



Strengthening Gable End Walls on Existing Homes

Course Information

Key Changes to FBC-Residential Eighth Edition Chapters 1-3

1 Hour General Credit

Training Provider:

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CILB Approval # 0614506

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General Requirements, Existing Building 1701

- Application

- Prescriptive methods to increase the resistance of gable end walls to out-of-plane wind loads during a partial structural retrofit.
- This section may not satisfy building code requirements for:
 - New construction
 - Alterations
 - Additions
 - Change of occupancy
 - Repairs



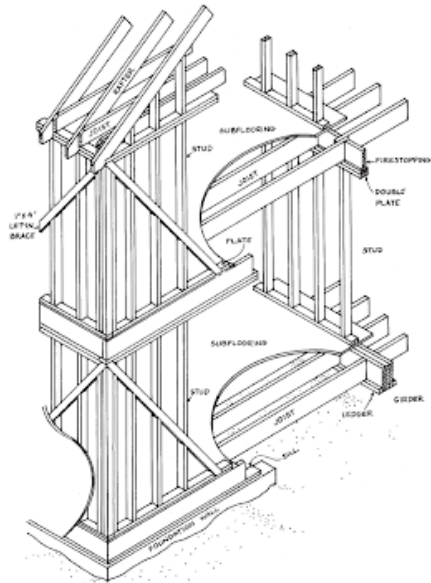
General Requirements, Existing Building 1701

- **701.3 Compliance** - All modifications required for conformance with this chapter shall be designed and constructed in accordance with the *Florida Building Code, Building* or *Florida Building Code, Residential* provisions for new construction except as specifically modified by this chapter.

General Requirements, Existing Building 1701

- Eligibility and use of Retrofitting
 - Group R-3 occupancy
 - Wood framed gable end walls using platform framing
 - **PLATFORM FRAMING** - A type of wall framing where structural framing members of the gable end wall terminate at or above the top plate on the rectangular wall below the gable end wall.

Figure 1. Platform Frame Construction



General Requirements, Existing Building 1701

- Eligibility and use of Retrofitting
 - Mean roof height of less than 35 ft
 - **MEAN ROOF HEIGHT** - The average of the roof eave height and the height to the highest point on the roof surface, except that eave height shall be used for roof angle of less than or equal to 10 degrees (0.18 rad).

General Requirements, Existing Building 1701

- Attic framing with conventional lumber
 - Rafters
 - Trusses
- Wall construction
 - Conventional lumber
 - Masonry



General Requirements, Existing Building 1701

- Maximum 24" on center wall spacing
- Maximum gable height of 16'
- Risk category I or II
 - One- and two-family dwellings typically fall into risk category II
- Solid and complete ceiling and roof diaphragm

Retrofit Materials 1703

- Existing materials must be in sound condition and suitable for their purpose.
- New materials must comply with *Florida Building Code, Residential*

**TABLE 1703.3
MATERIAL SPECIFICATIONS FOR RETROFITS**

Component	Minimum Size or Thickness	Minimum Material Grade or Type	Minimum Capacity
All lumber	2-inch nominal thickness minimum depth will vary according to application	#2 Spruce-Pine-Fir (S) or better	Not applicable
Gusset angle bracket	14 gage thickness	Galvanized sheet steel <i>approved</i> for connecting wood-to-wood, wood-to-CMU, or wood-to-concrete.	350 pounds uplift and lateral load
Stud-to-plate connector	14 gage thickness	Galvanized sheet steel <i>approved</i> for connecting wood-to-wood.	500 pounds uplift
Metal connectors	20 gage thickness	Galvanized sheet steel <i>approved</i> for connecting wood-to-wood, wood-to-CMU, or wood-to-concrete.	Not applicable
Nail plates and straps	20 gage thickness	Galvanized sheet steel <i>approved</i> for connecting wood-to-wood.	Not applicable

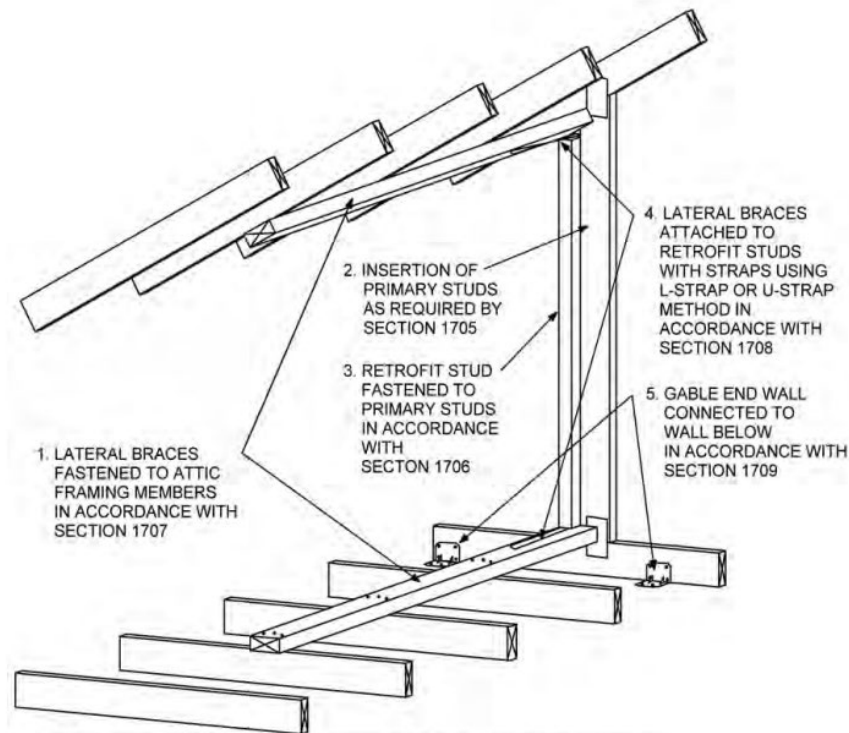
**TABLE 1703.5
NAIL AND SCREW REQUIREMENTS**

Minimum Fastener Length (inches)	Fastener Type	Shank Diameter (Neglecting Galvanizing) Minimum and Maximum	Minimum Length of Thread (inches)	Minimum Head Diameter (inches)
1½	#9 screws	0.177 inches	1¼	0.28
	8d common nails	0.131 inches	Not applicable	0.28
3	#9 screws	0.177 inches	1½	0.28
	10d common nails	0.148 inches	Not applicable	0.28

For SI: 1 inch = 25.4 mm.

General Requirements 1704

- Designed to supplement existing framing



THIS FIGURE SHOWS A TRUSS GABLE END USING THE L-BENT STRAP METHOD.
IN ORDER TO SHOW STRAPS, COMPRESSION BLOCKS ARE NOT SHOWN.
THE METHODOLOGY FOR A CONVENTIONALLY FRAMED GABLE END IS SIMILAR.
NOT ALL DETAILS ARE SHOWN.

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

**TABLE 1704.1
RETROFIT CONFIGURATION AS A FUNCTION OF EXPOSURE CATEGORY, DESIGN WIND SPEED, AND STUD HEIGHT**

RETROFIT ELEMENTS				SIZE AND NUMBER OF RETROFIT ELEMENTS Stud length limitations based on Exposure, Basic Wind Speed, and Configuration			
Exposure Category	Max Ultimate Design Wind Speed, V_{ult} (3-sec gust) (Interpolation is not permitted)	Connections of gable end wall to wall below. On center spacing (Section 1708)		Configurations A, B, C, or D			
		Gusset angle bracket (inches)	Fasteners to secure sill plate to wall (inches)	A	B	C	D
D	≤ 130 mph	39	14	6'-11"	10'-11"	14'-3"	16'-0"
D	>130 – 140 mph	34	12	6'-7"	10'-5"	13'-7"	16'-0"
D	>140 – 150 mph	29	10	6'-2"	9'-9"	12'-10"	16'-0"
D	>150 – 160 mph	26	9	5'-11"	9'-1"	12'-0"	15'-4"
D	>160 – 170 mph	23	8	5'-6"	8'-7"	11'-4"	14'-9"
D	>170 – 180 mph	20	7	5'-2"	8'-1"	10'-8"	14'-2"
C	≤ 130 mph	46	16	7'-4"	11'-6"	15'-1"	16'-0"
C	>130 – 140 mph	39	14	7'-0"	10'-11"	14'-5"	16'-0"
C	>140 – 150 mph	34	12	6'-8"	10'-5"	13'-8"	16'-0"
C	>150 – 160 mph	30	11	6'-4"	9'-10"	13'-0"	16'-0"
C	>160 – 170 mph	27	9	5'-11"	9'-3"	12'-3"	15'-6"
C	>170 – 180 mph	24	8	5'-7"	8'-9"	11'-7"	15'-0"
B	≤ 130 mph	63	22	8'-2"	12'-10"	16'-0"	Note a
B	>130 – 140 mph	54	19	7'-9"	12'-2"	15'-0"	Note a
B	>140 – 150 mph	47	17	7'-5"	11'-8"	15'-3"	16'-0"
B	>150 – 160 mph	42	15	7'-1"	11'-2"	14'-7"	16'-0"
B	>160 – 170 mph	37	13	6'-10"	10'-8"	14'-0"	16'-0"
B	>170 – 180 mph	33	12	6'-7"	10'-4"	13'-6"	16'-0"
Retrofit studs		Minimum size and number (Section 1706)		2 × 4	2 × 6	2 × 8	2 each 2 × 8
Lateral brace above and below (top and bottom) Minimum size and number (Section 1707)				2 × 4	2 × 4	2 × 4	2 each 2 × 8
Retrofit Elements for L-bent strap applications (Section 1708.1.1)							
Fasteners at each end for strap connecting retrofit studs to lateral braces using 1½-inch long fasteners complying with Table 1703.5 Minimum number				3	5	6	5 at each end of each strap
Fasteners to connected compression blocks to lateral braces using 3-inch long fasteners complying with Table 1703.5 Minimum number				4	6	7	5
Retrofit Elements for U-bent strap applications (Section 1708.1.2)							
Fasteners to connect straps to each edge of lateral braces using 1½-inch long fasteners complying with Table 1703.5 Minimum number				3	4	4	4 at each end of each strap

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

a. Configuration C is allowable.

Added Studs (Primary Studs) 1705

- **ADDED STUD** - Studs installed in a gable end wall to provide the required minimum spacing between existing wall studs prior to adding any retrofit studs needed to brace or stiffen the gable end wall.

Added Studs (Primary Studs) 1705

- Applies to gable wall assembly, including piggyback truss assemblies.
- Required when distance between studs three feet and longer exceed 22 ½ inches.



Added Studs (Primary Studs) 1705

- Each section, or stud shall be considered.
- Shall be at least the same dimension as the existing framing.
- Installed at same orientation as existing.

Added Studs (Primary Studs) 1705

- Attachment
 - Conventional framing attached to top and bottom pieces.
 - Truss assembly - attached to top and bottom chords.
 - Stud to plate connector with uplift capacity of 175 pounds with 1 ½ inch fasteners (Table 1703.5)



Retrofit Studs 1706

- **RETROFIT STUD.** A vertical lumber member used to supplement the strength or stiffness of an existing or added (primary) stud.
- Installed at each primary stud longer than three feet.
- Studs must be continuous through both sections of piggyback trusses.

Retrofit Studs 1706

- Methods
 - Face to face/face to edge
 - Butted retrofit
 - Offset retrofit
 - Nailer with retrofit



Retrofit Studs 1706

- Fasteners
 - Three inch fasteners with minimum 1 ½ inch penetration
 - Between 2 ¾ inches and 6” on center with restrictions close to the edge
 - Nail plate attachments
 - Maximum 20 inches between plates
 - Minimum three 1 ½ inch fasteners per plate in each stud
 - Fasteners between 2 ¾ inches and 6 inches from end of stud
 - Restrictions close to edge

Retrofit Studs 1706

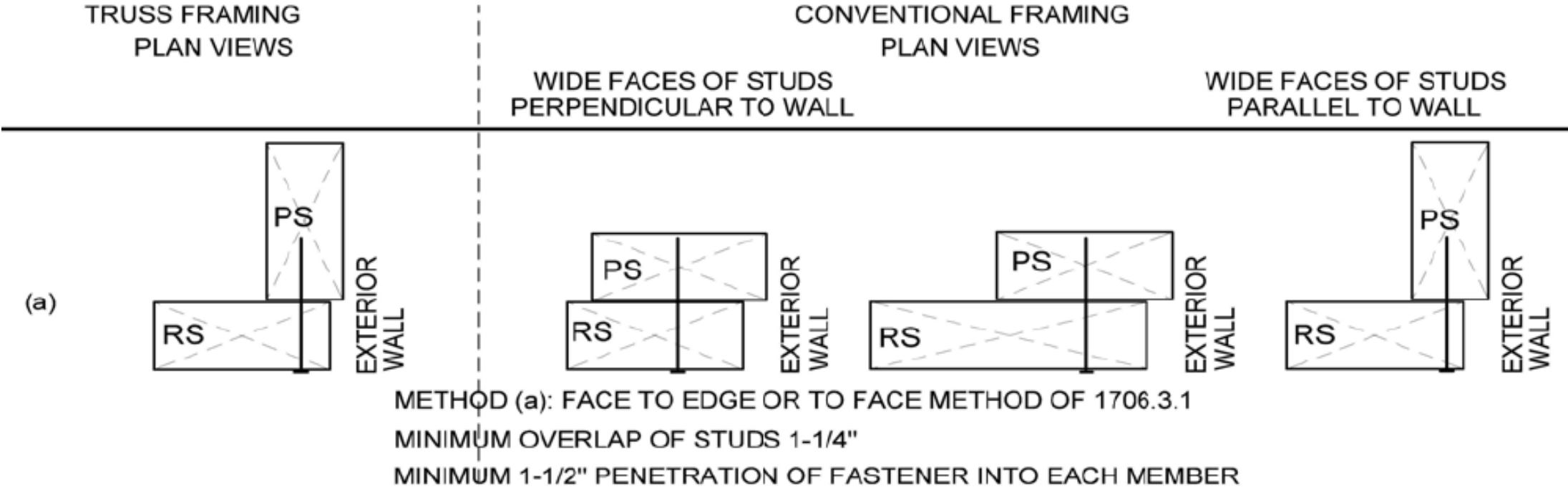
- Specific requirements if stud must be cut, notched, or modified.
- Up to two ladder assemblies can be used if existing conditions prevent a retrofit stud.



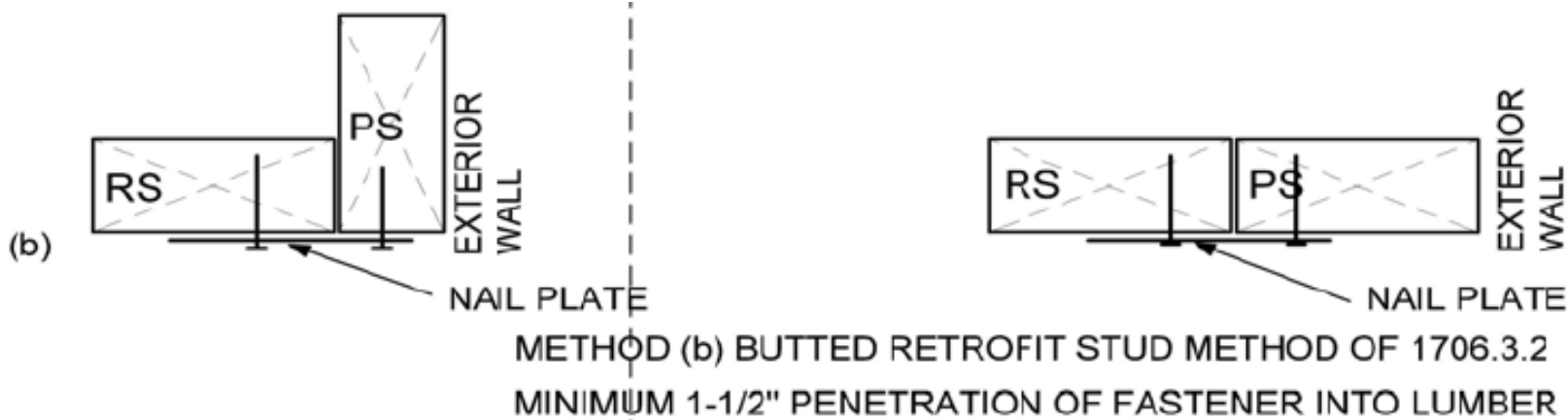
Retrofit Studs 1706

- A retrofit stud must be added to bridge interrupted primary studs.
- Splicing of retrofit studs is permitted in certain conditions.

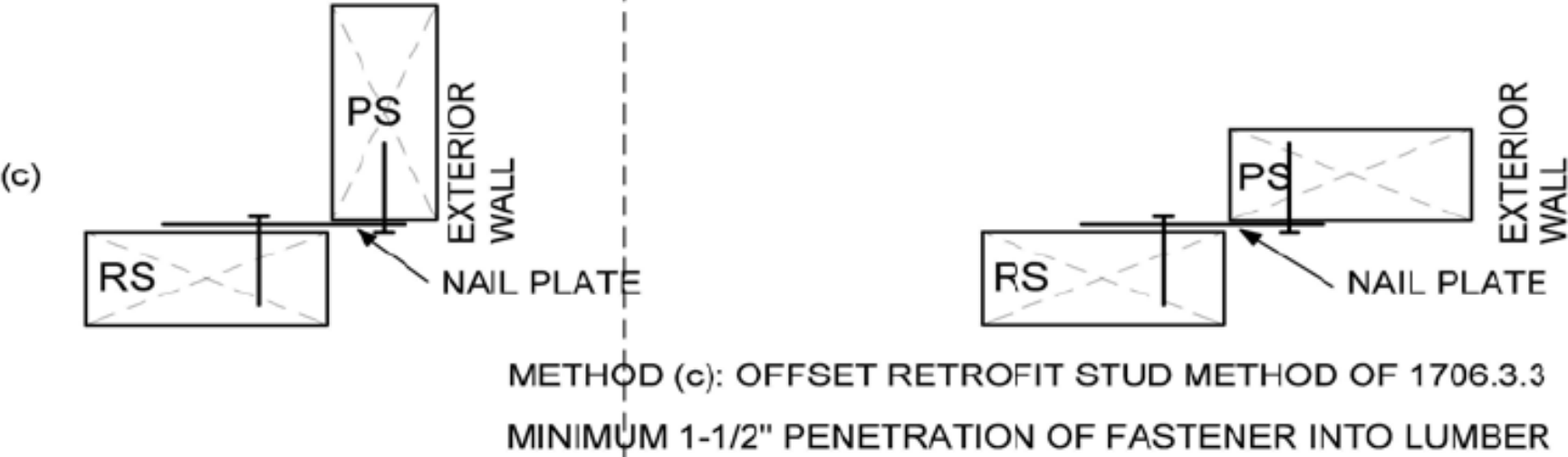
Retrofit Studs 1706-Face to Face/Face to Edge



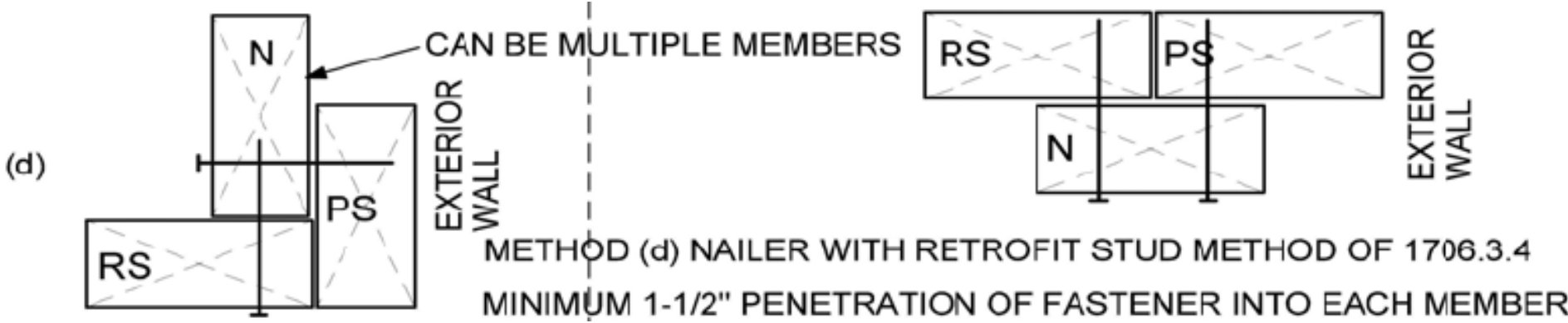
Retrofit Studs 1706-Butted Retrofit



Retrofit Studs 1706-Offset Retrofit



Retrofit Studs 1706-Nailer with Retrofit



Retrofit Studs 1706-Nailplate Fastening

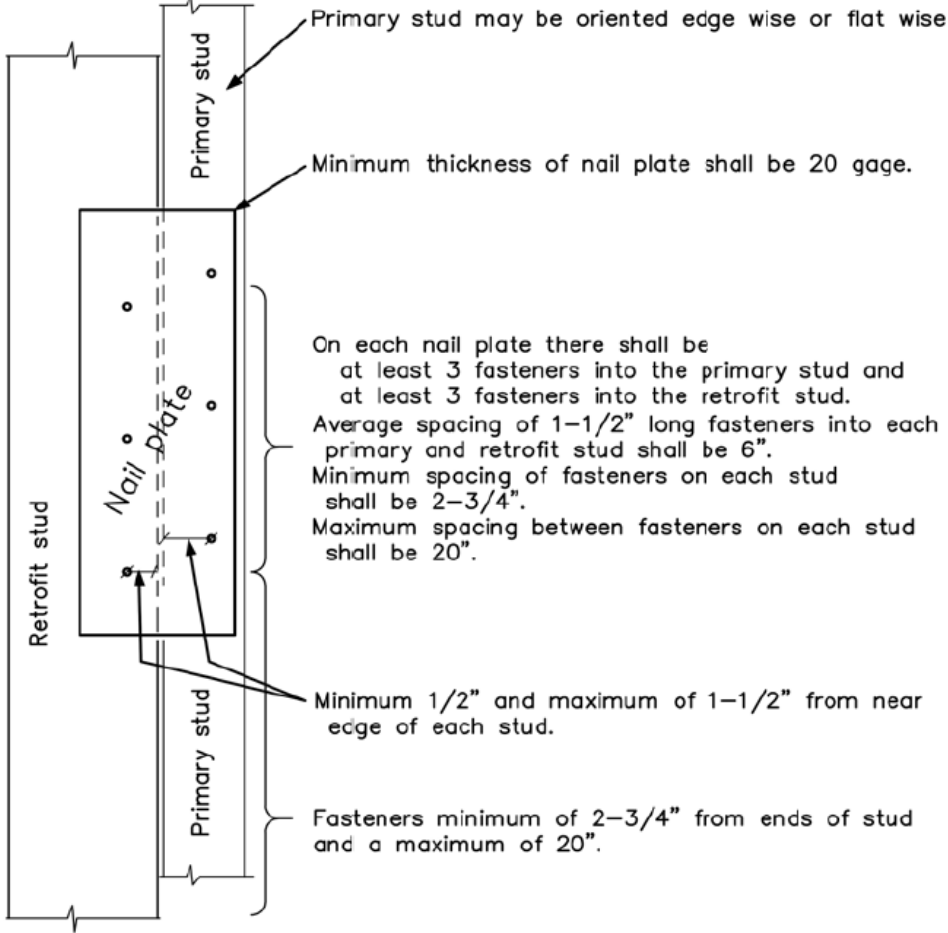


FIGURE 1706.4.2
NAIL PLATE FASTENING

Lateral Braces 1707

- Installed at the end of each retrofit stud
- Perpendicular and attached to at least three attic framing members
- Extend at least 2 $\frac{3}{4}$ inches past last framing member

Lateral Braces 1707

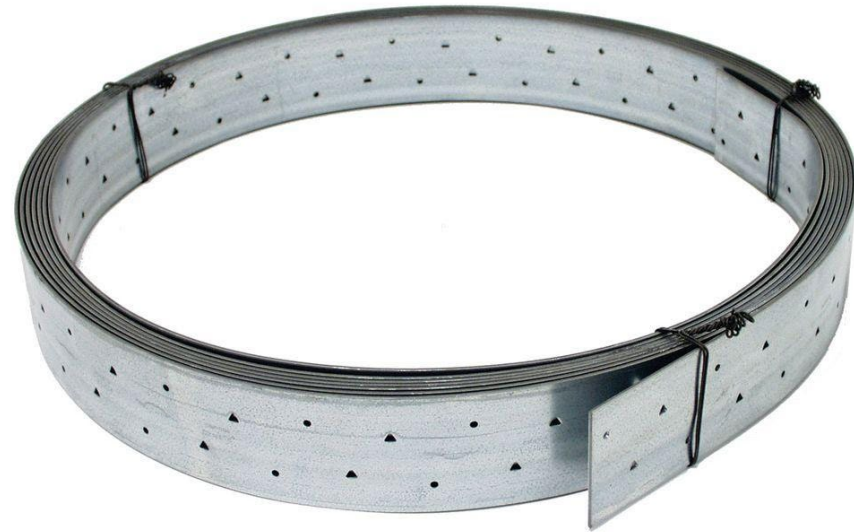
- Three inch fasteners.
- Anchor block required if bottom chord or ceiling joist is greater than six inches.

Lateral Braces 1707

- Alternatives permitted in certain situations.
 - Short lateral brace
 - Splices
 - Other alternatives

Attachment of Lateral Braces to Retrofit Studs 1708

- 1 ¼" wide flat or coil strap
- L-bent strap method
- U-bent strap method

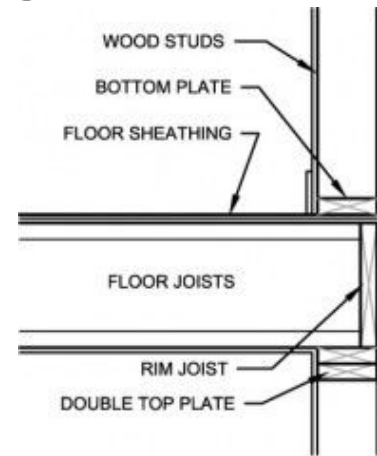


Connections to Wall Below 1709

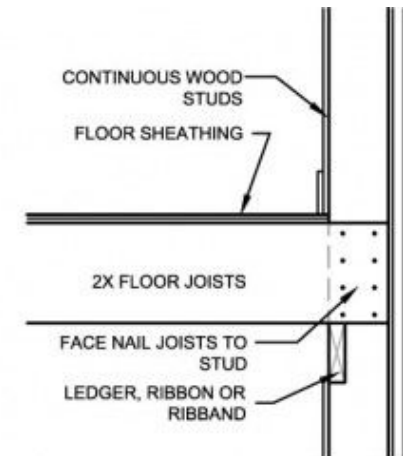
- Truss gable end walls shall be fastened to the wall below using angle brackets
 - Spaced in accordance with 1704.1
 - Minimum four fasteners per bracket
 - Lumber to lumber
 - Lumber to masonry/concrete

Connections to Wall Below 1709

- Platform construction
 - Stud to plate connector minimum uplift of 175 pounds at each primary stud
 - Screws from sill to top plate or concrete wall spaced per 1704.1
- Retrofits do not apply to balloon framing.



**PLATFORM
FRAMING**
② SCALE: NO SCALE



**BALLOON
FRAMING**
① SCALE: NO SCALE

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