Sound Transmissions in Log Walls

By Rob Pickett

Every so often, someone contacts the Log Homes Council to ask about research on Sound Transmission Class (STC) ratings for log walls. The calls are frequent enough to elicit the questions: "What are STC ratings? If one cannot find 'sound transmission' or even 'acoustical' in the index of either the International Residential Code or International Building Code, what is their significance to a log home?"

Extensive studies have been conducted and documented on the behavior of sound. Our knowledge of acoustics enables designers to create magnificent auditoriums where the spoken word is heard throughout the space without amplification. We know that an empty room with hardwood floors and bare walls will be extremely loud, almost echoing sound in larger spaces. This is referred to as airborne sound and noise. To limit noise, designers can select appropriate methods and materials for construction.

Sound Strategy

The STC is a numeric value generated by the methods described in ASTM E413-73 Standard Classification for Determination of Sound Transmission Class. The following excerpt from the standard explains it best:

"The purpose of this classification is to provide a single figure rating that can be used for comparing partitions for general building design purposes. The rating is designed to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, music and similar sources of noise in offices and dwellings."

ASTM E413 procedures compare the sound transmission loss of an assembly (from test results according to ASTM E90, Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions) to those published in the standard that range from 0 to 70 over frequencies of 125 to 4000 Hz. The sound insulation industry generated the following information to give you a better feel for the values associated with STCs.

The STC is a useful design tool when you want the occupants of one space to not be disturbed by sound from another space. Construction that increases the STC rating may be worthwhile to keep highway or neighborhood noise outside, but it could be used similarly to isolate a teen-ager's stereo noise from encroaching on the other spaces in the house. However, keep in mind that a knock on the door is an impact sound that is not

measured by the STC. Nor is the heavy bass from the stereo speakers sitting on the floor generating a structural vibration. Party walls between attached dwellings may be the most common application of STC ratings in log buildings.

Sound isolation is as important to the designer as the fire separation requirements would be to the building official. Log walls are effective in limiting transmission of sound from outside, as the mass of the wall not only provides thermal benefits, but acoustic benefits as well. While any wall surface reflects a considerable amount of the sound, the density of the solid wood will limit transmission much more than the siding and sheathing of an unfinished frame wall. Adding an interior wallboard will trap air in the cavity and improve the performance of the frame wall. Then, adding insulation in the wall cavity equalizes the performance of the two wall types to make both types of exterior walls effective sound barriers.

So how do we hear outside noise when we are inside the house? Through wall openings and around obstacles. Minimizing sound transmission, therefore, becomes the same effort that we use to minimize heat loss. The same qualities that provide better thermal value (for example, in windows and doors, methods to limit air infiltration) also perform better acoustically.

STC Ratings	*Speech heard through floor or wall*
30	Loud speech understood fairly well
35	Loud speech audible but unintelligible
42	Loud speech audible as a murmur
45	Loud speech barely audible
48	Hearing strained to notice loud speech
50	Loud speech is not audible

Limiting Noise Leaks

As with most building topics, sound construction is the best prevention for noise leaks. While landscaping techniques can help block outside noise (earth berms; tall, dense foliage), construction decisions are likely to have a larger impact.

- Seal all gaps with a sealant or insulating material prior to applying finish trim.
- Double-glazed windows are quieter than single-glazed windows.
- Solid-core doors have higher STC ratings than hollow-core doors. Weather-stripping also reduces sound transmission.
- Appropriate design and installation of plumbing lines will reduce vibrations and noise.

Lifestyle decisions further affect the acoustics in a home. The type of surfaces exposed to sound will control the acoustics in the space. Hard surfaces, such as log walls, wood floors, and glazing, may be desirable to reflect voices and music. In spaces where the occupant requires less reflected sound, sound-absorbing materials can be used.

- Floor treatment options include sound-deadening underlayment under wood floors and using carpets and carpet pads.
- In window treatments, drapes, valances and even open blinds will reduce reflection of sound from flat glazed areas or closed blinds. For draperies to absorb sound, consider using heavy textile material and closing them for maximum effect.
- Ceiling treatments such as acoustical tile, exposed beams (trusses, joist or rafters) and textured ceilings will help disperse sound reflected from one of the largest flat surfaces in the room.
- Consider insulating interior partitions to isolate sound from a media or music room from other living areas. Using a double, staggered stud framing method will eliminate vibration noise through the wall.

The acoustical benefits of a log wall include the reduced transmission of solid wood and the deflection characteristics of the profile of the log. The angle, shape and texture of the log surface impact the quantity and direction of the reflected sound, which can be beneficial to the internal acoustics.

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