

The Original IDEX CA Prep Class

SOUND TRANSMISSION

Sound Transmission Class (STC)

The Sound Transmission Class (STC) is a single-number rating of a material's or building assembly's barrier effect used to compare walls, floor-ceiling assemblies and doors for their sound-insulating properties with respect to speech and small household appliance noise. **Higher STC values are more efficient for reducing sound transmission.** For example, loud speech can be understood fairly well through an STC 30 wall but should not be audible through an STC 60 wall. The rating assesses the airborne sound transmission performance at a range of frequencies from 125 Hertz to 4000 Hertz. This range is consistent with the frequency range of speech.

The STC rating **does not assess the low frequency sound transfer.** Special consideration must be given to spaces where the noise transfer concern is other than speech, such as mechanical equipment or music.

Even with a high STC rating, any penetration, air-gap, or "flanking" path can seriously degrade the isolation quality of a wall. Flanking paths are the means for sound to transfer from one space to another other than through the wall. **Sound can flank over, under, or around a wall. Sound can also travel through common ductwork, plumbing or corridors.**

RECOMMENDED RATINGS

In general an **STC of 50 is a common building standard** and blocks approximately 50 dB from transmitting through the partition. However, occupants could still be subject to awareness, if not understanding, of loud speech. Constructions with a higher STC (as much as 10dB better - **STC 60**) should be specified in sensitive areas where sound transmission is a concern.

The 2007 California Building Code based upon the 2006 International Building Codes (IBC) contains requirements for sound isolation to protect persons from excessive noise within hotels, motels, dormitories, apartment houses, condominiums, monasteries and convents other than detached single-family dwellings.

- **Requirements for walls: STC rating of 50 (if tested in a laboratory) or 45 (if tested in the field*)**
- **Requirements for floor/ceiling assemblies: STC ratings of 50 (if tested in a laboratory) or 45 (if tested in the field*)**

An assembly rated at STC 50 will satisfy the building code requirement. However, as mentioned above, occupants could still be subject to awareness, if not understanding, of loud speech. Therefore, it is typically argued that luxury accommodations require a more stringent design goal.

*The field test evaluates the dwelling's actual construction and includes all sound paths.

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| STC | What can be heard |
|-----|--|
| 25 | Normal speech can be understood quite easily and distinctly through wall |
| 30 | Loud speech can be understood fairly well, normal speech heard but not understood |
| 35 | Loud speech audible but not intelligible |
| 40 | Onset of "privacy" |
| 42 | Loud speech audible as a murmur |
| 45 | Loud speech not audible; 90% of statistical population not annoyed |
| 50 | Very loud sounds such as musical instruments or a stereo can be faintly heard; 99% of population not annoyed |
| 60+ | Superior soundproofing; most sounds inaudible |

| STC | Partition type |
|-----|---|
| 33 | Single layer of 1/2" drywall on each side, wood studs, no insulation (typical interior wall) |
| 45 | Double layer of 1/2" drywall on each side, wood studs, batt insulation in wall |
| 46 | Single layer of 1/2" drywall, glued to 6" lightweight concrete block wall, painted both sides |
| 54 | Single layer of 1/2" drywall, glued to 8" dense concrete block wall, painted both sides |
| 55 | Double layer of 1/2" drywall on each side, on staggered wood stud wall, batt insulation in wall |
| 59 | Double layer of 1/2" drywall on each side, on wood stud wall, resilient channels on one side, batt insulation |
| 63 | Double layer of 1/2" drywall on each side, on double wood/metal stud walls (spaced 1" apart), double batt insulation |
| 72 | 8" concrete block wall, painted, with 1/2" drywall on independent steel stud walls, each side, insulation in cavities |

STC partition ratings taken from: "Noise Control in Buildings: A Practical Guide for Architects and Engineers"; Cyril M. Harris, 1994

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Noise Reduction Coefficient (NRC)

NRC rates interior materials versus building assembly materials. NRC is a scalar representation of the amount of sound energy absorbed upon striking a particular surface. **An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.**

NRC generally applies to a single material such as on the surface of a wall which determines the reverb or liveliness of a room. For example the NRC rating may be required for carpeting in an apartment complex.

Translating Sound Considerations into Office Space Planning

Plan your space with end users in mind:

1. What will open office space sound like, once the furniture is moved in and the employees report to work?
2. Does the placement of cubicles, restrooms, work areas, break rooms, and equipment rooms isolate potential acoustic distractions?

"Every component of an office must work in concert in order to experience an ideal acoustic setting," says Tony Sola, an acoustical consultant and instructor of architectural acoustics at Arizona State. The components Sola refers to include:

- ◆ Systems furniture
- ◆ Partition height and composition
- ◆ Space planning
- ◆ Ceiling height and material
- ◆ Wall treatment, shape, and placement
- ◆ HVAC noise and design
- ◆ Plenum depth and materials, and
- ◆ Mechanical systems within the plenum

Reference Notes

Sound is a sine wave measured in decibels (dB)

- ◆ Zero dB is the quietest sound an average human can hear
- ◆ On the opposite end, 130 dB is the threshold of painfully loud sounds
- ◆ A private office or home generally has noise levels at a maximum level of 30 dB
- ◆ Acceptable commercial entrance doors for airborne sound shall be solid-core wood-slab doors with a 1-3/8" minimum thickness or 18 gauge insulated steel-slab doors with compression seals all around are considered adequate (STC 26 or more)
- ◆ Laboratory tests include ASTM E 90, E 336, E 413, E 492, E 497, E 634, E 966, E 989, E 1007 and E 1014