

Urban planning and home usage trends are generating a substantial increase in the need for improved sound attenuation in today's home. Surround sound and home theater systems are becoming more prevalent, even as more families are choosing to live in multi-unit dwellings constructed closer to major sources of noise pollution. Responding to the discriminating demands of this new generation of homeowners can be frustrating, if not downright impossible. A comprehensive solution to sound attenuation must include the right materials, the right design, and of course proper execution. Icynene® is a spray in place two-component liquid material that expands into low-density foam insulation, and provides a significant contribution to a consistent, cost-effective, and comprehensive solution to homeowners demand for sound attenuation.

## 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 - even if still imperfect - indication of performance.

The STC rating of a building assembly is a reasonable measure of how effective a wall assembly is at preventing 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 as designed and its performance in the field. These 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 a wall. Even simple penetrations such as light switches and electrical outlets can contribute to a dramatic loss of performance.

To quantify the typical performance loss, the Canadian Building Code actually notes that builders often design for 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®

Sound can travel through a variety of mediums, but the most common means of transport is through air. The most effective way to reduce the transmission of airborne sound is therefore to effectively control air movement. As a combined air barrier and insulation, Icynene® is an effective means of reducing sound problems that are the result of air leaks, penetrations and alternative (flanking) sound paths. The best practice is to partially fill the cavity, sufficient to provide an air seal but also to provide an air gap discontinuity for the transmission of sound. Moreover, its flexible structure is designed to provide a durable, reliable air-seal for the life of the building.

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 and 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 material. 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 insulation 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, and point source isolation. Further reductions in sound transmission are achieved by adding mass to the wall or ceiling; low cost and 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 and subwoofers) are not directly in contact with walls or floors.

### Summary

The evolving habits of modern homeowners are constantly generating new challenges for designers, and sound attenuation is no exception. These challenges are further compounded by the use of testing procedures that do not universally reflect field conditions.

No matter the application, 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®** is a low-density soft foam insulation, which is sprayed into/onto walls, crawlspaces, underside of roofs, attics and ceilings by Icynene Licensed Dealers. Sprayed as a liquid, it expands to 100 times its volume in seconds to create a superior insulation and air barrier. Every crevice, crack, electrical box, duct and exterior penetration is effortlessly sealed to reduce energy-robbing random air leakage. Icynene® adheres to the construction material and remains flexible so that the integrity of the building envelope seal remains intact over time. Icynene® is ideal for residential, commercial, industrial and institutional indoor applications. **Information about Icynene® can be obtained by visiting [Icynene.com](http://Icynene.com) or contacting your local Icynene Licensed Dealer.**