Hearing assessment is an essential part of hearing conservation.

Kevin Hedges
Senior Principal Occupational Hygienist (Northern Region)

25 August 2009

Safety and Health is everyone's business.

Queensland Mines and Energy
Department of Employment, Economic Development and Innovation

Queensland Government

Helen Keller

"Blindness cuts people off from things: deafness cuts people off from people".

Mines are noisy.

Health Improvement and Awareness Committee

SEMINAR

Noise in Mining Assessment and Control

The Queensland Mining Health Improvement and Awareness Committee is offering a full day seminar on noise. This Committee is tripartite and is working collaboratively to share good practices to assess and control health hazards in mining.

This Committee has determined that noise is a high priority health hazard. Noise induced hearing loss (NIHL) is preventable. It is important that strategies be put in place to reduce the risk of NIHL. This seminar will provide practical advice on how to develop a noise management program that is solutions focussed.

Date / Venue: 17 September Woolloongabba Theatrette

Kevin Hedges,
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Queensland Government, Mines and Energy.
Senior Principal Occupational Hygienist (North Region),
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Persons most exposed to loud noise, for longer periods, are employed in the mining industry.

- Exposure to loud noise can cause ringing in the ears (tinnitus) and if prolonged can result in hearing “muffled” quality to speech.
- It also results in the inability to hear high-pitched sounds.

According NIOSH (2006), an analysis of NIHL in 1,349 US coal miners revealed an alarming prevalence of severe hearing loss among older miners.

The median hearing threshold of retired miners was 20 dB greater than that of the general population.

By age 60, more than 70% of miners had a hearing loss of more than 25 dB, and about 25% had a hearing loss of more than 40 dB.

CDC Workplace Safety and Health IC 9492 Information Circular /2006 p.3.
Source: http://www.cdc.gov/niosh/mining/pubs/pdfs/2006114.htm.pdf (accessed 28 April 2008).

Benchmarking of Exposures in Selected Australian Workplaces carried out for the ASCC 2008

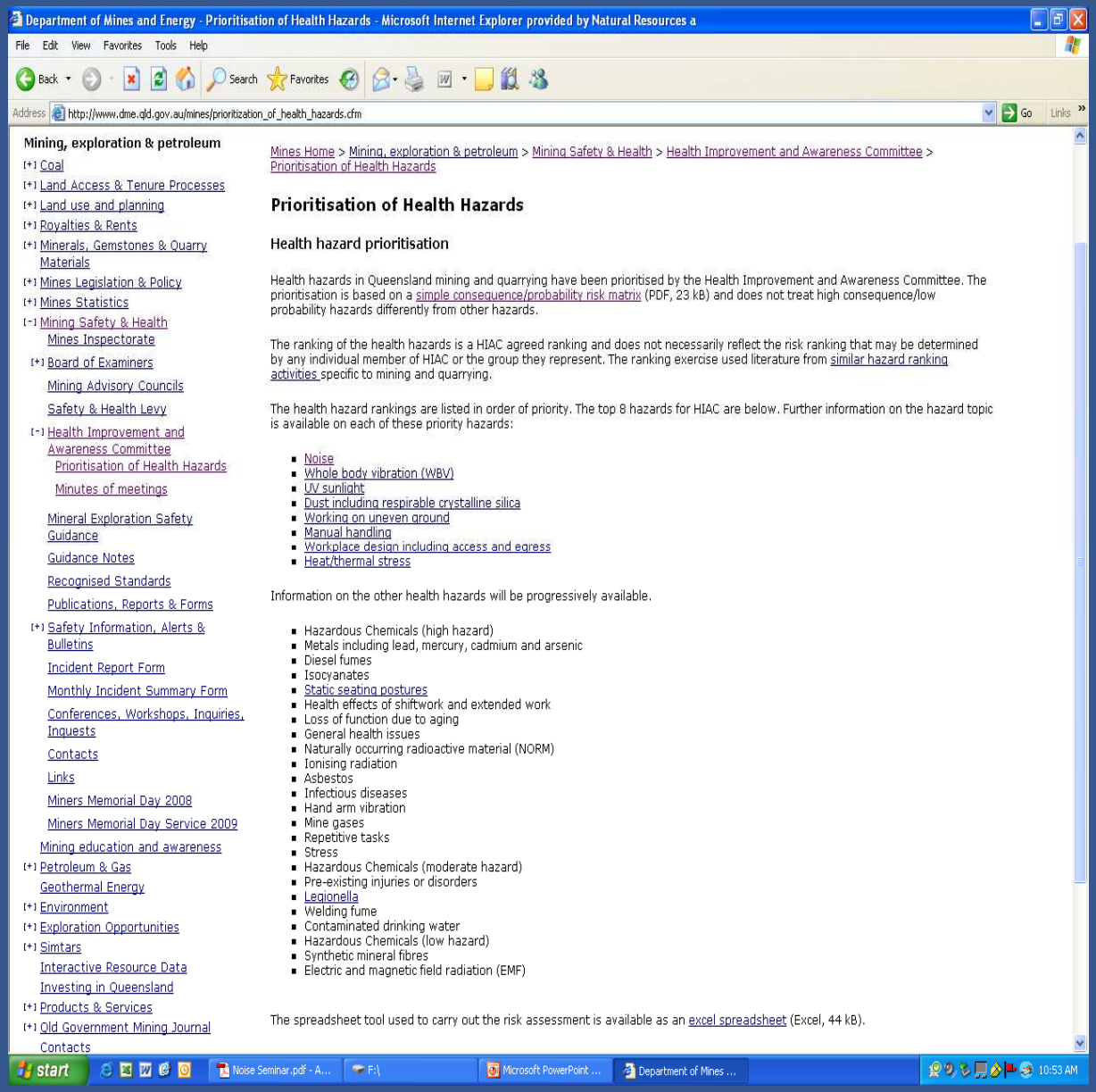
Based on the high levels of noise monitored especially in the underground mining,

15% who indicated that they suffered from ringing in the ear on a daily basis

4% indicated that suffered at least once a week.

This demonstrates that hearing protection is either not worn, or not effective.

The Queensland Mining Health Improvement and Awareness Committee (HIAC) have ranked noise as the number one health hazard in Queensland mining.


Department of Mines and Energy - Prioritisation of Health Hazards - Microsoft Internet Explorer provided by Natural Resources a
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Mining, exploration & petroleum
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[+] Mines Statistics
[-] Mining Safety & Health
Mines Inspectorate
[+] Board of Examiners
Mining Advisory Councils
Safety & Health Levy
[-] Health Improvement and Awareness Committee
Prioritisation of Health Hazards
Minutes of meetings
Mineral Exploration Safety Guidance
Guidance Notes
Recognised Standards
Publications, Reports & Forms
[+] Safety Information, Alerts & Bulletins
Incident Report Form
Monthly Incident Summary Form
Conferences, Workshops, Inquiries, Inquests
Contacts
Links
Miners Memorial Day 2008
Miners Memorial Day Service 2009
Mining education and awareness
[+] Petroleum & Gas
Geothermal Energy
[+] Environment
[+] Exploration Opportunities
[+] Simtars
Interactive Resource Data
Investing in Queensland
[+] Products & Services
[+] Qld Government Mining Journal
Contacts
Mines Home > Mining, exploration & petroleum > Mining Safety & Health > Health Improvement and Awareness Committee > Prioritisation of Health Hazards
Prioritisation of Health Hazards
Health hazard prioritisation
Health hazards in Queensland mining and quarrying have been prioritised by the Health Improvement and Awareness Committee. The prioritisation is based on a simple consequence/probability risk matrix (PDF, 23 kB) and does not treat high consequence/low probability hazards differently from other hazards.
The ranking of the health hazards is a HIAC agreed ranking and does not necessarily reflect the risk ranking that may be determined by any individual member of HIAC or the group they represent. The ranking exercise used literature from similar hazard ranking activities specific to mining and quarrying.
The health hazard rankings are listed in order of priority. The top 8 hazards for HIAC are below. Further information on the hazard topic is available on each of these priority hazards:
Noise
Whole body vibration (WBV)
UV sunlight
Dust including respirable crystalline silica
Working on uneven ground
Manual handling
Workplace design including access and egress
Heat/thermal stress
Information on the other health hazards will be progressively available.
Hazardous Chemicals (high hazard)
Metals including lead, mercury, cadmium and arsenic
Diesel fumes
Isocyanates
Static seating postures
Health effects of shiftwork and extended work
Loss of function due to aging
General health issues
Naturally occurring radioactive material (NORM)
Ionising radiation
Asbestos
Infectious diseases
Hand arm vibration
Mine gases
Repetitive tasks
Stress
Hazardous Chemicals (moderate hazard)
Pre-existing injuries or disorders
Legionella
Welding fume
Contaminated drinking water
Hazardous Chemicals (low hazard)
Synthetic mineral fibres
Electric and magnetic field radiation (EMF)
The spreadsheet tool used to carry out the risk assessment is available as an excel spreadsheet (Excel, 44 kB).
start
Noise Seminar.pdf - A...
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Department of Mines ...
10:53 AM

Health Hazard	Maximum reasonable consequences	Rating	Probability or exposure	Rating	Ranking
Noise	Severe negative impact - severe irreversible disability or impairment	2	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B	5
Whole body vibration	Severe negative impact - severe irreversible disability or impairment	2	Moderate, possible (typically once a year) or 25 - 50% OEL	C	6
UV sunlight	Severe negative impact - severe irreversible disability or impairment	2	Moderate, possible (typically once a year) or 25 - 50% OEL	C	6
Dust including RCS	Severe negative impact - severe irreversible disability or impairment	2	Moderate, possible (typically once a year) or 25 - 50% OEL	C	6
Working on uneven ground- leg problems	Major negative impact - severe health impacts on a number of people	3	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B	9
Manual handling	Major negative impact - severe health impacts on a number of people	3	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B	9
Workplace design including access and egress	Major negative impact - severe health impacts on a number of people	3	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B	9
Heat / dehydration	Major negative impact - severe health impacts on a number of people	3	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B	9
Hazardous chemicals - high hazard	Severe negative impact - severe irreversible disability or impairment	2	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	12
Metals including lead, mercury, cadmium or arsenic	Severe negative impact - severe irreversible disability or impairment	2	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	12
Diesel fumes	Severe negative impact - severe irreversible disability or impairment	2	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	12
Isocyanates	Severe negative impact - severe irreversible disability or impairment	2	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	12
Static seating / postures	Major negative impact - severe health impacts on a number of people	3	Moderate, possible (typically once a year) or 25 - 50% OEL	C	13
Health effects of shiftwork and extended shifts (time of day, hours of work, shift work)	Major negative impact - severe health impacts on a number of people	3	Moderate, possible (typically once a year) or 25 - 50% OEL	C	13
Loss of function due to aging	Major negative impact - severe health impacts on a number of people	3	Moderate, possible (typically once a year) or 25 - 50% OEL	C	13
General Health issues	Major negative impact - severe health impacts on a number of people	3	Moderate, possible (typically once a year) or 25 - 50% OEL	C	13
Naturally Occurring Radioactive Material (NORM)	Severe negative impact - severe irreversible disability or impairment	2	Rare (typically once every twenty five years) or < 10% OEL	E	16
Ionising - licensed sources (ie gauges)	Severe negative impact - severe irreversible disability or impairment	2	Rare (typically once every twenty five years) or < 10% OEL	E	16
Asbestos	Severe negative impact - severe irreversible disability or impairment	2	Rare (typically once every twenty five years) or < 10% OEL	E	16
Infectious diseases - such as hepatitis A from untreated or raw sewage for plumbers; HIV or hepatitis B for first aid providers.	Severe negative impact - severe irreversible disability or impairment	2	Rare (typically once every twenty five years) or < 10% OEL	E	16
Hand arm vibration	Major negative impact - severe health impacts on a number of people	3	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	17
Mine gases (UG)	Major negative impact - severe health impacts on a number of people	3	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	17
Repetitive tasks	Major negative impact - severe health impacts on a number of people	3	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	17
Stress	Major negative impact - severe health impacts on a number of people	3	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	17
Hazardous chemicals - moderate hazard	Negative impact - major impact on health of several people	4	Moderate, possible (typically once a year) or 25 - 50% OEL	C	18
Pre-existing injuries or disorders	Negative impact - major impact on health of several people	4	Moderate, possible (typically once a year) or 25 - 50% OEL	C	18
Untreated process water - legionella	Major negative impact - severe health impacts on a number of people	3	Rare (typically once every twenty five years) or < 10% OEL	E	20
Welding fumes	Negative impact - major impact on health of several people	4	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	21
Untreated drinking water	Negative impact - major impact on health of several people	4	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	21
Hazardous chemicals - low hazard	Minor negative impact - slight negative impact on individual health	5	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	24
Synthetic mineral fibres	Minor negative impact - slight negative impact on individual health	5	Unlikely (typically once every 5 years) or 10 - 25% OEL	D	24
Electric and Magnetic Field (EMF) Radiation	Minor negative impact - slight negative impact on individual health	5	Rare (typically once every twenty five years) or < 10% OEL	E	25

Consequence		Probability	
Catastrophic impact - major permanent negative health impacts on a large number of people	1	Almost certain to happen (everyday/weekly event) or > 100% OEL	A
Severe negative impact - severe irreversible disability or impairment	2	Likely to happen at some point (typically once a month) or 50 - 100% OEL	B
Major negative impact - severe health impacts on a number of people	3	Moderate, possible (typically once a year) or 25 - 50% OEL	C
Negative impact - major impact on health of several people	4	Unlikely (typically once every 5 years) or 10 - 25% OEL	D
Minor negative impact - slight negative impact on individual health	5	Rare (typically once every twenty five years) or < 10% OEL	E

Maximum reasonable consequences	Probability				
	A	B	C	D	E
1	1	2	4	7	11
2	3	5	8	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

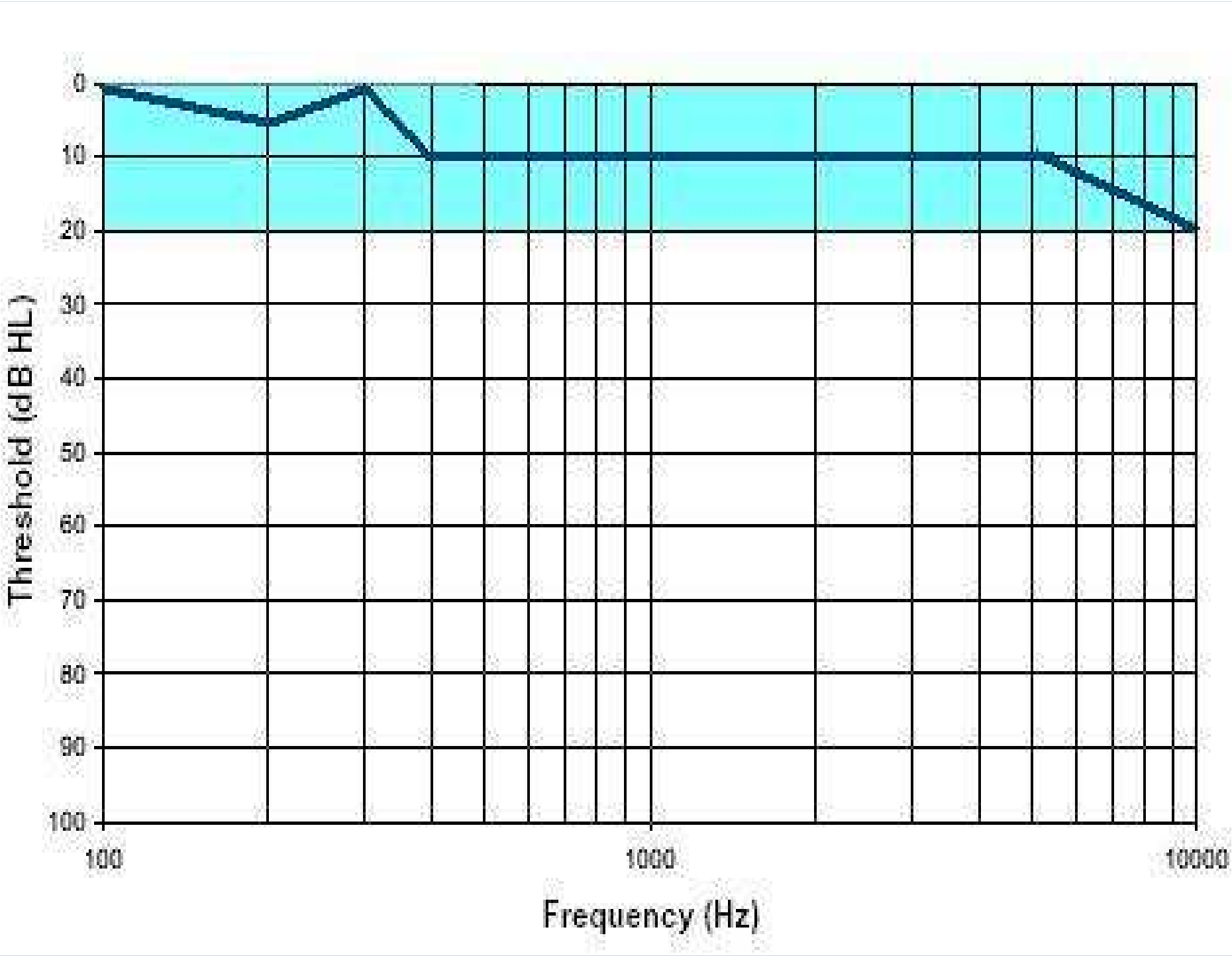
Notes:		
Maximum reasonable consequence	Rating 1 - 2	Irreversible
Maximum reasonable consequence	Rating 3 - 5	Reversible
Probability of exposure	Rated with current controls in place	

NSW Mines Safety Performance Branch, Dept of Primary Industry (2007)

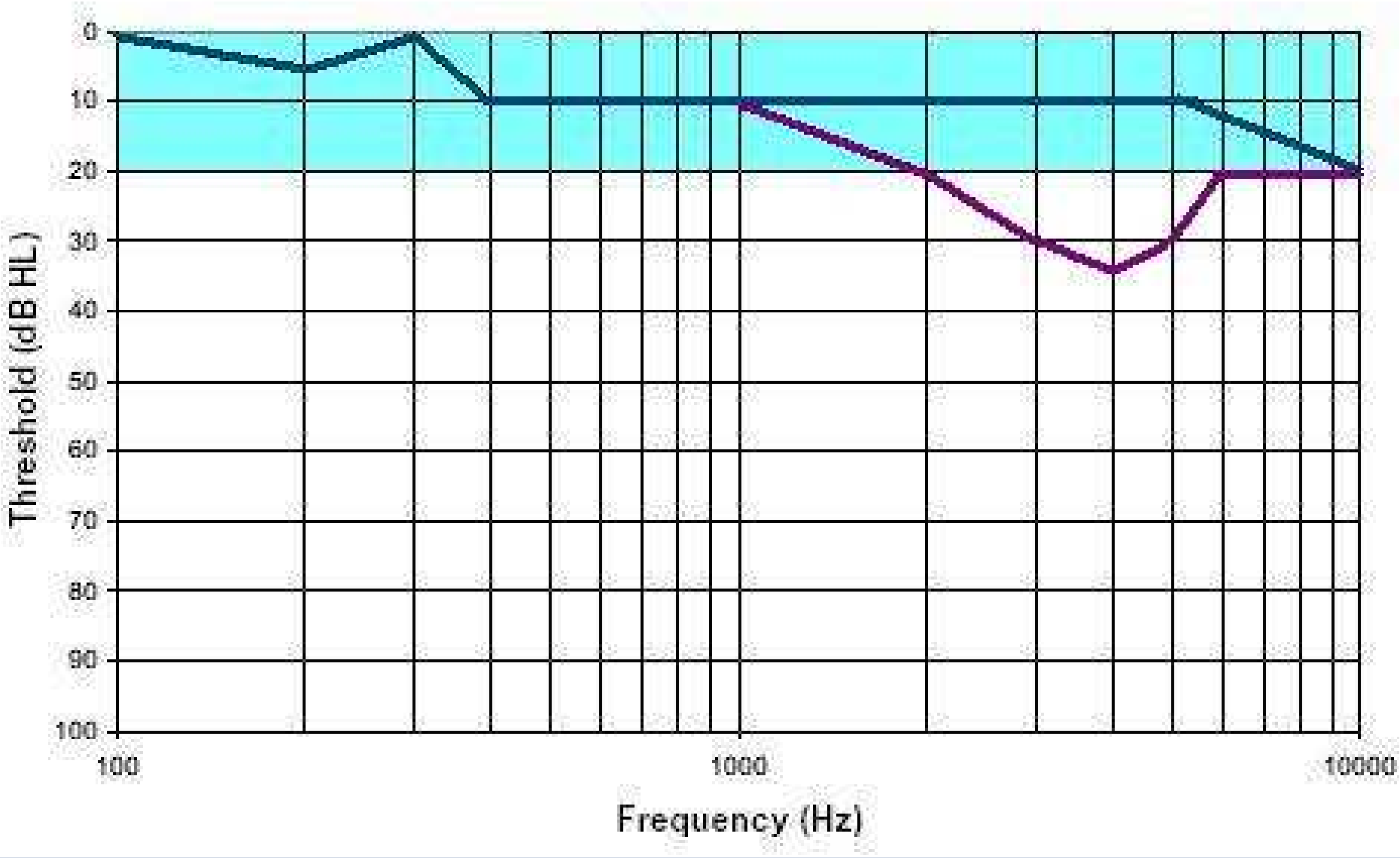
Summary of priority health issues

Table 1. Intensity, frequency, latency, severity, priority and key sector for main exposures and conditions

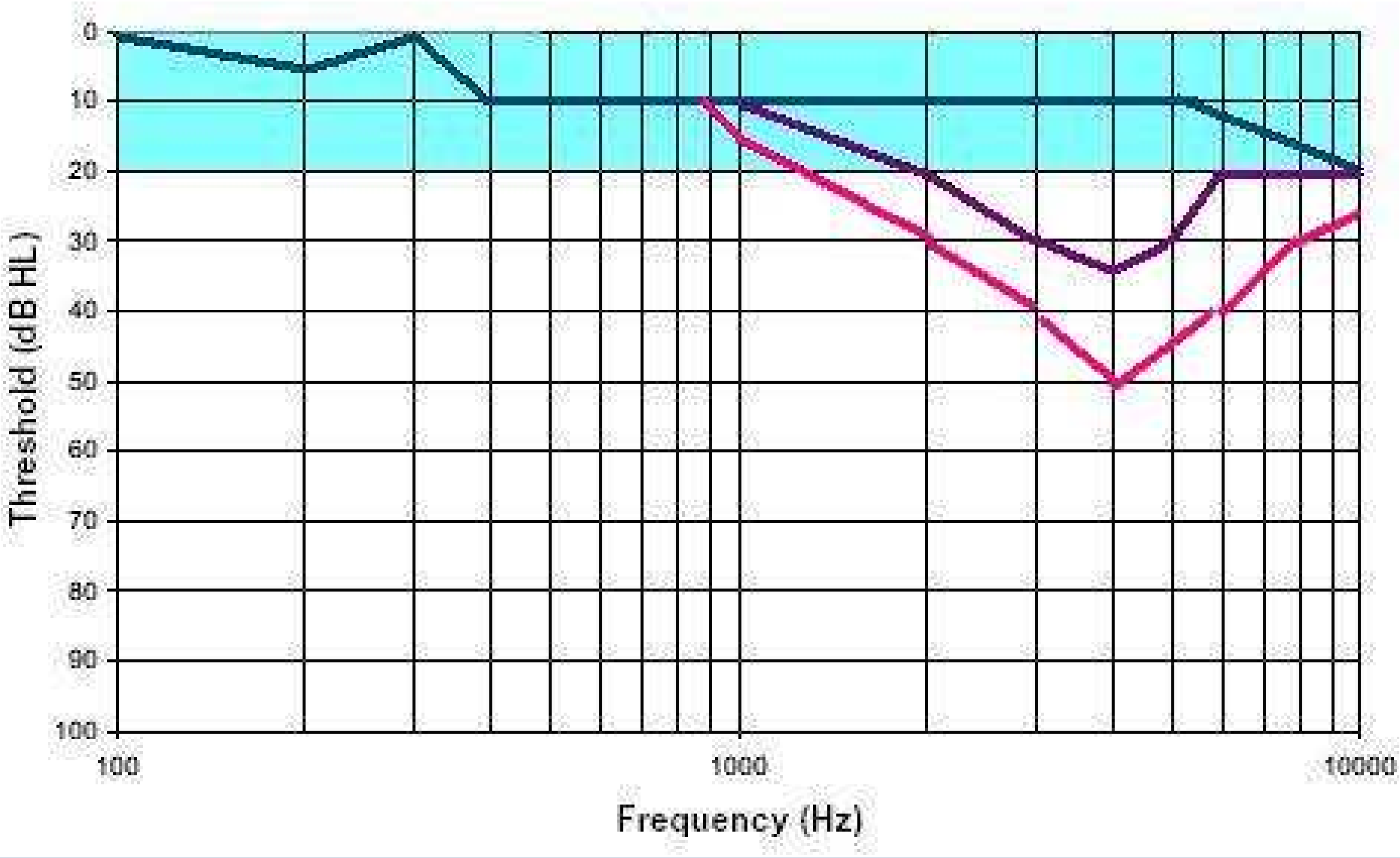
Exposure	Condition	Intensity[1]	Frequency[2]	Latency[3]	Severity[4]	Priority[5]	Key sector[6]
Noise	Noise-induced hearing loss	High	Common	Long	Medium	High	All
Vibration	Musculoskeletal disorders	High	Common	Medium	Medium	High	All
Diesel exhaust fumes	Bronchitis/emphysema, lung cancer	?Medium	Common	Medium	Medium	High	Underground
Hazardous substance exposure	Dermatitis	?High	Moderate	Short / Medium	Low	High	All
Ergonomic stressors	Musculoskeletal disorders (including back pain)	High	Common	Medium	Medium	High	All
Ergonomic stressors (shift work)	Fatigue and related disorders	?Medium	Common	Short and medium	Medium	High	All
Psychosocial hazards	Mental disorders, drug and alcohol use	Medium	Moderate	Short	Medium	High	All (particularly Remote)
Ultraviolet radiation	Skin cancer, cataracts	Medium	Common	Long	Medium	High	Above ground
Asbestos-related respiratory disease	Asbestosis, lung cancer, mesothelioma	Low	Common	Long	High	Medium	All
Silica-related respiratory disease	Silicosis, lung cancer, ?bronchitis / emphysema	Low	Common	Long	High	Medium	Gold


0
10
20
30
40
50
60
70
80
90
100
Threshold (dB HL)
100
1000
10000
Frequency (Hz)

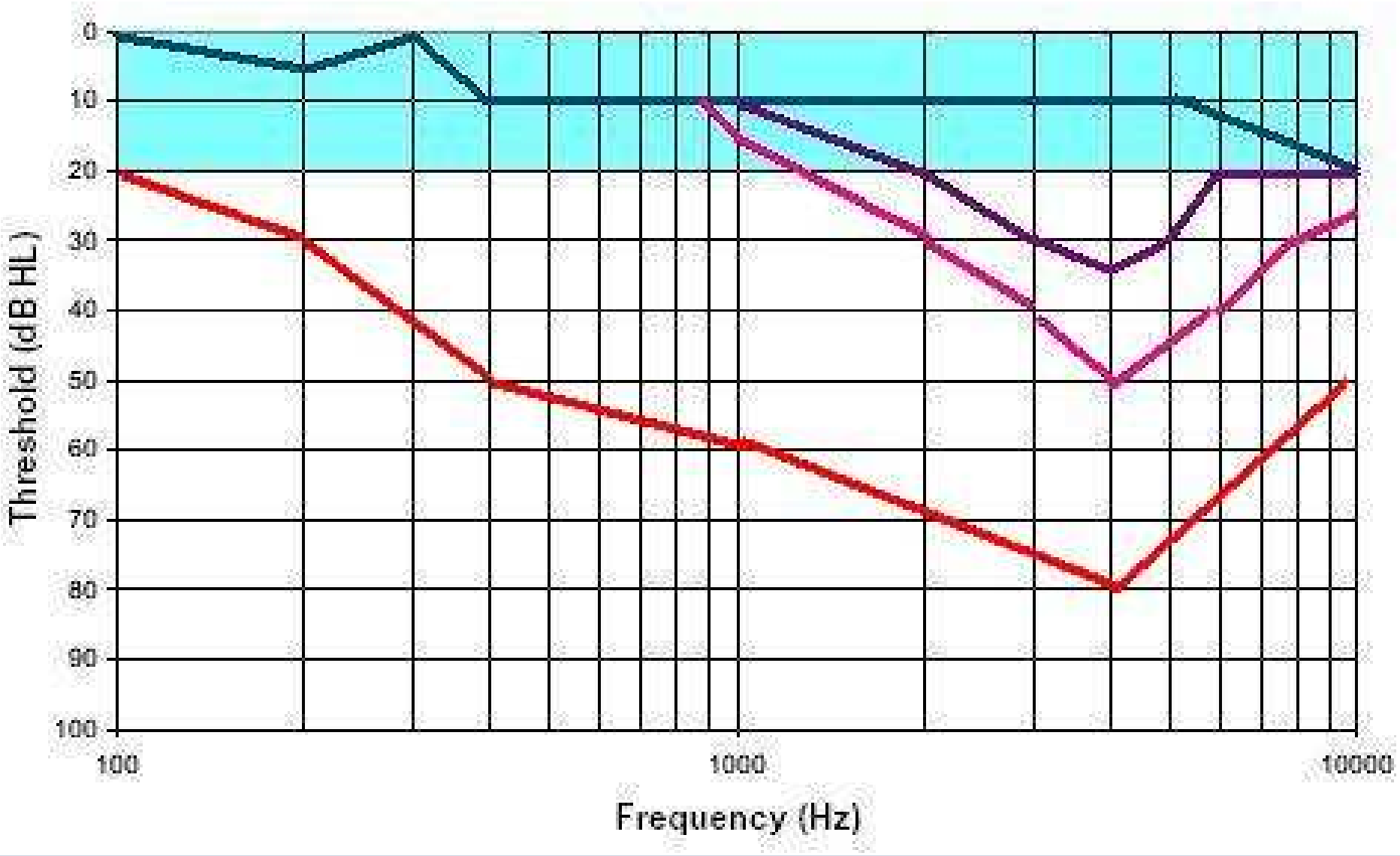
Early Stages of Noise Induced Hearing Loss



Moderate Noise Induced Hearing Loss



Severe Noise Induced Hearing Loss



Temporary threshold shift leads to

Permanent threshold shift

Anatomy of the Ear

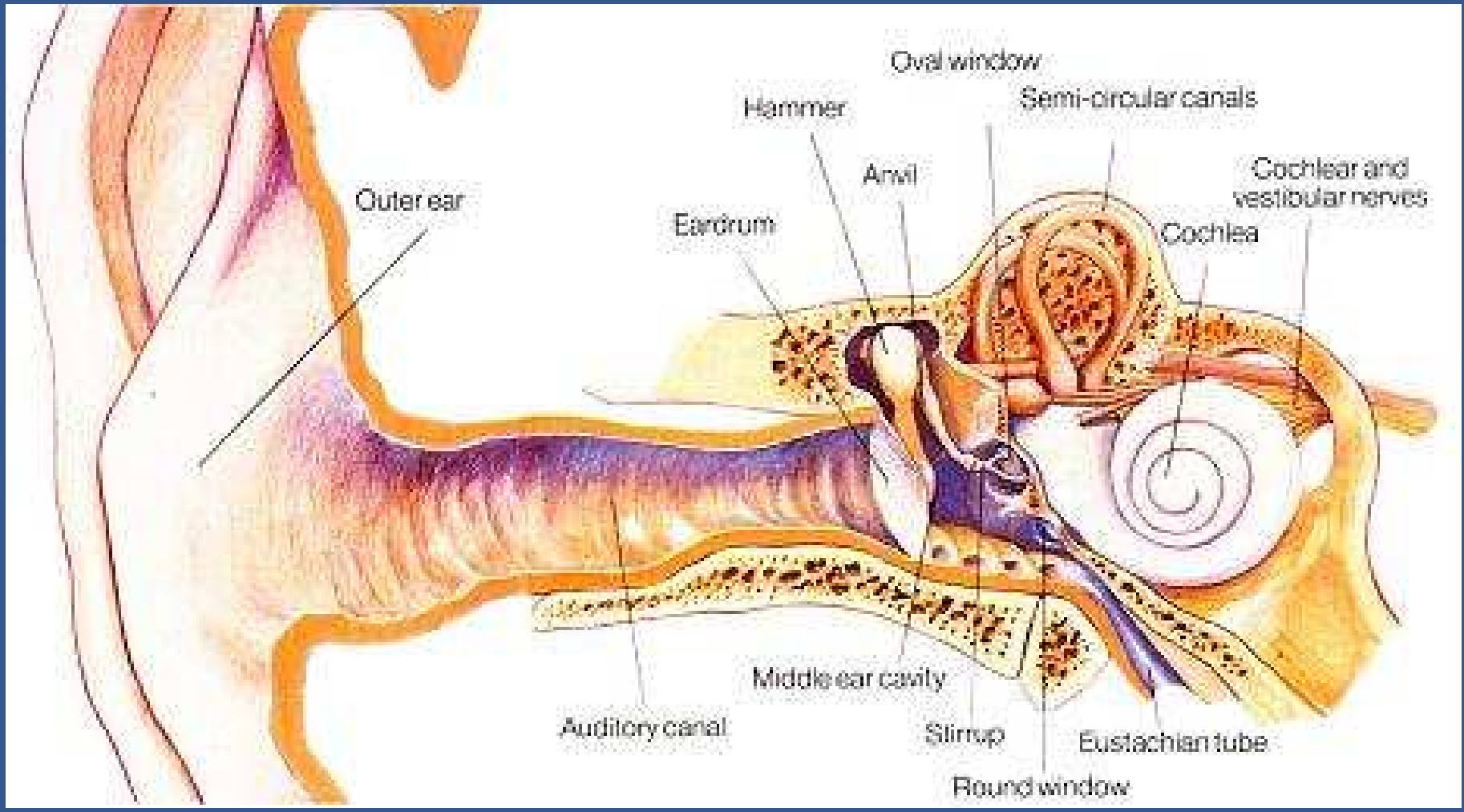


TABLE G4

ESTIMATED PREVALENCE AND DEGREE OF HEARING DISABILITY IN NOISE-EXPOSED, UNSCREENED MALE POPULATIONS

Exposure duration Years	Loss of Hearing %	Exposure level $L_{Aeq,8h}$ dB(A)					
		75	80	85	90	95	100
5	Percentage	28	29	33	41	53	72
	Mean PLH	2	2	3	3	5	7
10	Percentage	30	32	38	47	71	88
	Mean PLH	3	3	3	4	5	8
15	Percentage	34	36	42	57	78	92
	Mean PLH	3	3	4	4	6	10
20	Percentage	39	41	48	67	85	95
	Mean PLH	4	4	5	5	7	12
25	Percentage	46	48	59	75	89	96
	Mean PLH	5	5	5	6	9	15
30	Percentage	58	61	70	82	92	97
	Mean PLH	6	6	7	8	11	17
35	Percentage	69	72	79	87	94	98
	Mean PLH	8	8	8	10	13	20
40	Percentage	78	80	85	91	96	99
	Mean PLH	10	10	10	12	15	23

1. Noise Exposures

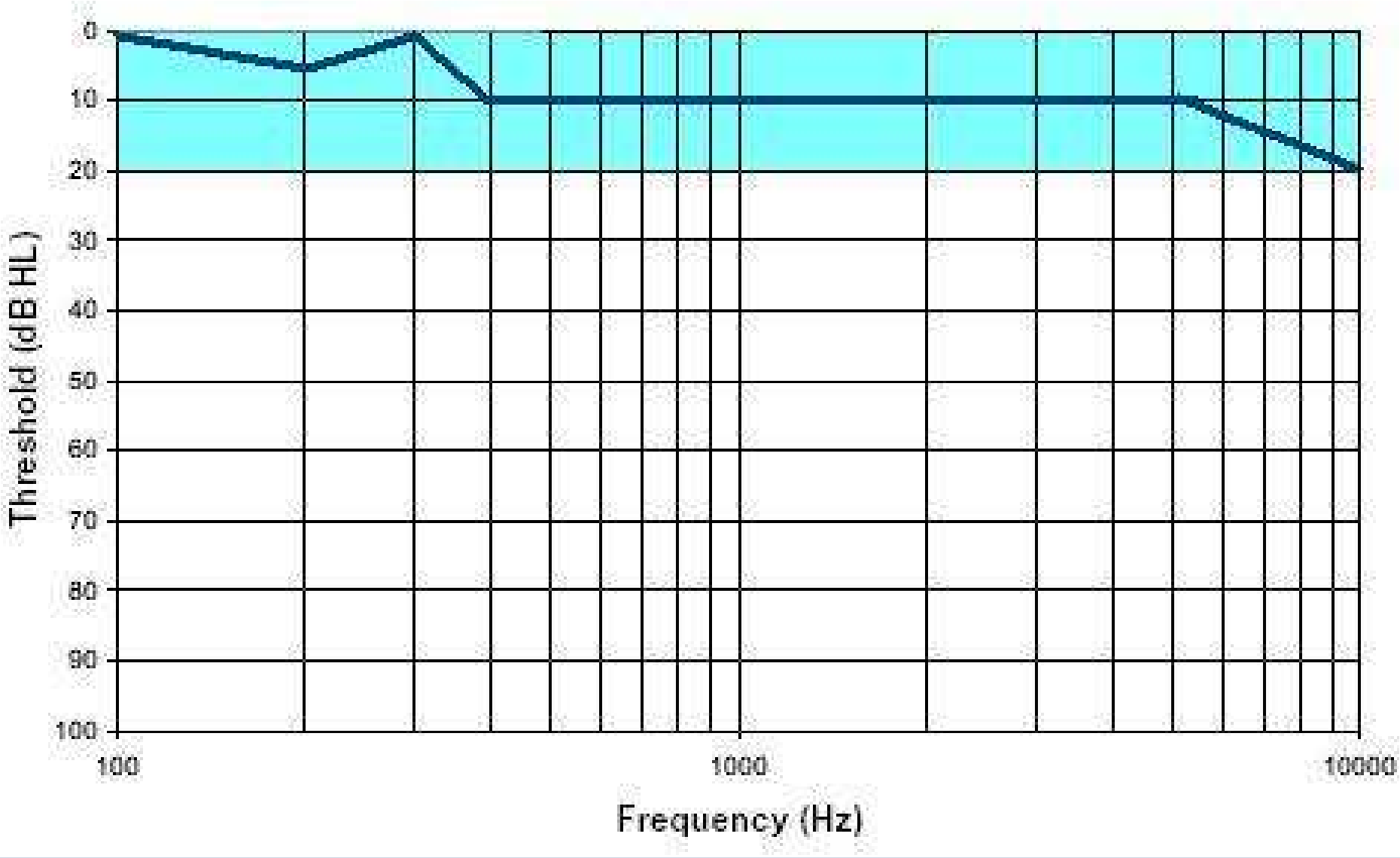
	No. of persons in survey	No. persons >85dB(A)	% > 85dB(A)
Employees	30720	16328	53
Contractors	10882	4316	40
Total	41602	20644	50

Permanent hearing loss is preventable. It is therefore important, that ongoing health surveillance incorporates a measure to **detect early hearing loss.**

How to detect early hearing loss:

US Occupational Safety and Health Administration (OSHA) has defined a **standard threshold shift:**

A change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 in either ear.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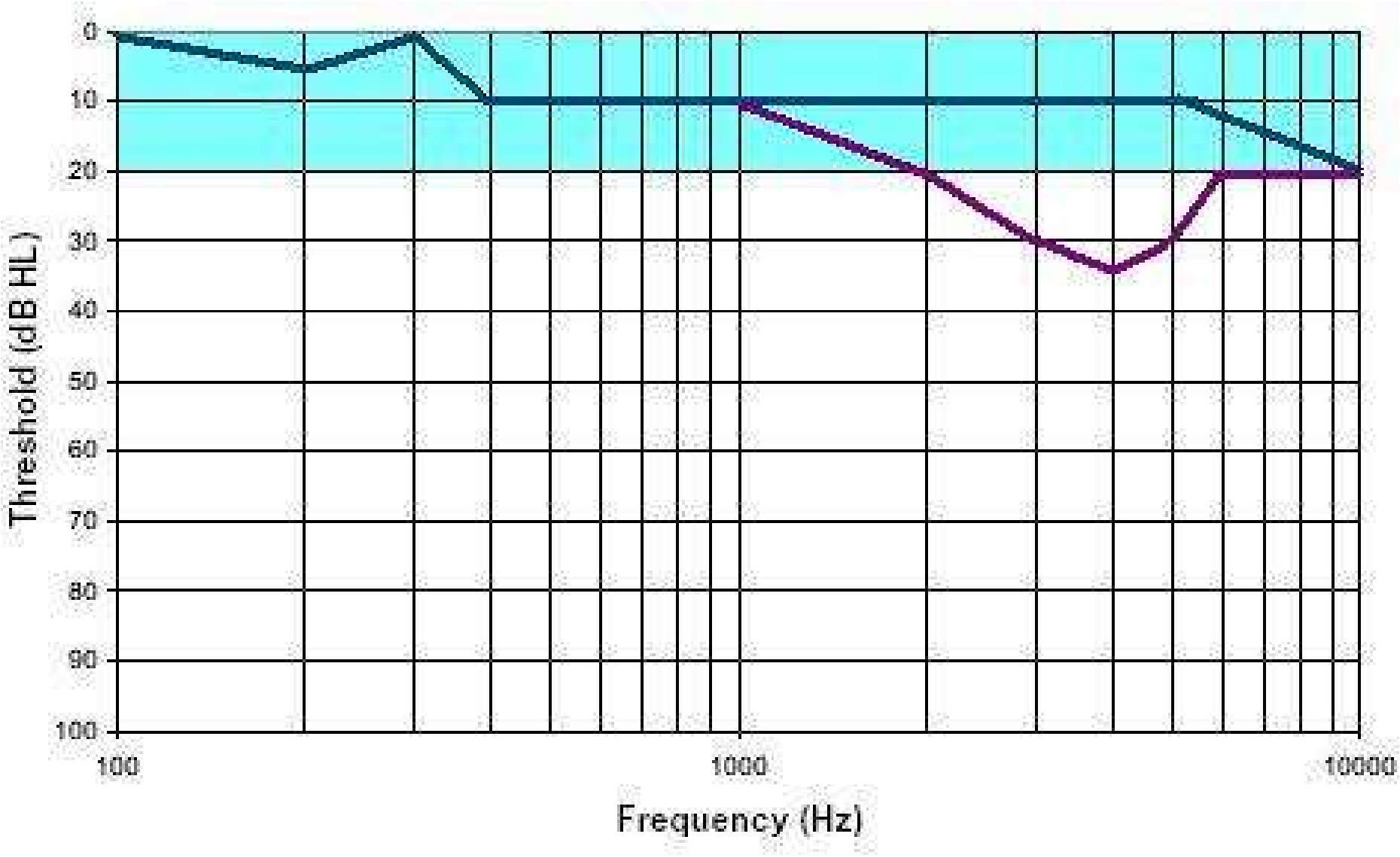
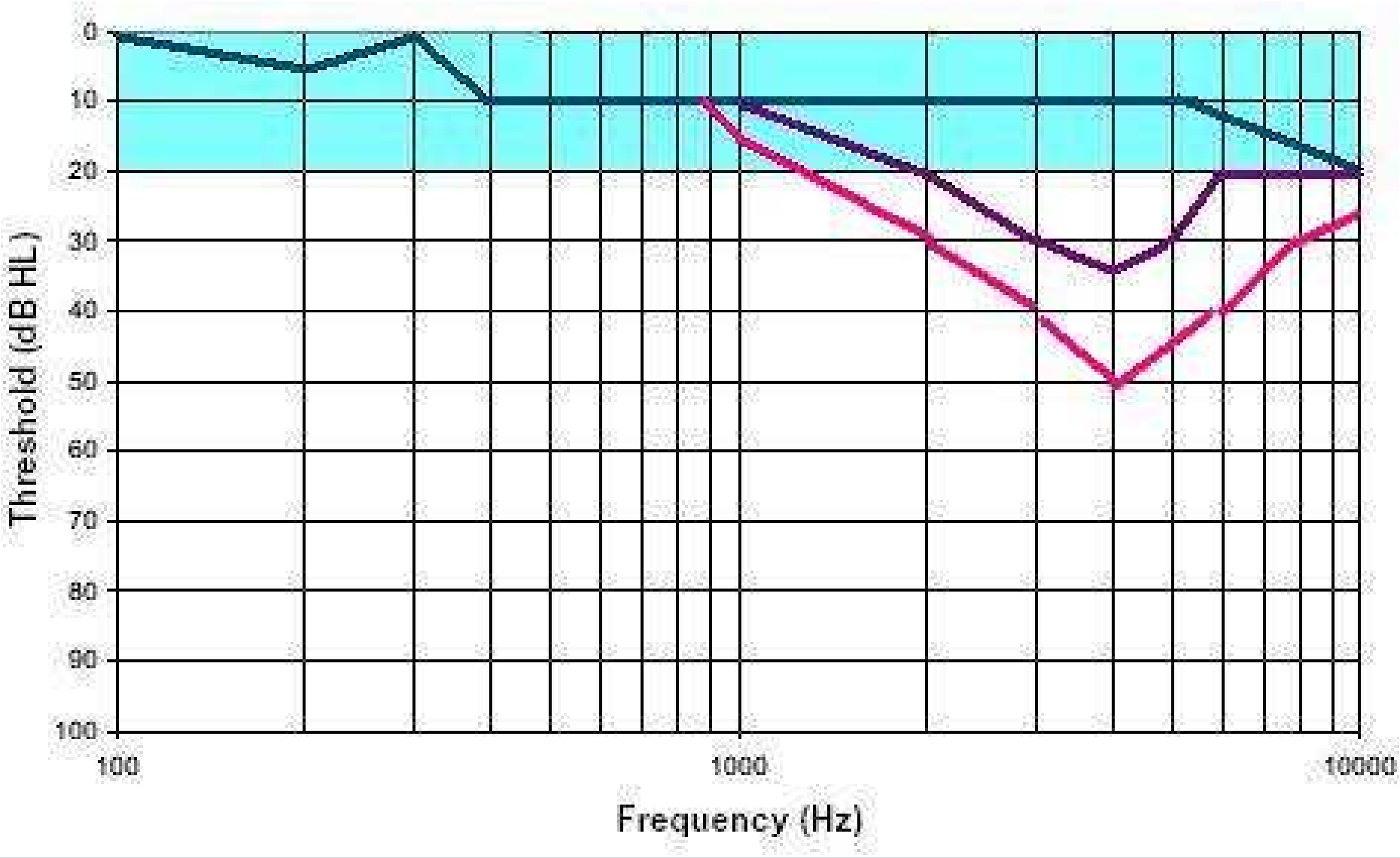
80
90
100
Threshold (dB HL)
100
1000
10000
Frequency (Hz)

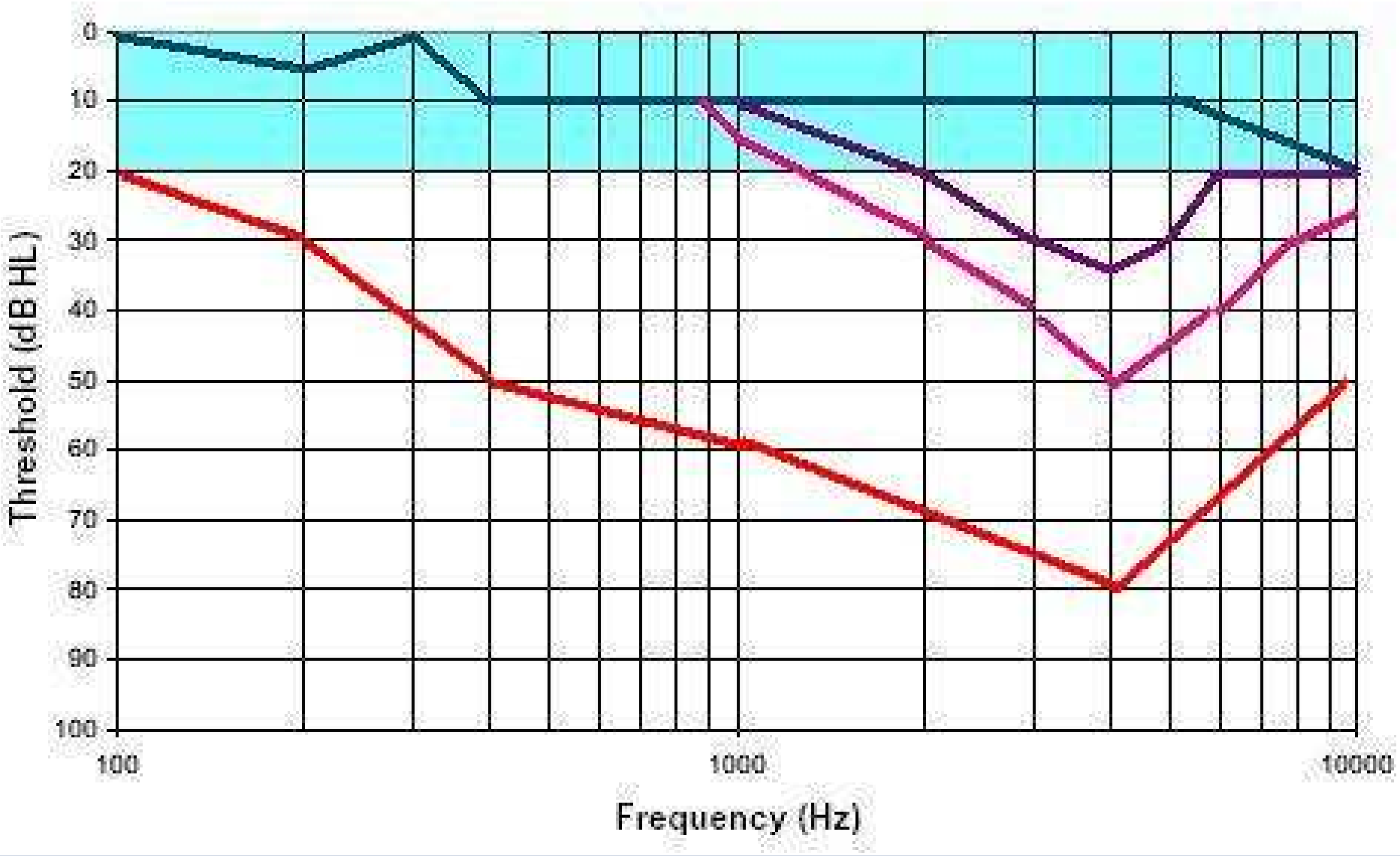
Early Stages of Noise Induced Hearing Loss



Moderate Noise Induced Hearing Loss

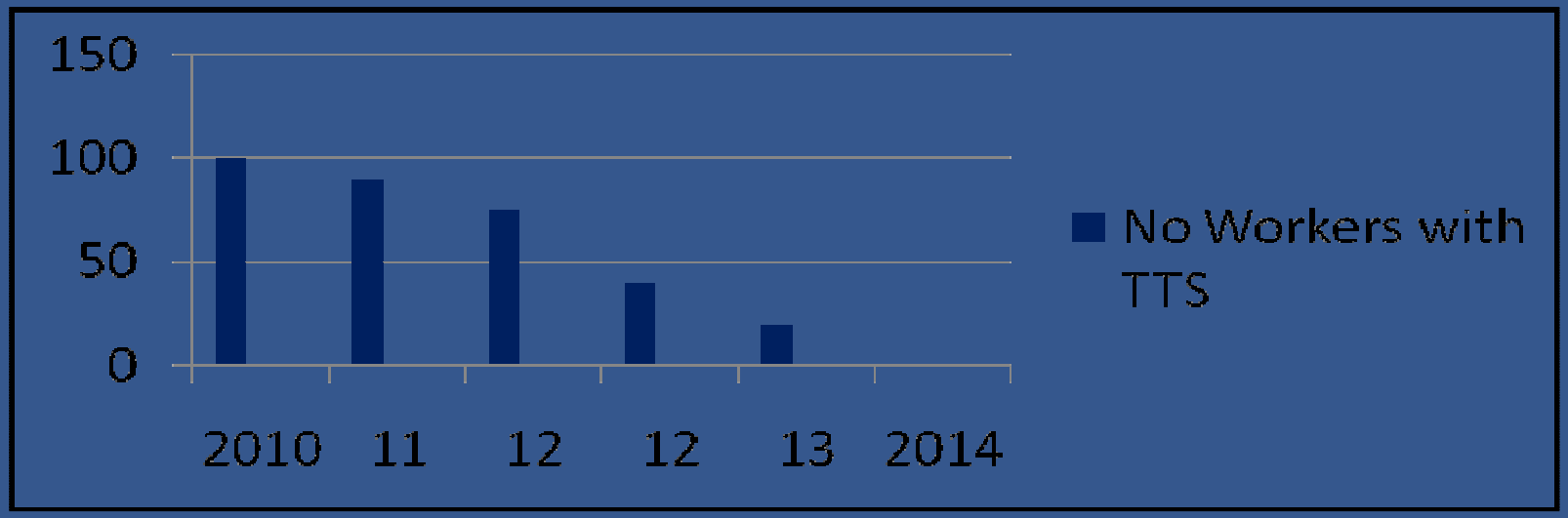


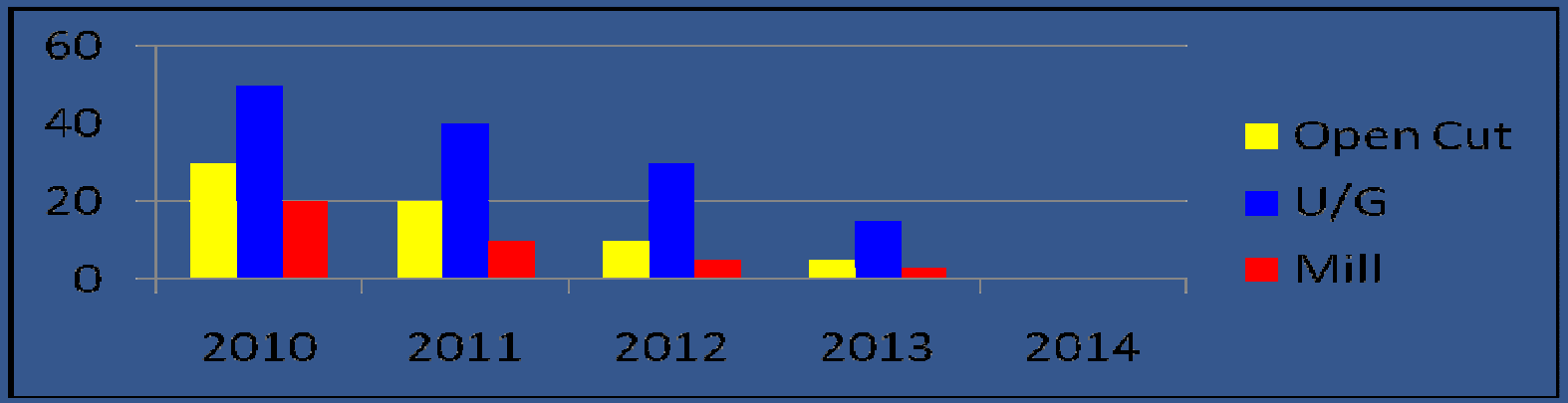
Severe Noise Induced Hearing Loss



Simple approach to predict early hearing loss.

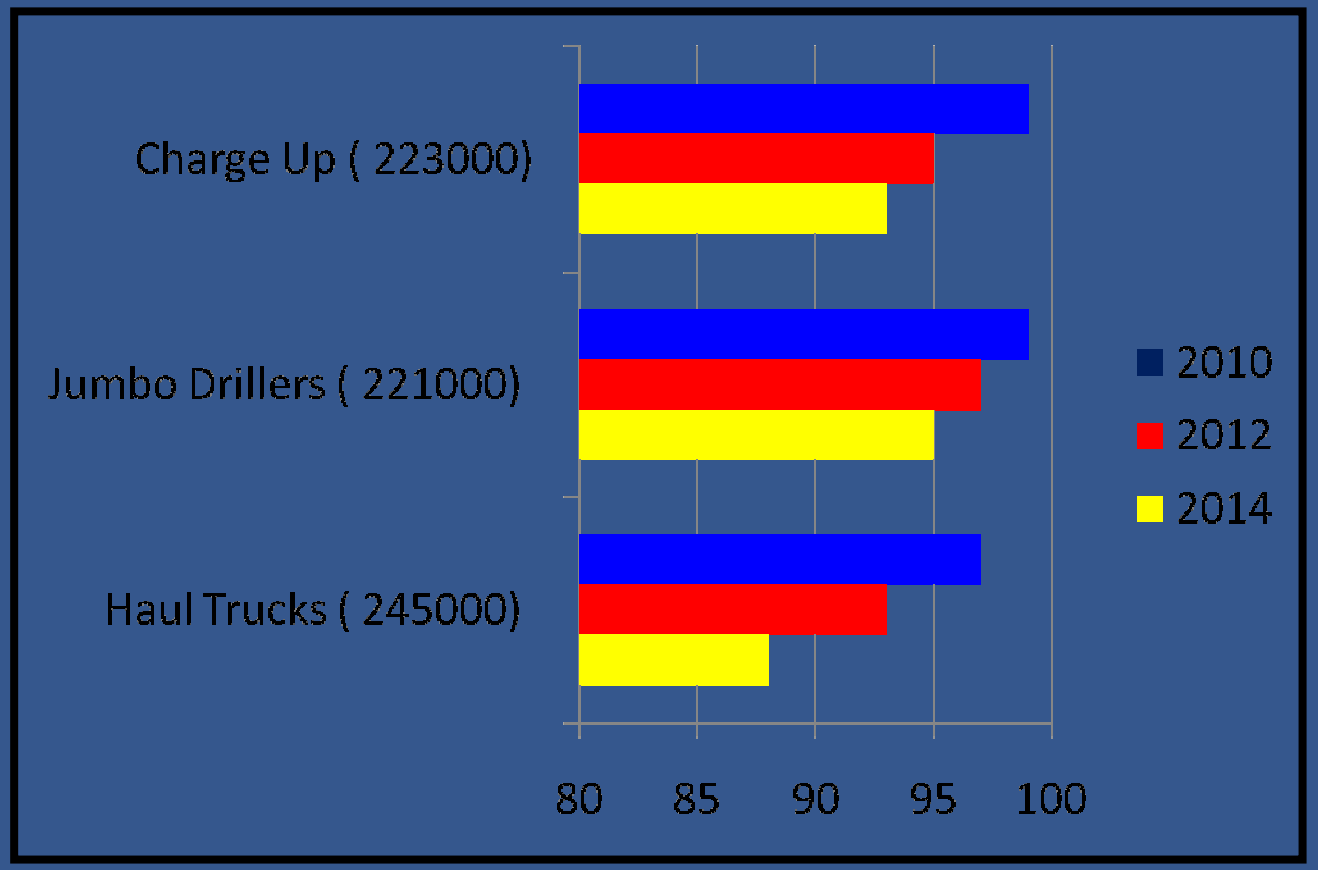
How can we show reduction of temporary hearing loss?





Source: Dr Sharann Johnson – President AIOH

Noise Induced Hearing Loss – Noise Exposures

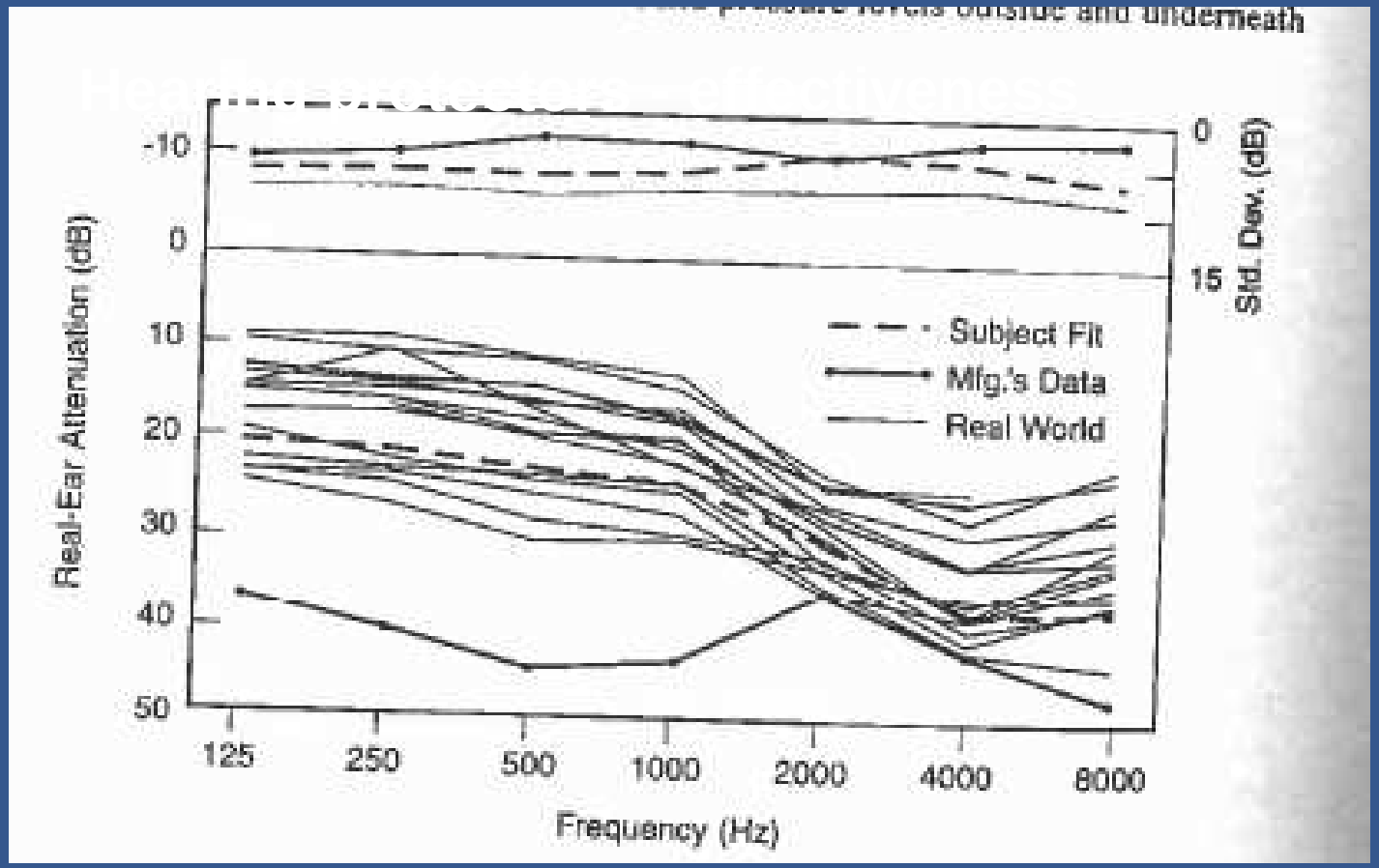


Geometric Mean Noise Exposures (Leq12)

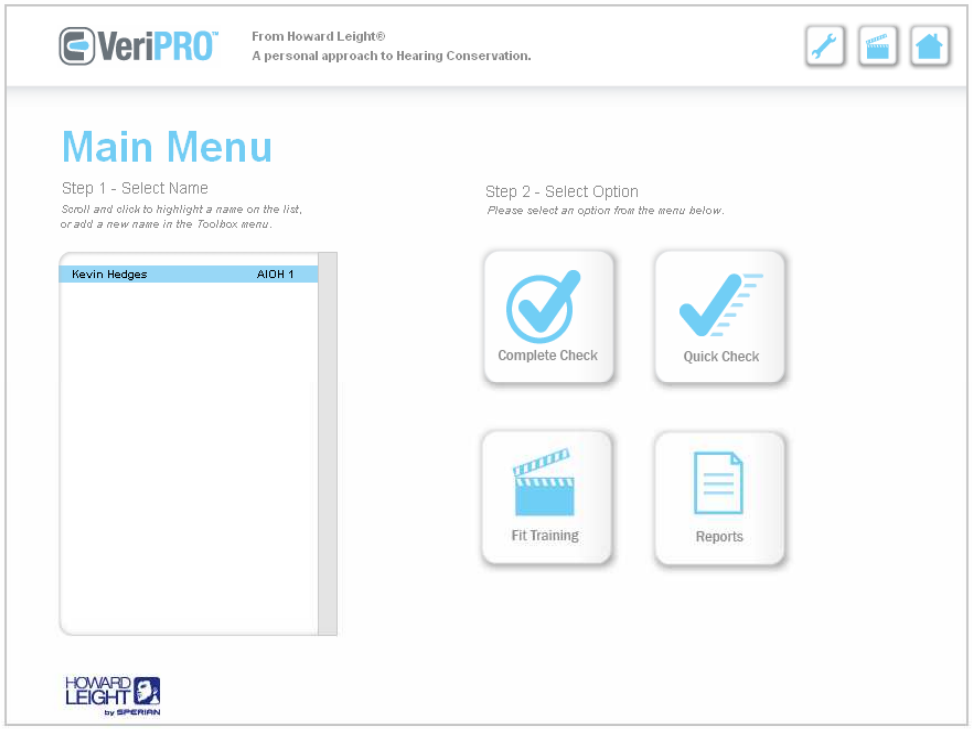
Noise exposure in mining is mainly controlled through the use hearing protectors including ear plugs and muffs.

If the type of hearing protector does not reduce the noise to an acceptable level nor is it fitted correctly, noise induced hearing loss (NIHL) will occur.

It is important that monitoring be carried out to evaluate the effectiveness of hearing conservation programs.



Source: Berger 1994


Exit Full Screen Mode
VeriPRO
From Howard Leight®
A personal approach to Hearing Conservation.
Main Menu
Step 1 - Select Name
Scroll and click to highlight a name on the list, or add a new name in the Toolbox menu.
Kevin Hedges AIOH 1
Step 2 - Select Option
Please select an option from the menu below.
Complete Check
Quick Check
Fit Training
Reports
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Microsoft PowerPoint ...
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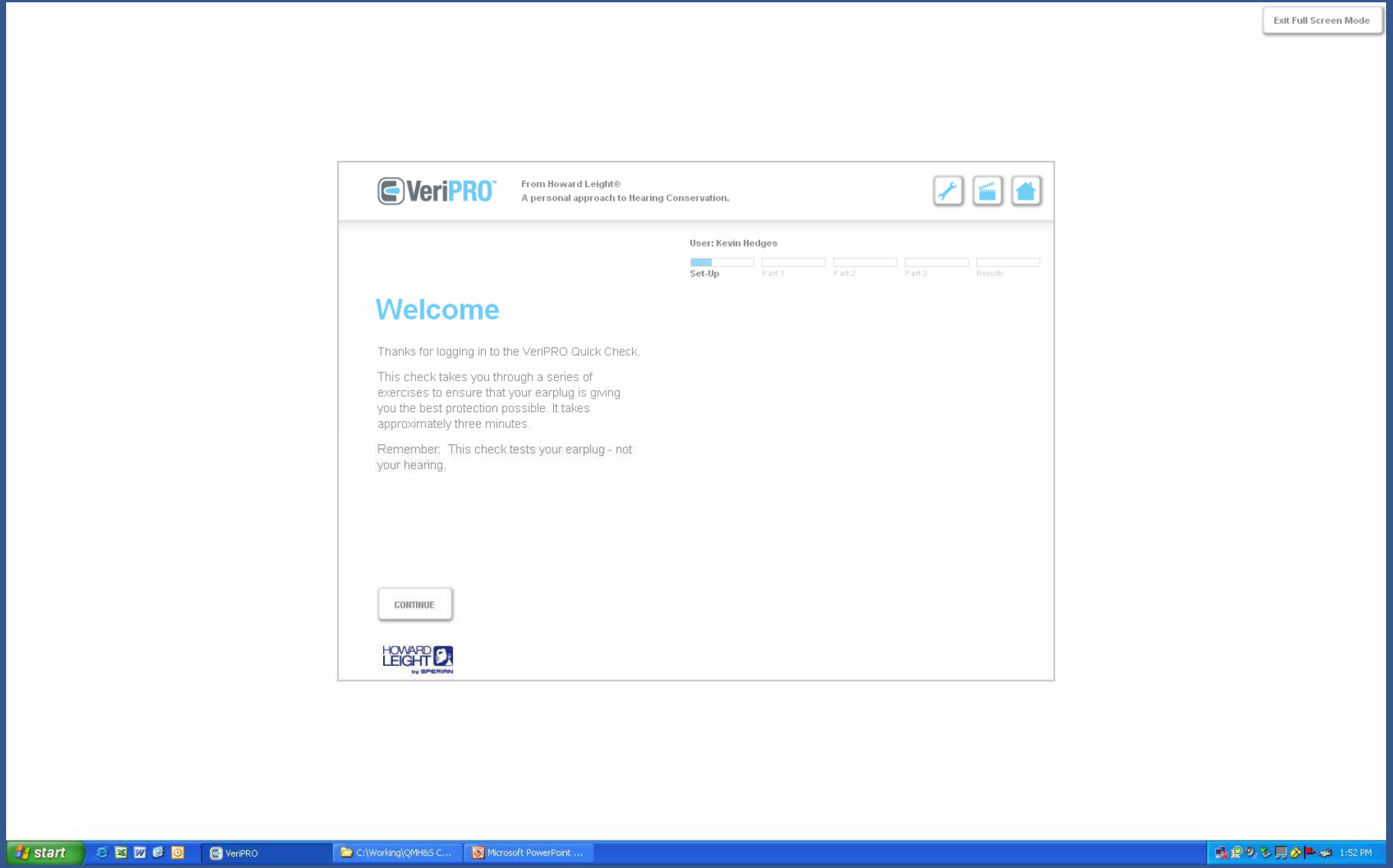
Exit Full Screen Mode
VeriPRO
From Howard Leight®
A personal approach to Hearing Conservation.
User: Kevin Hedges
Set-Up
Part 1
Part 2
Part 3
Results
Welcome
Thanks for logging in to the VeriPRO Quick Check.
This check takes you through a series of exercises to ensure that your earplug is giving you the best protection possible. It takes approximately three minutes.
Remember: This check tests your earplug - not your hearing.
CONTINUE
HOWARD LEIGHT by SPERIAN
start
VeriPRO
C:\Working\QMH&S C...
Microsoft PowerPoint ...
1:52 PM


Exit Full Screen Mode
VeriPRO
From Howard Leight®
A personal approach to Hearing Conservation.
User: Kevin Hedges
Set-Up
Part 1
Part 2
Part 3
Results
Single-Use Earplugs
Max ®
Matrix™
Max Lite ®
Laser Lite ®
MultiMax ®
Multiple-Use Earplugs
SmartFit ®
AirSoft ®
Fusion ®
Quiet ®
Detectable Earplugs
Laser Trak ®
Fusion ® Detectable
SmartFit ® Detectable
Other Earplugs
Other Earplug
NEXT
HOWARD LEIGHT by SPERIAN
start
VeriPRO
C:\Working\QMH&S C...
Microsoft PowerPoint ...
1:58 PM

Exit Full Screen Mode

VeriPRO™ From Howard Leight®
A personal approach to Hearing Conservation.

User: Kevin Hedges

Set-Up | Part 1 | Part 2 | Part 3 | Results

Set-Up

If you are wearing earplugs, please remove them.

Place the headset over your ears, with the blue earphone over your left ear, and the red earphone over your right ear.

You will hear a pulsing tone in your right ear. The slider bar controls the sound volume in the left earphone.

CONTINUE

HOWARD LEIGHT by SPERIAN

start | VeriPRO | C:\Working\QMH&S C... | Microsoft PowerPoint ... | 2:00 PM

Exit Full Screen Mode

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Set-Up | Part 1 | Part 2 | Part 3 | Results

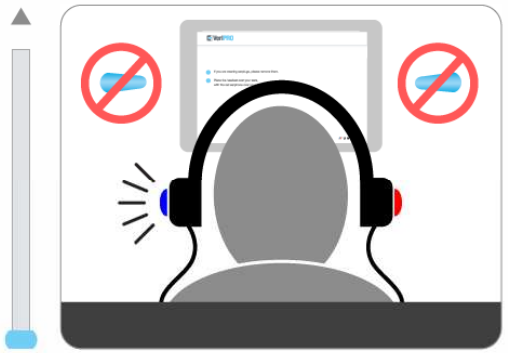
Earplug Check: 500Hz

Using either the up and down arrows on the keyboard, or using the mouse, raise or lower the slider bar until the sound volume in your left ear matches the sound volume in your right ear (which stays the same). Compare the volume only, and not the quality or pitch of the tone.

Click MATCH when the sound volumes match. If you cannot make a match, click CANNOT MATCH.

This is Test 1 of 1

MATCH | CANNOT MATCH | TOO LOUD



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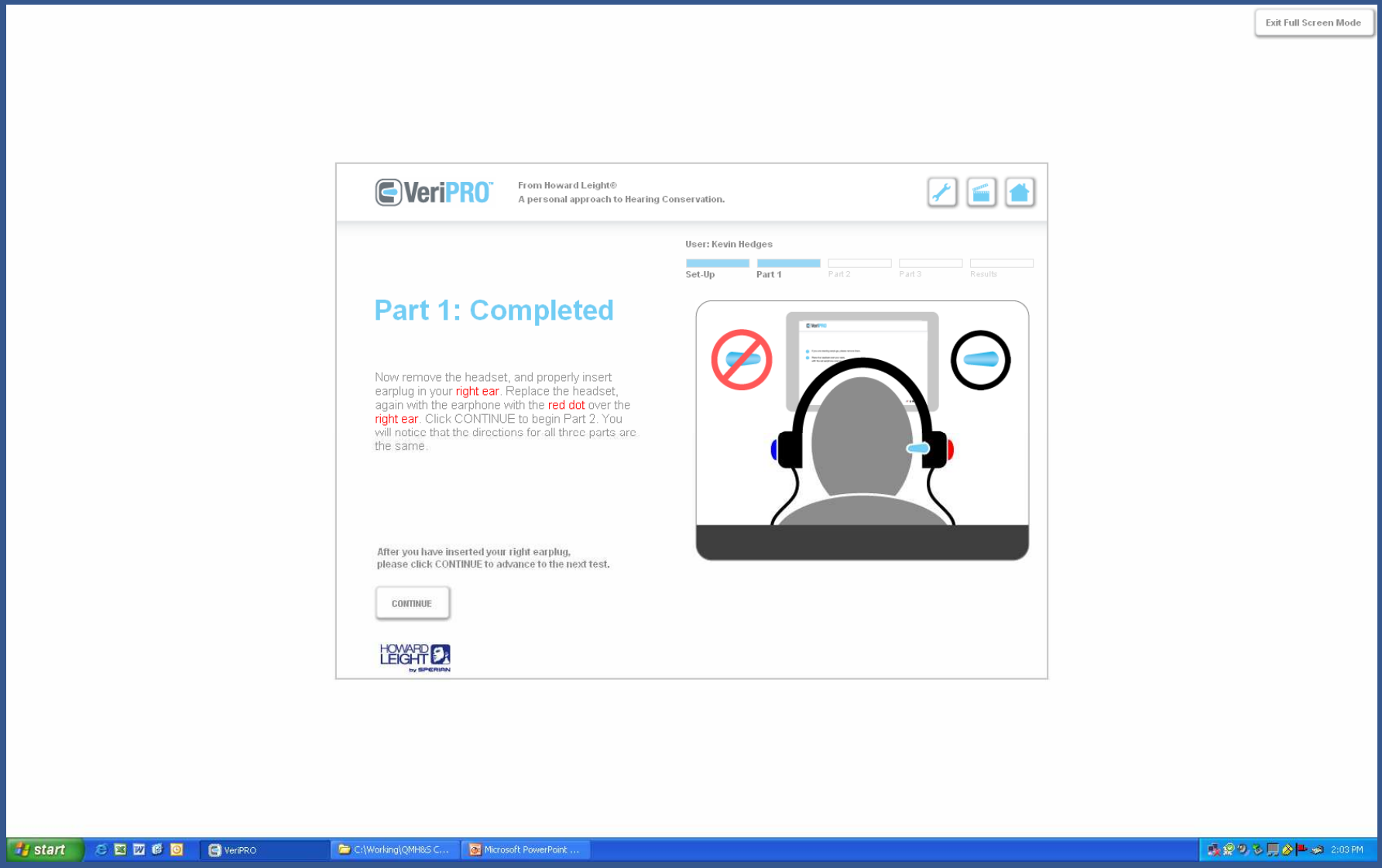

Exit Full Screen Mode
VeriPRO
From Howard Leight®
A personal approach to Hearing Conservation.
User: Kevin Hedges
Set-Up
Part 1
Part 2
Part 3
Results
Part 1: Completed
Now remove the headset, and properly insert earplug in your right ear. Replace the headset, again with the earphone with the red dot over the right ear. Click CONTINUE to begin Part 2. You will notice that the directions for all three parts are the same.
After you have inserted your right earplug, please click CONTINUE to advance to the next test.
CONTINUE
HOWARD LEIGHT
start
VeriPRO
C:\Working\QMH&S C...
Microsoft PowerPoint ...
2:03 PM

Exit Full Screen Mode

VeriPRO™ From Howard Leight®
A personal approach to Hearing Conservation.

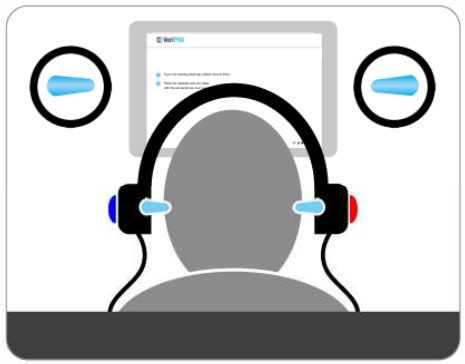
User: Kevin Hedges

Set-Up | Part 1 | Part 2 | Part 3 | Results

Part 2: Completed

Now remove the headset, and properly insert the other earplug in your left ear. You should be wearing **both** earplugs.

Replace the headset, with the red-dotted earphone over the right ear.

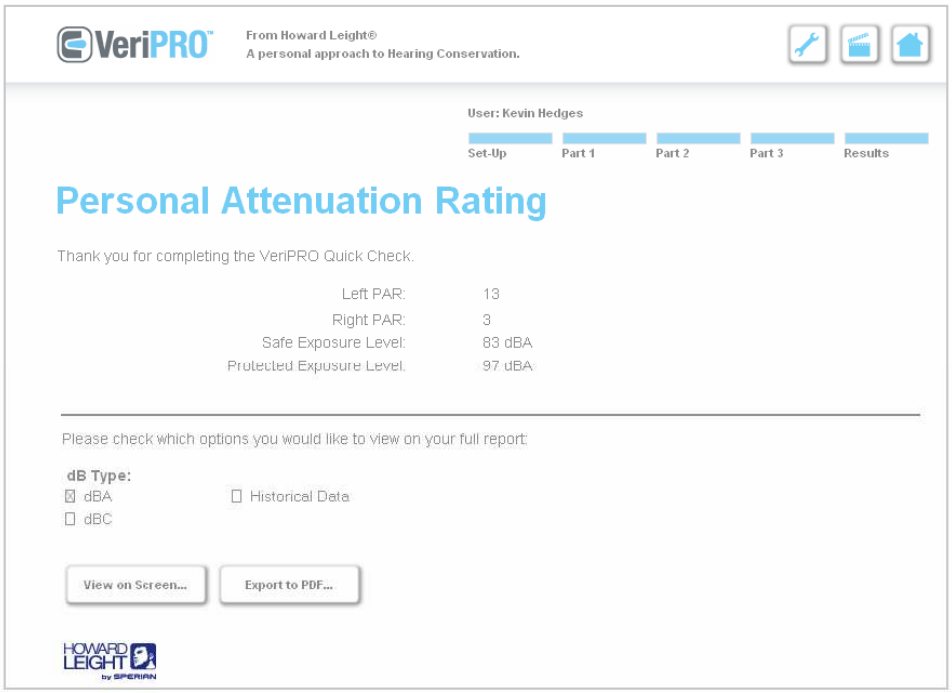


After both earplugs are in place,
please click CONTINUE to advance to the next test.

CONTINUE

HOWARD LEIGHT by SPERIAN

start | VeriPRO | C:\Working\QMH&S C... | Microsoft PowerPoint ... | 2:05 PM


VeriPRO
From Howard Leight®
A personal approach to Hearing Conservation.
User: Kevin Hedges
Set-Up
Part 1
Part 2
Part 3
Results
Personal Attenuation Rating
Thank you for completing the VeriPRO Quick Check.
Left PAR: 13
Right PAR: 3
Safe Exposure Level: 83 dBA
Protected Exposure Level: 97 dBA
Please check which options you would like to view on your full report:
dB Type:
dBA
dBC
Historical Data
View on Screen...
Export to PDF...
HOWARD LEIGHT by SPERIAN

Hearing Protector Individual Report

VeriPRO

User: Kevin Hedges
Test Date: August 24, 2009
Department:
ID #: AIOH 1
Exposure: 100 dBA
Earplug: Laser Lite®

Quick Check Result

The amount of protection provided by the earplug.

Left Ear	Right Ear	Published NRR
13 dBA	3 dBA	32 dB

Safe Exposure Level

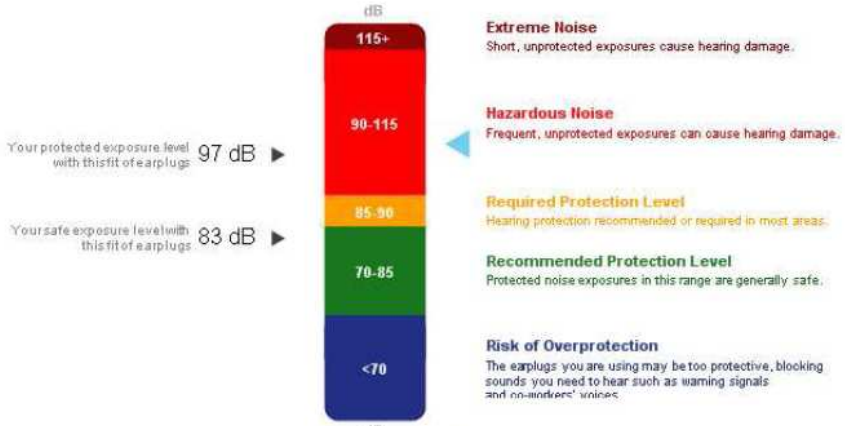
The highest level of noise to which this worker can be safely exposed.*

83 dBA

Protected Exposure Level

The estimated noise level experienced by this worker when wearing earplugs.†

97 dBA



* Calculated from the protection level of the least protected ear.

† Calculated by subtracting the lowest PAR from the exposure level in the employee's profile.

HOWARD LEIGHT by SPERIAN

www.howardleightveripro.com

- Prevent hearing loss through early detection.
- Evaluate effectiveness of hearing protectors (ear plugs).