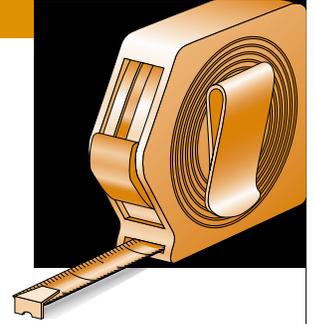


# CONSTRUCTION PRACTICES FOR WOOD I-JOIST FLOOR VIBRATION RETROFIT



## INTRODUCTION

Floor vibration is the natural result of dynamic forces acting upon a floor system, caused by something as simple as people walking across a room. Regardless of floor type, all above-grade floors are subject to some degree of vibration. If the vibration is excessive, it can annoy a home's occupants, detract from their sense of comfort and security, and even lead to fears about structural safety.

Fortunately, builders can minimize floor vibration through design considerations in new structures and retrofit of existing structures. This APA publication covers some of the basic construction practices for retrofitting floors.

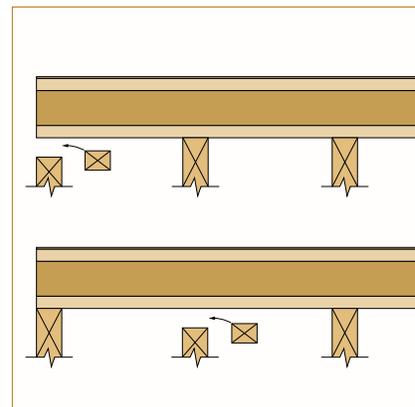
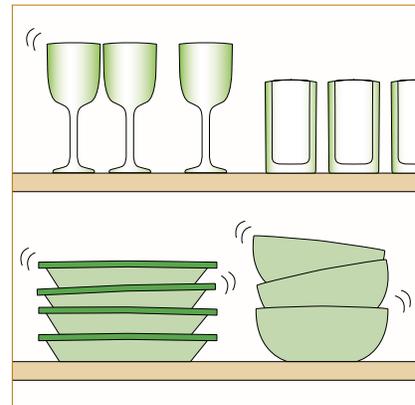
## FLOOR VIBRATION RETROFIT

There are a variety of retrofitting options to consider as you seek ways to minimize floor vibration in existing buildings. These options vary in effectiveness from one situation to another, and before choosing one or more of them, you should first identify the cause of each vibration.

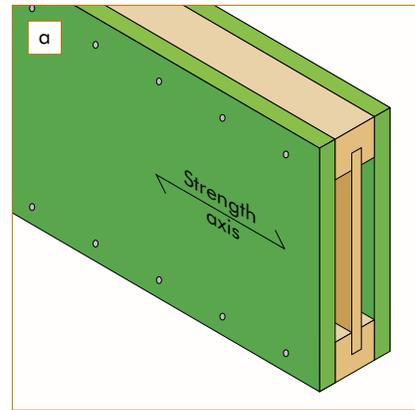
- **Removal of vibrating articles:** Since items that vibrate can call attention to floor movement, simply move or remove the items. For example, you might remedy a vibration problem by removing or rearranging the rattling dishes in a china cabinet.

- **Soft-spot correction:** Three common causes of vibration are unsupported joist ends (due to support settlement), dimensional change in supporting members, and inadequate attachment of floor sheathing to joists. In some cases, the resulting soft spots may be eliminated by inserting shims at appropriate locations.

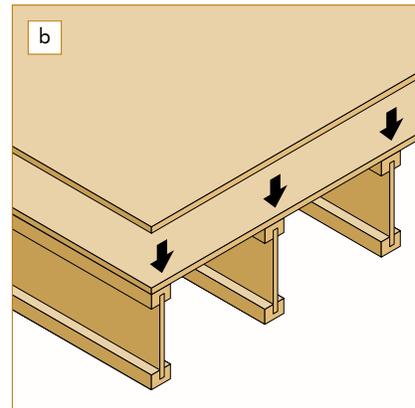
- **Increasing floor stiffness or mass:** You may be able to resolve vibration problems by increasing a floor's stiffness or mass. Here are five options to consider although some may not be feasible due to unavailable floor space, inaccessible floor framing and/or other considerations:



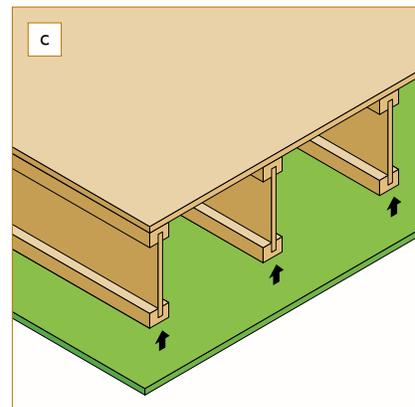
a) Floor joist reinforcement: To stiffen a floor system, attach 19/32-inch- or 23/32-inch-thick wood structural panels to both sides of each I-joist in the vicinity of the problematic area. Use panels with the same depth as the I-joist and install them with the strong panel axis running parallel to the joist length. When nailing into the I-joist flanges, use the minimum nail spacing recommendations published by the I-joist manufacturer or APA. Combining a construction adhesive with the nails will further increase the stiffness of the floor.



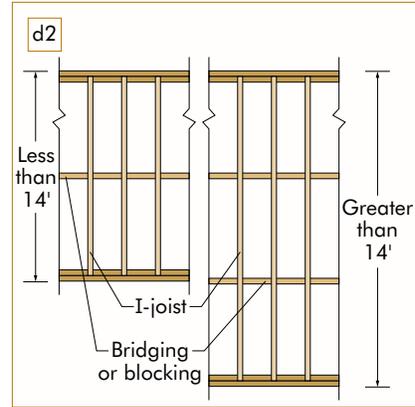
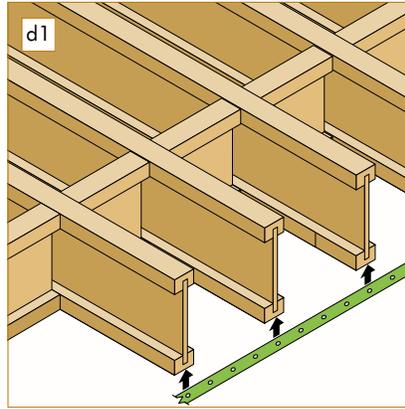
b) Floor sheathing/covering: To increase the stiffness across floor supports, properly attach (i.e., glue-nail) thicker floor sheathing to the floor joists. The added mass of an additional floor layer to the top of the joists has a positive effect on floor performance. Hardwood flooring can also improve floor performance by reducing vibration.



c) Ceiling board attachment: The glue-nail attachment of gypsum ceiling boards to the bottom of floor joists has a similar effect as the attachment of an additional floor layer on top. An added benefit is that you may improve the fire performance rating of the floor system.

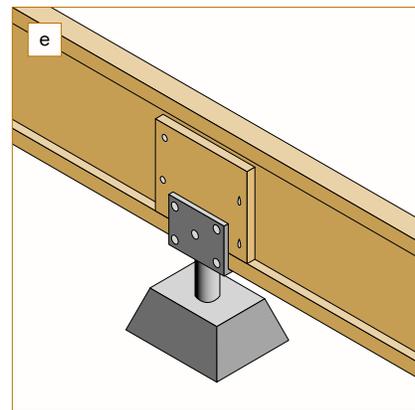


d) Bridging: By using methods such as blocking, cross bridging, and bottom strapping, you can increase floor stiffness in the across-the-joist direction. Although this has little effect on the natural frequency of a floor system, it can significantly reduce the vibration amplitude if it is attached with a continuous bottom strap. For floor systems of less than 14 feet, install a single line of between-joist bridging at the mid-span. For longer spans, it is generally recommended that you install two lines of between-joist bridging at the third-span locations.



e) Span reduction: You can drastically reduce floor vibration if you are able to add an intermediate support to the floor span. You might introduce a built-up, 2x lumber column in the location of the problem, a beam system below the I-joists, or more foundation supports for crawl spaces.

While you might need to consider multiple options to address an existing floor vibration problem, the nuisance effect can usually be mitigated. In severe cases, consult a design professional or the I-joist manufacturer. See APA Technical Note E710 for more information.



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