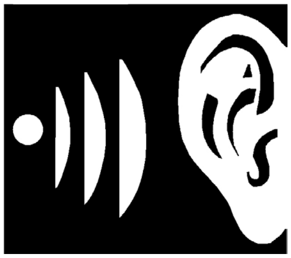
Making A Sound Decision In Operable Partitions



Introduction
Acoustical control is a critical factor in virtually every type of environment; therefore selection of the appropriate operable partition is critical. It's important when choosing an operable wall system to not only consider the space/configuration of your application and how the wall operates, but to also examine the wall's acoustical performance. The right wall system, in conjunction with complementing architectural elements, can help produce excellent acoustical control.

When selecting a wall system, several questions need to be asked relative to the room-to-room noise reduction. Also to be addressed is the need for the operable partition to provide a sound-absorbing surface in the rooms formed by the partitions.

What degree of acoustical control will you need?
What does it take to attain it?
Which wall system is better for your needs?
What architectural elements of the project should be considered?

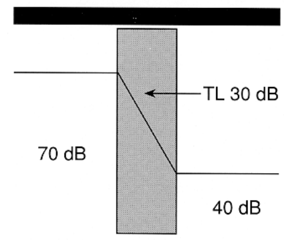
Modernfold developed this guide to answer these and many other questions. If you need more information, call us at 800-869-9685 or email info@modernfold.com.

Anticipate Sound Levels
In order to effectively specify a system to control/reduce the sound/noise in an environment, you must first identify the types and levels of sounds you are trying to control. Then, decide on what degree of "acoustical privacy" is necessary in your facility.

What sound levels are likely to be generated by functions using the rooms formed by the operable partitions? How much low frequency energy will there be in the generated sound? What sound levels are permissible on the "other side" of the operable partition?

The *Typical Sound Pressure Levels* chart indicates the sound-pressure levels of many everyday sounds. Sound levels are expressed in decibels (dB). The decibel scale ranges from zero (the threshold of audibility or the ability to hear) all the way up to 120 dB (the threshold of ear pain) and beyond. The chart can be a practical way to help gauge the sound levels of your environment. The chart indicates sound pressure levels in dBA—sound levels measured on the A scale of a sound level meter. The A scale minimizes the effect on the measurement of sound at low frequencies.

The industry accepted "measuring stick" for the acoustical performance of operable walls is the *Sound Transmission Class* (STC) rating. Walls are tested under laboratory conditions with varying frequencies (125-4000 cycles per second) to determine how much a sound level decreases when it transmits from one side of the wall/partition to the other. This decrease is called *Transmission Loss* (TL). For instance, if a sound measures at 70 dB on one side of a partition, and only 40 dB on the other, the TL rating would be 30 dB at that particular frequency. Since common sounds cover a wide range of frequencies, *Sound Transmission Class* (STC) ratings are used to provide a single number rating to identify the Transmission Loss of a partition as it varies with frequency. A higher STC rating indicates higher transmission loss, a desirable attribute of the partition.



There are several Modernfold Wall Systems available with STC ratings to meet most acoustical control applications. For comparison, see how the Modernfold systems rank with some typical fixed wall systems.

Typical Sound Pressure Levels		
Levels in dBA		**Common Sounds**
Short Exposure can cause Hearing Loss	140	Jet Take Off
	130	Jack Hammer
Threshold of Pain	120	Siren
Deafening/Threshold of Discomfort	110	Thunder Riveting Machine Hard Rock Band
	100	Boiler Factory Machine Shop
Very Loud	90	Noisy Plant
Intolerable for Phone Use	80	Printing Press Kitchen Equipment
Loud	70	Sports Car Interior (50mpg) 6-Piece Orchestra Amplified Speech Noisy Office
	60	Speech Average Factory Average Radio Normal Conversation
Moderate	50	Average Business Office
	40	Average Residence Quiet Radio
Faint	30	Private Office Average Auditorium
	20	Quiet Conversation Sound Stage (Movie)
Very Faint	10	Whisper
Threshold of Audibility	0	Sound Proof Room Human Breathing

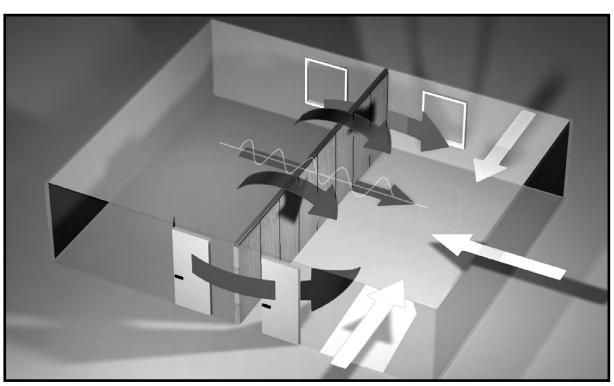
Common Fixed Partition Systems	Sound Transmission Class (STC)*	Partition Thickness	Partition Surface Weight (PSF)
1.75-inch Hollow Core Door 25% Louvered	12 STC	1.75-inch	1.75 PSF
1.75-inch Hollow Core Work Door No Gaskets	19 STC	1.75-inch	2 PSF
4-inch Cinder Block	25 STC	4-inch	25 PSF
.25-inch Plate Glass	26 STC	.25-inch	3.25 PSF
1.75-inch Solid Wood Door Fully Gasketed	31 STC	1.75-inch	7 PSF
.50-inch Gypsum Board ea side 2x4 Wood Studs	34 STC	4-inch	6-7 PSF
.62-inch Gypsum Board ea side 2x4 Wood Studs	35 STC	5-inch	7-8 PSF
4 Layers .62-inch Gypsum Board Wall	35 STC	2.50-inch	16 PSF
.25-inch Acoustic Glass (Laminate)	36 STC	.25-inch	3.75 PSF
6-inch Painted Concrete Block	44 STC	5.62-inch	34 PSF
2 Layers .50-inch Gypsum Board ea side Metal Studs	45 STC	3.62-inch	10-12 PSF
2 Layers .50-inch Gypsum Board ea side Metal Studs w/ Cavity Insulation	50 STC	3.62-inch	10-12 PSF
8-inch Brick Wall	52 STC	8-inch	80 PSF
8-inch Brick Wall w/ .50-inch Plaster ea side	54 STC	9-inch	80 PSF
2 Layers 5/8" Gypsum Board, 2 Tubes of Green Glue, Wood Studs, 2 Layers ½" Gypsum Board, and 2 Tubes of Green Glue	56 STC	6-inch	10-13 PSF
*Note: STC ratings were achieved under laboratory conditions and do not reflect construction or architectural variables found in the field.			

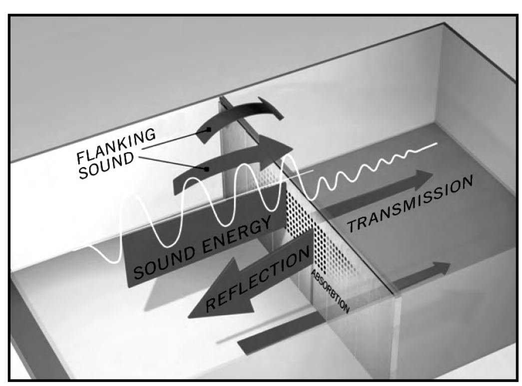
Ceilings, Floors, Furnishings, & Walls Must Work Together to Maximize Acoustical Performance
When you consider that an operable wall may represent only 10% of the surface area in a room, you realize how important the performance of the floor, ceiling, permanent walls and furnishings are in achieving effective acoustic control.

The importance is especially apparent when you think about how sound "travels" in a "divided" room. When sound energy strikes the partition, some is transmitted to the other side—this is *Sound Transmission*. The part that doesn't pass through the partition is reflected back into the room—this is *Reflected Sound*. Some of this transmitted and reflected sound is absorbed by room finishes, furnishings, etc.—this is *Sound Absorption*. Properly selected carpeting and other flooring, wall and ceiling treatments, and room furnishings can help reduce transmitted and reflected sound levels by increasing sound absorption in the rooms formed by the operable partition.

If a partition doesn't fit or interface correctly with a building, the sound-reducing characteristics of the partition can be significantly compromised. No operable partition can perform to expected levels if it is not installed correctly in a properly prepared opening. A loose or improper fit creates sound "leaks" at the perimeter of the partition and at panel intersections. Airborne sound can also be transmitted to adjoining rooms by way of adjacent doors, door grilles, air handling ducts, ceiling plenums, or floors and walls passing beneath the partition or from room-to-room at the ends of the partitions. These *flanking paths* can often be eliminated or diminished by installing baffling, sound barriers, or sound-absorbing insulation in key areas.

Maximizing Field Acoustical Performance
To achieve the best sound-reducing performance from an operable partition it is not only necessary to consider the transmission loss provided by the partition itself, but also of major importance is the amount of sound-absorbing material in each of the rooms formed by the partition. The amount of sound-absorbing material in the sending room will help reduce the level of sound generated in this room, and the amount of sound-absorbing material in the receiving room will help reduce the level of the sound transmitted through the operable partition. Also, for many uses of typical rooms separated





by an operable partition, a proper amount of sound-absorbing material will provide a more suitable overall acoustical environment in each of the rooms. Controlling the sound transmitted via flanking paths around, under, and over the partition is also of major importance.

Above the Partition Track *(Figure 1)*
A plenum above a partition can allow sound to pass up through the ceiling on one side and down to the other side. To eliminate this problem, a barrier (with a sound transmission loss equal to or greater than the partition) should be created above the partition. Often times air ducts will penetrate plenum sound barriers. Such ducts will lower the transmission loss of the plenum barrier since sound will be transmitted through the thin wall of the duct on one side of the barrier, through the duct, and then through the thin wall of the duct on the other side of the barrier. This situation can normally be prevented by installing a commercial duct silencer in the air handling duct with the silencer penetrating the barrier.

Hollow Floors *(Figure 2)*
When floors are designed with hollow spaces below—such as some gymnasium floors or computer access floors—sound may pass down on one side of the partition and up through the floor on the other side. The solution is to create a barrier (with a sound-transmission loss equal to or greater than the partition) directly below the operable wall as shown in the diagram.

Floor Surfaces *(Figure 3)*
It is difficult to achieve a good seal with an operable wall on a carpeted floor since sound will pass through the carpet and under the partition bottom seal. The best solution for this problem is to replace the carpet at the bottom partition seal with a strip of smooth material such as metal, wood, or vinyl. Another option is to interrupt the carpet with a carpet seam seal at the center of the operable partition where the bottom of the partition makes contact with the floor.

Partition-to-Wall Connections *(Figure 4)*
Operable walls use various methods to connect with permanent walls and partitions. These include bulb seals, fixed jambs mounted to the partition or permanent wall, or recessed jamb on the permanent surface. Whatever the case, provision should be made to allow for air tight closure against the permanent wall without interference from chair rails, crown moldings, or other surface materials. For partition-to-wall constructions it is essential that the gypsum wall board be discontinuous behind the jamb to prevent room-to-room sound flanking through the gypsum board and behind the jamb. It pays to plan ahead. The sound barriers discussed here are easy and relatively inexpensive to install during early construction. Post-construction corrections are always more difficult and costly.

Figure 1

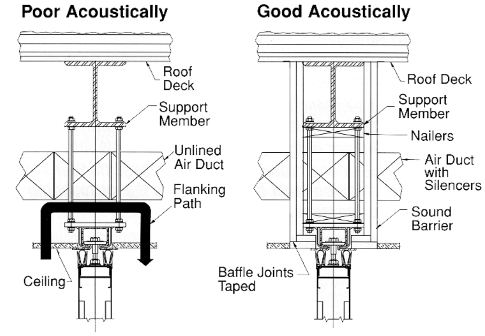


Figure 2

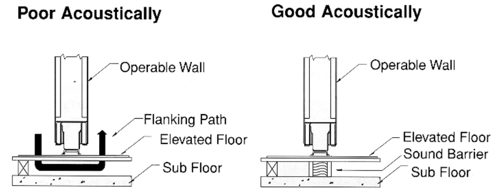


Figure 3

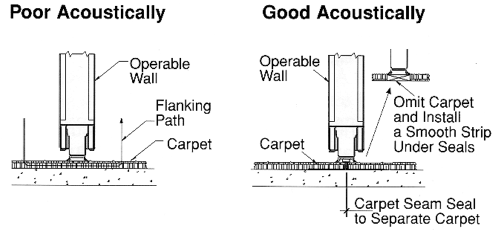
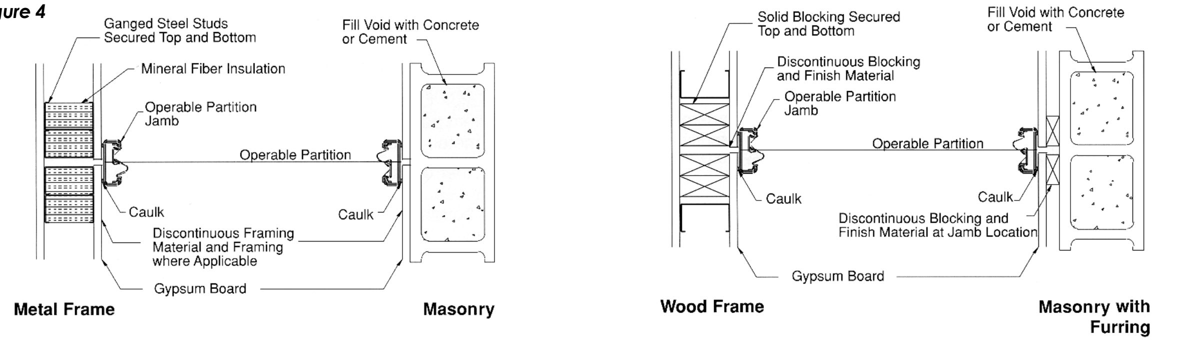


Figure 4



Field Sound Tests (NIC& FSTC)
The field performance of a building's operable wall is covered by ASTM E-336. Field test results are calculated according to ASTM E-413 and reported as Noise Isolation Class (NIC) or Field Sound Transmission Class (FSTC). It should be noted that NIC ratings are determined using Noise Reduction (NR) data, the arithmetic difference between sound levels in the sending and receiving rooms. NIC ratings are dependent upon the amount of sound-absorbing material in the receiving room and the size of the operable wall.

FSTC ratings attempt to remove the effect of receiving room sound absorption and the size of the particular partition. FSTC ratings are the field version of laboratory STC ratings. Experience indicates that NIC ratings will be approximately 9 points lower than carefully controlled laboratory STC measurements for any particular operable partition type. FSTC ratings can be higher or lower than NIC ratings depending on the relationship between the size of the partition and the amount of sound absorption in the receiving room.

Assuming that the proper partition type has been selected for a particular application and that the partition is properly fabricated, the purpose of field measurements is to show that the partition has been properly installed, is operating properly, and to discover any significant flanking paths (which are typically not within the control of the operable wall installer and manufacturer).

Sound Absorption
All building materials provide some sound absorption, but only those materials that have relatively high sound-absorbing properties are useful in reducing sound levels within a room and in improving room acoustics for many room uses. Sound-absorbing properties for a particular material are expressed by the material's coefficients of absorption (which vary with frequency). A common one-number rating for sound absorption is the Noise Reduction Coefficient (NRC), the average of coefficients of absorption at frequencies from 250 Hz to 2000 Hz. In general, soft porous materials have high NRC ratings when compared with hard materials such as gypsum board, plaster, or concrete. Effective sound-absorbing materials will have an NRC rating of 0.65 or greater. So adding porous materials such as sound-absorbing ceiling and wall materials, drapery, upholstered furniture, and carpet can increase both the comfort and acoustic performance of a facility. In regard to operable walls, NRC ratings apply only to the performance of sound-absorbing panel faces.

Sound Advice

- Acoustical control is critical in most facilities and it's a sound investment worth making.
- Wall systems are ranked according to Sound Transmission Class (STC) Ratings.
- Ceilings, floors, and furnishings are important to acoustic control.
- Flanking paths can significantly diminish the sound-reducing properties of an installed operable wall, but they can be avoided with proper building design and barrier installation.
- Remember, the sound-reducing properties specified for the operable partition must be matched by the surrounding ceiling, walls, and floor—the acoustical envelope.

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Form No. 2503 04/18