Avoiding Noise Overexposure at Underground and Surface Coal Mines, Preparation Plants and Surface Drilling

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Outline

- Introduction
- Exposure Reduction Methods
- Exposure Reduction Planning
- Exposure Reduction Examples
- Summary

Introduction

- Noise-Induced Hearing Loss (NIHL) is the most common occupational illness in the United States
- Workers in mining and surface drilling can be exposed to hazardous noise levels
- Both industries have recognized the importance of controlling overexposures and have taken the initiative to prevent overexposures

Introduction (con't)

- Cross-Sectional Survey Project has shown that overexposures (dose > MSHA PEL of 100%) occurred:
  - 43% of face workers in UG coal mines
  - 30% in surface coal mines (primarily dragline oiler)
  - 45% in coal prep plants (primarily plant controls man)

Note: Worker doses/overexposures were measured using MSHA Permissible Exposure Level (PEL) criteria in Part 62:

- A-weighting
- 90 dB Threshold Level
- 5 dB Exchange Rate
- 90 dB Criterion Level
- Slow Response
- 140 dB Upper Limit

Introduction (con't)

- NIOSH research of surface drilling operations has shown a significant hearing loss at the 4000 Hz frequency which indicates noise-induced hearing loss (NIHL) attributable to noise exposure during drilling operations

Exposure Reduction Methods

Two exposure reduction methods are:

- Engineering noise controls
- Administrative noise controls

And...protection using HPD's

Exposure Reduction Methods

Engineering noise controls:

- Reduce the sound levels of the equipment or process that reach the worker…

i.e.

"Isolate the noise from the worker"

Exposure Reduction Methods

Administrative noise controls:

- Limit the workers exposure to the noise by removing the worker from the noise source by distance, time, task efficiency, job rotation…

i.e.

"Isolate the worker from the noise"

Exposure Reduction Methods

An engineering noise control reduces the sound level that reaches the worker to reduce exposure

While

An administrative noise control reduces the time the worker is exposed to the sound level to reduce exposure

Engineering or Administrative?

Confusing? CERTAINLY

For instance, a quiet booth is an engineering noise control because the sound level reaching the worker is reduced by a physical barrier between worker and source

But

requiring the worker to spend time in the booth is an administrative noise control because it reduces the time of exposure to the sound level outside the booth

Engineering or Administrative?

The bottom line is...

If the control reduces the worker's exposure, then what it is called is not that important.

Exposure Reduction

What does and does not work when attempting to reduce exposures?

- Trial-and-error does not work but a systematic approach does
- "Same old, same old" attitude does not work but "thinking outside the box" does
- Half shift switch out does not work but selective task switching does

Exposure Reduction Planning

Effective implementation of administrative noise controls requires a complete understanding of a workers noise exposure:

1. Full-shift dosimetry
2. Task observations of worker
3. Comparison of dose to tasks
4. Representative sound level measurements
5. Selection/implementation of appropriate administrative noise control
6. Follow-up/Modify as needed

Exposure Reduction Examples

Examples include:

- Belt drive
- Quiet booths
- Heavy equipment operators at surface mines
- Roof bolter operator using spare bolter
- Mechanic working near noise source
- Dragline oiler
- Stageloader operator
- Longwall dinner hole
- Surface drilling
- Job rotation

Belt Drive Underground

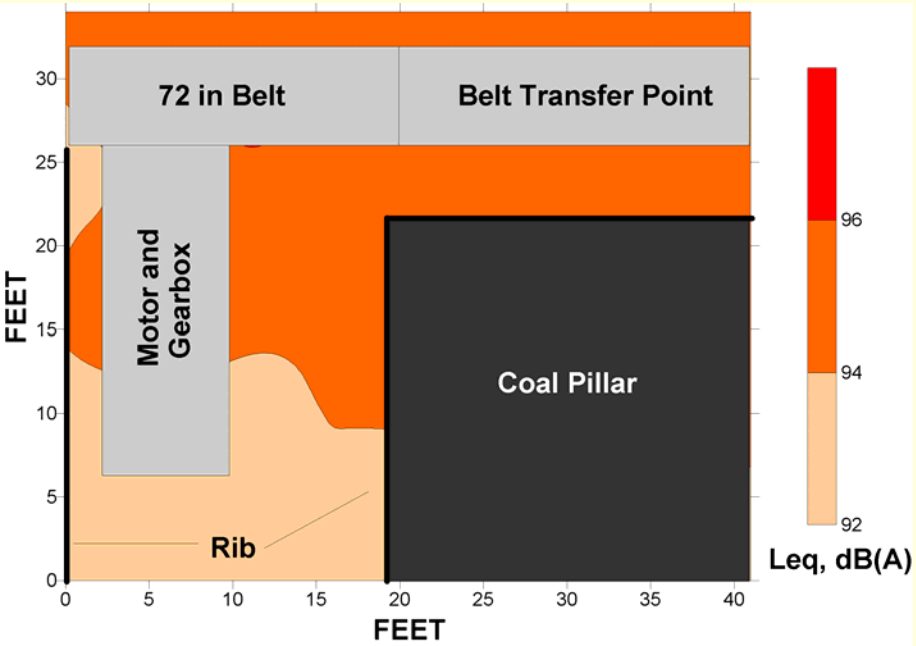
Problem:

- Belt drives, tail rollers, transfer points are noisy
- Difficult to clean around tail roller because of float coal dust/rock dust build-up (1 to 2 ft)

Result:

- Belt cleaners exposed to noise

Belt Drive Underground



Belt Drive Underground

Solution:

- Limit time belt cleaner works near tail roller

How:

- Dig out/back the build-up of coal dust/rock dust so cleaning can be done quicker and easier, thus less time/less exposure
- Complete on an off-shift or monitor worker's dose if during production shift

Quiet Booth in Prep Plant

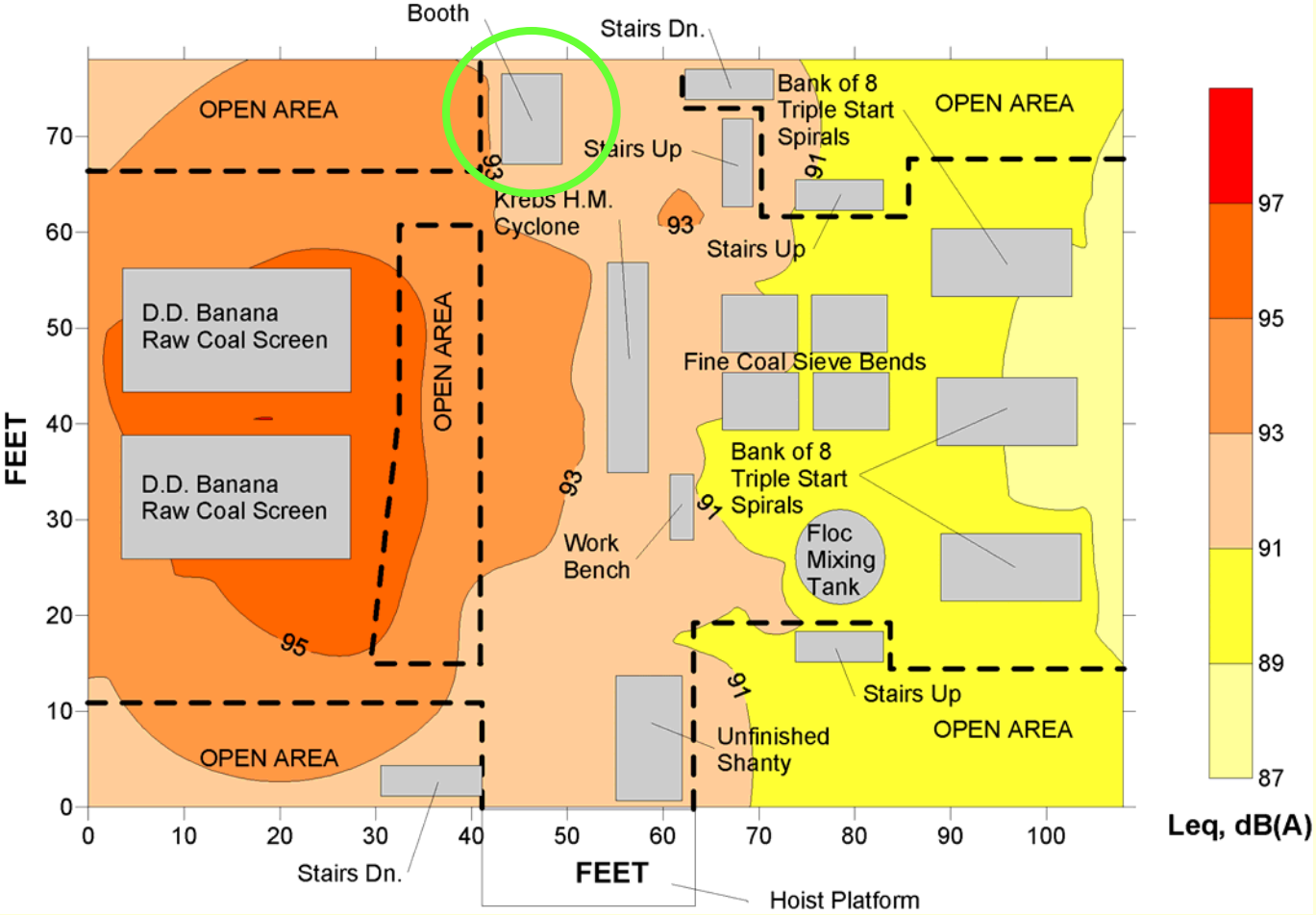
Problem:

- Noisy floors
- Worker required to stay on a certain floor or certain location

Result:

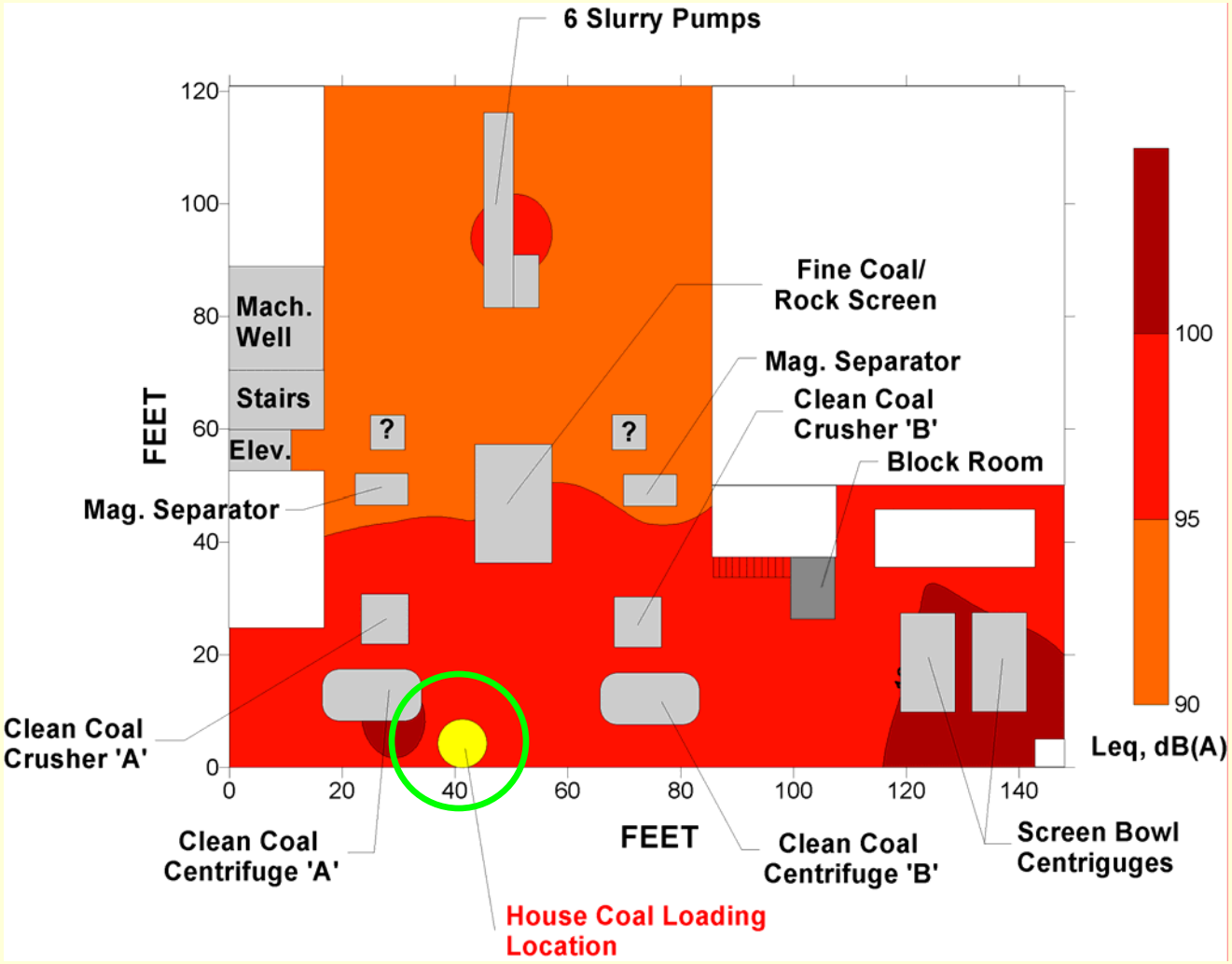
- Worker overexposed to noise

Quiet Booth in Prep Plant



Plant worker's dose ranged from 104 to 165%

Quiet Booth in Prep Plant



Plant worker's dose ranged from 147 to 206%

Quiet Booth in Prep Plant

91 to 93 dB(A) Outside booth

78 dB(A) Inside booth

Quiet Booth in Prep Plant

Solution(s):

- (First example) Complete construction of the quiet booth (well insulated, appropriate heat and air conditioning, remote monitoring, creature comforts) for worker to go to when not inspecting, adjusting, or cleaning equipment
- (Second example) Provide small booth simply for worker to sit in while loading house coal

Heavy Equipment Operators

Problem:

- Noisy engines and operation

Result:

- Overexposure of operator

Heavy Equipment Operators

Truck A – Outside dose: 111%
Inside dose (operator): 12%

Truck B – Outside dose: 396%
Inside dose (operator): 98%

Heavy Equipment Operators

Solution(s):

- Take truck out of service, operator use different truck
- Repair noisy equipment
- Provide acoustically treated cab
- Instruct operator to keep doors and windows closed

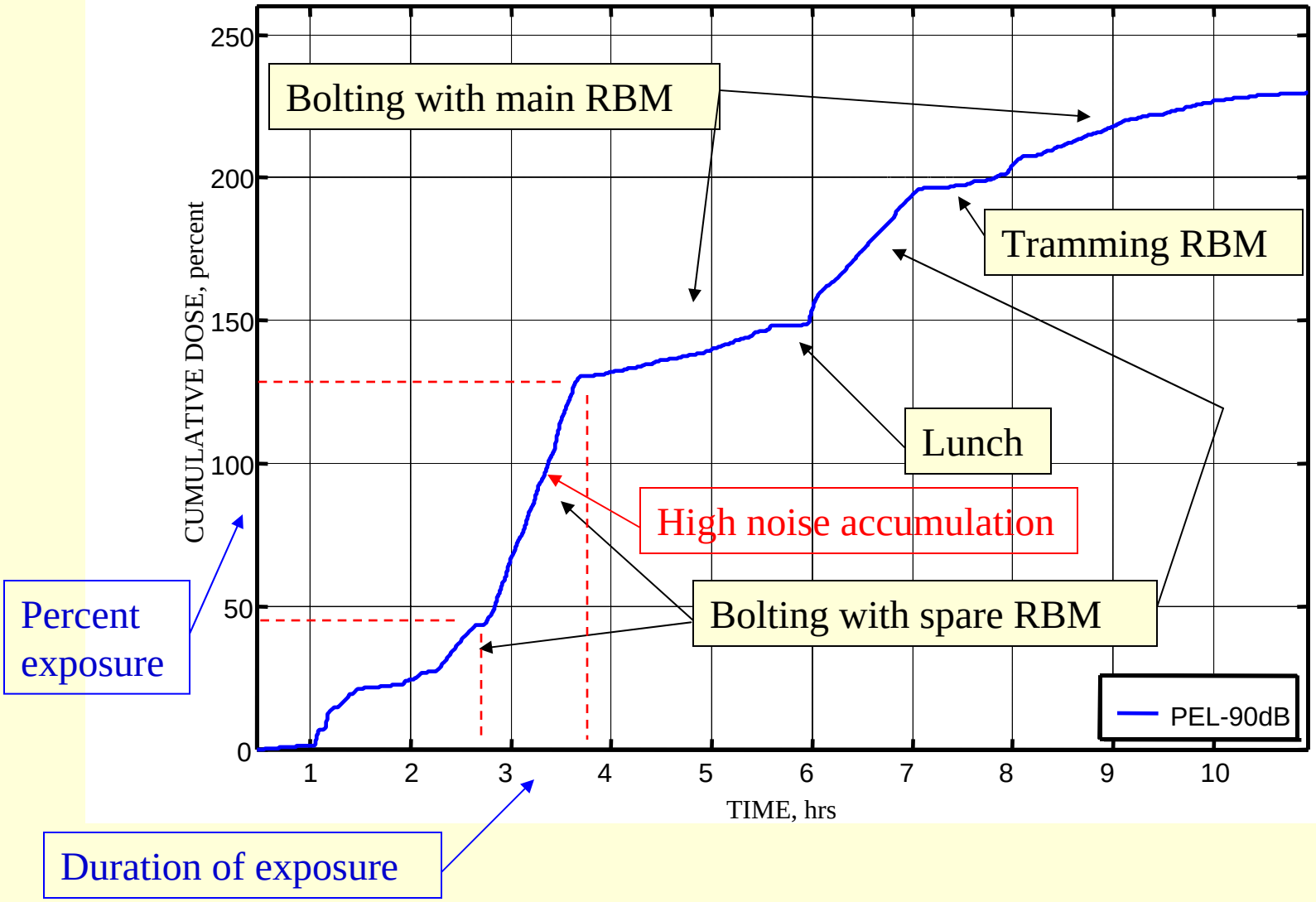
Operating Spare Bolter

Problem:

- Noisy spare roof bolting machine on CM section

Result:

- High rate of dose accumulation for roof bolting machine operator
- For shift (including spare bolter operation): 230% total dose in 630 min (0.37%/min)
- Spare bolter operation: 145% dose in 140 min (1.04%/min)


Bolting with main RBM
Tramming RBM
Lunch
High noise accumulation
Bolting with spare RBM
PEL-90dB
CUMULATIVE DOSE, percent
TIME, hrs
0
50
100
150
200
250
1
2
3
4
5
6
7
8
9
10
Percent exposure
Duration of exposure

Operating Spare Bolter

Solution(s):

- Limit operation of spare roof bolting machine
- Replace spare roof bolting machine
- Fix/quiet spare roof bolting machine

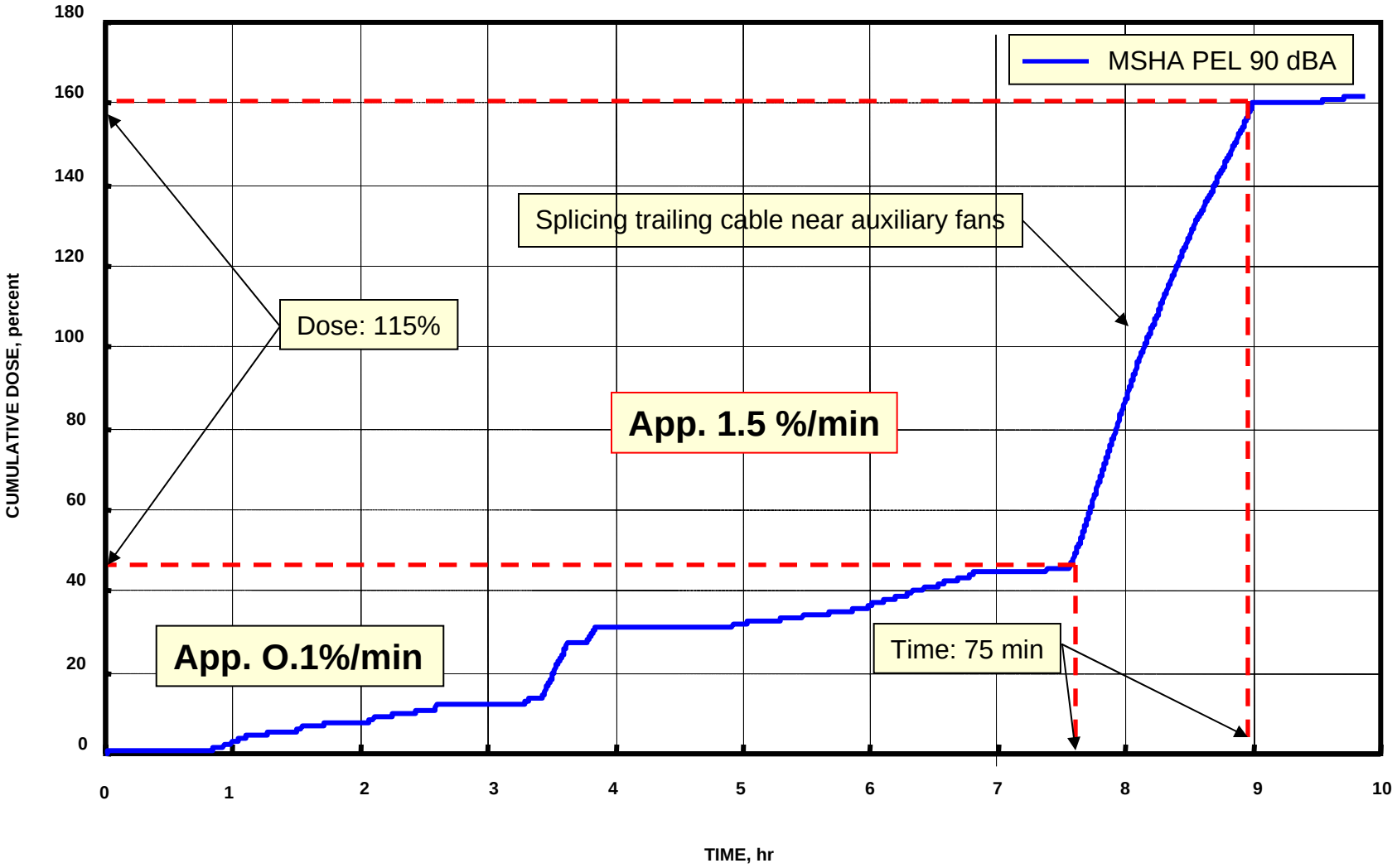
Working Near Noise Sources

Problem:

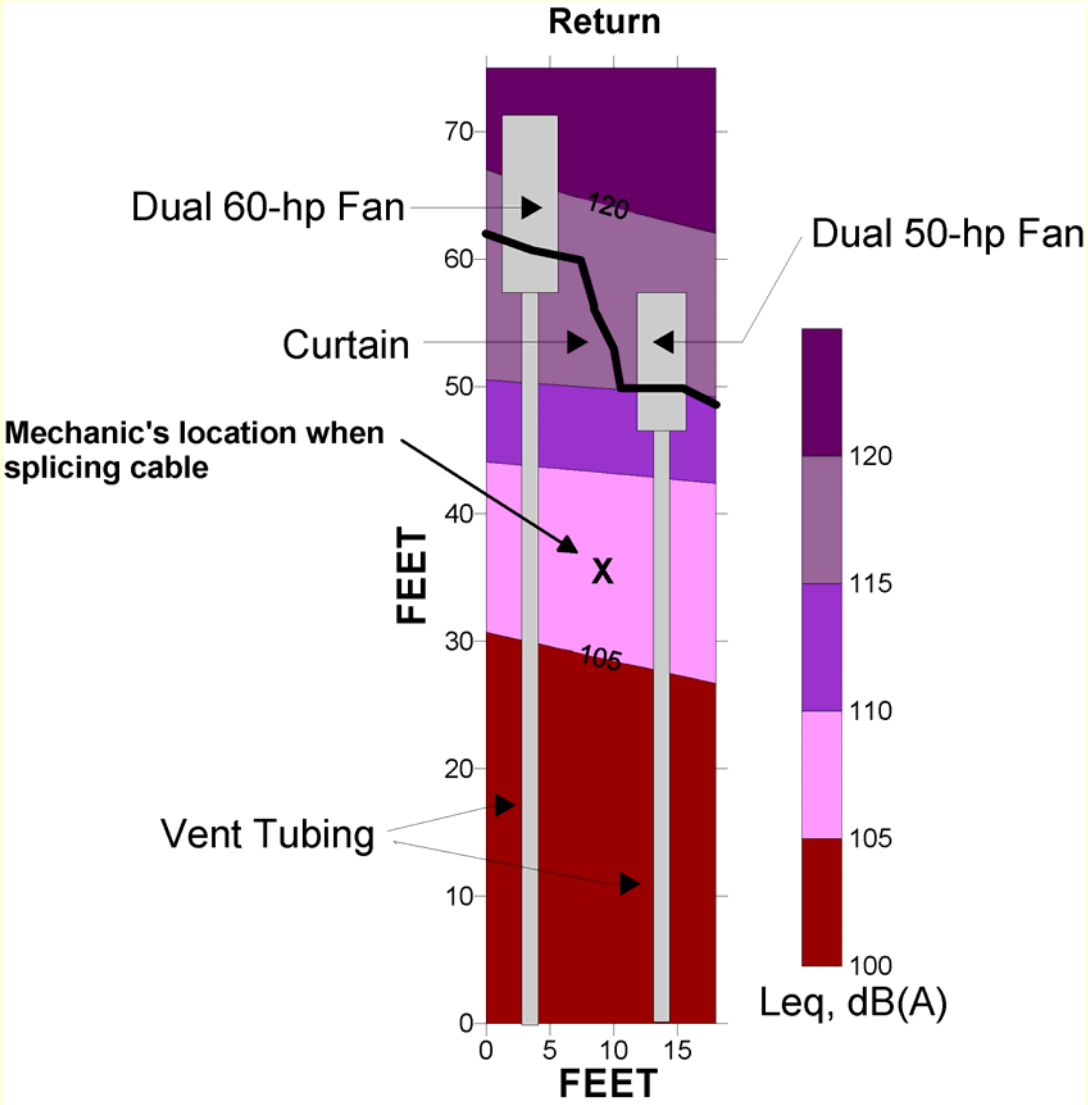
- Mechanic/Electrician working near auxiliary fans (splicing a roof bolting machine trailing cable)

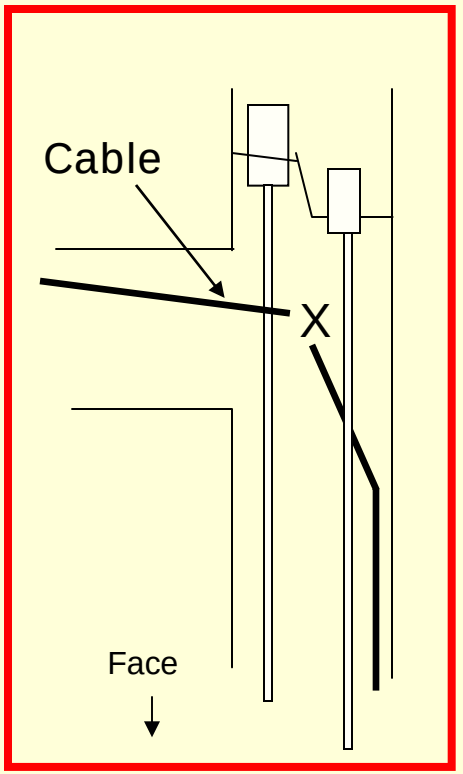
Result:

- Mechanic/Electrician experiencing exposure to high noise levels


MSHA PEL 90 dBA
Splicing trailing cable near auxiliary fans
Dose: 115%
App. 1.5 %/min
App. O.1%/min
Time: 75 min
CUMULATIVE DOSE, percent
TIME, hr
0
20
40
60
80
100
120
140
160
180
0
1
2
3
4
5
6
7
8
9
10

Working Near Noise Sources





Working Near Noise Sources

Solution(s):

- Drag trailing cable away from fans
- Faster cable splicing methods
- Provide a barrier/shield
- Don’t work, rest, stand, converse near known loud noise sources
- Training of workers to recognize noise sources and potential sources of exposure and how to avoid them

Dragline Oiler

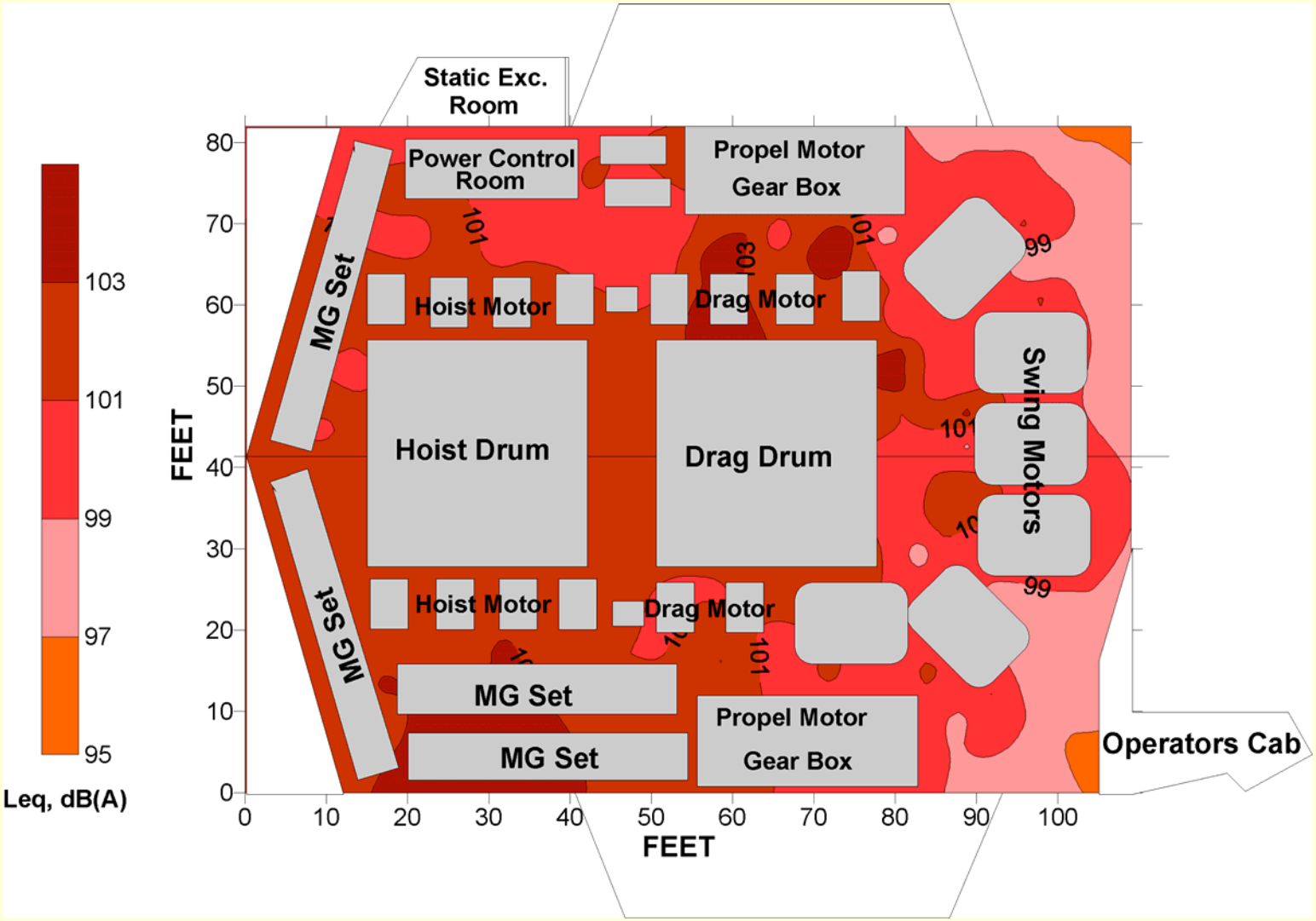
Problem:

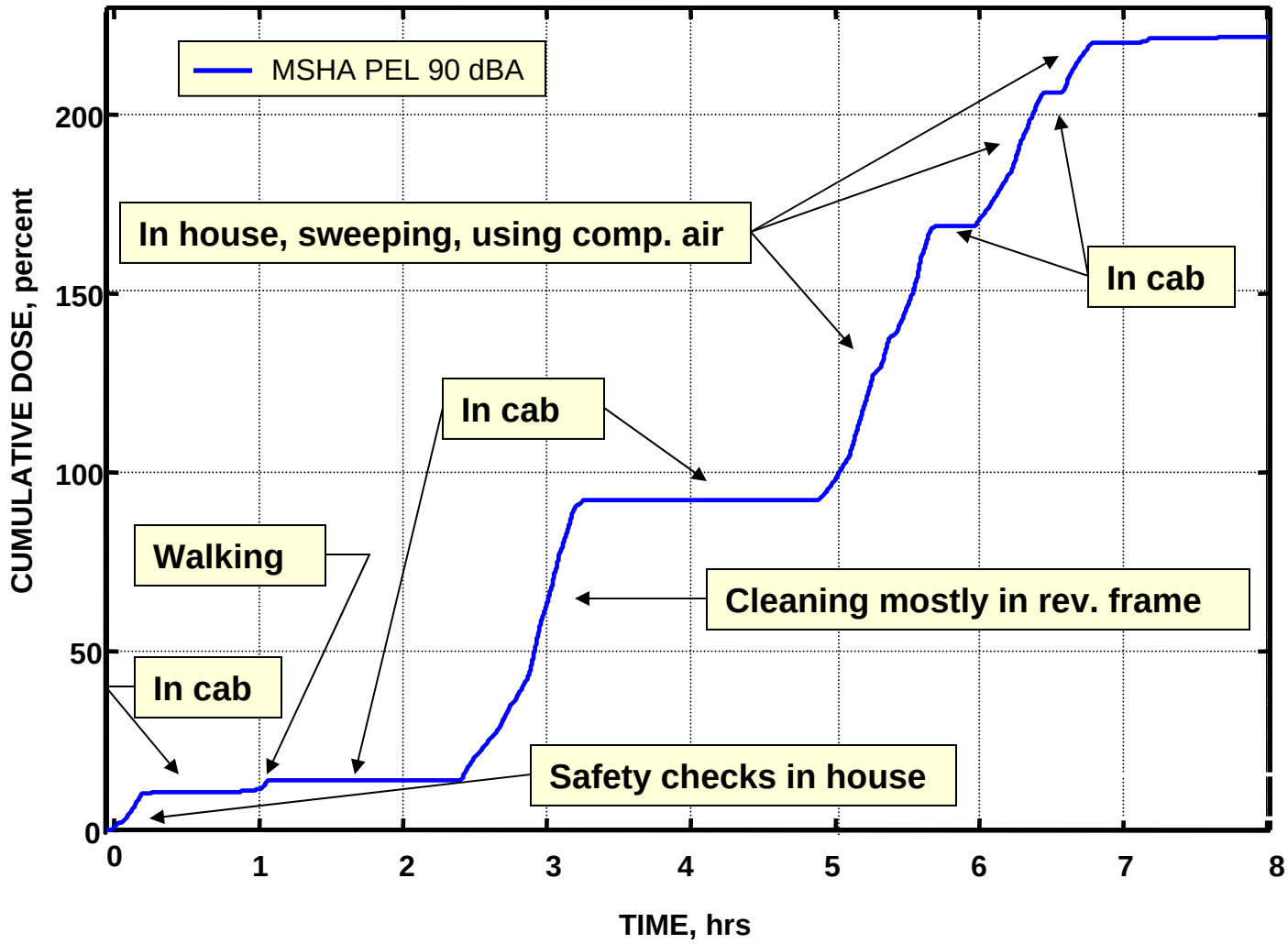
- House of dragline noisy

Result:

- Dragline oiler accumulating significant noise exposure while working in house of dragline

Marion 8750 Dragline




MSHA PEL 90 dBA
CUMULATIVE DOSE, percent
TIME, hrs
0
50
100
150
200
0
1
2
3
4
5
6
7
8
In house, sweeping, using comp. air
In cab
In cab
Walking
Cleaning mostly in rev. frame
In cab
Safety checks in house

Dragline Oiler

Solution(s):

- Limit dragline oilers time working in house
- Switch out oiler with dragline operator or groundsman (dozer operator)
- Perform maintenance, cleaning, etc. on off shifts or when dragline is down for routine maintenance or repairs
- Oiler must insert/employ hearing protection prior to entering house

Longwall Stageloader Operator

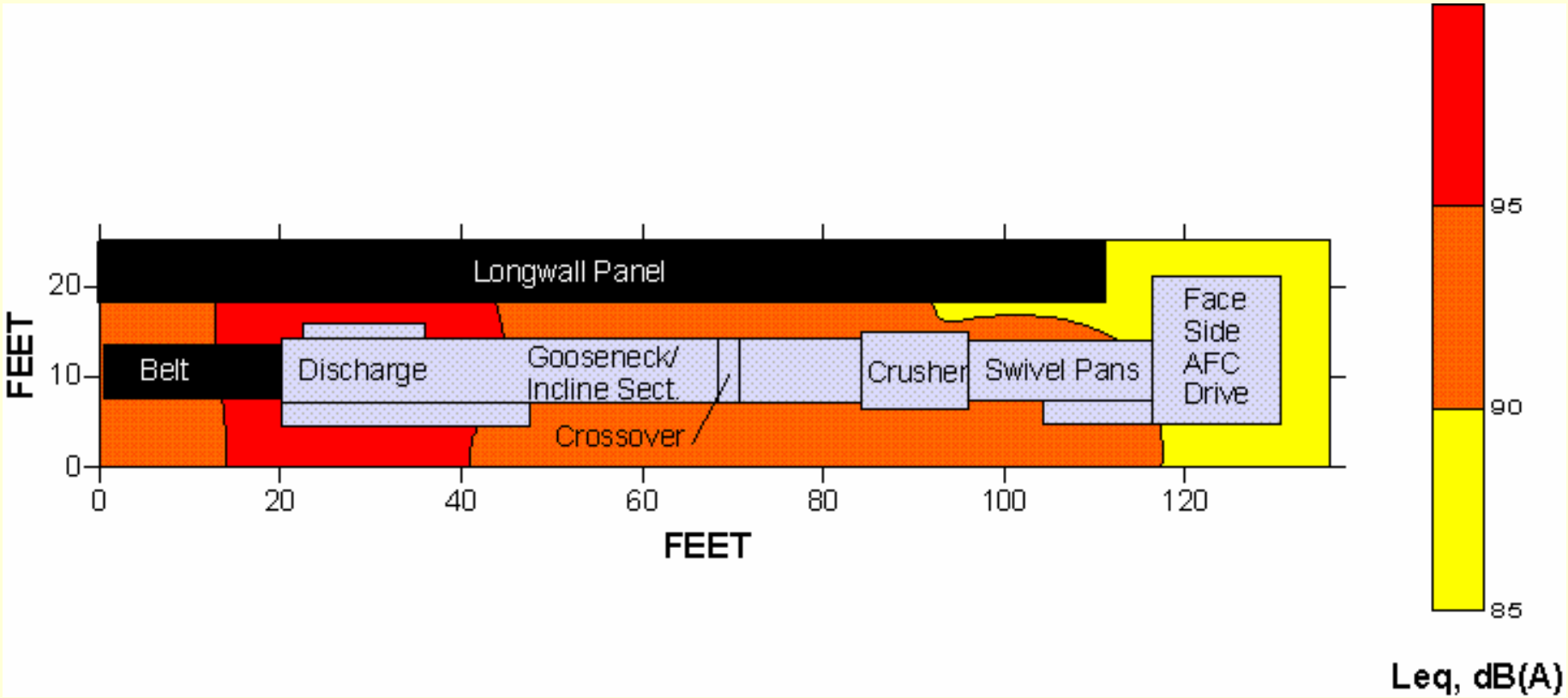
Problem:

- Stageloader noisy around head drive, crusher, and especially tail piece

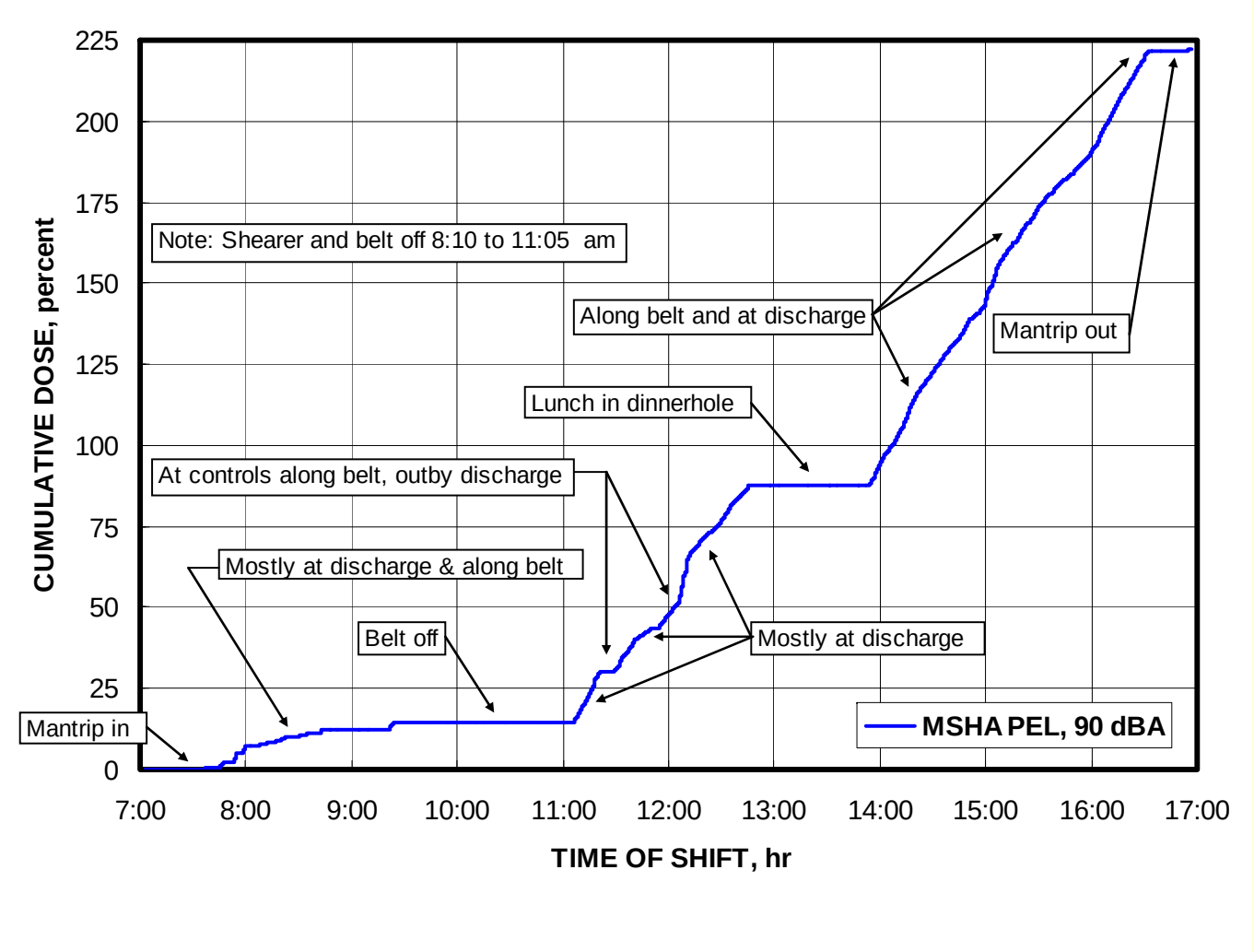
Result:

- Stageloader operator accumulating significant noise exposure while working around stageloader, especially when near discharge
- Measured doses up to 386%

Longwall Stageloader Operator



Longwall Stageloader Operator



Longwall Stageloader Operator

Solution(s):

- Limit stageloader operator's time working near discharge
- Locate controls and monitors away from stageloader
- Provide sound-proof booth for stageloader operator

Longwall Dinner Hole

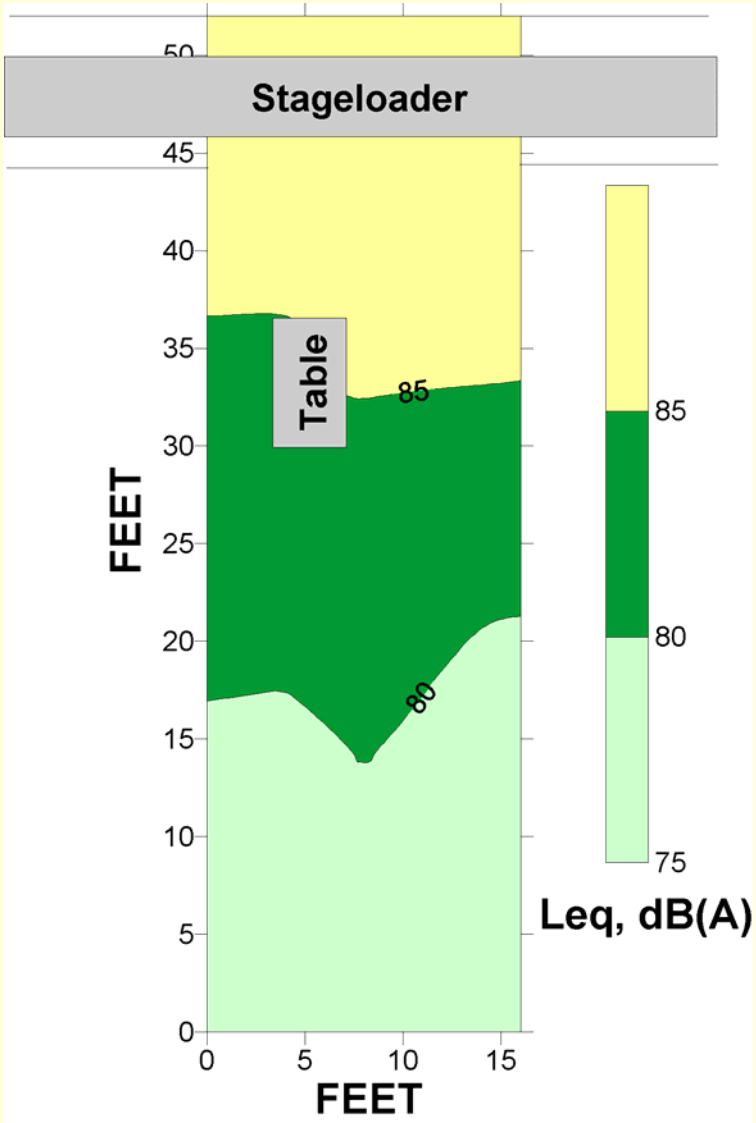
Problem:

- Dinner hole (picnic table) located in crosscut adjacent to stageloader (located to remain out of airflow and close to face)
- Measured noise levels approaching 90 dB(A)

Result:

- Longwall workers exposed to noise while eating lunch

Longwall Dinner Hole



Longwall Dinner Hole

Solution(s):

- Locate dinner hole in track entry (use brattice cloth to block airflow)
- Locate dinner hole in crosscut as far from stageloader as possible
- Locate dinner hole where noise levels are 85 dB(A) or less

Surface Drilling

Problem:

- Surface drills are noisy while drilling

Result:

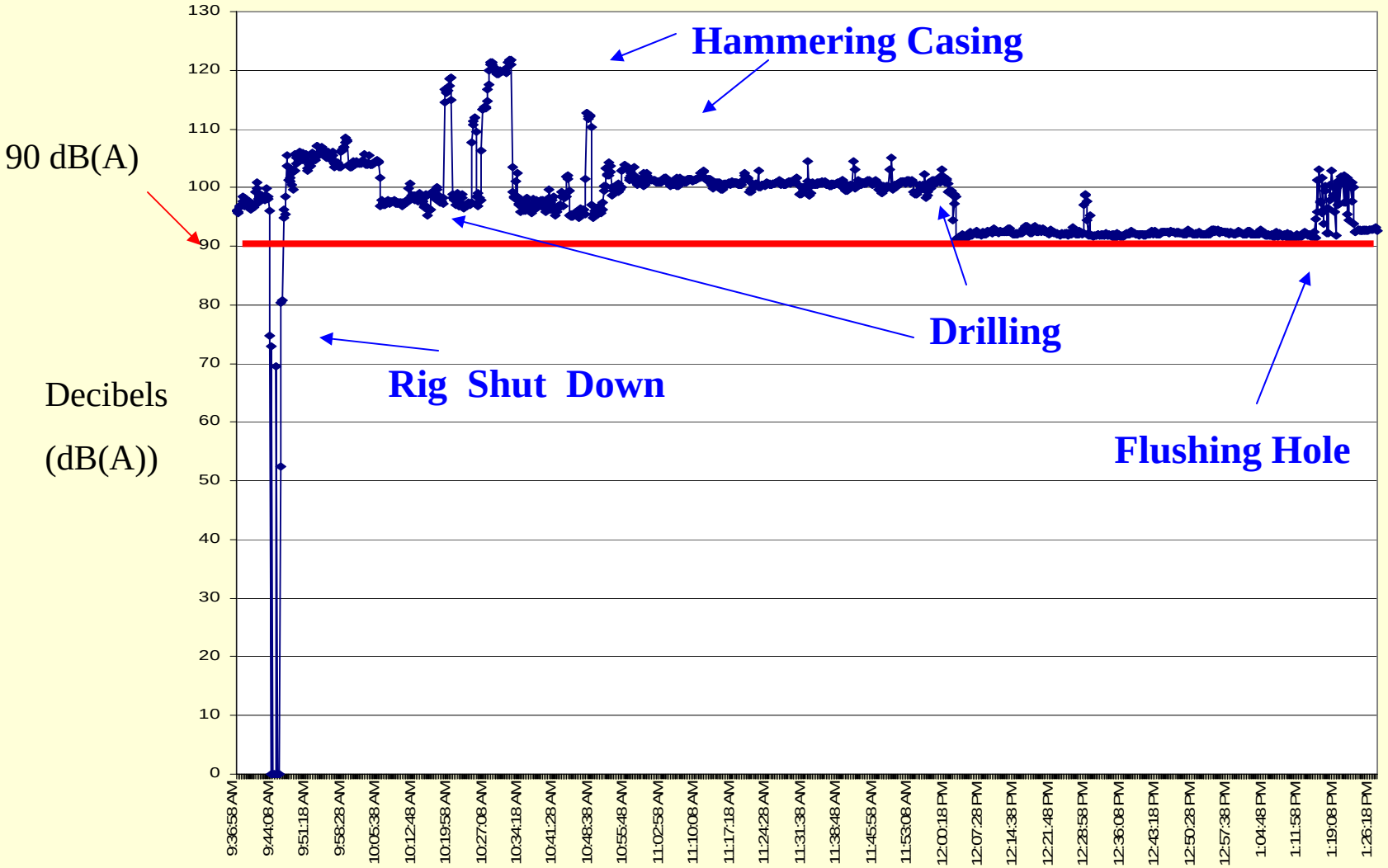
- Driller and helper experiencing high noise exposures from drilling noise

Surface Drilling

Rubber Tired

Track Mounted

Surface Drilling Dosimeter Data



Time (10 Seconds) 9:36AM – 12:53 PM

Surface Drilling

Solution(s):

- Locate helper in quiet zones
- If cab is installed, instruct driller to keep windows and doors closed.
- Relocate driller away from rig when possible
- Instruct driller/helper to avoid loud noise areas (compressor, fan, engine, dust collector, exhaust)

Job Rotation

Problem:

- Sound levels vary depending on occupation, equipment operated, worker location, task, etc.

Result:

- Workers experience different levels of exposure

Job Rotation

Solution(s):

- Selective rotation based on dose/observations
- Switch out high exposure occupations with lower exposure occupations

Job Rotation

Rotate From		Rotate To	
Occupation	**Range MSHA PEL Dose, %**	**Occupation**	**Range MSHA PEL Dose, %**
CM Oper.	44-347	Shuttle Car Oper. Laborer/Utility	33-165 6-297
M/B Oper.	45-323	LM Oper.	25-81
RBM Oper.	57-355	Shuttle Car Oper. Laborer/Utility	33-165 6-297
M/B RB Oper.	9-275	Center Bolter Oper.	17-57
Tail Shearer Oper.	22-785	Head Shearer Oper. Shieldman	33-266 13-192
Head Shearer Oper.	33-266	Shieldman	13-192
Stageloader Oper.	36-386	Shieldman	13-192
Dragline Oiler	46-318	Dragline Oper. Groundsman	0-63 14-130

Notes on Exposure Reduction

First... Success of any exposure reduction is contingent on working at lower sound levels

Second... Any exposure reduction must not introduce additional health or safety hazards

Summary

To avoid overexposure:

- Use a systematic approach
- Employ innovative solutions
- Involve workers in the process
- Conduct noise awareness training
- Proper use of HPD's

For more information

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