Sound Advice

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ISOLATION OF IMPACT SOUND

By Noral D. Stewart

The isolation of footstep and other impact sounds requires a completely different approach from the isolation of airborne sound. A structure can provide excellent blockage of airborne sound, but be very poor in isolating impact sounds. Conversely, some of the features required for good impact sound control add little to the airborne blockage capability of the structure. The basic difference is that in impact sound the structure itself becomes the source of the sound. The sound originates within the structure. The structure must be designed to strongly limit the transmission through the structure and also into other adjacent structures. Most commonly this concern is with the floor-ceiling. However, problems can occur with drawers and cabinets being closed when attached to walls. Impact sound also can transmit laterally to adjacent spaces through a floor and not just downward.

Wood frame and other light frame structures produce a low thumping sound in addition to the tapping impact sound. This thump is not present in heavy concrete construction. Methods addressed below do not resolve this "thump" problem which is not completely resolvable. See the separate Sound Advice discussion of this.

Carpet with pad does an excellent job of controlling footstep impact sound on floors when used. This essentially keeps the impact sound from being generated. However, once an impact is generated on a hard surface resilient elements must interrupt its transmission through the structure. Usually, more than one resilient element is required, with an airspace and sufficient mass on the opposite side to block the airborne sound within that airspace.

Any time a hard surface is used on a floor, some resilient material must be introduced between it and the subfloor, and other steps must be taken to isolate the ceiling below from the structure. The resilient material under the floor is essential to isolate the impact from surrounding walls and structure, but not sufficient to fully isolate the sound from the ceiling below. The ceiling must also be isolated from the structure. This is usually done with resilient channel. Some new systems are available to isolate the ceiling very well. In laboratory tests, these systems appear to eliminate the need for resilient elements under the floor. However, laboratory results do not include the effect of this floor sound flanking to the walls and radiating below. Isolating the ceiling alone, no matter how well done, cannot eliminate this.

Impact sound transmission can be a problem from side to side as well as up and down. A common problem is failure to treat for impact sound on the first occupied floor of a structure. Footsteps are then heard in adjacent units on the same level. Concrete floors on grade should be cut with a joint between units. Otherwise, footstep noise should be treated with resilient materials under hard floor surfaces just as they would be on upper floors.

A variety of resilient materials are available for use under hard surface floors. These include nylon mesh, ground up rubber, foam pads, fiberglass pads, cork, and special composites. Some of these require a thick layer of rigid material over them to support the floor surface, and some can be installed directly under the surface material. For wood frame structures, materials at least 3/8 inch thick are usually required. Thinner materials can work on heavy concrete floors.