Wind Uplift Design for Trus Joist® TJI® Roof Joists

In many structures, wind loading may result in uplift loads on roof rafters. Uplift loads can induce stress reversals in TJI® roof joists, as well as uplift reactions at bearing locations.

Under typical gravity loading, a joist experiences compression stress in the top flange and tension stress in the bottom flange. The aforementioned stress reversals cause the top flange to be subject to tension and the bottom flange to be subject to compression.

Design Considerations

Lateral stability and uplift at supports are important design considerations and may be addressed via the following methods:

Bottom Flange Restraint

The compression flange of a TJI® joist must be restrained to prevent buckling. When the top flange is in compression, properly attached roof sheathing provides sufficient resistance to buckling. Net uplift conditions, where the bottom flange may be subject to compression, often require bracing of the bottom flange. One method to provide additional lateral stability is 1x4 continuous strapping oriented perpendicular to roof joists and nailed to the face of the bottom flange.

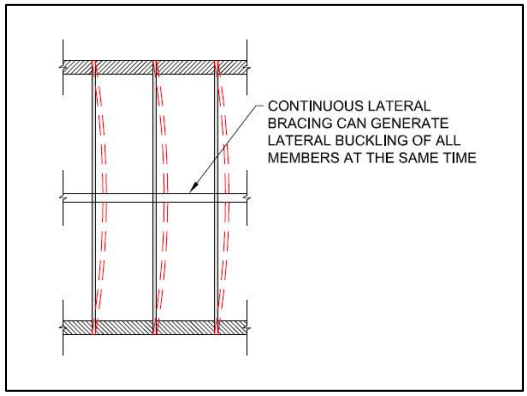

Figure 1: TJI® roof joist buckling

The adequacy of the rows of strapping, spacing of blocking, and connections shall be confirmed by the engineer or designer of record.

To prevent the roof joists from buckling as a unit as shown in Figure 1, the continuous strapping must transfer buckling forces into the roof diaphragm. This can be achieved by installing blocking panels intermittently along each continuous strapping line as well as perpendicular end wall locations as seen in Figure 2 and Figure 3.

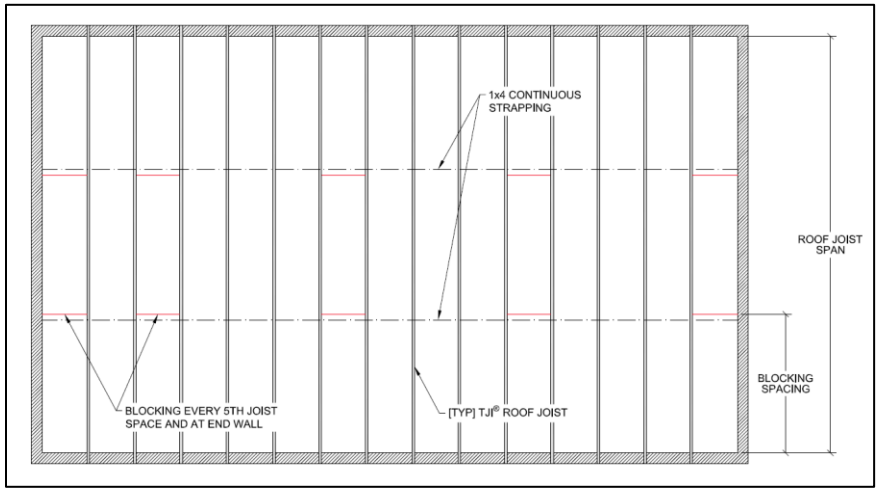

Figure 2: Example layout of strapping and blocking for uplift design

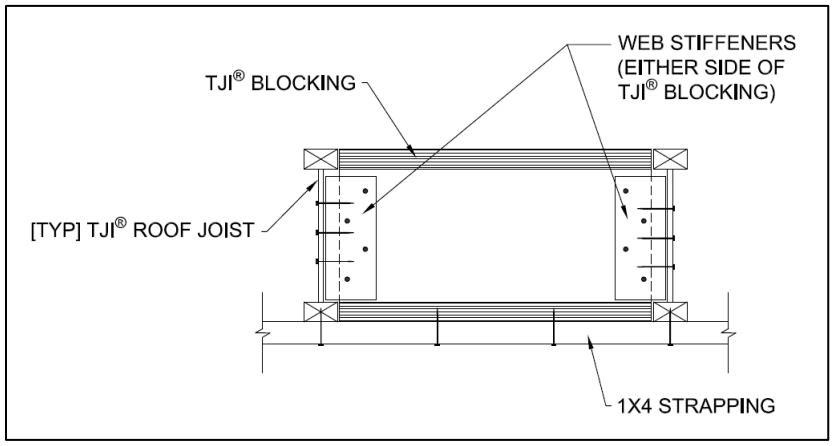

Figure 3: Blocking installation details at strapping line and perpendicular end walls

Uplift Connection at Bearings

The uplift capacity of the connection at joist bearing is another important aspect of wind design. When the joists are supported by hangers, refer to the hanger manufacturer's literature to determine if the uplift capacity of the hanger is sufficient. For TJI® roof joists bearing directly on walls or wood beams, a common detail, Figure 4, involves a combination of TJI® blocking panels and straps, such as a Simpson Strong-Tie® LTS twist strap. For TJI® joists bearing on a single 2x_ nailer attached to a steel beam, a potential solution is a Simpson Strong-Tie® H8 hurricane tie, adjusted accordingly for capacity reduction, attached to the nailer and TJI® (with web stiffeners).

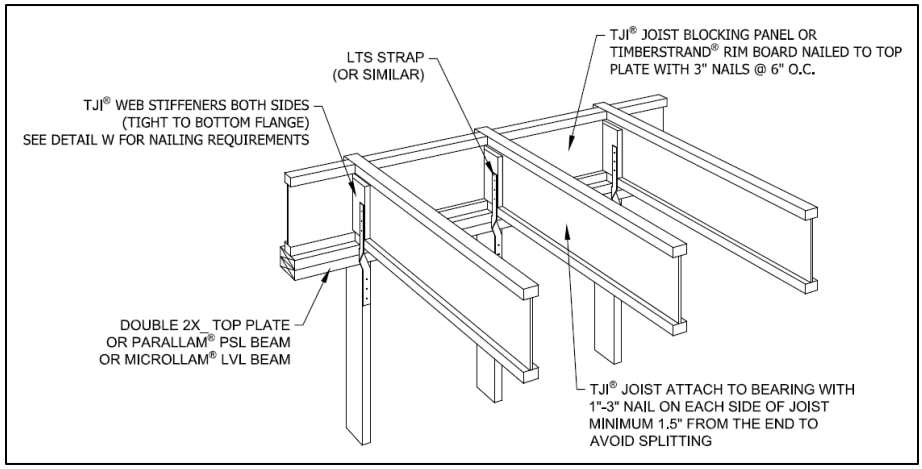

Figure 4: Example uplift connection at wall bearing

The adequacy of uplift connections at supports shall be confirmed by the engineer or designer of record.

If you have any questions, please contact your Weyerhaeuser representative.