

# Don't listen to this

Acoustics, privacy  
and the workplace...

# ...its not a concert hall, why worry?

- \* Confidential discussions:
  - \* Counseling
  - \* Personnel issues
  - \* Family/private conversations
- \* Business secrets
  - \* Deals in the works
  - \* Proprietary technology or processes
  - \* Confidential customer data

# Sound is energy

- \* Measured in tenths of “bels”
  - \* A ratio of two power quantities to two field quantities....its a proportion
- \* A decibel (dB) is one tenth of a bel (B), i.e.  $1\text{ B} = 10\text{ dB}$ . The bel is the logarithm of the ratio between two power quantities of 10:1, and between two field quantities in the ratio .[14] A field quantity is a quantity such as voltage, current, sound pressure, electric field strength, velocity and charge density, the square of which in linear systems is proportional to power.

# Energy moves molecules

- \* An ultrasonically welded shoe (upper)
- \* An LRAD Long Range Acoustic Device (hurts you before it melts you...)





# People and Sound

## mechanical, fluid, electrical transmission

Sound energy moves air molecules in waves towards your ear.

The eardrum membrane is vibrated by these waves

The anvil and stirrup bones move fluid in your inner ear

The minute hairs in your inner ear flex with the sound, transmitting an electrical signal to your brain



- Normal conversation: 60 dB
- Lawn mower: 90 dB
- Threshold of pain: 130 dB, depending on the person's tolerance
- LRAD maximum continuous volume: 162dB

# How loud am I talking?

Distance		Voice Level (dB)			
(feet)	(m)	Normal	Raised	Very Loud	Shouting
1	0.3	70	76	82	88
3	0.9	60	66	72	78
6	1.8	54	60	66	72
12	3.7	48	54	60	66
24	7.3	42	48	54	60

# Sound and construction...

## STC, Sound Transmission Class

- \* It's a measure of attenuation (reduction) of sound.
- \* Our industry uses it as a measure of sound attenuation across a partition or wall...and its an imperfect measure
- \* Its only measured between 125hz and 4000 hz
- \* So it leaves out a lot of low frequency sound (mechanical equipment, music, ...)
- \* But its about all we have to compare construction

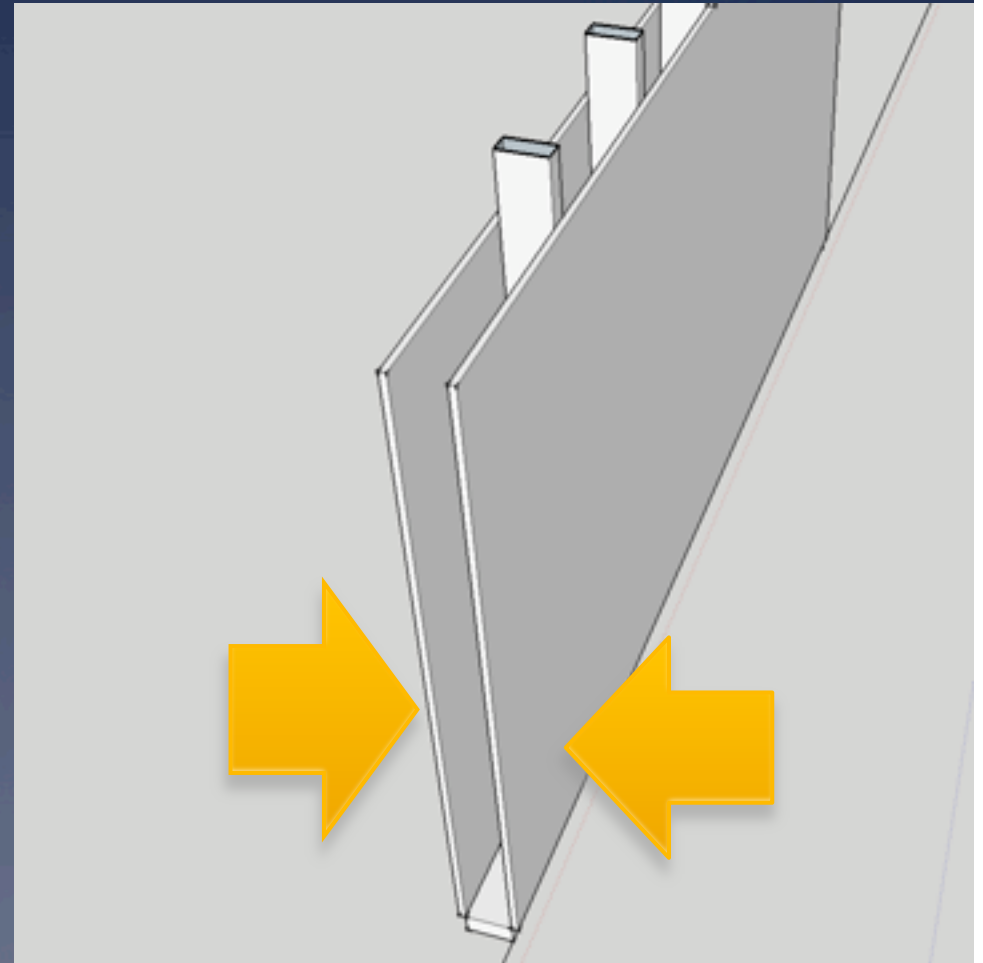
# What does STC mean to us?

## 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.  
**(minimum required for party walls, floors by IBC code)**
- 60+ Superior soundproofing; most sounds inaudible

# Paper thin!

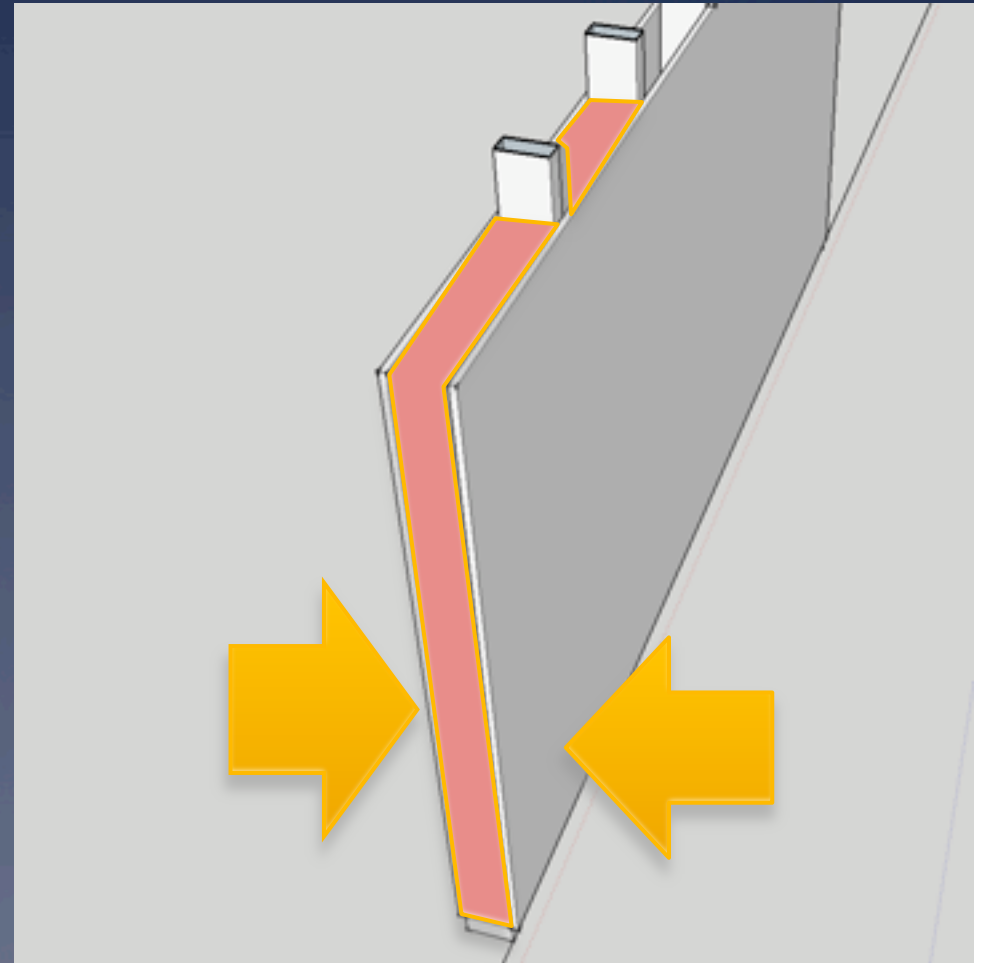
- \* ½" gwb each side of 2x4
- \* No insulation
- \* No suspension system
- \* No perimeter sealants
- \* Electrical boxes in same stud space



**STC 33** Loud speech can be understood fairly well, normal speech heard but not understood

# Thicker Paper!

- \* ½" gwb each side of 2x4
- \* R-13 fiberglass insulation
- \* No suspension system
- \* No perimeter sealants
- \* Electrical boxes in same stud space

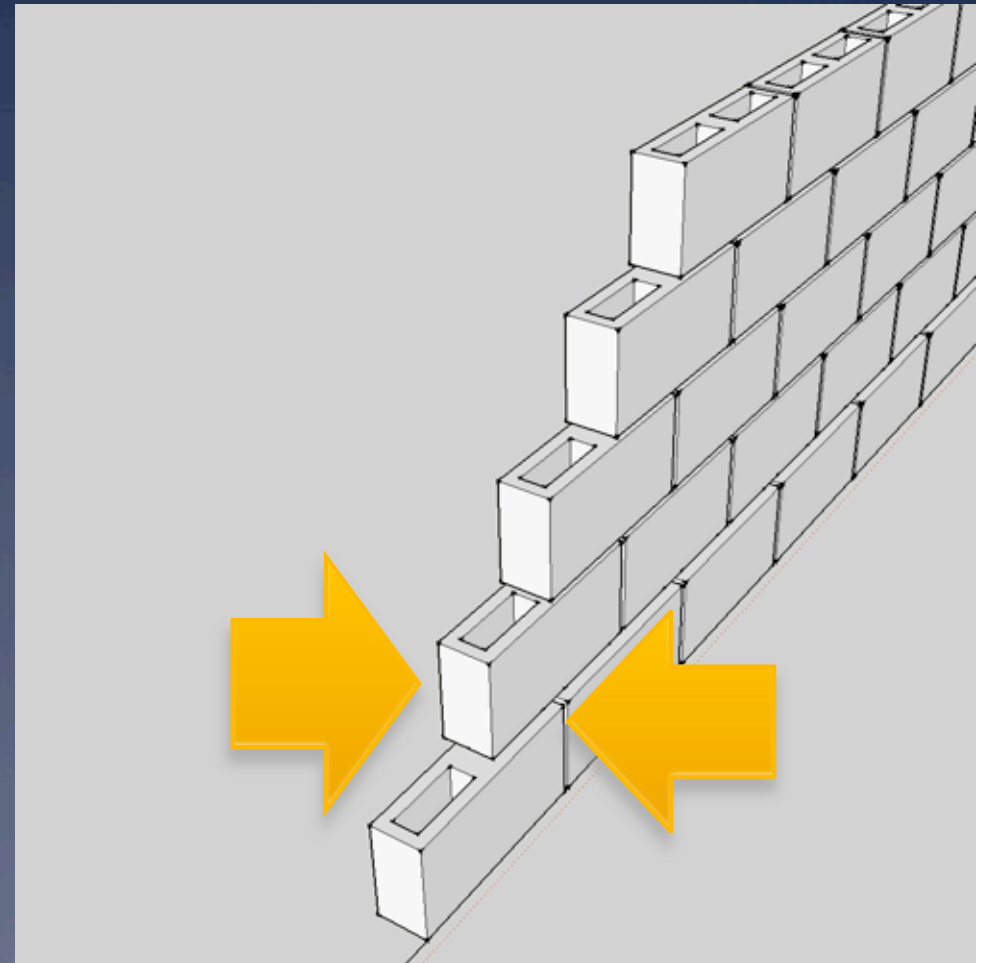


STC 39 Loud speech audible but not intelligible



# Mass Helps

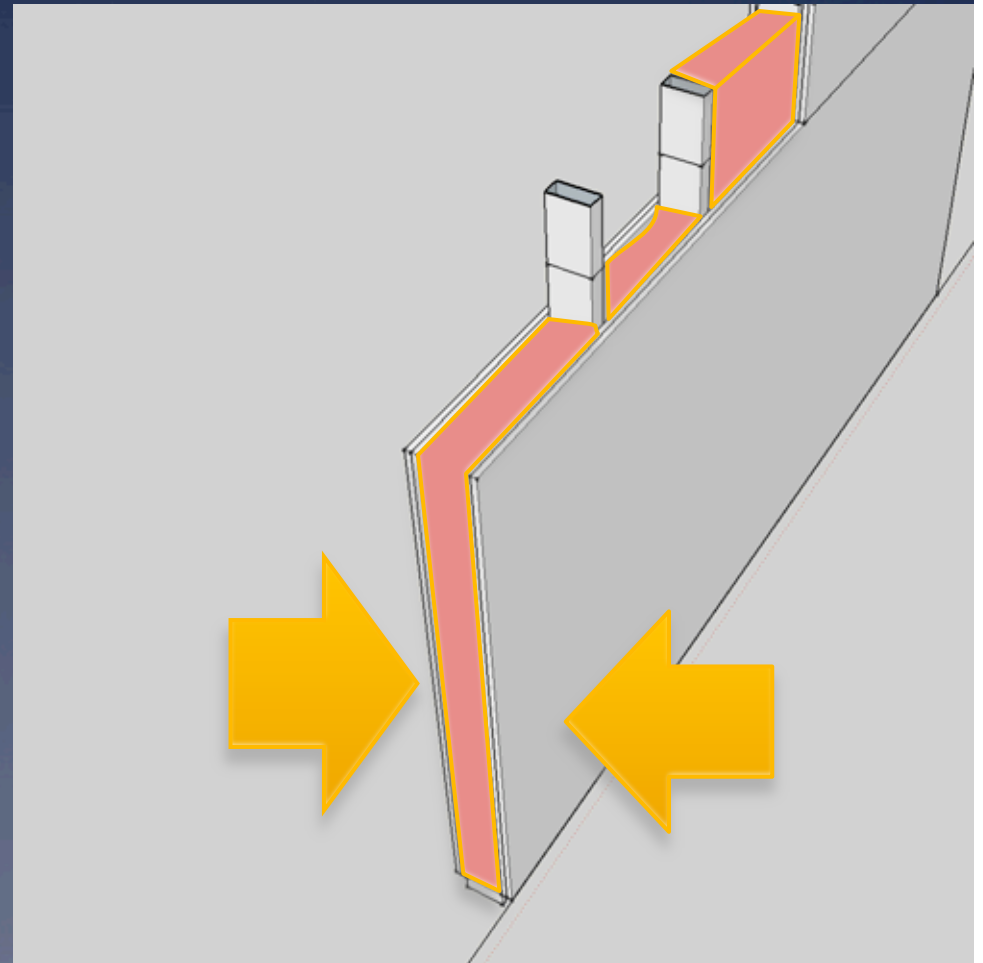
- \* 4" CMU (concrete masonry unit)
- \* No insulation
- \* No suspension system
- \* No perimeter sealants
- \* Electrical boxes compromise integrity



STC 44 Onset of "privacy," Loud speech audible as a murmur

# Even Sheetrock Mass

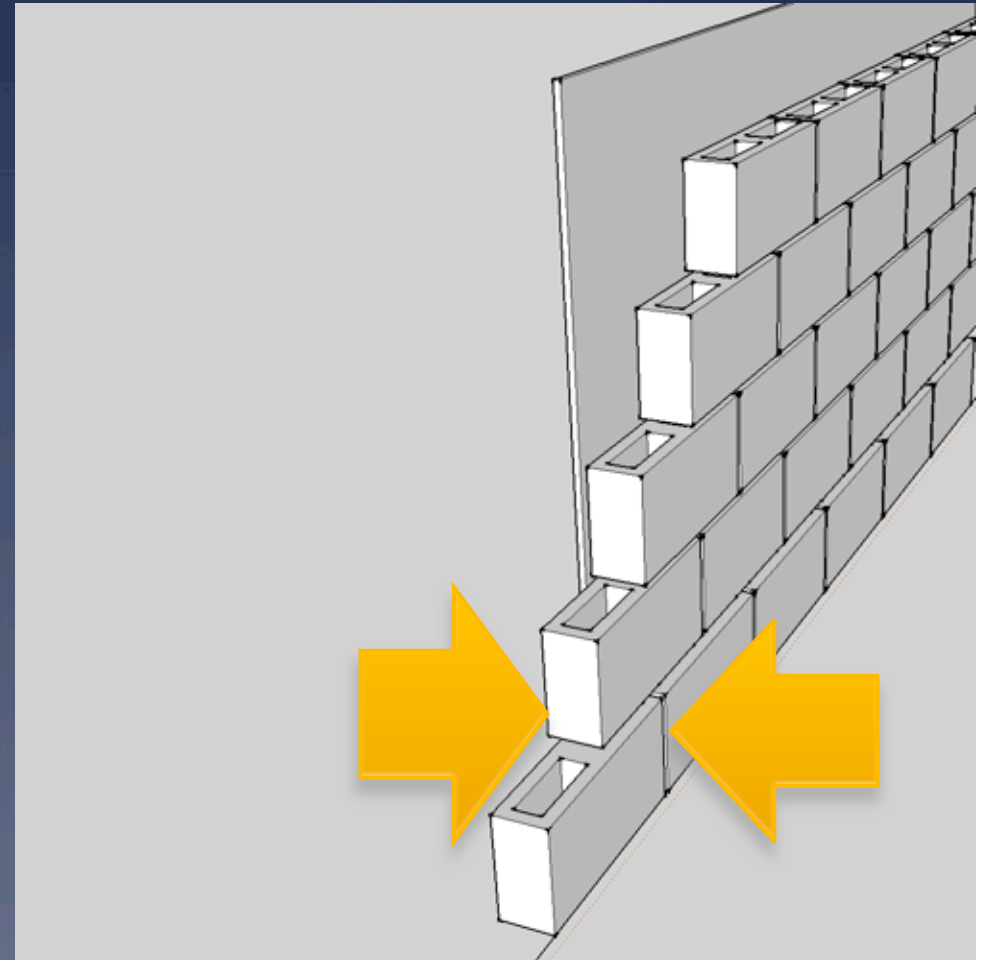
- \* **2 layers!** ½" gwb each side of 2x4
- \* R-13 fiberglass insulation
- \* No suspension system
- \* No perimeter sealants
- \* Electrical boxes in same stud space



STC 45 Onset of "privacy," Loud speech audible as a murmur

# CMU + Sheetrock = low annoyance!

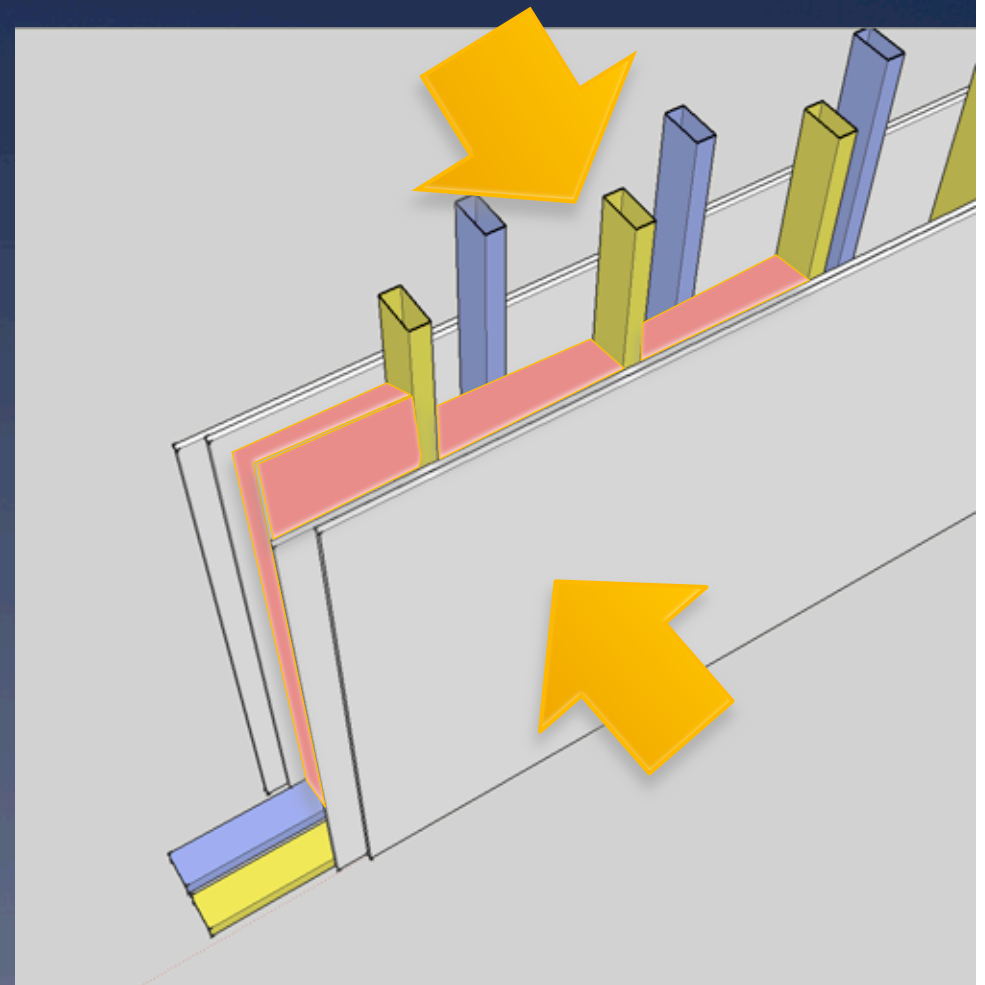
- \* ½" gwb **one** side of 6" cmu
- \* **Paint** both sides
- \* No insulation
- \* No suspension system
- \* No perimeter sealants
- \* Electrical boxes in same stud space



STC 46 Loud speech not audible; 90% of statistical population not annoyed

...can't hear  
you...you're not  
transmitting...

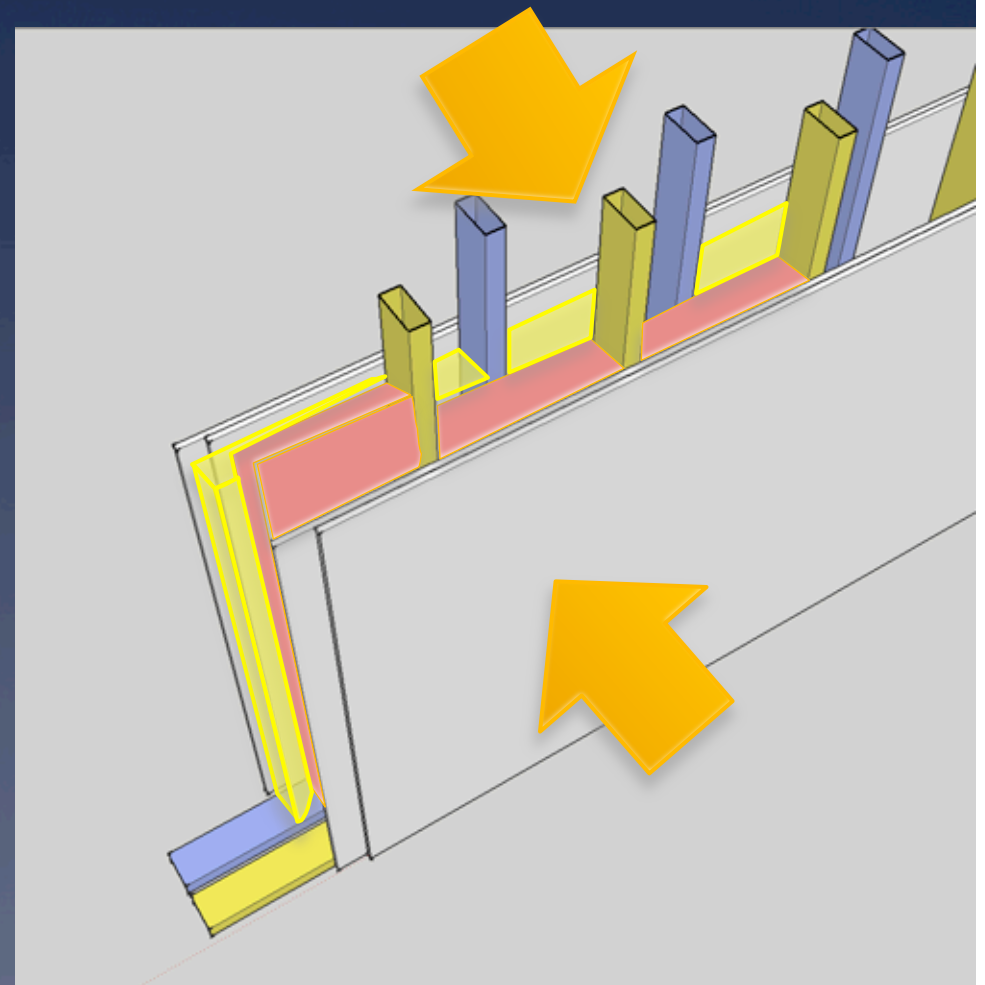
- \* **Two 2x4 staggered stud walls on plates 1" apart**
- \* **Two layers** ½" gwb **each** side of staggered studs
- \* **Paint** both sides
- \* fiberglass insulation
- \* No suspension system
- \* **Perimeter** acoustical sealant
- \* **Stagger** Electrical boxes



**STC 55** Very loud sounds such as musical instruments or a stereo can be faintly heard; 99% of population not annoyed.

...can't hear  
you...you're not  
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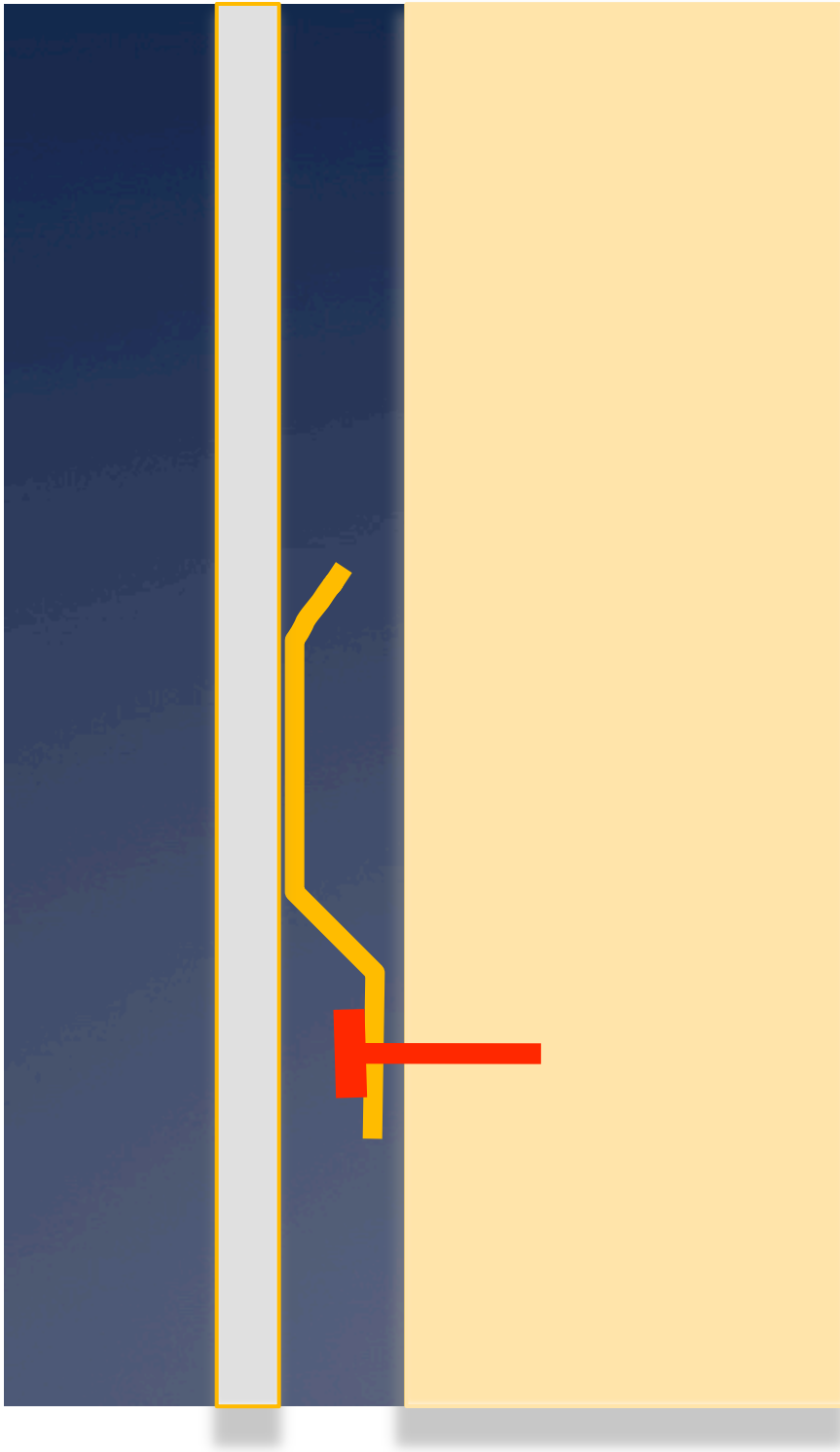
For an even better wall...add  
suspenders





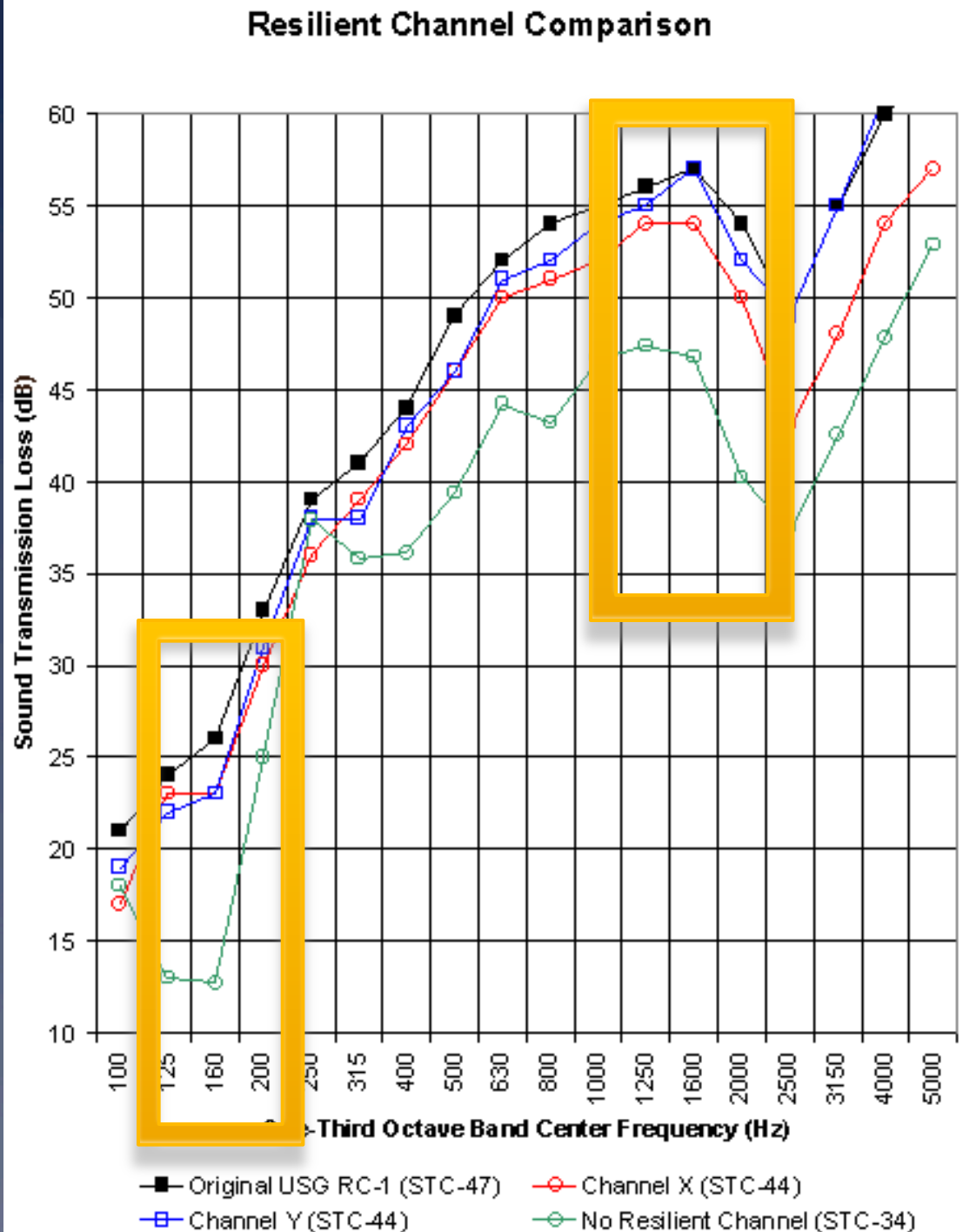
# USG RC-1 Channel

- \* Floats the GWB away from the stud
- \* Prevents direct sound conduction
- \* Requires flexible acoustical sealant at GWB edges



# Significant improvements

- \* Isolating the GWB from the stud makes it harder for sound that's vibrating the GWB to begin moving the air molecules on the opposite side of the wall...no eardrum membrane = no hearing



# A great wall is only as good as its edges

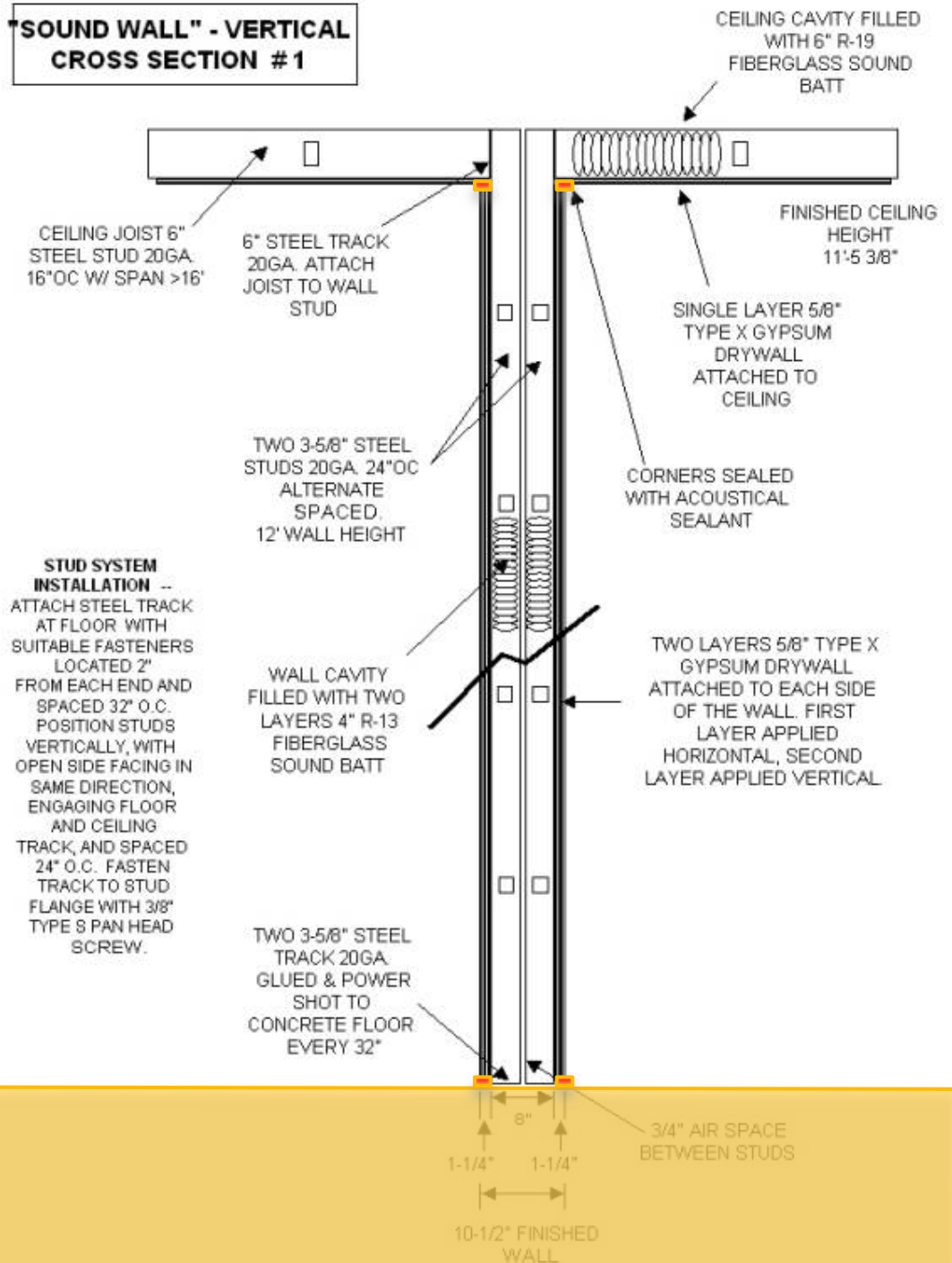
- \* Sound leaks
  - \* Over the wall where the ceiling runs across it
  - \* Through the wall at electrical outlets
    - \* Pipes passing through wall
  - \* Around the wall where ductwork serving adjacent spaces
  - \* Around its edges where it meets other materials and structure

# Seal the edges



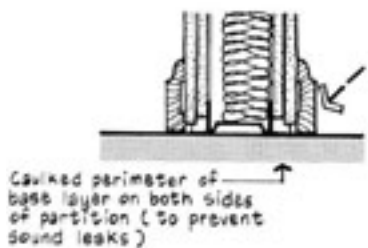
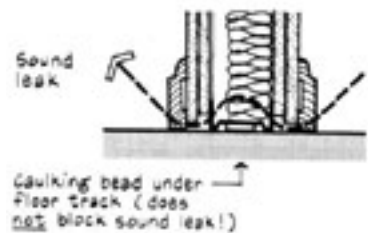
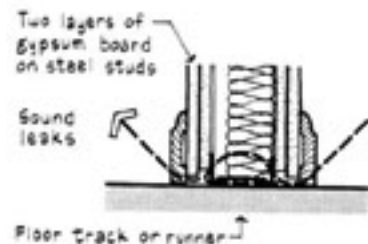
Acoustical sealant...always stays flexible

## "SOUND WALL" - VERTICAL CROSS SECTION #1

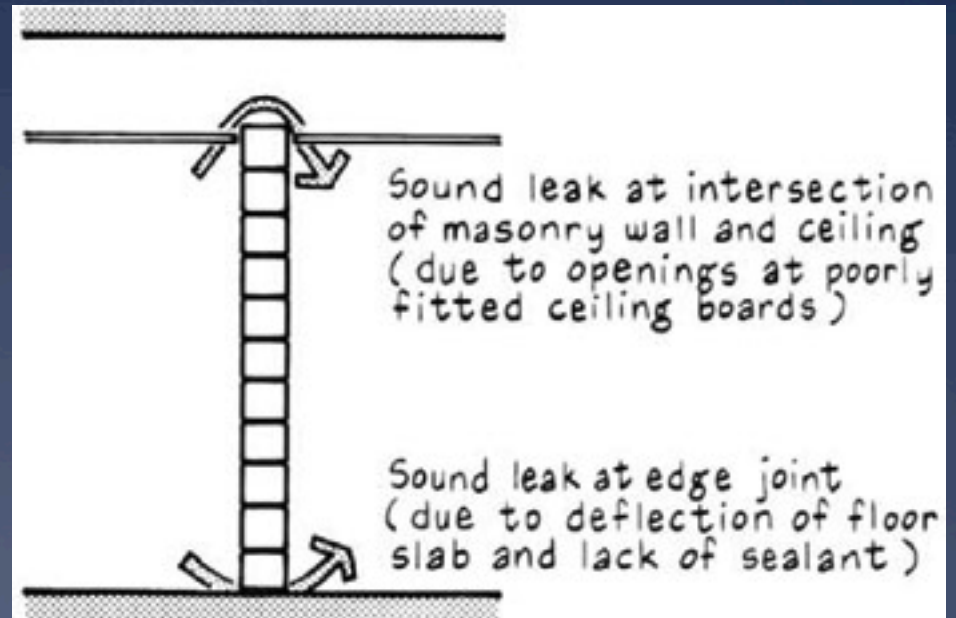
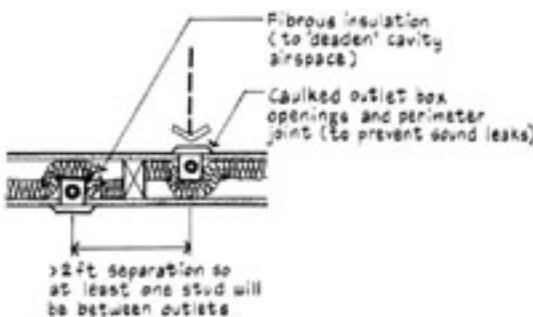
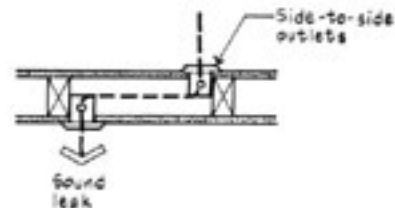
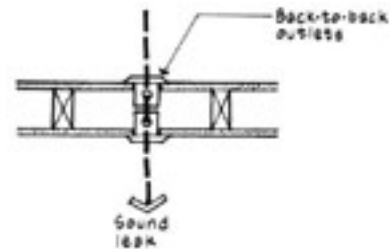


# M. David Egan, the master of acoustics...buy this book!

Partition Leaks



Electrical Outlet Leaks



“Architectural Acoustics”



...or  
buy spy  
gear...

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[Bear Spray, ASP, Mace](#)  
[Police Sabre Mace Sprays](#)  
[Stun Guns Stun Batons](#)  
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[Home](#) > [Bug Detect Audio GPS SPY](#) > **White Noise Generator Professional ANG2200**



**White Noise Generator Professional ANG2200**  
**White Noise Generator Professional makes conversations secure. Stops eavesdropping.**

**Privacy of Conversations Assured**  
For your protection against listening devices that are not detectable by conventional methods, engineers have developed the ANG-2200 White Noise Generator (Acoustic Noise Generator). This professional white noise generator defeats such listening devices as wired microphones buried in a wall, contact or spike microphones, transmitters located in AC outlets and laser/microwave reflection from windows. This is accomplished by producing a security blanket of generated noise completely covering your private conversations with unfilterable sound.  
Used by many government agencies, military and business organizations. Most sound masking systems inject noise into an otherwise benign environment. In this environment, the occupants must raise their voices above the noise level to communicate, which invariably, eliminates the benefit of noise masking. REI's masking system injects noise into the environment perimeter and not directly into the environment. This approach allows normal conversation while defeating eavesdropping devices that rely on acoustic leakage.  
**Note: There is an End User Agreement which must be signed and faxed to us before we can fulfill an order for this item. The end user agreement can be found here:**[End User Form](#)  
The ANG-2200 is an excellent addition to high level countermeasures or can stand alone to provide perimeter protection. Various transducer adapters are included with the ANG-2200 for coupling walls, ceiling, air ducts, plumbing, windows, etc.  
Features The ANG-2200 offers two channels each with a truly random noise source. Both channels have a separate high and low frequency control in order to compensate for losses found in the environments material composition.  
Used by numerous government and military agencies as well as private concerns. End User Form required for purchase, see here:[End User Form](#).  
The REI noise masking system consist of a main unit (the ANG-2200) and three optional