Wood Doors

ASSA ABLOY

Build a Better Building - Serenity Door

The global leader in door opening solutions

Stringent construction standards and innovations in building technology are creating a new breed of structures that enhance the atmosphere of the modern indoor space. Today's superefficient buildings are designed for the safety, security, health and comfort of the occupants within. Discover how door openings are essential in the quest to build a better building.

Source	dB level
Saturn Rocket	200 dB
Jet Engine	160 dB
Threshold of Pain	140 dB
Elevated Train	120 dB
OSHA Limitation	100 dB
Industrial Noise	80 dB
Normal Speech	60 dB
Quiet Office	40 dB
Whisper	20 dB

Sound Attenuation

The noisy neighbors next door. The loud laughter from the kindergarten class down the hall. The chatty co-worker just outside your office. The clanging carts in the hospital corridor. The late night revelers in the adjoining hotel room. Whether you are in an apartment, a school, an office, a hospital or hotel, wouldn't it be nice if you could just close the door and escape into serenity?

Building component technology, including door openings, have evolved in recent years to make sound attenuation a practicality—both in affordability and ease of installation—in any type of application. The latest generation of Sound Transmission Class (STC) openings are designed and tested to pacify the noisiest environments.

These sound control innovations go hand-in-hand with the latest sustainable construction guidelines that seek to create more healthful buildings by enhancing the acoustical performance of the indoor environment. Sustainable construction guidelines, such as LEED, award credits for workspaces and classrooms that promote occupants' well-being, productivity, and communications through effective acoustic design that meets the STC requirements of ANSI Standard S12.60-2002.

The Science of Sound

Before designing with sound in mind, it's helpful to understand the basic scientific principles of acoustics. When sound is generated, it creates a wave of pressure that travels through the air to a receptor—the human ear—where it is perceived by the brain. The decibel (dB) is the measurement of sound pressure levels. The accompanying chart provides a spectrum of dB levels from a variety of sources.

Sound attenuation is the practice of using physical barriers to lessen the pressure waves before they reach a receptor. Sound proofing materials in the barrier will block some of the sound waves and absorb others. A certain amount of the sound waves, depending on the sound proofing material used, will continue to transmit through the barrier.

The sound blocking properties of a barrier is measured by its STC number. This number is based on a simple calculation that takes the dB level of the source sound and subtracts the dB level after it crosses the barrier into the receiving room. The average noise reduction created by the barrier is its STC number. Say the high school band is practicing in the music room. The noise level inside the room is 100 dB. The noise perceived in the hallway, or receiving room, is measured at 55 dB. This means the sound barrier reduced the noise by 45 dB. The STC number for that barrier is 45.

Building components with an STC rating receive this designation after undergoing testing according to ASTM E413-04 Classification for Rating Sound Insulation or ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements. There is also an Apparent Sound Transmission Class (ASTC) test that is conducted in the field to determine the exact STC level for the intended application.

Of course, not all sound is created equally. STC tests 16 predetermined frequencies in a range between 125 Hz and 4000 Hz. Amplified music, mechanical and industrial equipment, along with traffic noise (trains, planes, automobiles) usually fall below 125 Hz. The Outdoor-Indoor Transmission Class (OITC) tests down to 80 Hz. The higher Hz frequencies carry more weight in the calculations. The STC measurement is most accurate for speech.

Even a small reduction in dB levels makes a noticeable difference. A reduction of 5 dB produces a 25% change in loudness, a 10 dB reduction generates a 50% change, while a 20 dB reduction creates a 75% change. If the intent is to block out slight noises, such as normal speech, a lower STC rating will be effective, while very loud noises will need an STC rating of 50. (See chart)

STC Rating	Impact on Acoustics
STC 25	Normal speech can be understood easily and distinctly through wall
STC 30	Loud speech can be understood fairly well; Normal speech heard but not understood
STC 35	Loud speech audible but not intelligible
STC 40	Onset of privacy
STC 42	Loud speech audible as a murmur
STC 45	Loud speech not audible; 90% of statistical population not annoyed
STC 50	Very loud sounds (musical instruments, stereo) faintly heard; 99% of population not annoyed

Sound waves travel through the path of least resistance, which makes it imperative to consider all elements including the wall, door opening and floor, when designing a sound control system, commonly referred to as a partition. If the wall has an STC rating of 55 but the doorway has an STC rating of 35, the superior rating of the wall will not compensate for the lesser rating of the door.

The material used in wall construction greatly impacts the STC performance of a partition. The typical interior wall, consisting of half-inch drywall and wood studs, has an STC rating of 33. Fiberglass insulation can increase the STC level to 36. Concrete and concrete block walls feature STC values of 40 for a four-inch thick wall and 50 for an eight-inch thick wall. The STC rating of a partition can be negatively affected by inadequate wall or ceiling construction and the positioning of outlets, electrical boxes and conduits. This leaking of sound is referred to as flanking.

The door opening itself is a complex sound transmission control system. Its ability to block noise depends in part on the material from which it is constructed. Most importantly, though, is how well the individual parts of a doorway work together. A door opening is actually an assembly of several different components—the door, frame, gasketing and hardware. So the sound blocking abilities of a door opening depends on how these components perform as a complete opening assembly.

Door Openings Deconstructed

Doors are the most obvious component of the opening and have the most variations. An STC opening can have a wood door or hollow metal door, a single door or pair of doors, glazing or no glazing.

In the recent past, highly rated STC doors were constructed with materials such as lead that resulted in a single door that tipped the scales at more than 300 pounds. This meant not only a very heavy door to operate, but also significant load for the overall opening, requiring heavy-duty hinges (typically the costly cam-lift type) as well as a more laborious installation process.

Innovations in door construction has led to lighter-weight doors that can carry the same STC ratings of their heavier counterparts. These doors are typically 30 percent lighter and can be hung with standard weight hinges with no more installation effort than that of a regular door. Still, these doors have operable STC ratings that range from the mid-40s through the mid-50s.

Lightweight acoustical doors provide a huge advantage and convenience for contractors during shipping and handling of doors at the jobsites. Further, these doors also eliminate the need and cost for heavy-duty hinges during installation. When installing multiple openings on a job, the use of lightweight acoustical doors will amount to a large savings just on hinges alone. On top of this, the new generation of doors is typically 10% cheaper in terms of first costs compared to their more traditional counterparts.

From a long-term perspective, the lighter doors have greater durability and create less wear and tear on the opening. Even when using heavy-duty hinges, a large-weight door places more stress on the door frame. Over time, the added stress can cause the frame to bend ever so slightly, requiring replacement of the entire opening. The new construction methods do not limit the scope of applications where the doors can be used. The doors still attain all appropriate fire ratings and can be used on any opening that requires a fire-rated door.

Flanking issues—the areas of a partition that can allow sound intrusion—were mentioned earlier. Door frames and seals present potential flanking weaknesses on door openings. A standard hollow metal frame can be used in an STC rated opening. Applications that require an STC rating greater than 40 will necessitate door frames that are filled with a flank-proof material.

When selecting an STC door, it is important to review the rating for each product and determine how it was achieved.

Assembly Rating

Was the product tested to ASTM standards? Were the most recent testing methods used? Is the rating based on the more realistic operable testing procedures or less accurate calculated values? Are the products manufactured in compliance with Steel Door Institute (SDI) 128, Acoustical Performance of Standard Steel Doors and Frames, and Hollow Metal Manufacturers Association (HMMA) 865-03, Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames? These are important questions that must be asked to accurately conclude which door will deliver the best performance.

Look for complete door opening assemblies with ratings based on the ASTM E 90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements. Products tested at an independent lab are subjected to the most recent ASTM testing methods. This processes changes every few years. Consequently, STC results posted before 1999 may not produce the same results today; this difference becomes wider as one goes further back in time. The science of sound transmission control has increased since earlier standards were drafted, along with the methods of testing product performance and the software used to gather testing results. This all-around boost in knowledge has raised the bar for any product attempting to attain an STC rating.

Innovations in sound attenuation technology and its application in door openings are making a noticeable difference in the built environment.

Performance Elements

Schools can enhance learning conditions with quieter classrooms. Healthcare facilities can promote patient healing with a more restful environment. Offices can offer a productive atmosphere. Hotels and multifamily residences can provide greater privacy between living spaces.

Door openings contribute to better sound control, all while maintaining the safety and security of building occupants. Today's door openings are an essential element in the quest to build a better building.

ASSA ABLOY Mason City
1502 12th Street NW
Mason City, IA 50401
Phone +1 (641) 423-2444
Fax: +1 (800) 672-8110

ASSA ABLOY Springfield
3839 East Mustard Way
Springfield, MO 65803
Phone: +1 (417) 862-0681
Fax: +1 (417) 862-3780

www.assaabloywooddoors.com

ASSA ABLOY is the global leader in door opening solutions, dedicated to satisfying end-user needs for security, safety and convenience

Copyright © 2016, AADG, Inc., an ASSA ABLOY Group company. All rights reserved. Reproduction in whole or in part without the express written permission of AADG, Inc. is prohibited.