

# Engineered Noise Control Solutions



John Sofra

Director of Sales - North America

*Commercial "Airflow", Industrial, Environmental Markets*

Kinetics Noise Control, Inc., Dublin, Ohio

[jsofra@kineticsnoise.com](mailto:jsofra@kineticsnoise.com)



# Why Choose Engineered Noise Control Solutions?



# Types of Noise Controls

- Engineered – Eliminate or engineer out the noise, by using noise control products or replacing loud, older equipment with new, quieter equipment.
- Administrative – incorporate changes in work procedures such as reducing the duration & frequency personnel are exposed to high noise levels.
- PPE - personal protective equipment



# When is Noise Control Required

OSHA's Noise standard (29 CFR 1910.95) requires employers to have a hearing conservation program in place if workers are exposed to a time-weighted average (TWA) noise level of 85 decibels (dBA) or higher over an 8-hour work shift.

Level (dBA)	Comment
65	normal conversation
90-95	hearing loss from sustained exposure
125	start to experience pain
140	quickly causes irreversible hearing damage



# Costs of a Hearing Conservation Program

Hearing conservation programs (HCPs) mandated by the US Occupational Safety and Health Administration (OSHA) cost an employer about \$350/worker/year.

No. of Factory Employees	Total Estimated Cost Per Year
10	\$3,500
30	\$10,500
50	\$17,500
100	\$35,000
250	\$87,500
500	\$175,000

- Audiometric testing
- Testing Equipment
- Worker's compensation
- Hearing protective devices
- Training
- Hearing loss investigation
- Worker's time

.....PER YEAR



# Methods of Noise Control

- Absorbers
- Barriers
- Composites
- Ventilation Silencing

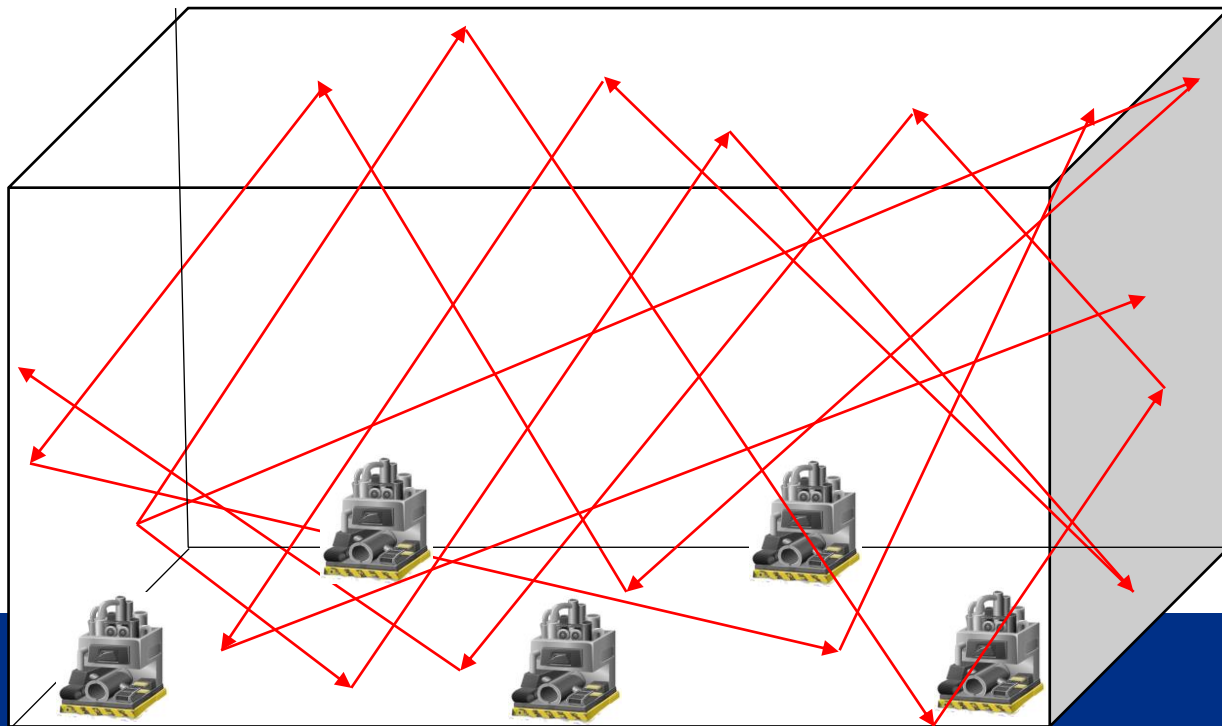


# Sound Absorption

## Why Is Sound Absorption Important?

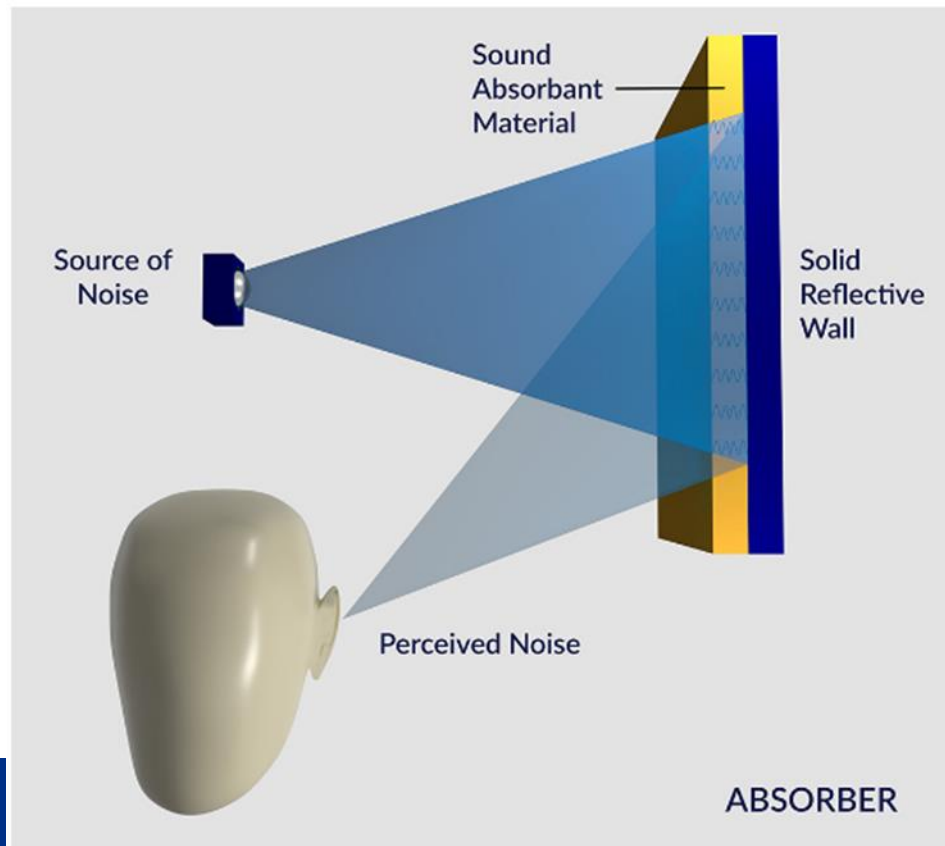
Absorption will lessen the reverberation (echo) within the room and improve speech intelligibility and overall clarity.

Reverberation increases overall sound volume in the room.



# Sound Absorption

A material takes in sound energy as opposed to reflecting the energy. Part of the absorbed energy is transformed into heat and part is transmitted through the absorbing body.





# Sound Absorption

## NRC – Noise Reduction Coefficient

Arithmetic Average sound absorption of the 250, 500, 1000 and 2,000 Hertz octave band center frequencies to yield a single number value of merit for comparison

$NRC = 0.00$  = perfectly reflective

$NRC = 1.00$  = “perfectly” absorptive



# Sound Absorption

- If it is not possible to reduce noise at its source, then sound absorption in the space should be considered.
- Noise reduction targets of (10-12) dBA or less are suitably obtained using sound absorption techniques. (*10 dBA reduction is perceived as sounding half as loud and significant*).
- Walls and ceiling of the space become the focus.
- Key factors:
  - Construction of walls, ceiling, and floor
  - Length, width and height of the space
  - Lighting, sprinklers and other obstructions



# Quilted Absorber

## (NRC 0.70-1.10)

- Issue: Reverberant (echo) industrial facilities
  - Automotive Garages
  - Environmental control booths
  - Congested equipment spaces
  - Mechanical equipment rooms
- The thicker the material the better the sound absorption



# Quilted Absorber -



# Hanging Baffles-

- Reverberant (echo) industrial facilities
  - Warehouses
  - Conveyor facilities
  - Mail handling facilities
  - Printing facilities
- Various facing materials standard and FDA approved

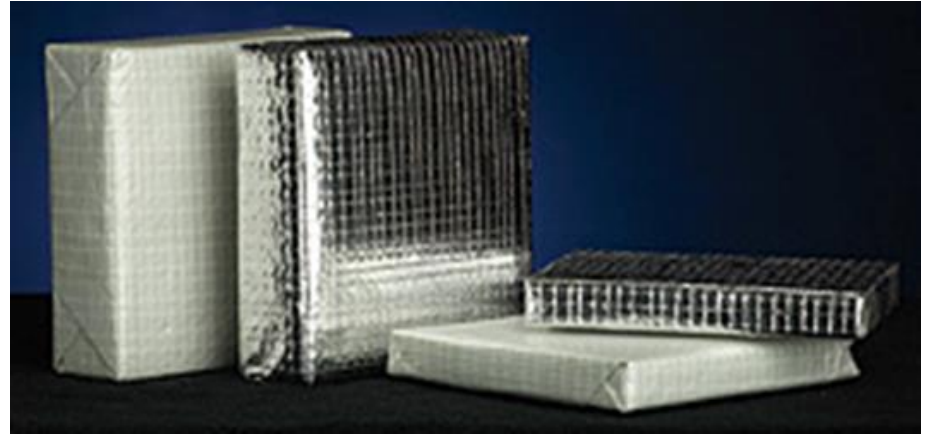


# Hanging Baffles -



# Sound Absorption Panel- (NRC 0.75-0.96)

- Reverberant (echo) industrial facilities
  - Warehouses
  - Conveyor facilities
  - Mail handling facilities
  - Printing facilities
  - Mechanical equipment rooms
- Class A fire Rated



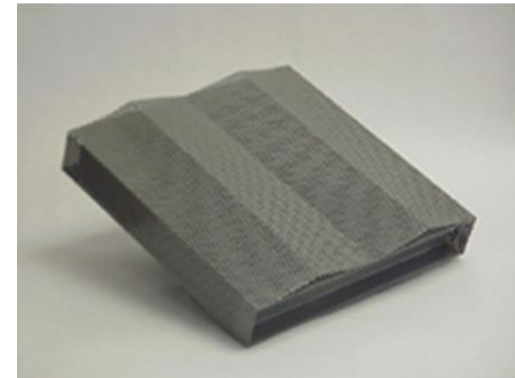
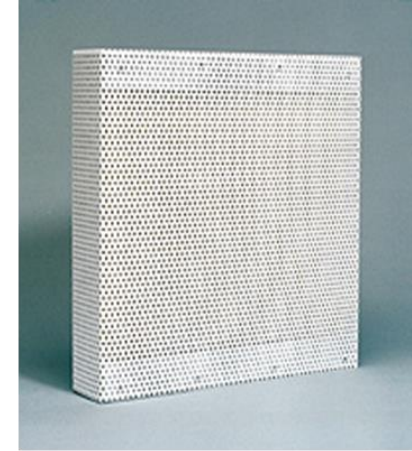
# Sound Absorption Panel-





# Rigid Absorption Panel- (NRC 0.90 – 1.00)

- Reverberant (echo) industrial facilities
  - Wastewater Treatment Plants
  - Indoor or outdoor equipment yards
  - Shipping containers used for generator enclosures
  - Anywhere where high durability is required.

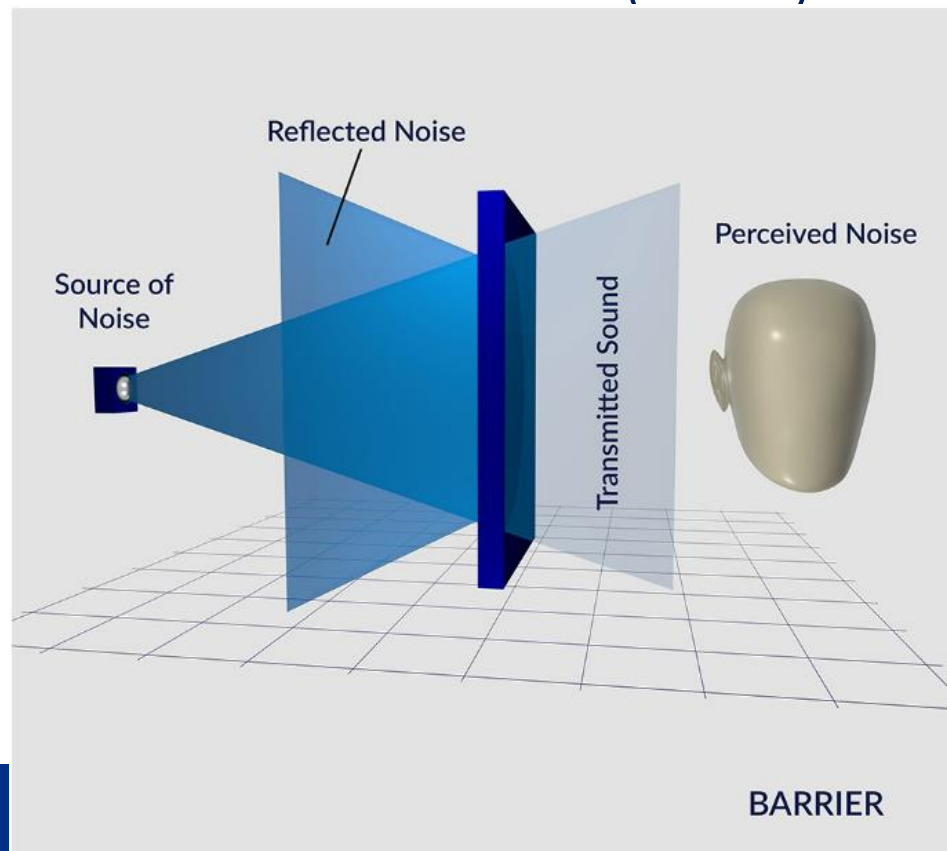


# Rigid Absorption Panel-



# Sound Blocking

Some sound energy is reflected while some is blocked. The magnitude of sound energy blocked is in direct relation to the mass of the material (lb./ft<sup>2</sup>).



# Sound Blocking

## STC – Sound Transmission Coefficient

STC is a rating describing the ability of a mass to block sound. The greater the STC, the greater the material's ability to block sound. This value is dimensionless and for comparison only.

### Examples:

	1" Thick Plywood	¼" Thick Glass	1" Thick Plaster	8" Hollow Concrete Block	6" Thick Concrete	12" Thick Concrete
STC	24	28	31	45	48	52



# Sound Blocking

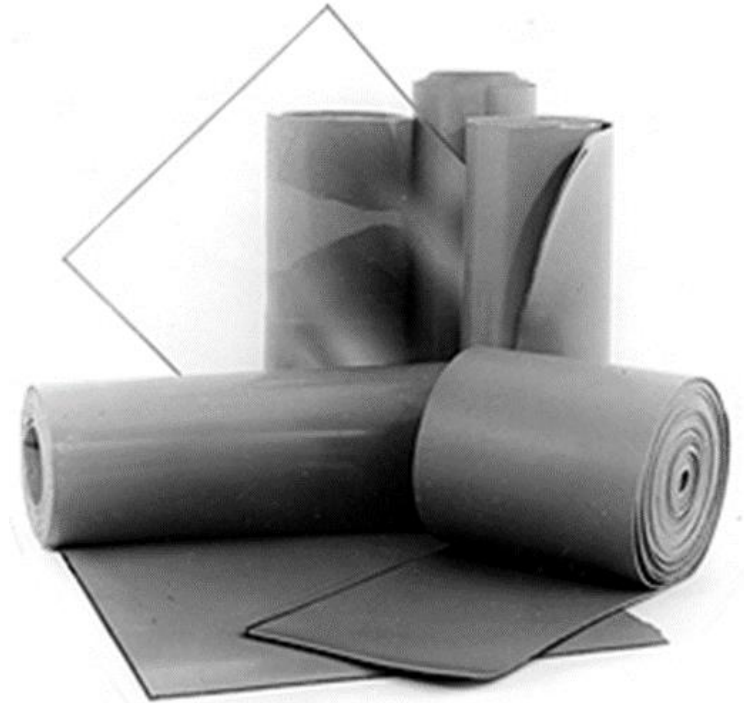
- Significant amount of noise can be reduced by using blocking
- Noise reduction targets range from 18 dBA – 45 dBA.
- Treating noise at the source becomes the focus.
- Key factors:
  - Proper ventilation of heat radiating equipment
  - Access for routine and catastrophic maintenance
  - Visual access (i.e., ports, process, personnel, etc.)



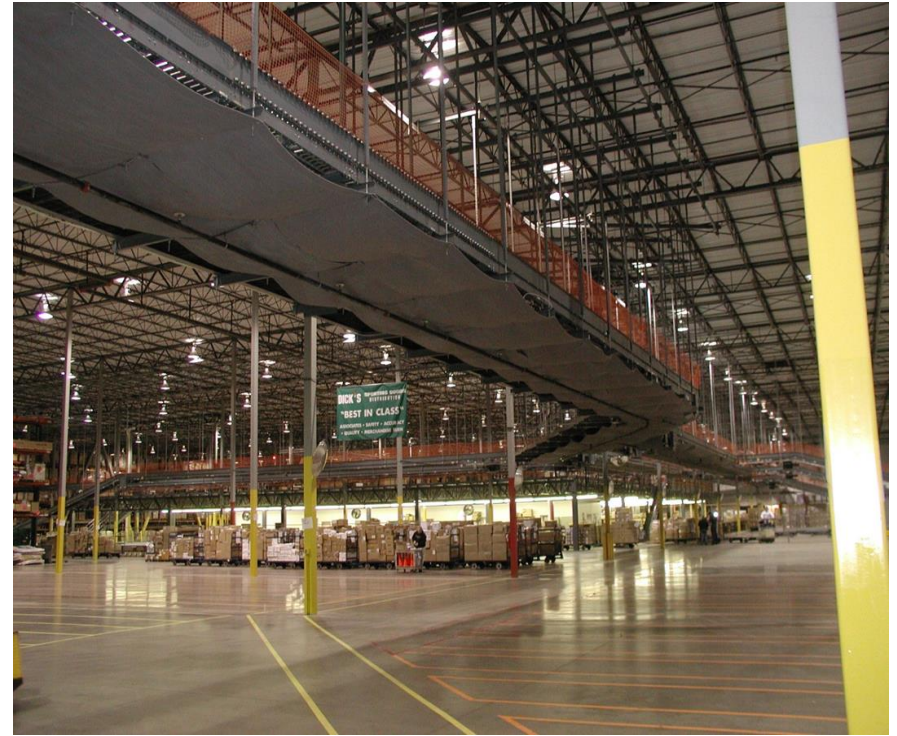
# Flexible Barrier (Mass Loaded Vinyl)

(STC 21 – 31)

- Above drop ceilings of break rooms, facility manager's office
- Part chutes
- Material handling duct
- Process piping

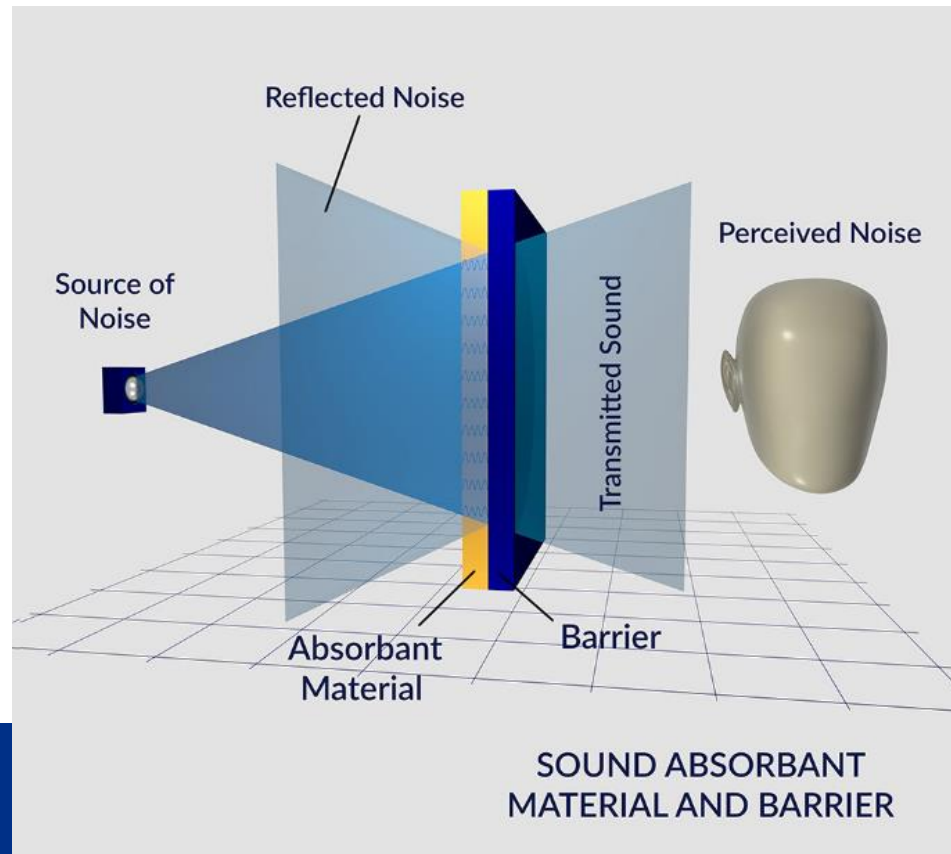


# Flexible Barrier (Mass Loaded Vinyl)



# Sound Absorption & Blocking

Sound absorbing material takes in sound energy as opposed to reflecting it. Part of the absorbed energy is transformed into heat and part is transmitted through the absorbing body. A portion of the remaining sound energy is blocked by the solid mass material.





# Sound Absorption & Blocking

- Often referred to as a sound absorption and blocking composite.
- Significant amount of noise can be reduced by combining sound absorption and sound blocking.
- Noise reduction targets range from 18 dBA – 45 dBA.
- Treating noise at the source becomes the focus.
- Key factors:
  - Proper ventilation of heat radiating equipment
  - Access for routine and catastrophic maintenance
  - Visual access (i.e., ports, process, personnel, etc.)

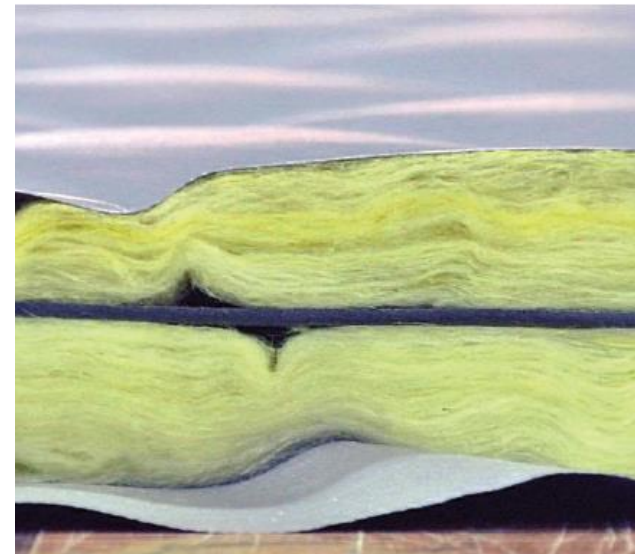


# Quilted Barrier (MLV) Composite

(NRC 0.70 – 1.10)

(STC 20 – 33)

- Both absorbs and blocks sound
  - Fiberglass media
  - Aluminum, vinyl impregnated, fiberglass facing
  - 1.0 psf. / 2.0 psf. mass-loaded vinyl



# Quilted Barrier (MLV) Composite

- Engineering controls can be simplistic
- High frequency intense whining noise
- Only the operator requires PPE



# Quilted Barrier (MLV) Composite



# Quilted Barrier (MLV) Composite

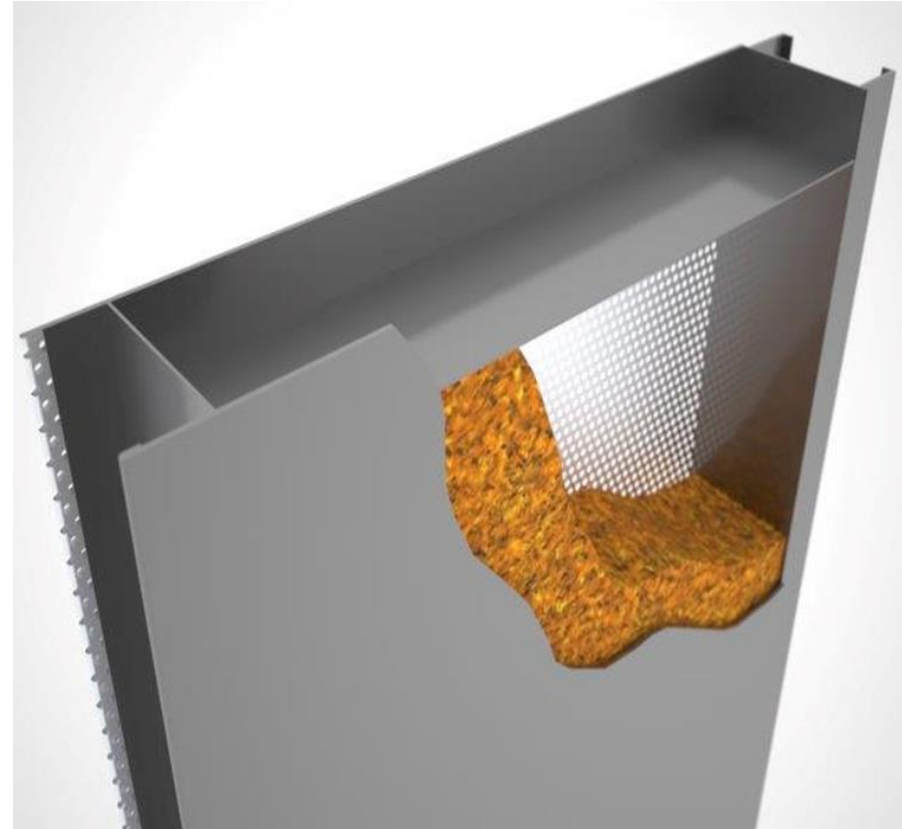


# Rigid Double-Wall Composite

(NRC 0.95 – 1.00)

(STC 37 – 48)

- Both absorbs and blocks sound
  - Fiberglass / mineral wool media
  - Galvanized, stainless steel, aluminum sheet construction
  - Available in various thicknesses for increased noise reduction performance



# Rigid Double-Wall Composite



# Rigid Double-Wall Composite





# Rigid Double-Wall Composite

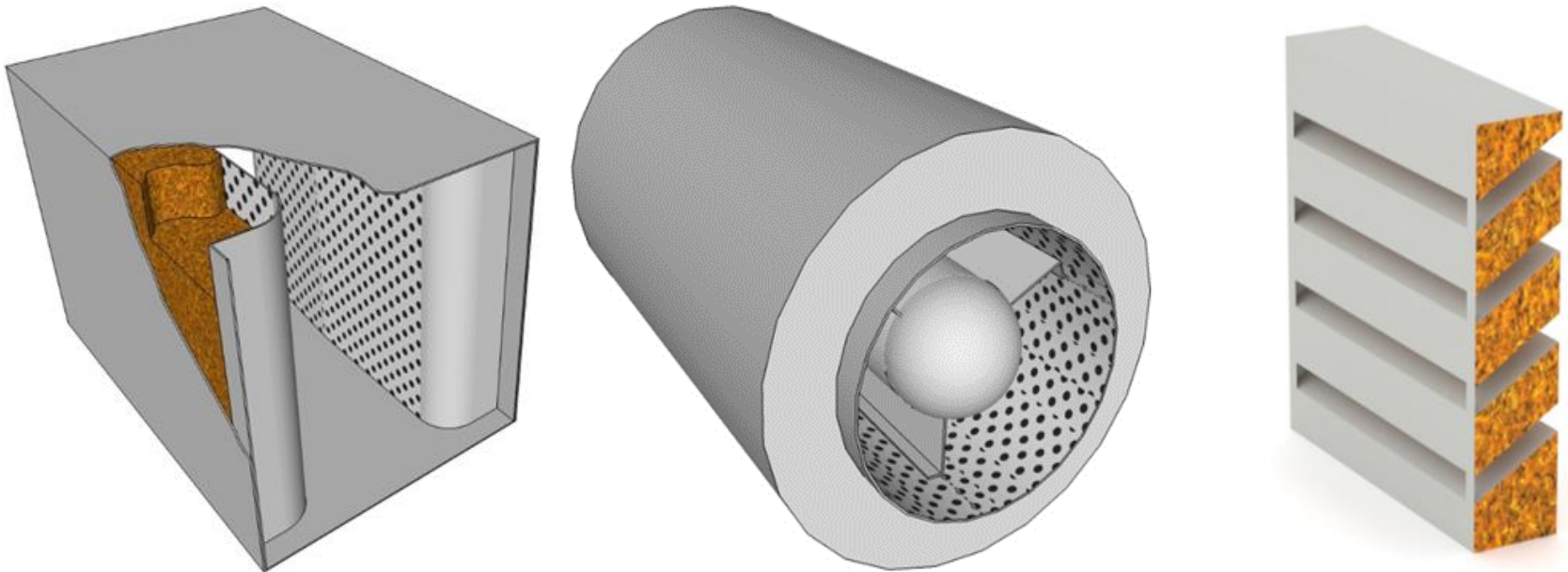


# Rigid Double-Wall Composite



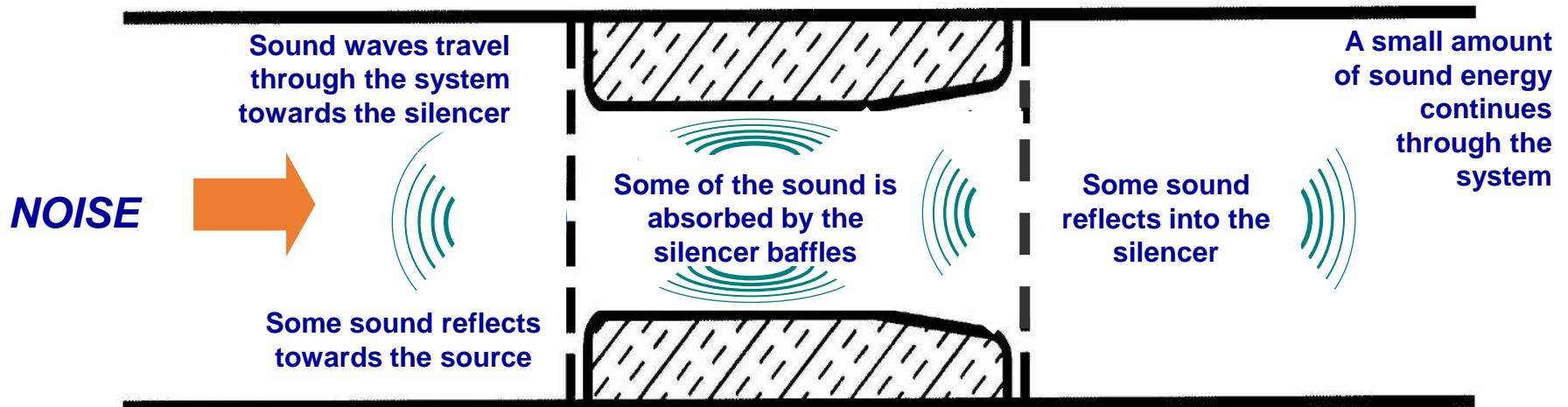
# Ventilation Silencing

- Silencers come in many shapes, sizes and performance
- Fixed-blade acoustic louvers, many models, many thicknesses



# Ventilation Silencing

Sound absorbing material takes in sound energy as opposed to reflecting it. Part of the absorbed energy is transformed into heat and part is transmitted through the absorbing body. A portion of the remaining sound energy is blocked by the solid mass material.



# Ventilation Silencing

**Insertion Loss** (dB) – Silencers ability to attenuation, reduce the sound levels per octave band.

**Regenerated Noise** (dB) – silencers regenerate noise downstream due to the abrupt expansion of air.

**Pressure Loss** (inches Wg.) – A silencer's ability to attenuate noise is a function of % open area between silencer baffles. The lower the % open area the more resistance to airflow resulting in pressure loss increase (energy consumption).



# Ventilation Silencing

- Fans used to move processes (i.e., dust collection, particulate conveying) or cool equipment and personnel all make noise.
- Noise is generated by the fan blades imparting upon air molecules or bad flow conditions.
- Silencers & acoustic louvers can be tuned to balance pressure loss and noise reduction are a great method of solving noise issues.
- Key factors:
  - Airflow rate (cfm)
  - Available fan/system static pressure (energy)



# Ventilation Silencer

*General building exhaust*



# Ventilation Acoustic Louver

## *Pump House*

