NAIMA
North American Insulation Manufacturers Association

Acoustical Performance of Wall Cavity Insulation Products

Full Scale Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC) Testing Results from Seven Residential Wall Assemblies

STC

Sound Transmission Class (or STC) is an integer rating of how well a building partition attenuates airborne sound. In the U.S., it is widely used to rate interior partitions, ceilings, floors, doors, windows and exterior wall configurations. The frequencies used in STC ratings correlate in a general way with subjective impressions of sound transmissions for speech, radio, and television. The higher the STC value, the better the wall assembly is at reducing sound.

OITC

Outdoor-Indoor Transmission Class (or OITC) is a relatively new way of measuring sound transmission, an OITC rating is designed to account for sound transmission from typical outdoor sounds which consists of frequencies lower than an STC rating. Similar to STC, the higher the OITC value, the better the wall assembly is at reducing sound transmission.

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Executive Summary

This report documents acoustical testing of typical residential wall assemblies sponsored by the North American Insulation Manufacturers Association and conducted by Intertek Labs in York, Pennsylvania. A total of seven wall assemblies were tested with variations in cavity insulation products, including fiberglass mineral wool, open cell spray foam, closed cell spray foam, and flash and batt applications with spray foam and fiberglass.

The tests collected both the Sound Transmission Class (STC) and Outdoor/Indoor Transmission Class (OITC) values for each of the wall assemblies. There was minimal variation in the results between insulation types with the variation being 3 or less for STC and 2 or less for OITC. Performance differences of this level can be heard but are generally on the edge of perception. These values are used by engineers when specifying building assemblies to reduce sound transmission.

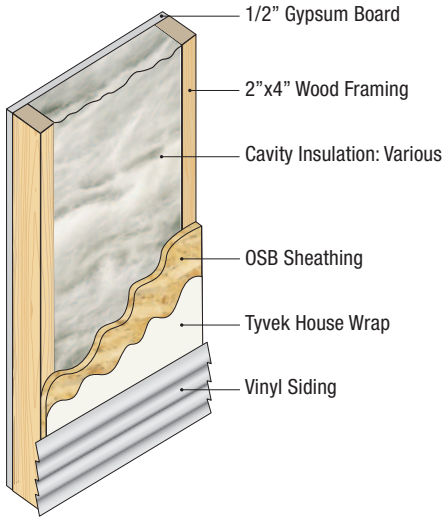
Wall Assembly Acoustical Testing Results

Insulation Type	STC	OITC
Fiberglass R-13 Unfaced	33	25
Fiberglass R-15 Unfaced	34	25
Mineral Wool R-15	34	25
Open Cell Foam - Full Cavity	33	25
Closed Cell Foam - Full Cavity	31	24
Open Cell Foam Flash & R-13 Batt	34	26
Closed Cell Foam Flash & R-13 Batt	34	25

Sample Construction

Each test specimen was built to be 96” wide x 96” high, with studs spaced at 16” on center, and single top and bottom plates. All specimens were constructed at the Intertek Labs in York, PA. Each wall assembly test specimen included the following features from the interior to exterior:

- One layer, 1/2” Gypsum Board
- Cavity Insulation / 2x4 Wood Framing
- One layer, 7/16” OSB Sheathing
- One layer, Tyvek House Wrap
- One layer, Vinyl Siding



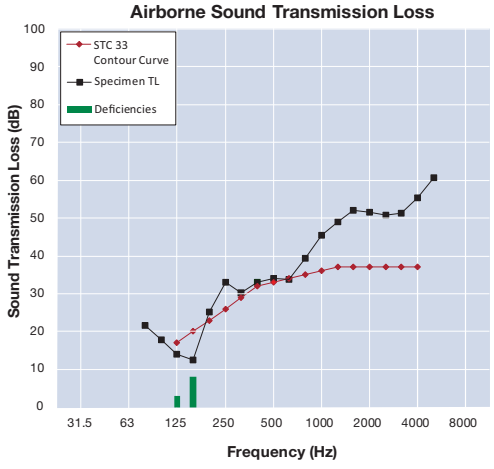
Test Procedures

A sound transmission loss test was initially performed on an empty specimen plug as a baseline. The 96” wide x 96” high specimen plug was removed from the wall testing assembly. The specimen was placed on an isolation pad in the test opening. Duct seal was used to seal the perimeters for the specimens to the test opening on both sides of the assembly. The interior side of the specimens, when installed, were approximately 1/4” from being flush with the receive room side of the filler wall. A stethoscope was used to check for any abnormal air leaks around the test specimen prior to testing.

Once the sample preparation and installation was completed, the specimens were evaluated in accordance with the following standards:

- ASTM E90-09 (2016), *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*
- ASTM E413-16, *Classification for Rating Sound Insulation*
- ASTM E1332-16, *Standard Classification for Rating Outdoor-Indoor Sound Attenuation*
- ASTM E2235-04 (2012), *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods*

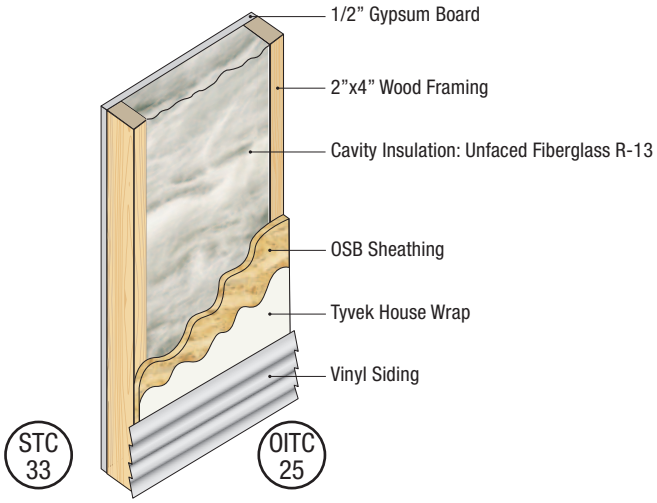
The sound transmission loss for each specimen has been plotted on a graph of frequency and sound level in decibels. Based on how people perceive sounds, a contour curve for each STC value was developed in ASTM E413. The deficiencies noted on each graph are included to show where a given specimen did not meet the contour curve for the STC. However, there are allowances that deficiencies not exceed 8 decibels for a given frequency or a total of 32 deficiencies across all frequencies.

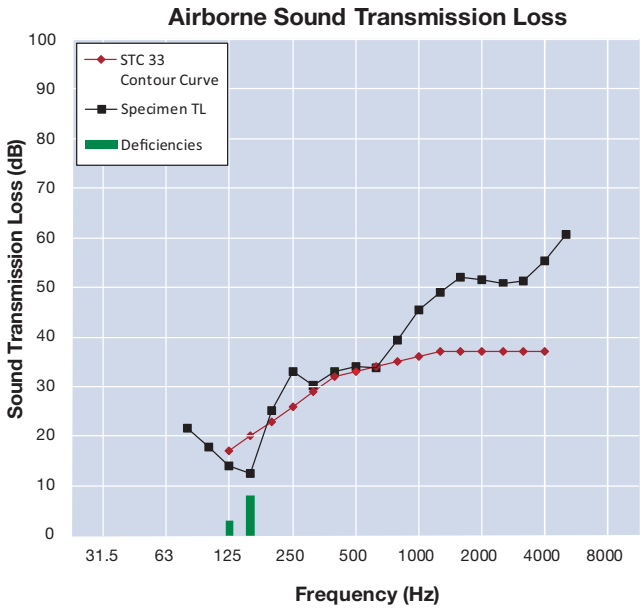


Test Results

Wall System with R-13 Fiberglass Batt Insulation

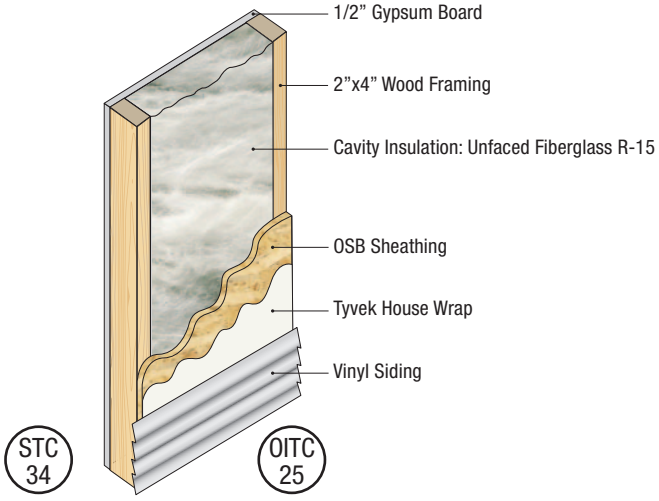
- Intertek Report Number K2810.01-113-11-R0
- Testing was conducted on 10/16/19

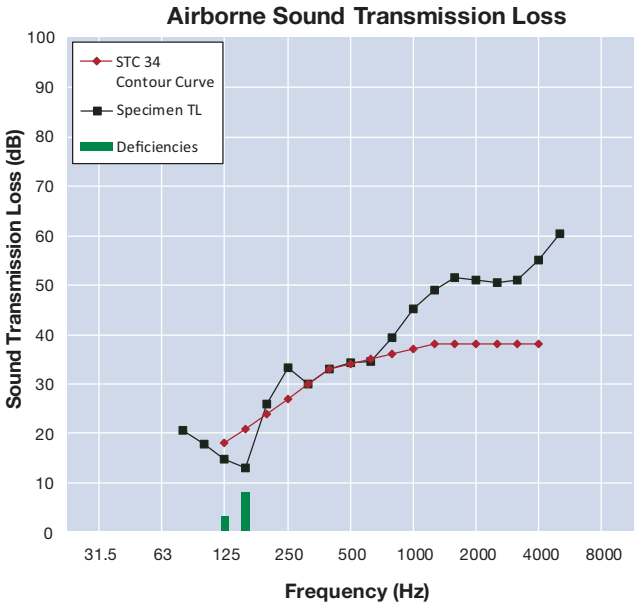




Wall System with R-15 Fiberglass Batt Insulation

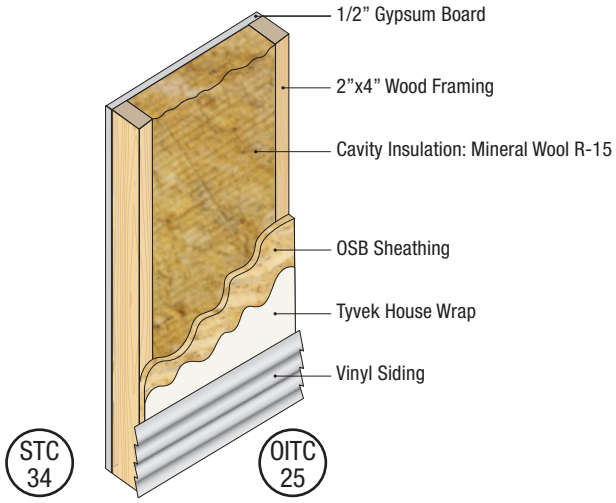
- Intertek Report Number K2810.02-113-11-R0
- Testing was conducted on 10/15/19

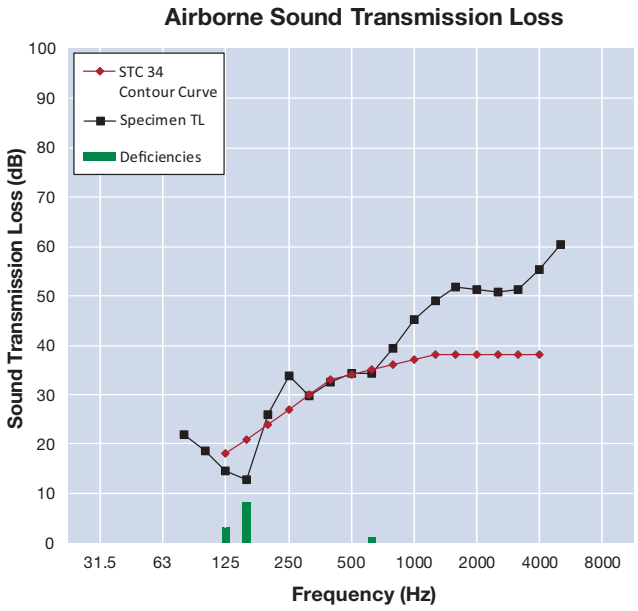




Wall System with R-15 Mineral Wool Batt Insulation

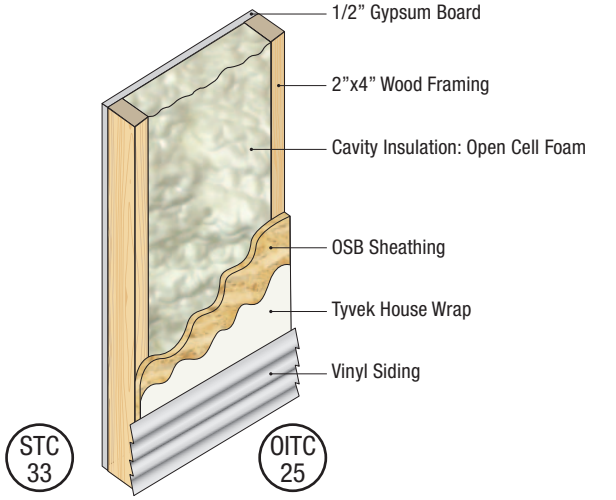
- Intertek Report Number K2810.03-113-11-R0
- Testing was conducted on 10/15/19

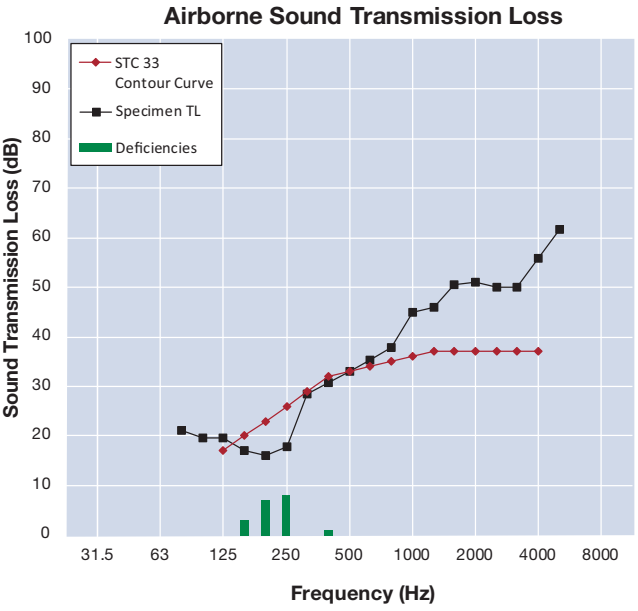




Wall System with Sprayed Open Cell Foam (Full Cavity)

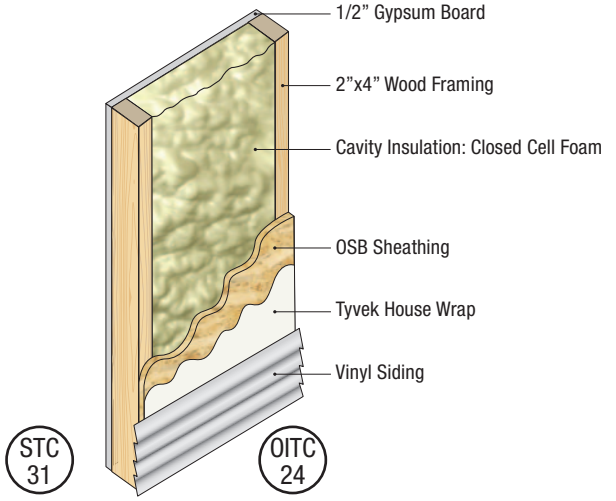
- Intertek Report Number K2810.04-113-11-R0
- Testing was conducted on 10/18/19

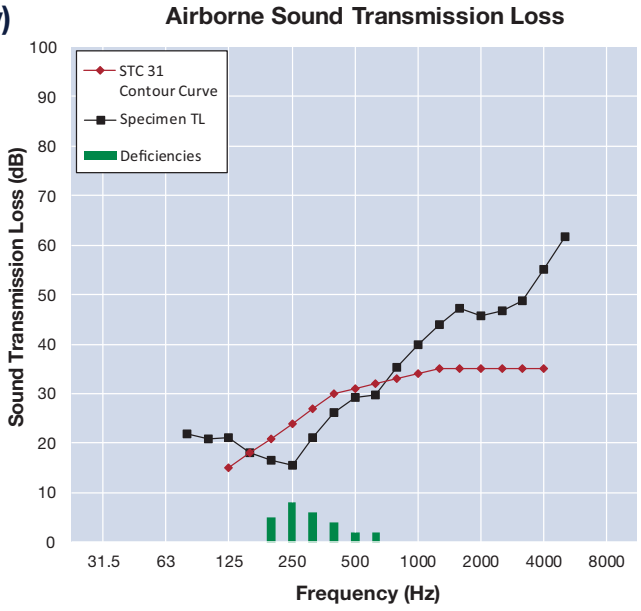




Wall System with Sprayed Closed Cell Foam (Full Cavity)

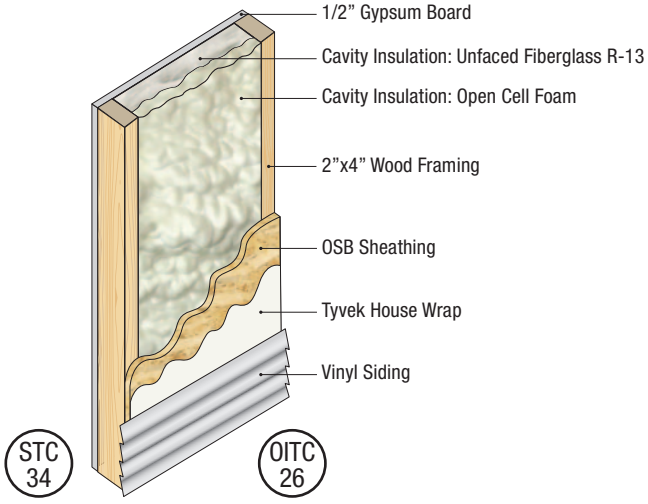
- Intertek Report Number K2810.05-113-11-R0
- Testing was conducted on 10/21/19

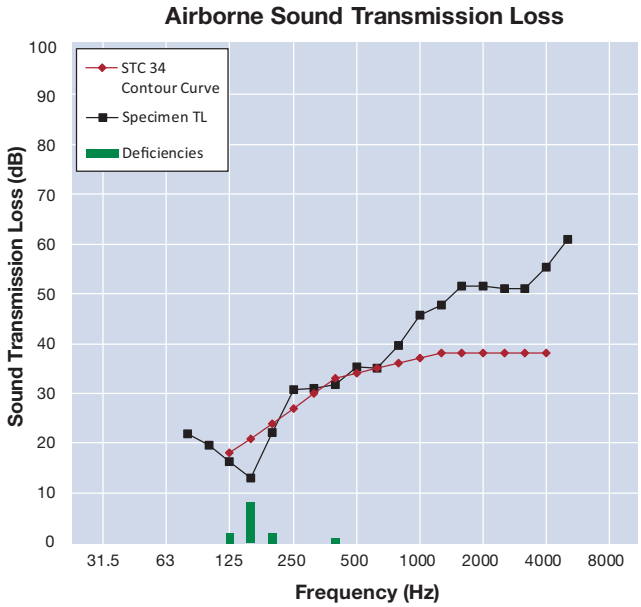




Wall System with Sprayed 1” Open Cell Foam (Flash Cavity) with R-13 Batt Insulation

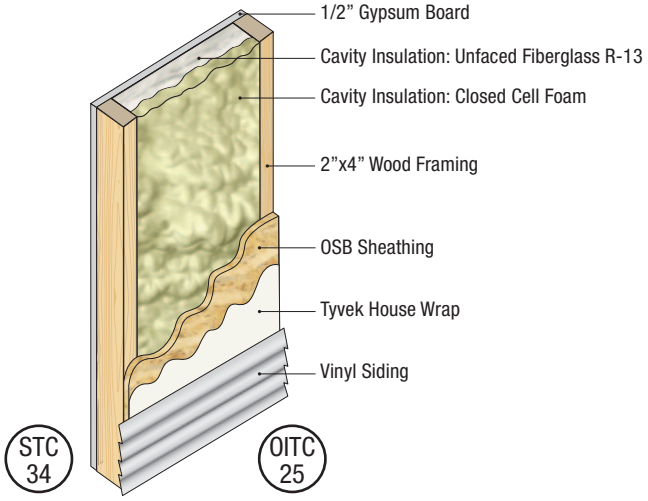
- Intertek Report Number K2810.06-113-11-R0
- Testing was conducted on 10/21/19

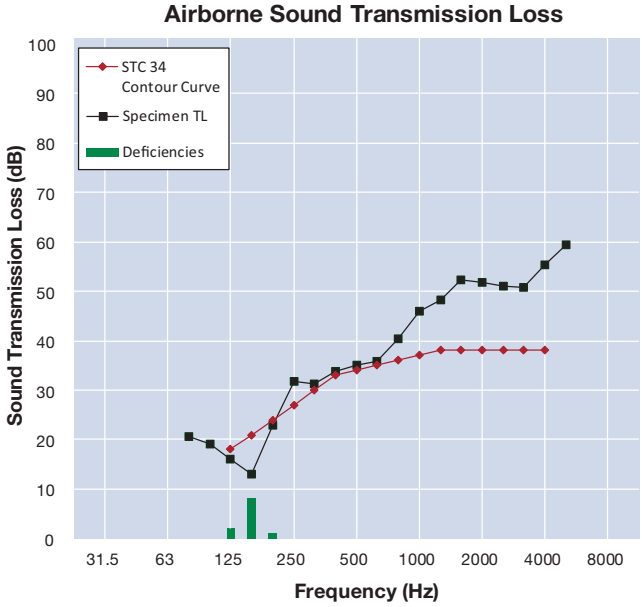




Wall System with Sprayed 1” Closed Cell Foam (Flash Cavity) with R-13 Batt Insulation

- Intertek Report Number K2810.07-113-11-R0
- Testing was conducted on 10/18/19





Conclusion of Test Results

Based on the results included in this report, the variation in results across insulation types studied was minimal. These STC and OITC results generally show that in a residential setting, it does not matter which insulation product is used to fill the cavity to achieve a consistent reduction in sound transmission. When selecting products for acoustical purposes, designers can rest assured that providing cavity insulation is a driver for sound reduction and can look to improvements other than the type of insulation when seeking additional sound reduction.

About NAIMA

NAIMA is the association for North American manufacturers of fiberglass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiberglass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.

NAIMA, continuing its members' commitment to safety, has established a renewed Product Stewardship Program, which embodies the components of the earlier OSHA-NAIMA Health and Safety Partnership Program (HSPP). The HSPP was a comprehensive eight-year partnership with OSHA, which NAIMA completed in May 2007, and now NAIMA incorporates these safe work practices into NAIMA's Product Stewardship Program.

Building Insulation Committee Members

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Pub. # BI507 2/21