MODERNUS' approach to noise reduction in an office setting [1]

WHAT IS SOUND?

Sound waves travel through the air in the form of very small changes in atmospheric pressure. Sound pressure (which we perceive as volume) is the average deviation in the atmospheric pressure above or below the static value (barometric pressure). We also hear sound as a pitch which is the frequency of its change or its cycle. The faster the change (frequency) the higher the pitch. Our ear drum is vibrated by these waves and we hear "sound"!

HOW IS SOUND MEASURED?

The loudness or volume of sound (which is what we are most concerned with here) is measured in decibels (db). The dynamic range of human hearing is from 0 to 120db. The pitch of sound is measured in cycles per second (cps). Note: A cycle per second is now referred to as a "Hertz" (Hz). The frequency range humans normally can hear is from 125 to 4000 cycles per second.

WHAT IS NOISE?

Noise is simply a sound that you are not interested in hearing.
Intent is what distinguishes sound from noise: your child crying is a sound (important one) for you, but it is probably noise for anybody else; your favorite tunes could also represent a great soundtrack to a nice night with friends (sound) but they become an irksome noise to your neighbor who is trying to fall asleep.
Similarly, in an office environment, the voice of your client on the phone is (could be) a welcome sound to you, but not to your colleague sitting in the next office trying to push a deadline.

COMMON NOISE LEVELS.

Refer to Table No. 1.

1 Based in part on a NSSEA document

HOW DO WE CONTROL NOISE?

There are two general ways we can control noise:

BLOCK THE NOISE (STC)

Probably the best understood way of controlling sound is by erecting a physical barrier that stops sound waves from propagating. In doing so, we take advantage of basic physical properties of different materials. There is a strong correlation between a material mass and its ability to stop sounds. The denser a material, the more likely it is that it can stop the transmission of sound. Lead is better performing than cement, which in turn performs better than wood. Often, a combination of materials can stop sound better than each individual material – for these reasons, in this context, we often talk about composite cores, air gaps, etc.

The ability of a wall to stop the transmission of sound is described as its "Sound Transmission Class" (STC). The higher the number, the better the wall is performing.

ABSORB THE NOISE (NRC)

There is also another way of controlling noise, by absorbing it.

Sound waves bounce around once they hit a surface, not unlike an ocean wave bouncing against a rocky shore. The harder the material, the more energy is transferred back once that material is hit, the stronger the wave (sound). Ocean waves bounce back totally differently when they hit a rocky cliff, a pebble beach, or a sandy beach. Material properties, structure and shape affect this.

So in the case of sound, the harder, sharper edged the material the more reverberation [sound kicked back] you experience.

So by carefully modeling the surfaces that noise [sound] is likely to encounter in its propagation in space [air], we can control the amount of noise that is pushed back. The more noise we do not push back, or we capture, the more we control the noise level in one environment.

We measure the effectiveness of reducing this reverberation or "slap-echo" by the "Noise Reduction Coefficient" (NRC) of materials within the room.

STC - HOW DO WE MEASURE IT?

STC is a single number expression of how much sound is stopped in frequencies ranging from 125 to 4000 cycles per second (Hertz). The actual test results are graphed and then compared to a standard “STC profile”. The closest “profile” to the actual test results is adopted as the STC value for a specific material. The modding follows the following rules.
No more than 32 deficiencies below this profile are allowed. When properly adjusted on the graph the point where the profile crosses the 500 cycles per second line is the “STC”. The higher this number the more effective the wall is in stopping the broad range of sound.
For walls, all tests should be performed in accordance to the ASTM E90 standard for fully demountable walls in a 14’-0 by 9”-0 opening.

SOUND TRANSMISSION CLASS FOR COMMON BUILDING MATERIALS.

Refer to Table No. 2.

SOUND TRANSMISSION CLASS FOR COMMON BUILDING WALL CONSTRUCTION.

Refer to Table No. 3.

IT`S THE PERCEIVED NOISE DIFFERENCE THAT COUNTS!

Equal levels of sound in adjoining areas tend to cancel each other out. Also all areas have ambient or background noise level which aids in masking sound from adjoining areas; but if you have 80db of sound in one room and 40db of sound in an adjoining room you have 40db of “noise” to deal with. A wall with an STC value of 40
would solve this problem. Addendum #1

NRC – HOW IT IS MEASURED, WHEN YOU WANT TO USE IT.

“NRC” stands for “Noise Reduction Coefficient” and expresses as a decimal the effectiveness of an absorptive material or surface as compared to a theoretically perfect absorber. A sound absorber is designed to deaden sound within a room, to eliminate the reverberation of sound and to reduce the build-up of sound within an enclosed space. The higher the number the better

NIC - HOW DOES IT DIFFER FROM STC?

“NIC” stands for “Noise Isolation Class” and it is a single number (like STC) expressing the actual degree of sound control between two adjoining areas measured at various frequency levels (pitches), on site in a building and is commonly referred to as a “Field Test”. The higher the number the better the control. Such tests try to take into consideration the entire environment and not just the primary wall or barrier. (See below.)
The test is conducted according to the ASTM procedure E366.
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NOT JUST THROUGH, BUT OVER, UNDER, AND AROUND

Sound can go around corners, over the top of walls, under the wall, through duct work as well as through a wall. It’s the “end run” of the sound business. If careful attention is not paid to these “flanking paths”, the effectiveness of an expensive demountable wall with a high sound transmission rating can be devalued. The pathways that allow sound to get around an demountable wall must be blocked with construction equal to the acoustical rating of the demountable wall. Refer to the ASTM E557 Standard “Architectural Applications and Installation of Demountable Walls”.

HOW TO SELECT THE PROPER LEVEL OF SOUND CONTROL FOR AN DEMOUNTABLE WALL.

The beginning point is to examine the types of activities you are going to have in adjoining areas separated by a demountable wall. If the activities are similar in nature and will generate fairly equal levels of noise then the STC requirements can be moderate (around 32 to 39 STC). However when dissimilar activities are anticipated and greater differences in sound levels are present, then the STC requirement should be higher (43 to 52 STC). Only when widely different levels of sound are present and particular care is taken with surrounding construction and flanking paths, should walls above 52 STC be specified.

WHY THE NUMBERS CHANGE BETWEEN A LABORATORY TEST AND IN -FIELD PERFORMANCE.

Because of the many variables involved in the construction of a building and the presence of flanking paths as compared to the controlled environment of the laboratory setting, the results of a field test (NIC) will always be lower than that of a laboratory test (STC). In very good design and construction this difference might be as little as 6 but may go as high as 12 or higher. A rule of thumb is to expect the NIC to be 8 to 10 below the STC. Remember, in a field test, the NIC can never be higher than the NIC of the flanking paths no matter how good the demountable wall. So you could have a wall tested at 43 STC and an NIC of 18 because of the existence of flanking paths

THE VALUE AND RISKS OF UTILIZING PUBLISHED LABORATORY TEST RESULTS FOR SPECIFICATION PURPOSES.

Laboratory tests give a way of comparing the sound performance of different wall constructions by the same and different manufacturers under a controlled set of conditions. It can be a useful tool in the selection and an aid in matching other construction elements to the same sound requirements.

There is however a varying degree of conformity in the quality of tests that are currently used in the demountable wall industry. Changes in regulatory and testing standards do not allow a perfect comparison between test results. Old test results are often still being used because they present a more favorable picture than newer ones.
Widely accepted old benchmarks are still used because they portray a better picture than what more newly drawn benchmarks would.

It is important to have clear this background when comparing test results from different sources and forming expectations about the performance of a wall product. This background noise often distorts the quality of the discussion.

MODERNUS products test results

Modernus is committed to engineering the best performing wall systems in the market. Each product we design is aimed at besting expectations for its intended category and offer the best feasible performance.

Sound Blocking Wall Systems

Lama and Fimo

Lama is the BEST TESTED performing glass wall system in the market with a sound performance (for a glass wall, not a blind wall) as high as 49 in accordance to the ASTM 90E (2016).

In tests, Lama was found to be sound neutral – less sound transmitting than the glass it was designed to accept.

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		Glass Thickness	Lamination Type	STC
Single Glaze				
	Laminated Glass			
		3/8”	0.030 P.V.B.	36
			0.060 P.V.B	37
		½”	0.030 P.V.B.	38
			0.060 P.V.B	39
	Monolithic Glass	3/8”		34
		½”		36
Double Glaze				
	Laminated Glass			
		3/8” + 3/8”	0.030 P.V.B.	43
			0.060 P.V.B	45
		½” + 3/8”	0.030 P.V.B.	47
			0.060 P.V.B	49
	Monolithic Glass	3/8” +3/8”		34
		½” + 3/8”		43

Seven

Seven was developed over a period of 20 years with one objective in mind: performance. Seven is the wall partition product with the highest test scores in the world, ever. It was tested at a level 55dB in 2016 in accordance to UNI EN ISO 10140-1=2014 + UNI EN ISO 10140-2:2010 + UNI EN ISO 10140-4:2010 + UNI EN ISO 717-L2013.

SOUD ABSORBING SYSTEMS

CIMENTO

Cimento is the only cement finish which can also offer sound absorbency. Cimento cement cladding panels were tested at 0.37 in accordance to UNI EN ISO 354 and 11654 in 2013.

COMMON NOISE LEVELS

TABLE NO. 1

SOURCE	DB
HUMAN BREATHING	0 - 10
SOFT WHISPER	30
AVERAGE HOME AMBIENT	40
AVERAGE OFFICE AMBIENT	50
CONVERSATIONAL SPEECH (3 FEET)	60
QUIET TYPEWRITER	70
AVERAGE STREET NOISE	0
BUSY RESTAURANT	80
AVERAGE FACTORY	80 - 90
POWER LAWN MOWER	100
CONSTRUCTION BULLDOZER	110
LOUD MOTORCYCLE	110
ROCK BAND	110 - 120
THRESHOLD OF PAIN	120

STC VALUES FOR BUILDING MATERIALS

TABLE NO. 2

MATERIAL	STC
5/16" PLYWOOD	25
24 GAUGE STEEL	26
1/2" Gypsum BOARD	26
5/8" Gypsum BOARD	28
1/16" LEADED VINYL	29
1/8" PLATE GLASS	28
1/4" PLATE GLASS	0
3/16" STEEL PLATE	35
1" THICK WOOD PANEL	36
4" TWO CELL CONCRETE BLOCK	41
8" LIGHTWEIGHT HOLLOW CONCRETE BLOCK	46
8" HOLLOW CORE CONCRETE BLOCK	50
4" BRICK-WALL WITH 1/2" PLASTER	50
8" BRICK WALL	52
6" DENSE CONCRETE	54
12" BRICK WALL	59

STC VALUE FOR STANDARD WALL CONSTRUCTION

TABLE NO. 3

TYPE OF CONSTRUCTION	STC VALUE
1. STANDARD WOOD STUD	
1/2" GYPSUM BOARD BOTH SIDES OF 2" x 4"	
WOOD STUDS 16" OR 24" ON CENTER	32
2. SLIT WOOD STUD	
WOOD STUDS SLIT WITH STANDARD SAW BLADE WITHIN 6" OF TOP & BOTTOM. WITH 1/2" GYPSUM BOARD BOTH SIDES	
WITHOUT INSULATION	40
WITH FIBERGLAS INSULATION	43
3. 3 5/8" STEEL CHANNEL STUD	
5/8" GYPSUM BOARD BOTH SIDES	
WITHOUT INSULATION	39
WITH FIBERGLAS BLANKET	42
4. 6" CONCRETE BLOCK WALL	44
5. 2 5/8" STEEL CHANNEL STUD	
TWO LAYERS 5/8" GYPSUM BOARD ONE SIDE, ONE LAYER 5/8" GYPSUM BOARD OTHER SIDE	
WITHOUT INSULATION	40
WITH FIBERGLAS INSULATION	46
6. 2 5/8" STEEL CHANNEL STUD	
TWO LAYERS OF 5/8" GYPSUM BOARD BOTH SIDES	
WITHOUT INSULATION	45
WITH FIBERGLAS INSULATION	55