Luxor's Floor Performance Rating

The Need for a Floor Performance Rating

Footsteps create the bounce and vibration in floors, which may in some cases, be unacceptable to a homeowner. The homeowner's perception of an acceptable or an unacceptable floor is subjective. Luxor developed a Floor Performance Rating (FPR) for designers/builders to predict how a homeowner will evaluate a floor.

The performance of the floor provides a constant reminder of design quality. Every foot step reminds the homeowner of the decisions made during the design-build process. A homeowner's floor performance expectations vary widely as housing moves from entry level through move-up and custom to luxury.

Based on 15 years of experience, Luxor recommends the following FPR's for entry level (good), move-up (better) and luxury (best). A higher rating means the floor will feel less "springy" resulting in a higher degree of customer satisfaction.

Classification of Floor	Luxor's Recommended FPR	Home Category
Good	70 - 100	Entry Level
Better	100 - 125	Move-up
Best	125 +	Luxury

The History of Defining Acceptable Floors:

All floors deflect, bounce and vibrate when a person walks across the floor. The magnitude of deflection, bounce or vibration will range from barely noticeable to very annoying. Historically uniform load deflection (ULD) has been used to evaluate floor performance and it was found to not be satisfactory because there is no relationship between ULD and human acceptance. In contrast, point load deflection (PLD) has a relationship between PLD and human acceptance. For this reason, PLD was introduced as a reliable method to evaluate floor performance in Canada and other countries.

Research was conducted during a 30 year period (Don Onysko and others) to define floor performance in technical terms. In 1989, this resulted in the National Building Code of Canada (NBCC) to be the first in the world to adopt a serviceability requirement to supplement its existing stiffness and strength criterion. This serviceability requirement was based on homeowner surveys where homeowners walked across their floor and then advised whether the floor was acceptable or not. These findings were verified in laboratory floor tests. The NBCC criterion has stood the test of time and is still considered the best floor acceptance criterion.

This criterion's status was supported by the US ASCE Standard 16-95, which states: “In a recent study of floor vibrations in residences (Onysko 1986), it was found that the deflection under point load of 1kN (100kg or 224 lb.) provides the best measure for identifying floors with excessive springiness (bounce and vibration) under occupants movement”.

An Engineering Software Tool to Determine Floor Performance

Luxor developed the Floor Navigator using NBCC's criterion, where point load deflection is related to span, to accurately predict floor performance. Floor Navigator rates any floor configuration with or without IBS. The FPR applies to any type of wood frame floor joists, including sawn lumber, I-joists and open web trusses. Floor Navigator evaluates and optimizes contribution of all floor components including intermediate devices.

IBS Improves a Floor's Performance

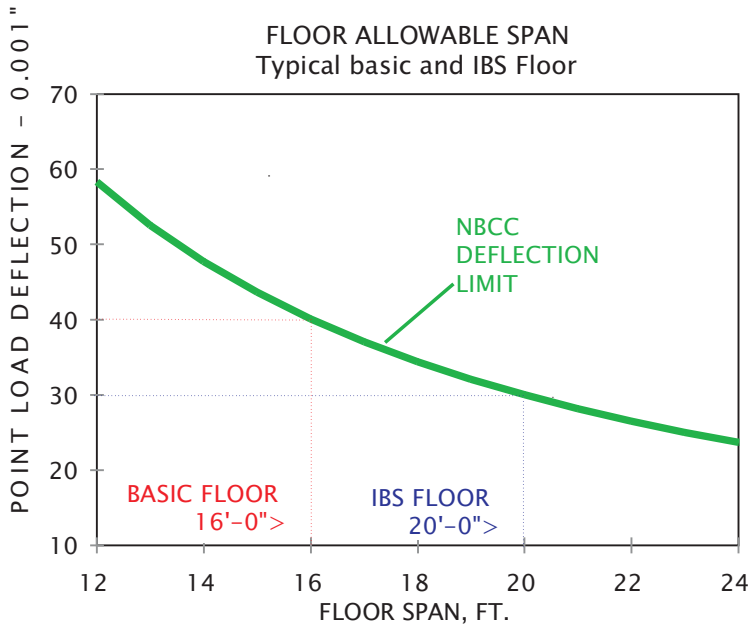
Extensive testing in laboratories and on site installations has demonstrated IBS's robust product attributes. IBS is industrially produced and consistently provides the same performance though the life of the structure. IBS improves the static and dynamic properties of floors such as deflection, vibration length, acceleration amplitude and frequency.

To achieve maximum floor span, the building industry traditionally has increased the amount of wood used in floor assembly. For example, increasing joist depth, subfloor thickness or I-joist flange width or decreasing joist on-center spacing. The gain in span increase from these methods is marginal because contribution to floor performance is marginal. In contrast, IBS significantly increases floor performance achieving longer spans with less floor material.

IBS's product attributes provide great design flexibility-IBS can be used to maximize floor span while holding floor performance constant (in Canada), increase floor performance to an acceptable level while holding span constant at code maximum (in the United States) and/or a partial combination of both. IBS's design flexibility is illustrated in the two examples below.

The first example demonstrates IBS's ability to maximize floor span in Canada by comparing allowable span for the same floor configuration without and with IBS.

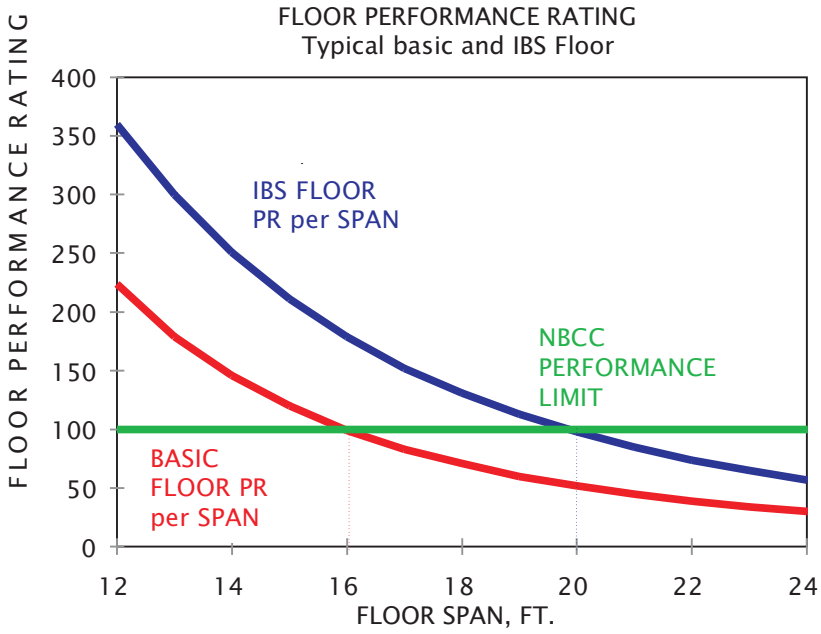
- The green line represents the NBCC point load deflection limit. All floors with deflection on the green line should feel equivalent (Luxor FPR of 100).
- The red dotted line defines allowable span for a typical non-IBS floor of 16'-0", based on a maximum allowable point load deflection of 0.040".
- The blue dotted line defines allowable span for a typical IBS floor of 20'- 0", based on a maximum allowable point load deflection of 0.030".



Both floors as illustrated in the above example comply with NBCC. Both floors would feel equivalent to the homeowner, as each floor's FPR is equal to 100. However, the IBS floor spans 25% longer than the non-IBS floor. Additionally, fiber use per foot/floor span for the IBS floor is 20% less compared to the use of fiber for the non-IBS floor.

The second example demonstrates IBS's ability to achieve maximum allowable code span in the United States while maintaining acceptable floor performance.

- The green line represents NBCC's performance limit which equates to a Luxor FPR of 100.
- The red solid line shows FPR's for non-IBS floors across a range of spans.
- The blue solid line shows FPR's for IBS floors across a range of spans.
- The red dotted line shows that the non-IBS floor at a span of 16’ has a FPR of 100 whereas the IBS floor at 16’ has a FPR of 180.
- The blue dotted line shows that the IBS floor at a span of 20’ has a FPR of 100 whereas the non-IBS floor at 20’ has a FPR of 55.



A 20' span non-IBS floor would comply with the code but have an FPR of 50. To achieve an FPR of 100, the span would have to be reduced to 16' or the floor could be reinforced with IBS. Adding IBS would increase the FPR to 100 and maintain the maximum allowable span. In the United States the majority of floors are built with a FPR of less than 100. By using 1 row of IBS, United States builders can avoid decreasing span to increase floor performance, in other words, build to maximum code allowable spans while maintaining acceptable floor performance.