Application of Engineering Noise Controls:
What Works and What Doesn't

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Outline

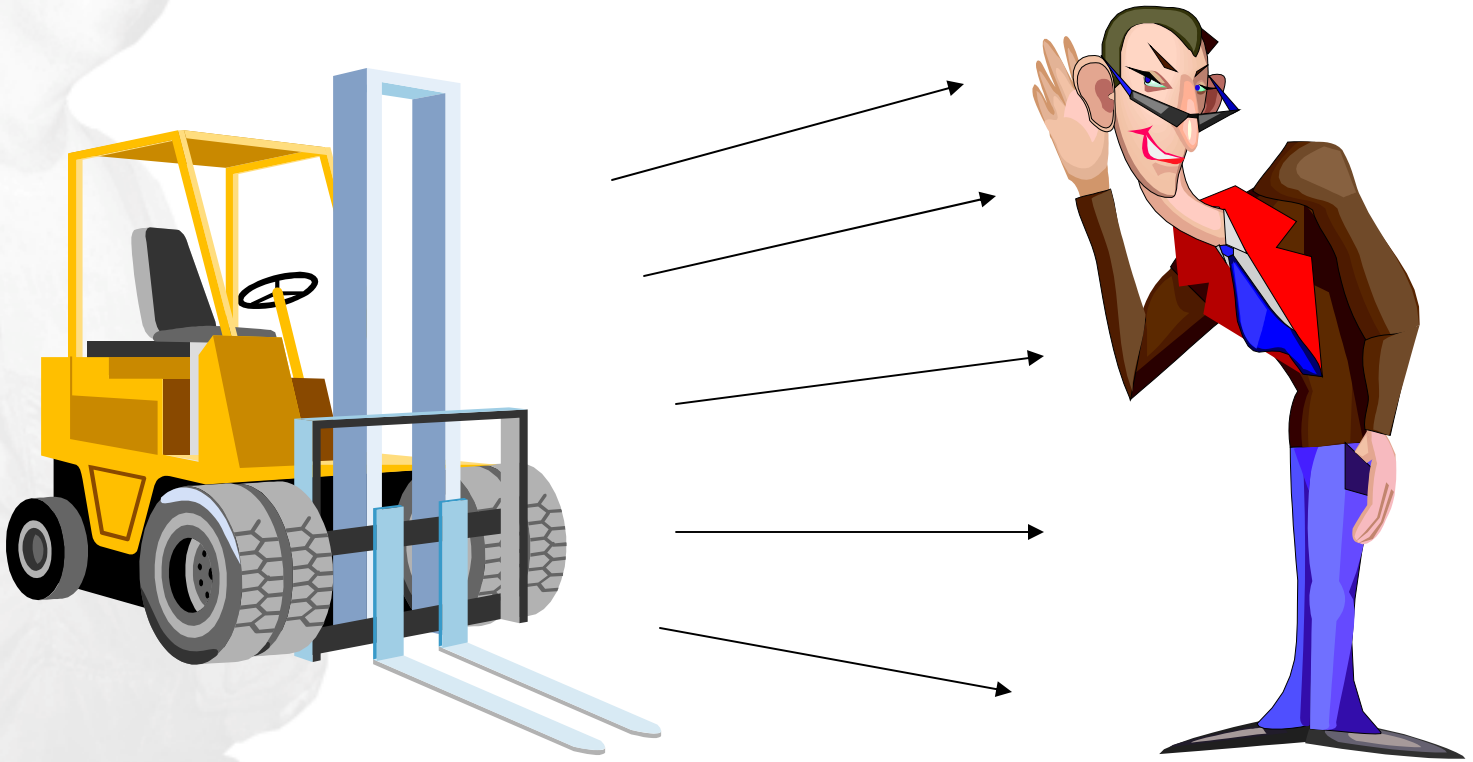
- Review of Noise Control Basics
- Assessment of Engineering Noise Controls
- Conclusions

Noise Control Basics

- Source => Path => Receiver
  - Source: Equipment or process directly responsible for sound generation
  - Path: Media sound waves encounter as they travel from the source
  - Receiver: Final destination of concern for the sound

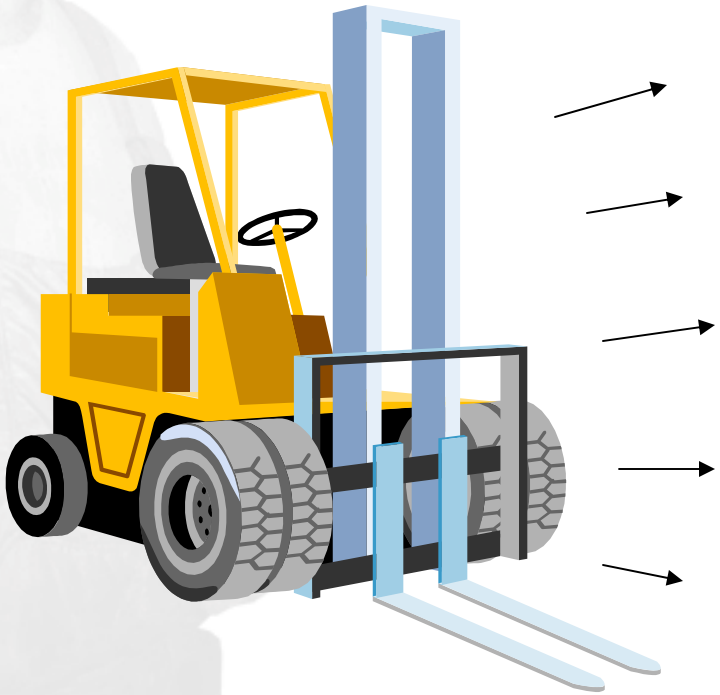
Noise Control Basics

- Source => Path => Receiver



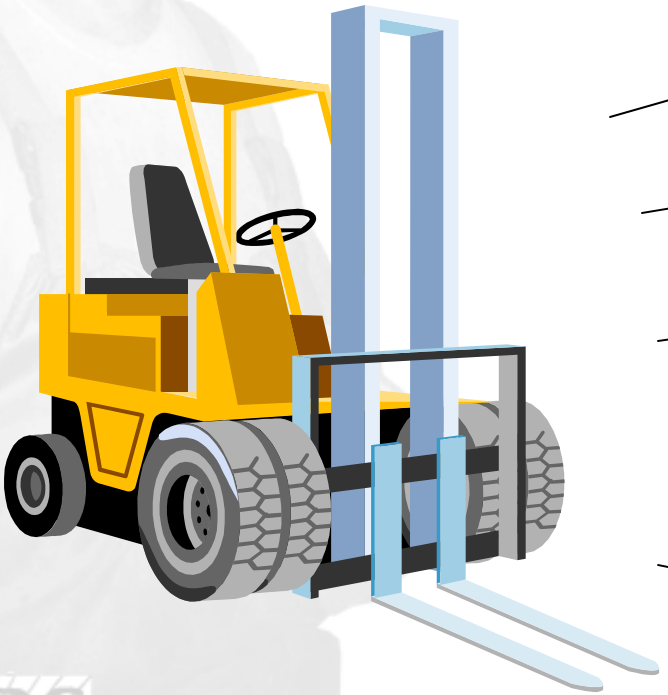
Noise Control Basics

- Source => Path => Receiver
  - Most effective to eliminate noise at the source



Noise Control Basics

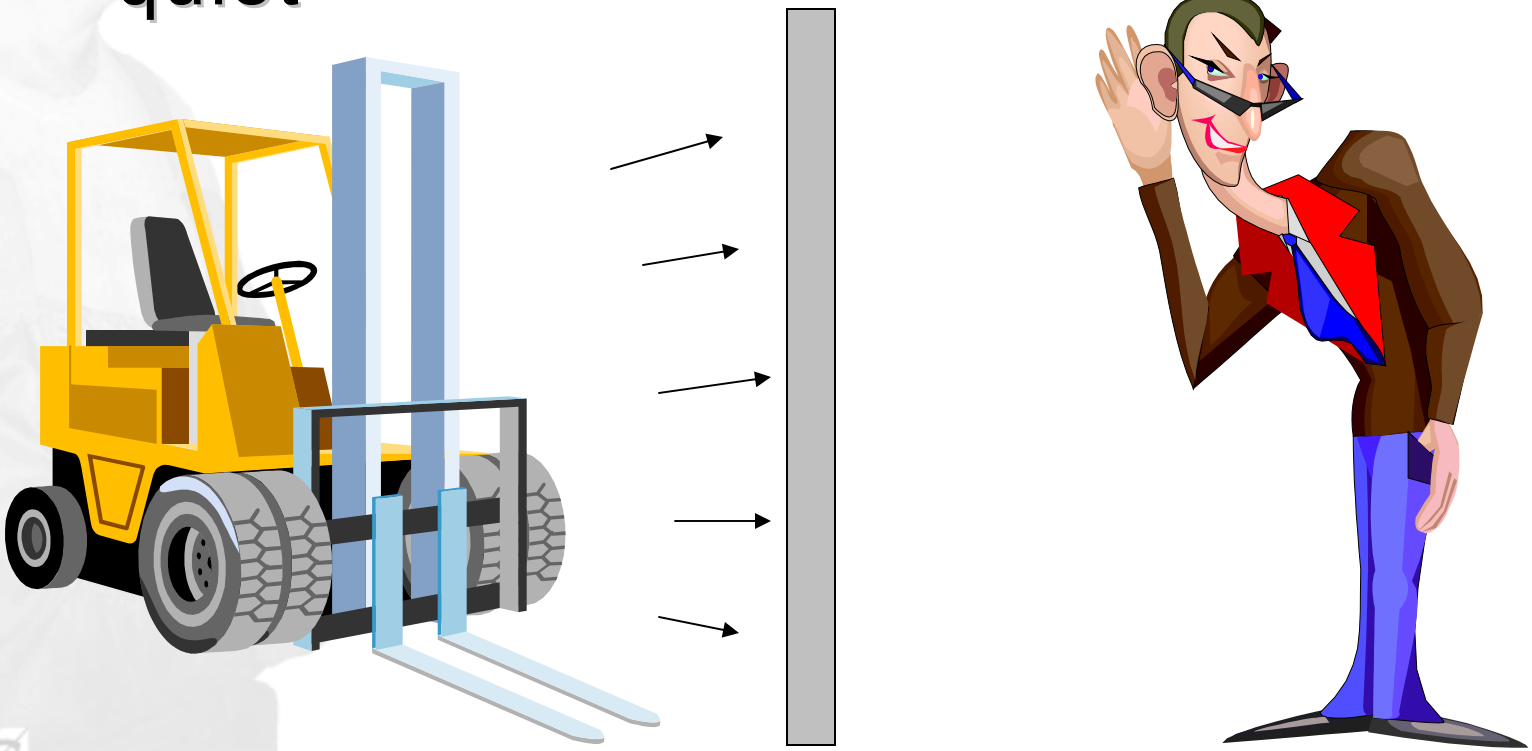
- ***Source*** => Path => Receiver
  - Basic source noise control options:



- Reduce Mechanical Power
- Maintenance
- Source Relocation
- Removal of Unnecessary Sources
- Purchase Quieter Models

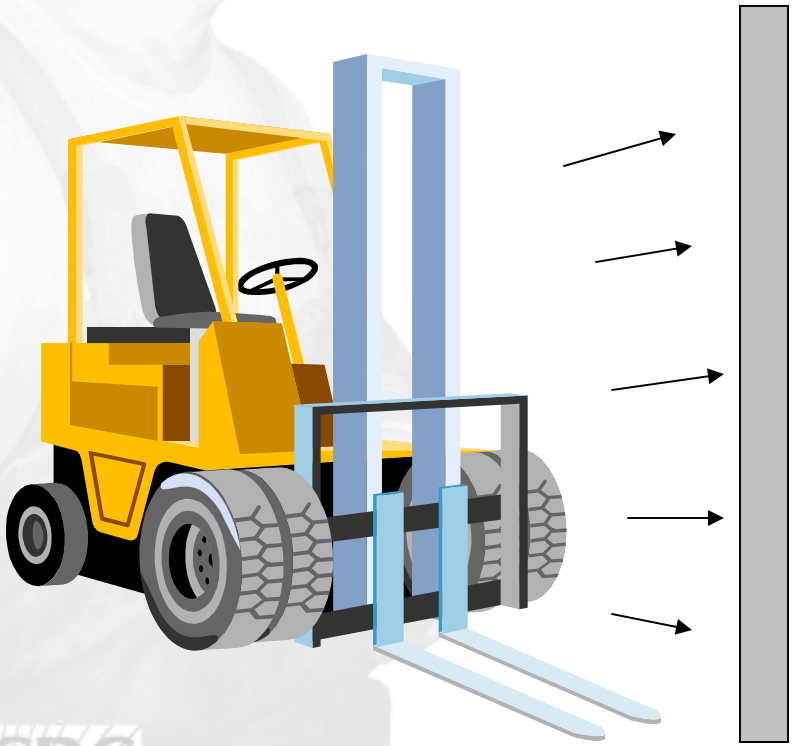
Noise Control Basics

- Source => Path => Receiver
  - Modify path if source cannot be made quiet



Noise Control Basics

- Source => ***Path*** => Receiver
  - Basic path noise control options:



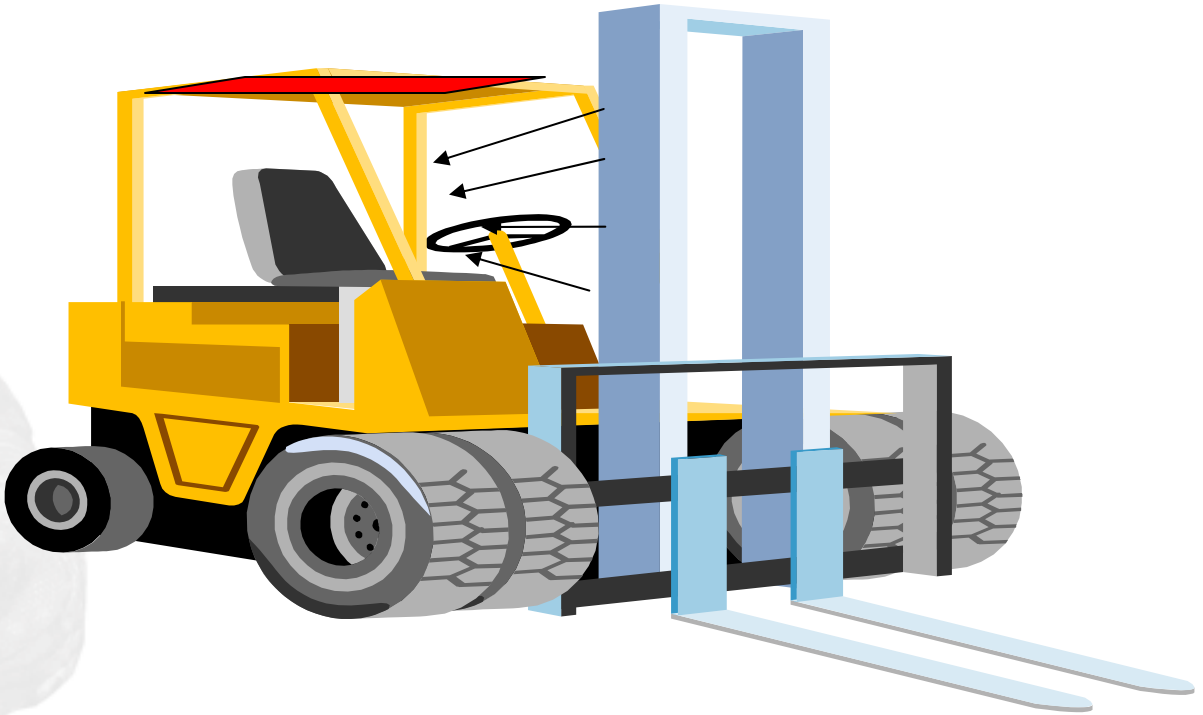
- Erect Barrier
- Enclose Source
- Isolate Vibrations
- Use Active Noise Control
- Install Absorptive Treatment

Noise Control Basics

- Sound Absorbing Materials
  - Used to control reflections
  - Most effective for high frequencies
  - Not effective for blocking noise
  - NOT A CURE-ALL FIX!!!

Noise Control Basics

- Placement of absorbing materials is VERY important

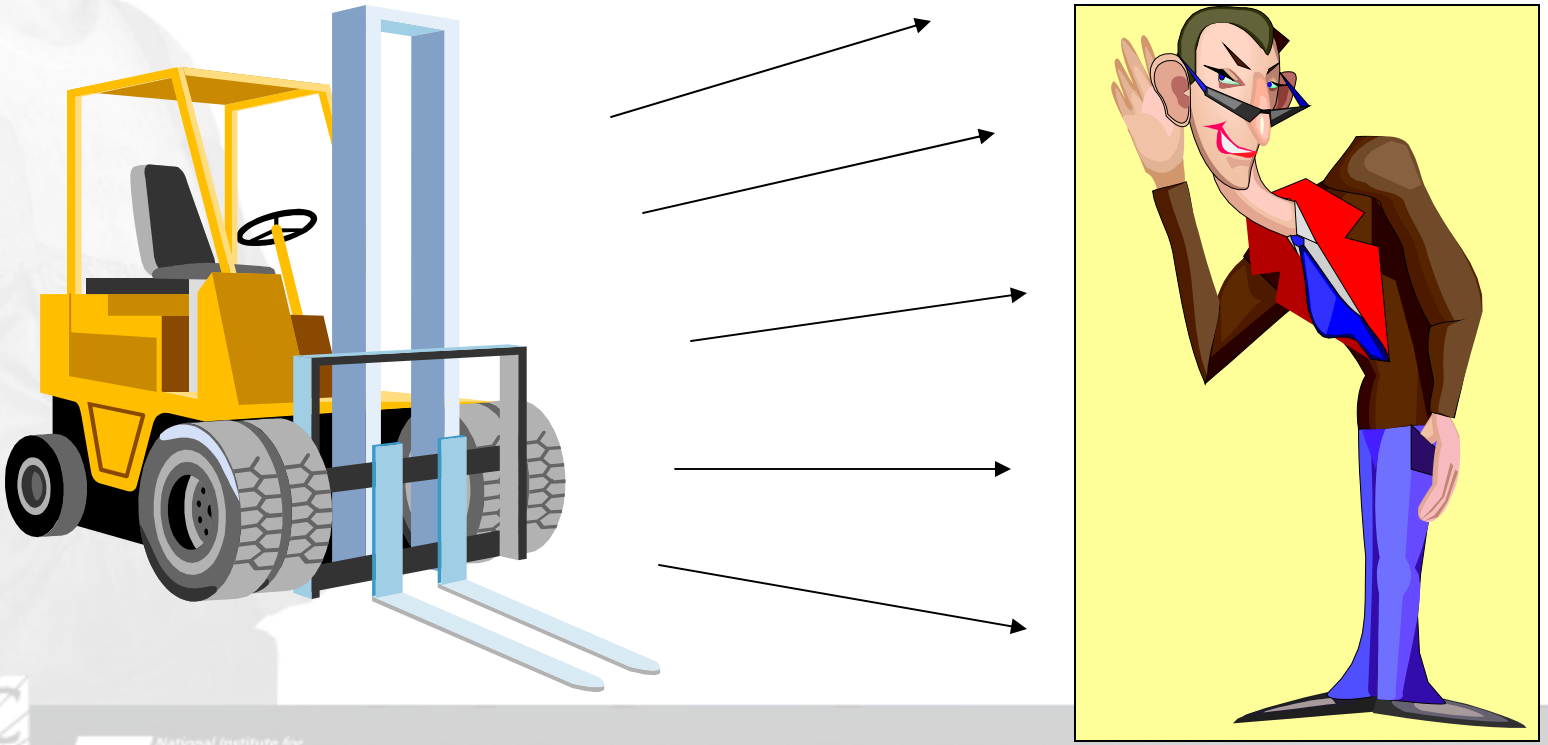


Noise Control Basics

- Special attention is required when attempting noise control underground

Noise Control Basics

- Source => Path => Receiver
  - Control at the receiver should be explored if source and/or path control do not work



Noise Control Basics

- Source => Path => ***Receiver***
  - Basic receiver noise control options:

- Enclose Receiver
- Relocate Receiver
- Use HPDs

Administrative Controls

- Job/Task modification
- Work/Job sharing
- Automation/Remote control

Noise Control Basics

- Approach: Locate the most dominant source or the source that contributes the most to overall noise dose – Remember 97 dB + 84 dB = 97 dB

Review

- Noise can be controlled at the source, in the path, or at the receiver
- Low frequency sounds have long wavelengths that are difficult to block or absorb
- High frequency sounds have short wavelengths and are easier to control
- Attack the most significant source(s) first

Assessment of Engineering Noise Controls

What is the Assessment of Controls?

- Determining how well a control works
- Determining why a control does or doesn't work

Assessment of Engineering Noise Controls

Why Assess Controls?

- Save Time
- Save Money
- Protect Workers

Assessment of Engineering Noise Controls

Controls Assessed:

- Motor Covers
- Absorptive Materials
- Windshields/Barriers
- Enclosed Environmental Cab

Motor Covers

Conveyor Belting

Fiberglass Blanket

Plexiglass

Motor Covers

Motors		Uncontrolled Level dB(A)	Controlled Level dB(A)	Reduction dB(A)
Bolter 1	(conveyor belt)	84.9	83.2	1.7
Bolter 2	(fiberglass)	77.3	76.9	0.4
Face Drill 1	(conveyor belt)	79.4	77.2	2.2
Face Drill 2	(fiberglass)	79.9	79.5	0.4
Face Drill 3	(plexiglass)	84.3	81.9	2.4

- This application requires a barrier material

- Make sure sound level warrants treatment

Absorptive Material in Canopy

Absorptive Material in Canopy

Canopy	Uncontrolled Level dB(A)	Controlled Level dB(A)	Reduction dB(A)
Bolter 2	97.4	97.3	0.1
Face Drill 1	99.1	99.3	-0.2
Face Drill 2	99.6	99.6	0
Face Drill 2 (no windshield)	100.3	100.1	0.2

Absorptive Material in Lower Front of Cab

Absorptive Material in Lower Front of Cab

Lower Cab Absorption	Uncontrolled Level dB(A)	Controlled Level dB(A)	Reduction dB(A)
Bolter 2 (drilling)	98.1	97.9	0.2
Bolter 2 (bolting)	99.9	99.9	0

Absorptive Material

Absorptive Material

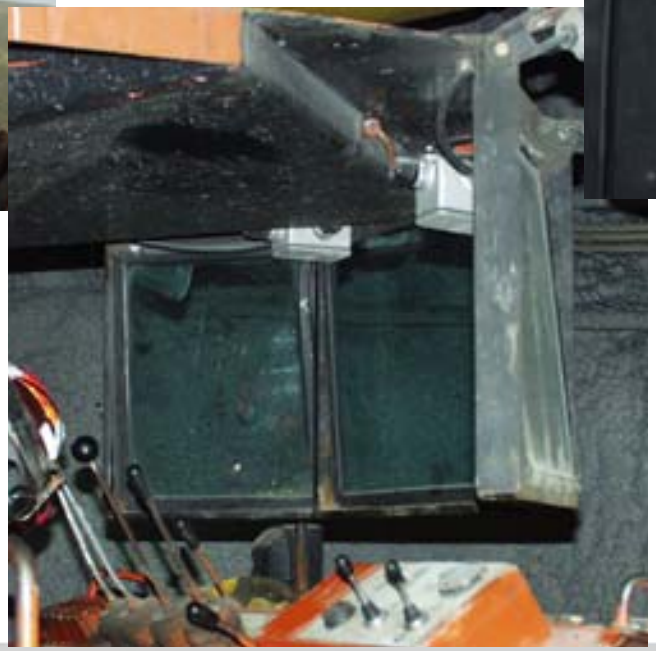
Absorptive Material in Haul Truck

High Idle	No Padding dB(A)	Padding dB(A)	Reduction dB(A)
Truck 1	101.3	100.6	0.7
Truck 2	101.3	101.3	0
Truck 3	100.6	99.6	1

Noise Control Basics

- Special attention is required when attempting noise control underground

Windshields



Windshields

Windshields	Uncontrolled Level dB(A)	Controlled Level dB(A)	Reduction dB(A)
Bolter 2 (Drilling)	98.5	97.9	0.6
Bolter 2 (Bolting)	101.2	99.9	1.3
Bolter 5 (Drilling)	100.6	99	1.6
Bolter 3 (Drilling)	99.2	96	3.2
Bolter 3 (Bolting)	105.7	102.5	3.2
Face Drill 1	101.7	99.3	2.4
Face Drill 2	100.3	99.6	0.7
Face Drill 3	97.1	95.3	1.8
Face Drill 4 (single boom)	94	91.9	2.1
Face Drill 4 (dual boom)	98.9	95.6	3.3
Face Drill 5	101.9	100.6	1.3

Windshields

Gaps greatly reduce the effectiveness of barriers

Windshield with Belting

Belting ‘cab’ not effective due to gaps between strips

Environmental Cab

Environmental Cab Sound Levels

High Idle	Exterior Avg dB(A)	Interior Avg dB(A)
All Windows Open	99.9	96.9
Left Window Closed	98.2	93.8
Back and Left Window Closed	98.4	92.9
Back, Left, and Right Window Closed	99.9	89.1
All Windows Closed	100.3	77.7

An enclosed cab can be a very effective noise control

NIOSH Partial Cab for Drill Rigs

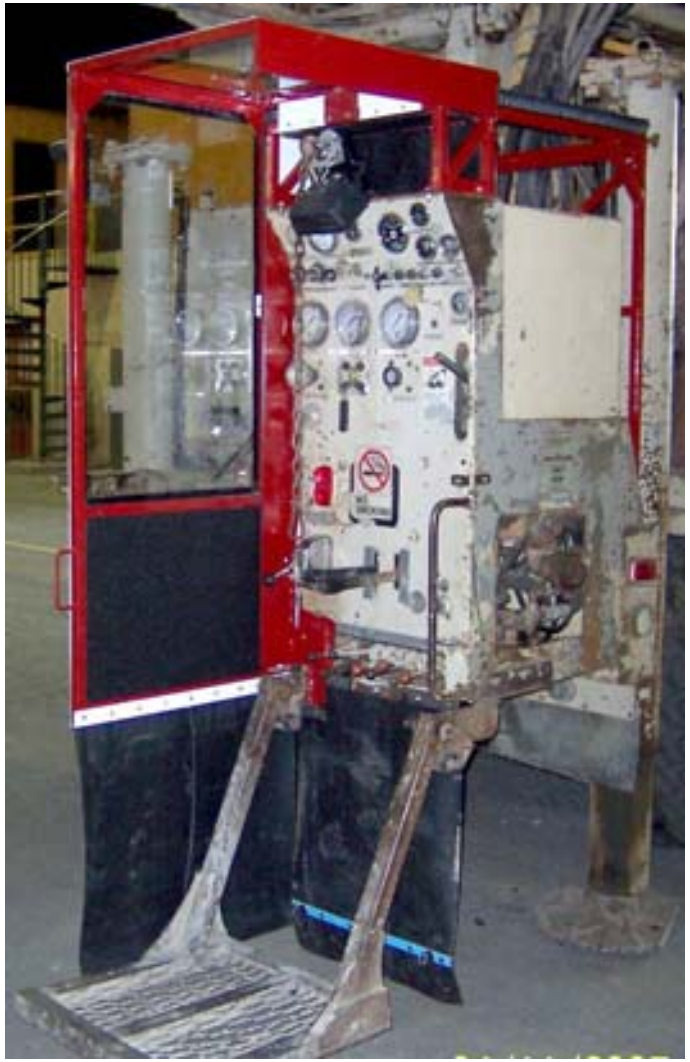
- High sound levels near drill steel during hammer drilling (110 dB)
- Control panel very close to drill steel (3 ft)
- Many surface rigs do not have full cabs
- OEM and aftermarket cabs expensive or unavailable.

Partial Cab Construction

- Frame constructed of welded 1-inch steel tubing
- Support framework bolted to existing control panel for quick removal
- Heavy duty linear slide rails and blocks attach the frame to the rig

Partial Cab - Final Product

- 0.040-inch-thick Aluminum sheets attached to frame
- ¼-inch-thick laminated glass installed in side and top of door
- Acoustic foam installed wherever possible to reduce reverberant sound
- Loaded vinyl barrier hung from bottom to block ground reflections



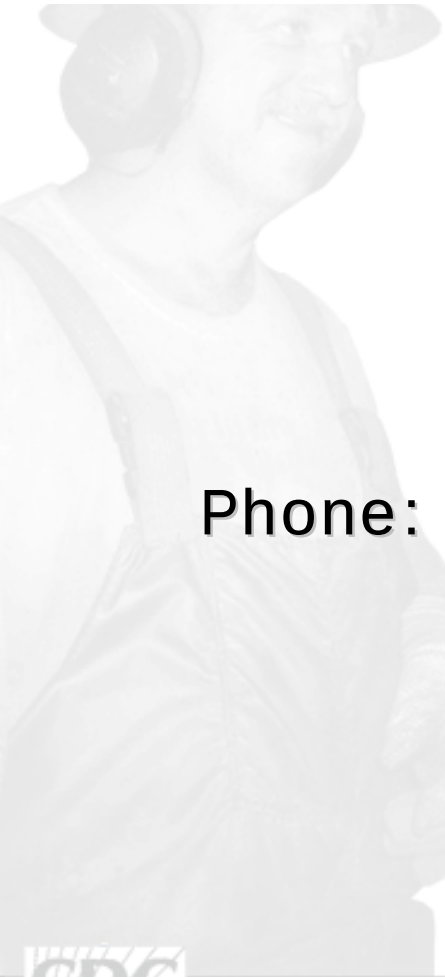
Partial Cab - Field Testing

Operator ear sound level at the control panel reduced by ***5 to 9 dB(A)*** during hammer drilling

Conclusions

- Care should be taken to select the proper noise treatment for the situation
- Due to the operating environment and openness of the operator area, absorptive material was of limited benefit on the machines tested
- For maximum effectiveness all gaps should be eliminated from barriers

For more information contact:



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