' 0"	16' 2"	14' 1"	16' 2"	14' 1"
550S162-33	10' 5"	9' 5"	14' 5"	12' 8"	16' 4"	13' 10"
550S162-43	11' 2"	10' 1"	15' 7"	13' 10"	18' 0"	15' 5"
550S162-54	12' 0"	10' 9"	16' 7"	14' 9"	19' 5"	16' 8"
550S162-68	12' 11"	11' 7"	17' 8"	15' 10"	20' 11"	18' 1"
550S162-97	14' 11"	13' 2"	19' 10"	17' 8"	23' 2"	20' 3"
800S162-33	11' 8"	10' 6"	16' 5"	14' 9"	19' 5"	16' 7"
800S162-43	12' 6"	11' 3"	17' 6"	15' 10"	21' 2"	18' 7"
800S162-54	13' 4"	11' 11"	18' 7"	16' 9"	22' 7"	20' 0"
800S162-68	14' 3"	12' 9"	19' 8"	17' 8"	23' 11"	21' 4"
800S162-97	16' 2"	14' 5"	21' 10"	19' 6"	26' 3"	23' 6"
1000S162-43	13' 4"	12' 1"	18' 9"	16' 11"	22' 11"	20' 6"
1000S162-54	14' 2"	12' 9"	19' 10"	17' 10"	24' 2"	21' 9"
1000S162-68	15' 2"	13' 7"	21' 0"	18' 11"	25' 6"	23' 0"
1000S162-97	17' 1"	15' 2"	23' 2"	20' 9"	27' 11"	25' 1"
1200S162-43	14' 1"	12' 8"	19' 10"	17' 11"	24' 3"	21' 6"
1200S162-54	15' 0"	13' 5"	20' 11"	18' 11"	25' 7"	23' 1"
1200S162-68	15' 11"	14' 4"	22' 2"	19' 11"	27' 0"	24' 4"
1200S162-97	17' 10"	15' 11"	24' 4"	21' 10"	29' 4"	26' 5"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Bearing stiffeners shall be installed at all bearing and concentrated load locations.

²Deflection criteria: L/240 for total loads

³Ceiling dead load = 5 psf (0.24 kN/m²)

Table 8.5
Allowable Spans for Cold-Formed Steel Ceiling Joists
Two Equal Spans With Bearing Stiffeners
10 Lbs. Per Sq. Ft. Live Load (No Attic Storage)^{1,2,3,4,5}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	12' 4"	10' 11"	13' 5"	10' 11"	13' 5"	10' 11"
350S162-43	13' 6"	12' 1"	16' 4"	13' 4"	16' 4"	13' 4"
350S162-54	14' 9"	13' 1"	18' 4"	15' 0"	18' 4"	15' 0"
350S162-68	16' 4"	14' 5"	19' 8"	16' 9"	19' 8"	16' 9"
350S162-97	19' 6"	17' 2"	21' 8"	18' 11"	21' 8"	18' 11"
550S162-33	14' 0"	12' 7"	18' 2"	14' 10"	18' 2"	14' 10"
550S162-43	15' 2"	13' 7"	20' 11"	18' 1"	22' 1"	18' 1"
550S162-54	16' 5"	14' 8"	22' 5"	19' 5"	24' 11"	20' 4"
550S162-68	17' 11"	15' 11"	24' 1"	21' 5"	28' 0"	22' 10"
550S162-97	21' 2"	18' 8"	27' 7"	24' 5"	31' 1"	27' 2"
800S162-33	15' 7"	14' 1"	21' 3"	15' 10"	21' 3"	15' 10"
800S162-43	16' 10"	15' 1"	23' 6"	21' 2"	27' 6"	22' 5"
800S162-54	18' 1"	16' 2"	24' 11"	22' 5"	30' 2"	26' 6"
800S162-68	19' 7"	17' 6"	26' 8"	23' 11"	32' 2"	28' 7"
800S162-97	22' 10"	20' 2"	30' 2"	26' 10"	35' 10"	31' 11"
1000S162-43	17' 11"	16' 2"	25' 1"	22' 7"	30' 6"	24' 9"
1000S162-54	19' 3"	17' 3"	26' 7"	23' 11"	32' 4"	29' 1"
1000S162-68	20' 9"	18' 6"	28' 5"	25' 6"	34' 4"	30' 10"
1000S162-97	23' 11"	21' 2"	31' 10"	28' 4"	38' 0"	34' 0"
1200S162-43	18' 11"	17' 0"	26' 6"	23' 10"	32' 4"	24' 5"
1200S162-54	20' 2"	18' 1"	28' 1"	25' 3"	34' 2"	30' 9"
1200S162-68	21' 9"	19' 5"	29' 10"	26' 10"	36' 2"	32' 7"
1200S162-97	24' 10"	22' 1"	33' 4"	29' 9"	39' 10"	35' 8"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Bearing stiffeners shall be installed at all bearing and concentrated load locations.

³Deflection criteria: L/240 for total loads

⁴Ceiling dead load = 5 psf (0.24 kN/m²)

⁵Interior supports for multiple span joists shall consist of structural walls or beams. Interior supports shall be located within 2 feet (610 mm) of mid span provided that each of the resulting spans do not exceed the maximum applicable span shown in the table above.

Table 8.6
Allowable Spans for Cold-Formed Steel Ceiling Joists
Single Spans With Bearing Stiffeners
20 Lbs. Per Sq. Ft. Live Load (Limited Attic Storage)^{1,2,3}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	8' 0"	7' 0"	9' 8"	8' 1"	9' 11"	8' 3"
350S162-43	8' 8"	7' 8"	10' 9"	9' 1"	10' 10"	9' 5"
350S162-54	9' 3"	8' 3"	11' 7"	9' 11"	11' 7"	10' 1"
350S162-68	10' 0"	8' 11"	12' 5"	10' 10"	12' 5"	10' 10"
350S162-97	11' 7"	10' 3"	13' 7"	11' 11"	13' 7"	11' 11"
550S162-33	9' 2"	8' 3"	12' 2"	10' 5"	13' 3"	11' 0"
550S162-43	9' 10"	8' 10"	13' 4"	11' 6"	14' 9"	12' 5"
550S162-54	10' 5"	9' 5"	14' 4"	12' 6"	16' 1"	13' 7"
550S162-68	11' 3"	10' 0"	15' 4"	13' 5"	17' 5"	14' 10"
550S162-97	12' 9"	11' 4"	17' 1"	15' 1"	19' 7"	16' 9"
800S162-33	10' 3"	9' 3"	14' 4"	12' 5"	15' 11"	13' 4"
800S162-43	10' 11"	9' 10"	15' 5"	13' 8"	17' 11"	15' 5"
800S162-54	11' 8"	10' 6"	16' 3"	14' 7"	19' 3"	16' 8"
800S162-68	12' 5"	11' 2"	17' 3"	15' 6"	20' 7"	18' 0"
800S162-97	13' 11"	12' 5"	18' 7"	17' 0"	22' 9"	20' 1"
1000S162-43	11' 9"	10' 7"	16' 6"	14' 10"	19' 10"	17' 1"
1000S162-54	12' 5"	11' 2"	17' 5"	15' 8"	21' 1"	18' 7"
1000S162-68	13' 3"	11' 10"	18' 5"	16' 7"	22' 4"	19' 11"
1000S162-97	14' 9"	13' 2"	20' 2"	18' 1"	24' 4"	21' 10"
1200S162-43	12' 5"	11' 2"	17' 5"	15' 8"	20' 9"	18' 0"
1200S162-54	13' 1"	11' 9"	18' 5"	16' 7"	22' 5"	20' 1"
1200S162-68	13' 11"	12' 6"	19' 5"	17' 6"	23' 8"	21' 3"
1200S162-97	15' 5"	13' 10"	21' 2"	19' 0"	25' 8"	23' 1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Bearing stiffeners shall be installed at all bearing and concentrated load locations.

²Deflection criteria: L/240 for total loads

³Ceiling dead load = 5 psf (0.24 kN/m²)

Table 8.7
Allowable Spans for Cold-Formed Steel Ceiling Joists
Two Equal Spans With Bearing Stiffeners
20 Lbs. Per Sq. Ft. Live Load (Limited Attic Storage)^{1,2,3,4,5}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	10' 5"	8' 6"	10' 5"	8' 6"	10' 5"	8' 6"
350S162-43	11' 8"	10' 4"	12' 8"	10' 4"	12' 8"	10' 4"
350S162-54	12' 9"	11' 3"	14' 3"	11' 7"	14' 3"	11' 7"
350S162-68	14' 0"	12' 4"	15' 11"	13' 0"	15' 11"	13' 0"
350S162-97	16' 7"	14' 5"	18' 3"	15' 5"	18' 3"	15' 5"
550S162-33	12' 3"	11' 0"	14' 1"	11' 0"	14' 1"	11' 0"
550S162-43	13' 3"	11' 10"	17' 2"	14' 0"	17' 2"	14' 0"
550S162-54	14' 3"	12' 9"	19' 2"	15' 9"	19' 4"	15' 9"
550S162-68	15' 6"	13' 9"	20' 9"	17' 8"	21' 8"	17' 8"
550S162-97	18' 0"	15' 11"	23' 7"	20' 6"	25' 11"	21' 1"
800S162-33	13' 8"	10' 9"	14' 8"	10' 9"	14' 8"	10' 9"
800S162-43	14' 9"	13' 3"	20' 6"	17' 5"	21' 3"	17' 5"
800S162-54	15' 9"	14' 1"	21' 10"	19' 6"	25' 2"	20' 6"
800S162-68	17' 0"	15' 2"	23' 3"	20' 10"	27' 8"	23' 2"
800S162-97	19' 6"	17' 3"	26' 0"	23' 2"	30' 11"	27' 0"
1000S162-43	15' 9"	14' 2"	22' 0"	17' 3"	23' 0"	17' 3"
1000S162-54	16' 9"	15' 0"	23' 4"	21' 0"	27' 11"	22' 10"
1000S162-68	18' 0"	16' 1"	24' 9"	22' 3"	30' 0"	26' 7"
1000S162-97	20' 6"	18' 2"	27' 6"	24' 7"	33' 0"	29' 6"
1200S162-43	16' 7"	14' 11"	22' 7"	16' 7"	22' 7"	16' 7"
1200S162-54	17' 7"	15' 10"	24' 7"	22' 2"	30' 0"	24' 9"
1200S162-68	18' 10"	16' 11"	26' 1"	23' 5"	31' 8"	28' 5"
1200S162-97	21' 5"	19' 0"	28' 10"	25' 10"	34' 8"	34' 1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Bearing stiffeners shall be installed at all bearing and concentrated load locations.

³Deflection criteria: L/240 for total loads

⁴Ceiling dead load = 5 psf (0.24 kN/m²)

⁵Interior supports for multiple span joists shall consist of structural walls or beams. Interior supports shall be located within 2 feet (610 mm) of mid span provided that each of the resulting spans do not exceed the maximum applicable span shown in the table above.

Table 8.8
Allowable Spans for Cold-Formed Steel Ceiling Joists
Single Spans Without Bearing Stiffeners
10 Lbs. Per Sq. Ft. Live Load (No Attic Storage)^{1,2}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	9' 2"	8' 3"	11' 9"	10' 0"	11' 9"	10' 0"
350S162-43	9' 11"	8' 10"	12' 10"	11' 2"	12' 0"	11' 2"
350S162-54	10' 8"	9' 6"	13' 9"	12' 0"	13' 9"	12' 0"
350S162-68	11' 7"	10' 4"	14' 8"	12' 10"	14' 8"	12' 10"
350S162-97	13' 7"	12' 0"	16' 2"	14' 1"	16' 2"	14' 1"
550S162-33	10' 5"	9' 5"	14' 5"	10' 0"	15' 1"	10' 0"
550S162-43	11' 2"	10' 1"	15' 7"	13' 10"	18' 0"	15' 5"
550S162-54	12' 0"	10' 9"	16' 7"	14' 9"	19' 5"	16' 8"
550S162-68	12' 11"	11' 7"	17' 8"	15' 10"	20' 11"	18' 1"
550S162-97	14' 11"	13' 2"	19' 10"	17' 8"	23' 2"	20' 3"
800S162-33	-	-	-	-	-	-
800S162-43	12' 6"	11' 3"	17' 6"	15' 10"	21' 2"	17' 9"
800S162-54	13' 4"	11' 11"	18' 7"	16' 9"	22' 7"	20' 0"
800S162-68	14' 3"	12' 9"	19' 8"	17' 8"	23' 11"	21' 4"
800S162-97	16' 2"	14' 5"	21' 10"	19' 6"	26' 3"	23' 6"
1000S162-43	-	-	-	-	-	-
1000S162-54	14' 2"	12' 9"	19' 10"	17' 10"	24' 2"	21' 9"
1000S162-68	15' 2"	13' 7"	21' 0"	18' 11"	25' 6"	23' 0"
1000S162-97	17' 1"	15' 2"	23' 2"	20' 9"	27' 11"	25' 1"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	15' 11"	14' 4"	22' 2"	19' 11"	27' 0"	24' 4"
1200S162-97	17' 10"	15' 11"	24' 4"	21' 10"	29' 4"	26' 5"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Bearing stiffeners shall be installed at all bearing and concentrated load locations.

²Deflection criteria: L/240 for total loads

Table 8.9
Allowable Spans for Cold-Formed Steel Ceiling Joists
Two Equal Spans Without Bearing Stiffeners
10 Lbs. Per Sq. Ft. Live Load (No Attic Storage)^{1,2,3,4}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	11' 6"	8' 9"	11' 6"	8' 9"	11' 6"	8' 9"
350S162-43	13' 6"	11' 8"	15' 2"	11' 8"	15' 2"	11' 8"
350S162-54	14' 9"	13' 1"	18' 2"	14' 2"	18' 2"	14' 2"
350S162-68	16' 4"	14' 5"	19' 8"	16' 7"	19' 8"	16' 7"
350S162-97	19' 6"	17' 2"	21' 8"	18' 11"	21' 8"	18' 11"
550S162-33	13' 8"	10' 1"	13' 8"	10' 1"	13' 8"	10' 1"
550S162-43	15' 2"	13' 7"	18' 8"	14' 0"	18' 8"	14' 0"
550S162-54	16' 5"	14' 8"	22' 5"	17' 6"	22' 11"	17' 6"
550S162-68	17' 11"	15' 11"	24' 1"	21' 5"	27' 9"	21' 7"
550S162-97	21' 2"	18' 8"	27' 7"	24' 5"	31' 1"	27' 2"
800S162-33	-	-	-	-	-	-
800S162-43	16' 10"	15' 1"	20' 7"	15' 3"	20' 7"	15' 3"
800S162-54	18' 1"	16' 2"	24' 11"	20' 3"	26' 11"	20' 3"
800S162-68	19' 7"	17' 6"	26' 8"	23' 11"	32' 2"	25' 11"
800S162-97	22' 10"	20' 2"	30' 2"	26' 10"	35' 10"	31' 11"
1000S162-43	-	-	-	-	-	-
1000S162-54	19' 3"	17' 3"	26' 7"	20' 11"	28' 1"	20' 11"
1000S162-68	20' 9"	18' 6"	28' 5"	25' 6"	34' 4"	28' 5"
1000S162-97	23' 11"	21' 2"	31' 10"	28' 4"	38' 0"	34' 0"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	21' 9"	19' 5"	29' 10"	26' 10"	36' 2"	29' 0"
1200S162-97	24' 10"	22' 1"	33' 4"	29' 9"	39' 10"	35' 8"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Deflection criteria: L/240 for total loads

³Ceiling dead load = 5 psf (0.24 kN/m²)

⁴Interior supports for multiple span joists shall consist of structural walls or beams. Interior supports shall be located within 2 feet (610 mm) of mid span provided that each of the resulting spans do not exceed the maximum applicable span shown in the table above.

Table 8.10
Allowable Spans for Cold-Formed Steel Ceiling Joists
Single Spans Without Bearing Stiffeners
20 Lbs. Per Sq. Ft. Live Load (Limited Attic Storage)^{1,2}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	9' 2"	8' 3"	11' 9"	10' 0"	11' 9"	10' 0"
350S162-43	9' 11"	8' 10"	12' 10"	11' 2"	12' 0"	11' 2"
350S162-54	10' 8"	9' 6"	13' 9"	12' 0"	13' 9"	12' 0"
350S162-68	11' 7"	10' 4"	14' 8"	12' 10"	14' 8"	12' 10"
350S162-97	13' 7"	12' 0"	16' 2"	14' 1"	16' 2"	14' 1"
550S162-33	10' 5"	9' 5"	14' 5"	10' 0"	15' 1"	10' 0"
550S162-43	11' 2"	10' 1"	15' 7"	13' 10"	18' 0"	15' 5"
550S162-54	12' 0"	10' 9"	16' 7"	14' 9"	19' 5"	16' 8"
550S162-68	12' 11"	11' 7"	17' 8"	15' 10"	20' 11"	18' 1"
550S162-97	14' 11"	13' 2"	19' 10"	17' 8"	23' 2"	20' 3"
800S162-33	-	-	-	-	-	-
800S162-43	12' 6"	11' 3"	17' 6"	15' 10"	21' 2"	17' 9"
800S162-54	13' 4"	11' 11"	18' 7"	16' 9"	22' 7"	20' 0"
800S162-68	14' 3"	12' 9"	19' 8"	17' 8"	23' 11"	21' 4"
800S162-97	16' 2"	14' 5"	21' 10"	19' 6"	26' 3"	23' 6"
1000S162-43	-	-	-	-	-	-
1000S162-54	14' 2"	12' 9"	19' 10"	17' 10"	24' 2"	21' 9"
1000S162-68	15' 2"	13' 7"	21' 0"	18' 11"	25' 6"	23' 0"
1000S162-97	17' 1"	15' 2"	23' 2"	20' 9"	27' 11"	25' 1"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	15' 11"	14' 4"	22' 2"	19' 11"	27' 0"	24' 4"
1200S162-97	17' 10"	15' 11"	24' 4"	21' 10"	29' 4"	26' 5"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Bearing stiffeners shall be installed at all bearing and concentrated load locations.

²Deflection criteria: L/240 for total loads

Table 8.11
Allowable Spans for Cold-Formed Steel Ceiling Joists
Two Equal Spans Without Bearing Stiffeners
20 Lbs. Per Sq. Ft. Live Load (Limited Attic Storage)^{1,2,3,4}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	8' 1"	6' 0"	8' 1"	6' 0"	8' 1"	6' 0"
350S162-43	10' 10"	8' 3"	10' 10"	8' 3"	10' 10"	8' 3"
350S162-54	12' 9"	10' 2"	13' 3"	10' 2"	13' 3"	10' 2"
350S162-68	14' 0"	12' 4"	15' 9"	12' 5"	15' 9"	12' 5"
350S162-97	16' 7"	14' 5"	18' 3"	15' 2"	18' 3"	15' 2"
550S162-33	9' 3"	6' 9"	9' 3"	6' 9"	9' 3"	6' 9"
550S162-43	13' 0"	9' 8"	13' 0"	9' 8"	13' 0"	9' 8"
550S162-54	14' 3"	12' 4"	16' 4"	12' 4"	16' 4"	12' 4"
550S162-68	15' 6"	13' 9"	20' 3"	15' 7"	20' 3"	15' 7"
550S162-97	18' 0"	15' 11"	23' 7"	20' 6"	25' 10"	21' 0"
800S162-33	-	-	-	-	-	-
800S162-43	14' 0"	10' 2"	14' 0"	10' 2"	14' 0"	10' 2"
800S162-54	15' 9"	13' 10"	18' 9"	13' 10"	18' 9"	13' 10"
800S162-68	17' 0"	15' 2"	23' 3"	18' 3"	24' 2"	18' 3"
800S162-97	19' 6"	17' 3"	26' 0"	23' 2"	30' 11"	25' 11"
1000S162-43	-	-	-	-	-	-
1000S162-54	16' 9"	14' 1"	19' 4"	14' 1"	19' 4"	14' 1"
1000S162-68	18' 0"	16' 1"	24' 9"	19' 8"	26' 4"	19' 8"
1000S162-97	20' 6"	18' 2"	27' 6"	24' 7"	33' 0"	29' 0"
1200S162-43	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-
1200S162-68	18' 10"	16' 11"	26' 1"	19' 10"	26' 1"	19' 10"
1200S162-97	21' 5"	19' 0"	28' 10"	25' 10"	34' 8"	31' 1"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

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

²Deflection criteria: L/240 for total loads

³Ceiling dead load = 5 psf (0.24 kN/m²)

⁴Interior supports for multiple span joists shall consist of structural walls or beams. Interior supports shall be located within 2 feet (610 mm) of mid span provided that each of the resulting spans do not exceed the maximum applicable span shown in the table above.

Table 8.12
Allowable Horizontal Rafter Spans^{1,2,3}
33 ksi Steel

Member Designation	Ground Snow Load							
	20 psf		30 psf		50 psf		70 psf	
	Spacing (in.)		Spacing (in.)		Spacing (in.)		Spacing (in.)	
	16	24	16	24	16	24	16	24
550S162-33	12' 8"	10' 4"	11' 9"	9' 7"	9' 11"	8' 1"	8' 10"	7' 2"
550S162-43	15' 5"	12' 7"	14' 3"	11' 8"	12' 1"	9' 10"	10' 8"	8' 9"
550S162-54	13' 0"	14' 2"	16' 1"	13' 1"	13' 8"	11' 2"	12' 1"	9' 10"
550S162-68	18' 1"	15' 10"	17' 3"	14' 9"	15' 4"	12' 6"	13' 6"	11' 1"
550S162-97	20' 1"	17' 6"	19' 1"	16' 8"	17' 1"	14'	15' 7"	13' 2"
800S162-33	15' 5"	11' 5"	14' 4"	9' 10"	10' 7"	7' 1"	8' 3"	5' 6"
800S162-43	19' 1"	15' 7'	17' 9"	14' 6"	15' 1"	12' 3"	13' 3"	10' 9"
800S162-54	22' 7"	18' 5"	21' 0"	17' 1"	17' 9"	14' 6"	15' 9"	12-10"
800S162-68	24' 7"	20' 9"	23' 4"	19' 3"	20' 0"	16' 4"	17' 8"	14' 5"
800S162-97	27' 3"	23' 9"	26' 0"	22' 8"	23' 3"	19' 7"	21' 3"	17' 4"
1000S162-43	21' 2"	17' 3"	19' 8"	16' 0"	16' 8"	13' 1"	14' 9"	10' 3"
1000S162-54	25' 1"	20' 6"	23' 3"	19' 0"	19' 9"	16' 1"	17' 5"	14' 3"
1000S162-68	29' 6"	24' 6"	27' 9"	22' 9"	23' 8"	19' 3"	21' 0"	17' 1"
1000S162-97	32' 0"	28' 8"	31' 3"	27' 3"	28' 0"	23' 2"	25' 1"	20' 6"
1200S162-43	23' 0"	18' 2"	21' 4"	15' 7"	16' 9"	11' 3"	13' 2"	8' 9"
1200S162-54	27' 3"	22' 3"	25' 3"	20' 7"	21' 5"	17' 6"	18' 11"	15' 5"
1200S162-68	32' 1"	26' 2"	29' 9"	24' 3"	25' 3"	20' 7"	22' 4"	18' 2"
1200S162-97	38' 4"	33' 6"	36' 6"	31' 6"	32' 8"	26' 9"	29' 0"	23' 7"

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 psf = 0.0479 kN/m².

¹Table provides maximum horizontal rafter spans in feet and inches for slopes between 3:12 and 12:12.

²Deflection criteria: L/240 for live loads and L/180 for total loads

³Roof dead load = 12 psf (0.575 kN/m²)

Table 8.13
Wind Speed to Equivalent Snow Load Conversion^{1,2}

Basic Wind Speed And Exposure		Equivalent Ground Snow Load (psf)									
		Roof Slope									
Exp. B	Exp. C	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
70 mph		20	20	20	20	20	20	30	30	30	30
80 mph	70 mph	20	20	20	20	30	30	30	30	50	50
90 mph	80 mph	20	20	20	20	30	50	50	50	50	50
100 mph	90 mph	30	30	30	50	50	50	70	70	70	-
110 mph	100 mph	30	50	50	50	70	70	70	-	-	-
	110 mph	50	50	50	70	70	-	-	-	-	-

For SI: 1 mph = 1.61 km/hr, 1 psf = 0.0479 kN/m².

¹Exposure C category shall be used if site wind exposure is unknown.

²In areas where the basic wind speed equals or exceeds 90 mph (145 km/h), the equivalent snow load shall be used only to determine the size of members. Connections of rafters to the ridge and the roof members to walls shall comply with the "Ridge Tension Connections" and the "Roof Tie-Down" sections.

Table 8.14
Ridge Tension Strap Connection Requirements Per Foot of
Ridge Span³

Roof Pitch	Roof Span (ft.)	Basic Wind Speed (mph)			Basic Wind Speed (mph)		
		90	100	110	90	100	110
		Number of No. 8 Screws in Each End of a Steel Ridge Strap (See Table 8.15.)			Required Ridge Connection Capacity ^{1,2} (plf)		
3:12	24	2	2	3	475	624	788
	28	2	3	3	554	727	919
	32	2	3	3	633	831	1051
	36	3	3	4	712	935	1182
4:12	24	2	2	3	378	495	765
	28	2	2	3	441	577	727
	32	2	2	3	504	659	831
	36	2	4	3	567	742	935
5:12	24	1	2	2	289	380	480
	28	1	2	2	338	443	560
	32	2	2	2	386	507	640
	36	2	2	3	434	570	720
6:12	24	1	1	2	262	342	431
	28	1	2	2	306	399	503
	32	2	2	2	350	457	575
	36	2	2	2	393	514	647
7:12 - 12:12	24	1	2	2	246	320	401
	28	1	2	2	287	373	468
	32	1	2	2	328	426	535
	36	2	3	2	369	480	602
Framing Spacing		12 in		16 in	19.2 in		24 in
Multiplier		1.0		1.33	1.6		2.0

For SI: 1 inch = 25.4 mm, 1 foot = 0.3048 m, 1 lb. = 4.4 N, 1 mph = 1.609 km/hr.

¹Connection requirements are based on a roof assembly dead load of 10 psf.

²Connection capacities shown in the table are based on a 12 inch (305 mm) ridge strap spacing. For spacing greater than 12 inches (305 mm), capacity values shall be increased using the multipliers in the table above.

³The required number of screws shown in the table are based on a 12 inch (305 mm) strap spacing. For spacing other than 12 inches (305 mm), the appropriate connection capacity in the table shall be increased using the multipliers above and dividing by the screw shear value of 263 lb. (e.g., 263 x 1.33 = 350 lb/screw for 16" spacing).

Table 8.15
Minimum Size of Ridge Strap

Strap Width (in.)	Minimum Thickness of Ridge Strap (in.)					
	Required Number of Ridge Strap Screws ¹					
	4 or less	5	6	7	8	9
1.25	0.043	0.054	0.054	--	--	--
1.5	0.043	0.043	0.054	0.054	--	--
1.75	0.043	0.043	0.043	0.054	0.054	--
2	0.043	0.043	0.043	0.043	0.054	0.054

For SI: 1 inch = 25.4 mm.

¹Required number of screws per Table 8.14 on each end of the ridge strap.

9

MECHANICAL, UTILITIES, INSULATION, FIRE AND ACOUSTICS

Plumbing

Plumbing shall comply with the applicable plumbing code. Copper pipes shall be separated from the steel framing by non-conductive grommets or other approved methods. A list of the appropriate types of plastic insulators and grommets for web holes, which are pre-punched, is generally available from the steel supplier.

Construction Guidelines

Hangers for Plumbing Pipes Hangers for plumbing pipes in steel framing should be secured with a 3/4 inch (19.1 mm), No. 6, sharp-point screw in 18 and 27 mil (0.46 and 0.69 mm) studs and a No. 8 self-drilling screw in thicker studs.

Protection of Plumbing Pipes Plastic pipes need not be protected from corrosion when in contact with steel studs. However, corrosion is a possibility where copper comes in direct contact with the steel. Copper shall be separated from the steel framing by either of the following methods. (Refer to Figure 9.1.)

- Plastic insulators, foam insulators, or grommets should be used where copper passes through a steel stud.
- Copper piping shall be wrapped with pipe insulation when the copper piping run(s) are immediately parallel to the steel framing member. The insulation is intended to separate the copper piping from the steel member.

Drain Lines Some manufacturers provide joists with large web holes to accommodate the installation of drain lines and other mechanical installations as shown in Figure 9.2.

Attachment of Plumbing Fixtures Plumbing fixtures can be attached with No. 8, low-profile screws with a sharp point for 18 and 27 mil (0.46 and 0.69 mm) studs and self-drilling point screws for 33 mil (0.84 mm) and thicker studs.

Electrical Systems

Electrical system installation shall comply with the latest edition of the National Electric Code. Snap-in plastic insulators, grommets, conduit, or other approved wire protection methods shall be used to protect the plastic sheathing on electrical cables when passing through holes in steel framing members (i.e., punchouts in studs and joists) as shown in Figure 9.1.

Construction Guidelines

Electrical Boxes and Service Panels Electrical boxes with mounting brackets that attach to the side of the studs rather than to the front should be used to prevent bulges in the gypsum board. Electrical boxes can be attached with 3/4 inch (19 mm), No. 6 sharp-point screws for 18 and 27 mil (0.46 and 0.69 mm) studs and No. 8 self-drilling screws for thicker studs. Service panels are typically mounted as shown in Figure 9.3.

Securing Wiring Two holes in the web (one as small as 1/4 inch [6.3 mm]) and a zip tie are typically used to secure multiple wires such as at a receptacle installation. Duct tape should not be used without consulting the electrical inspector. Where multiple wires exit a box, such as in a double or triple gang box, standoff clips are typically used for securing the wiring. These clips can be installed with a single 3/4 inch (19 mm), No. 6 sharp-point screw for 18 and 27 mil (0.46 and 0.69 mm) studs and No. 8 self-drilling screws for thicker studs.

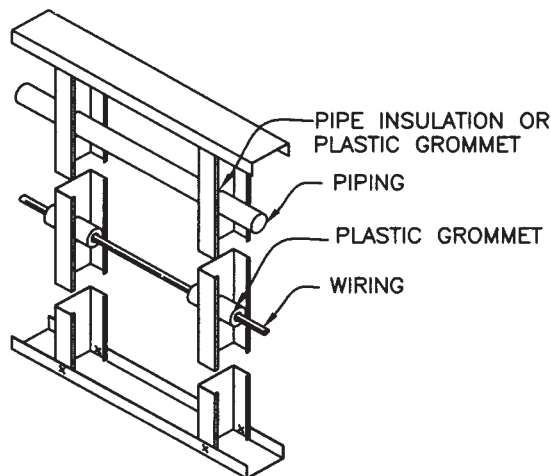


Figure 9.1
Wiring and Piping Installation

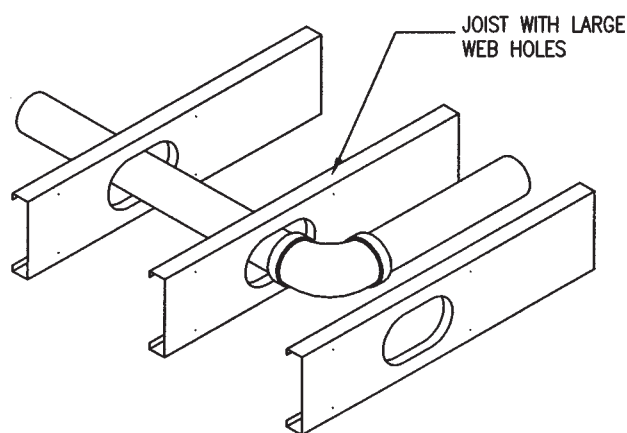


Figure 9.2
Drain Line Installation

HVAC Systems and Duct Work

HVAC installation shall comply with the applicable mechanical code and energy code. Figure 9.4 shows a round duct installed through a joist with large web opening.

Construction Guidelines

Hangers for Ducts Hangers for ducts are typically attached to steel framing with minimum 3/4 inch (19 mm), No. 8 self-drilling screws.

Bulkhead Framing Ducts are normally run in attic space, interior walls, or drop down ceilings; however, bulkheads will occasionally be needed. Where desired, this framing is typically non-load bearing and can be framed using 33 mil (0.84 mm) or thinner C-shaped studs and tracks. Sections are assembled the same as walls with No. 8 self-drilling, low profile screws.

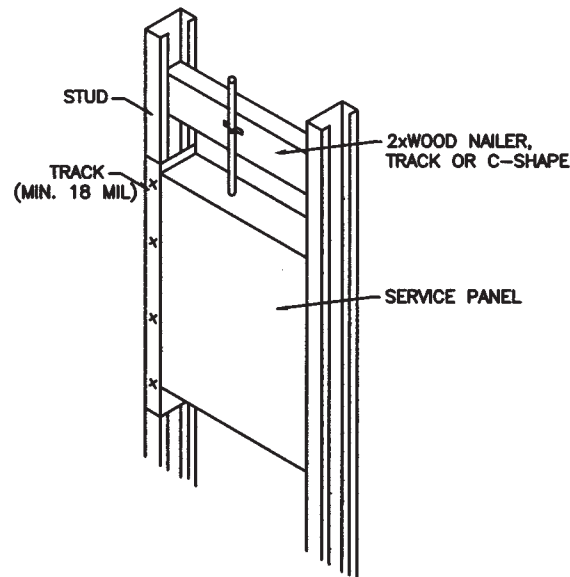


Figure 9.3
Service Panel Mounting Detail

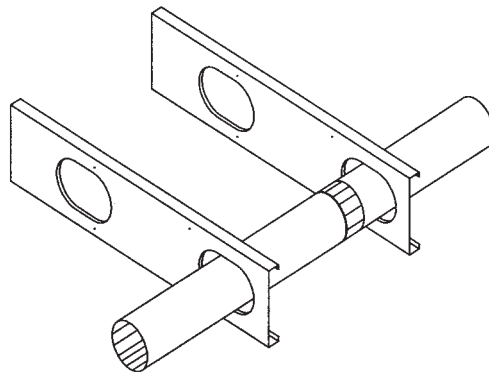


Figure 9.4
Round Duct Through Joist Web

Other Trades Construction Guidelines

Cabinets and Vanities Special consideration has to be made to provide for the installation of cabinetry. Use one of the methods listed below. (See Figure 9.5.)

- Wood blocking may be used between the studs. The blocking should be notched on one end at the lip of the stud.
- A 33 mil (0.84 mm) minimum thickness track may be used between the studs. The flanges at each stud should be notched. The track should be fastened with two screws.

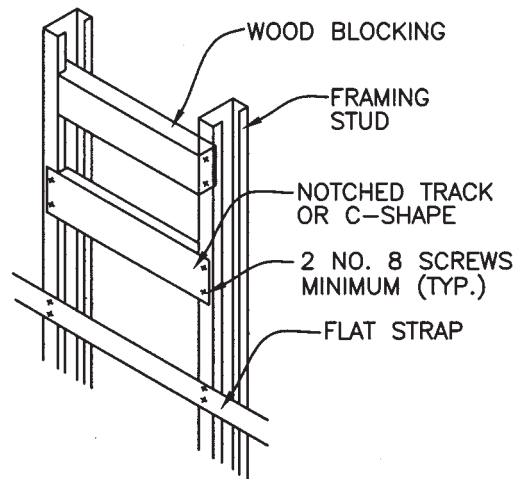


Figure 9.5
Cabinet Blocking Detail

Closest Shelving Bugle-head fasteners are commonly used to attach wood supports for closet shelving. Sharp-point screws are used for 18 and 27 mil (0.46 and 0.69 mm) thick studs and wing tip screws for 33 mil (0.84 mm) and thicker studs. Hex-head or low profile screws can be used for the attachment of shelving brackets.

Gypsum Board Installation No. 6, 1 1/4 inch (31.8 mm) bugle-head screws with sharp-point tips are typically used to hang gypsum board on 18 to 33 mil (0.46 to 0.84 mm) thick steel studs. Self-drilling No. 6, 1 1/4 inch (31.8 mm) bugle-head screws are used to hang gypsum board on thicker studs. Construction adhesive may also be used. Refer to ASTM C955 [13] and ASTM C1002 [20].

Baseboard and Other Interior Trim Attachments Several methods are used to secure trim to steel studs. The following is a list of current methods of attaching interior trim, cabinets and vanities, closet shelving, and gypsum board installation.

- Construction adhesive.
- Finishing nails driven at criss-cross angles into the track in pairs hold the trim firmly in place while the adhesive dries. (See Figure 9.6.)
- Self-drilling finishing screws.
- A wood-nailer may be installed during framing or 2 x 4 blocks may be placed in the track after the wall is framed. This will allow the trim to be attached with finishing nails.

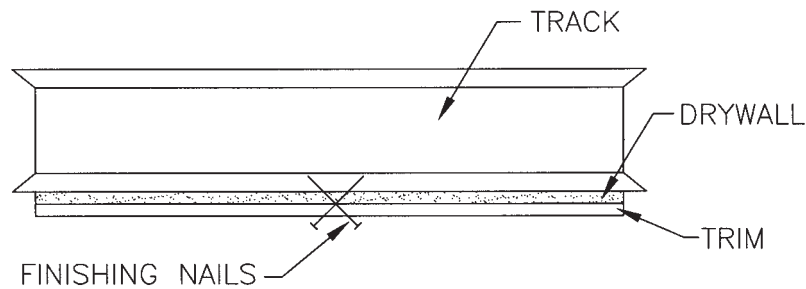


Figure 9.6
Plan View of Trim Attached With Finishing Nails

Insulation

Insulation of steel frame exterior walls, floors, and roofs shall comply with the applicable energy code. All types of insulation are compatible with steel framing (e.g., batt insulation, spray-applied foam, foam-plastic board, etc.) In many climates, a layer of exterior foam sheathing is required to meet energy code. Suggested insulation R-values for walls in various areas of the country can be found in NASFA publication NT14-95 *Thermal Design Guide for Exterior Walls* [21].

Batt Insulation A “full-width” batt shall be used for batt installation in the cavity of the framing member in order to span from framing member web to framing member web. While batt insulation may friction fit between studs, duct tape could be used to hold the insulation in place until the gypsum board is installed.

Liquid Foam Insulation The installation of liquid foam type insulation typically requires some lateral support for the framing members due to the forces of the wet foam product expanding during its curing process. Therefore, it is recommended that the manufacturer be contacted for the installation preparation and installation instructions.

Exterior Rigid Foam Insulation In many climates, the use of board type rigid foam insulation may be required on the exterior flanges of the studs to provide a thermal break between the steel framing and the exterior temperatures. Suggested solutions may be found in the *Thermal Design Guide For Exterior Walls* [21]. For a complete energy analysis, a design professional who is familiar with thermal analysis of steel framing may be consulted. Table 9.1 provides a partial list of foam sheathing R-values at 75° F mean temperature. Table 9.1 is provided here for reference only. Manufacturers’ data, publications, and technical catalogs should always be consulted.

Exterior rigid foam insulation is typically installed on steel-framed walls using any of the following:

- Self-drilling screws with washers to prevent the screws from pulling through.
- Construction adhesive applied to the studs to hold the foam in place before the siding material is applied.
- Double-sided tape applied to the studs to hold the foam until the siding is applied.

Where plywood or oriented-strand-board (OSB) sheathing is used, roofing nails, screws, or adhesive may be used to attach the foam.

Table 9.1
Foam Sheathing R-Values at 75° F Mean Temperature

Product	Nominal Board Thickness (inches)				
	1/2"	3/4"	1"	1 1/2"	2"
Celotex Tuff-R	4.0	5.6	8.0	12.0	16.0
Celotex Thermax	3.6	5.4	7.2	10.8	14.4
Dow Styrofoam	3.0	4.0	5.0	-	-

For SI: 1 inch = 25.4 mm, 1° F = 1.8(°C) + 32.

Fire and Acoustics

Fire Safety Building codes generally require buildings to be designed such that in case of a fire, occupants have sufficient time to leave the building safely. Protection is usually provided by surfaces with low flame-spread rates and barriers that contain the fire within a small space for a minimum specified time. Fire rating of a steel wall or floor assembly is a measurement that indicates how long the assembly will resist the spread of fire while maintaining structural integrity. Fire resistance ratings are expressed by the number of hours that an assembly can maintain its integrity while containing the fire, smoke, and temperature of a working fire.

Fire ratings of floor or wall assemblies are given in terms of the time to reach one of the following limiting states:

- elements collapse (stability),
- cracks develop, allowing flames to pass through (integrity), or
- temperature rise of 250° F on the non-fire-exposed surface (insulative capacity).

Although no fire-rating requirements are provided in the building codes for single family detached homes (other than attached garages), building codes provide fire endurance requirements for wall and floor constructions in multi-family dwellings. The Gypsum Association's *Fire Resistance Design Manual* [22] and the UL's *Fire Resistance Directory* [23] are the most commonly used documents for fire-rated steel framed assemblies. The Light Gauge Steel Engineer's Association Technical Note No. 420, *Fire Rated Assemblies of Cold-Formed Steel Construction*, [24] provides a comprehensive list of resources for fire rated steel assemblies.

Fire Blocking Fire blocking prevents the movement of flame through concealed spaces to other parts of the building that may cause rapid involvement of the building in fire. Fire stops may be required for some steel floor systems in multi-family housing. Mechanical chase fire stops are usually required in stud spaces at floor and ceiling levels to prevent the spread of fire in the vertical direction in concealed spaces. Fire stopping is also required at stairwell and chimney locations.

Where a stud cavity consists of wallboard attached to steel studs, building code requirements for fire stopping generally do not apply since the cavity is constructed of noncombustible materials and no fire blocking would be required between that wall cavity and floor spaces or attic spaces regardless of their combustible content. Gypsum wallboard meets the definition of non-combustible material as defined in the model building codes. However, if the wall cavity contains combustible sheathing such as OSB or plywood, the building code provisions for fire stopping should be applied; in that case, the typical fire blocking would probably be mineral or glass fiber batts or blankets.

Draft Stopping Draft stopping prevents the movement of gases through concealed spaces to other parts of the building that may cause rapid involvement of the building in fire. Draft stoppings are typically required where there are combustible materials exposed in the attic spaces. For example, where plywood were affixed to steel roof framing members, draft stops would be required and building code requirements for draft stops should be followed. However, if the attic space were constructed entirely of noncombustible materials, there would be no need for draft stopping.

Recommended Construction Methods for Controlling Sound Fiberglass or cellulose insulation installed in floor assemblies can significantly reduce the sound transmission (i.e., increase the sound transmission class [STC] rating). STC ratings are used to measure the effectiveness of a given floor system construction in reducing airborne sound transmission. The higher the STC rating, the better the construction is (i.e., noise transmission is better controlled). An STC rating of 42-50 is considered acceptable in designing CFS floors. Good construction practices can also result in significant reduction in sound transmission through CFS floors. Some of the good construction practices are listed below.

- Surface mount any ceiling fixture on resiliently mounted gypsum ceilings.
- Do not use recessed type fixtures without enclosing (boxing) the fixture.
- Design pipe runs with swing arms to eliminate noise from binding due to expansion and contraction.
- Eliminate water hammer in plumbing lines (due to abrupt stopping of flowing water) by providing air chambers.
- Use resilient pads to isolate piping from floor framing and seal for air tightness.
- Adequately size water piping and valves to minimize whistling.
- Use quiet, high quality appliances (i.e., air conditioners and furnaces).
- Select quiet external ballast on fluorescent fixtures.
- Reduce the speed of flowing water by using over-sized pipes and reduced pressure.
- Minimize disturbance from the noise of flowing water in pipes by developing a well-planned layout of plumbing.
- Use duct liners to quiet fan noise and the sounds of air rushing through the ducts.

Vibration Control Spans given in this document provide reasonable performance based on past experience with residential floor design. However, there may be cases where reduced vibration may be desirable. Although many subjective criteria are available to design floor joists for certain vibration characteristics, no such requirements exist in the building codes for steel floor framing. The most common vibration control approaches are the following:

- Tighter deflection limit.
- Vibration criteria check (such as the criteria contained in [7]).
- Limit the mid-span deflection due to live load (40 psf) and dead loads (10 psf) to a maximum of 1/2 inch (12 mm).

10 CONSTRUCTION GUIDELINES

The construction guidelines are provided to supplement the requirements of the *Prescriptive Method* and are considered good construction practices. These guidelines should not be considered comprehensive. Manufacturers' catalogs, recommendations, and other technical literature should also be consulted. Additional construction guidelines are provided below.

General

- Always follow applicable Occupational Safety and Health Administration (OSHA) guidelines and safety requirements.
- Work gloves (especially thin gloves) are highly recommended to protect hands from cuts and injuries when working with steel.
- Ear protection is recommended when cutting steel with an abrasive or metal blade. Compressible foam earplugs are the best for long-term wear, although plastic plugs are easier to pop in and out.
- Safety goggles are recommended when cutting steel with a chop saw or when fastening members overhead.
- Cutting and welding galvanized steel can produce harmful fumes that can be hazardous to health and cause irritation to the respiratory system. All cutting and welding shall be done in a well-ventilated area.
- Use caution when working with steel in the rain. Steel members are slippery and may cause injuries if not properly handled.
- Steel may be oily from the roll forming process, resulting in members that are slippery and difficult to walk on. Keep this in mind before you try to use a steel joist as a plank on scaffolding or a ramp to your truck. Steel can buckle unexpectedly when loaded in a flatwise position.
- Caution should be exercised when handling steel members around electrical wires and equipment. Steel members can easily damage electrical cords.
- To prevent electrocution hazard, always isolate steel from any source of electricity, because steel is an excellent conductor of electricity.
- Steel joists will not support workers or other loads until properly installed and braced. To minimize injury, each steel joist should be properly fastened as it is erected.
- Improper storage or installation, failure to follow applicable building codes, failure to follow proper load tables, failure to use acceptable hole sizes and locations, or failure to use bearing stiffeners when required can result in serious accidents.
- Installation tolerances are very critical in achieving an acceptable floor or roofline in establishing effective bracing. String lines, plumb bobs, levels, or transits shall be used in order to achieve acceptable installation tolerances.
- Each stud, joist, and track member shall bear the manufacturer's identification (such as name, logo, or initials), base metal thickness (uncoated), minimum coating designation, and minimum specified yield strength.

- All structural members shall be aligned vertically (in-line framing) to transfer all loads to the foundation.
- Track members shall not be used individually for any load carrying applications without an approved design.
- Studs, joists, tracks, and other steel members shall be in good condition. Bent, warped, split, or otherwise damaged members shall be replaced.
- Bearing surfaces for joists, rafters, and trusses shall be uniform and level.
- Adequate temporary construction bracing of wall, floor, and roof framing shall be provided until permanent bracing has been installed.

Storage and Handling

- Steel bundles shall be stored level.
- Steel members shall be protected from weather.
- Do not open bundles until time of installation. Use care when handling bundles and individual components to prevent injury to handlers or damage by forklift or crane.
- Twisting of steel members, or applying loads to the members when flat, can damage them.
- Damaged steel members shall not be used.
- Care should be exercised when handling flat steel joist members. Beginning with the unloading process, and throughout all phases of construction, care must be taken to avoid lateral and torsional bending (twisting) of members, which can cause damage to the steel joist members.

Cutting and Fastening

- Cutting methods that cause significant heating of the steel or damage to the coatings should be avoided.
- Welding, in lieu of fastening, is permitted provided that weld capacity is shown to exceed the specified screw capacity (shown in Table 10.1). All shop and field welds shall be brushed clean and provided with a corrosion protective metallic coating.
- Screws should typically be driven through the thinner material into the thicker material and extend through the steel member a minimum of three exposed threads.
- When connecting steel to steel members, drilling tools should drive screws at low speeds of 2,500 RPM.
- Pre-drilled holes for preset bolts shall not be oversized more than 1/16 inch (1.6 mm) for bolt sizes up to 1/2 inch (12.7 mm) and no more than 1/8 inch for bolt sizes larger than 1/2 inch (12.7 mm) in diameter unless designed as such. A washer should be used between the nut and member in all bolted connections.

Floor Joist Installation

- Follow in-line-framing layout when required.
- Use of string line, plumb bob, level, or transit is encouraged to ensure that the foundation is relatively “true” before beginning installation because tolerances are very critical in achieving an acceptable floor.
- Track members shall not be used individually for any load carrying applications without an approved design.
- Bearing surfaces for joists shall be uniform and level.

- Adequate temporary joist bracing shall be provided until permanent bracing has been installed. Temporary construction bracing may also remain in place after permanent bracing is installed.
- All anchors, hangers, tie-downs, bearing ledgers, etc., that are part of the supporting structure shall be properly placed and attached. No steel joist shall ever be installed on anchors or ties that have temporary connections to the supporting structure.
- Web stiffeners shall be installed at all concentrated load locations and are often required at bearing points (i.e., where joists bear on bearing walls or beams) unless designed otherwise.
- Web stiffeners are permitted to be installed on either face of the joist web.
- Floor joists shall not be loaded before bracing or sheathing is installed.
- Heavy construction loads, such as stacks of plywood, gypsum board, bricks, etc., shall not be placed on floor joists before they are properly braced or without appropriately distributing the load so the capacity of the floor system is not exceeded.
- Walking across unbraced floor systems should be avoided. This may cause an unexpected fall.
- Sub-flooring should be checked for squeaks. Correct as necessary.
- Allow a small gap on either end of the floor joist to keep the floor joist away from the rim joist so that the potential problem of the floor joist rubbing against the rim joist and causing squeaks in the floor is eliminated.

Wall Stud Installation

- All load bearing studs, including king and jack studs, shall be seated in the tracks with a maximum gap of 1/8 inch (0.32 mm) between the end of the stud and the web of the track.
- Wall bridging shall use the same pattern of blocked bay at the end of each run with additional intermediate blocked bays at 12 foot (3.6 m) on center for lengths of walls greater than 12 feet (3.6 m). Wall bridging is not necessary if appropriate sheathing is placed on both flanges of the stud prior to loading the wall.
- Adequate temporary wall bracing shall be provided until permanent bracing has been installed. Temporary construction bracing may also remain in place after permanent bracing is installed.
- A sill sealer, or equivalent, shall be provided between the underside of the wall when fastened directly to concrete.

Trusses

- Floor or roof trusses shall be engineered by a design professional.
- Dimensions and proper bearing locations, as shown on truss design drawing, shall always be verified before starting installation of the truss.
- Temporary construction bracing shall remain in place as long as necessary for the safe and acceptable completion of the roof or floor and may also remain in place after permanent bracing is installed.
- Trusses are laterally unstable until bracing is properly installed; necessary caution shall be employed during the installation process.
- Overloading of roof trusses before permanent bracing and/or sheathing is installed is not permitted.

- Heavy construction loads, such as stacks of plywood, gypsum board, bricks, HVAC units, etc., shall never be placed on trusses before they are properly braced. Trusses are not typically designed for dynamic loads (moving loads). Sleepers for mechanical equipment shall be located at panel points or over main supporting members, or on trusses that have been designed to carry such loads.
- Any corrections that involve cutting, drilling, or relocation of any truss member or component shall not be made without notifying the truss manufacturer of the need for and extent of the modifications. All major corrections, cutting, or drilling of truss members without the approval of a qualified design professional shall be prohibited.
- Trusses shall not be placed over loose lintels, shelf angles, headers, beams, or other supporting structures not securely attached to the building.
- Trusses that do not meet interior load bearing walls shall be shimmed for adequate bearing.
- Trusses shall not be pulled down to any interior partition.

Table 10.1
Minimum Allowable Fastener Capacity for Steel to Steel
Connections^{1,2}
[Safety factor = 3.0]

Screw Size	Minimum Shank Diameter (inches)	Minimum Head Diameter (inches)	Minimum Capacity (lbs.)			
			Shear Capacity		Pullout Capacity	
			43 mils	33 mils	43 mils	33 mils
No. 8	0.164	0.322	244	164	94	72
No. 10	0.190	0.384	263	177	109	84

For SI: 1 inch = 25.4 mm, 1 lb. = 4.5 N.

¹Values represent the smaller thickness of two pieces of steel being connected.

²Screw capacities given are calculated in accordance with CCFSS Technical Bulletin [25].

11 STEEL TOOLS AND FASTENERS

Proper tools and fasteners are essential to the success of any job. Before starting a steel framing job, the correct tools and fasteners should be required.

Cutting and Punching Tools

Cutting tools are required to cut studs, joists, rafters, web stiffeners, straps, blocking, and framing members around openings. The following summarizes available cutting tools and their application. (See also Table 11.1.)

- **Aviation Snips** These are hand tools that cut steel thicknesses up to 43 mils (18 gauge). They are good for making minor cuts “on-the-go.”
- **Electric Power Shears** A hand-held tool used to cut steel thicknesses up to 68 mils.
- **Chop Saw** A chop saw is the most efficient means of cutting steel members. It is a circular saw with an abrasive blade and is generally set up at a central location.
- **Lather’s Nibblers** Ideal for making and cutting wire-tied attachments to framing components.
- **Power Nibblers** Typically used for making quick cuts in steel up to 68 mil thickness.
- **Step Drill Bit** For drilling holes of various sizes.
- **Stud Crimpers** A hand-held tool used to punch out hanger-wire holes in ceiling grids.
- **Circular Saws** These are portable hand-held electric power tools with carbide tipped blades.
- **Plasma Cutter** Electric tool that cuts the steel by melting it. The melting is accomplished by producing an arc where the probe is applied.
- **Portable Hydraulic Shear** These are typically found in panelization plants. They use hydraulic force to leave a clean cut.
- **Hole Punch** A hand-held tool used to punch utility holes in steel members.

Other cutting tools such as cut-off saws, power bandsaws, portable power hacksaws, and channel stud shears can also be used.

Bending Tools and Clamps

Hand seamers are the most common tools used by steel framers to bend steel members (such as web flanges for blocking). They are typically used for small bends and are often called “duck-billed pliers.” Press brakes can also be used to bend steel members. Press brakes are machines that bend steel lengths up to 10 feet (3 m). They are generally used in metal shops.

Locking C-clamps are essential tools for steel framers and come in a variety of sizes. Locking C-clamps are typically used to hold the steel pieces together during fastening.

Fastening Tools

Screw guns and pin nail guns are generally used for fastening steel-framed components. (Refer to Table 11.2 for typical screw sizes.) Pneumatic screwdrivers (or air driven screw guns) are also used, although they are still new to the steel framing market. Powder actuated tools are typically used to fasten steel members to concrete or to structural steel. Welding machines are frequently used in panelized steel systems. Clinching equipment are also gaining popularity among panelized steel fabricators.

Screw Guns and Nail Guns

The screw gun is the primary tool for a steel framer. It is as important as the nail gun for a wood framer. A screw gun is an electric screwdriver and not a drill. The screw will spin only when pressure is applied against the screw tip. Cordless screw guns are also available and operate on battery power. Two types of screw guns are needed to frame with steel:

- **Adjustable Torque/Clutch Screw Gun** This is the most highly recommended screw gun for making steel-to-steel connections. This type of screw gun has adjustable clutch and torque settings with a maximum speed range of 0-2,500 rpm. It typically has a quick change bit chuck for bit tips and a reverse switch to remove screws if incorrectly installed. It is highly recommended.
- **Drywall Screw Gun** Drywall screw guns are designed to attach plywood or gypsum board to steel. They should be industrial strength with 5.4 amps and a maximum speed range of 0-4,000 rpm. They should be reversible and equipped with a removable, depth sensitive nosepiece for installing sheathing and gypsum board. Drywall screw guns should not be used for steel-to-steel connections because they do not have adjustable clutches, run at high speeds, and often burn up the screws and screw drill tips. They are designed primarily for sharp point screws. A nail pin gun is also recommended for a steel framer.
- **Nail Pin Guns** Nail pin guns are generally used to attach sheathing (such as plywood or OSB) to floor joists. They are not used for steel-to-steel connections. Nail guns have an advantage over screw guns in that they are faster. Nail pins are specially designed nails with a knurled surface to bite into the steel when it penetrates. Nail pin guns are essentially identical to pneumatic nailers used in wood framing.

Table 11.1
Recommended Tools for Use With Residential Steel Framing

<p>Cutting and Punching Tools</p> <ul style="list-style-type: none"> • Aviation Snips—for cutting up to 43 mil material • Swivel Head Electric Shear—for cutting up to 68 mil material • Abrasive Blade Shop Saw—for cutting multiple sections simultaneously, especially partition studs • Step Drill Bit—for drilling holes of various sizes in studs and tracks • Lather Nibblers—ideal for making and cutting wire-tied attachments to framing components • Power Nibblers—typically used for making quick cuts in steel up to 68 mil thickness • Stud Crimpers—for punching out hanger wire holes in ceiling grids • Hole Punch - 1 1/4 inch—for field punching holes for the installation of electrical and plumbing systems
<p>Fastening Tools</p> <ul style="list-style-type: none"> • Adjustable clutch screw gun with industrial motor (6.5 amps), 0-2,500 rpm variable speed, reversible, bit tip holder release, adjustable torque control for framing • Magnetic bit tip holder and No. 2 Phillips bit tips • 5/16 inch magnetic hex driver for hex-head screws • 3 inch, 6 inch, and 12 inch locking C-clamps with regular tips for clamping steel together while fastening • Nail pin gun for attaching sheathing to floor joists, wall studs, and siding • Drywall screw gun with industrial motor (5.4 amps), 0-4,000 rpm variable speed, reversible, with depth locating nosepiece for sheathing and gypsum wallboard installation
<p>Miscellaneous Tools</p> <ul style="list-style-type: none"> • 3 1/2 inch and 5 inch hand seamers for bending and coping track • Bull-nose pliers for removing screws • Magnetic level • Felt markers for layout and cuts (black and red) • Gloves and eye and ear protection • Tape measure, speed square, utility knife, wallboard ax, chalk line, plumb bob, hammer, tool pouch, and 50' grounded extension cord

For SI: 1 inch = 25.4 mm, 1 mil = 0.025 mm, 1 foot = 0.3048 m.

Table 11.2
Typical Fasteners Used With Residential Steel Framing

Application	Fastener
Steel to steel non-load bearing (less than 33 mils)	Minimum No. 6, sharp point, low-profile head.
Steel to steel load bearing	Minimum No. 8, self-drilling, low profile-head where gypsum board or sheathing is to be installed; otherwise, a hex head can be used.
Gypsum board	Minimum No. 6, sharp point/self drilling, bugle-head screws. Sharp point screws for steel up to 33 mils (0.84 mm) and self-drilling for thicker steel. (A No. 6 screw may penetrate 43 mil steel with extra force applied.)
Interior trim	No. 6 minimum, sharp point/pilot point, finish or trim-head screws. If wood blocking is installed use finishing nails.
Foam insulation	Roofing nails to structural sheathing, or minimum No. 6, self-drilling, bugle head with a washer to prevent the screw from pulling through the foam.
OSB/Plywood to floor joists	Minimum No. 8, sharp point/self drilling, bugle-head screw (1 15/16" long). Winged screws and pneumatic fasteners are also available.
Stucco lath	Nail lath to wood sheathing or screw through foam backing to stud with No. 8 minimum drill point, low profile.
Siding	Minimum No. 8, sharp point/self drilling, bugle head. Winged screws are also available.
Brick ties	Minimum No. 8, sharp point/self drilling, hex-head screws.
Exterior trim	Minimum No. 8, sharp point/self drilling, bugle-head, or trim-head fastener.
Steel to poured concrete and concrete block surfaces	3/16" x 1 3/4" acron-slotted anchors.

For SI: 1 inch = 25.4 mm, 1 mil = 0.025 mm.

12 HOW TO USE THE *PRESCRIPTIVE METHOD*

This section provides a step-by-step procedure on how to apply the requirements of the *Prescriptive Method* when designing a home. A typical residential building is used to demonstrate the application of steel framing requirements.

Building Example

The example building has the following physical characteristics:

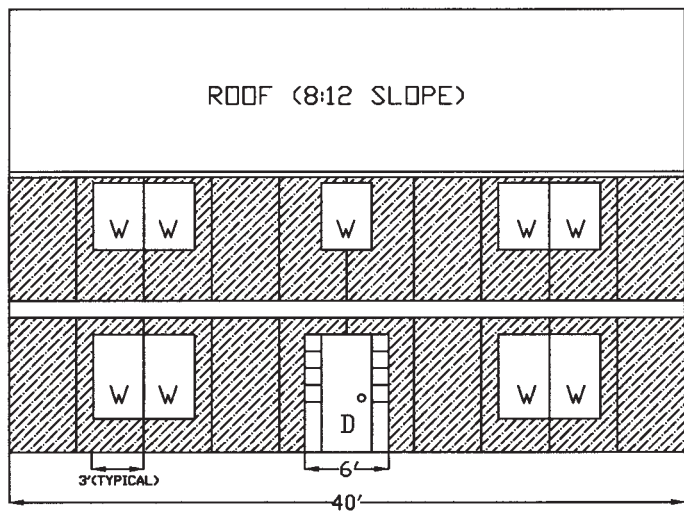
Building type:	Two story house (over an unfinished basement) with a center load bearing beam supporting the first floor and center load bearing wall supporting the second floor.
Building width:	28 feet (8,534 mm)
Building length:	40 feet (12,192 mm)
First story wall height:	8 feet (2,438 mm)
Second story wall height:	8 feet (2,438 mm)
Wall stud spacing:	24" on center (610 mm)
Floor joist spacing:	24" on center (610 mm)
Roof framing:	Ceiling joists with rafters
Roof slope:	8:12
Roof soffit overhang:	1 foot (305 mm)

The following design criteria is applicable to the example home:

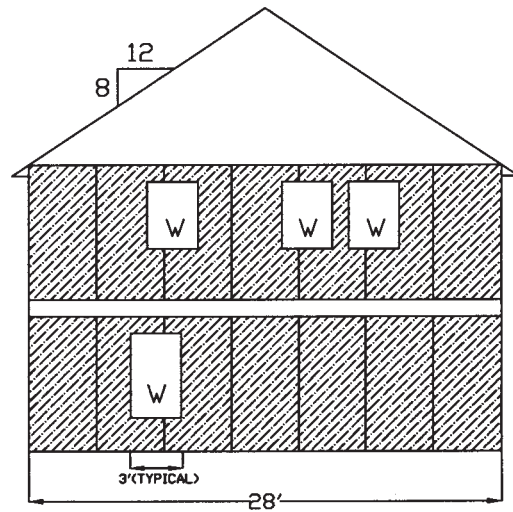
Ground Snow Load (psf)	Wind Speed (mph) and Exposure	Seismic Condition by Category	Bottom Floor Live Load	Top Floor Live Load	Floor Dead Load
50 psf	70 mph, Exp. C	Category A	40 psf	30 psf	10 psf

For SI: 1 mph = 1.609 km/hr, 1 psf = 0.0479 kN/m².

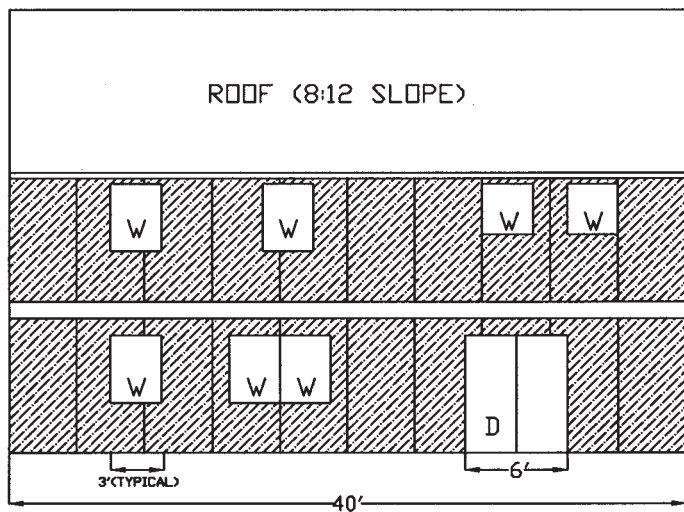
Building elevations are shown in Figure 12.1 on the following page.



Elevation View - Front



Elevation View - Side



Elevation View - Back

Figure 12.1
Building Elevations

Framing Members

The list below summarizes the framing member selection, which results from applying the *Prescriptive Method* to the example building. A detailed description of the process is given in the following section. Connection requirements are not highlighted in this example, since adequate details and tables are provided in the *Prescriptive Method*. The omission of detailed connection requirements from this example is not intended to diminish the importance of proper fastening. The novice user should devote substantial effort to this area, which cannot be adequately conveyed in a simple example. Equally important, the user must recognize that in-line framing is a requirement (i.e., floor joists, studs, and ceiling joists are aligned with one another).

<u>Member Location</u>	<u>Member Type</u>	<u>Reference</u>
<u>First Floor:</u>		
Floor joists	800S162-54 (@ 24" oc)	(Table 5.3)
Wall studs	350S162-54 (@ 24" oc)	(Table 6.3)
Headers	2-350S162-54 (3' 0" opening)	(Table 6.15b)
	2-800S162-68 (6-foot opening)	(Table 6.17b)
or	2-600L150-54 (3' 0" opening)	(Table 6.27)
Jack studs	350S162-54 (1 for 3' & 6' opening)	(Table 6.18)
King studs	350S162-54 (1 for 3' 0"opening)	(Table 6.18)
	(2 for 6' 0"opening)	
Subflooring	23/32" TNG APA rated sheathing.	
Wall sheathing	7/16" OSB or 15/32" plywood, APA rated	
Shearwall requirements		(Table 6.36)
<u>Second Floor:</u>		
Floor joists	800S162-43 (@ 24" oc)	(Table 5.3)
Wall studs	350S162-33 (@ 24" oc)	(Table 6.2)
Headers	2-350S162-43 (3' 6" opening)	(Table 6.15b)
or	2-600L150-54 (3' 6" opening)	(Table 6.21)
Jack studs	2-350S162-33 (1 for 3' & 6' opening)	(Table 6.18)
King studs	2-350S162-33 (1 for 3' 0"opening)	(Table 6.18)
Subflooring	23/32" TNG APA rated sheathing.	
Wall sheathing	7/16" OSB or 15/32" plywood, APA rated	
Shearwall requirements		(Table 6.36)
<u>Roof Framing:</u>		
Ceiling joists	2-800S162-43 (@ 24" oc)	(Table 8.9)
Rafters	2-350S162-33 (@ 24" oc)	(Table 8.12)
Roof Sheathing	15/32" plywood, APA rated	

Floor Framing Selection

Floor Joist Selection

The design house is 28' 0" (8534 mm) wide, and by taking into account the depth of the end wall supports and a beam or bearing wall at the middle span, the first floor clear span is 13' 3" (4039 mm) and the second floor span is 13' 6" (4115 mm). A 13' 3" (4039 mm) clear span for the first floor framing members is used in conjunction with the desired 24 inch on-center spacing of joists and 40 psf (1.92 kN/m²) live load in order to select a 800S162-54 joist member from Table 5.3 as shown below. (Table 5.4 could have been used if a continuous joist is to be used.) The 800S162-54 member happens to have an allowable span of exactly 13' 3" (4039 mm).

Applying the same sequence for the second floor framing, in this case the 13' 6" (4115 mm) clear span in conjunction with the 24 inch (610 mm) on-center spanning and the 30 psf (1.44 kN.m²) live load, Table 5.3 allows the use of a 800S162-43 joist member. The 800S162-43 member has an allowable span of 13' 7" (4140 mm).

In addition to the selection of joist members, Table 5.2 requires one No. 8 screw per flange of the joist member for connection to the joist track or two No. 8 screws per bearing stiffener. Bearing stiffeners shall be located, for purpose of this exercise, as illustrated in Figures 2.7 and 5.1.

Lateral bracing for the example building shall be provided in the form of subfloor sheathing panels, steel straps or gypsum board. For the application of plywood sheathing to the top flanges of the joists, the "Joist Bracing" section in Chapter 5 shall be employed with Table 5.2, which states that subflooring shall be fastened with No. 8 screws at six inches on-center at the edges and ten inches on-center at intermediate supports.

Table 5.3
Allowable Spans for Cold-Formed Steel Floor Joists^{1,2,3,4}
Single Span With Web Stiffeners

Joist Designation	30 psf Live Load Spacing (inches)				40 psf Live Load Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	11' 7"	10' 7"	9' 11"	9' 1"	10' 7"	9' 7"	9' 0"	8' 1"
550S162-43	12' 8"	11' 6"	10' 10"	10' 0"	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' 5"	11' 6"	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' 5"	12' 3"	11' 0"	14' 0"	12' 0"	11' 0"	9' 2"
800S162-43	17' 1"	15' 6"	14' 7"	13' 7"	15' 6"	14' 1"	13' 3"	12' 3"
800S162-54	18' 4"	16' 8"	15' 9"	14' 7"	16' 8"	15' 2"	14' 3"	13' 3"
800S162-68	19' 8"	17' 11"	16' 10"	15' 7"	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"

Recognizing that the first floor framing is constructed over an unfinished basement, steel strapping may be used as bottom flange lateral support in lieu of gypsum ceiling board. The strapping shall be attached to the bottom of each flange of the joist members with No. 8 screws. In addition, blocking or bridging shall be spaced at 12-foot (3,658 mm) perpendicular to the framing direction, which complies with the “Joist Bracing” section in Chapter 5 and Figures 5.1 and 5.11. Since the second floor joists are framed over a finished space, the use of gypsum board sheathing will be employed pursuant to the “Joist Bracing” section in Chapter 5.

Wall Framing Selection

Wall Studs Selection

As part of the selection process for wall studs, it had been assumed that the building is 28 feet (8534 mm) in width, is subject to a wind speed of 70 mph (110 km/hr), Exposure C and 50 psf (2.4 kN/m²) ground snow load, has walls 8 feet (2438 mm) high per floor, and a stud spacing of 24 inches (610 mm) on-center. For the second floor wall framing, Table 6.2 allows a 350S162-33 stud to be used as shown below. For the first floor stud wall framing (i.e., the first story of a two story building), we find that Table 6.3 results in a 350S162-54 stud member as shown below. Since the exterior is structurally sheathed and the interior is finished with 1/2 inch (12.7 mm) gypsum wall board, the thickness of steel may be reduced to 43 mil (1.09 mm) in accordance with footnote 4 in Table 6.3. A No. 8 screw through each flange is used to fasten studs below to the top and bottom track pursuant to Table 6.14.

As currently required in the *Prescriptive Method*, all exterior portions of the walls are fully sheathed. The interior face of the wall is assumed to have a gypsum wall board finish. The “Stud Bracing” section in Chapter 6 provides the proper fastening requirements of the gypsum board. Interior load bearing wall(s) are sheathed with gypsum board on each side in accordance with the “Stud Bracing” section in Chapter 6.

Table 6.2
Steel Stud Thickness for 8-Foot Walls Supporting Roof and Ceiling Only
(One Story or Second-Floor of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2}															
Exp. A/B	Exp. C			Building Width (feet) ^{3,4}															
		24				28				32				36					
Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)							
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	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	33	43
		550S162	16	33	33	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	33	33
80 mph	70 mph	350S162	16	33	33	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	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33

Table 6.3
Steel Stud Thickness for 8-Foot Walls Supporting One Floor, Roof, and Ceiling
(First Story of a Two Story Building)
33 ksi Steel

Wind Speed		Member Designation	Member Spacing (inches)	Stud Thickness (mils) ^{1,2,5}															
Exp. A/B	Exp. C			Building Width (feet) ^{3,4}															
		24				28				32				36					
Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)							
				20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
70 mph		350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	33	43
			24	43	43	43	43	43	43	43	43	43	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	33	33	33	33	33	43	33	33	43	43	33	43	43	54
80 mph	70 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	54	54	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	43

Header Selection

In this example, there are two header sizes, the 6' 0" (1829 mm) wide headers for the entrance doorway, slider door, and large window opening at the first floor level, and the 3' 0" (914 mm) wide window openings throughout the remainder of the building. Three tables will be employed in this exercise to determine the header types and the number of jack and king stud members to use in supporting the header. They are Tables 6.15b, 6.17b, and 6.18.

Both 6' 0" openings are located at the first floor of the building; therefore, Table 6.17b shall be used to determine the header member sizes. To recap, the building is 28' 0" (8534 mm) wide, is located in an area with a ground snow load of 50 psf (2.4 kN/m²), and the headers are supporting one floor, roof, and ceiling with center load bearing wall. Table 6.17b illustrates that a 2-800S162-68 header will suffice as it can span up to 6' 10" (2083 mm). Supporting this header will be 1-jack stud and 2-king studs in accordance with Table 6.18 (opening category 5' 6" to 8' 0"). Fastening requirements of the jack and king stud members dictate that 4 No. 8 screws are to be used for a header spanning between 4' 0" and 8' 0" (1219 mm and 2438 mm) in accordance with Table 6.19.

Applying the same process to the 3' 0" (914 mm) window openings both Tables 6.15b (Allowable Header Spans for Headers Supporting Roof and Ceiling Only) and 6.17b (Allowable Header Spans for Headers Supporting One Floor, Roof, and Ceiling) must be used. For the first floor application 2-350S162-43 type header will be required with support provided by one jack and one king stud at each end of the header. The second floor windows require a minimum 2-350S162-43 header which will be supported by one jack and one king stud at each end of the header in accordance with Table 6.18.

Table 6.17b
Allowable Header Spans for Headers Supporting One Floor,
Roof, and Ceiling^{1,2}
(First Story of a Two-Story Building With Center Load Bearing
Beam)
33 ksi

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

Table 6.15b
Allowable Header Spans for Headers Supporting Roof and Ceiling Only^{1,2}
33 ksi

Member Designation	50 psf Ground Snow Load				70 psf Ground Snow Load			
	Building Width ³				Building Width ³			
	24'	28'	32'	36'	24'	28'	32'	36'
2-350S162-33	3' 0"	2' 7"	2' 4"	2' 1"	2' 4"	2' 1"	--	--
2-350S162-43	3' 10"	3' 7"	3' 4"	3' 2"	3' 5"	3' 2"	3' 0"	2' 9"

Table 6.18
Total Number of Jack and King Studs Required at Each End of an Opening

Size of Opening	24" o.c. Stud Spacing		16" o.c. Stud Spacing	
	No. of Jack Studs	No. of King Studs	No. of Jack Studs	No. of King Studs
Up to 3' 6"	1	1	1	1
> 3' 6" to 5' 0"	1	2	1	2
> 5' 0" to 5' 6"	1	2	2	2
> 5' 6" to 8' 0"	1	2	2	2

Applying the same process to the 3' 0" (914 mm) and 3' 6" (1,067 mm) window openings using L-header tables, both Tables 6.21 and 6.27 must be used. For the first floor application 2-600L150-54 L-header will be required with support provided by one jack and one king stud at each end of the header. The second floor windows require a minimum 2-600L150-54 header which will be supported by one jack and one king stud at each end of the header in accordance with the Table 6.18.

Table 6.21
Double L-Header Supporting Roof and Ceiling Only
28-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	4' 6"	4' 4"	4' 0"	3' 9"	3' 5"	3' 2"	3' 0"
2-600L150-54	5' 2"	4' 11"	4' 6"	4' 2"	3' 10"	3' 7"	3' 5"

Table 6.27
Double L-Header Supporting One Floor, Roof, and Ceiling
28-Foot-Wide Building^{1,2}

Double L-Header Designation	Ground Snow Load (psf)						
	16	20	30	40	50	60	70
2-600L150-43	3' 0"	3' 0"	2' 10"	2' 9"	2' 8"	2' 7"	2' 6"
2-600L150-54	3' 5"	3' 4"	3' 3"	3' 1"	3' 0"	2' 11"	2' 10"

Shearwall/Structural Sheathing

To determine the minimum amount of structural sheathing required for the example house, the “Wall Bracing (Shearwall Bracing)” section in Chapter 6 and Table 6.36 must be employed with the design example information. The design house is two story house, is 28' 0" (8534 mm) wide (endwalls) by 40' 0" (12192 mm) long (sidewalls), has a roof slope of 8:12, and is located in a 70 mph (110 km/hr) Exposure C area. At the beginning of the example, the entire house was assumed to be covered with structural sheathing. In fact, this is a requirement to meet the wall bracing requirements of the “Structural Sheathing” section in Chapter 6.

Addressing only the first floor of this two-story house, we see that the closest roof slope category is 9:12. Under the appropriate wind speed/exposure category the minimum percentage of full-height sheathing on each wall is 55 percent.

FIRST FLOOR ENDWALL

- 9:12 (55 percent) minus 6:12 (40 percent) equals three equal percentage increments at 5 percent; $(55 \text{ percent} - 40 \text{ percent})/3 = 5.0$
9:12 minus 8:12 (design house slope) equals one increment at 6.66 percent.
- 9:12 (55 percent) minus 1:12 (5 percent) indicates the endwall will require 50 percent of coverage.
- Therefore, a 28' 0" (8534 mm) wide house requires 50 percent coverage which equals 14' 0" (4267 mm). Rounding to a figure more appropriate to plywood dimension, say 16' 0" (4877 mm) or four 48 inch (1219 mm) wide panels.
- Remember that the “Structural Sheathing” section in Chapter 6 requires a minimum of one 48 inch (1219 mm) wide panel at each corner.

FIRST FLOOR SIDEWALL

- 9:12 (55 percent) minus 6:12 (40 percent) equals three equal percentage increments at 5 percent; $(55 \text{ percent} - 40 \text{ percent})/3 = 5.0$
9:12 minus 8:12 (design house slope) equals one increment at 5 percent.
- 9:12 (55 percent) minus 1:12 (5 percent) indicates the sidewall will require 50 percent of coverage.
- Therefore, 40' 0" (12192 mm) long house requires 50 percent, which equals 20' 0" (6096 mm). That is equivalent to five 48 inch (1219 mm) wide panels.
- Reminder, that the “Structural Sheathing” section in Chapter 6 requires a minimum of one 48 inch (1219 mm) wide panel at each corner.

SECOND FLOOR ENDWALL:

Applying the method above to the second story level of the example building, the following results are obtained:

- 28' 0" (8534 mm) multiplied by 26.67 percent requires 7' 6" (2286 mm) of full-height sheathing. (The 26.67 percent value was interpolated between 30 percent and 20 percent similar to the first floor calculation.)

SECOND FLOOR SIDEWALL:

- 40' 0" (12192 mm) multiplied by 26.67 percent requires 10' 8" (3251 mm) of full-height sheathing.
- No adjustment to the lengths of full-height sheathing is necessary in either case.

Table 6.36
Minimum Percentage of Full Height Structural Sheathing on Exterior Wall^{1,2,3,4}

Wall Supporting:	Roof Slope	Basic Wind Speed (mph) and Exposure				
		70 A/B	80 A/B	<90 A/B		
				70 C	80 C	<90 C
Roof and Ceiling Only (One Story or Second-Floor of Two-Story)	3:12	8	9	12	16	20
	6:12	12	15	20	26	35
	9:12	21	25	30	50	58
	12:12	30	35	40	66	75
One Story, Roof, and Ceiling (First Floor of a Two-Story Building)	3:12	24	30	35	50	66
	6:12	25	30	40	58	74
	9:12	35	40	55	74	91
	12:12	40	50	65	100	115
Wall Supporting:	Seismic Zone 0	Seismic Zone 1		Seismic Zone 2		
Roof and Ceiling Only	6	6		19		
One Story, Roof, and Ceiling	13	13		40		

Roof Framing Selection

Ceiling Joists Selection

The design house is 28' 0" (8534 mm) wide, and by taking into account the depth of the end wall supports and a beam or bearing wall at the middle span, the ceiling joist clear span is 13' 9" (4191 mm). A 13' 9" (4191 mm) desired ceiling joist span is used in conjunction with the 24 inch (610 mm) on-center spacing of members and the 20 psf (0.96 kN/m²) attic live load in order to select a 800S162-54 joist member from Table 8.11 as shown below. Moreover, no stiffeners are required for the ceiling joists.

Table 8.11
Allowable Spans for Cold-Formed Steel Ceiling Joists
Two Equal Spans Without Bearing Stiffeners
20 Lbs. Per Sq. Ft. Live Load (Limited Attic Storage)^{1,2,3,4}
33 ksi Steel

Member Designation	Lateral Support of Top (Compression) Flange					
	Unbraced		Mid-Span Bracing		Third-Point Bracing	
	Spacing (inches)		Spacing (inches)		Spacing (inches)	
	16	24	16	24	16	24
350S162-33	8' 1"	6' 0"	8' 1"	6' 0"	8' 1"	6' 0"
350S162-43	10' 10"	8' 3"	10' 10"	8' 3"	10' 10"	8' 3"
350S162-54	12' 9"	10' 2"	13' 3"	10' 2"	13' 3"	10' 2"
350S162-68	14' 0"	12' 4"	15' 9"	12' 5"	15' 9"	12' 5"
350S162-97	16' 7"	14' 5"	18' 3"	15' 2"	18' 3"	15' 2"
550S162-33	9' 3"	6' 9"	9' 3"	6' 9"	9' 3"	6' 9"
550S162-43	13' 0"	9' 8"	13' 0"	9' 8"	13' 0"	9' 8"
550S162-54	14' 3"	12' 4"	16' 4"	12' 4"	16' 4"	12' 4"

In addition to the selection of joist members, Table 8.1 requires two No. 10 screws per joist for connection to the top track of a load-bearing wall. Bearing stiffeners are not required for the ceiling joists selected.

Lateral bracing for the selected ceiling joists shall be provided in the form of sheathing, steel straps, or gypsum board. A 350S162-33 C-shape or track member or steel strapping may be used as bracing of the top flange. The strapping should be fastened to each top flange of the ceiling joists with a minimum of one No. 8 screw. Blocking or bridging shall also be installed in-line with the strapping at a maximum spacing of 12' 0" (3658 mm) and at the termination of all straps. The blocking and/or bridging details are similar to those used for the steel floor assembly. Gypsum board shall be installed on the bottom flanges (tension flanges) of ceiling joists with No. 6 screws in accordance with the "Ceiling Joist Bracing" section in Chapter 8.

Rafters Selection

The design house is 28' 0" (8534 mm) wide, and therefore, the horizontal rafter span is 14' 0" (4267 mm). The ground snow load is 50 psf (2.4 kN/m²) and the design wind speed is 70 mph (110 km/hr), Exposure C.

The first step is to convert the design wind speed into an equivalent snow load, using Table 8.13 as shown below. From that table, a 70 mph (110 km/hr) wind exposure C with roof slope of 8:12 is equivalent to a 30 psf (1.44 kN/m²) ground snow load.

Table 8.13
Wind Speed to Equivalent Snow Load Conversion^{1,2}

Basic Wind Speed And Exposure		Equivalent Ground Snow Load (psf)									
		Roof Slope									
Exp. B	Exp. C	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
70 mph		20	20	20	20	20	20	30	30	30	30
80 mph	70 mph	20	20	20	20	30	30	30	30	50	50

The second step is to select the rafter size using the maximum of the ground snow load, 50 psf (2.4 kN/m²) or the equivalent ground snow load converted from the wind speed, 30 psf (1.44 kN/m²). In this case, the ground-snow load of 50 psf (2.4 kN/m²) controls. Using Table 8.12, 800S162-54 rafter is selected with a maximum allowable span of 14' 6" (4420 mm) and a 24 inches (610 mm) on center rafter spacing.

Ceiling joists shall be connected to rafters (heel joints) with 5 No. 10 screws evenly spaced as shown in Table 8.2 below.

Table 8.12
Allowable Horizontal Rafter Spans^{1,2,3}
33 ksi Steel

Member Designation	Ground Snow Load							
	20 psf		30 psf		50 psf		70 psf	
	Spacing (in.)		Spacing (in.)		Spacing (in.)		Spacing (in.)	
	16	24	16	24	16	24	16	24
550S162-33	12' 8"	10' 4"	11' 9"	9' 7"	9' 11"	8' 1"	8' 10"	7' 2"
550S162-43	15' 5"	12' -7"	14' 3"	11' 8"	12' 1"	9' 10"	10' 8"	8' 9"
550S162-54	13' 0"	14' 2"	16' 1"	13' 1"	13' 8"	11' 2"	12' 1"	9' 10"
550S162-68	18' 1"	15' 10"	17' 3"	14' 9"	15' 4"	12' 6"	13' 6"	11' 1"
550S162-97	20' 1"	17' 6"	19' 1"	16' 8"	17' 1"	14'	15' 7"	13' 2"
800S162-33	15' 5"	11' 5"	14' 4"	9' 10"	10' 7"	7' 1"	8' 3"	5' 6"
800S162-43	19' 1"	15' 7'	17' 9"	14' 6"	15' 1"	12' 3"	13' 3"	10' 9"
800S162-54	22' 7"	18' 5"	21' 0"	17' 1"	17' 9"	14' 6"	15' 9"	12' 10"

Table 8.2
Number of Screws Required for Ceiling Joist to Rafter Connections¹

Roof Slope	Building Width (feet)															
	24'				28'				32'				36'			
	Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)				Ground Snow Load (psf)			
	20	30	50	70	20	30	50	70	20	30	50	70	20	30	50	70
3/12	5	6	9	12	6	7	10	13	7	8	12	15	8	9	13	17
4/12	4	5	7	9	5	6	8	10	6	6	9	12	6	7	10	13
5/12	4	4	6	7	4	5	7	9	5	5	8	10	5	6	9	11
6/12	3	4	5	7	4	4	6	8	4	5	7	9	4	5	7	10
7/12	3	3	5	6	3	4	5	7	4	4	6	8	4	5	7	9
8/12	3	3	4	5	3	3	5	6	3	4	5	7	4	4	6	8

The rafter to ridge member connection shall use four No. 10 screws at each leg of the angle as shown in Table 8.3 below.

Table 8.3
Number of Screws Required at Each Leg of Clip Angle for Rafter to Ridge Member Connection¹

Building Width (feet)	Ground Snow Load (psf)			
	0 to 20	21 to 30	31 to 50	51 to 70
24	2	3	4	4
28	2	3	4	5

Bottom flange rafter bracing can be accomplished using a 1 1/2" x 33 mil strap (38 x 0.84 mm), 33 mil (0.84 mm) C-shape member, or 33 mil (0.84 mm) track at a maximum spacing of 8 feet (2438 mm) along the rafter span. A 350S162-33 C-shape member at mid span is selected here. The C-shape member is fastened to each rafter with a minimum of one No. 8 screw.

Permanent roof bracing for the example building is provided by structural (roof) sheathing fastened to the rafters with minimum No. 8 screws at 6 inches (152 mm) on center along the edges and 12 inches (305 mm) on center at interior supports in accordance with Table 8.1. Adequate temporary bracing of the roof framing is required for stability during construction until the roof sheathing is applied.

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APPENDIX, 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 fromtomultiply by

Length

inch (in)	micrometer (μm)	25,400
inch (in)	millimeter (mm)	25.4
inch (in)	centimeter (cm)	2.54
inch (in)	meter (m).....	0.0254
foot (ft).....	meter (m).....	0.3048
yard (yd).....	meter (m).....	0.9144
mile (mi)	kilometer (km)	1.6

Area

square foot (sq ft).....	square meter (sq m).....	0.0929
square inch (sq in)	square centimeter (sq cm)	6.452
square inch (sq in)	square meter (sq m).....	0.00064516
square yard (sq yd)	square meter (sq m).....	0.8391
square mile (sq mi)	square kilometer (sq km)	2.6

Volume

cubic inch (cu in)	cubic centimeter (cu cm).....	16.387064
cubic inch (cu in)	cubic meter (cu m)	0.00001639
cubic foot (cu ft)	cubic meter (cu m)	0.02831685
cubic yard (cu yd)	cubic meter (cu m)	0.7645549

Force

kip (1000 lb)	kilogram (kg)	453.6
kip (1000 lb)	Newton (N)	4,448.222
pound (lb).....	kilogram (kg)	0.4535924
pound (lb).....	Newton (N)	4.448222

Stress or pressure

kip/sq inch (ksi)	megapascal (Mpa)	6.894757
kip/sq inch (ksi)	kilogram/square centimeter (kg/sq cm)	70.31
pound/sq inch (psi)	kilogram/square centimeter (kg/sq cm)	0.07031
pound/sq inch (psi)	pascal (Pa)*	6,894.757
pound/sq inch (psi)	megapascal (Mpa)	0.00689476
pound/sq foot (psf).....	kilogram/square meter (kg/sq m)	4.8824
pound/sq foot (psf).....	pascal (Pa)	47.88

* A pascal equals 1000 Newton per square meter

To convert fromtomultiply by

Mass (weight)

pound (lb) avoirdupois.....	kilogram (kg)0.4535924
ton, 2000 lb	kilogram (kg)907.1848
grain	kilogram (kg)0.0000648

Mass (weight) per length

kip per linear foot (klf)	kilogram per meter (kg/m)0.001488
pound per linear foot (plf) ..	kilogram per meter (kg/m)1.488

Moment

1 foot-pound (ft-lb)	Newton-meter (N-m).....	1.356
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Mass per volume (density)

pound per cubic foot (pcf) ..	kilogram per cubic meter (kg/cu m)	16.01846
pound per cubic yard	kilogram per cubic meter (kg/cu m)	0.5933

(lb/cu yd)

Velocity

mile per hour (mph).....	kilometer per hour (km/hr)	1.60934
mile per hour (mph).....	kilometer per second (km/sec)	0.44704

Temperature

degree Fahrenheit (°F)	degree Celsius (°C) $t_C = (t_F - 32)/1.8$
degree Fahrenheit (°F)	degree Kelvin (°K) $t_K = (t_F + 59.7)/1.8$
degree Kelvin (°F)	degree Celsius (°C) $t_C = (t_K - 32)/1.8$

The prefixes and symbols below are commonly used to form names and symbols of the decimal multiples and submultiples 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

