TECHNICAL BULLETIN No. 204

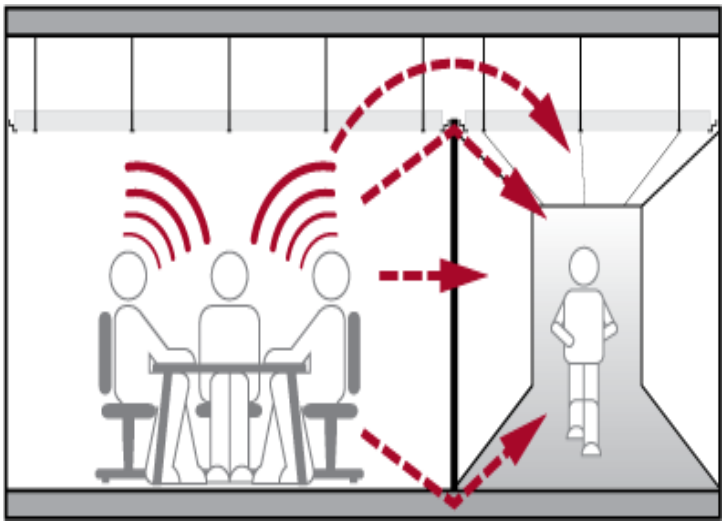
Date: January 1, 2020

Subject: Sound Transmission Class (STC)

The purpose of this bulletin is to provide a progressively detailed understanding of Sound Transmission Class (STC) from Basic, Level One, and Level Two. The STC testing methods are also included for added knowledge. Sound transmission from room to room is a very important aspect of our privacy. The International Building Code (IBC) requires a 50 STC (45 STC field tested) for wall assemblies between dwelling units and dwelling units adjacent to public spaces.

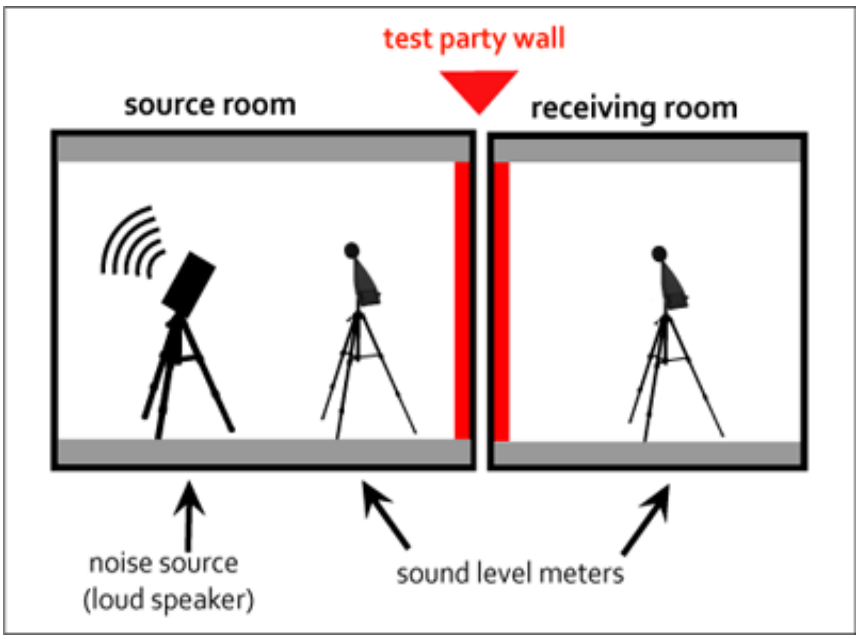
Basic STC Understanding

- STC is a rating number of a building partition's resistance to airborne sound transmission.
- Although STC is derived from sound transmission decibel loss, STC is a rating (with no decibel units).
- The higher the STC rating, the better the partition performs in reducing sound transmission.
- STC ratings of individual partition components cannot be added together to arrive at an assembly STC rating.
- The diagram below represents airborne (conversation) sound passing directly through a wall.
- Those arrows in the diagram below with indirect sound paths represent what is called **"flanking"** sound; or sound escaping or leaking through ceilings, doors, electrical outlets, plumbing, ventilation ducts, cracks and windows. Flanking has a significant effect in lowering STC ratings.



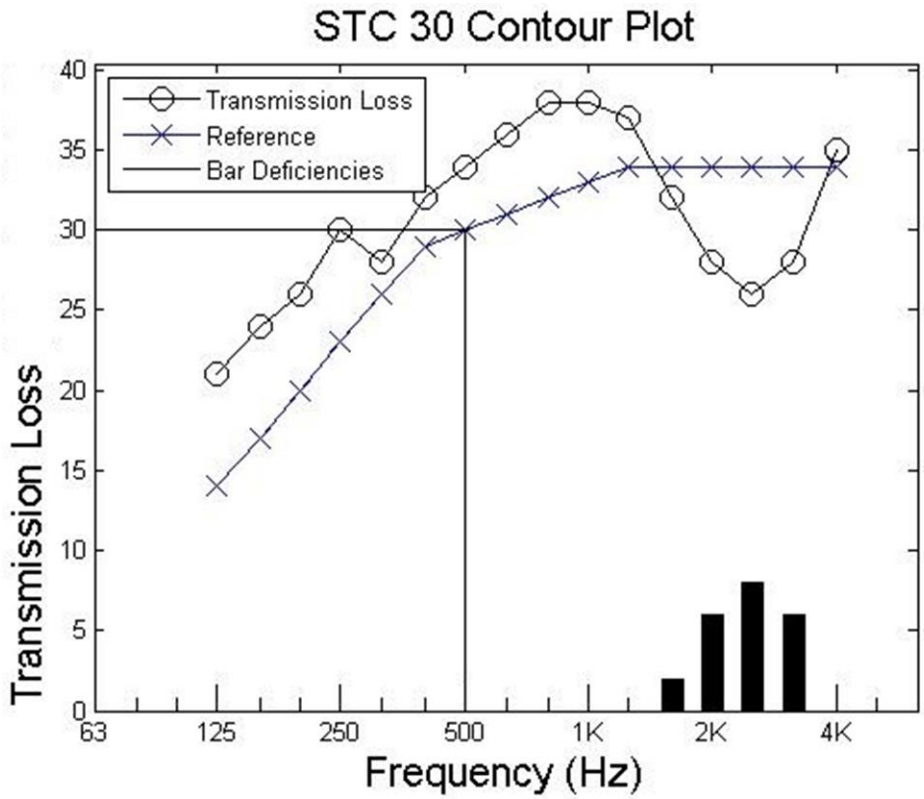
How is STC Tested?

- ASTM E90 is the laboratory test method to determine a STC rating.
- Referring to the diagram below, the test specimen or assembly is mounted between a "source room" containing a noise source, and an isolated "receiving room."
- During the test, the loss of sound (called **transmission loss)** is measured between the source room and receiving room.
- The sound transmission loss is measured in **decibels (dB)** at 16 standardized sound frequencies for the STC rating determination.
- ASTM E90 would be considered ideal sound testing conditions.
- ASTM E336 is used for STC "field" testing.
- Field testing considers other variables, including "flanking" sound paths that may increase sound transmission leakage.
- Since a STC rating is determined at a standardized 500 Hz frequency, all 16 tested frequencies should be evaluated to fully understand the performance of the partition.
- Matching the frequency of the unwanted sound transmission to the assembly that performs best for that sound frequency is key to effectively blocking sound.
- STC only considers frequencies down to 125 Hz. However, many of our problematic daily noise sources are below 125 Hz. For example: traffic, home theaters, planes.



Level One STC Understanding

- Referring to the typical STC 30 rating chart below, STC is determined by testing sound transmission decibel loss at 16 standard frequencies from 125 to 4000 Hertz (Hz).
- STC primarily measures airborne sound; however, structure borne sounds are also measured in the low frequencies below 300 Hz.
- The STC 30 rating is calculated at the 500 Hz frequency after adjustments, based on performance at the 16 tested frequencies.
- It is this number rating at the standard 500 Hz frequency that allows partitions to be compared for sound performance.
- Although STC is derived from sound transmission decibel loss, it is not a measure of how many decibels of sound partition can stop.
- Example: A wall rated at 47 STC, may not mean the wall stops 47 decibels of sound.



Level Two STC Understanding

- Referring to the same typical STC chart above, the STC number is derived from sound transmission loss (or decibel loss) tested at 16 frequencies from 125 Hz to 4000 Hz.
- Note these tested Transmission Loss decibel values plotted at the 16 frequencies.
- The Transmission Loss line is then compared to what is called a "Standard Reference Contour" line which is common to all STC assemblies.
- (Note: The derivation of the standard reference contour line is beyond the scope of this bulletin.)
- The standard reference contour line is a fixed shape, however it moves vertically……up and down……. between 125 and 4000 Hz.
- The vertical location of the standard reference contour line is determined by the number of decibel "deficiencies" plotted on the Transmission Loss line that are below the standard reference contour line.
- By rule, the standard reference contour line can move up or down a maximum 32 total points for all deficiencies, or a maximum 8 points for a single deficiency.
- In this case, the Transmission Loss line dips below the standard reference contour line in the 1500-3500 Hz frequency range.
- Although the deficiencies in this 1500-3500 Hz frequency range total 22, there is a single deficiency of 8 at 2500 Hz, so by rule, the standard reference contour line is shifted downward relative to the single 8 point deficiency.
- The STC is the point at which the vertical line at 500 Hz intersects the standard reference contour line.
- Due to poor performance in the 1500-3500 Hz frequency range, this partition gets a STC rating of 30 when the standard reference contour line is applied.
- Without any deficiencies, the STC would be slightly higher and closer to the Transmission Loss point tested at 500 Hz.

Summary

- **STC is a rating number of a partition's (building material or assembly) resistance to airborne sound transmission.**
- **Since the STC rating is taken at a standardized 500 Hz frequency, all 16 tested frequencies should be evaluated to fully understand the partition's performance.**
- **Matching the frequency of the unwanted sound transmission to the partition that performs best for that sound frequency is key to effectively blocking unwanted sound.**
- **STC only considers frequencies down to 125 Hz. However, many of our problematic daily noise sources are below 125 Hz. For example: traffic, home theaters, planes.**
- **Flanking sound or sound leakage through ceilings, doors, penetrations, plumbing, and windows represents a significant impact in lowering STC ratings.**

Tom Verrill, Technical Manager