Controlling Sound with LD-C-50®

With modern home design there is a tendency to remove walls to create a sense of spaciousness. Sound generating devices have been added such as additional appliances in the kitchen and laundry room and in the family room, sound surround sound home theatre systems. Also, more families are choosing to live in multi-unit dwellings constructed closer to major sources of noise pollution. With that noise pollution has become a challenge.

Whenever air can leak through walls and around doors and windows, noise can leak through as well. Icynene® is a spray in place, low-density foam insulation and air barrier material that can effectively air seal wall systems and thereby provide a significant contribution to the homeowner’s need for noise reduction.

Insulate interior walls with Icynene® when you want to minimize the transfer of noise between rooms.

Spray Icynene® around pipes, especially plastic (ABS) waste and vent pipes, which are notorious for transmitting the rushing sound of water when a toilet is flushed.

When using Icynene® the best practice is to partially fill the cavity, sufficiently to provide an air seal but also to provide an air space between the insulation and the interior drywall to provide a discontinuity for the transmission of sound. A dead air space within the cavity will serve to further reduce the transmission of sound through the wall.

Icynene® is a flexible insulation that will move along with building materials that it is bonded to and thereby provide a durable and reliable air-seal for the life of the building.

**STC & NRC Ratings**

In construction, Noise Reduction Coefficient (NRC) and STC (Sound Transmission Class) ratings are used to measure how absorptive a particular material is. The NRC rating is representative of the ratio of sound that is reflected back into the area where the sound has originated. It is generally an appropriate tool for the selection of interior finishes, such as when designing auditoriums or gymnasiums. Where insulation is installed behind an interior finish for sound attenuation, the NRC of the exposed insulated cavity is not applicable, and NRC rating gives little indication of how sound is transmitted through an assembly. In these situations, STC rating gives a more appropriate indication of performance.

The STC rating of a building assembly is a reasonable measure of how effective a wall assembly is at reducing sound transmission through the assembly. However, it is important to note that the frequency range for the STC testing is limited to 125 Hz - 4,000 Hz. This range of frequencies is the common set for human speech, and was selected because traditionally speech attenuation was the primary concern. The difficulty arises due to the fact that human hearing has a range that varies from 20 Hz - 15 kHz, and modern stereo equipment can generate sound at a range of 10 Hz - 48 kHz. Exterior noise can be generated even further outside this range. As a result, the STC rating does not give an accurate representation of performance in all situations, and against all frequencies.

**Field Performance**

A second fundamental difficulty in sound design comes from the differential in performance between an assembly that is tested in a laboratory and its performance in the field. The deficiencies can be the result of poor workmanship, unforeseen circumstances, or the choice of insulation, and in combination, can cause a significant drop in the performance of the wall assembly. Even simple penetrations such as light switches and electrical outlets can contribute to a dramatic drop in performance.

To quantify the typical in field performance loss, the Canadian Building Code actually notes that builders often design with STC ratings 5 dB higher than the code requirement in order to overcome “construction deficiencies, penetrations, and flanking paths”. This is actually a fairly dramatic upgrade, and usually at considerable expense; an increase in STC rating by 5 dB should provide the ability to attenuate sound at more than twice the intensity.
In order to encourage a higher construction standard, the Canadian Code actually grants an alternative standard for compliance by testing in the field. Field-tested assemblies need to meet a rating that is substantially lower than the laboratory rating, based on the poor reliability of laboratory results. This type of provision is not yet available under the U.S. national building codes.

Icynene® fills every gap and crevice in the building cavity while adhering to all adjoining components for a tight seal. By greatly reducing airborne sound transfer, flanking sound, and the effect of drywall penetrations, wall assemblies insulated with Icynene® generally do not suffer from the typical performance difference between laboratory & field STC ratings. The overdesign that is typically necessary to guarantee performance can be reduced; the savings in terms of both material and cost are considerable.

Structural Vibration & Impact Noise

Certain types of sound transmission cannot be resolved through the use of insulation materials, even when using a combined air-barrier and insulation system. This can be either because of the frequency at which the sound is transmitted, or because of the nature of the sound itself. Very-low frequency sounds have the ability to be transmitted through the building structure, bypassing any insulative materials in assembly cavities.

Impact noise, specifically, is not transmitted through air, and rather causes vibrations through the building structure itself. Adding insulation will not dampen those sounds effectively; and providing sufficient mass can become very costly. Instead the solution relies on properly addressing the issue at the design stage.

For the best possible performance, Icynene® should always be combined with other sound attenuation practices, including structural dampening, structural breaks, & point source isolation. Further reductions in sound transmission are achieved by adding mass to the wall or ceiling; low cost & ease of installation make adding gypsum board or drywall the preferred method to significantly increase STC values. Additional measures can also include the use of resilient channel systems, mounting mechanical equipment on pads, or ensuring point sources (speakers & subwoofers) are not directly in contact with walls or floors.

Summary

Icynene® provides a reliable air-seal for the duration, reducing the effect of airborne sound leakage and alternative sound paths. Alongside structural dampening and point source isolation, Icynene® is a necessary addition to any comprehensive sound design strategy. Icynene® also reduces the need for costly overdesign by bridging the gap between laboratory ratings and performance in the field.
Icynene products have an excellent health and safety record spanning more than 350,000 insulation projects over more than 25 years. Nonetheless, safe handling practices during and immediately following installation are required to eliminate the possibility of health effects from exposure to isocyanates. Asthma, other lung problems, and irritation of the nose and throat can result from inhalation of isocyanates. Direct contact with the skin and eyes can result in irritation. Different individuals will react differently to the same exposures; some will be more sensitive than others.

Everyone (other than Icynene-certified spray technicians) must vacate the job site, remaining completely out of the building or at least 50 feet away, while the spray is applied and for at least 24 hours after spraying is completed to allow active ventilation of the job site and to ensure the foam chemicals are completely cured. No exceptions.

Independent studies indicate that with 24 hours’ active ventilation after spraying is completed, Icynene spray foam insulation is safely cured.