Low-Rise Residential Construction

Details

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Introduction

These details were developed by the Light Gauge Steel Engineers Association (LGSEA) for the North American Steel Framing Alliance (NASFA). They are intended to provide designers and contractors with guidance on design, detailing, and construction of low-rise residential buildings that utilize cold-formed steel framing members. Details contained in this document were selected based on their cost effectiveness at the time of this publication. Efforts have been made to present accurate, reliable, and useful information. The connections between members are shown as screw connections; other types of connections such as welds, bolts, powder-actuated fasteners, clinches, or pneumatically driven fasteners are acceptable. Although it is common for cold-formed steel framing members to have web "punchouts" for passing bracing or utilities, punchouts are shown in some details only. Punchouts are acceptable and vary in size, configuration, and spacing depending on the manufacturer and/or design. NASFA acknowledges Nader Elhajj, P.E., for assembling and drafting the details. Special appreciation is extended to Kevin Bielat of the American Iron and Steel Institute (AISI) and Tim Waite of NASFA for their assistance and guidance. NASFA recognizes the following LGSEA committee members who helped select the details contained in this document:

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The materials set forth herein are for general information only. They are not a substitute for competent professional assistance. Application of any information contained in this document to a specific project or setting should be reviewed by a qualified individual. NASFA believes that the information contained in this publication substantially represents industry practice and related scientific and technical information, but the information is not intended to represent an official position of NASFA or to restrict or exclude any other construction or design technique. Additional design and detailing (i.e., coordinating with other materials, material specifications) is required for many of the details before they can be incorporated into construction documents. Anyone making use of the information set forth herein does so at his or her own risk and assumes any resulting liability.

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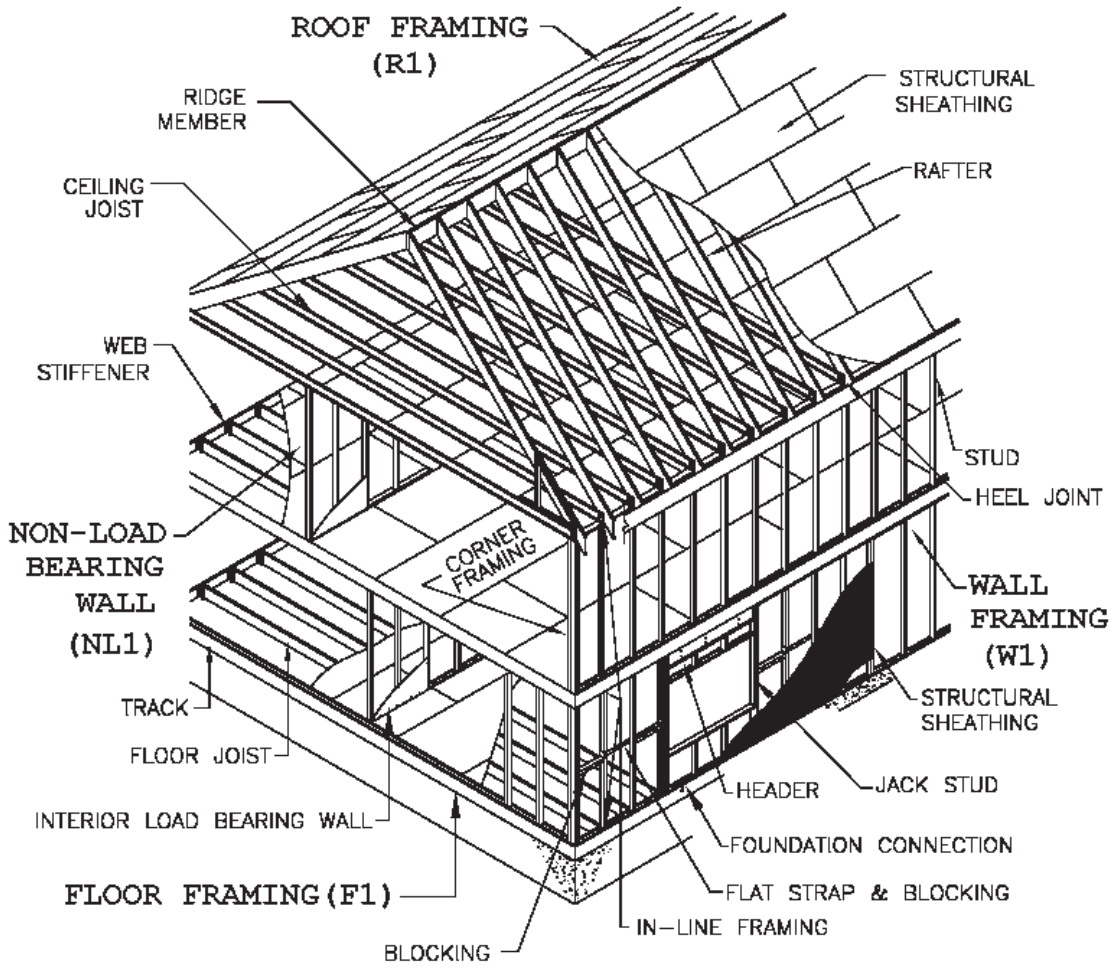
Definitions

Anchor:	Metal rod, wire, strap, or bolt that secures structural members (such as joists and tracks) to its structural supports (such as foundation).
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.
Bridging:	Cross bracing or blocking placed between joists to provide lateral support.
C-Shape:	A basic cold-formed steel shape used for framing members (such as studs, joists, headers, and rafters). It consists of a web, flange, and lip. It is also called a “C-section.”
Cantilever:	An extension of roof or floor framing members without a direct support.
Ceiling Joist:	A horizontal structural framing member that supports a ceiling and attic loads.
Clip Angle:	An L-shaped short piece of metal (normally with a 90–degree bend). It is typically used for connections.
Continuous Joist:	A joist that spans over interior supports.
Collar Tie:	Brace member used to brace roof rafters near the top.
Cripple Stud:	A stud that is placed between a header and a window sill (or jamb) or a windowsill and a bottom track to provide a backing to attach finishing and sheathing material.
Diaphragm:	A roof or floor system designed to transmit lateral forces to shear walls or other vertical resisting elements.

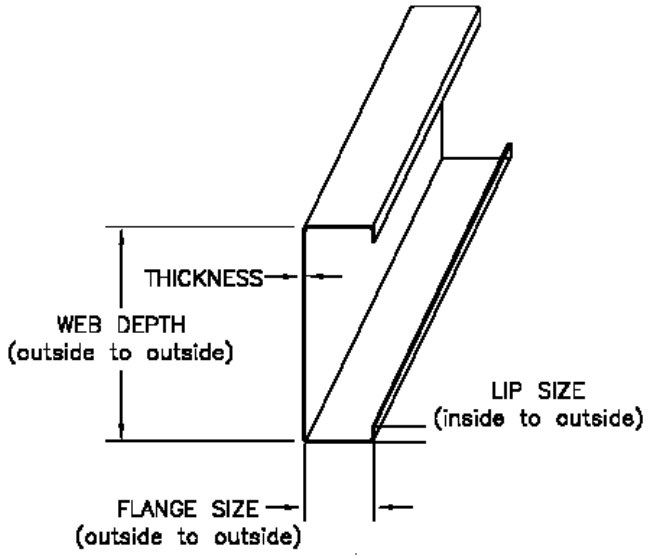
Flange:	The part of a C-Shape or track that is perpendicular to the web.
Flat Strap:	Sheet steel cut to a specified width without any bends. Typically used for bracing and transfer of loads by tension.
Floor Joist:	A horizontal structural framing member that supports floor loads.
Gable End:	Where the triangular upward extension of either side walls or the front walls of the house provide the end supports for the two sloping roof planes.
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.
Heel Joint:	The connection between the roof rafter and the ceiling joist.
In-Line Framing:	Framing method where all vertical and horizontal load carrying members are aligned when required to properly transfer loads.
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 trimmer studs.
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 and acts as a stiffener to the flange.
Material Thickness (steel):	The base metal thickness excluding any protective coatings. Thickness is now commonly expressed in mils (1/1000 of an inch).
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.
Overlap Joists:	Two or more joists extending over a common support where the end of one joist is fastened to the end of another joist.
Overhang:	See cantilever.
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.

Ridge:	The horizontal line formed by the joining of the top edges of two sloping roof surfaces.
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.
Single Span:	The span made by one continuous structural member without any intermediate supports.
Splice:	A joint at which two pieces are joined to each other.
Span:	The clear horizontal 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 that 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.
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:	
Load Bearing:	Wall systems subject to loads that exceed the limits for a non-structural system (e.g. wall studs).
Non-Load Bearing:	Wall systems that are limited to 10 psf maximum lateral (transverse) load and/or limited, exclusive of sheathing materials, to 100 pounds per lineal foot or 200 pounds 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 Opening:	See “Punchout.”
Web Perforation:	See “Punchout.”
Web Stiffener:	Additional material that is attached to the web to strengthen the member against web crippling. Also called a bearing stiffener.

Detail G1
Schematic of Typical Steel-Framed House



Detail G2
C-Shape Configuration



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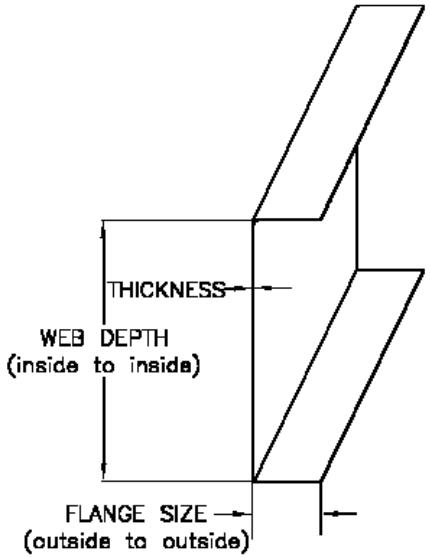
Track Configuration



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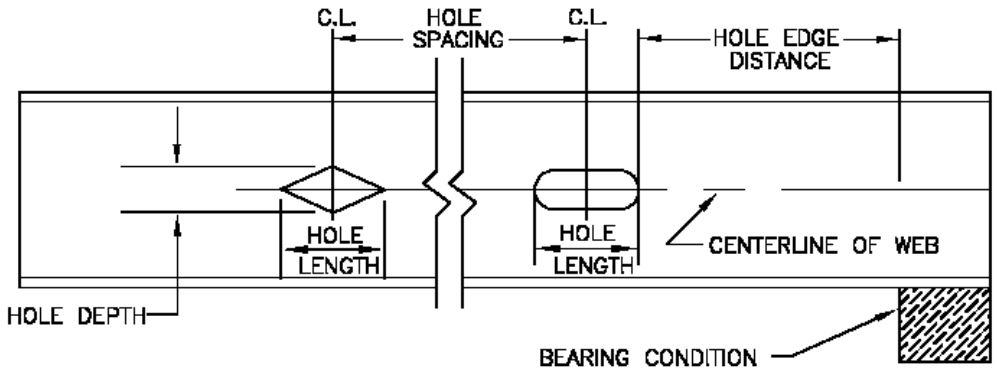
Joist Web Holes



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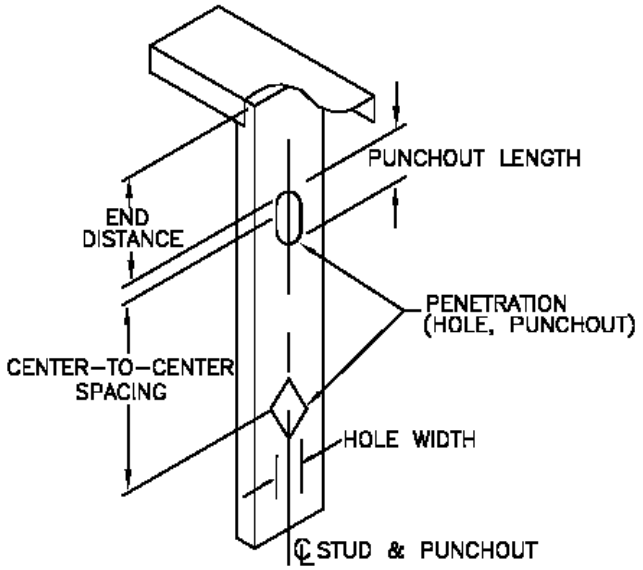
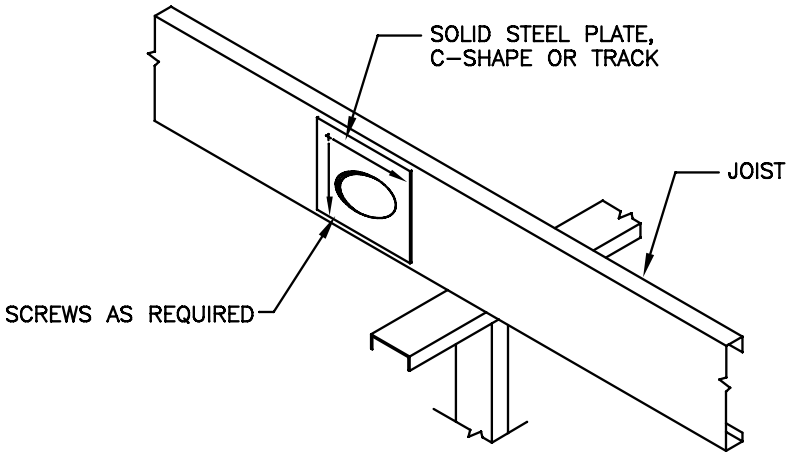
Stud Web Holes



Detail G6
Joist Web Hole Patch



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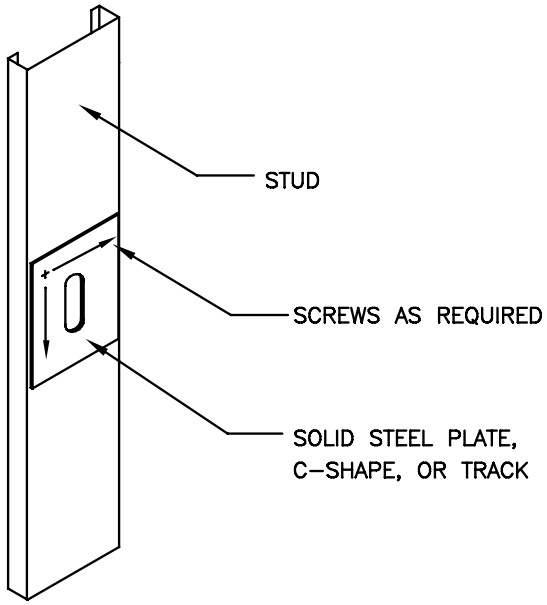
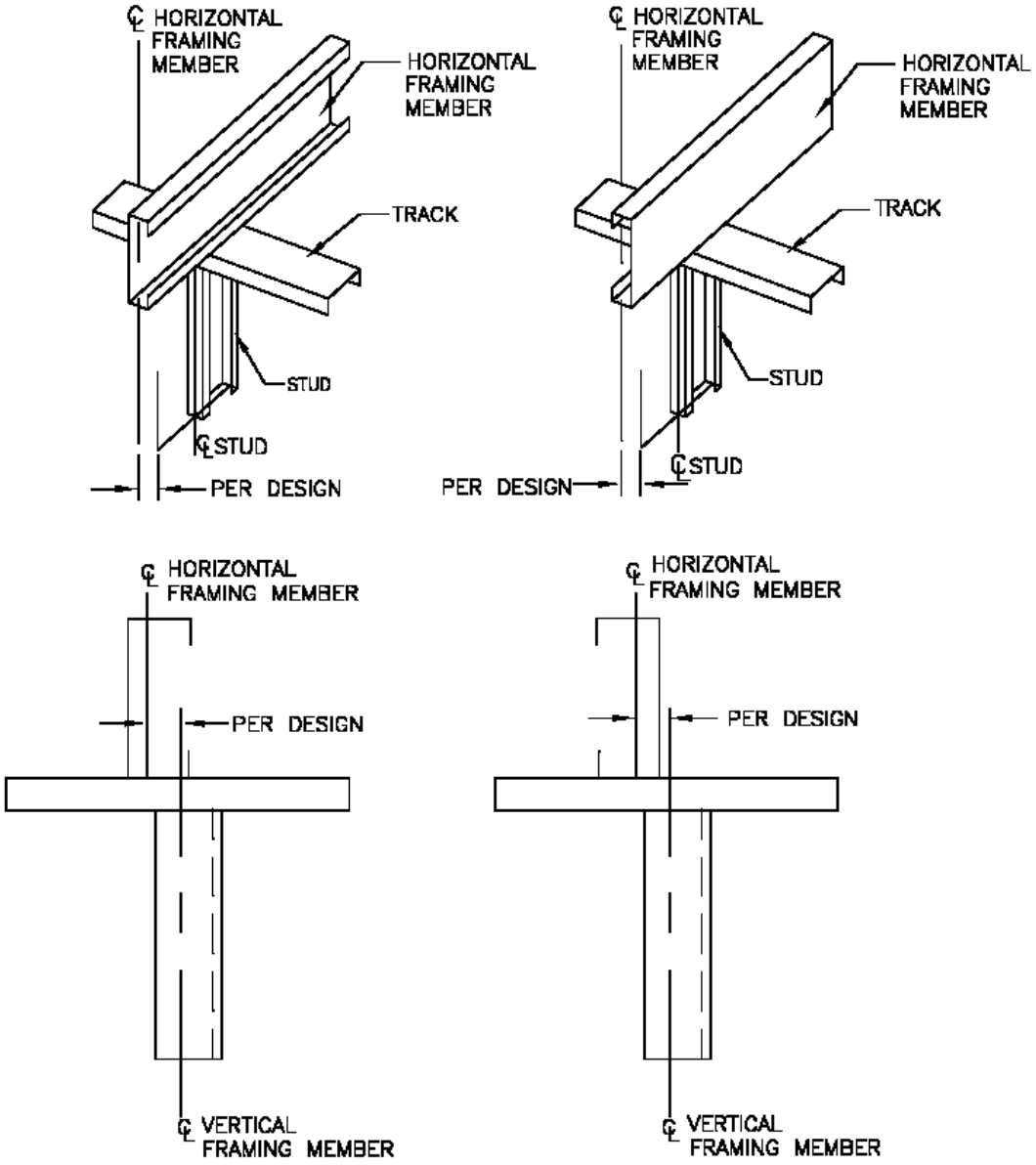
Stud Web Hole Patch



Detail G8
In-Line Framing Detail



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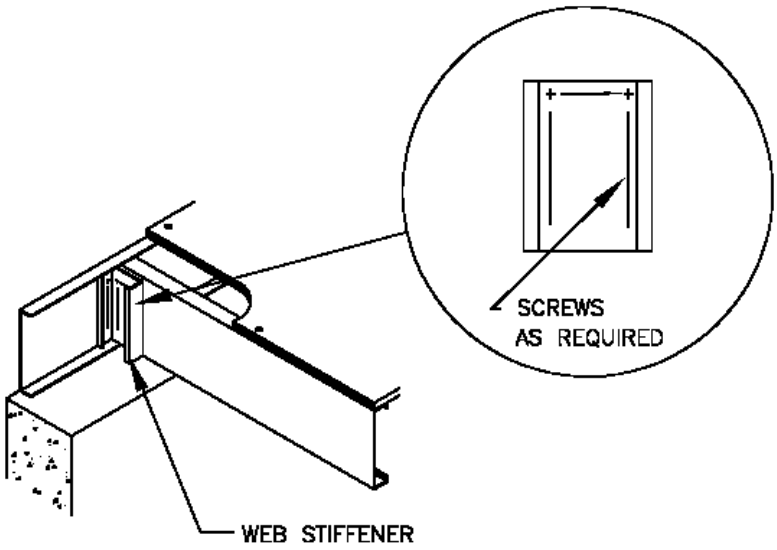
Web Stiffener Detail 1



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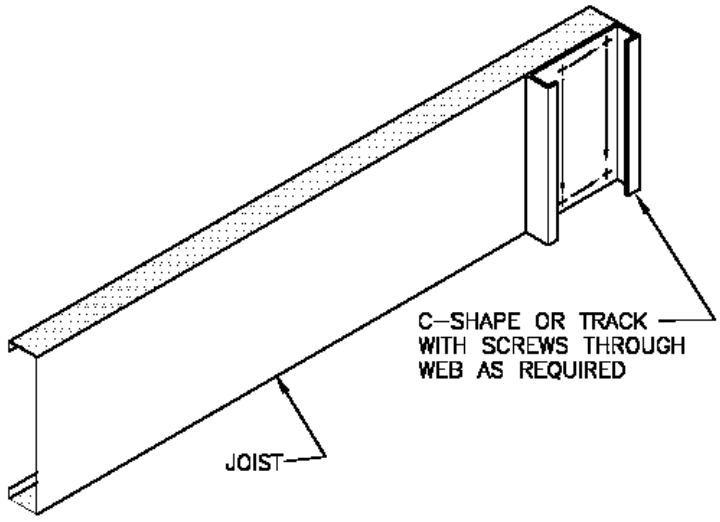
Web Stiffener Detail 2



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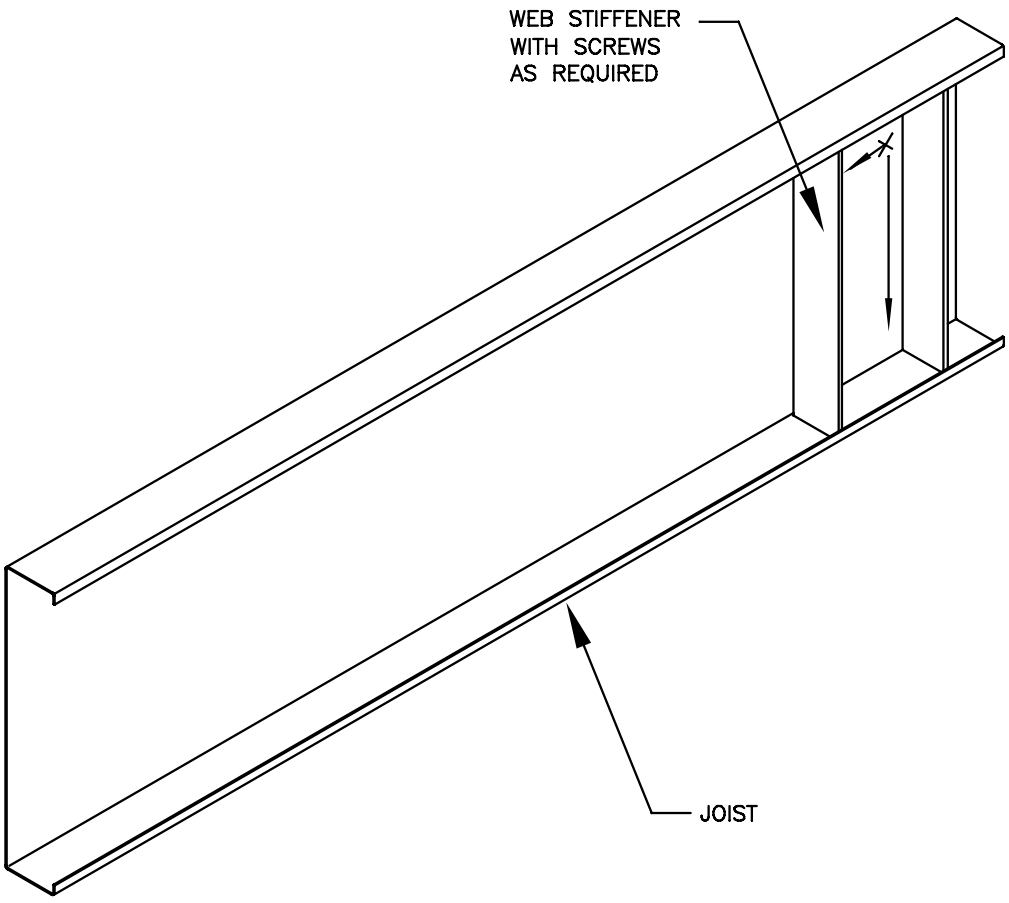
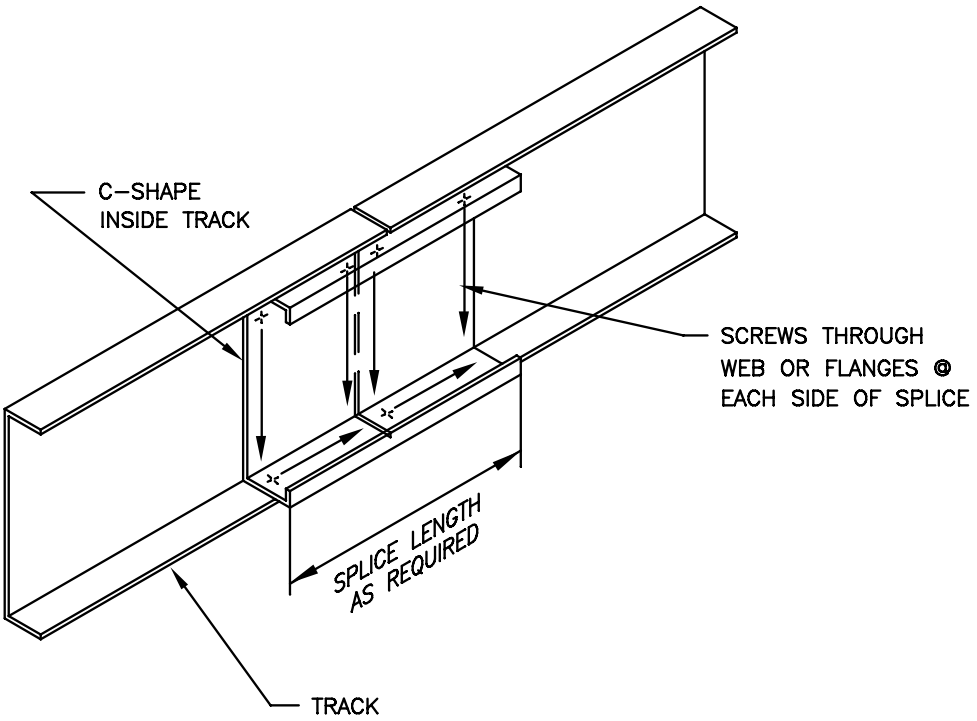
Web Stiffener Detail 3



Detail G12
Track Splice Detail



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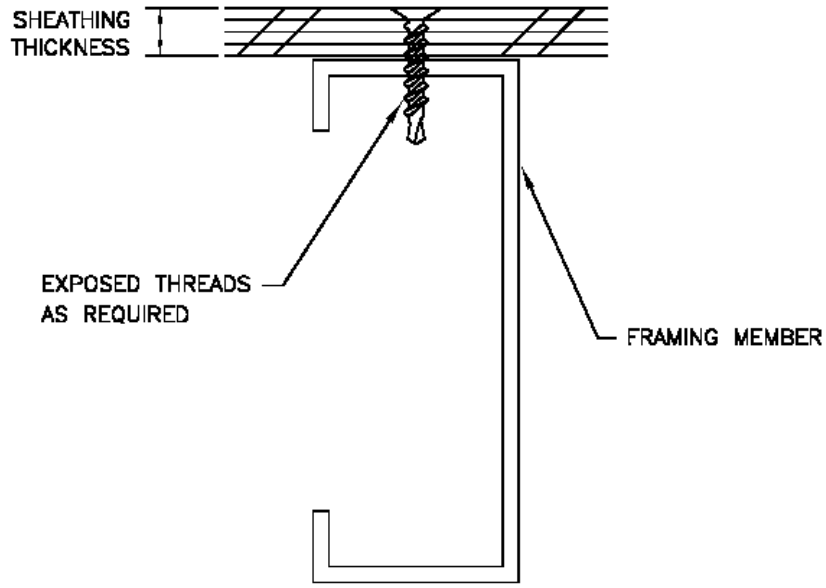
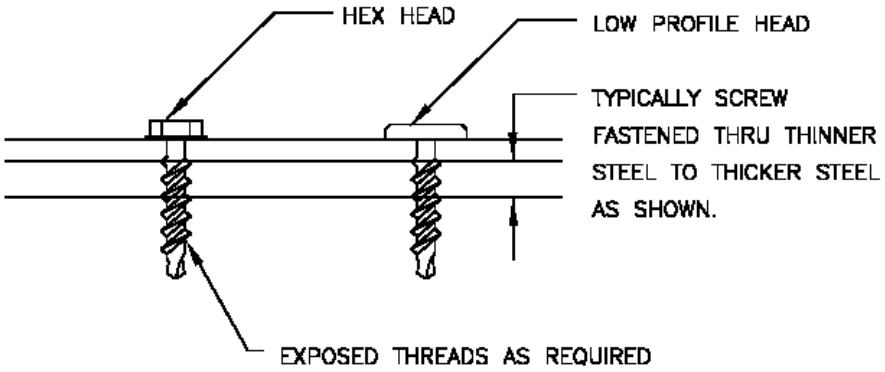
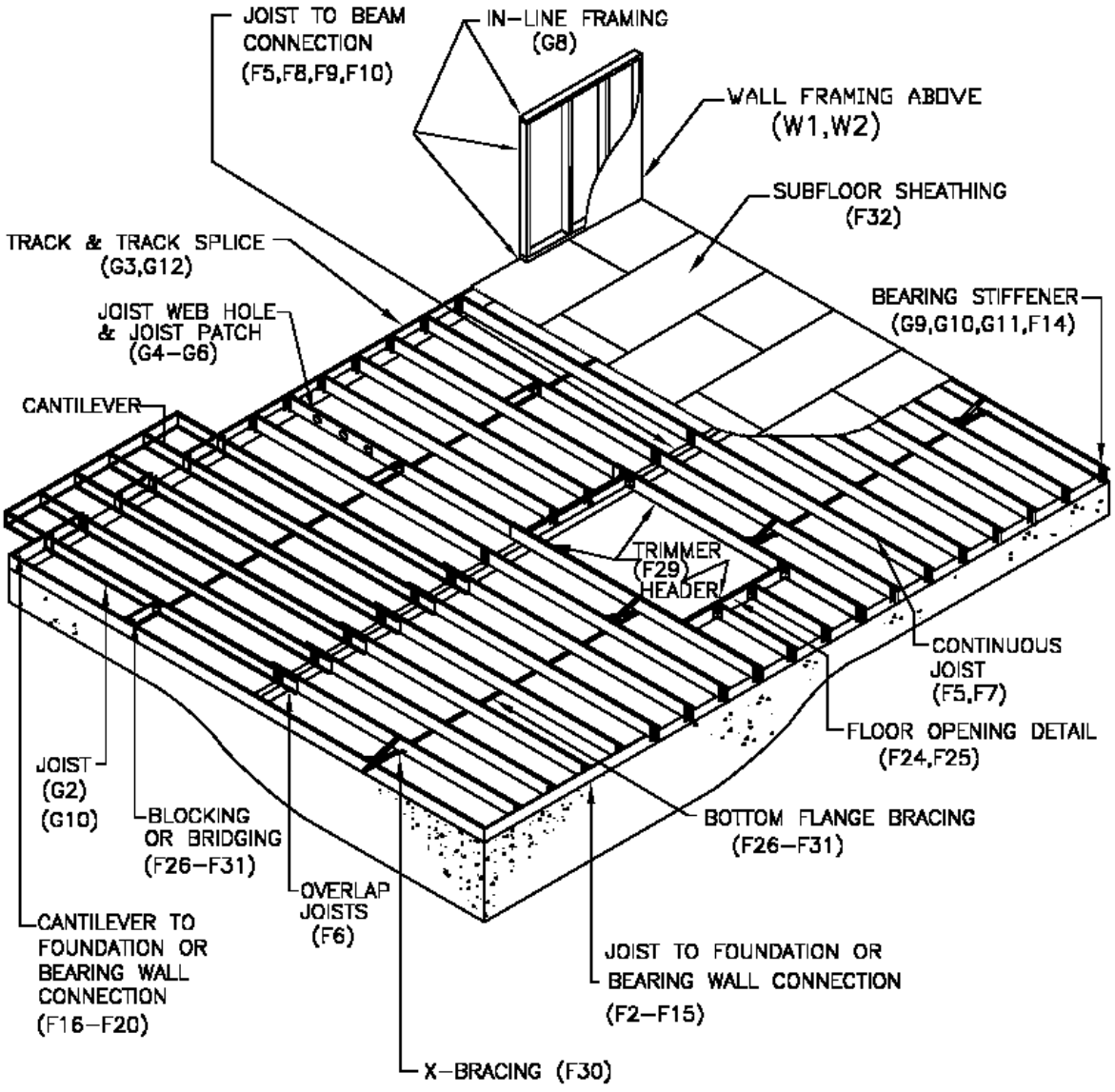
Screw Attachment Detail





Detail F1
Floor Framing



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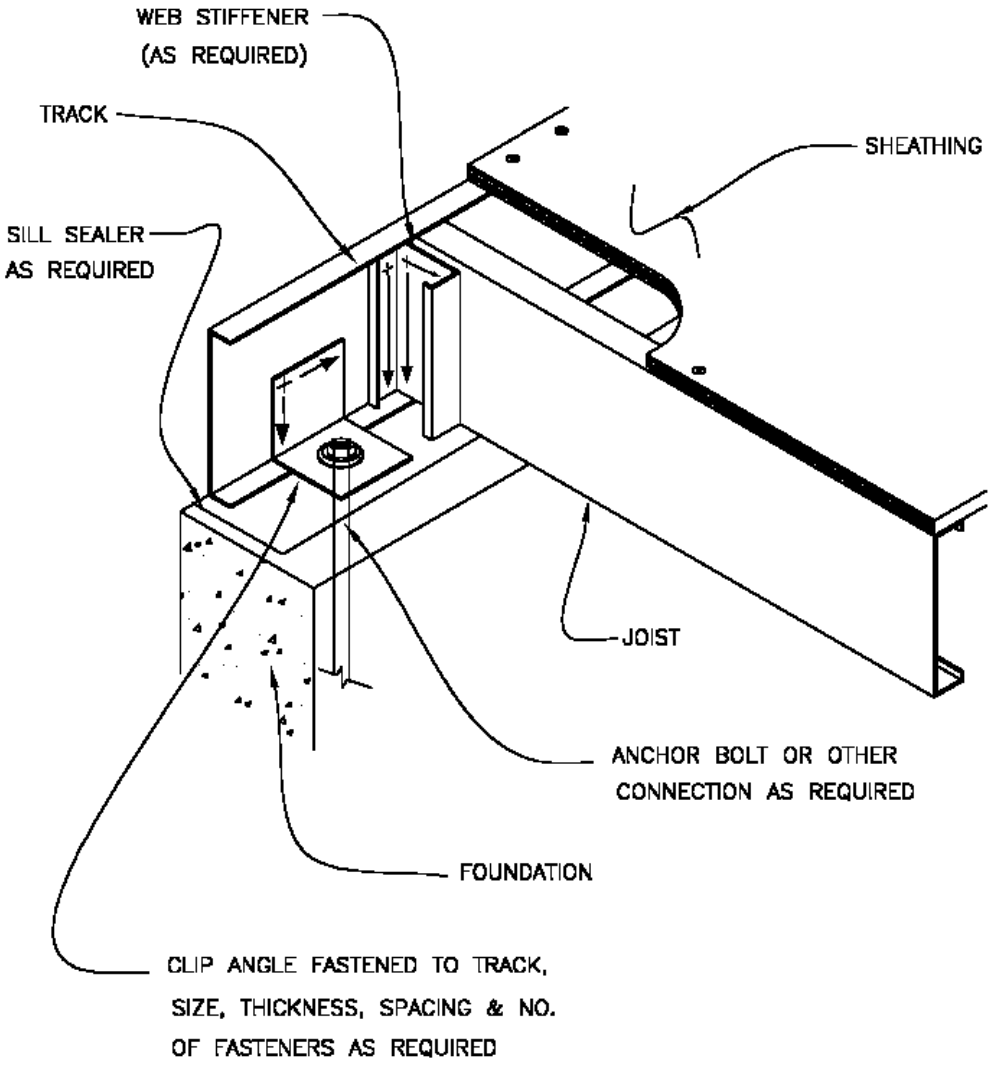
Floor to Foundation Connection



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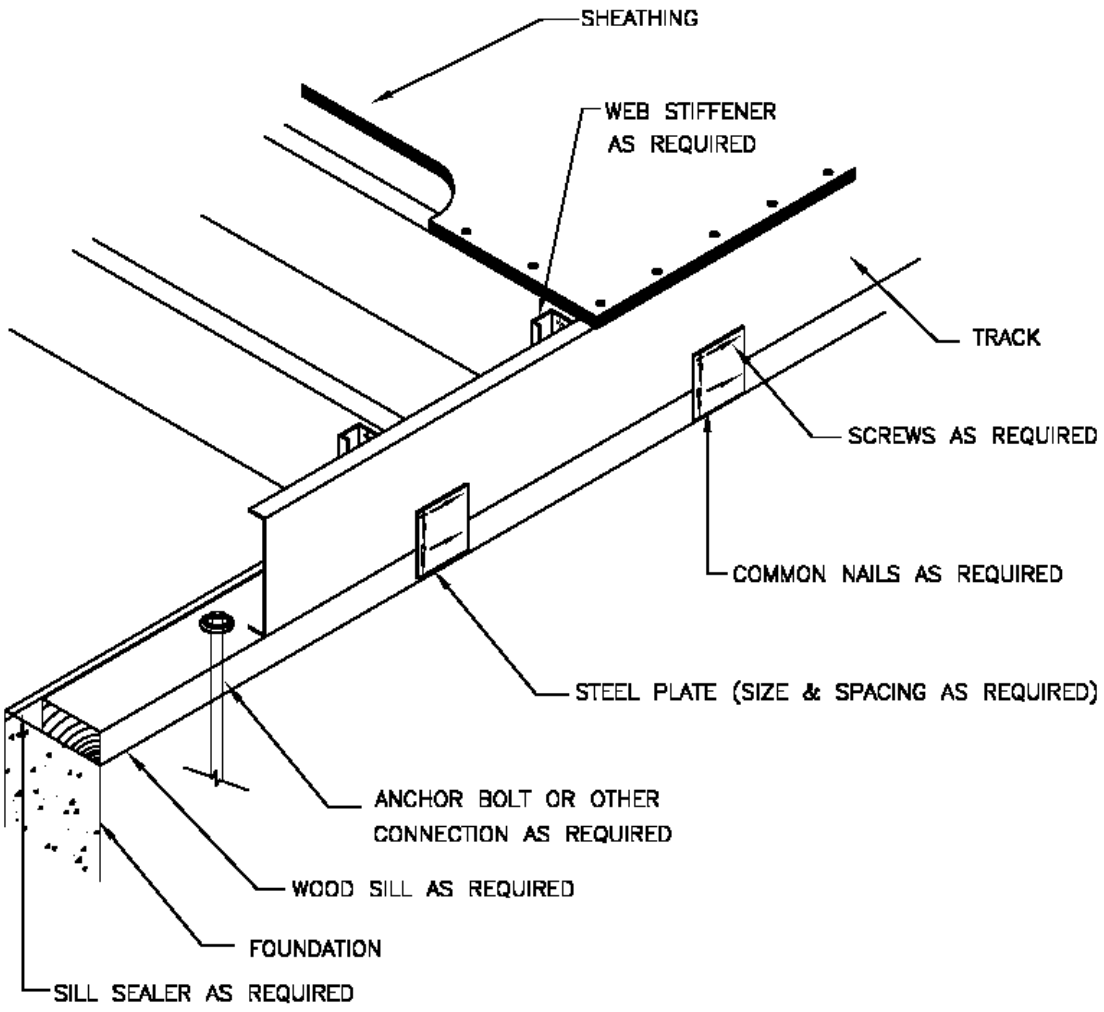
Floor to Wood Sill Connection



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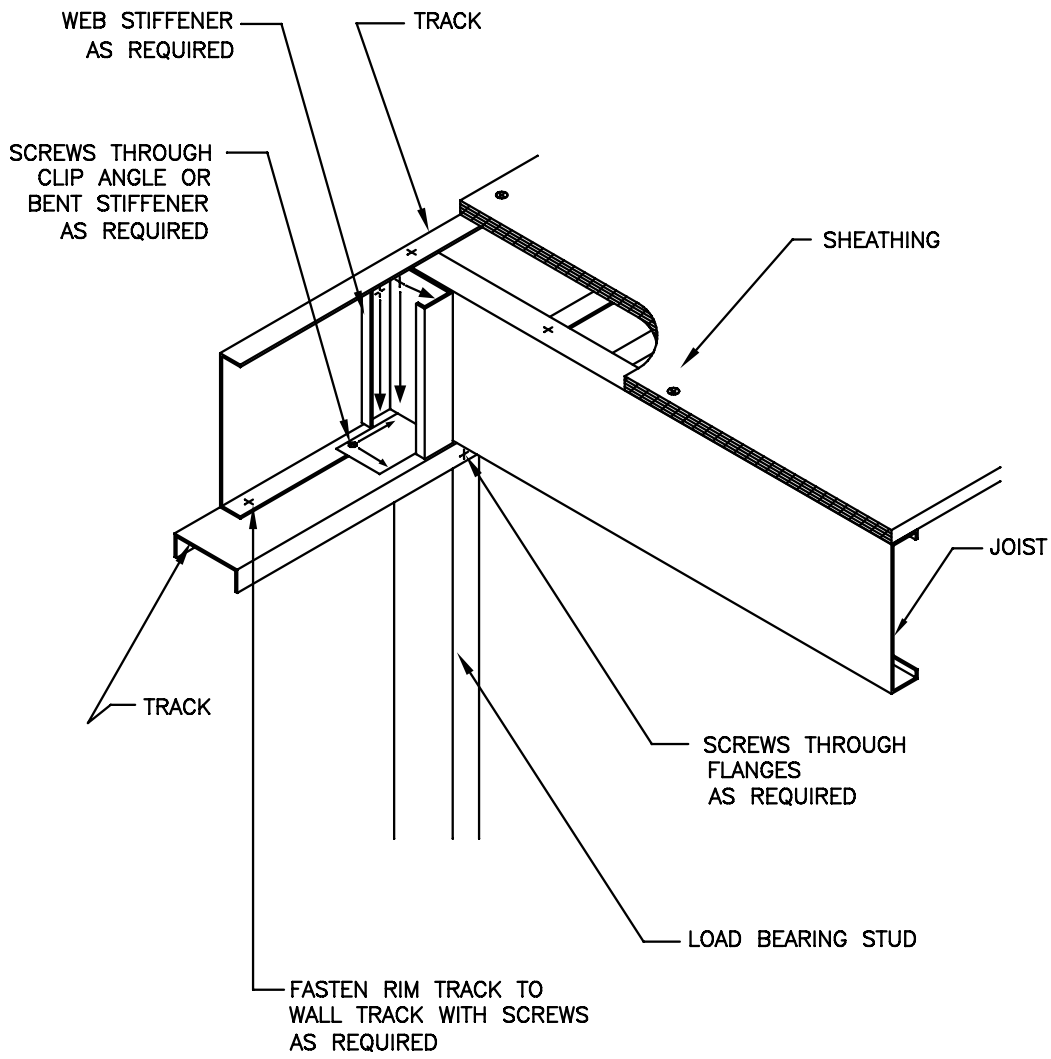
Floor to Load Bearing Wall Connection



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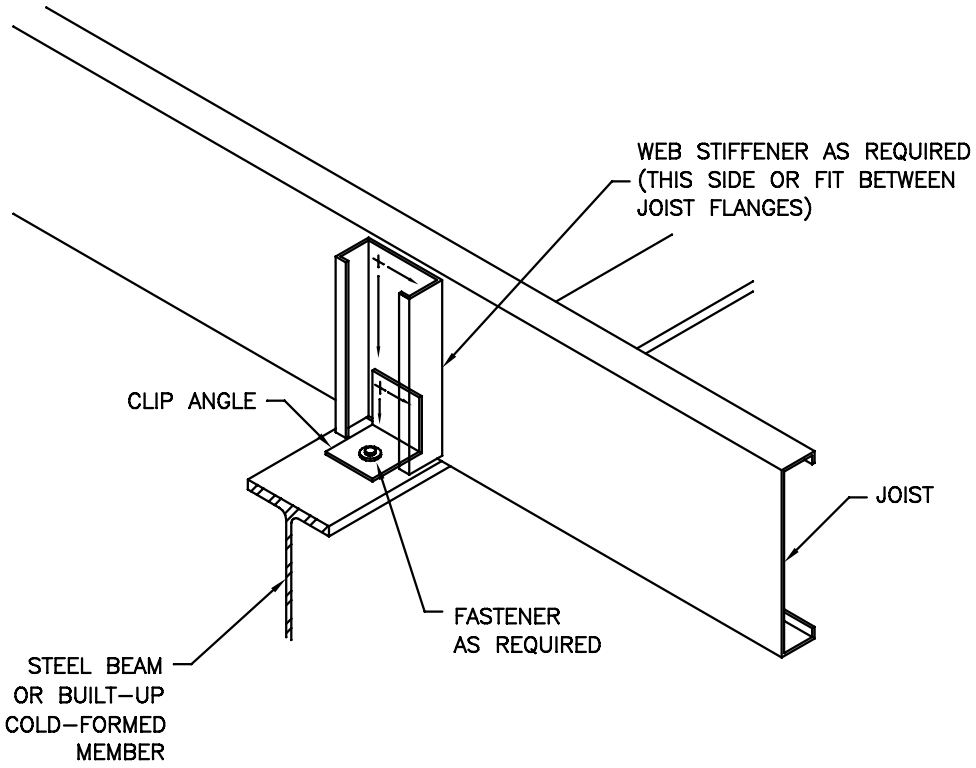
Floor Bearing on I-Beam Connection



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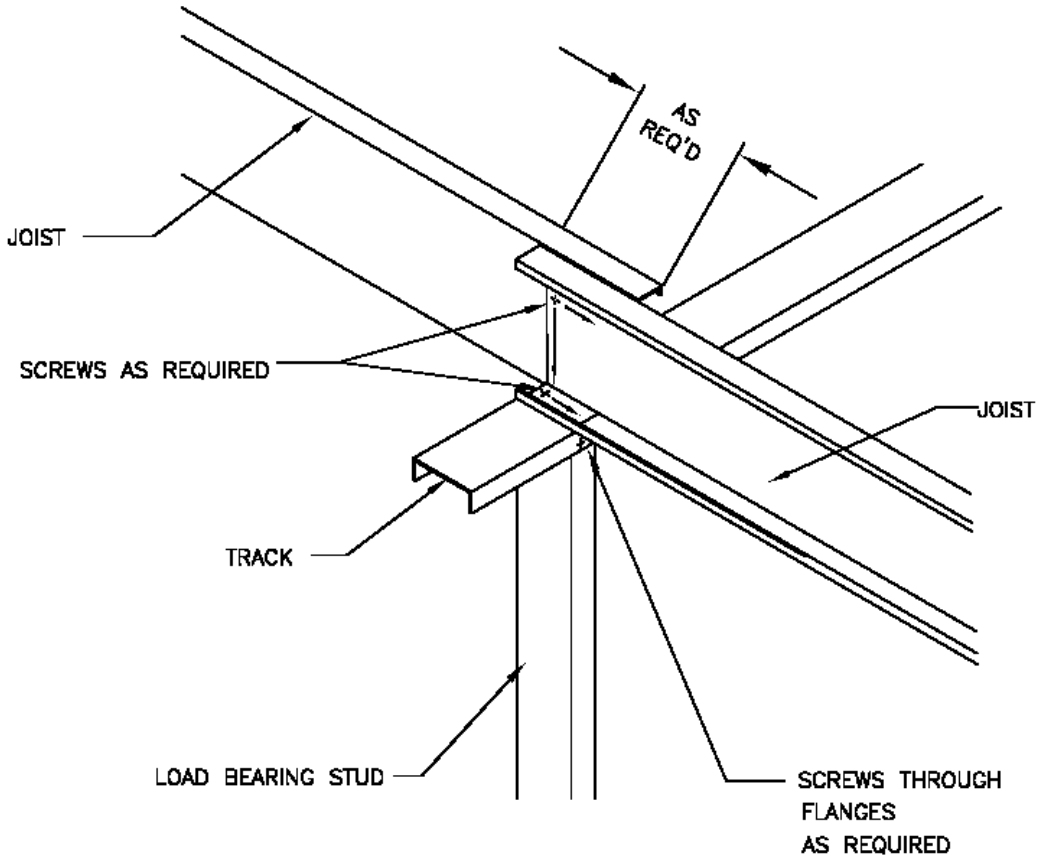
Lapped Joists



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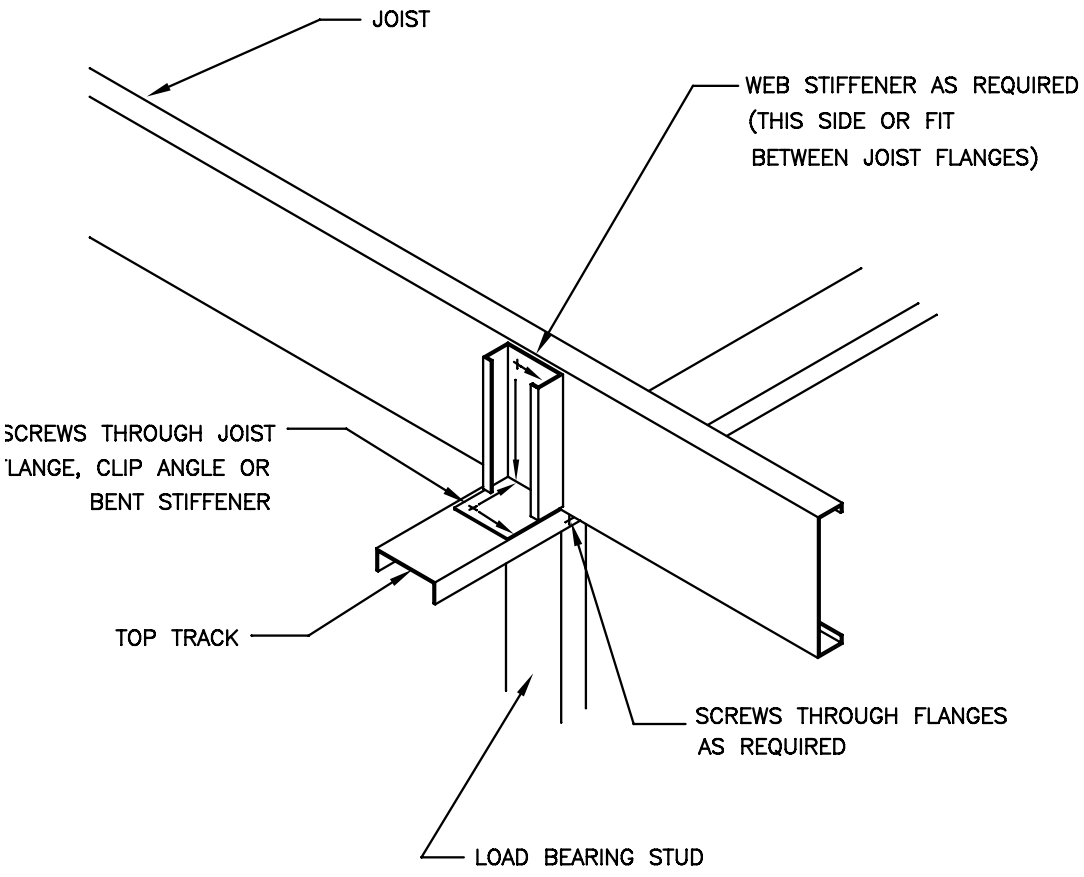
Continuous Joist



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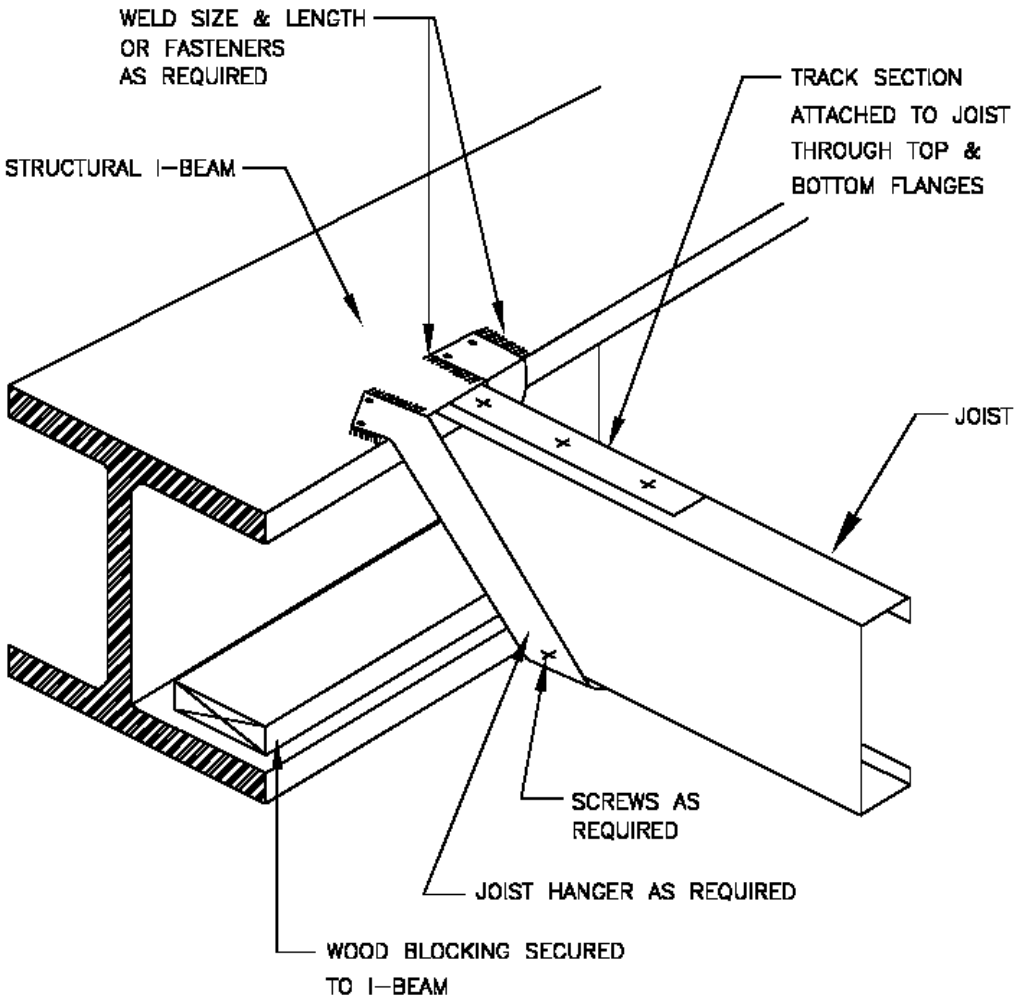
Floor to I-Beam Side Connection



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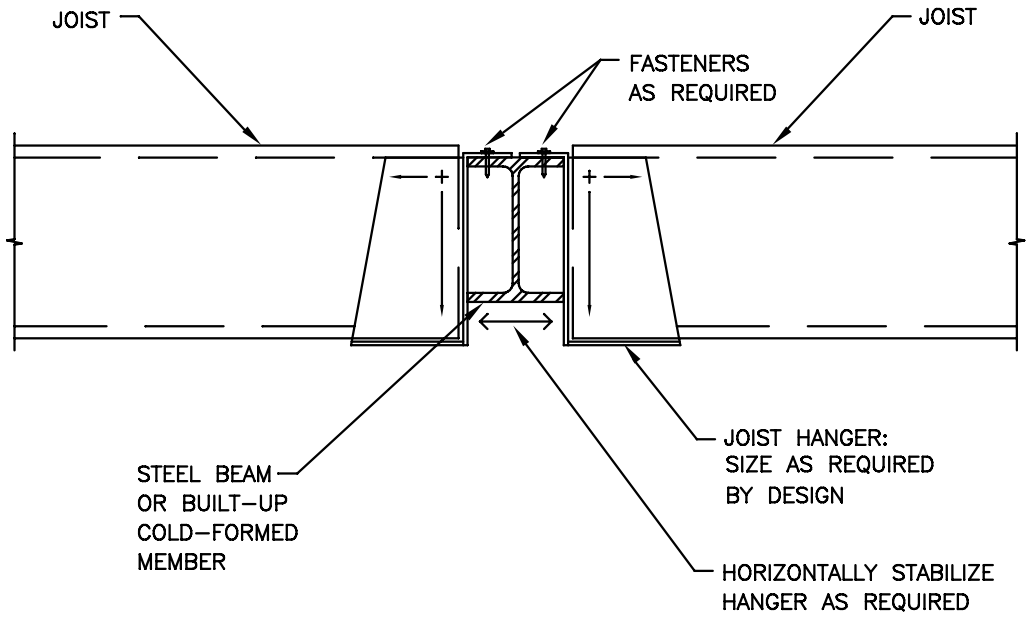
Joists Supported by Shallow I-Beam



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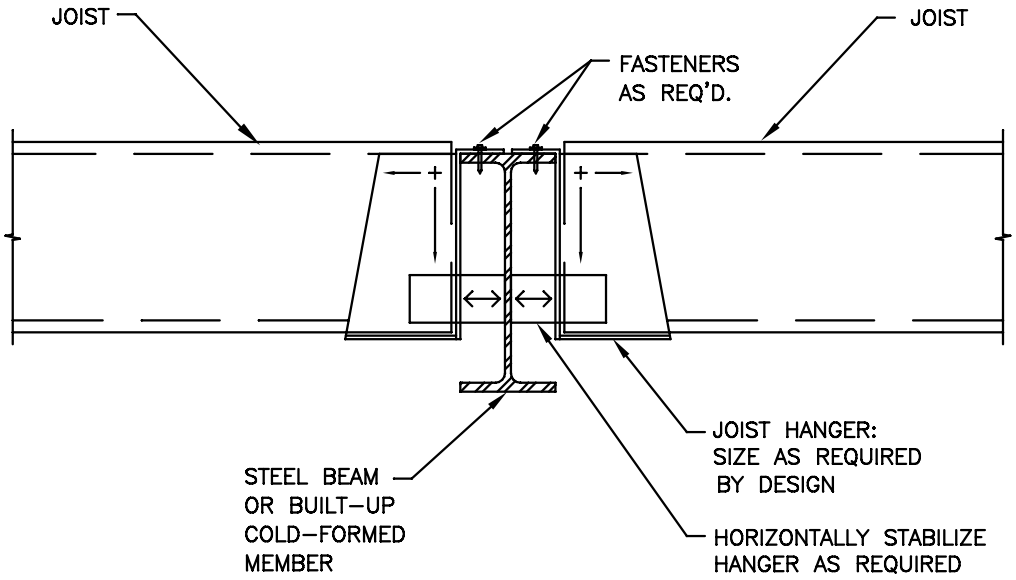
Joists Supported by Deep I-Beam



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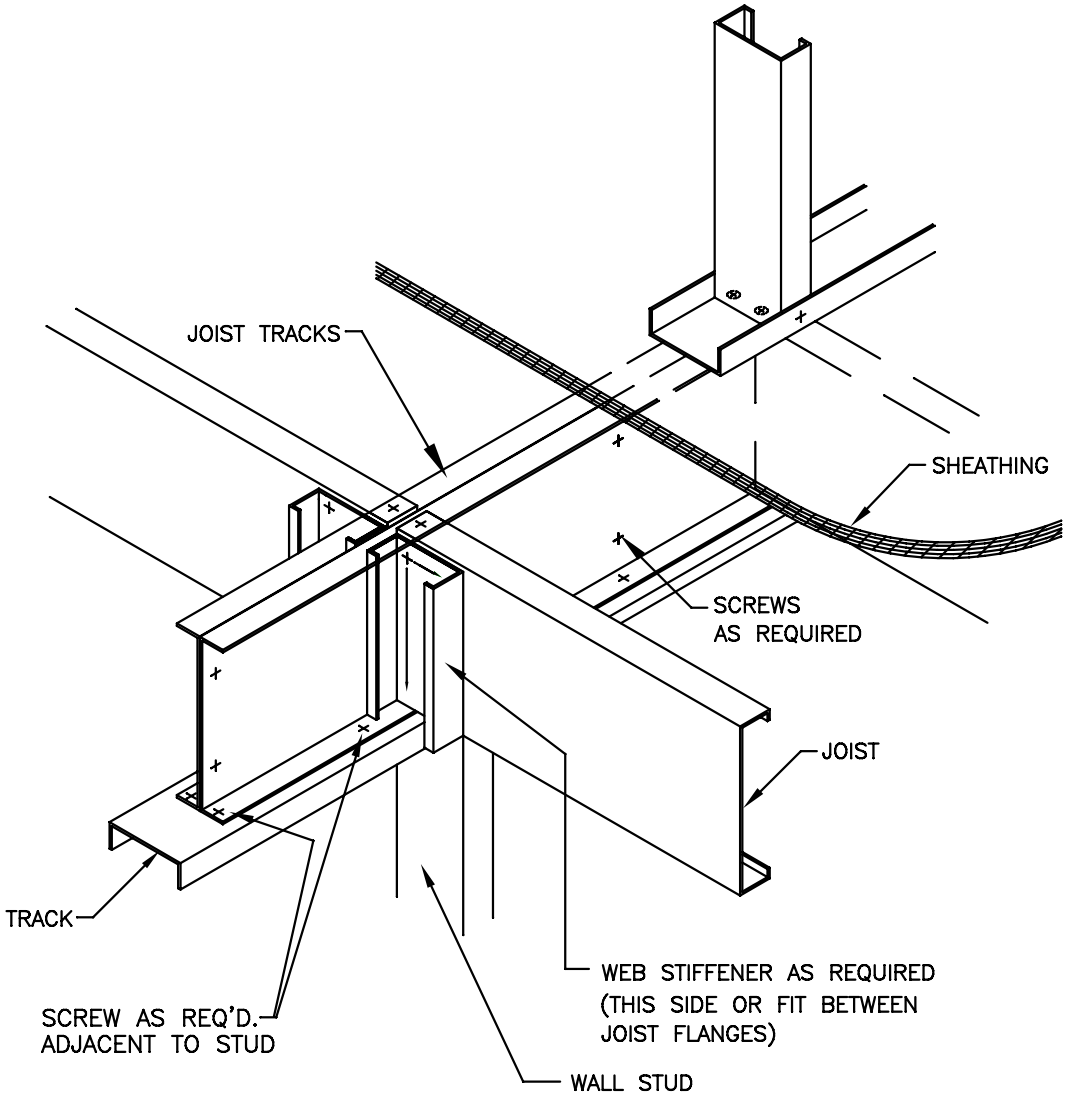
Floor Joists at Interior Bearing Wall



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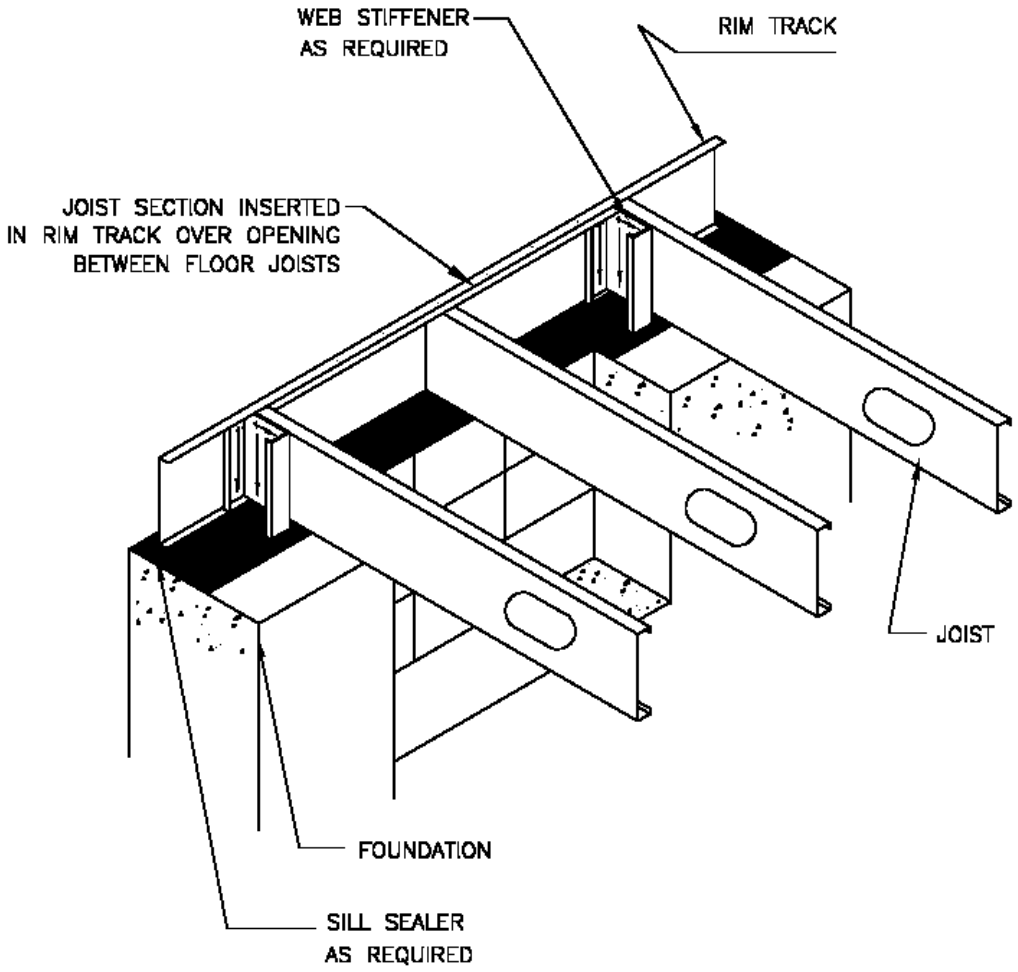
Joists Bearing on Foundation at Opening



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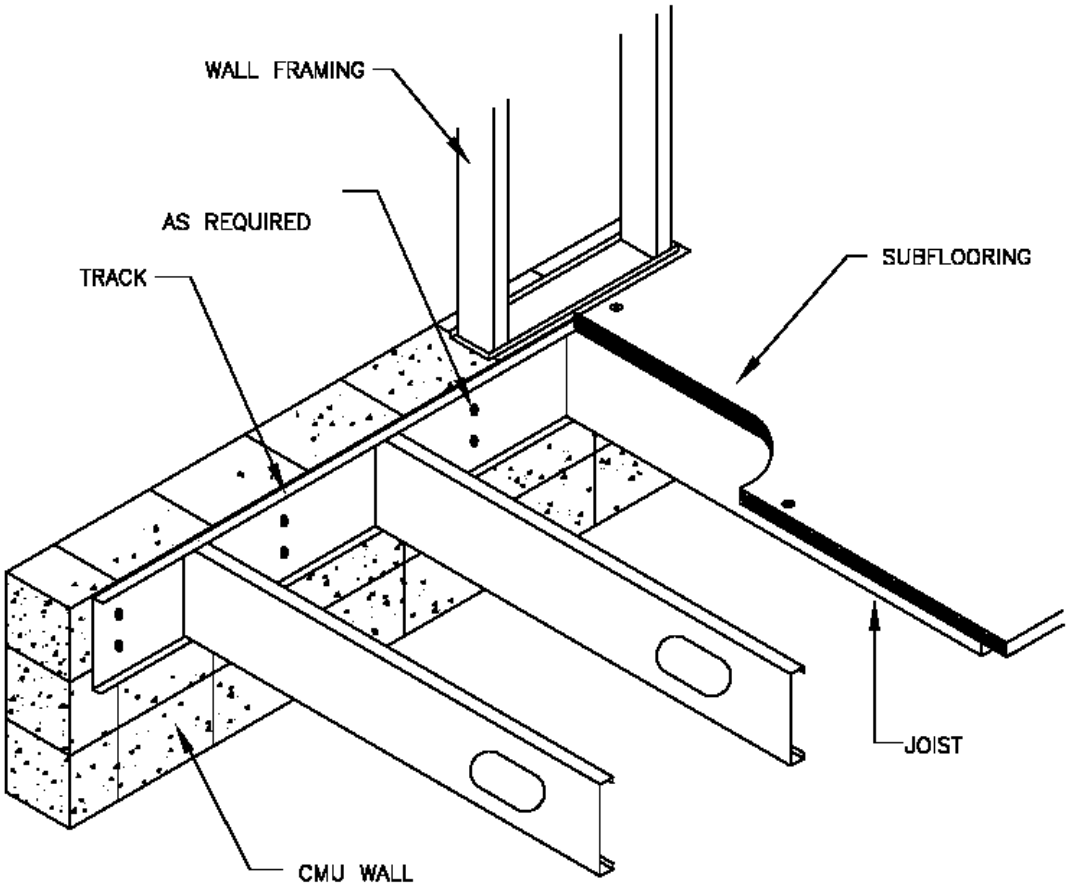
Floor to CMU Wall Side Connection



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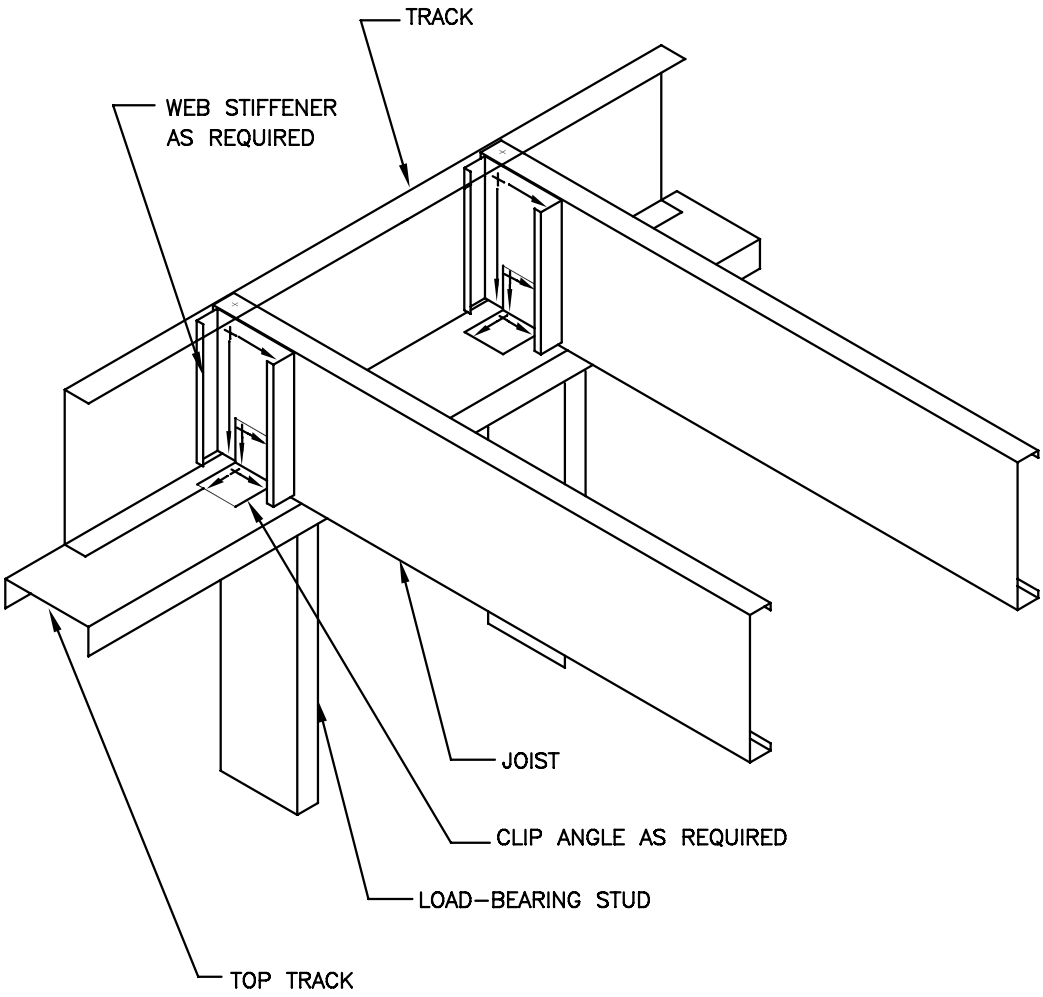
Web Stiffener at Load Bearing Wall



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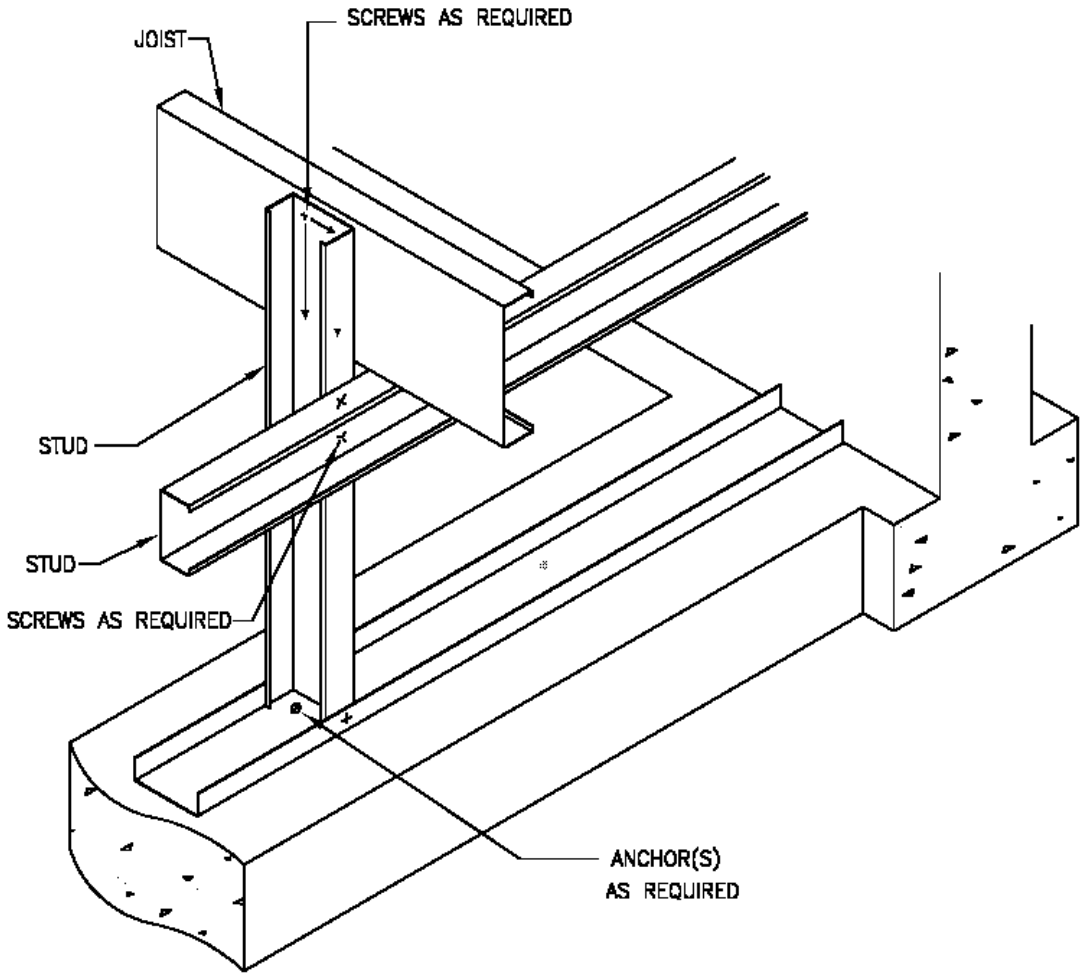
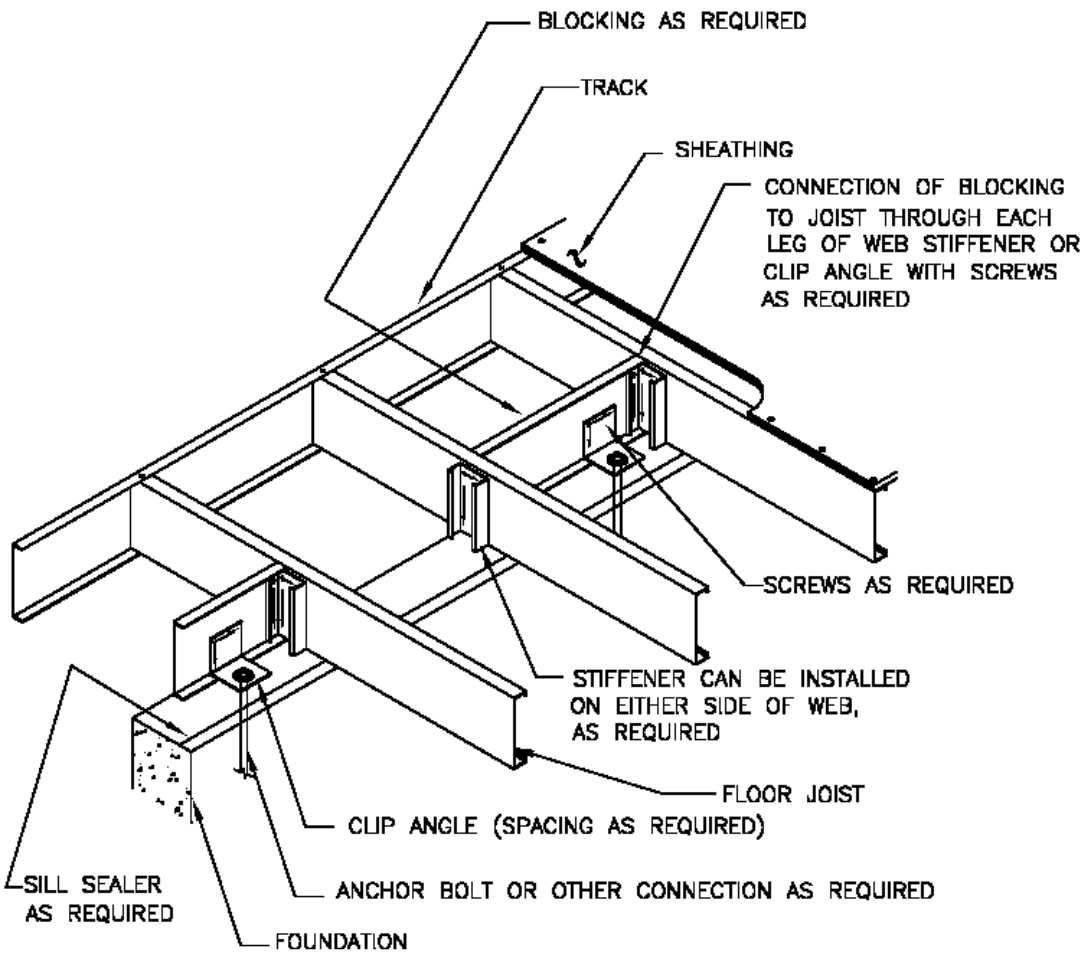
Alternate Pony Wall Detail



Detail F16
Cantilevered Joist to Foundation Connection



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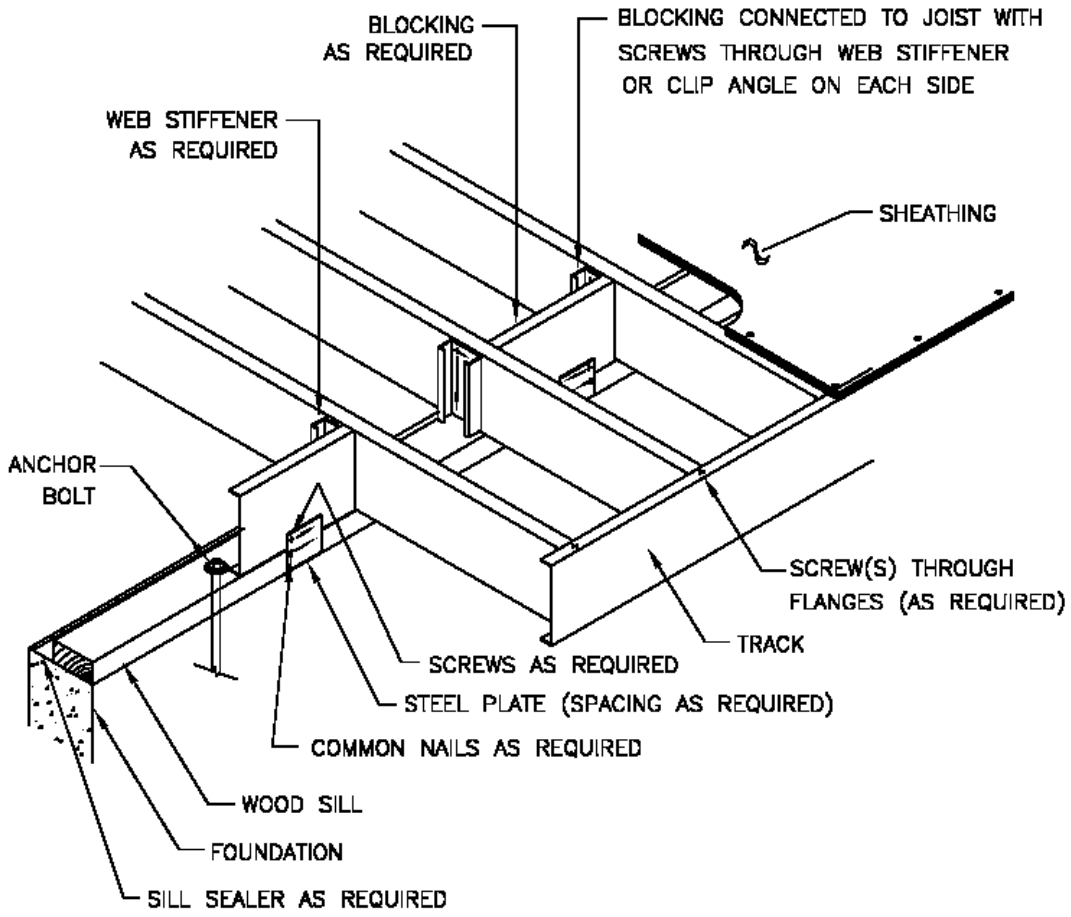
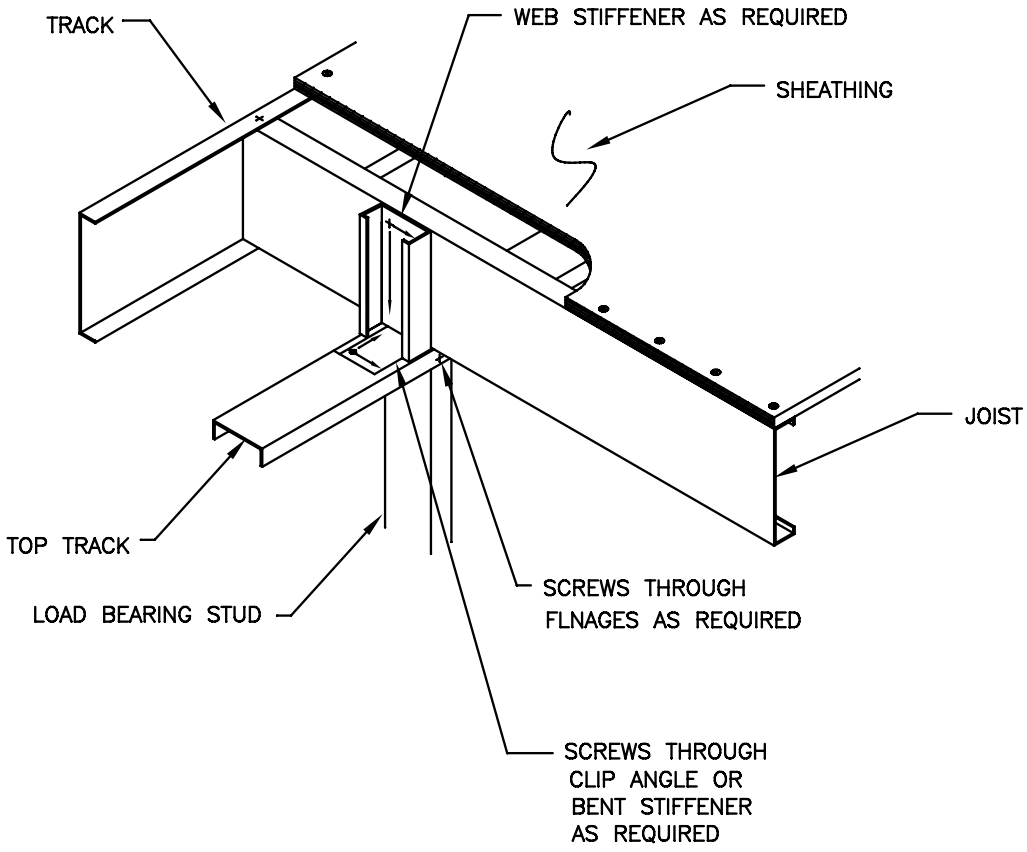
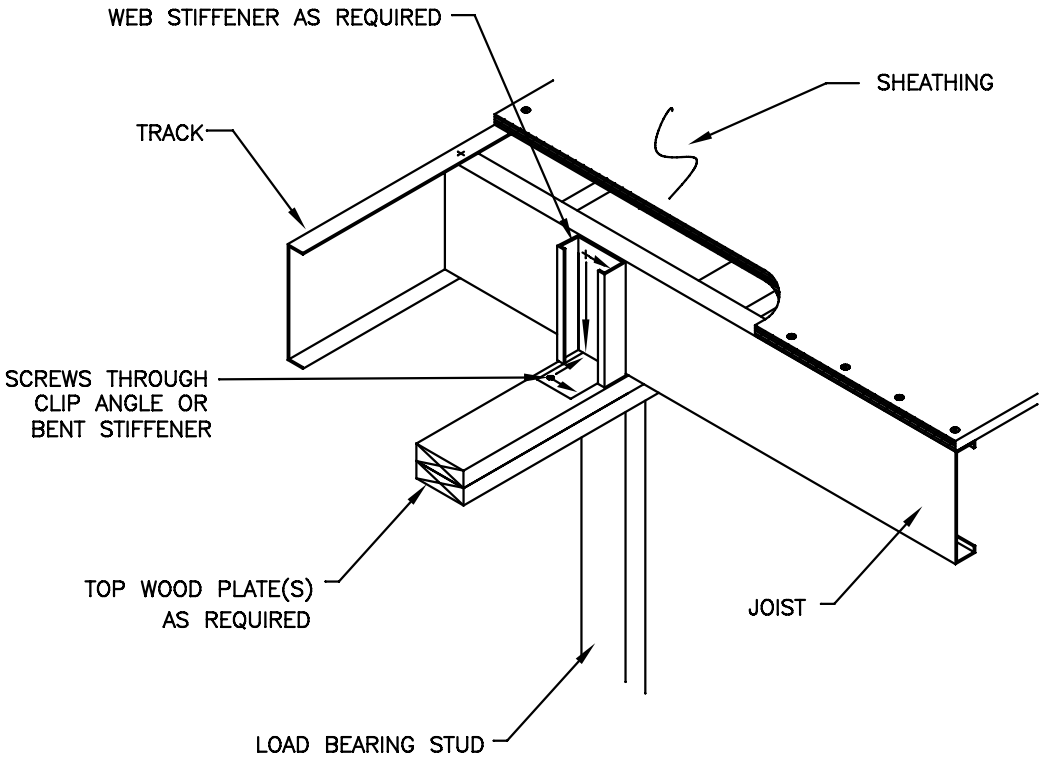
Cantilevered Joist to Wood Sill Connection



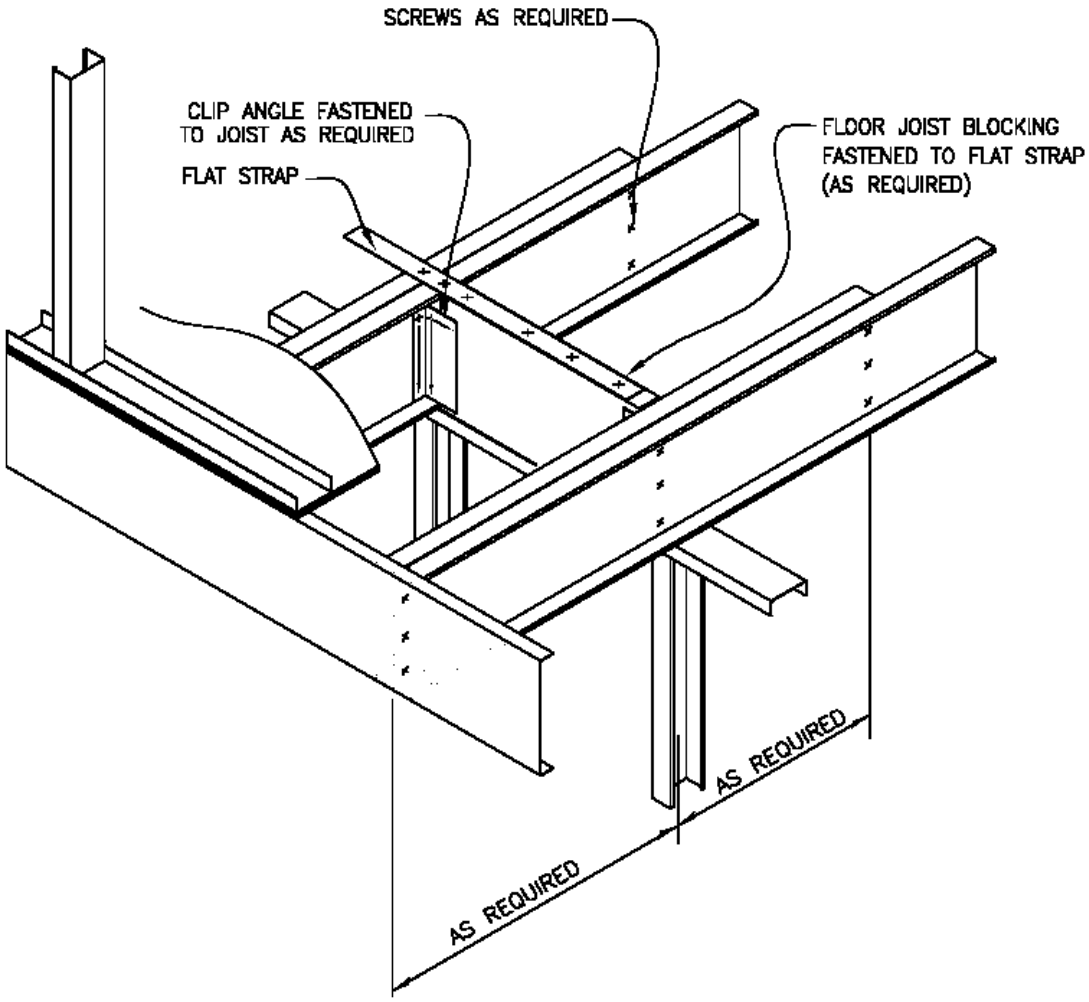
Detail F18
Cantilevered Joist to Bearing Wall Connection



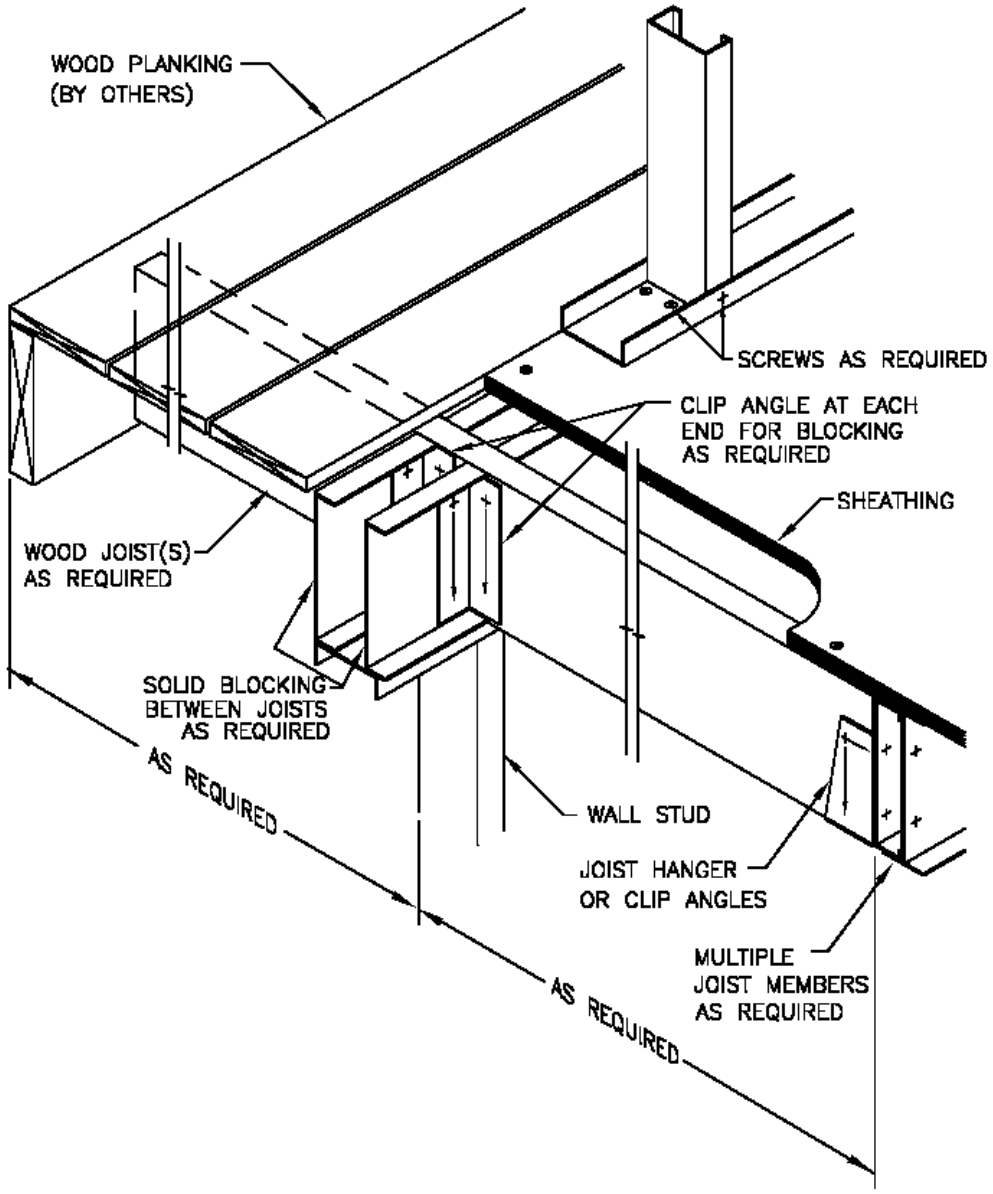
Detail F19
Cantilevered Joist to Wood Top Plate Connection



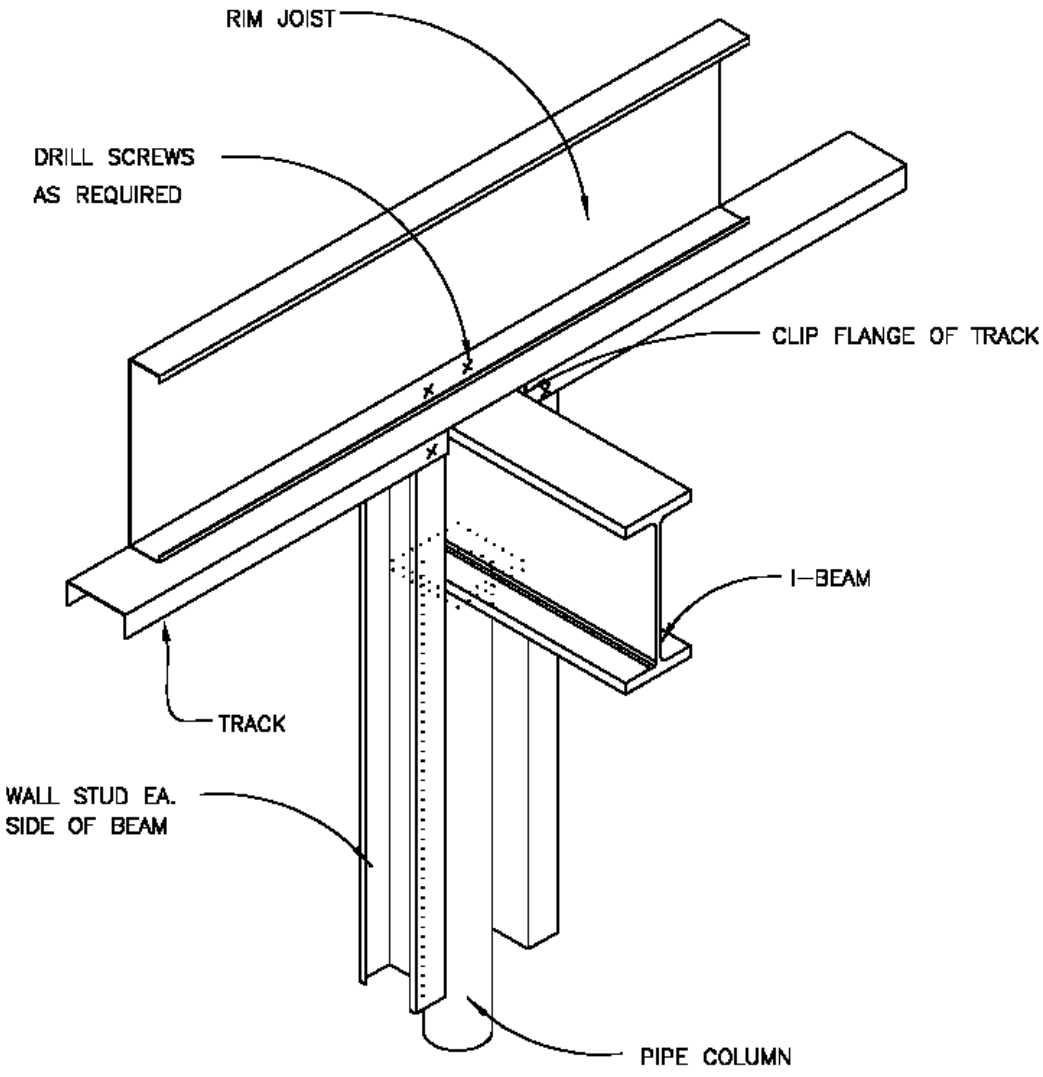
Detail F20
Double Cantilevered Joists



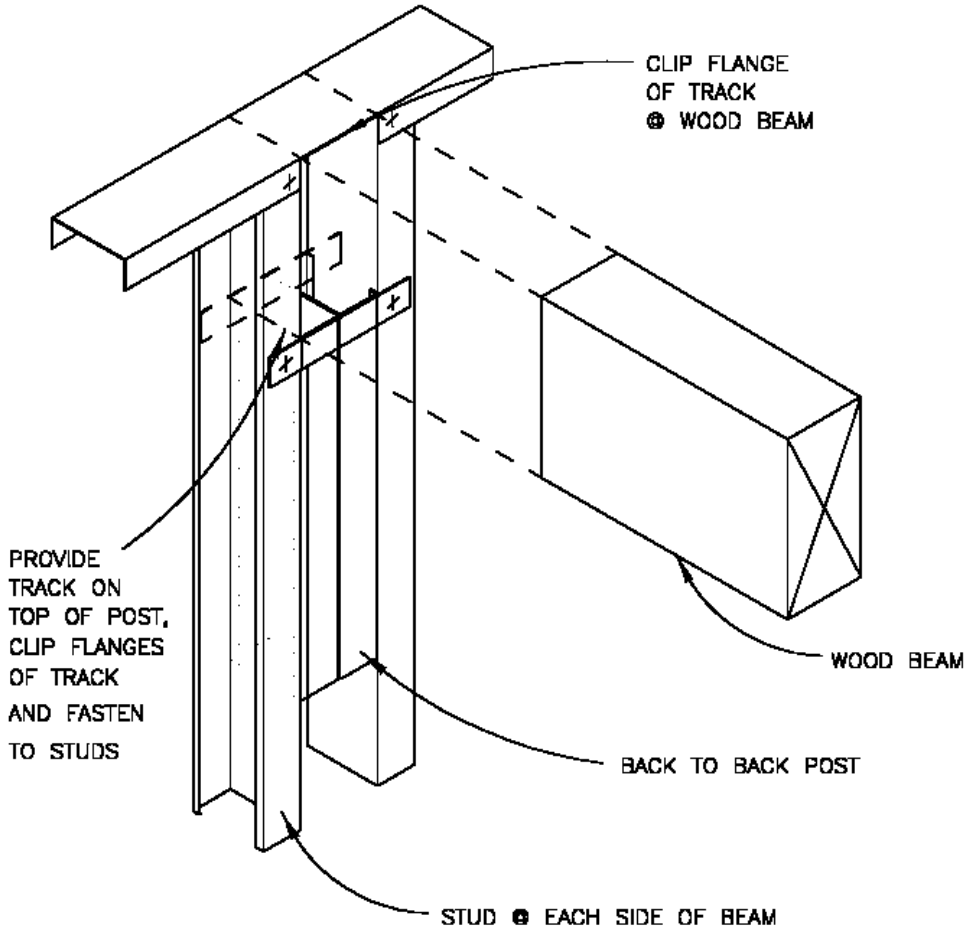
Detail F21
Wood Deck Balcony



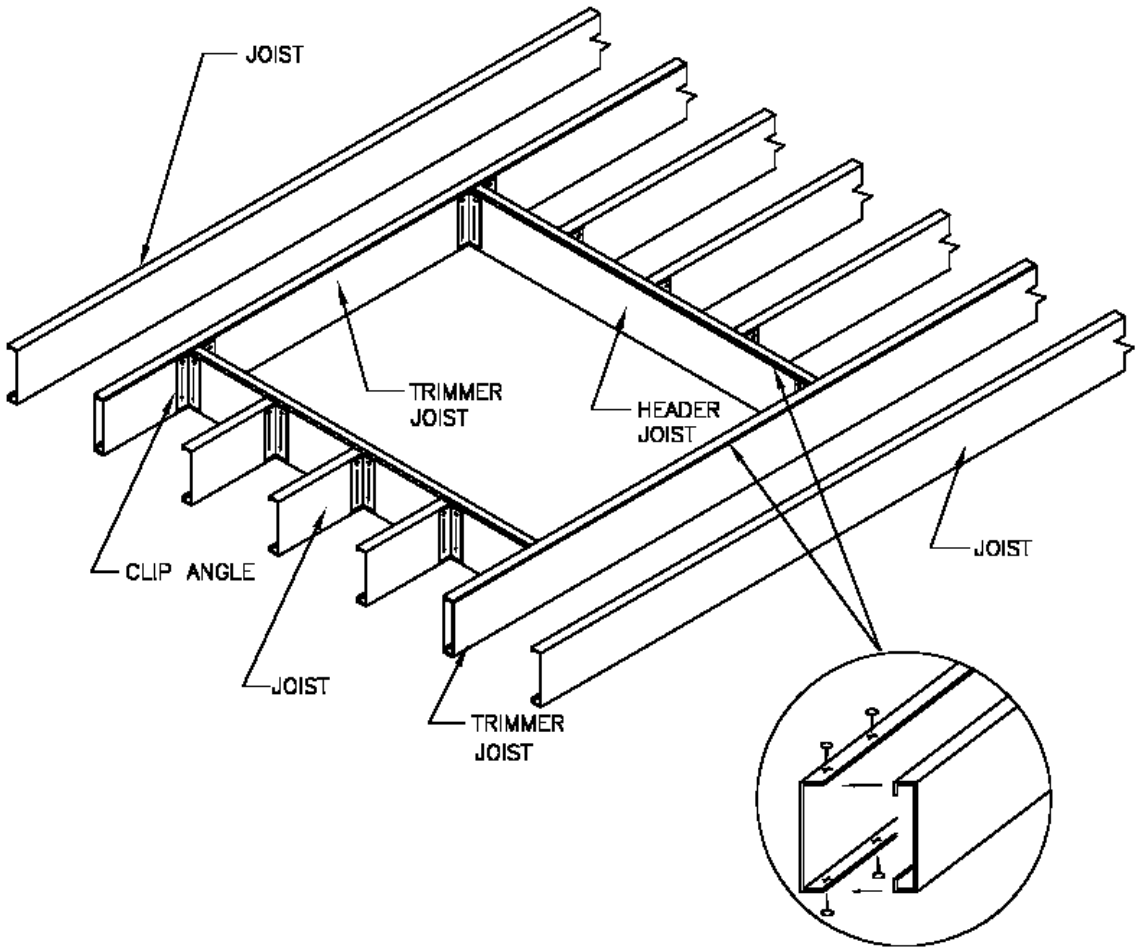
Detail F22
Beam Support with Column



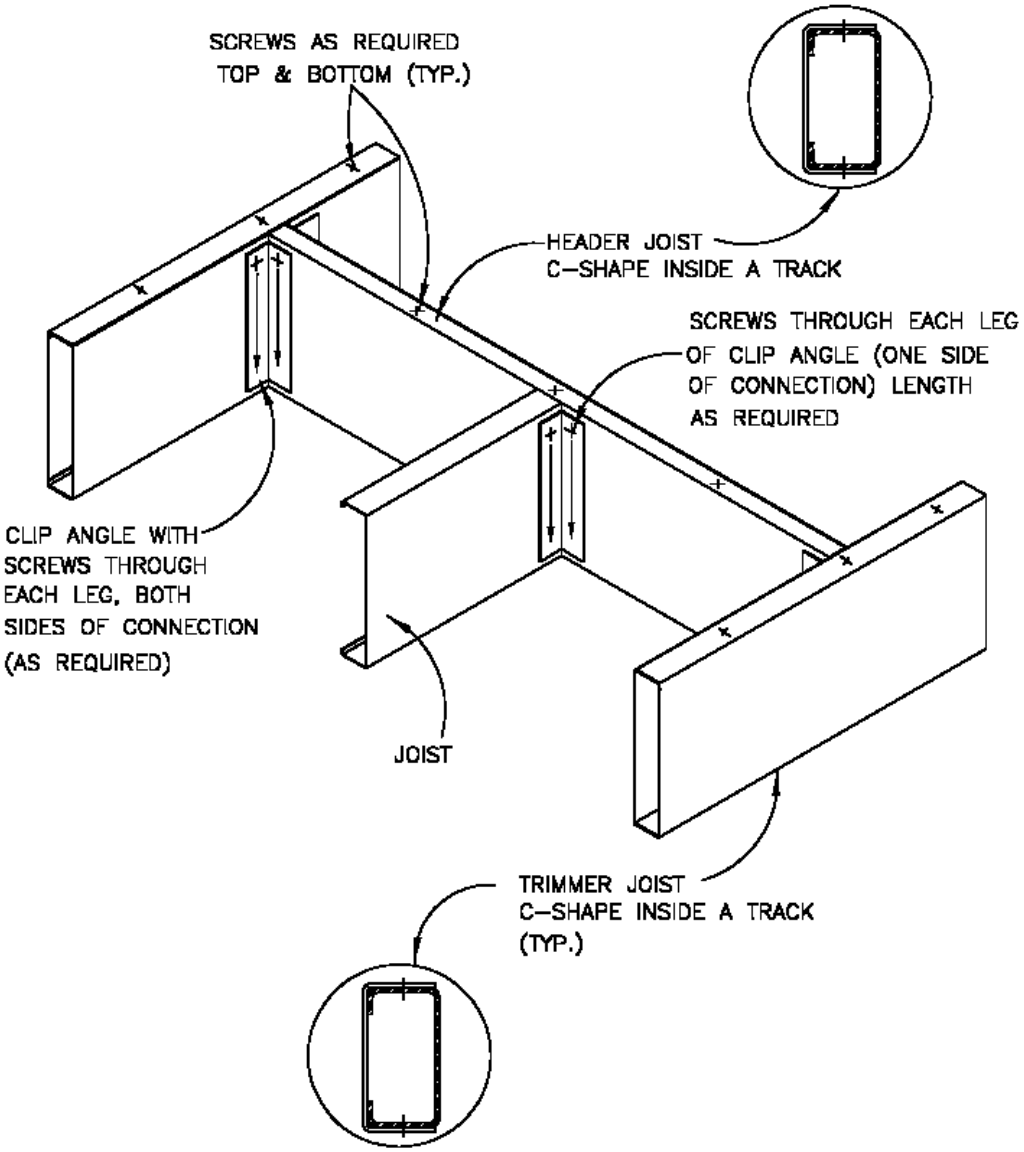
Detail F23
Beam Support



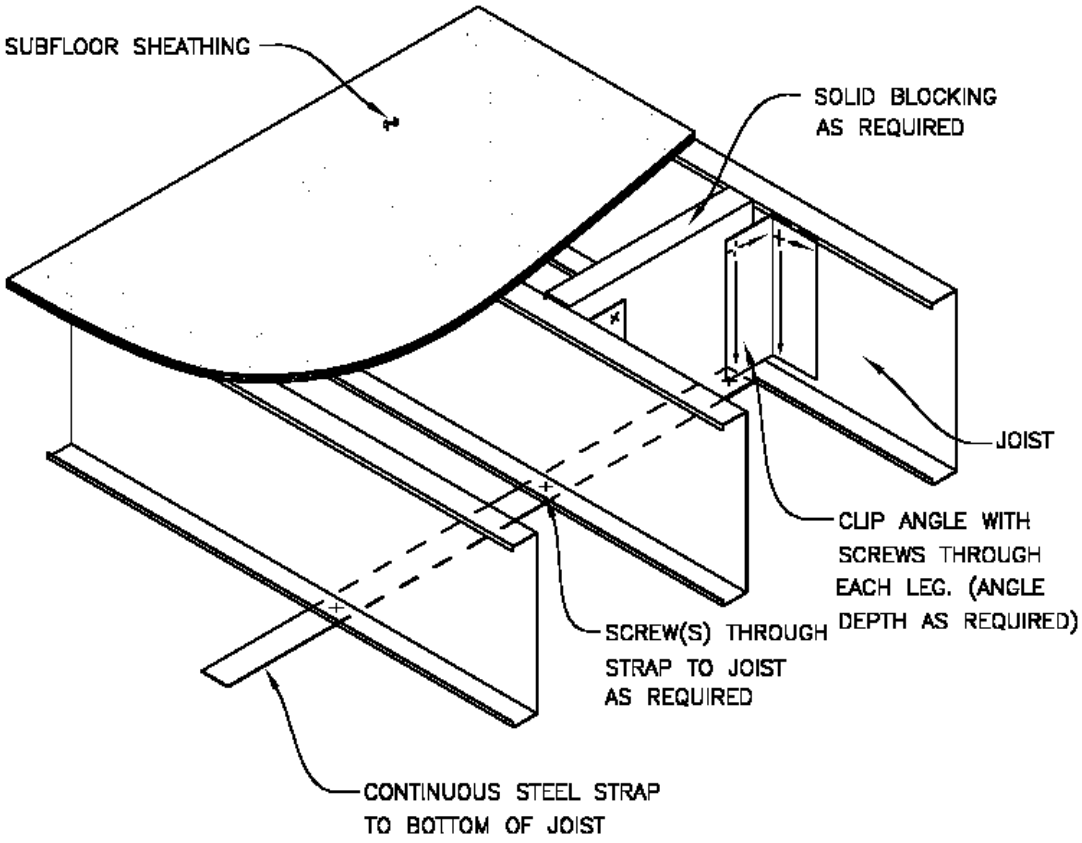
Detail F24
Floor Opening Detail



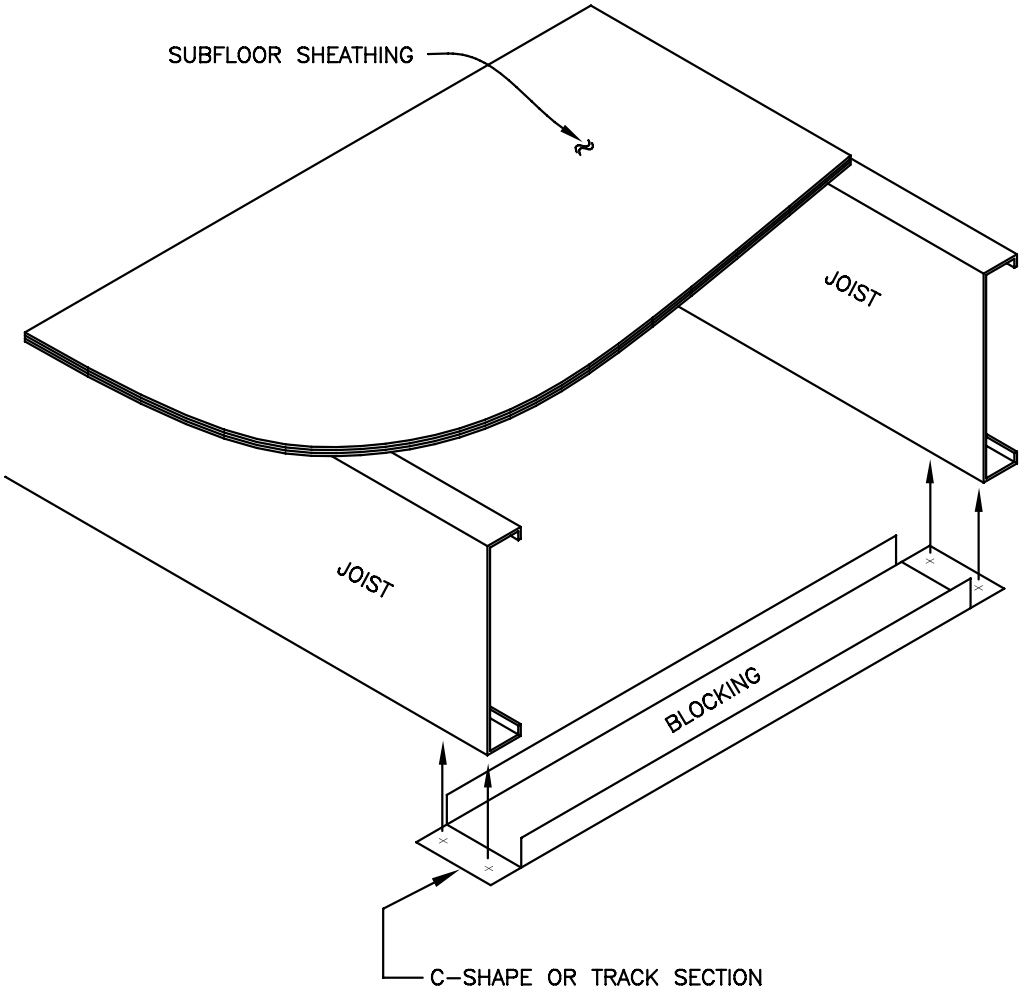
Detail F25
Floor Header and Trimmer Detail



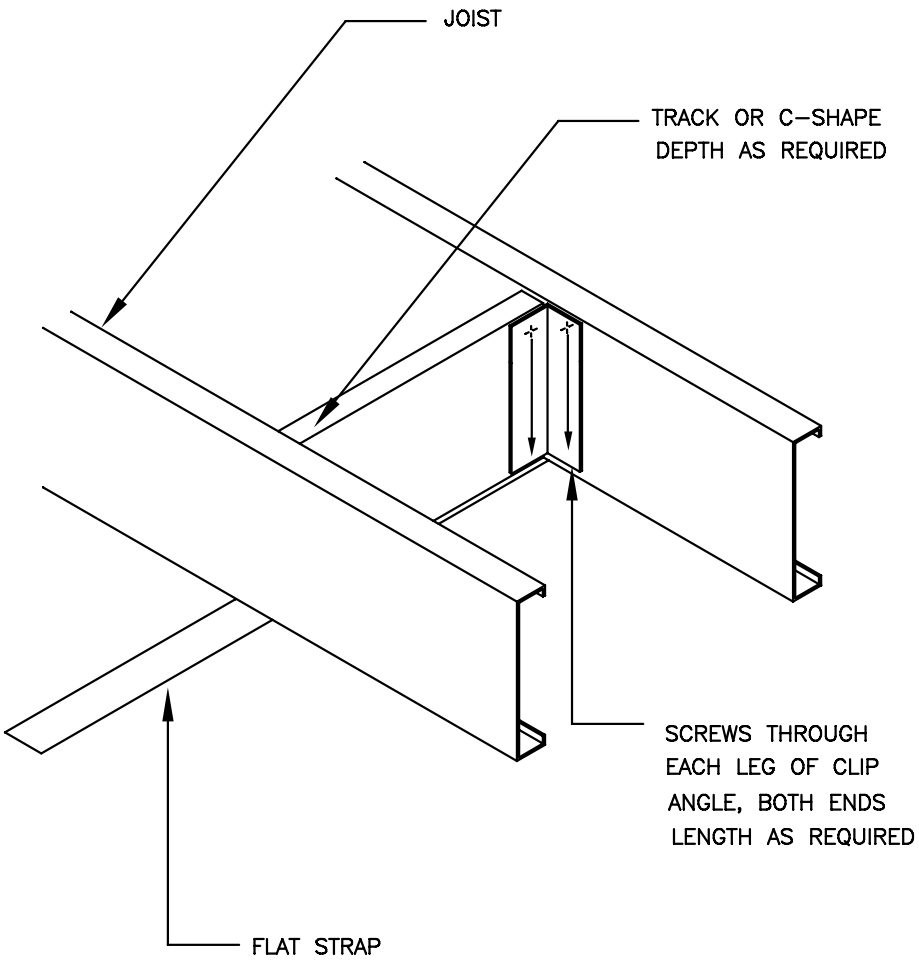
Detail F26
Floor Blocking Detail 1



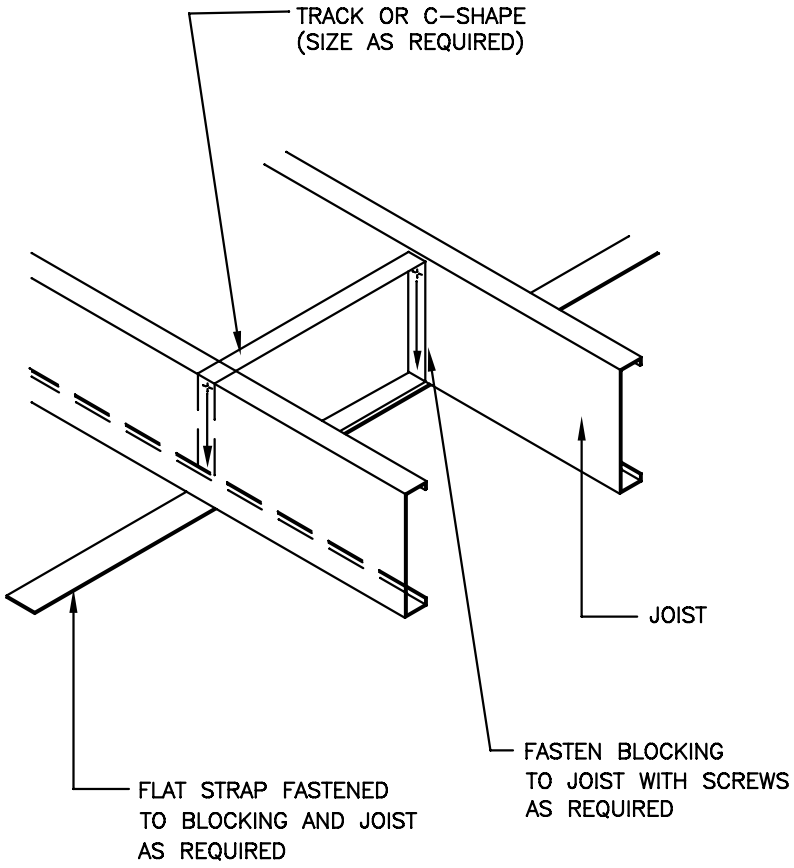
Detail F27
Floor Blocking Detail 2



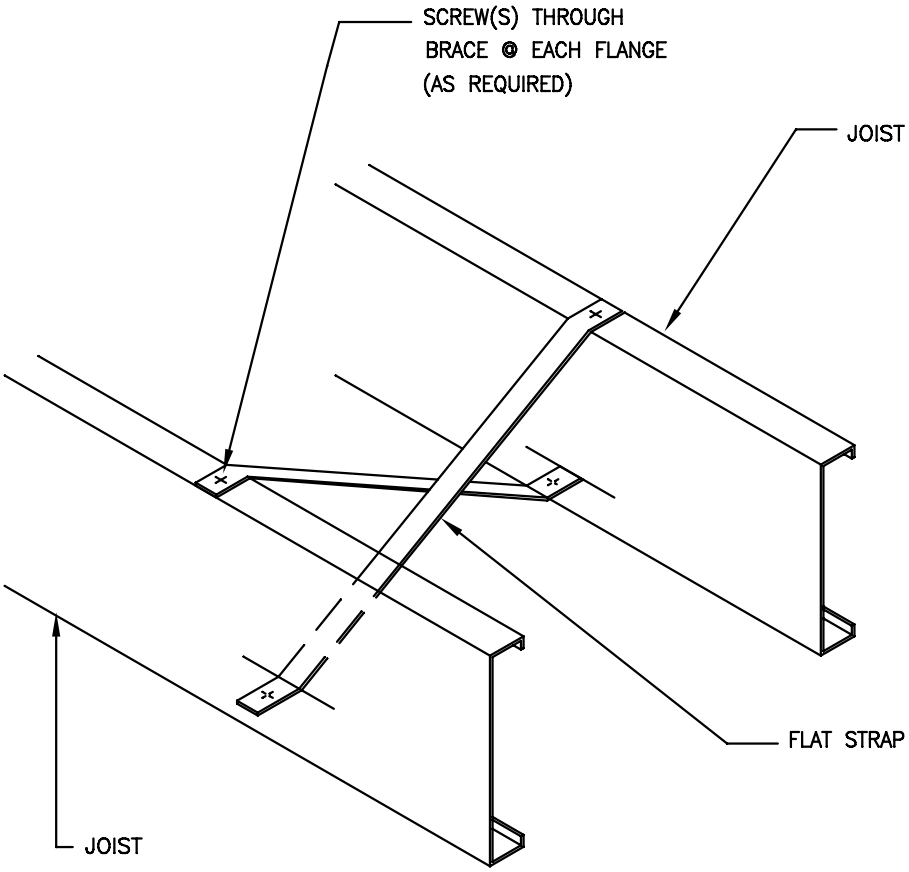
Detail F28
Floor Blocking Detail 3



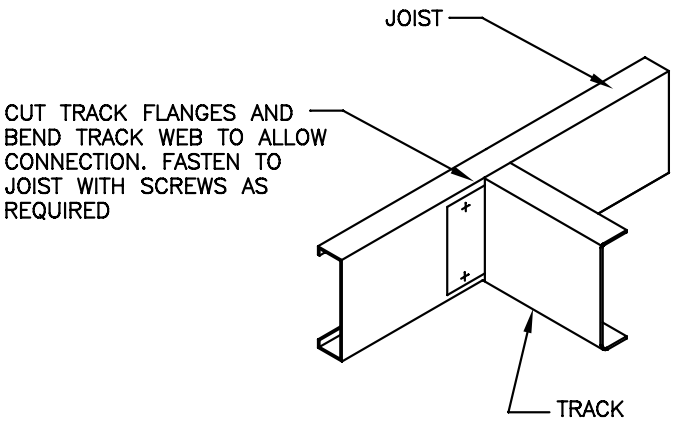
Detail F29
Floor Blocking Detail 4

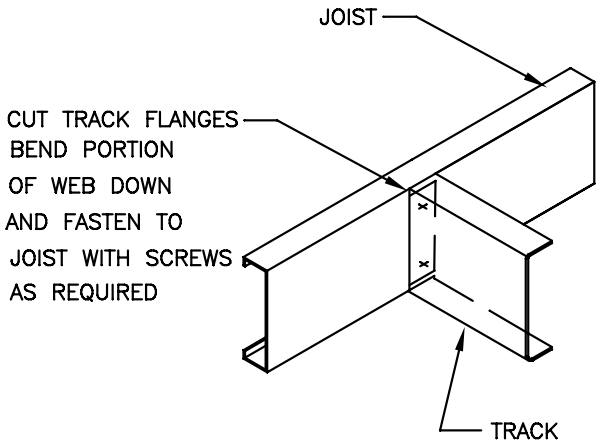


Detail F30
X-Bracing Detail

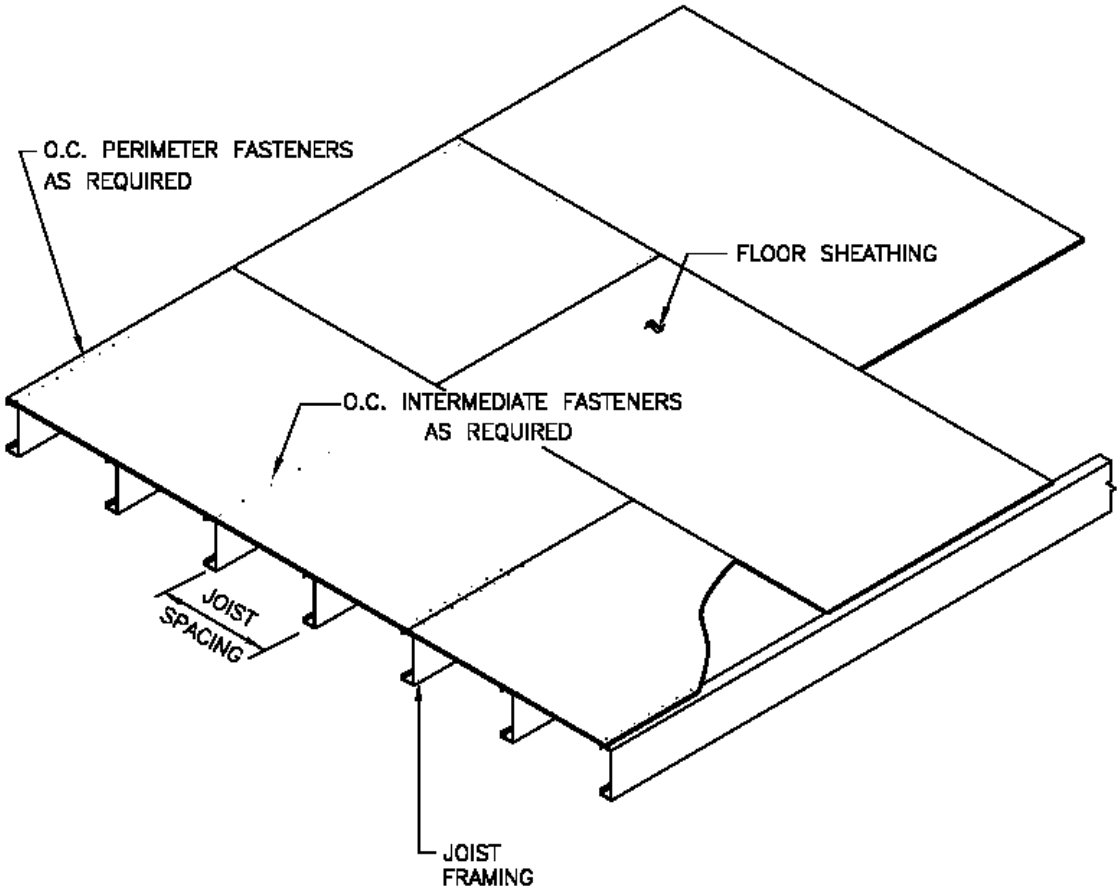


Detail F31
Blocking Connection Detail

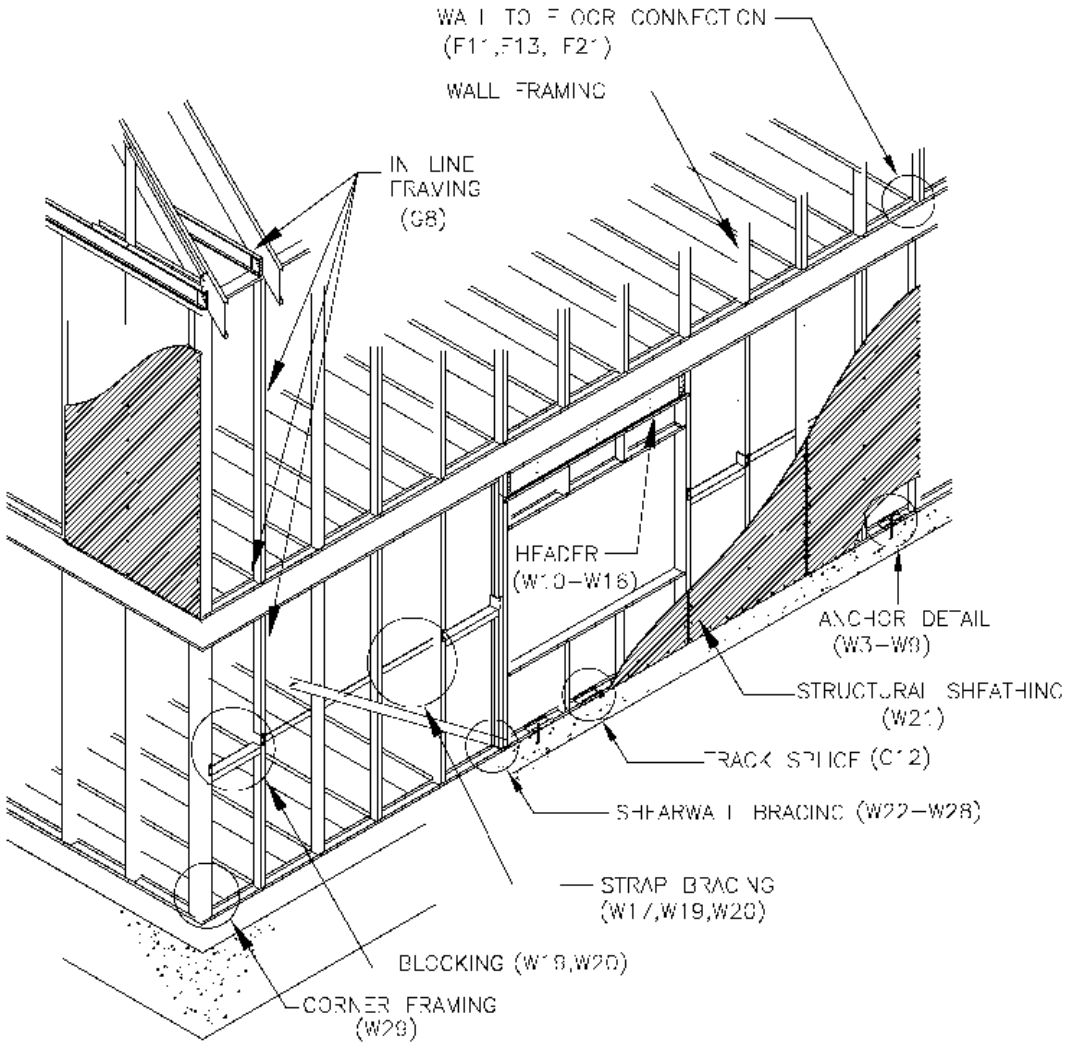




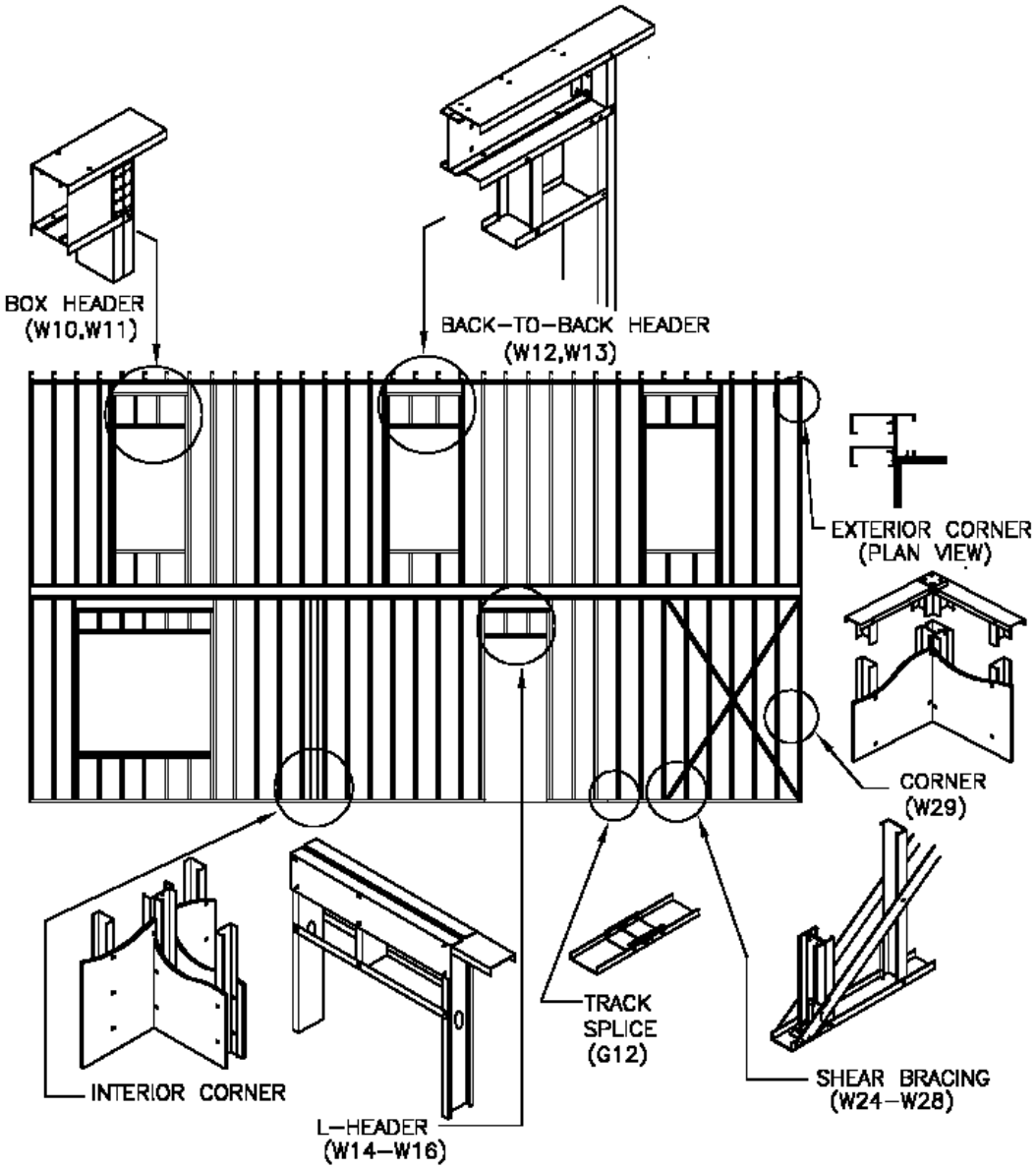
Detail F32
Floor Sheathing Connection Detail



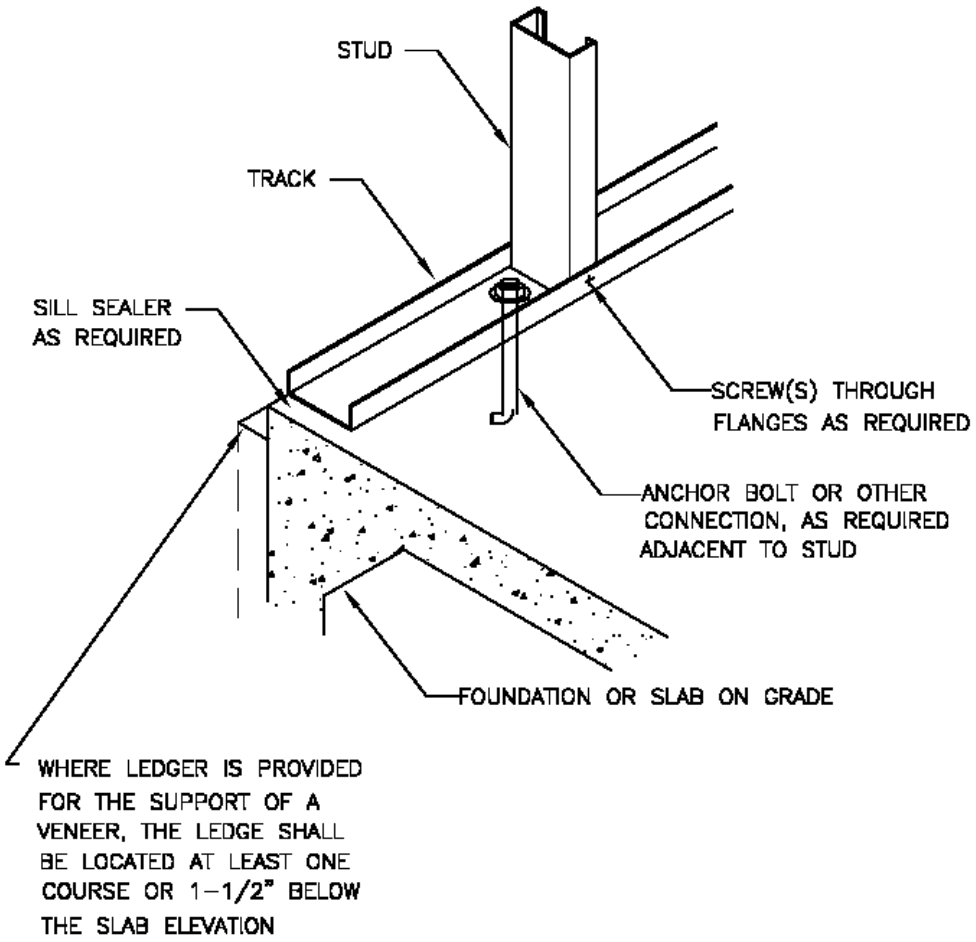
Detail W1
Wall Framing



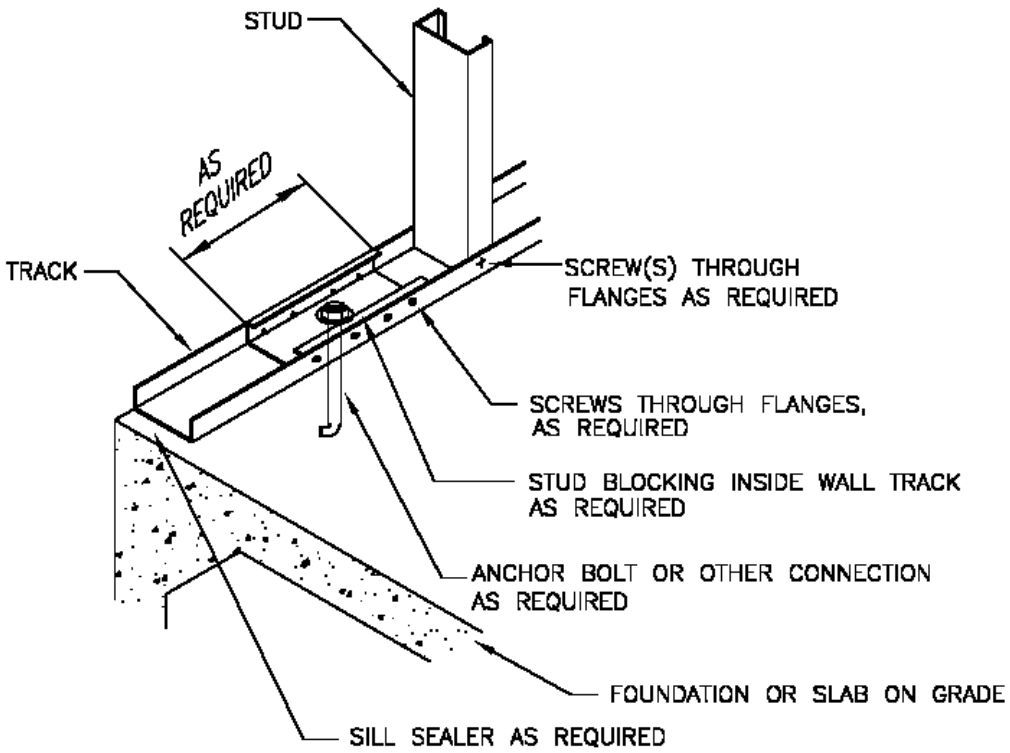
Detail W2
Wall Framing Elevation



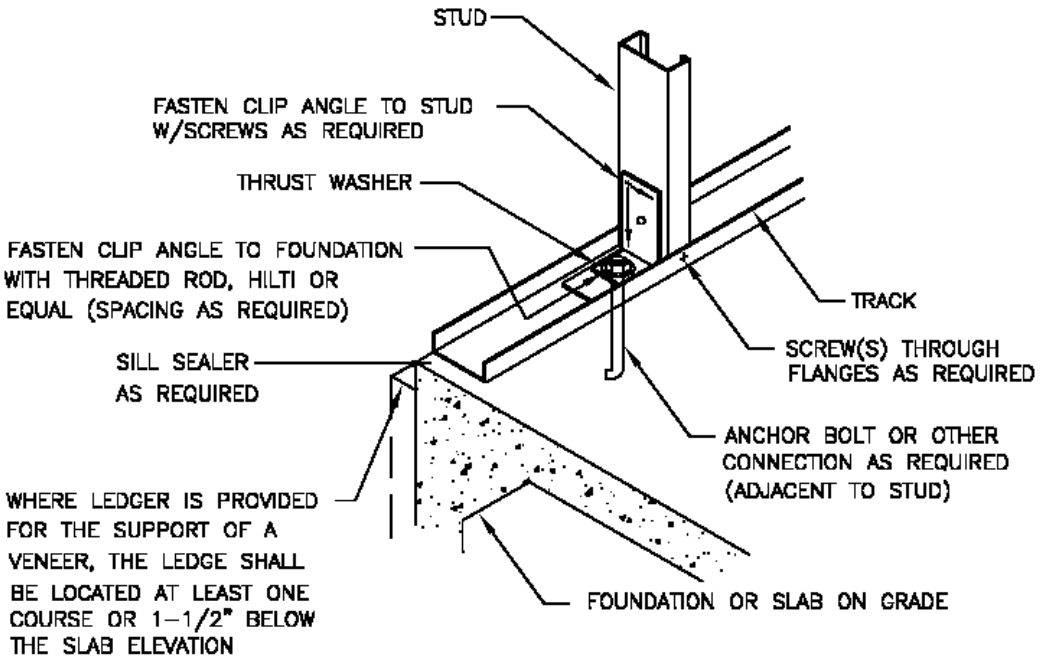
Detail W3
Wall to Foundation/Slab on Grade Connection 1



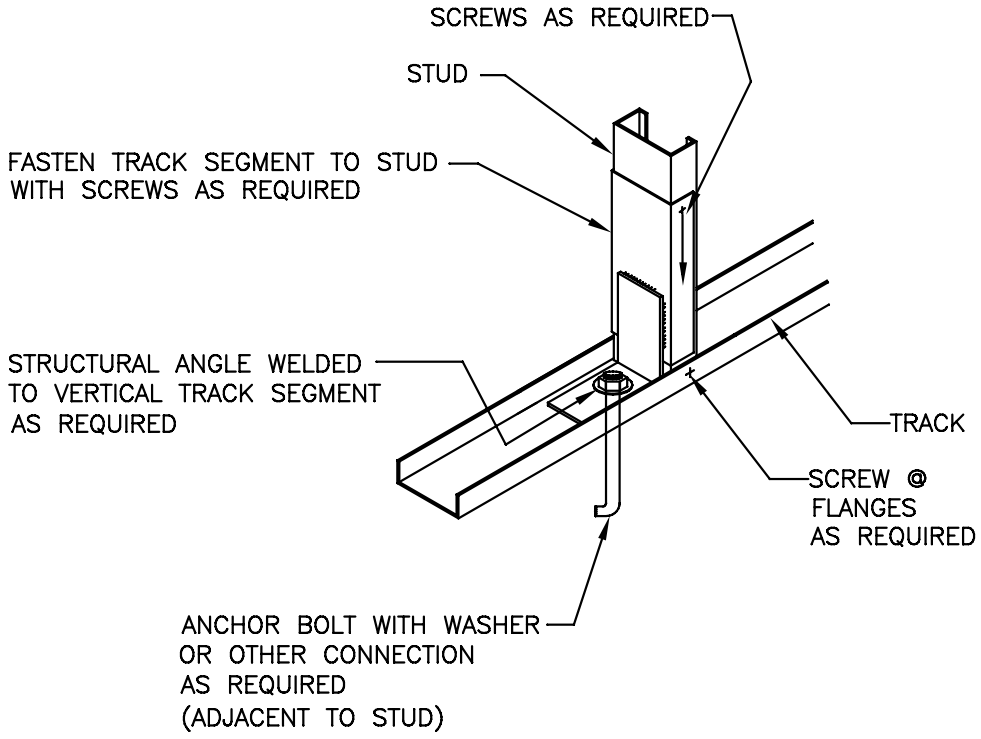
Detail W4
Wall to Foundation/Slab on Grade Connection 2



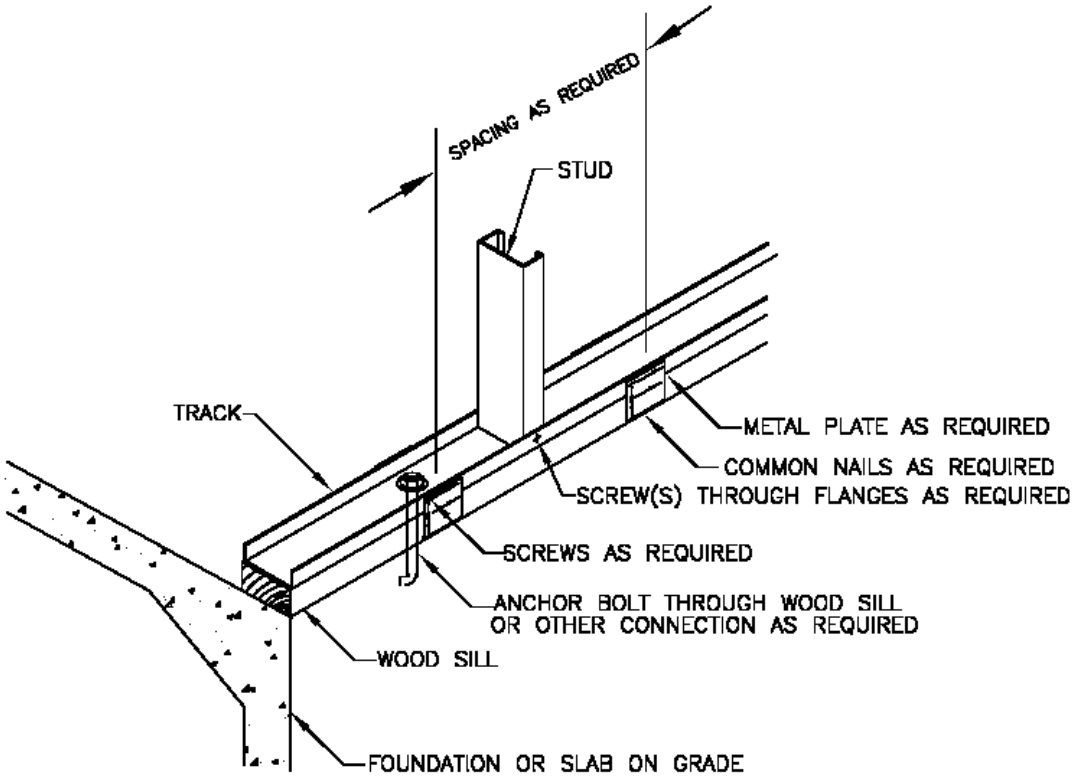
Detail W5
Wall to Foundation/Slab on Grade Connection 3



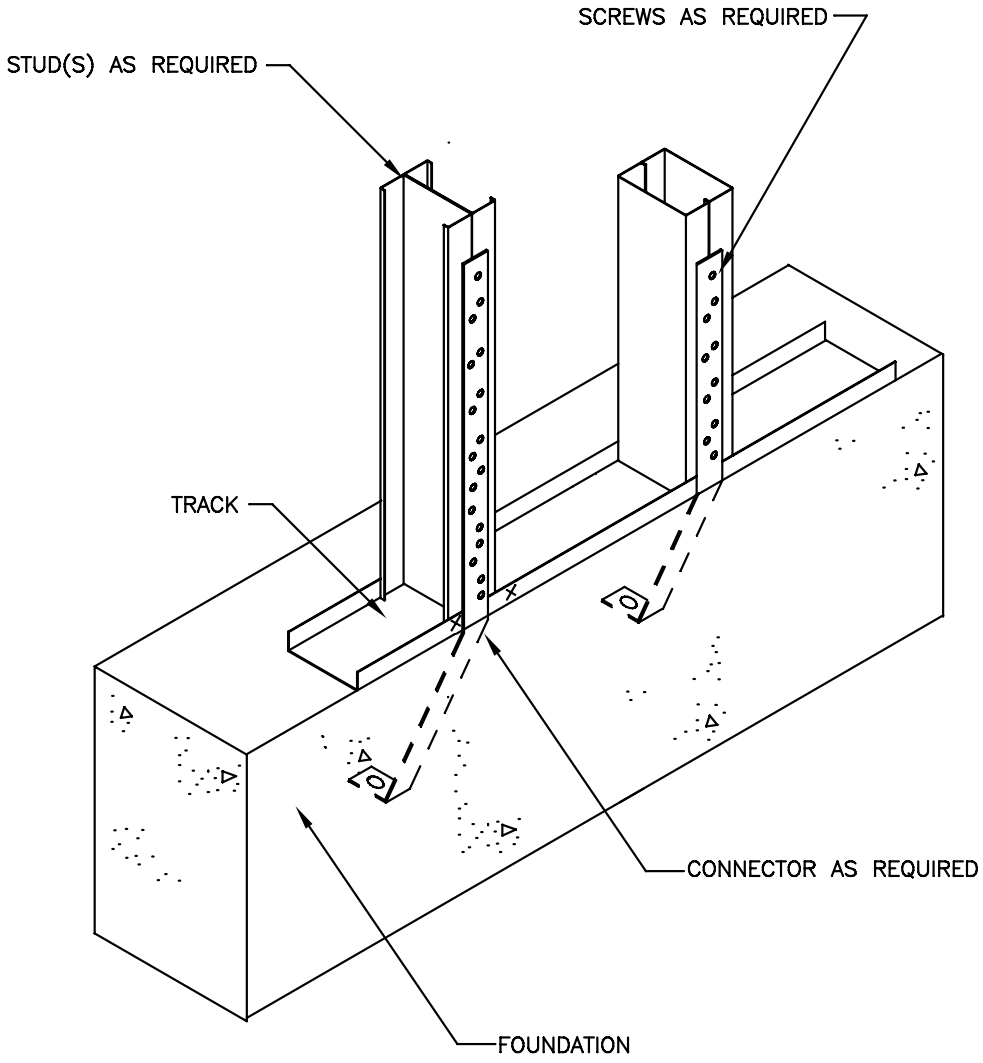
Detail W6
Wall to Foundation/Slab on Grade Connection 4



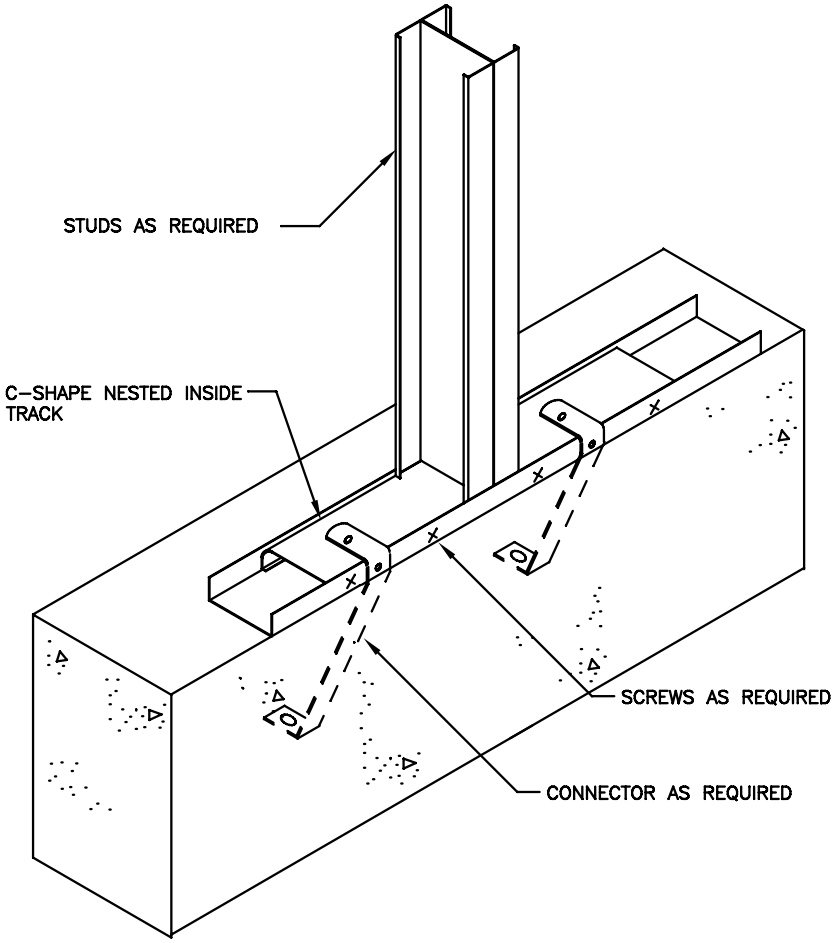
Detail W7
Wall to Wood Sill Connection



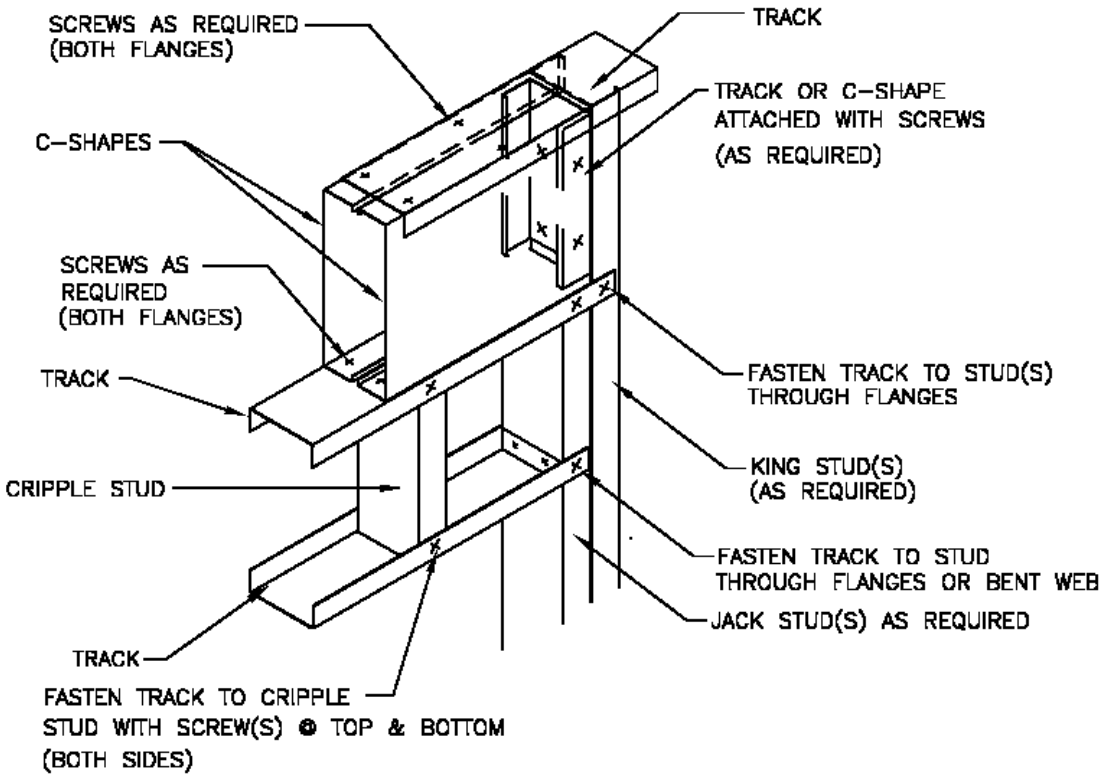
Detail W8
Hold-Down Connection Detail 1



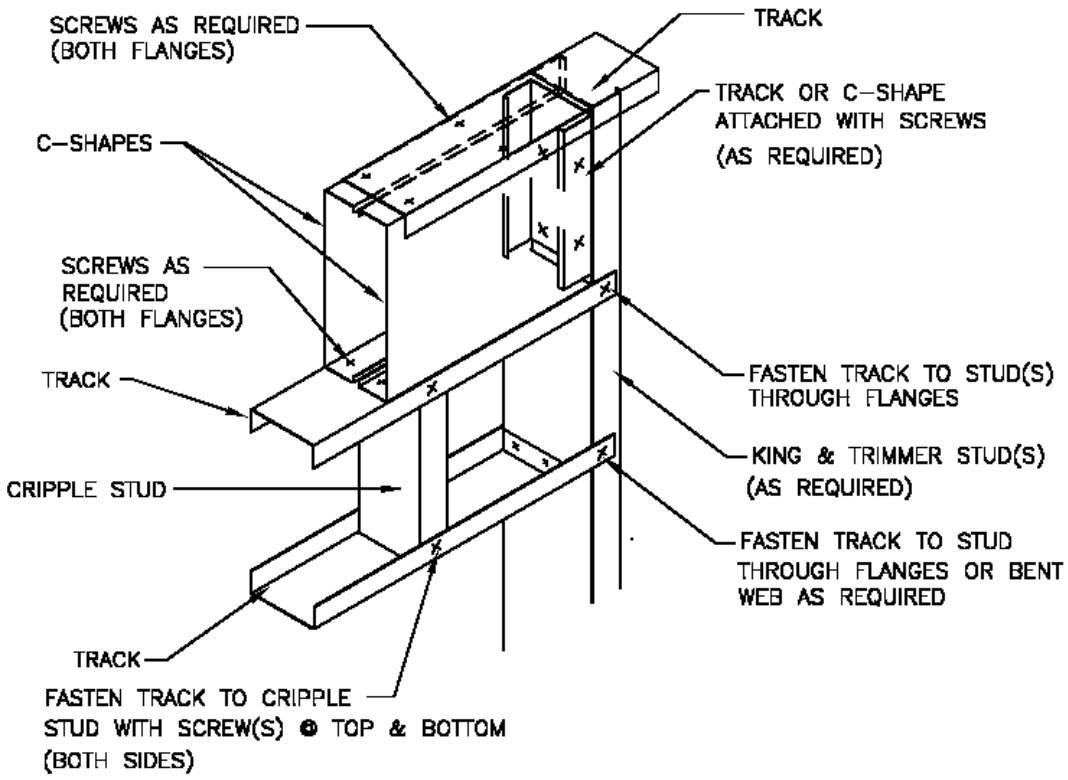
Detail W9
Hold-Down Connection Detail 2



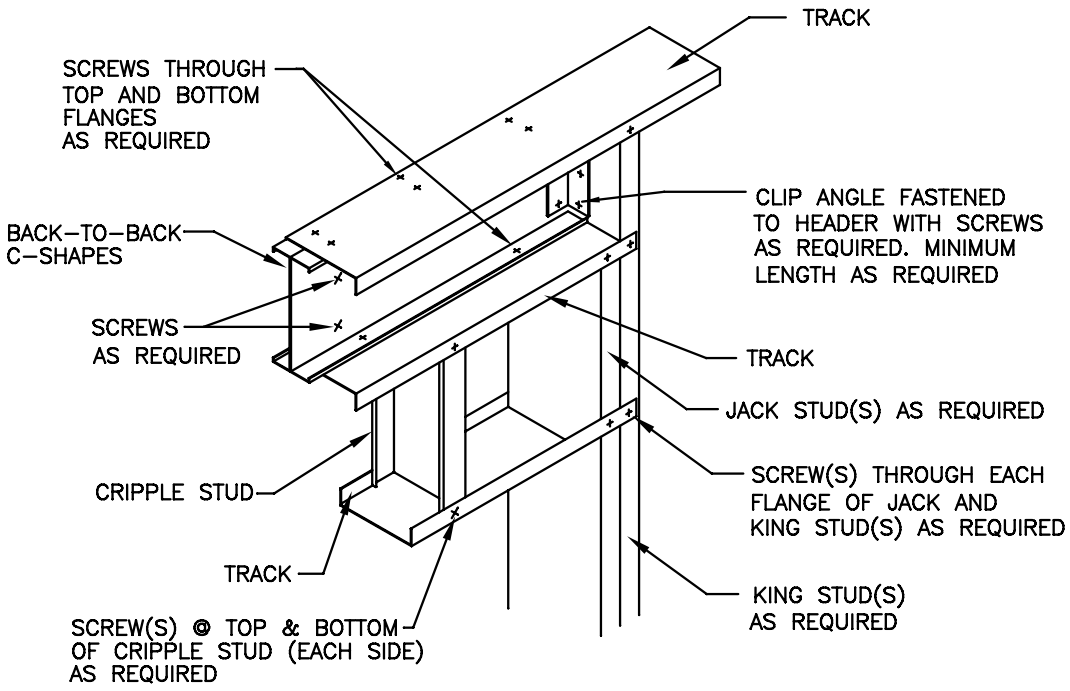
Detail W10
Box Beam Header with Jack Stud



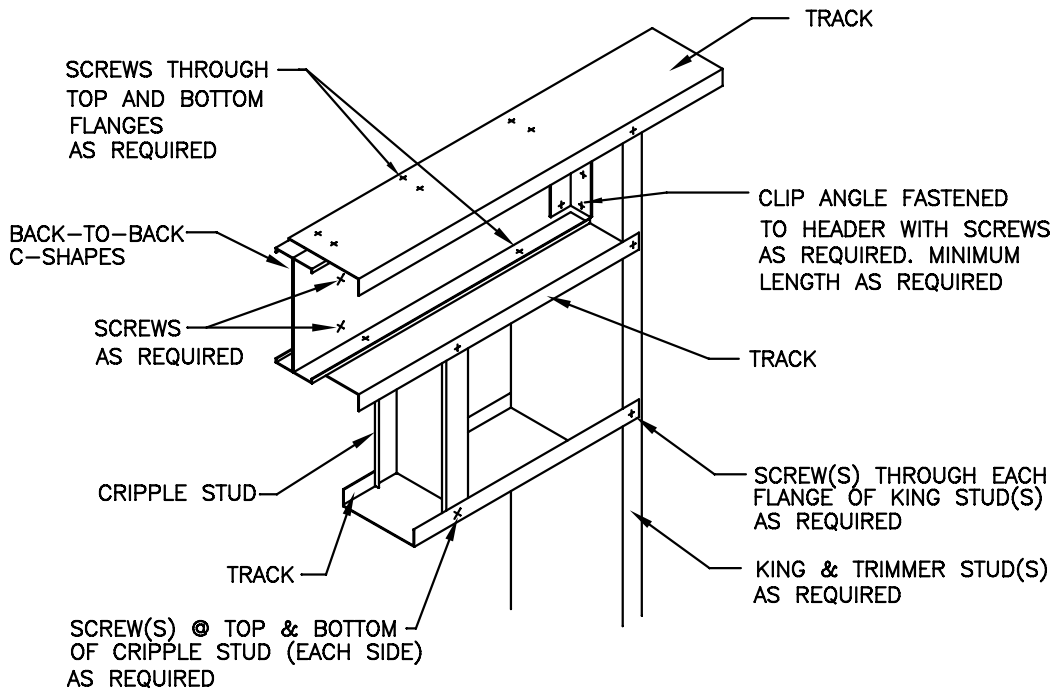
Detail W11
Box Beam Header



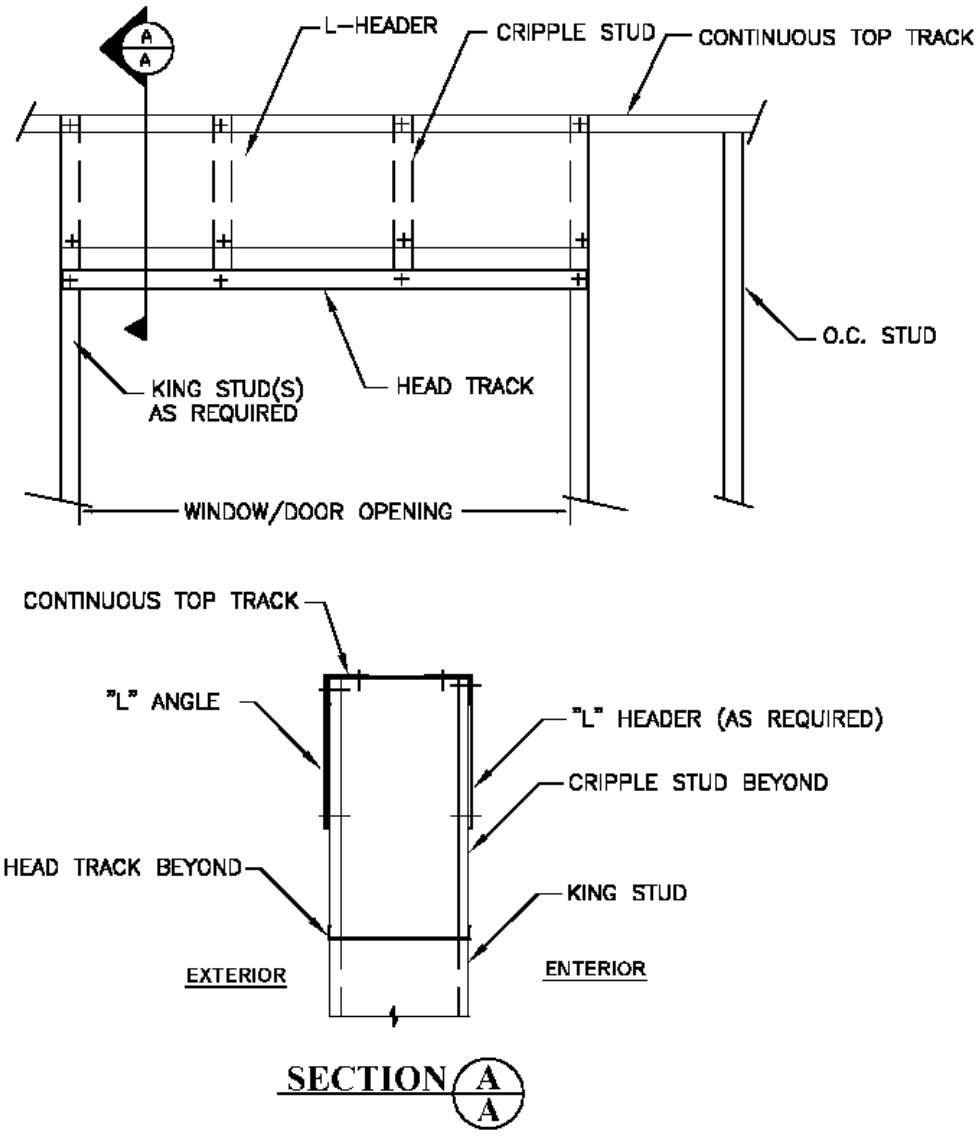
Detail W12
Back-to-Back Header with Jack Stud



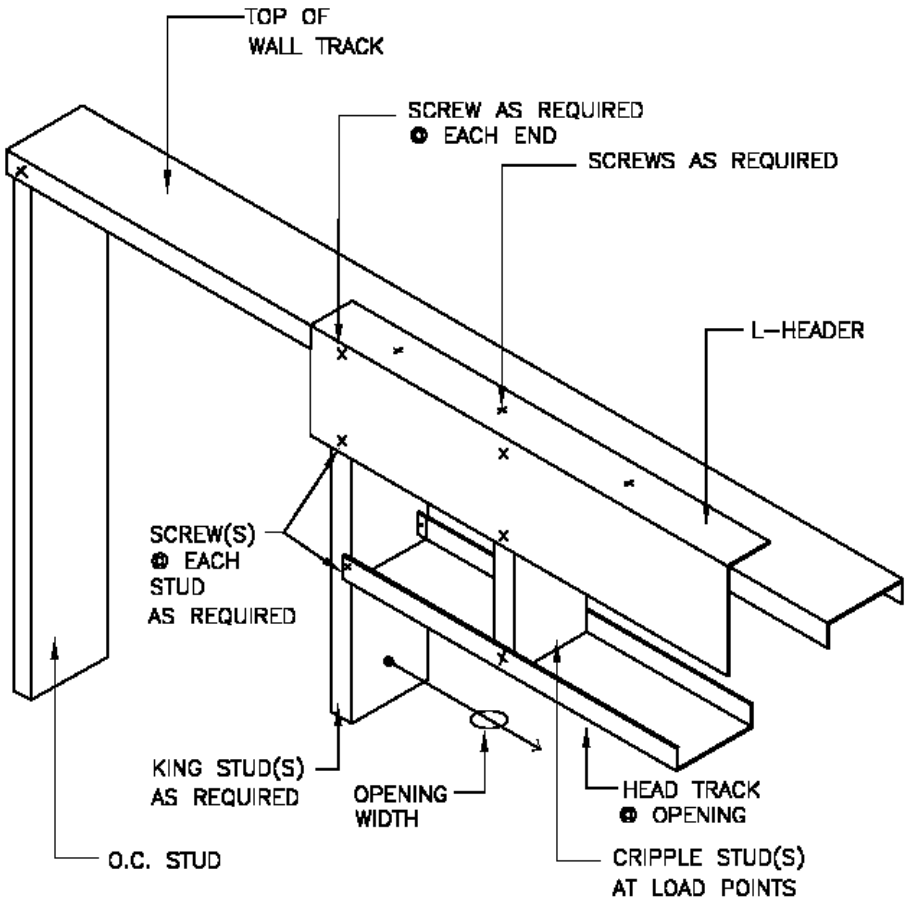
Detail W13
Back-to-Back Header



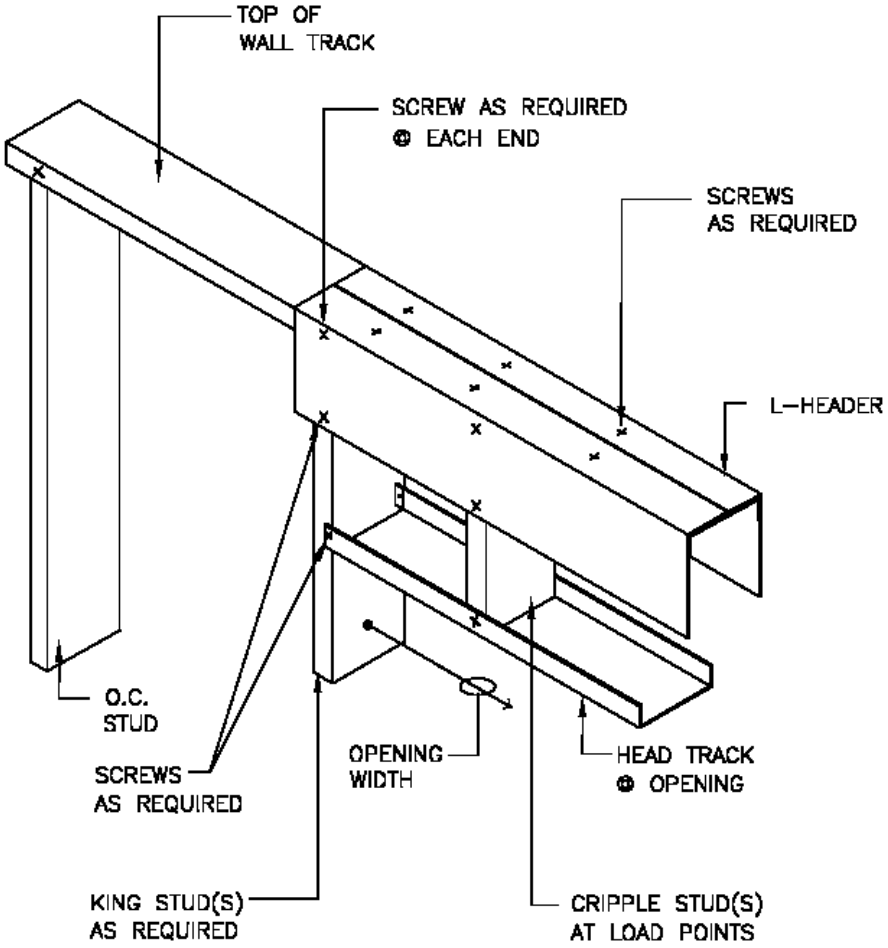
Detail W14
L-Header Detail



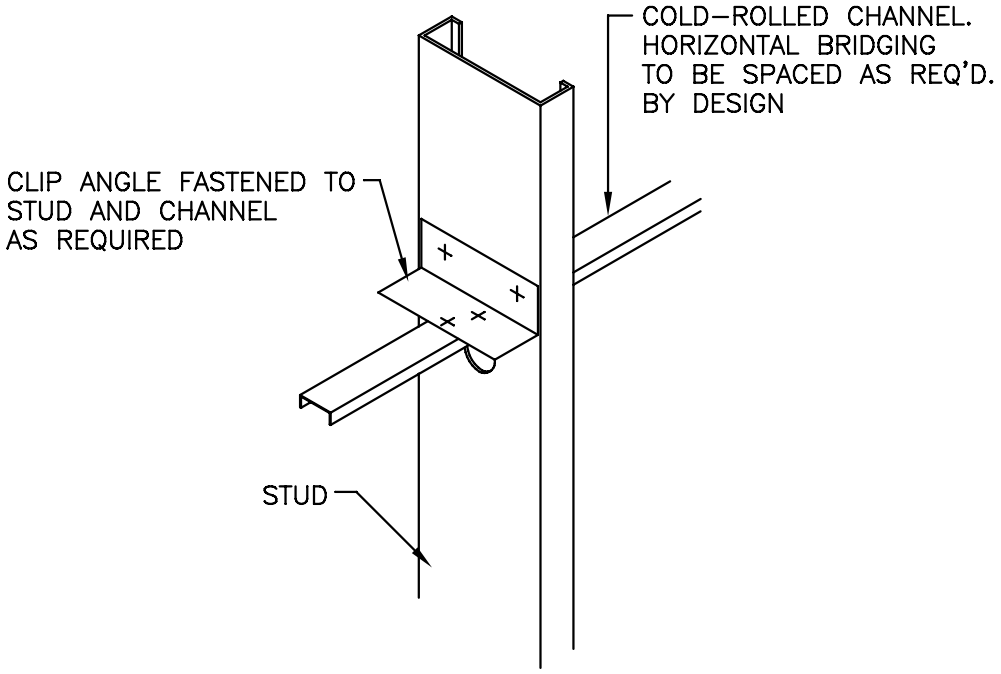
Detail W15
Single L-Header Detail



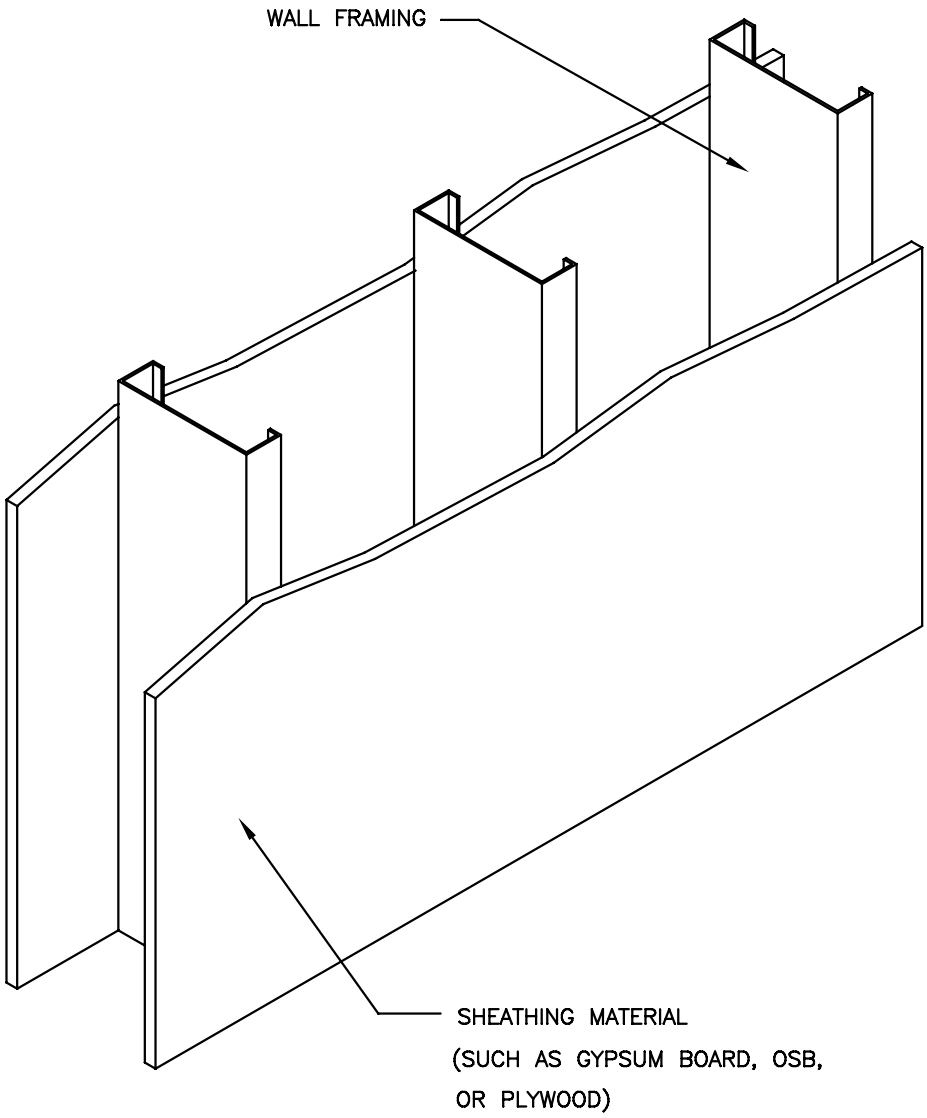
Detail W16
Double L-Header Detail



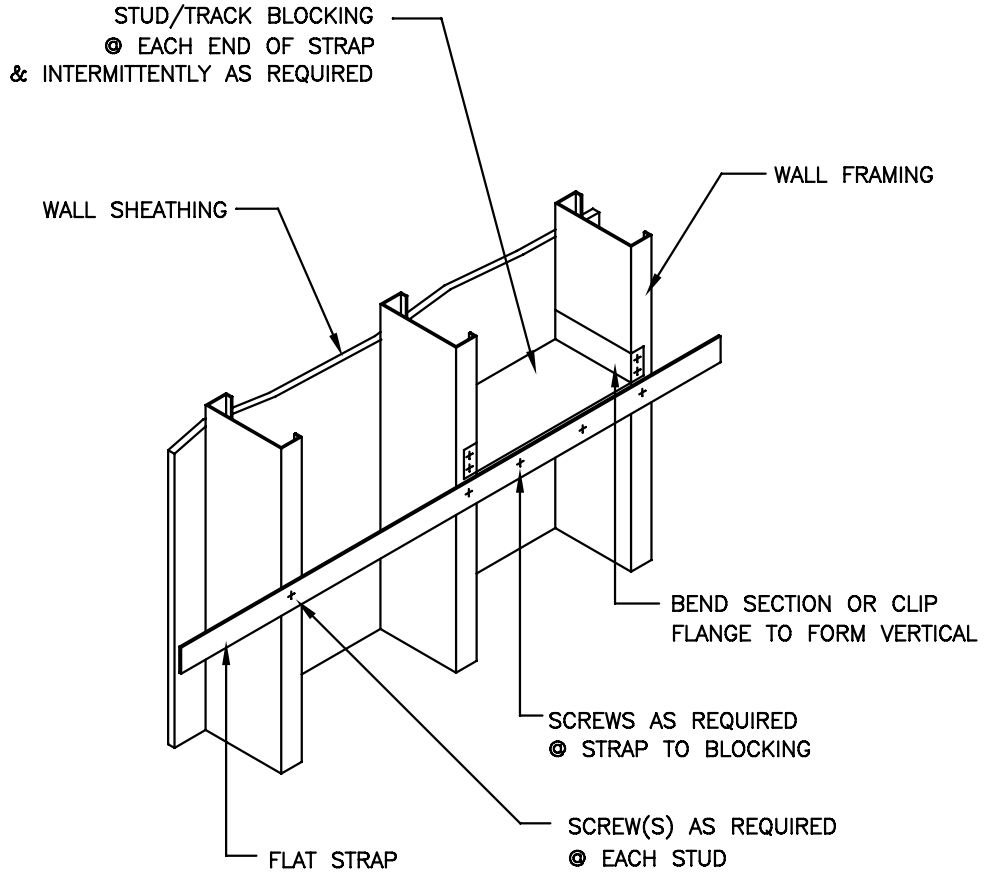
Detail W17
Stud Bracing with Cold-Rolled Channel



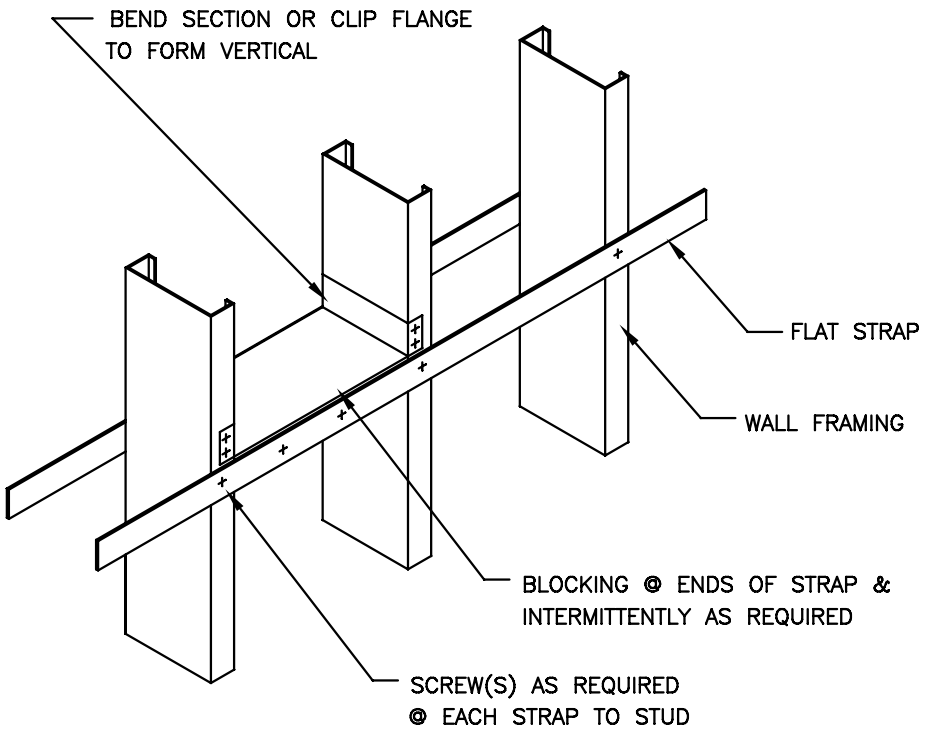
Detail W18
Stud Bracing with Sheathing



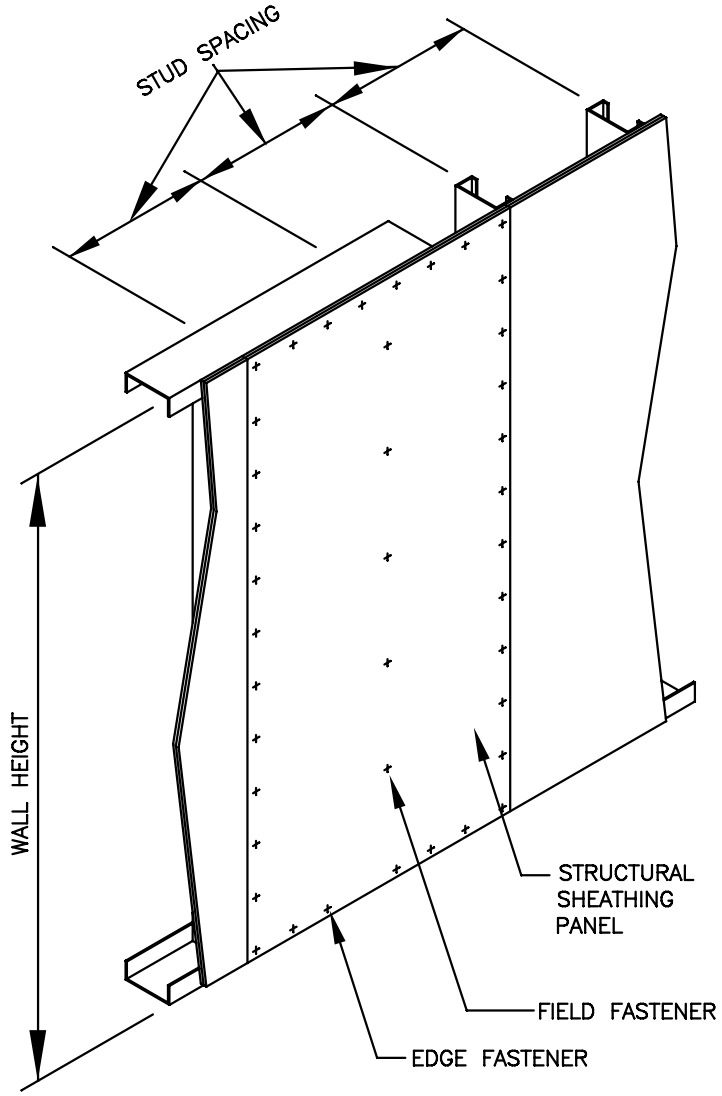
Detail W19
Stud Bracing with Strapping and Sheathing



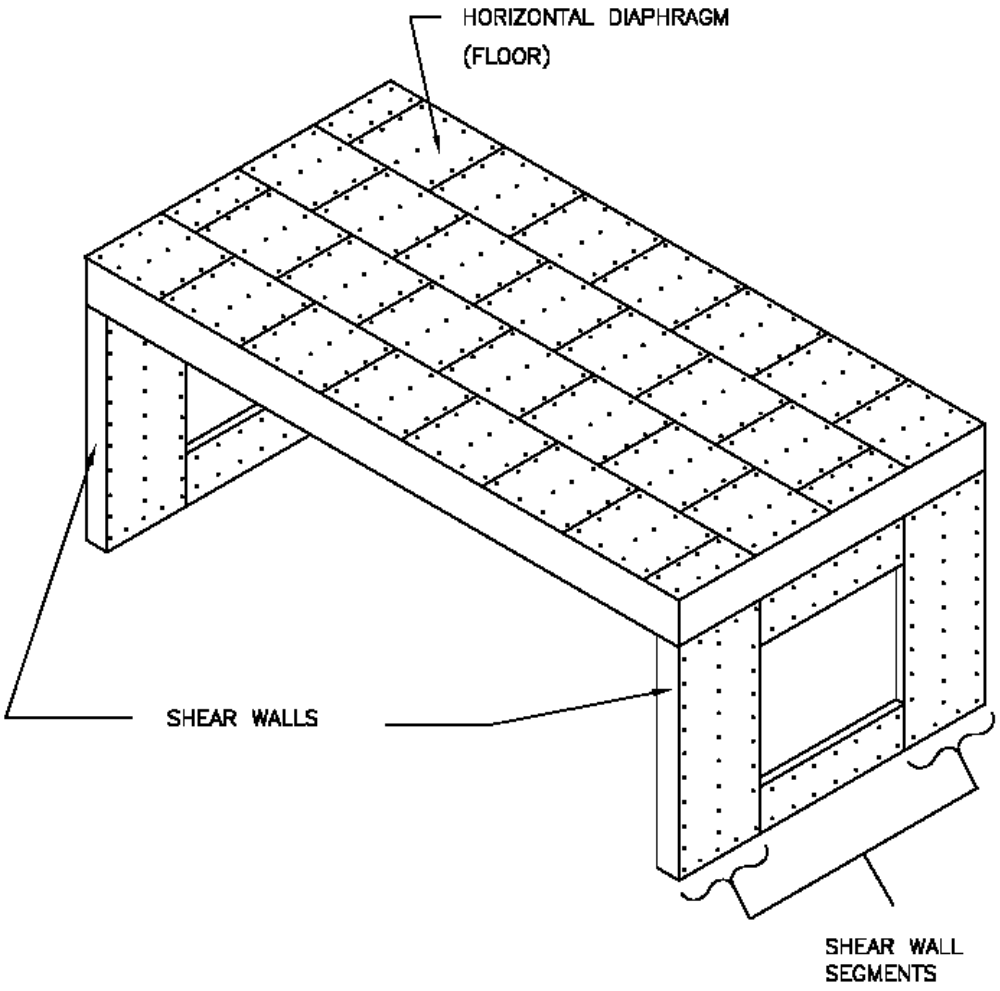
Detail W20
Stud Bracing with Strapping and Blocking



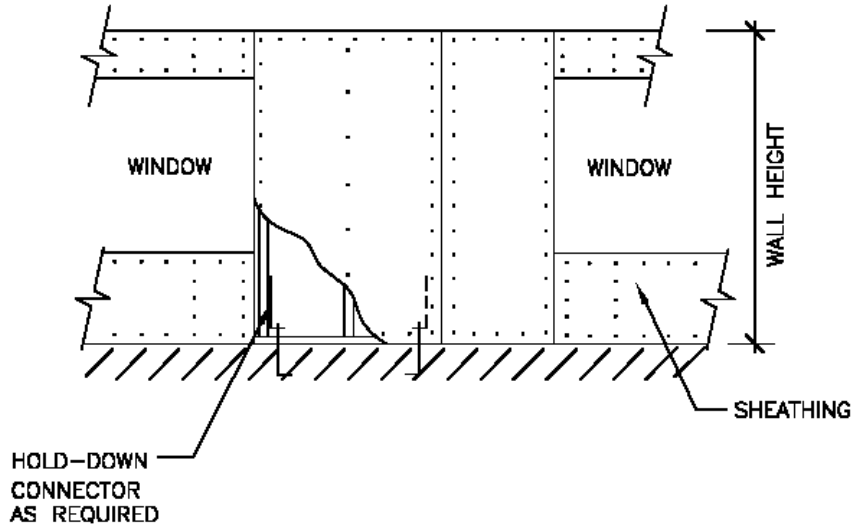
Detail W21
Structural Sheathing Fastening to Wall Studs

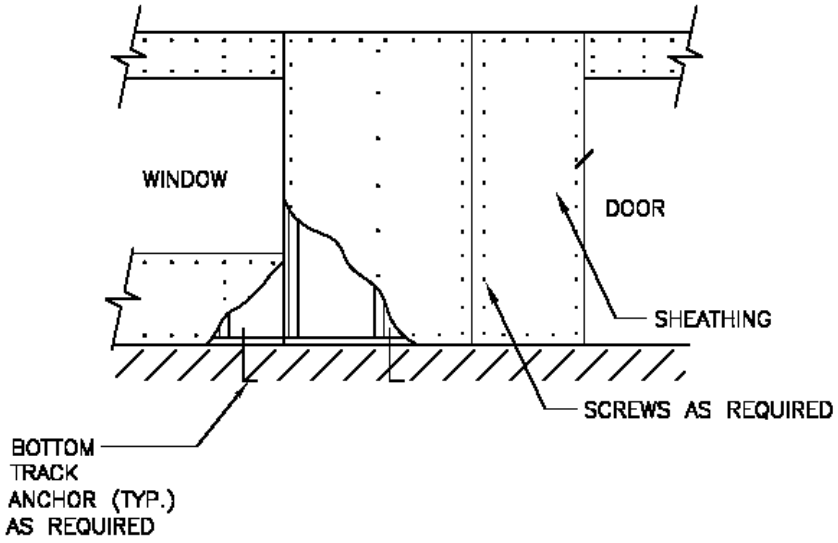


Detail W22
Shearwall and Diaphragm Details

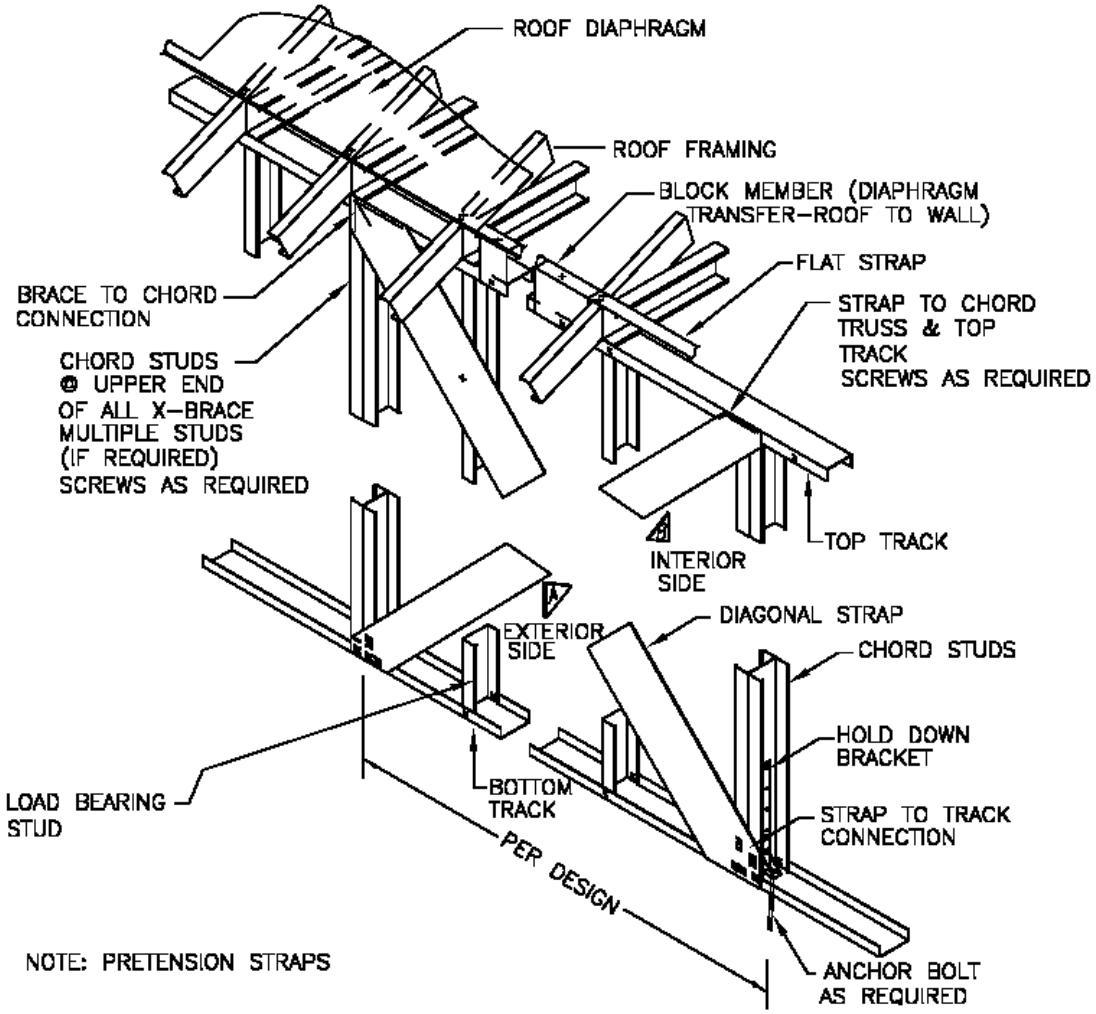


Detail W23
Sheathed Wall with Openings

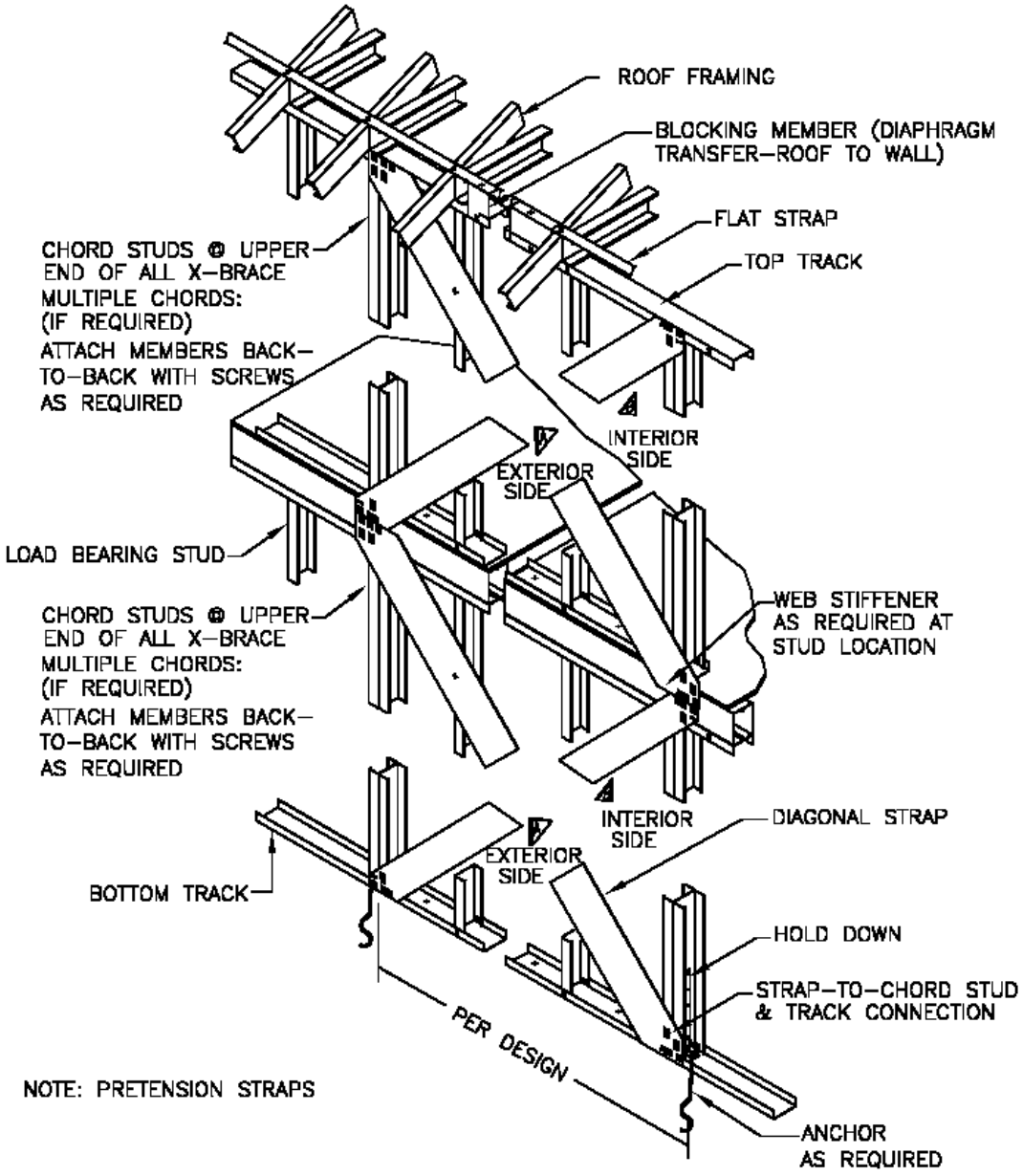




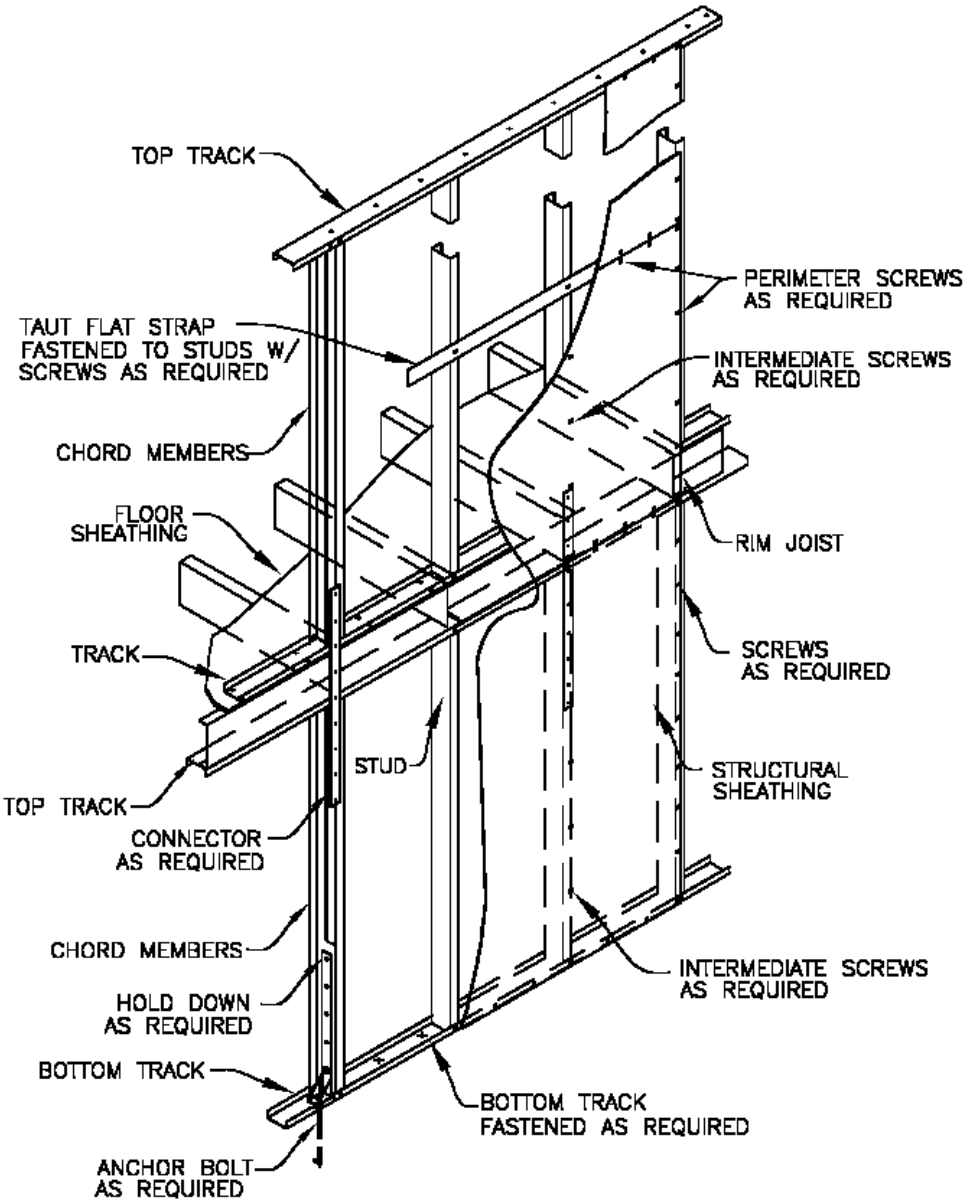
Detail W24
Single Story X-Brace Detail



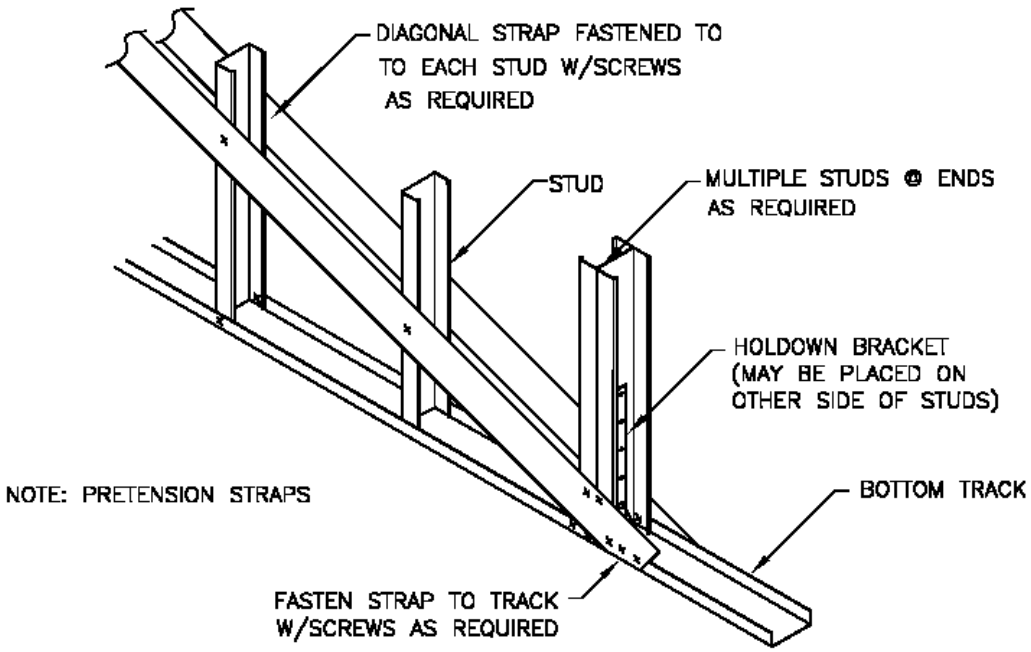
Detail W25
Two Story X-Brace Detail



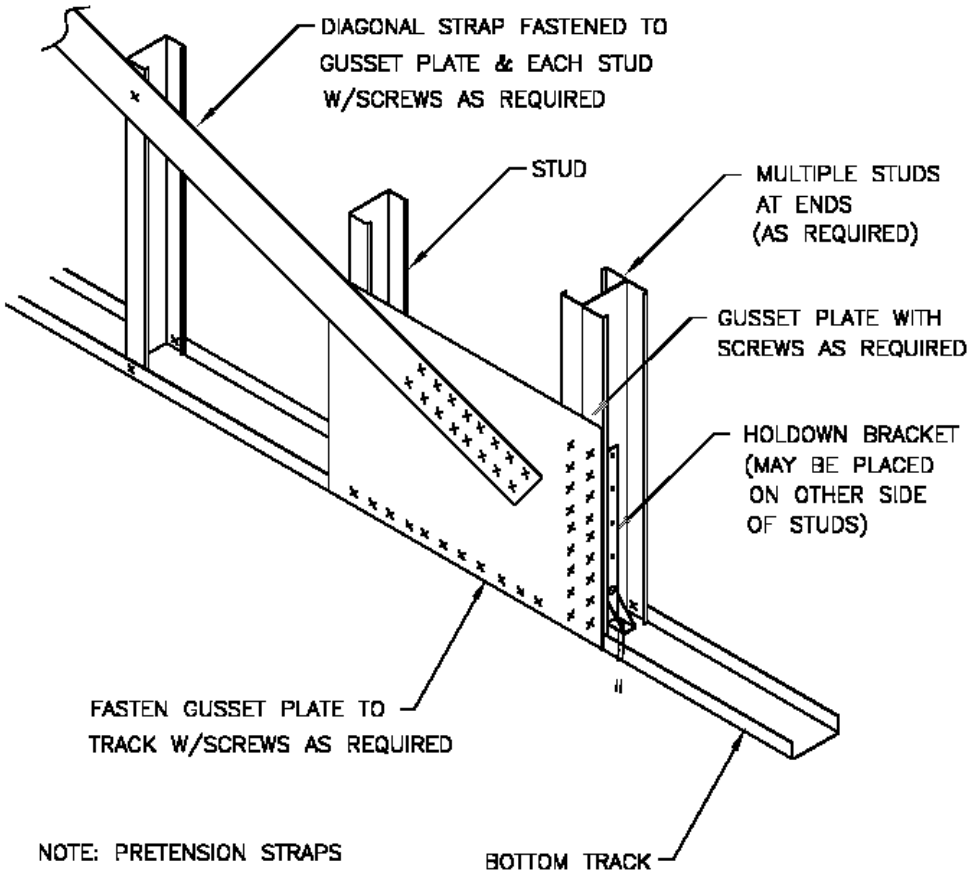
Detail W26
Two Story Sheathed Wall Detail



Detail W27
X-Brace Detail



Detail W28
X-Brace with Gusset Detail



Detail W29
Corner Framing Detail

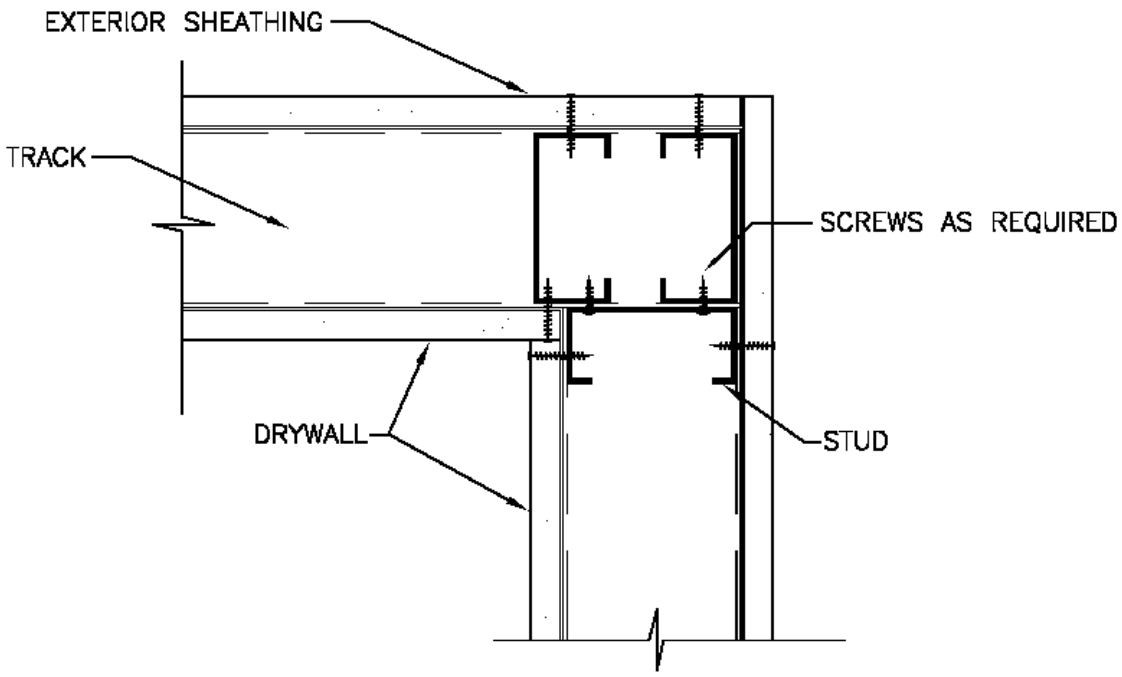


Figure NL1
Non-Load Bearing Wall Framing

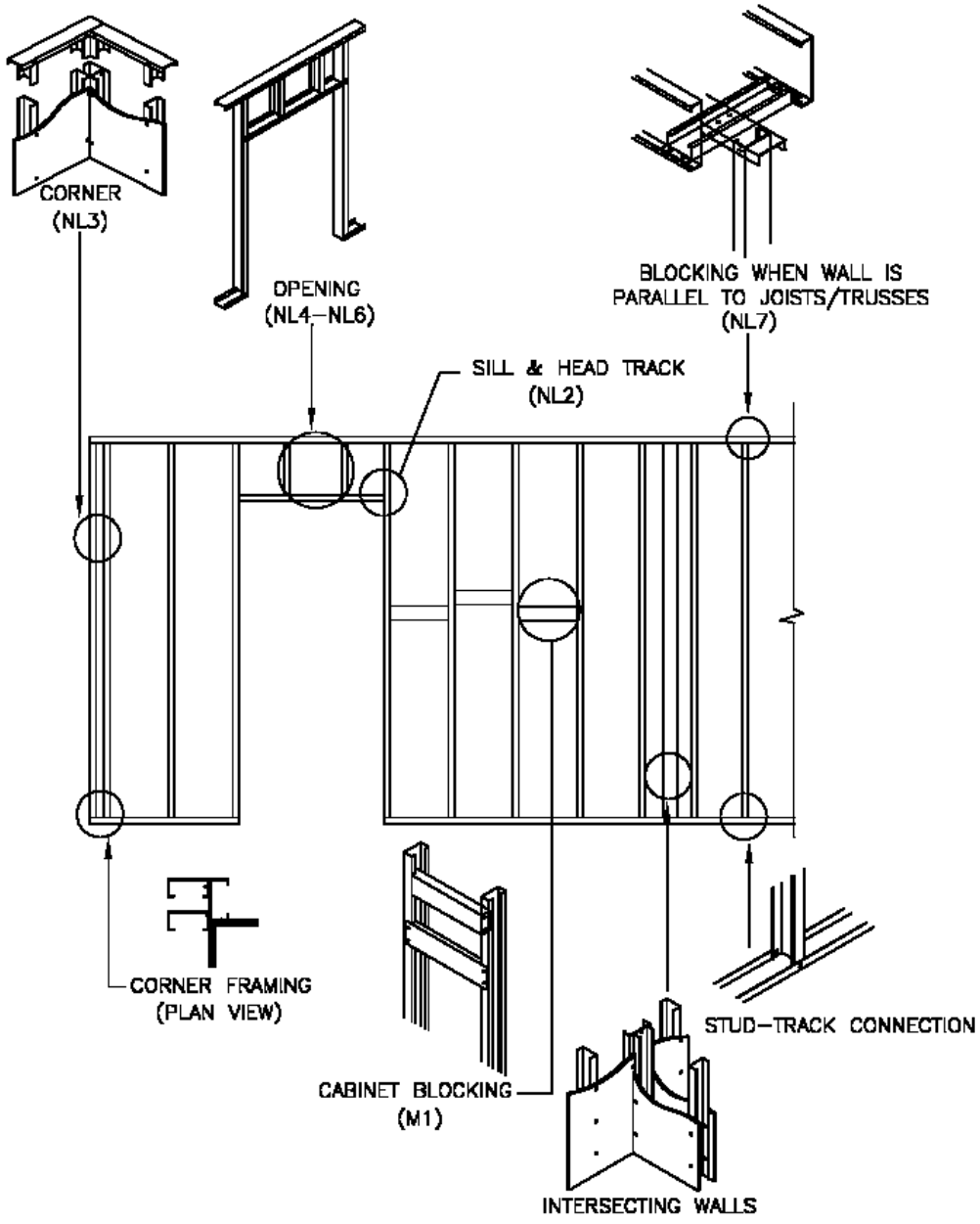


Figure NL2
Sill and Head Track Connection Detail

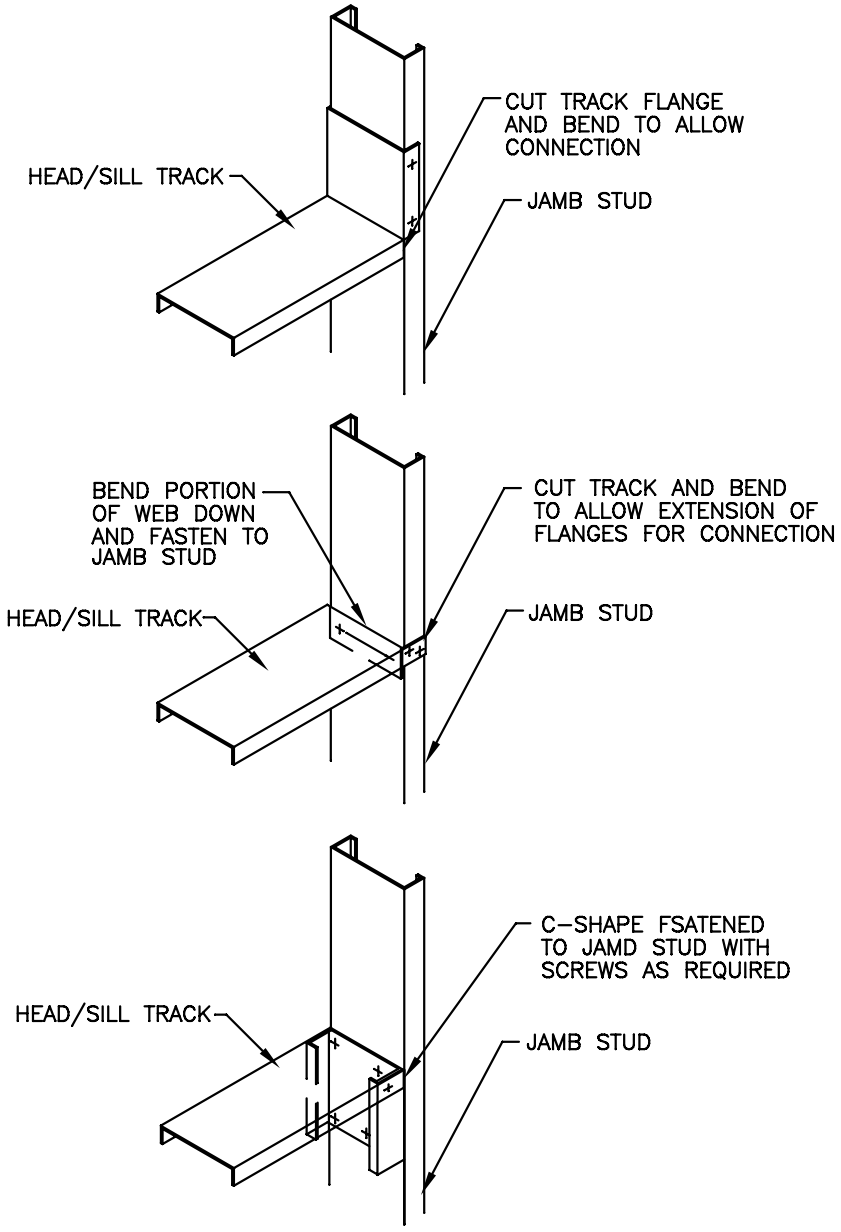


Figure NL3
Corner Framing Detail

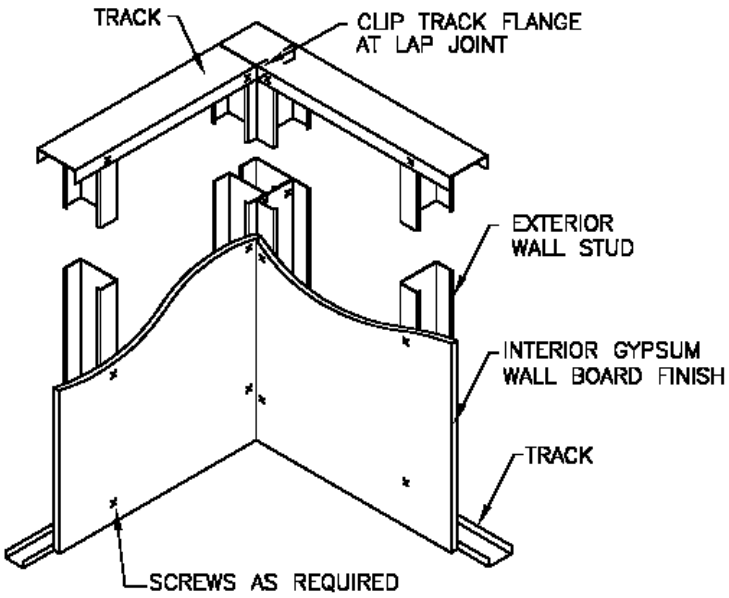


Figure NL4
Slammer Stud Detail

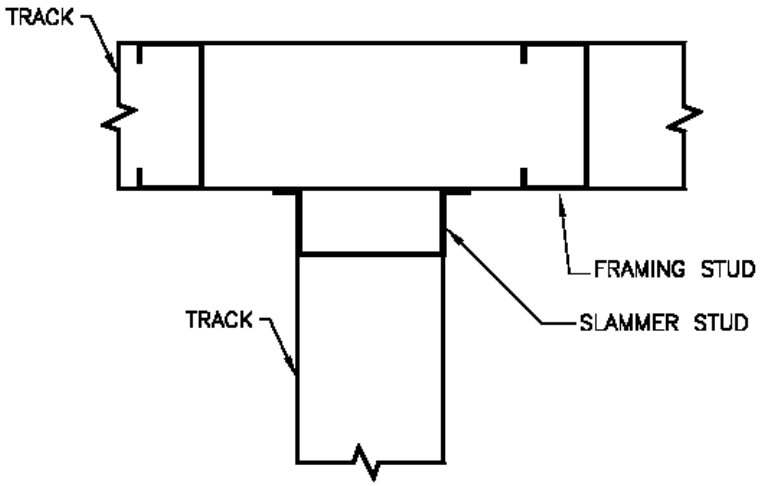


Figure NL5
Window Opening Framing Detail

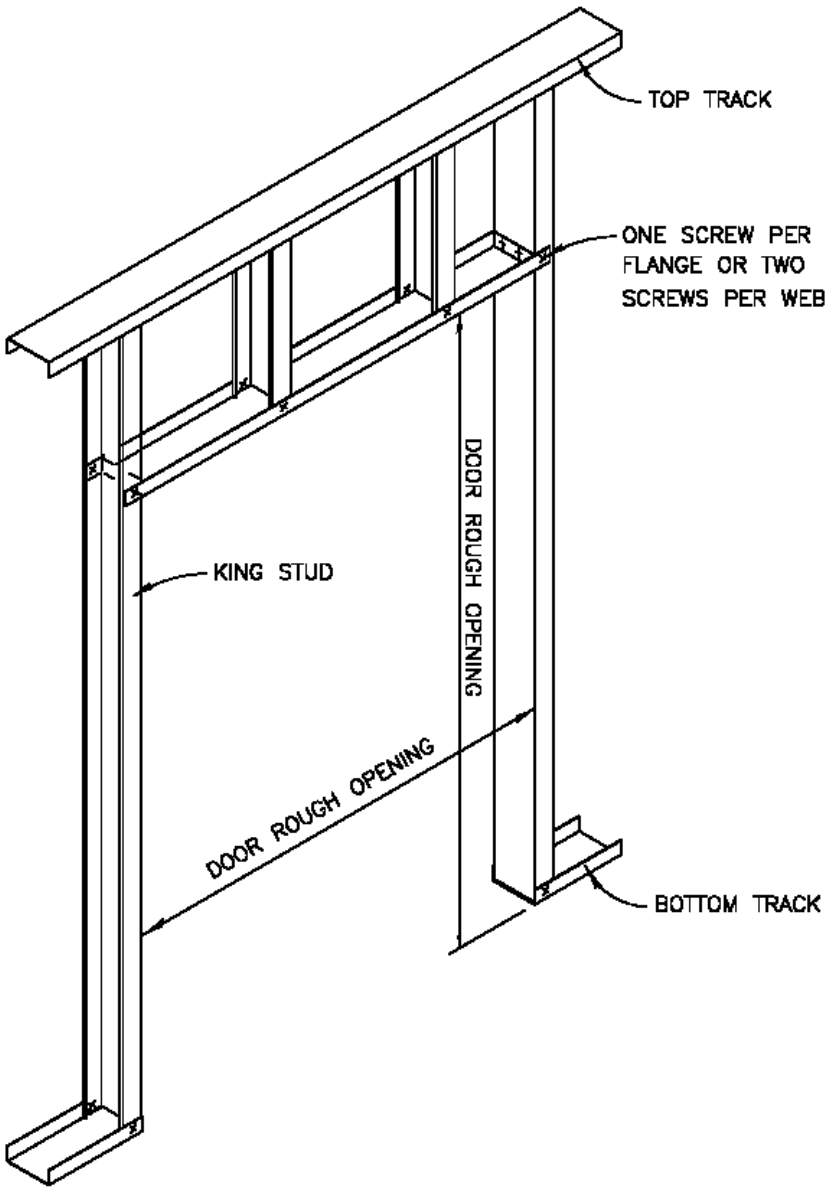


Figure NL6
Door Opening Framing Detail

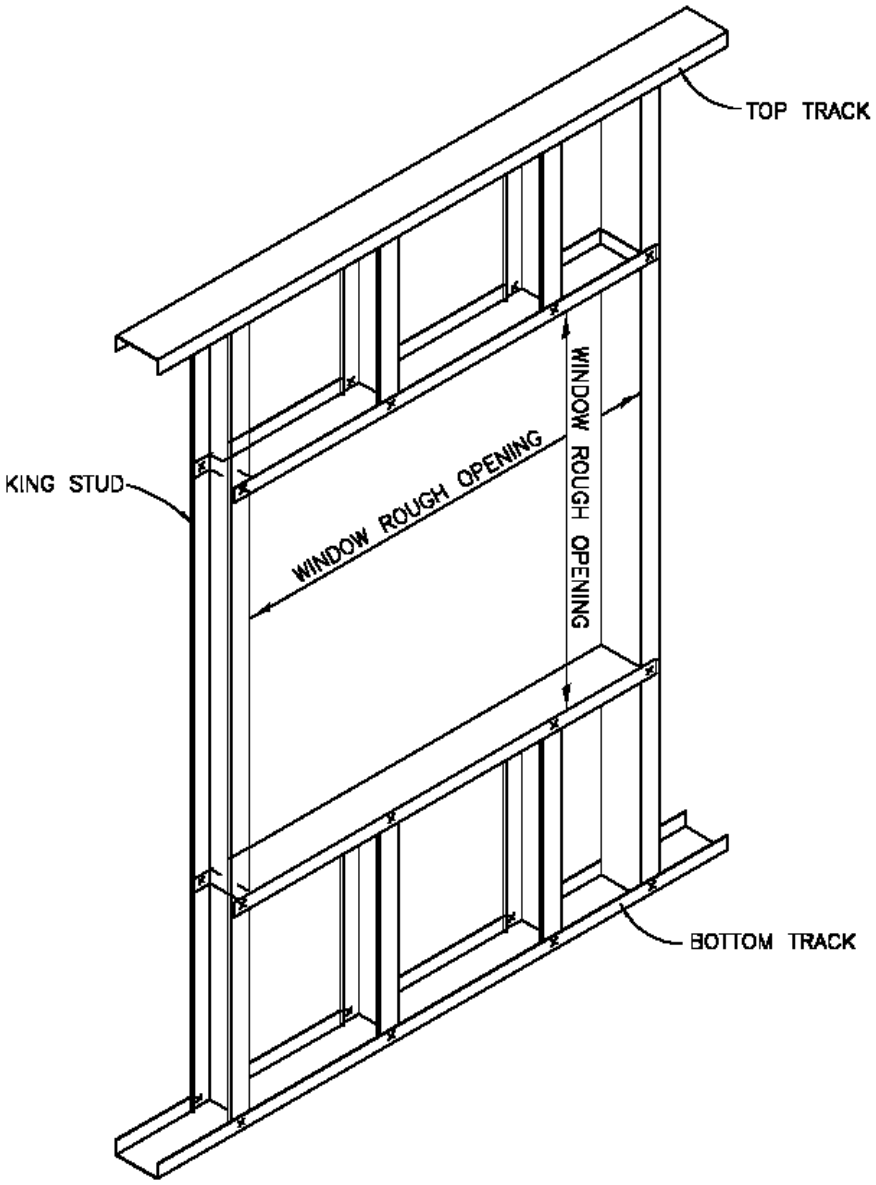


Figure NL7
Non-Load Bearing Opening

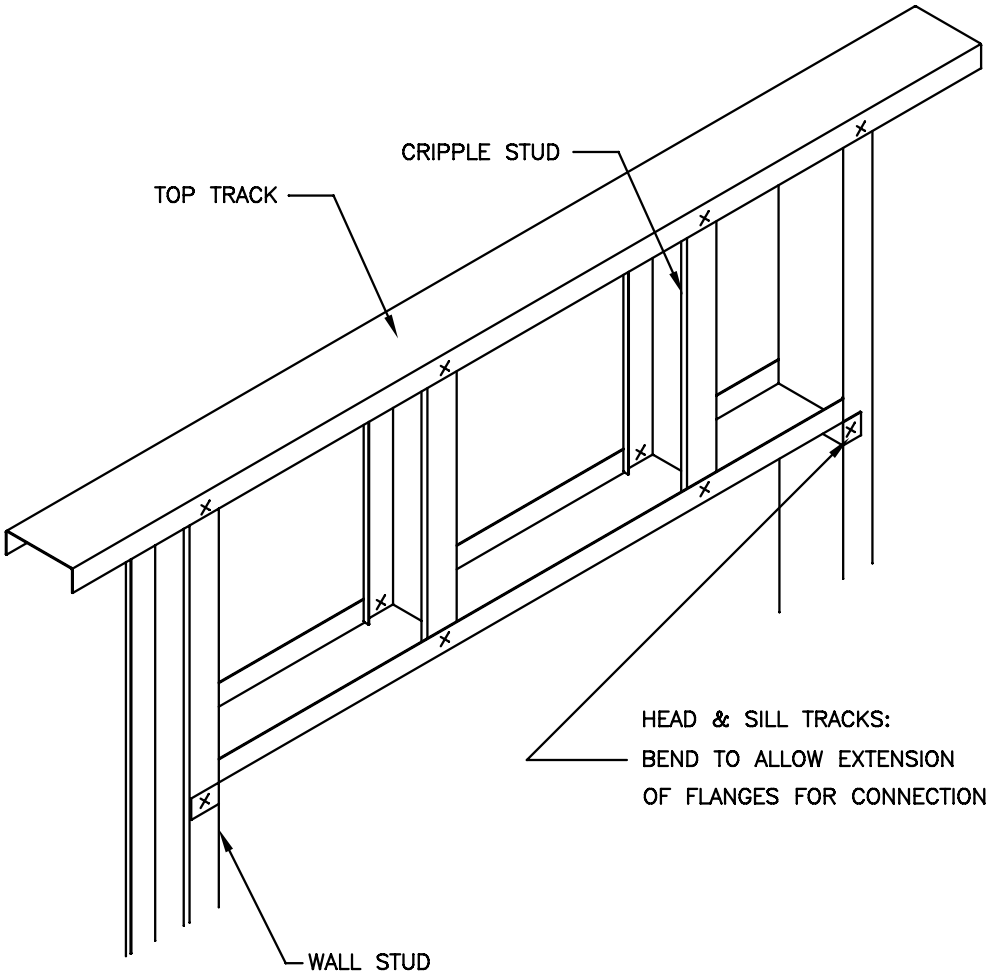
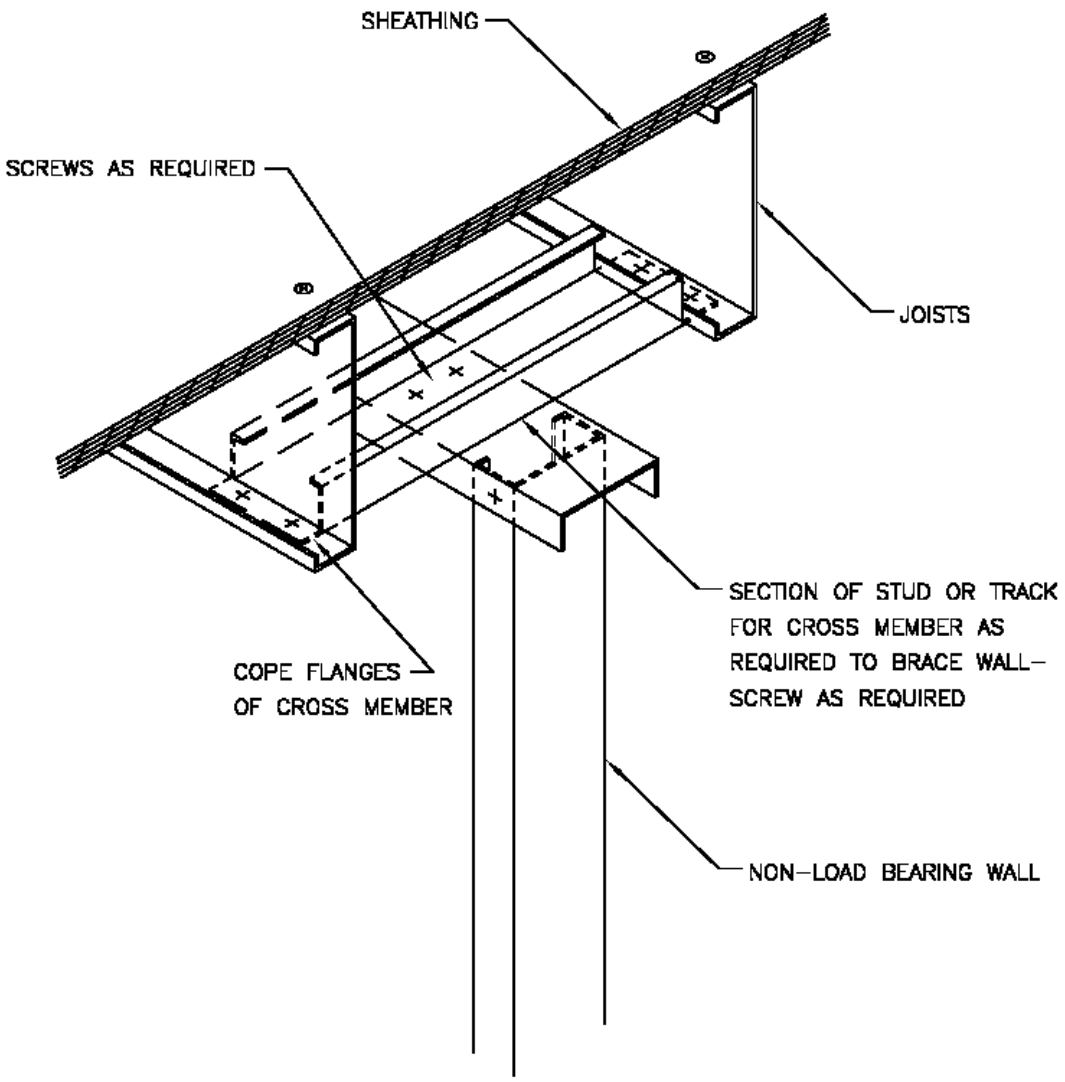
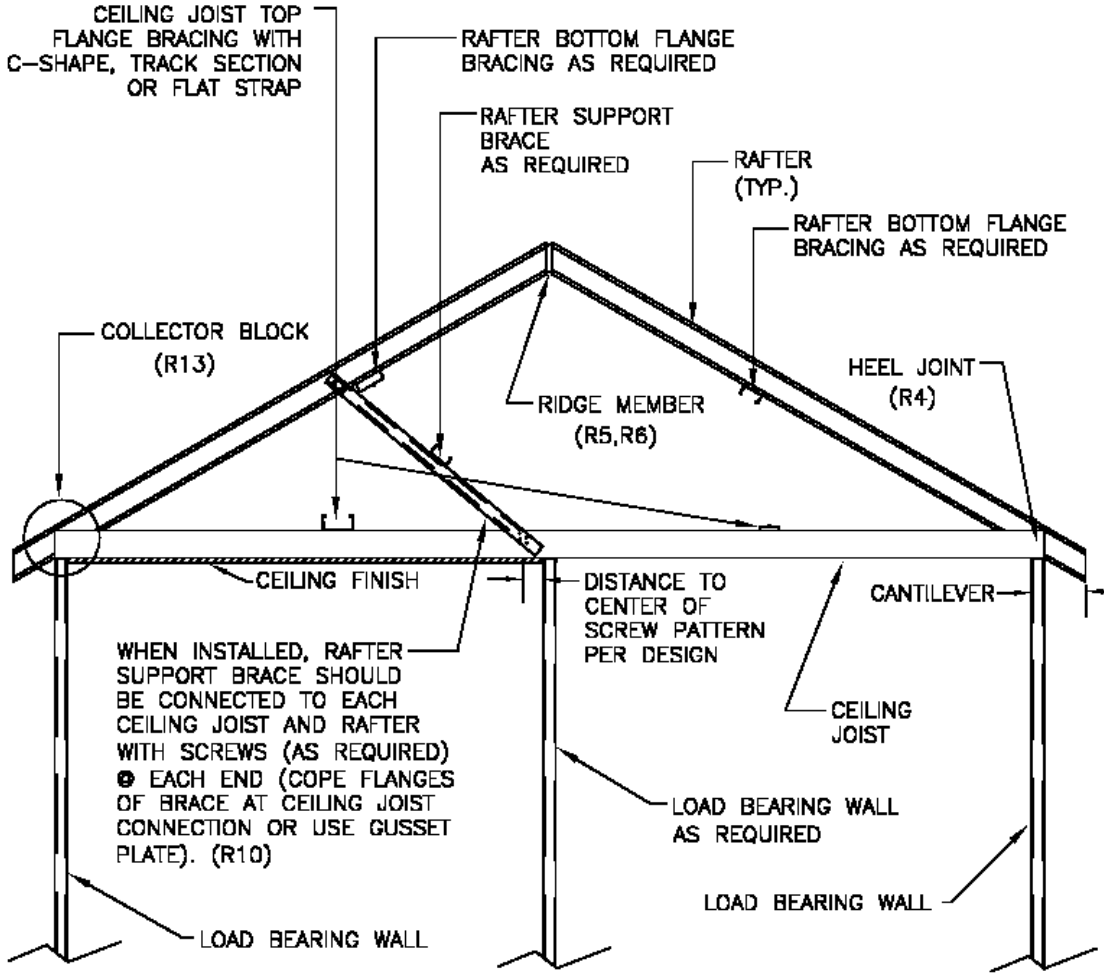


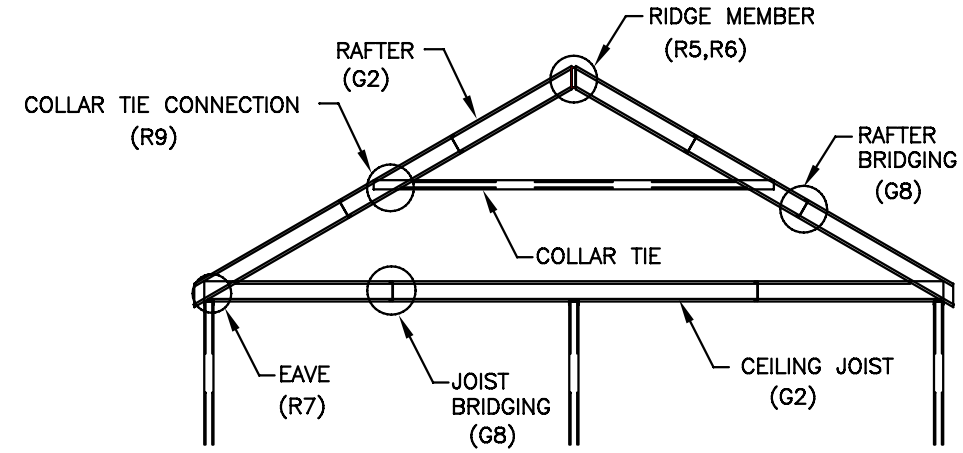
Figure NL8
Non-Load Bearing Wall Parallel to Joist

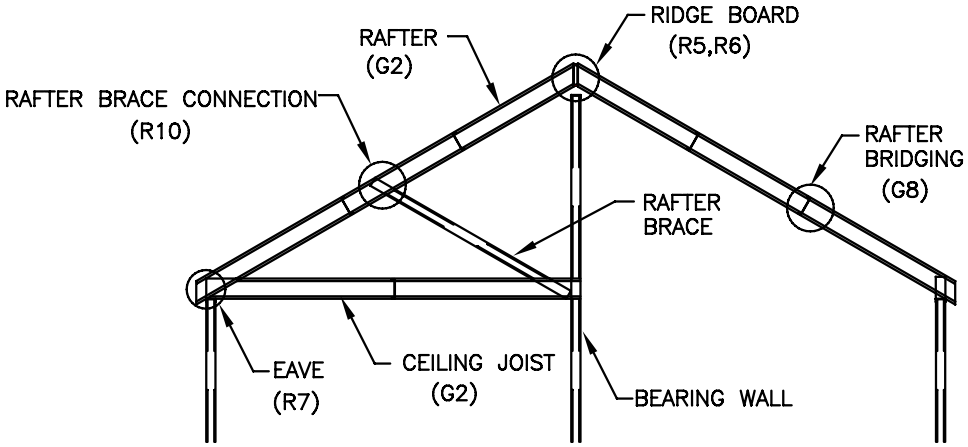


Detail R1
Roof Framing

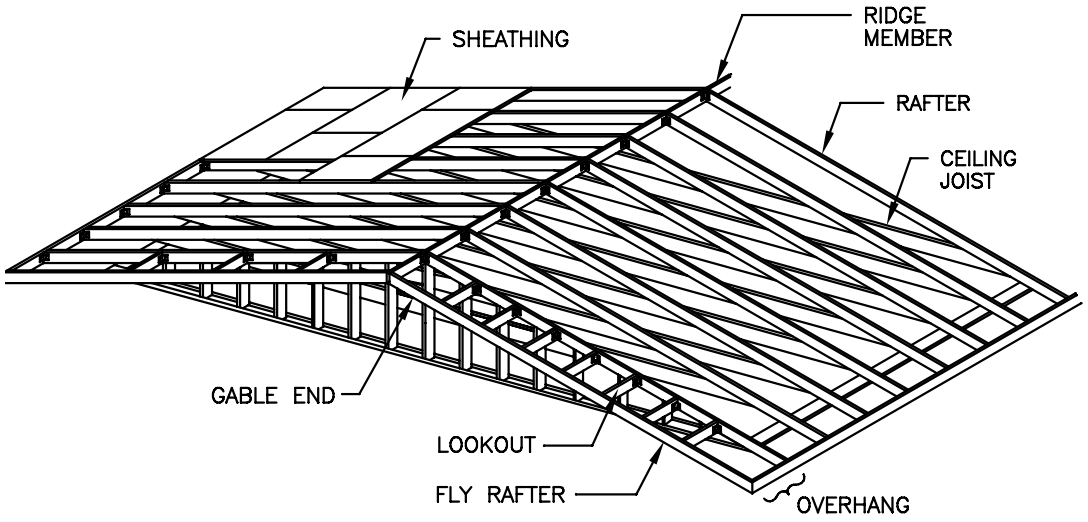


Detail R2
Joist and Rafter Detail

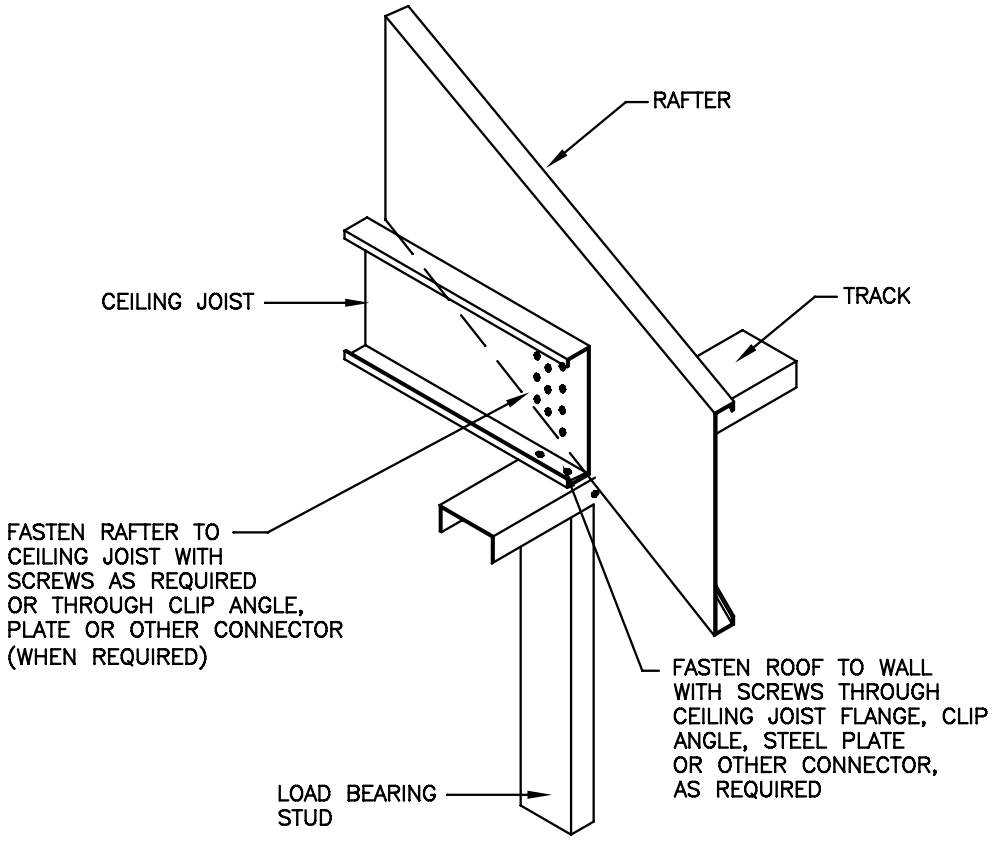




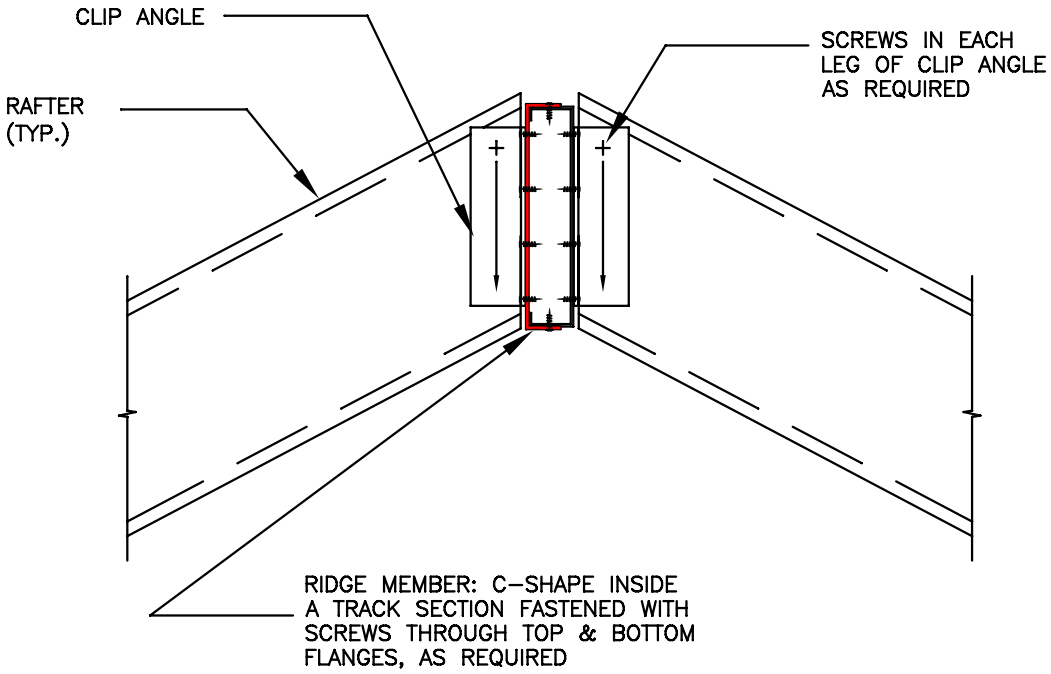
Detail R3
Roof Framing Isometric View



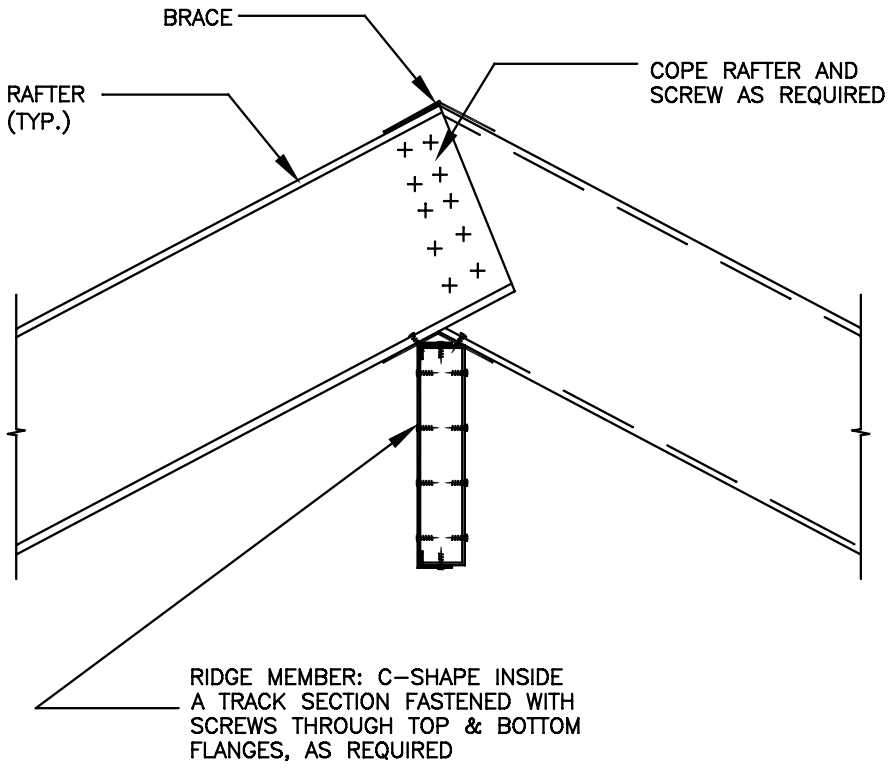
Detail R4
Heel Joint Connection Detail



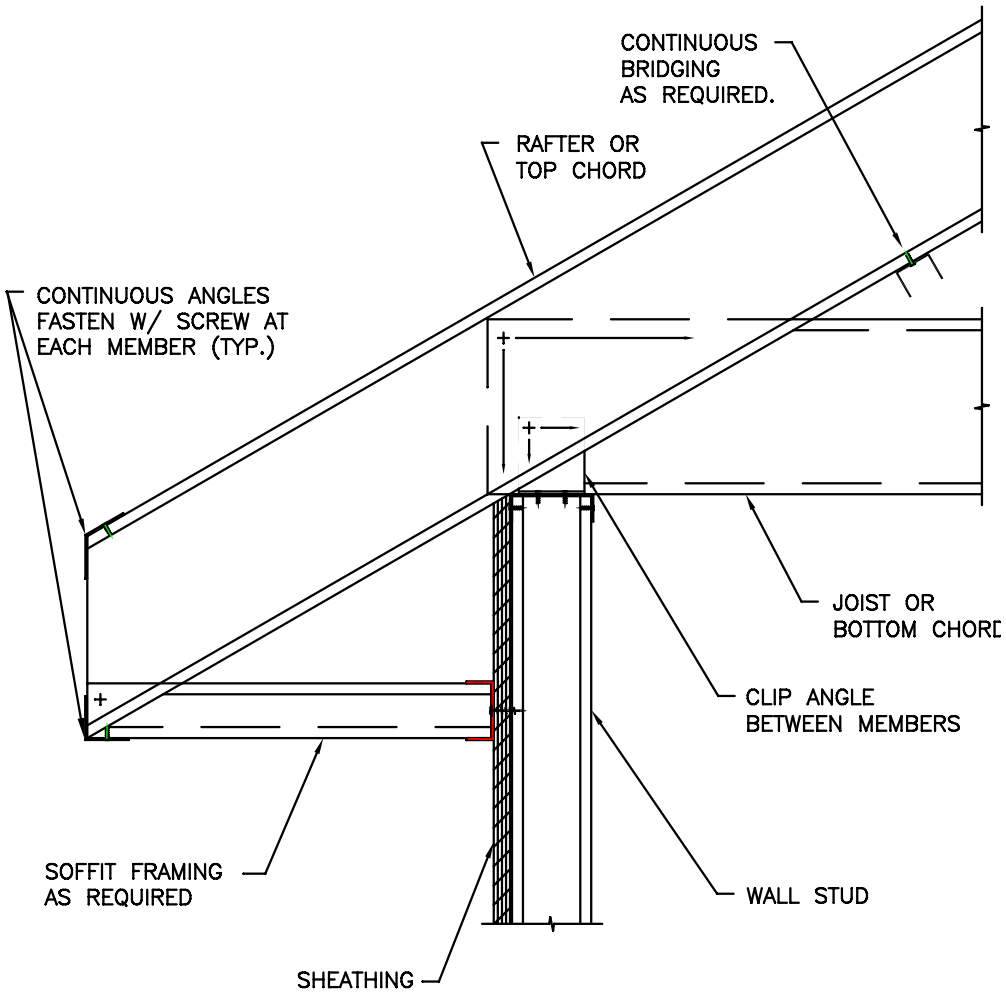
Detail R5
Ridge Member Connection Detail



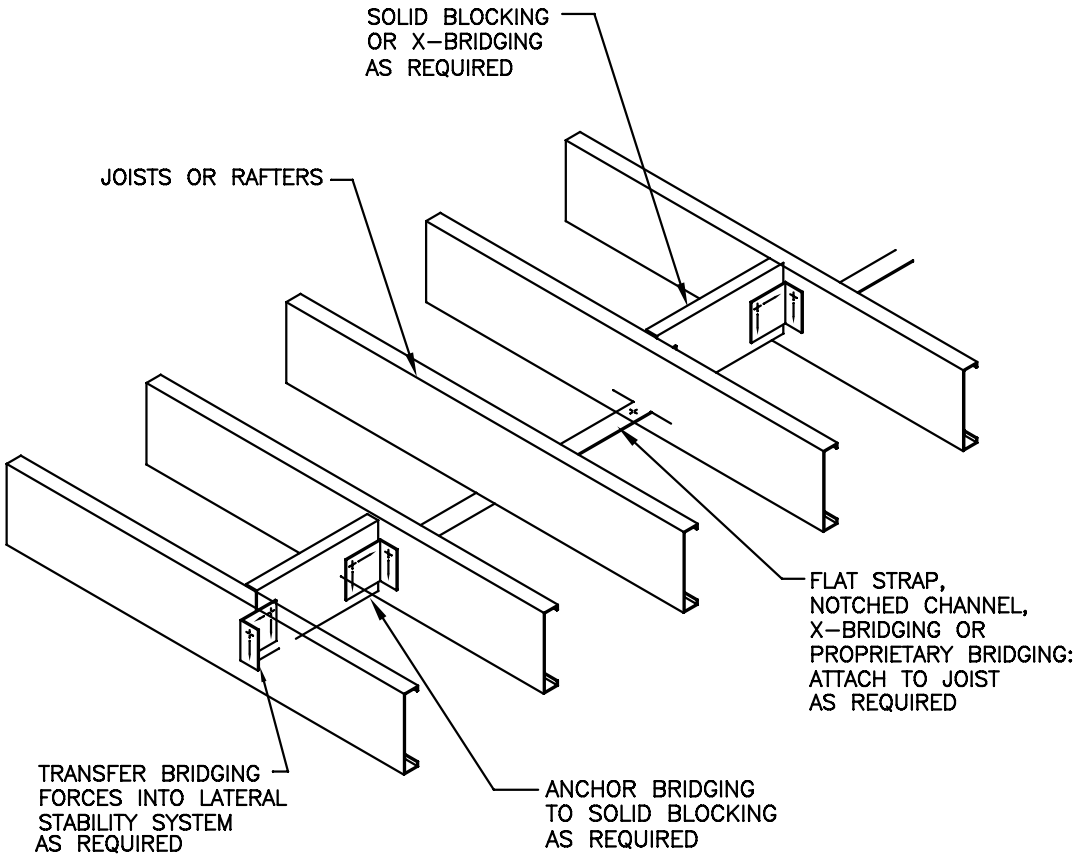
Detail R6
Ridge Member with Coped Rafters



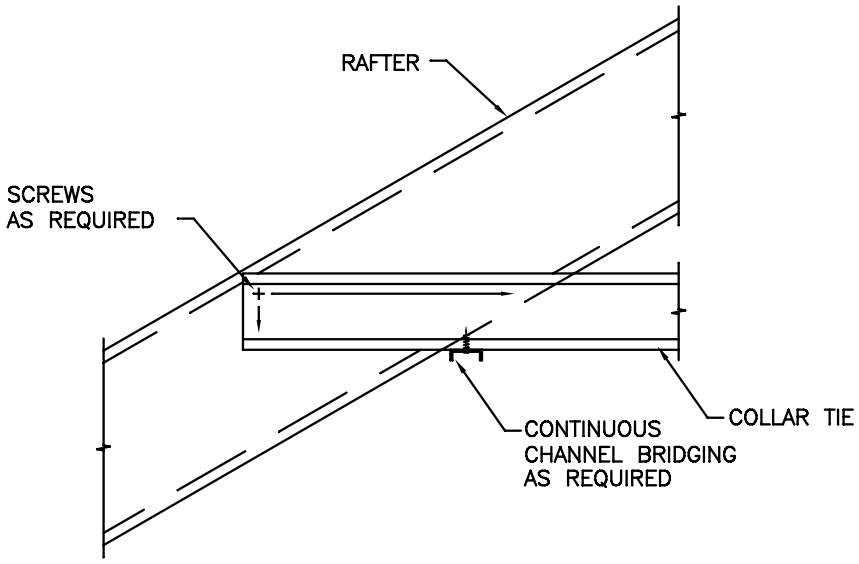
Detail R7
Roof Eave and Soffit Detail



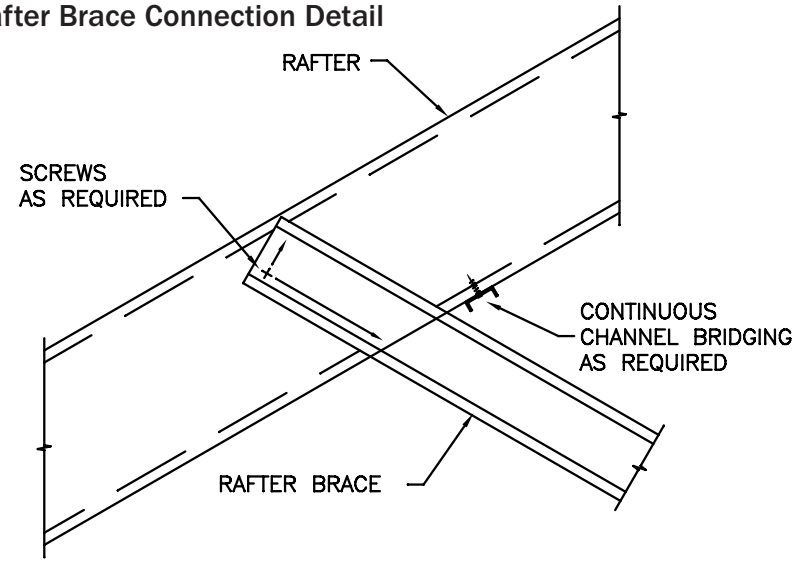
Detail R8
Rafter and Joist Bridging



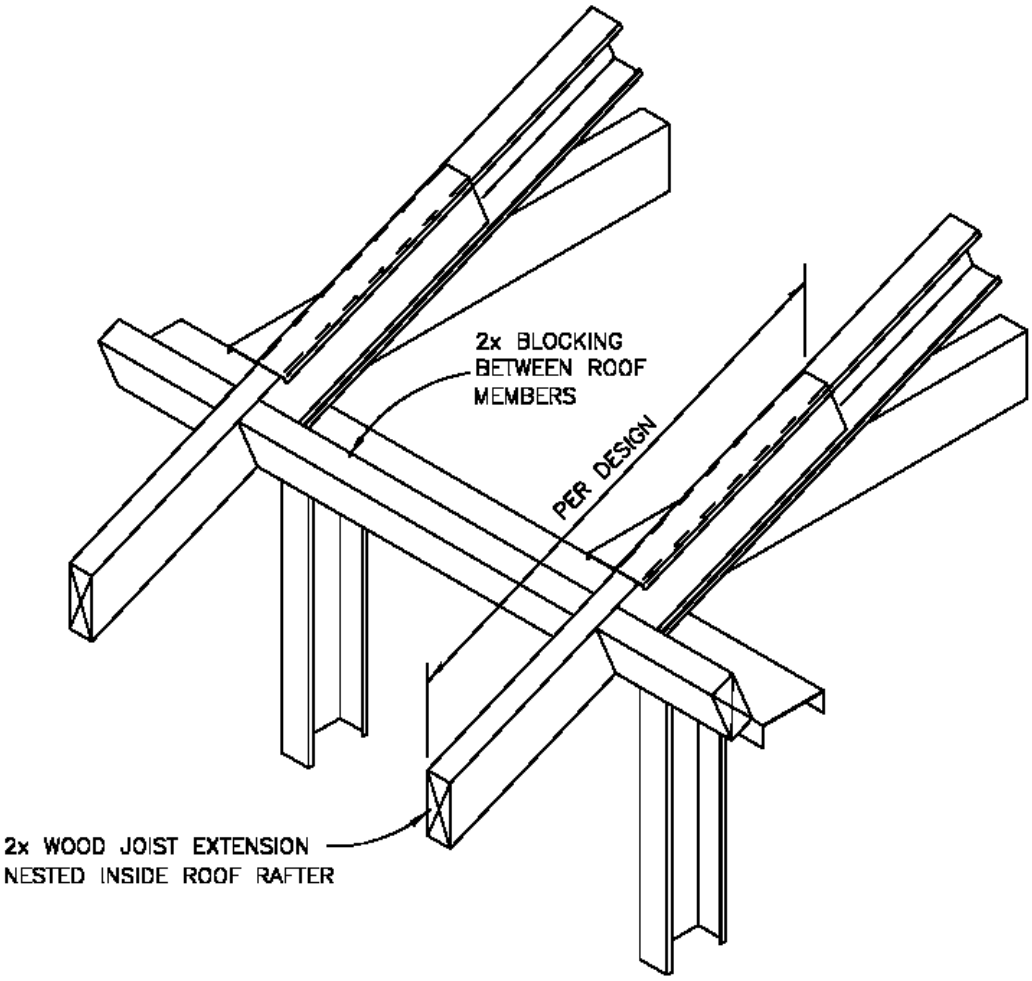
Detail R9
Collar Tie at Rafter Detail



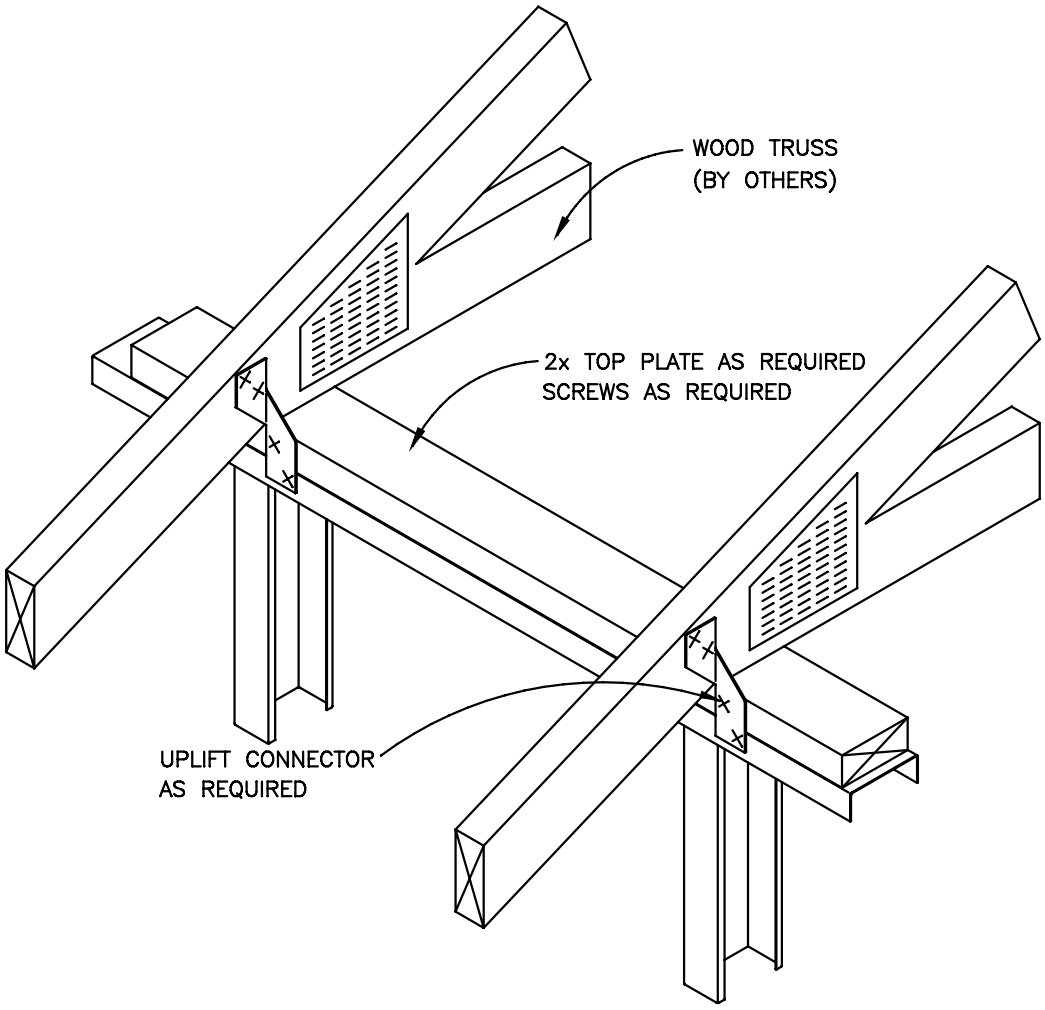
Detail R10
Rafter Brace Connection Detail



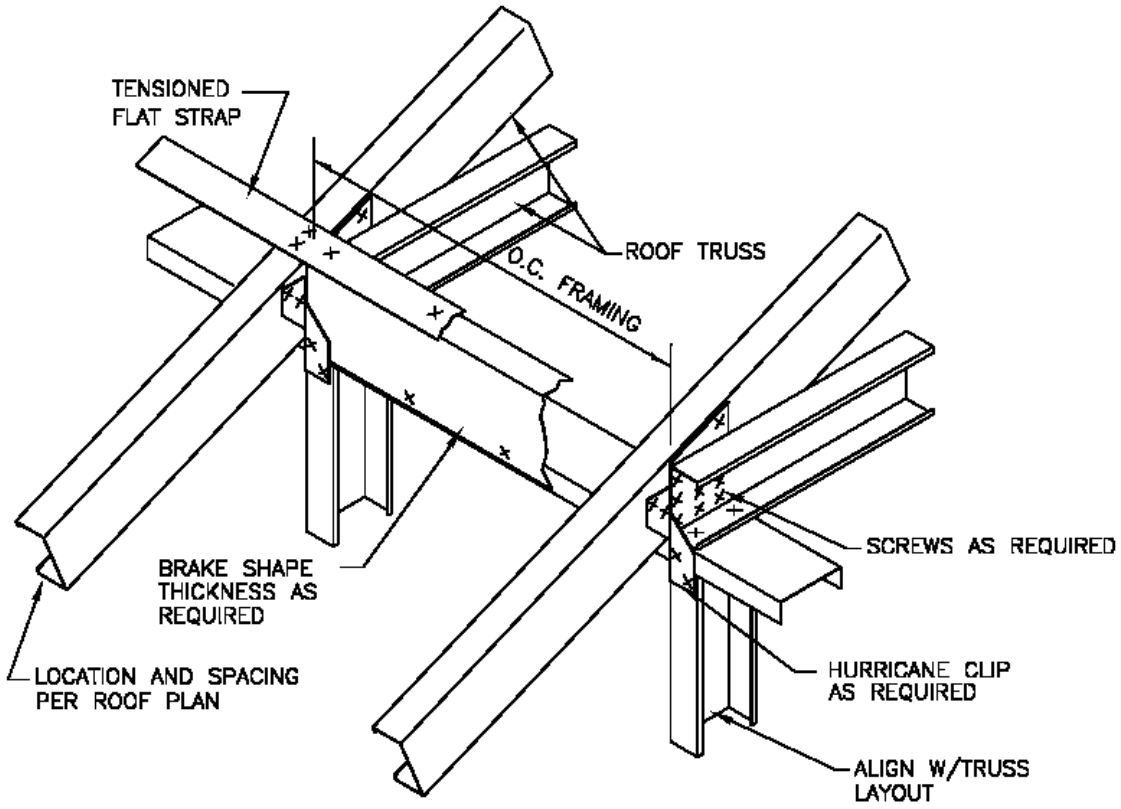
Detail R11
Roof Framing with Wood Tail Extension



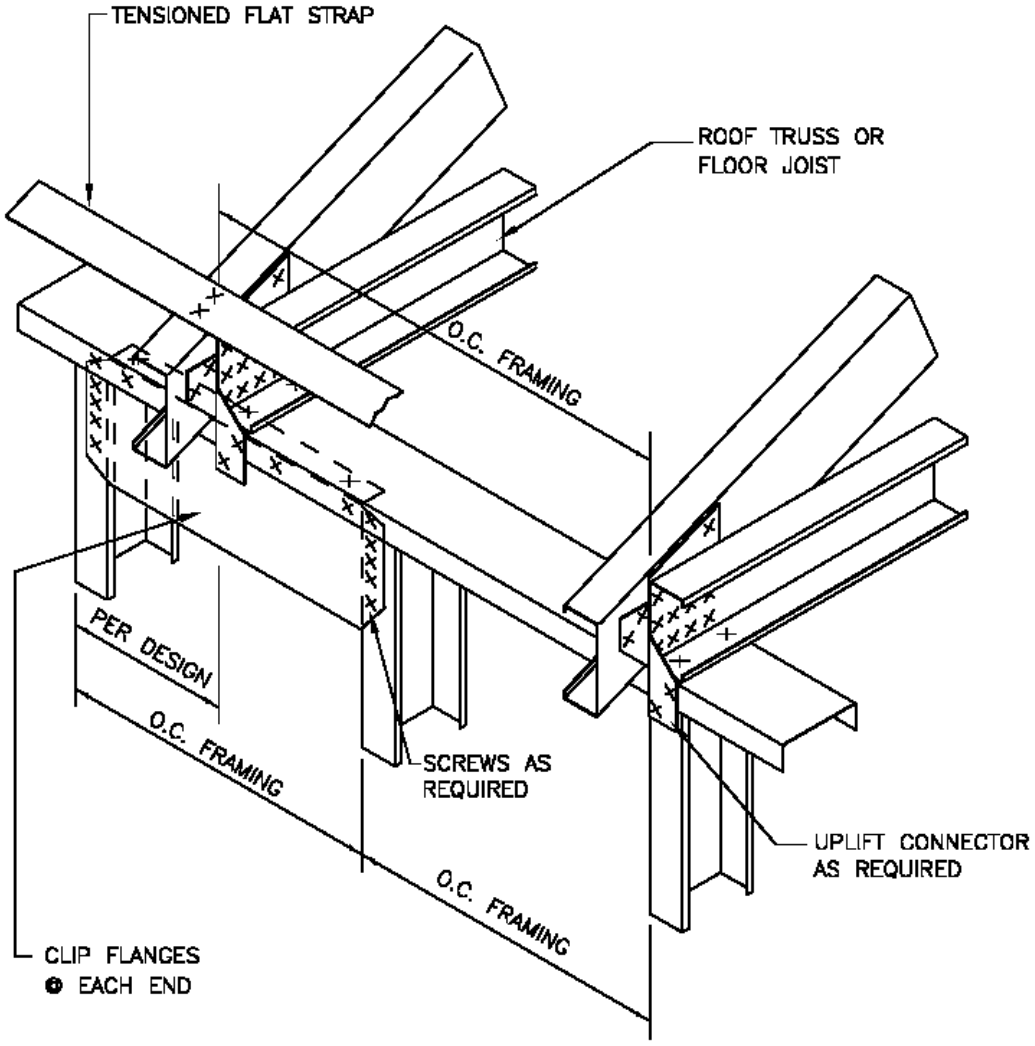
Detail R12
Wood Truss Bearing on Steel Wall



Detail R13
Collector Block Detail



Detail R14
Non-Aligned Roof-Wall Framing



Detail R15
Hip Beam

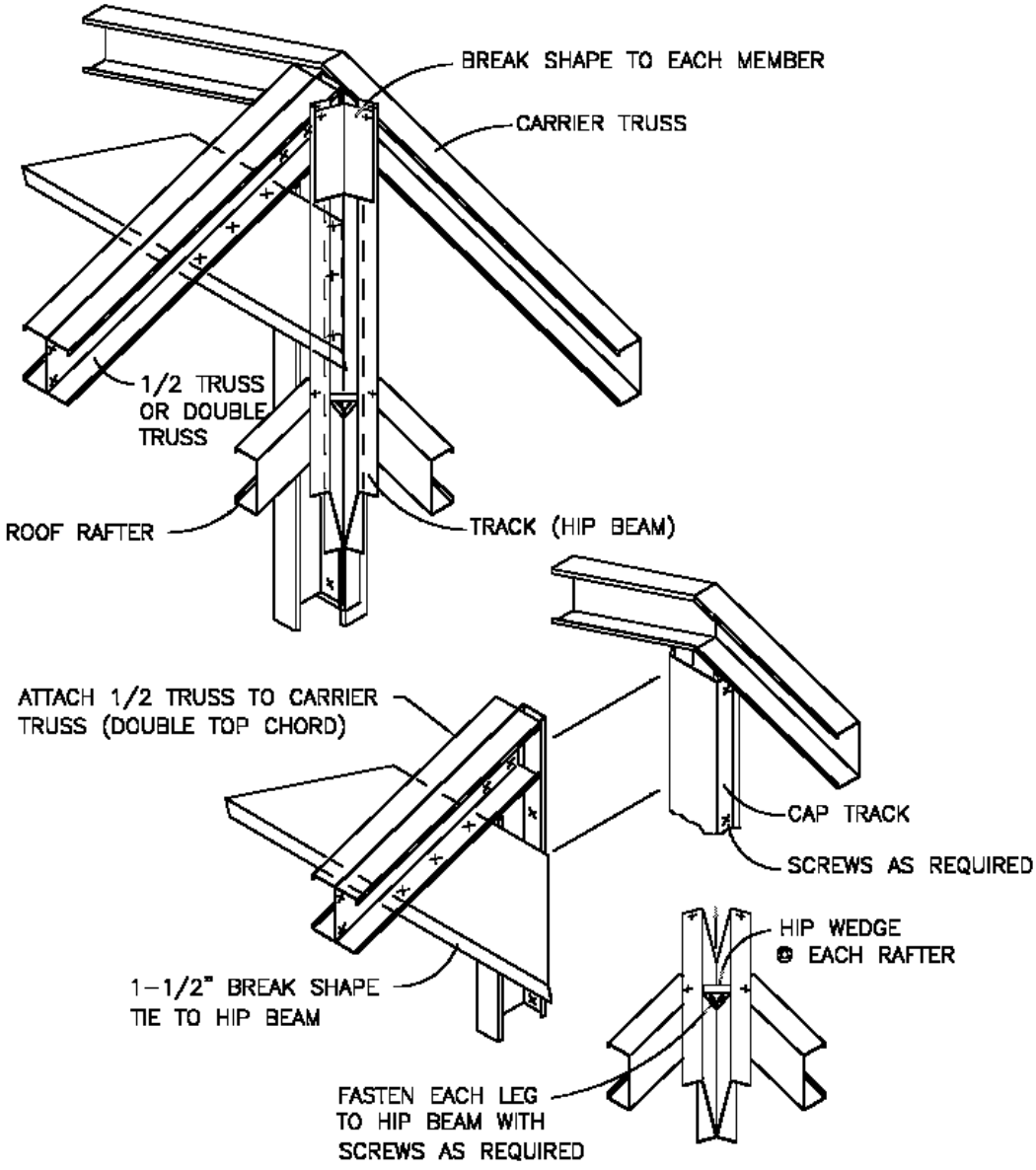


Figure M1
Cabinet Blocking Detail

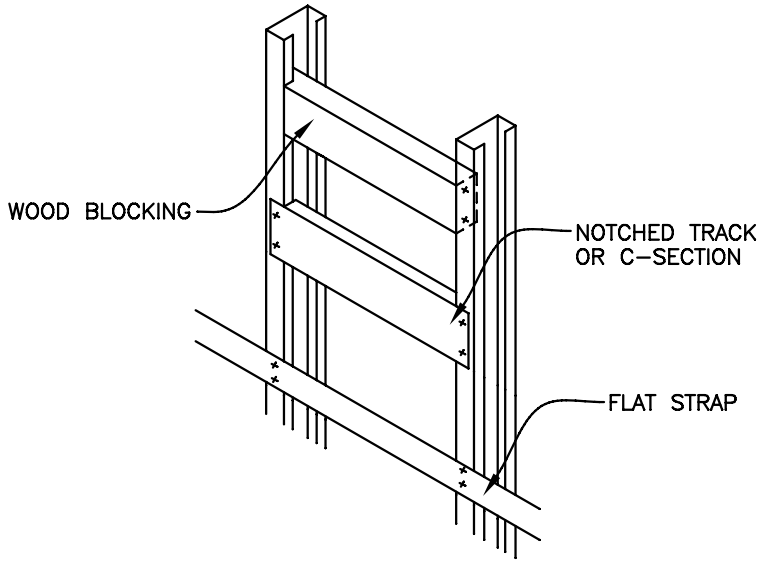


Figure M2
Wiring and Piping Installation Detail

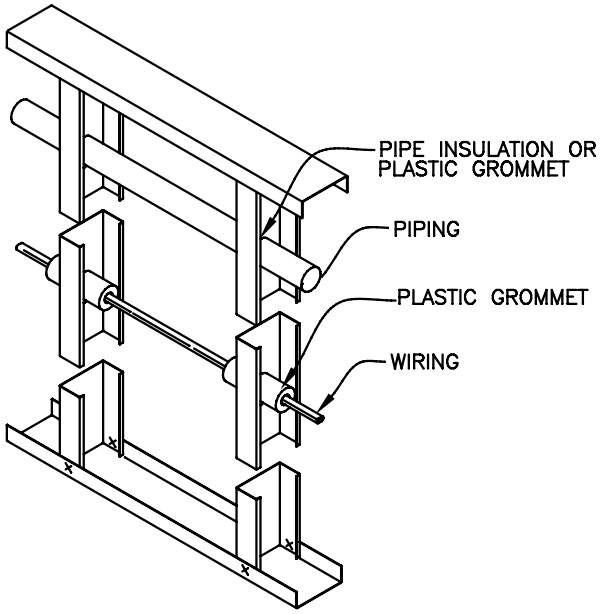


Figure M3
Stair Framing Detail

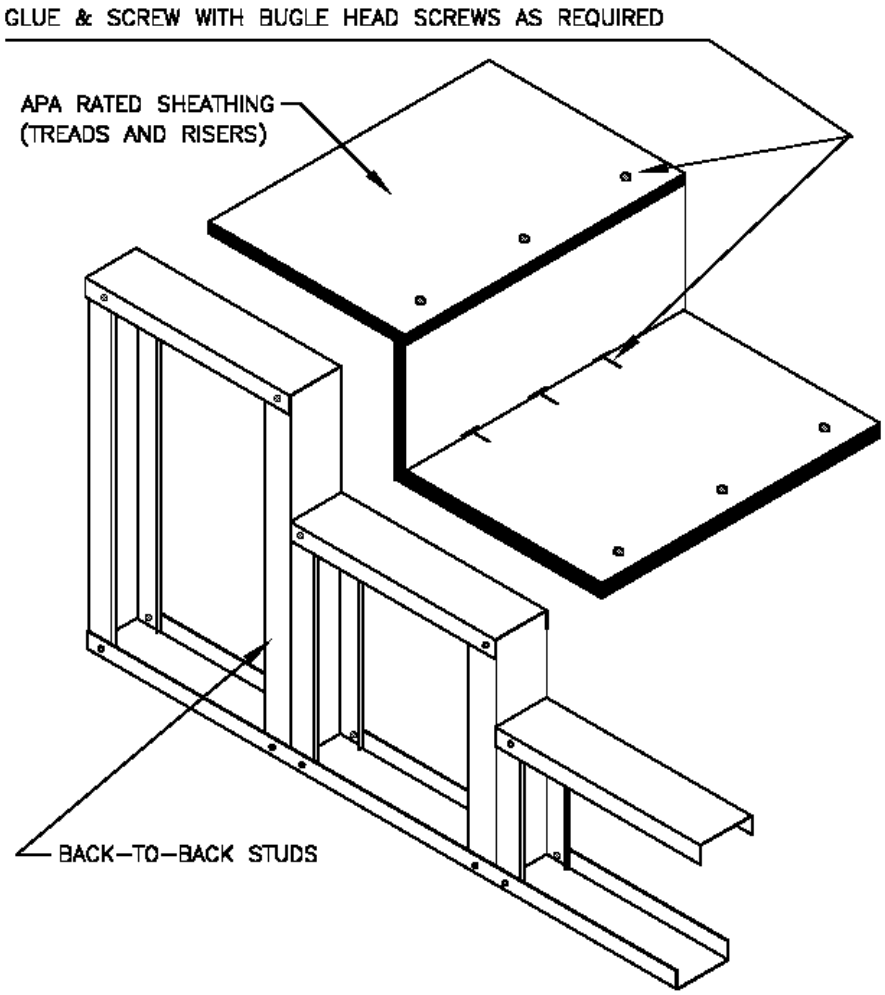


Figure M4
Stair Framing Detail 2

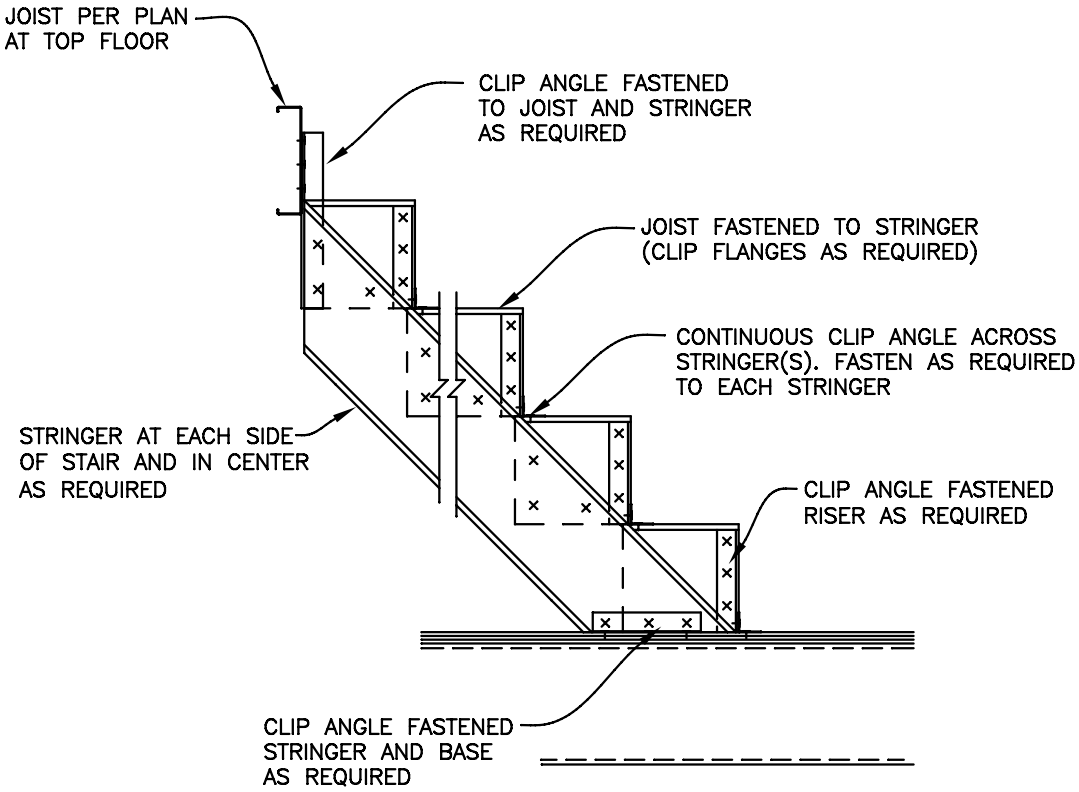


Figure M5
Stair Landing Detail

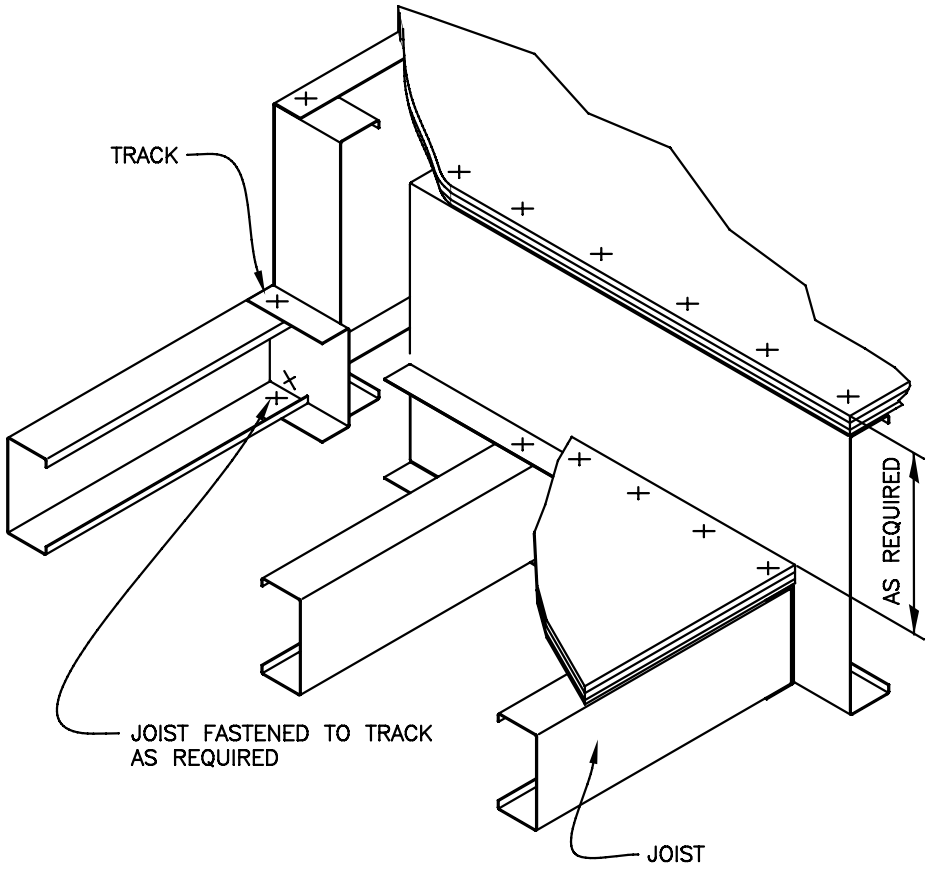
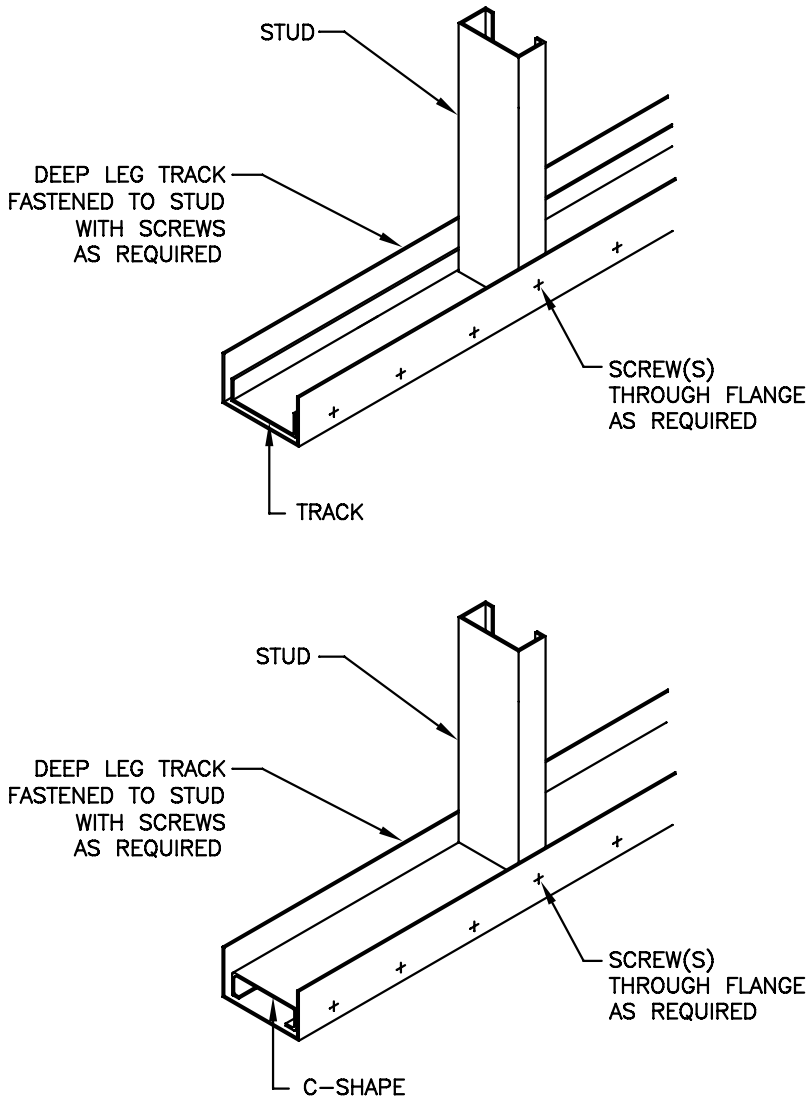


Figure M6
Wind Sill Details



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