

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.

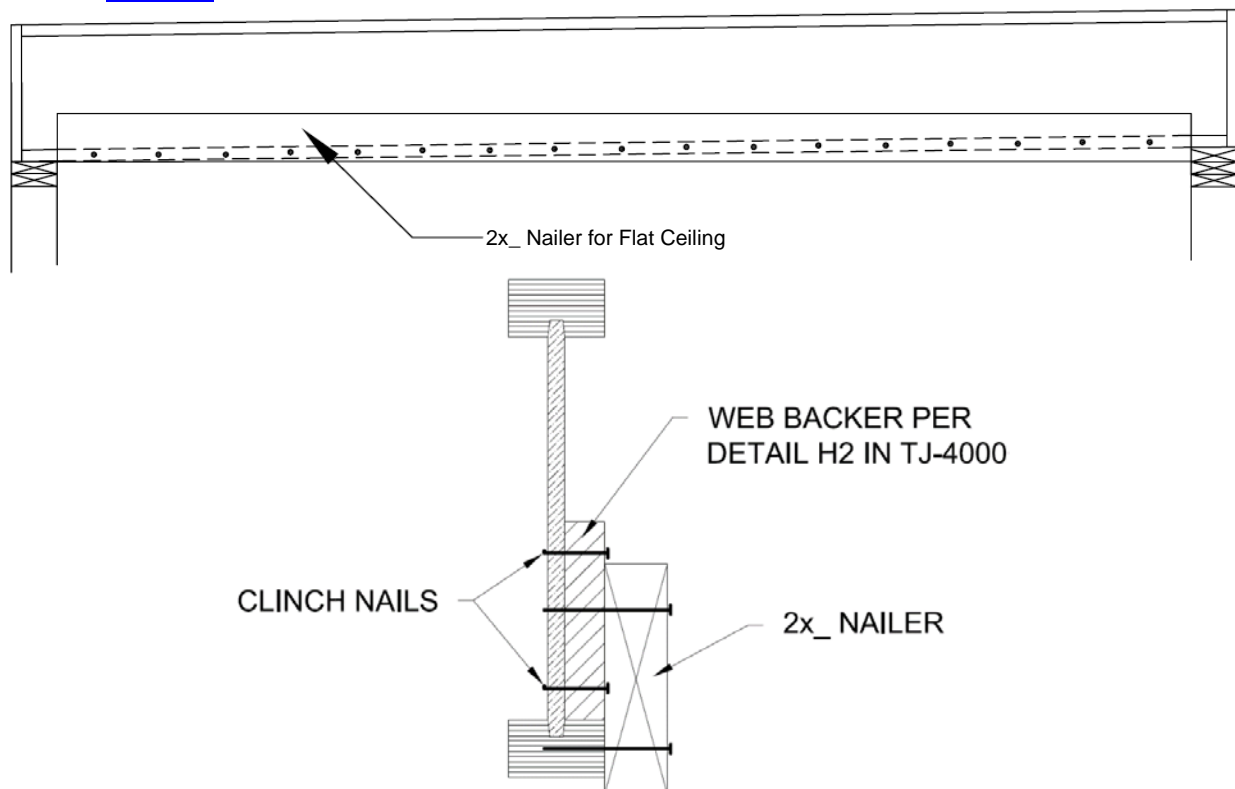
- Section 7.10 requires rain-on-snow surcharge for when the slope (in degrees) is less than W/50. (W is horizontal distance from eave to ridge, in feet).
- Section 7.11 requires the structure to be designed such that ponding instability is prevented at design level snow load.

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 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. 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_ vertical nailer, and 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. The Designer of Record is responsible for providing connections as required for the load. 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.

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)

