CRASHING THROUGH THE SOUND BARRIER

Welcome to the World of Acoustic Doors

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Have you ever lived in the same house as a person who listened to loud music? Do you have children who turn up cartoons full blast when you try to sleep in on Saturday morning? What's the classic response to all of this noise? CLOSE THE DOOR! Welcome to the world of acoustic doors. Perhaps you can use one at your home!

Noise Control is a Serious Problem

Noise seeps through walls and floors as well as doors. This is known as flanking noise, i.e., noise that goes around things, because parts of a building are not isolated from one another.

Noise control in doors is particularly difficult to achieve because a door (unlike a wall or floor) must be operable. Walls and floors have the luxury of achieving their acoustic goals in a 6" to 9" thick space, whereas architectural aesthetics demand that an acoustic door appear and function as a normal 1-3/4" thick door. The process of developing a product to achieve these goals takes a great deal of expertise and many years of research and development. Very few firms in North America possess this knowledge and manufacturing capability.

The Term "Sound Transmission Class" is Key

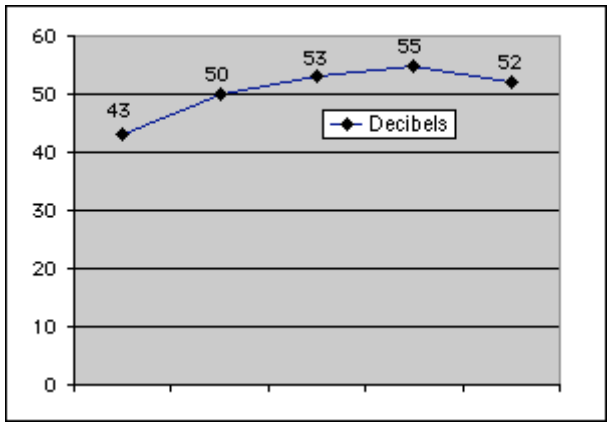
In order to understand acoustic doors one must understand the concept of "Sound Transmission Class" (STC). This is a method of gauging acoustic retardance by the American Standards and Testing Materials (ASTM) that is accepted by architects, designers, manufacturers and distributors of acoustic building products. The higher the STC rating, the greater the sound attenuation of the acoustic barrier.

One must have knowledge of two other simple concepts to understand the basics of sound transmission loss: "sound frequencies" and "decibel ratings" Sound frequencies simply refer to the pitch of the noise in question. For example, a bass drum would have a low range frequency in the 250 hertz range whereas a flute would emit a relatively high frequency sound in the 2500 hertz range. Human voices create sound in the "mid range" (1000-1250 hertz).

A flute, a drum or a human voice can, of course, make both soft and loud noises. These noise levels are measured in decibels. Normal office conversation creates about 60db of noise. Orchestral music creates noise levels in the area of 75db. Street traffic has a noise level in the 90db range. At the extreme - satellite test cells simulate the noise of rocket launches in the range of 150db!

The information in Table I is a typical STC contour chart. It shows the performance of a typical acoustic door at the STC 52 level. The performance of the door is measured across 18 different sound frequencies (100hz-5000hz) and it measures the extent of noise (in decibels) stopped by the door at each frequency. You will notice that the STC contour is not flat, i.e., it attenuates less sound at low range frequencies than it does at the high range frequencies.

TABLE I - Performance of Typical acoustic doors at the STC 52 Level



This is extremely important to understand as it greatly affects your ability to specify the proper acoustic door product for the particular application. Under ASTM E90-90 and ASTM E413-87, a product is given an STC rating which is an "average" of its acoustic performance across the different sound frequencies. The calculation, which assigns the STC value, is calculated by the testing lab in accordance with ASTM E90-90. When an end user has a requirement for a given amount of sound reduction as a specific frequency, the consultant must examine the supplier's test data to ensure optimum performance. For example: A mechanical room in a building may generate 80db of sound at a frequency of 250hz only. The requirement may be to reduce the noise at that frequency only by 40db. If one were to simply specify an acoustic door and frame of STC 40, it might not meet the owner's requirements. As a result, it is advisable to consult with an acoustics expert if you are in a position to specify the STC rating of the door in question.

Most of the time you will simply be required to source a product achieving a specific STC rating. Make certain that an STC rating is noted either in the remarks section of the door schedule or in Section 08348. To simply provide a "sound door" without an STC rating is like providing a "fire door" without a fire rating.

Specify the Material

When specifying an acoustic opening, it is imperative that the door, frame and seals be specified as a unit. If one component is missing, the acoustic performance of the unit will be compromised in unexpected ways. Usually manufacturers test their products with a standard latch set and heavy weight butts. These are available from the usual sources of builders hardware and are not integral to the unit's acoustic performance. At times,

certain products will have been tested with specialized cam lift hinges. When this is the case, these hinges may be supplied by the door/frame manufacturer. It's important to note that it is the STC rating of the overall unit that is critical. The precise manner by which this is achieved is useful information, but it is a secondary consideration. After all, your primary concern in specifying or purchasing an acoustic door is the acoustic performance level of that product.

Two things are certain if you want to provide the end user with a certifiable acoustic barrier:

1. You must demand that the manufacturer provide you with copies of acoustic test reports. These are usually two or three-page documents from an independent acoustic test laboratory. They will certify the test criteria to which the door was subject as well as the performance levels of the door achieved.
2. All components of the opening must be supplied by the acoustic door manufacturer - this will include the door frame, door, glazing (if applicable), perimeter and bottom seals.

On many occasions, distributors are asked to supply acoustic openings by providing quality items that were not part of the prototype tested by the manufacturer. For example, professionals are sometimes misled by the claims of weatherstrip manufacturers with respect to the acoustic properties of their weather seal. Very high acoustic ratings (over STC 50) are claimed by some weatherstrip manufacturers. Of course, the weather seal is only as good as the door/frame unit to which it is attached. Table II clearly shows that even the most superior door seals combined with off the shelf door/frame products produce modest results. The old saying that "a chain is only as good as its weakest link" is especially apt in this case.

Architectural grade A wood and steel doors are incapable of creating a high level acoustic barrier. Only when an acoustic panel is engineered to function as an acoustic door and is combined with specially-designed acoustic seals can superior results be achieved.

TABLE II - Door/Frame Performance Levels

	Without Seals	With Seals
Hollow Core Wood 1-3/8	18	21
Solid Core Wood 1-3/4	25	28
Hollow Metal Door	30	32
Low Range Acoustic Doors 1-3/4"	32	36*
Mid Range Acoustic Doors 1-3/4"	36	45*
High Range Acoustic Doors 1-3/4"	42	52*

** indicates use of custom designed acoustic seals by door manufacturer*

Figuring Out the Proper STC for Your Building

You might ask yourself, "How much sound reduction do I require?" Table III & Table IV will help provide the answer. Table III lists common noise level requirements in different working environments; Table IV lists approximate noise levels generated by various common items in our environment. If you cross reference the information in these two tables, you can determine the approximate STC ratings required in specific areas. For example, you might be helping design a broadcast area where the background noise cannot exceed 30 decibels. This area is next to a monitoring area where televisions will be on at all times creating a noise level of 80 db. By referring to Table IV, you can see that the noise level made by an average television is 80 db. From Table III, you can see that the acceptable level of background noise is 30 db. Now you are able to estimate that the approximate STC level of the acoustic door should be 50 (i.e., 80-30). I say "approximately" 50 not to be evasive but to alert you to the necessity of always being aware of the frequency level (hertz) of the source of the noise. As you can see from Table I, the STC 52 stopped 43db at 200 hertz and 53 db at 1000 hertz!

TABLE III - Typical Ambient Noise Level	
Broadcast Studio	30db
Office Area	40db
Apartment Living Room	45db

TABLE IV - Typical Noise Levels Generated	
Jet Take Off	120db
Rock Band	100db
Unmuffled Truck	90db
Average TV	80db
Human Voice at 3 Feet	60db
Background in Office	40db

Now you're probably at the point where you're thinking, "I know enough about this acoustic stuff to be dangerous." I would say, "you know enough about acoustic doors to ask acoustics experts some intelligent questions." The most accessible sources of acoustic door information will be the manufacturers of these products and those who represent them.

These firms have had the expertise to develop these doors over many years involving a great deal of research and development. They understand the demands of the marketplace and can recommend products that can meet your needs.

Saturday mornings will never be the same!

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