

# Shrinkage & Floor Systems

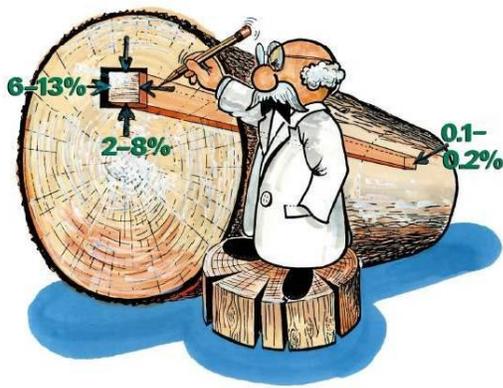
Wood by nature expands and contracts in unison with its atmospheric environment. For most low level residential applications, this natural event is not a major cause of concern. For the Pacific Northwest and especially in a Midrise application though, moisture content of wood products at time of construction enclosure and its affects thereof, needs to be addressed:

Lumber if left out exposed to rain will absorb moisture and cause the wood to “swell” the net cumulative effect if not properly addressed beforehand could result in a building consolidation of several inches if the building is designed using solid sawn floors in platform framing.

This in turn could potentially cause cracking of the interior drywall and buckling of any continuous exterior finishing. However with proper consideration and pre-knowledge the outcome can be controlled.

*Courtesy of Les Jozsa, Wood Guy Emeritus, FPIinnovations*

## Typical Shrinkage Values for “Normal” Wood



**Maximum Shrinkage: from sopping wet (30%MC) to bone-dry.**

The above picture illustrates clearly that wood shrinks in different manner depending on the end usage and application. As current industry standards require 19% MC at time of construction enclosure typical shrinkage value for flat grain orientation( at 15%MC) will only be 4% not 8% for top plates and 6.5% for perpendicular to grain (dimensional joists).

With this in mind, here is a look at the three available wood floor systems and what one might consider when attempting to mitigate shrinkage in a floor system. Each building design team must complete their own due diligence as to what system best works for their building, and the building’s end user.

### **Traditional 2x10/12 floor system:**

This floor system uses solid 2x10/12's in a horizontal orientation where the joist is connected on edge (1.5" wide) to the top plate of the walls. A solid rim board of the same material is then nailed to the ends of the joist at the exterior perimeter walls and cross-bracing is then installed mid-panel. The rim board and the X-bracing assist in providing rigidity and stiffness to the floor system.

Over six floors, however, this system would have (5x9.25") 46" of solid sawn joist members orientated parallel to grain that could (at 3-6.5%) result in cumulative shrinkage of 1.5-3". How can this be mitigated?

*One option is to consider removing the dimensional joist away from the exterior and party walls:.*

By removing the large propensity for shrinkage from perpendicular to grain orientation and replacing it with balloon frame perimeter unit walls, the shrinkage factor of studs on end would only be ( 0.05-0.10 %) 2/100<sup>th</sup> to 4/100<sup>th</sup> of an inch. But this would require that the joists be connected to the balloon framed wall structure via hangers.

While this reduces net consolidation shrinkage for the building which in turn, greatly reduces potential shrinkage issues as it pertains to exterior cladding installation. This technique results in additional costs in both onsite labour and hardware requirements, not to mention that shrinkage of the joists in the hanger will still occur potentially causing squeaky joists and/or ceiling drywall cracks, also balloon framing might not be allowable over a certain height in the building code so its use may be limited.

### **EWP and I Joists**

Manufactured in a controlled environment (off site) and with low moisture content components, these innovative products are much less prone to shrinkage as compared to traditional 2x\_ joists, primarily because of the design, an I-joist regardless of its depth only has 3" of material that is perpendicular to grain.

I-joists are structurally engineered joists that are manufactured using a 2x\_/ LVL flange that is glued to a continuous OSB web thus making an "I-beam. The advantage is they are inherently straighter, stronger, available in lengths of up to 48 and 60' and are priced uniformily per foot.

Wood I-joists are available in 9.5, 11-7/8, 14, 16, 18, 20 and 24 inches deep with varying strength and pricing based upon chord material/lumber grades and chord orientation (1.5" wide to 3.5" wide).

For additional information concerning manufacture, quality control, installation and fire safety of I-Joists as well as other engineered products such as LVL and Parallam please link to: [Engineered Wood Products](#). Here is an I-Joist manufacturing video clip: [I-Joist Manufacturing](#)

Also available is a video discussing [best practices for I-Joists](#) . To navigate this site select on Framing and then I-joists. While the video is geared to single family residential construction the information presented is applicable to Midrise.

## Open Web Floor Truss Systems

Floor truss systems are also manufactured in a controlled environment offsite and are also manufactured with only 3" of material in a perpendicular to grain orientation and therefore have the same shrinkage characteristics as I-joists.

Where open web floor truss systems thrive are in long span applications. Open web floor trusses achieve much longer span capability than both traditional 2x10/12 joists and I joists making them the most cost-effective long span wood floor system and therefore are gaining much popularity over engineered I-joist systems in North America.

This floor system is especially popular with heating and plumbing contractors who can without any additional work run ductwork and pipes through the predetermined open web configurations. Framing contractors find that installation is quicker and easier than 2x10's and that this system also completely eliminates the need for dropped bulkheads.

There are three different manufactured open web floor trusses that are available in the BC market: 4x2/3x2's use wood web members with wood chords and metal connector plates while Open Joist 2000, uses wood web members glued to wood chords and Space-joist uses metal webs with wood chords. Additional information concerning best practices, manufacture, quality control and installation of floor truss systems are available online in video format. While the videos show single family residential construction the information presented is applicable to Midrise construction: [Open Web Floor Trusses](#) and [Space Joist](#).



Construction details and span charts are available on this PDF file:

For a list of manufactures/suppliers in your area(for the any of the above-mentioned floor systems), contact Sukh Johal, Technical Advisor, Canadian Wood Council, Wood**WORKS!** BC 1-877-929-9663 ext 3.

Did we miss anything? Do you have a particular inquiry that needs addressing?

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