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LOG TECH NOTE 03-01

Sound Transmission & Log Walls

In certain design conditions, there is a need or desire to limit the passage of sound. When this is the case, the design professional turns to the STC rating to select the appropriate assembly to isolating and insulating the space enclosing the origin of the sound. While there are no published STC ratings for log walls, this paper provides some background for understanding how log walls perform.

Extensive study has been conducted and documented on the behavior of sound. Our knowledge of acoustics has enabled designers to create magnificent auditoriums where the spoken word is heard throughout the space without amplification. On a more practical level, we know that an empty room with hardwood floors and bare walls will be extremely loud, almost echoing sound in larger spaces.

The STC (Sound Transmission Class) 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:

> **"1.1 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 to those published in the standard that range from 0 to 70 over frequencies of 125 to 4000 Hz. A rating of 30 would be representative of when it is easy to hear loud speech through an assembly, while a wall with a 50 rating would effectively block the sound. The STC is a useful design tool to identify which building techniques, such as party (separation) walls between attached dwellings, can be used to limit the travel of airborne noise. Keep in mind that the knock on the door is an impact sound that is not measured by the STC.

STC ratings of conventional construction have been published (American Plywood Association (APA) publication, *Noise-Rated Systems*), typically showing a stiff finish surface (thin exterior sheathing/siding) to reflect the sound, with interior buffers and insulation that trap air in a framing cavity. Research has shown that the connection between layers of materials affects transmission, and that cavity construction uses the airspace to reduce transmission.

In comparison, research has also shown that stiffness and mass combine to increase transmission loss (or increase STC).

Without actual test results on the variety of styles of log walls available, it is improper to imply an STC rating. However, the fact that log walls use the density of the solid wood to limit transmission cannot be denied. Add the experience of those who live or work in log buildings – outside noise is not an issue.

So if both wall types are so effective, how do we hear outside noise when we are inside the house? Wall openings. Sound travels around obstacles, through openings in those obstacles, and is transmitted through the obstacle at points where the assembly has a lower STC rating. Minimizing sound transmission, therefore, becomes the same effort that we use to minimize heat loss. The same qualities that provide better thermal value (i.e., in windows and doors, methods to limit air infiltration) also perform better acoustically.

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

- ✍✍ Seal or insulate all gaps prior to applying finish trim.
- ✍✍ Double glazed windows are quieter than single glazed.
- ✍✍ Use weatherstripped, solid core doors.
- ✍✍ Appropriate design and installation of plumbing lines will reduce vibrations and noise.
- ✍✍ In multi-family construction, avoid penetrations of the party wall (e.g. flush-mounted fixtures or medicine cabinets) and be sure to seal around and insulate behind electrical boxes.

Life-style decisions further affect the acoustics in a home. The type of surfaces that are 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. Softer or textured surfaces may absorb sound while obstacles can disperse sound instead of reflecting it.

- ✍✍ Placement of furnishings, wall hangings, and fixtures in a room intrude into the space, reducing the size of flat surfaces.
- ✍✍ Floor treatment: Options include sound-deadening underlayment under wood floors; using carpets and carpet pads.
- ✍✍ Window treatment: Use drapes, valences, or even open blinds to reduce reflection off flat glazed areas or closed blinds. For draperies to absorb sound, consider using heavy textile material, fuller than usual, and closing them for maximum effect.
- ✍✍ Ceiling treatment: 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. Vaulted and cathedral ceilings deflect sound and can be used to alter acoustics in a room.

The acoustical benefits of a log wall, therefore, are the reduced transmission provided by its solid mass and the sound deflection provided by the profile of the log (the angle, shape, and texture of the log surface).

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