2x10 & 2x12 COMPARISON

SUBSTITUTION OF RFPIs FOR UNIFORMLY LOADED SOLID SAWN LUMBER(1)

2 x 10 Sawn Lumber No. 2 Spaced 16″ o.c. Live Load Deflection = L/360		9½″ RFPIs Live Load Deflection = L/480			
Species	Maximum Simple Span	I-Joist Designation	Spacing	Simple Span	Multiple Span
SPF (South)(2)	14′– 6″	9½″ RFPI 20	16″ o.c.	15′– 2″	16′– 3″
Hem-fir(2)	15′– 2″	9½″ RFPI 40	19.2″ o.c.	15′– 7″	15′– 8″
Douglas fir-Larch(2)	15′– 7″	9½″ RFPI 40	16″ o.c.	16″– 6″	17′– 2″
Southern pine(3)	16′– 1″	9½″ RFPI 70	19.2″ o.c.	16′– 8″	18′– 1″

2 x 12 Sawn Lumber No. 2 Spaced 16″ o.c. Live Load Deflection = L/360		11⅞″ RFPIs Live Load Deflection = L/480			
Species	Maximum Simple Span	I-Joist Designation	Spacing	Simple Span	Multiple Span
SPF (South)(2)	16′– 10″	11⅞″ RFPI 20	19.2″ o.c	17′– 2″	16′– 9″
Hem-fir(2)	17′– 7″	11⅞″ RFPI 30	19.2″ o.c	17′– 9″	18′– 10″
Douglas fir-Larch(2)	18′– 1″	11⅞″ PRI 20	16″ o.c.	18′– 2″	18′– 10″
Southern pine(3)	18′– 10″	11⅞″ RFPI 40	19.2″ o.c	18′– 2″	18′– 2″

(1) Uniform live load = 40 psf
Uniform dead load = 10 psf

(2) Western Lumber Use Manual – Base Values for Dimension Lumber

(3) Southern Pine Use Guide – Empirical Design Values for Dimension Lumber

FLOOR SYSTEM PERFORMANCE

It is always a good idea to consider the performance (i.e., vibration, bounce etc.) of **any floor system**. Currently, there are no true industry standard guidelines to use for I-joists but there are several practical aids that have shown to be useful. Some are design aids, some are installation aids and (unfortunately) some are retrofit aids. They are offered as tools to help you minimize floor performance complaints but can not be guaranteed to eliminate all floor performance problems.

Begin by using the concepts of **fundamental natural frequency** and **damping** when designing floor systems. The **fundamental natural frequency** (FNF) is a measure of how the floor vibrates when you walk on it and is measured in cycles per second (called a Hertz or Hz). **Damping** is a measure of how quickly a floor stops vibrating and is expressed as a percent between 1% and 100% (most residential floors have a damping range between 5% – 25% damping).

Our bodies are extremely sensitive to vibrations below 9 Hz so the ideal floor would have a high FNF with high damping. Most problem floors have a **combination** of a low FNF (below 9 Hz) and a low damping (around 5%). The following list will help you determine the effect of different parameters on floor performance. **It is the combination and interaction of these parameters that determines how the floor "feels."**

DESIGN PARAMETERS	EFFECT ON FNF	EFFECT ON DAMPING
▪ Longer Spans	significantly lowers	little or no effect
▪ Higher "L over" deflection limit (L/480 vs. L/360)	significantly increases	little or no effect
▪ Using an absolute upper limit on live load deflection (Usually between ⅓″ to ½″ max)	significantly increases	little or no effect
▪ Using deeper I-joists	increases	little or no effect
▪ Reduced on-center spacing	increases	little or no effect
▪ Adding perpendicular partition walls	little or no effect	significantly increases
▪ Increasing overall weight of floor	significantly lowers	significantly increases
INSTALLATION PARAMETERS		
▪ **Unleveled** bearings (walls, beams & hangers)	significantly lowers	significantly lowers
▪ Direct applied sheet-rock ceiling	significantly increases	significantly increases
▪ Thicker sub-floor	increases	increases
▪ Screw & Glued sub-floor	increases	increases
▪ T&G sub-floor	increases	increases
RETROFIT PARAMETERS		
▪ I-joist mid span blocking (one row)	little or no effect	increases
▪ 2x4 flat on I-joist bottom (perpendicular)	little or no effect	increases
▪ 2x4 strong back on I-joist bottom (perpendicular) (vertical 2x4 nailed to side of flat 2x4)	increases	significantly increases