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Publisher's version / Version de l'éditeur:

Home Builder, 19, Nov/Dec. 6, pp. 22-23, 2006-11-01

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NRCC-49218

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A version of this document is published in
/ Une version de ce document se trouve
dans: Home Builder, v. 19, no. 6,
Nov/Dec. 2006, pp. 22-23



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Sound quirks

by Luc Saint-Martin

For that upscale low-rise condo in a trendy part of town, the designer had selected wood-frame wall and floor assemblies with a higher sound attenuation rating than required by code to separate the units. As the general contractor, you built those floors and walls according to spec and avoided obvious mistakes like back-to-back electrical outlets in the same stud space of separations between units. Soon after they move in, however, the occupants are complaining that they can hear conversations and music from adjoining units. They are demanding corrective work and the threat of a lawsuit is in the air. What happened here? How do you fix something when you don't even know what the problem is?

Welcome to the quirky world of flanking sound transmission. This is the dark place where the complex interactions of wall and floor connections systematically reduce the laboratory-derived sound transmission class (STC) of assemblies to give you what is called the *Apparent-STC*.

Apparent-STC? But what about the numbers listed in Table A-9.10.3.1 of the NBC? The STC ratings in the NBC and in industry literature give you an idea of how the wall or floor assembly attenuates sound that is transmitted *directly* through the assembly. Laboratory tests to determine these ratings are set up so that flanking noise transmission is not a factor.

In actual housing construction, however, the connections between walls and floors will cause significant sound energy to travel through paths in the structure as indicated in Figure 1. Adding this structure-borne sound to the sound transmitted directly through the assembly gives you the resulting Apparent-STC. From the perspective of the occupant, therefore, the perceived overall sound insulation might be only around STC 47 where you expected STC 58. As if this isn't bad enough, floors are also subject to impact noise, primarily from footsteps or objects being dropped or dragged, which can cause even more annoyance to the occupant.

"Great," you say, "are you done cheering me up"? Well, the good news is that help is on the way. Research at NRC-IRC has provided answers to some of the questions about flanking sound transmission in wood-frame buildings such as low-rise multi-family dwellings and rowhouses. The studies showed that flanking sound transmission can be controlled with proper attention to details.

These advances in knowledge have been captured in a design guide that is available at no charge on the NRC-IRC website (see side bar). Practitioners can use the guide to design separating walls or floors to prevent flanking without resorting to over-design, or redundancy, which is a waste of both money and materials. The guide points out that if you wish to achieve greater sound isolation, you will have to pay more attention to flanking at the design stage so as to choose details that will not adversely affect your intended result. The guide provides practical solutions and examples of assemblies that can achieve high levels of sound isolation, based on a

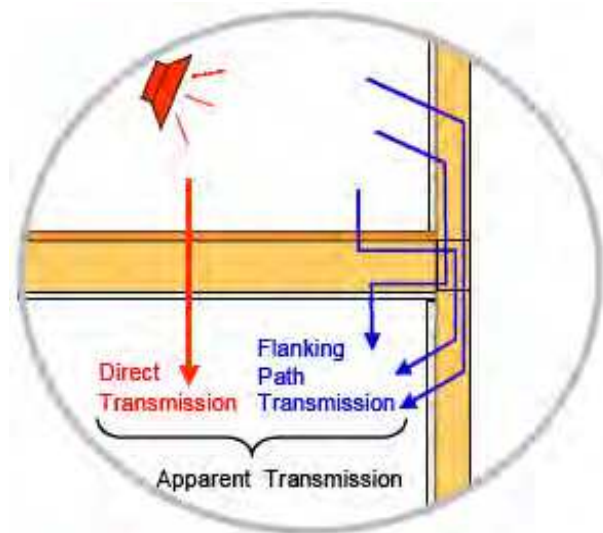


Figure 1 – Sound Transmission paths between vertically separated rooms. Flanking transmission exists between all rooms in a building.

systems approach, which helps minimize the added cost of controlling flanking. Several details for wood-frame hotels, residential homes, row housing, and apartments are provided.



More help will soon be on the way. NRC-IRC researchers recently commissioned a world-class facility (see photo) in which they will shortly begin a new series of flanking experiments to answer some other more-challenging questions. Studies will seek to expand the types of wood framing and floor treatments appearing in the guide.

More importantly, the research will eventually lead to an interactive web-based design software that will allow users to determine the Apparent-STC rating of various combinations of wood-frame assemblies easily and accurately.

To stay tuned on this and many other subjects, you can subscribe to the free NRC-IRC newsletter *Construction Innovation* on-line by visiting

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To download the flanking guide and complete architectural drawings in AutoCad , visit the NRC-IRC Web site at <http://irc.nrc-cnrc.gc.ca/fulltext/rr/rr219/> . Technical experts from the supporting partners reviewed the details and approaches to ensure their practicality. Technical information, and the basis for the guide, is also available at <http://irc.nrc-cnrc.gc.ca/fulltext/rr/rr218/>.

NRC-IRC partners were Canada Mortgage and Housing Corporation, Forintek Canada Corporation, Marriott International, Owens Corning, Trus Joist, and USG.

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