

Wood Structural Panels on Hip Roofs

In typical residential roof applications, it is recommended that wood structural panels be installed with their strong axis or face-grain direction (in the case of plywood) perpendicular to roof framing. This usually results in roof panels that are installed with the long dimension oriented horizontally (parallel with the roof eaves) or perpendicular to the direction of the roof slope. This panel orientation ensures that panel maximum load capacity and stiffness are attained.

For hip-roof construction, installation of panels with the strength axis perpendicular to the hip trusses assumes that the panels are oriented with their long axis up and down the roof slope, i.e., perpendicular to the hip trusses. Although the hip trusses maintain their normal spacing (e.g., 24" oc), the actual distance between panel supports (i.e., hip-roof area supports) measured along the roof slope is greater than the truss spacing and may exceed the panel span rating for roof applications. As a practical matter, however, the increased length of the support spacing may be inconsequential. For example, for hip trusses spaced at 24" oc with a 3:12 roof slope, the actual support span is increased only 3/4 inch, to 24.74 inches. Therefore, even though the support spacing along the roof slope may be increased slightly, the ability of the panel to support gravity loads is not compromised.

However, when roof slopes become steeper, the increase in effective support spacing can be significant, which may result in increased panel deflection and/or bouncing under concentrated or uniform loads. For example, for hip trusses spaced at 24" oc with an 8:12 roof slope, the increase in support span is almost five inches, to 28.84 inches. In such cases, following are three commonly used construction and/or installation methods to properly address this increased span length in the hip-truss section of a steeply sloped roof. Which of these options is selected depends on several factors, not the least of which is the roof slope in the hip-roof area.

1. Installing panels with a span rating greater than the hip-truss on-center spacing will increase panel stiffness in the hip roof area (for example, using Sheathing Span[®] panels with a 32/16 span rating with hip trusses spaced at 24 inches). Note that applying panels with greater span ratings may result in the use of thicker panels.
2. Install 2x lumber blocking attached to the top chords of the hip trusses. Lumber blocking will decrease the panel support span along the roof slope, improve panel stiffness, and potentially reduce deflection and excess bouncing in the hip area of the roof (see Figure 1 and Table 1).
3. Reduce the spacing of hip trusses in the hip roof area (for example, reducing hip truss spacing from 24 inches to 16 inches on-center, while using panels with a 24/16 span rating that are used on the rest of the roof).

When hip-roof trusses are used, a wood cant strip, field cut from 2x lumber so the bevel matches the roof slope, should be securely nailed to the top chord of hip trusses to provide adequate bearing length for the roof panels (see Detail "A" of Figure 1). Wood cant strips will prevent uneven panel edges and joints from telegraphing through the roofing, prevent gaps between the sheathing and framing, reduce the likelihood of nail pops, increase uplift resistance and reduce panel deflection and bouncing.

In addition, panel buckling (see Figure 2) may occur as a result of the combined effects of the increased span along the roof slope and excess moisture, whether from exposure to rain or snow during panel installation or from inadequate attic ventilation after installation. Numerous field investigations involving buckled panels in hip-roof construction have revealed that, in addition to increased span along the roof slope, the recommended spacing between panels was not provided. Providing the recommended end and edge spacing is especially important if the panels will be exposed to wet weather conditions during construction and/or experience inadequate roof ventilation.

Figure 1.

Installation recommendation for 24/16 span rated panel sheathing for use over hip-roof supports at 24" o.c.

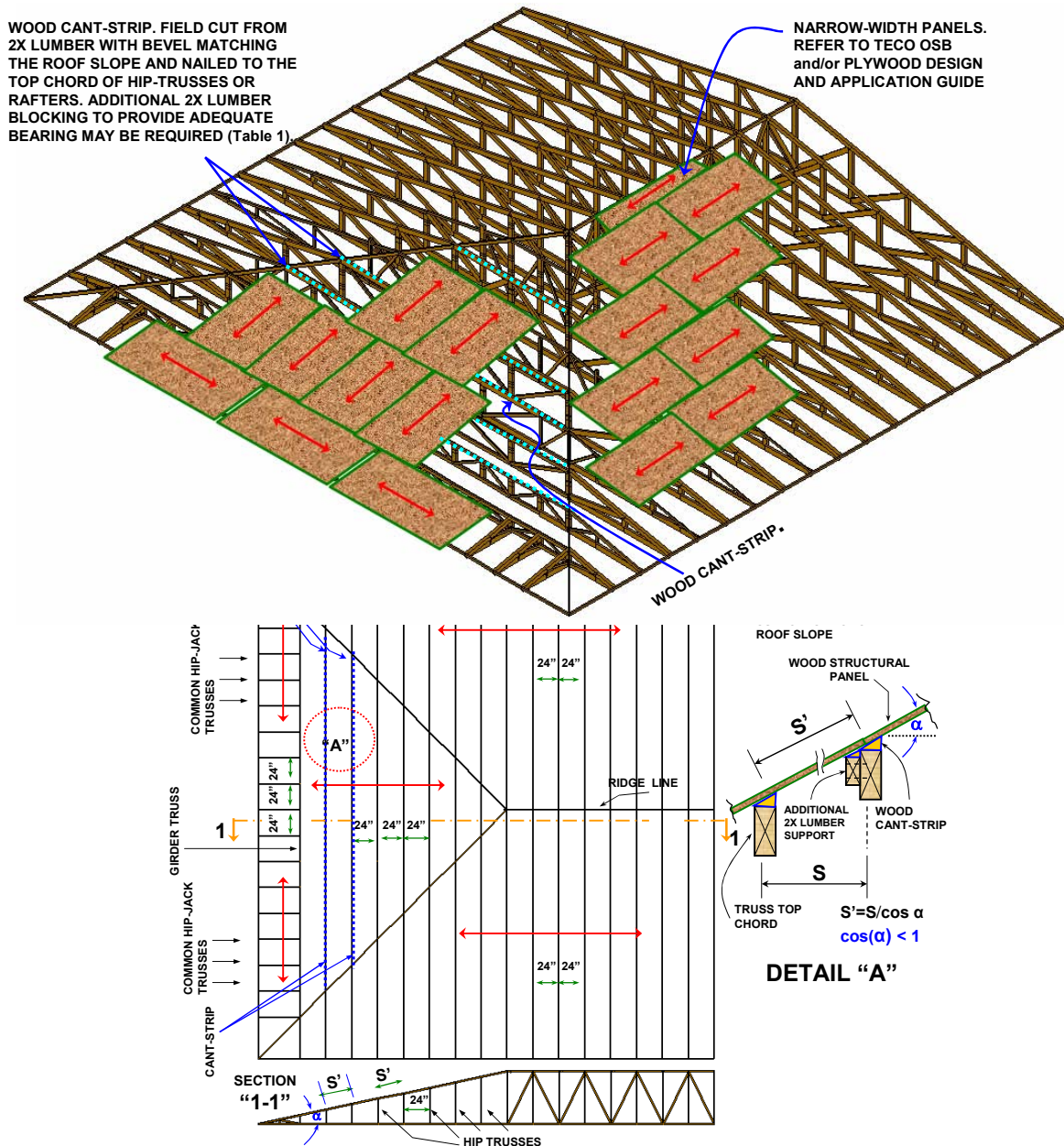


Table 1.
Panel blocking recommendations for use over hip-roof supports spaced at 24" oc

Panel Span Rating	No blocking required for hip-roof slopes less than or equal to	Use 2x lumber blocking for hip-roof slopes greater than
24/16	4:12	4:12
32/16	8:12	8:12
40/20	11:12	11:12
48/24	14:12	14:12



Figure 2.

Top left: Panel orientation with strength axis perpendicular to roof framing in the jack-truss and hip-truss area of the roof.

Bottom left: Inadequate installation of 24/16 rated wood structural sheathing panels in the hip area of the roof. Panels exhibited excess deflection and uneven panel edges due to absence of 2x lumber blocking and cant strips of the hip-truss top chords.

Right: Buckling and/or bowing of the panels due to increased span along the slope of hip area of the roof and excess moisture due to inadequate ventilation of the attic area.