Design Considerations for Flat Roof Construction

For flat roof construction, adequately designed and installed drainage is essential to avoiding leakage problems from pooled water on the roof. Generally, a minimum ¼:12 slope will allow water to drain properly. The International Building Code (IBC) requires a minimum roof deflection criteria of L/240 Live Load and L/180 Total Load, however, a more restrictive deflection criteria of L/360 Live Load and L/240 Total Load may help reduce the amount of water which collects on a flat roof.

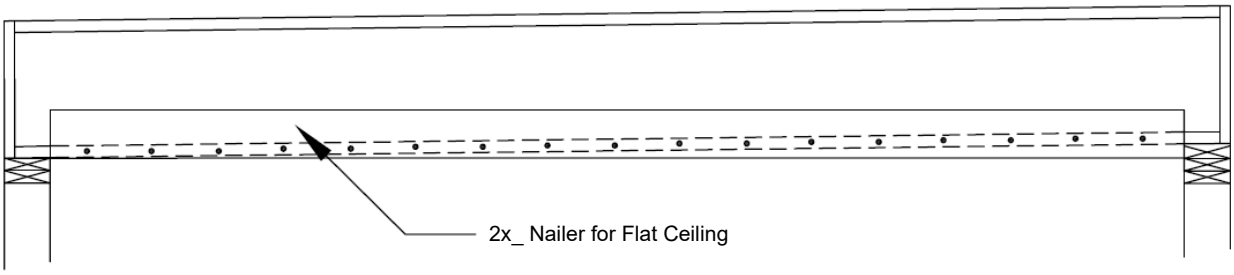
Additionally, ASCE 7-16 requires additional consideration for flat roofs as stated in chapter 7.
- Section 7.10 requires rain-on-snow surcharge for when the slope (in degrees) is less than W/50. (W is horizontal distance from eave to ridge, in feet).
- Section 7.11 requires the structure to be designed such that ponding instability is prevented at design level snow load.

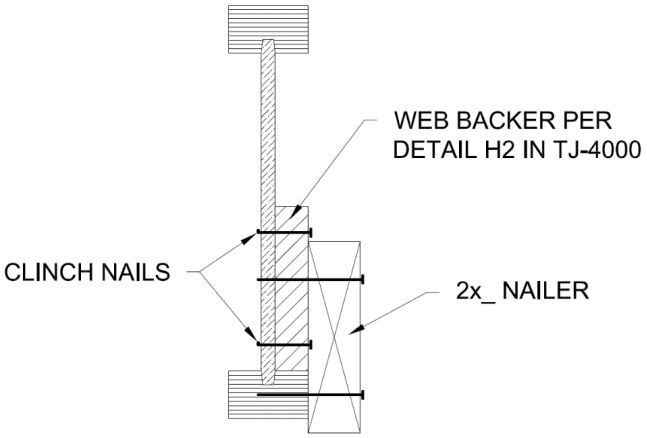
FLAT ROOF CONSTRUCTION WITH TRUS JOIST® PRODUCTS

Flat roofs with slight slope can be achieved using Trus Joist® TJI® joists and solid section products. It is the responsibility of the Designer of Record (DOR) to address the following when adding slope: roof loads (including snow and drift), lateral loads, wind loads, connections, TJI® joist flange bracing, ventilation, insulation, and fire blocking within the cavity where required. Below are a few variations for creating slope when using Trus Joist® products.

Raised Bearing

Raise the plate height of one end of the joist and add a backer block to fill the web flush with the joist flange. Attach a vertical 2x_ nailer to the side of the TJI® bottom flange and backer block to provide a flat ceiling surface. To achieve a minimum ¼" per foot of slope, bearing wall elevations need to be raised the thickness of a 2x_ plate for every 6 foot of joist span. Beveled bearing plates are required when joist slope exceeds ¼:12. A maximum 15 PLF may be hung from the 2x_ nailer unless alternate connections are detailed by the project DOR. This additional load should be included when designing the joist. See Weyerhaeuser Technical Bulletin TB-206 for recommended on center spacing of fasteners into the side of a TJI joist flange. See W detail in TJ-4000 for web stiffener sizes.





Taper Cut Trus Joist® Solid Section Products

A Designer of Record may specify 1-3/4" (or wider) TimberStrand® LSL, Microllam® LVL or Parallam® PSL roof joists to be field modified with a taper cut. Slopes may be cut in Trus Joist® solid section products per Weyerhaeuser Technical Bulletin TB-305 *Resawing Microllam LVL, Parallam PSL and TimberStrand LSL*. Guidance for design of taper sections can be found in the *Timber Construction Manual* published by AITC.

Tapered Rigid Insulation

Most often seen on large scale projects, tapered rigid insulation can be used to create minimum slope on a TJI® joist roof system. Contact insulation manufacturer for thermal and installation information.

Ripper Strips on TJI® Joist Top Flange

Rip dimension lumber diagonally (also known as a ripper) to the desired slope and fasten to the top flange of the TJI® joist with nails or Simpson Strong-Tie® Ripper Clips (RC clips available for TJI® 110 and 210 series only). A minimum 1½" depth is recommended at lower end of the ripper. Rim board/blocking must be attached to the roof sheathing (see below image). Diaphragm capacity requirements are the responsibility of the design professional of record. Additional lumber grading may be required for ripped dimension lumber pieces.

Ripper-to-joist connections are to be designed and detailed by the design professional responsible for the project. ***Minimum requirements*** for stability of the TJI® joist are stated below:

- **Ripper depth between 1½" and 2":** Attach 10d (0.148"x3") nails vertically into ripper at 12" on center or RC Clips at 18" maximum on center (Section A-A)
- **Ripper depth greater than 2":** Fasten with 10d (0.148"x3") nails (toe-nailed) or RC Clips at 18" on center. (Section B-B)
  - Install 2x4 blocking at 24" on center when ripper depth exceeds 3½" (up to 9¼" ripper depth). 2x4 block to be tight to TJI® joist flange-to-ripper interface. (Section C-C)