



Exterior Brick Masonry Veneer Supported by Metal Plate Connected Wood Trusses.

DD No. 1608-01

Structural Building Components Association (SBCA)

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1. General Notes:

- 1.1. The details that follow focus on the support of brick masonry veneer by metal plate connected wood trusses (MPCWT) at the transition from a wider portion of a building to a narrower section. However, the concepts shown here can be applied to many different applications of brick masonry veneer supported by MPCWT.
- 1.2. In addition to the gravity loads supported by the MPCWT, the lateral support of brick veneer shall be provided by the ties and wood backing system, including proper restraint of the MPCWT to resist the lateral loads imposed.
- 1.3. The ties must be capable of resisting tension and compression resulting from forces acting perpendicular to the truss plane.
- 1.4. Typical design of the MPCWT only accounts for gravity loads in the plane of the truss. The building designer or Registered Design Professional, understanding the intended flow of loads for the entire building system, is required to account for these loads as well as for taking the resultant of all applicable loads that exist within the truss and/or Gable End Frame and safely transfer these loads into the ground.

2. Truss Design Assumptions

- 2.1. Truss total load deflection is limited to $L/600$.
- 2.2. Load Duration factor is $C_D=0.9$.
- 2.3. Creep factor for long-term deflection calculation shall be 1.5 for dry lumber and 2.0 for unseasoned lumber.
- 2.4. Maximum weight of brick masonry veneer is 40 psf.

The seal on this design drawing indicates acceptance of professional engineering responsibility solely for the component(s) depicted. The design assumptions, loading conditions, suitability and use of this component for any particular building is the responsibility of the building designer or owner of the components, per *ANSI/TPI 1*. The responsibilities and duties of the component designer, component design engineer and component manufacturer shall be in accordance with the latest edition of *ANSI/TPI 1* Chapter 2 unless otherwise defined by a contract agreed upon by the parties involved.

DrJ Design Detail

- 2.5.** Attachment of steel lintel to MPCWT should be based on the recommended details per [Figure 1](#). A minimum 6 inches x 4 inches x $\frac{5}{16}$ inch (152 mm x 102 mm x 8 mm) steel angle, with the long leg placed vertically, shall be anchored to MPCWT using bolts installed per recommendations in [Table 1](#).
- 2.5.1.1.** The maximum slope of the roof construction without stops welded to the steel angle shall be 7:12. Supporting the brick veneer with trusses that include slopes greater than 7:12 but not more than 12:12 shall have stops of a minimum 3 inches x 3 inches x $\frac{1}{4}$ inches (76 mm x 76 mm x 6 mm) steel plates welded to the angle at max. 24 inches (610 mm) on center along the angle or as approved by the building official.
- 2.6.** The ties must be capable of resisting tension and compression resulting from forces acting perpendicular to truss plane.
- 2.6.1.** Stainless steel ties specified under ASTM A 240 or A 580 or corrosion protected ties such as zinc coated corrugated steel ties, minimum 22 U.S. gauge thick (0.0299"), $\frac{7}{8}$ -inch wide and 6-inch long (0.76mm x 22 mm x 152 mm) complying with ASTM A 653 and A 153 class B2 shall be used.
- 2.6.2.** Veneer ties shall be spaced at maximum 32" o.c. (610 mm) horizontally and 24" o.c. vertically and shall support max 2.67 ft² (0.25 m²) of brick veneer wall area; however, it is suggested that for newer construction wall studs be spaced at 16" o.c., so that ties can be anchored at this spacing ([Figure 1](#)).
- 2.6.3.** Strand wire ties are less susceptible to corrosion than corrugated steel sheet ties. Minimum strand wire size diameter shall be 9 U.S. gauge [(0.148") or (4 mm)] and be spaced same as corrugated steel ties and shall have a hook embedded in the mortar joint.
- 2.6.4.** [Table 2](#) provides recommendations for maximum vertical tie spacing for high wind areas when structural gable truss vertical members are spaced at 24", 16" and 12" on center spacing. In the areas that are susceptible to both high wind and seismic loads, masonry brick veneer system should be evaluated by Registered Design Professional to ensure that brick veneer cladding can resist both seismic and wind design loads.
- 2.7.** Flashing and weep holes shall be located in the brick veneer wythe above the steel angle in accordance with [Figure 1](#). Flashing below the steel lintel should consist of typical step flashing and counter flashing installed directly on the adjacent (i.e., lower) roof sheathing including weep holes at maximum 33" o.c.
- 2.8.** Create vertical expansion joint @ maximum 25' (7.6 m) o.c. spacing.
- 2.8.1.** The actual location of vertical expansion joints in a structure depends on the structural configuration as well as the expected amount of horizontal movement. In addition, vertical expansion joints should be considered at or near corners, offsets, and setbacks, wall intersections, changes in the wall height, where wall backing system changes, where support of brick veneer changes and where wall function or climatic exposure changes ([Figure 3](#)).

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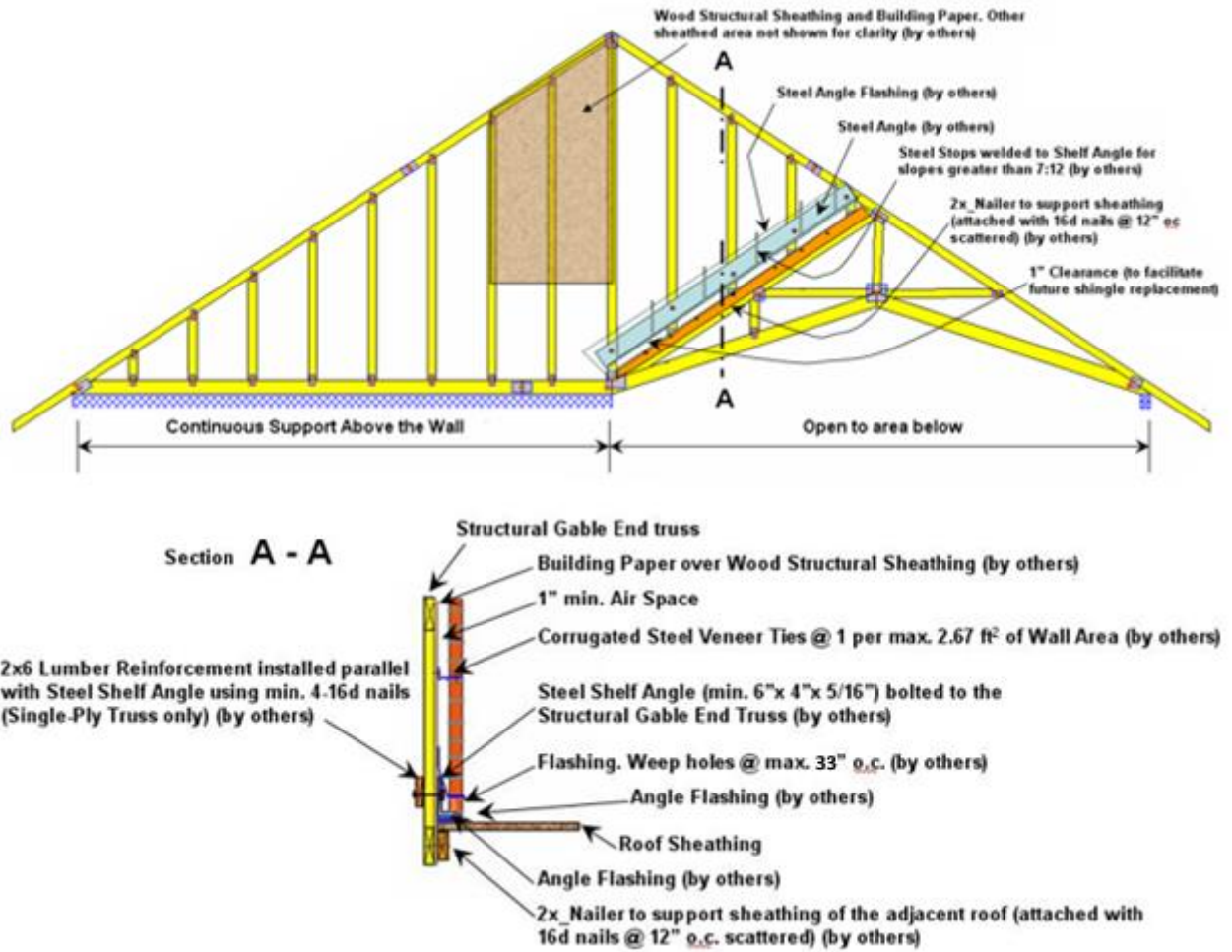


Figure 1. Recommended detail for attaching steel lintel to MPCWT supporting brick masonry veneer

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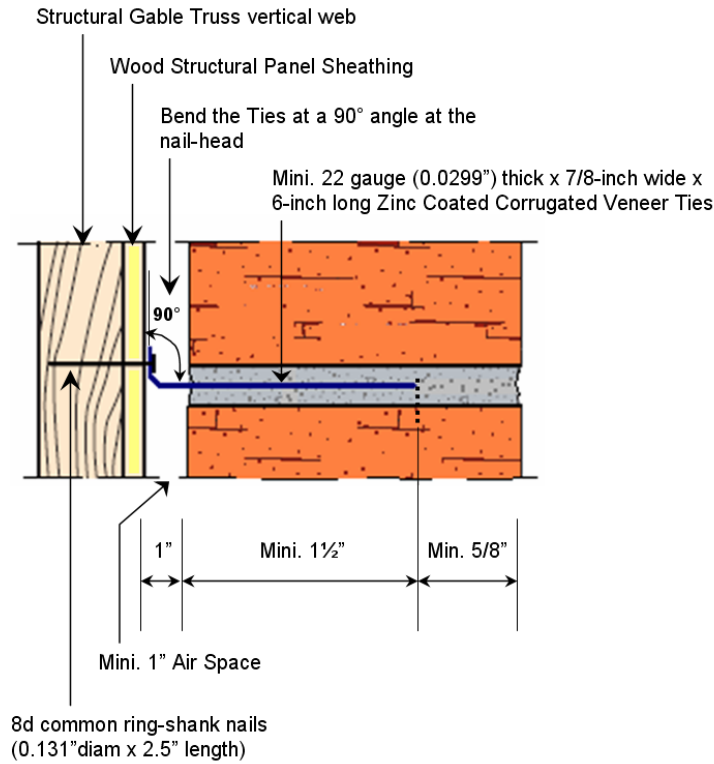


Figure 2. Recommended detail for masonry brick veneer corrugated steel tie embedment

Anchor-Bolt Spacing (Truss Vertical Member Spacing)	Anchor-Bolt Diameter ^{1,b}			
	³ / ₈ -inch bolt diam.	¹ / ₂ -inch bolt diam.	⁵ / ₈ -inch bolt diam.	³ / ₄ -inch bolt diam. ²
24 inches o.c.	Max. 4'-0" brick height	Max. 5'-6" brick height	Max. 7'-0" brick height	Max. 8'-6" brick height
16 inches o.c.	Max. 6'-6" brick height	Max. 8'-6" brick height	Max. 10'-6" brick height	Max. 12'-8" brick height
12 inches o.c.	Max. 8'-6" brick height	Max. 11'-6" brick height	Max. 14'-0" ^a brick height	Max. 16'-8" ^a brick height

¹ Bolt shear capacity is calculated based on 2015 NDS for Wood Construction for truss lumber with Specific Gravity G=0.42 (Spruce-Pine-Fir) with moisture content less than 19% and the following adjustment factors: C_D=0.9, C_t and C_M =1.0.² Use only with minimum 2x6 vertical truss members.

^a The maximum height of brick masonry veneer above the steel angle support using prescriptive requirements of 2015 IRC shall be 12'-8".

^b Pre-drill oval holes in the shelf angle for easier field installation adjustment.

Table 1: Shelf angle bolt sizing based on the supported height of brick masonry and truss vertical member spacing

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Wind Speed (3-sec Peak Gust)	Wind ^{1,2} Pressure (psf)	Maximum Vertical spacing for Ties in inches ^{1,2,3,4} 8d (0.131" x 2.5") nails					
		Truss members @ 24" o.c.		Truss members @ 16" o.c.		Truss members @ 12" o.c.	
		SPF	SYP	SPF	SYP	SPF	SYP
115 mph	19.1	20	24 ⁵	24 ⁵	24 ⁵	24 ⁵	24 ⁵
120 mph	20.8	19	24 ⁵	24 ⁵	24 ⁵	24 ⁵	24 ⁵
130 mph	24.4	16	24 ⁵	24 ⁵	24 ⁵	24 ⁵	24 ⁵
140 mph	28.3	14	24	21	24 ⁵	24 ⁵	24 ⁵
150 mph	32.5	12	12 ⁶	18	18 ⁶	24 ⁵	24 ⁵
160 mph	37.0	10	12 ⁶	16	18 ⁶	21 ⁵	24 ⁵
180 mph	46.8	NA ⁷	NA ⁷	12	18 ^{6,7}	17	18 ⁷

¹ The vertical tie spacing is based on wind loads derived from ASCE 7-10 Components and Cladding – Method 1 (simplified – Figure 30.5-1, Zone 5, Effective wind area = 10 sf), located in Exposure category B, h = 30 ft., importance factor (I=1) and no topographic influence ($K_{zt}=1.0$). For other heights, exposure, importance factor and topographic influence, an engineered design is recommended. Table based on a tie in every vertical.

² Net Design Wind Pressures from ASCE 7-10 Figure 30.5-1 have been multiplied by 0.6 for Allowable Stress Design.

³ Nail withdrawal strength is for truss lumber with Specific Gravity G=0.42 (Spruce-Pine-Fir (SPF)) and G=0.55 (Southern Yellow Pine (SYP)) with moisture content less than 19% and the following adjustment factors: $C_D=1.6$, C_t , C_M , C_{eg} , and $C_{in}=1.0$. $W = 1800G^2D \times 1.6$

⁴ Nail embedment depth of 2" was assumed for 8d common ring-shank nails (0.131"-diameter x 2 1/2"-long).

⁵ The maximum vertical spacing allowed by the [Brick Industry Association's Technical Note 28 is 24"](#)

⁶ Where the wind pressure exceeds 30 psf, reduce wall area supported by each anchor to max. 2 SF per the IRC R703.8.4.1 & the [Brick Industry Association's Technical Note 28](#)

⁷ Where wind pressure exceeds 40 psf do not space anchors more than 18" vertically & horizontally per the [Brick Industry Association's Technical Note 28](#)

Table 2: Suggested Maximum vertical spacing for brick veneer ties for truss members spaced at 24", 16" and 12" centers

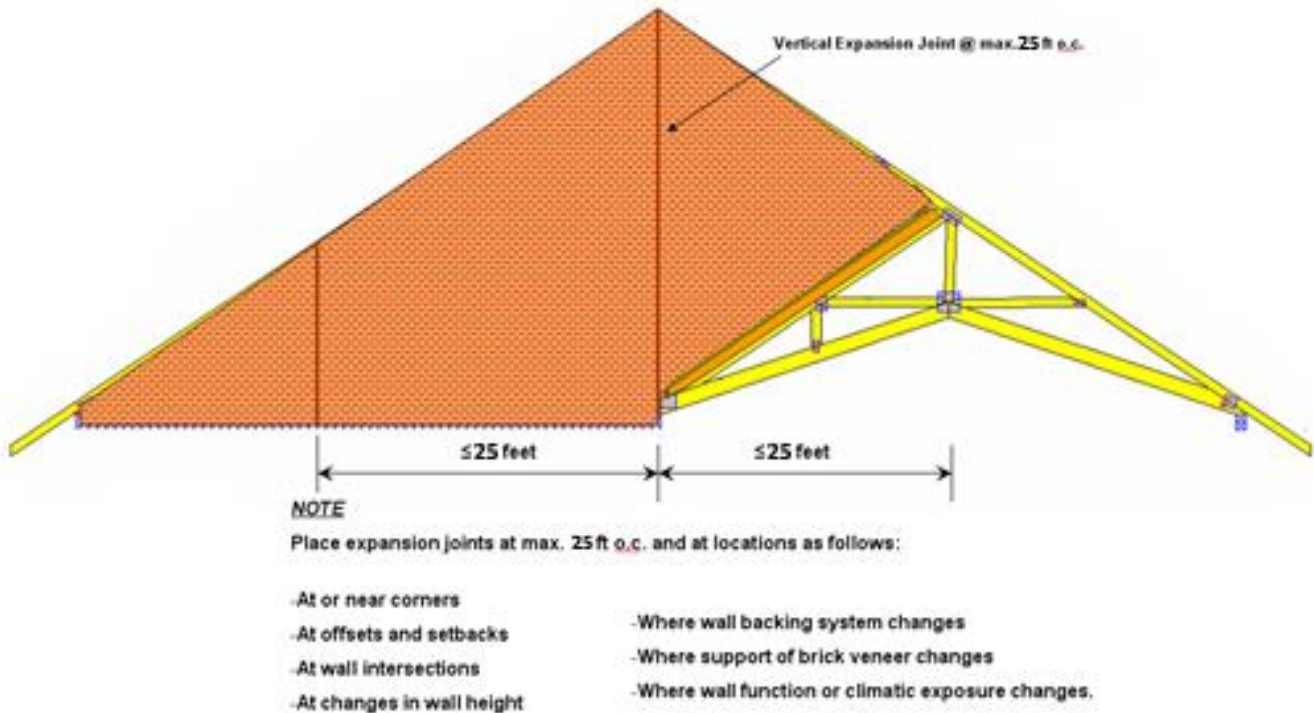


Figure 3. Recommended expansion joint location for brick veneer cladding supported with MPCWT through steel lintel