Control of Noise at Work Regulations 2005

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Disclaimer

This PowerPoint Presentation is an overview of my experience in dealing with noise issues in the working environment. My views and opinions do not confer any professional advice and you are respectfully asked to seek your own expert opinion when dealing and assessing noise issues within your work place.

Huw A Thomas.

How do we hear?

- Pressure fluctuations caused by molecules of air vibrating back an forth around their original position but passing on some of their energy.
- The ear acts as a “Transducer” converting these sound pressure waves into electrical signals which can be interpreted by the brain.
- Audible range 20Hz -20kHz
- Question: which has the widest hearing range cat or dog?
- Answer: Cat 55Hz – 77Hz
- Compared to dog 64Hz – 44Hz.

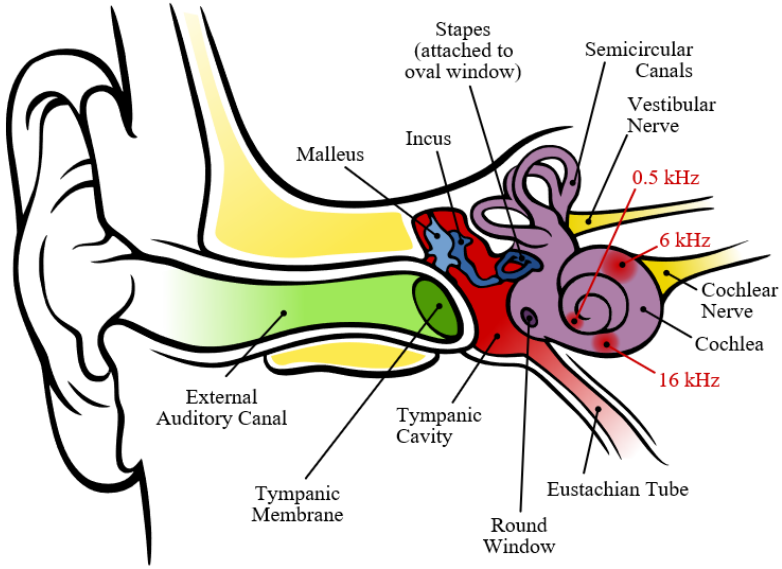
“Mechanics” of hearing

- Sounds are pressure variations due to particles moving back an forth.
- No particles = no sound.

- “Meatus” tube connecting outer ear resonates at 3KHz.
- Liquid filled inner ear – impedance mismatch.
- Small bones act like step-up transformer (x 20 or approximately 30dB) to compensate difference in air- liquid transmission).
- Temporary threshold shift (e.g. concerts)

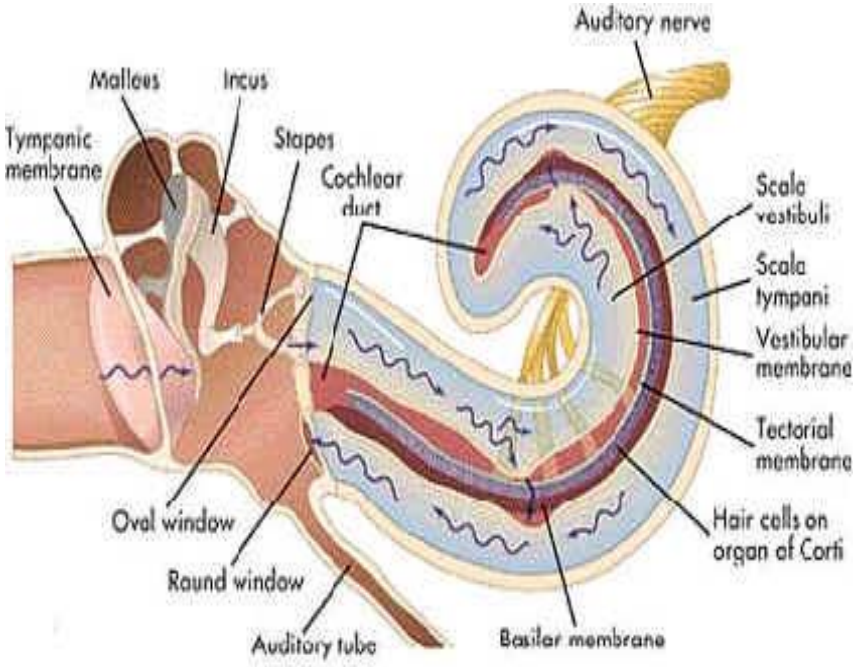
http://www.hear-it.org/temporary-threshold-shift

- Permanent threshold shift.



Cochlea

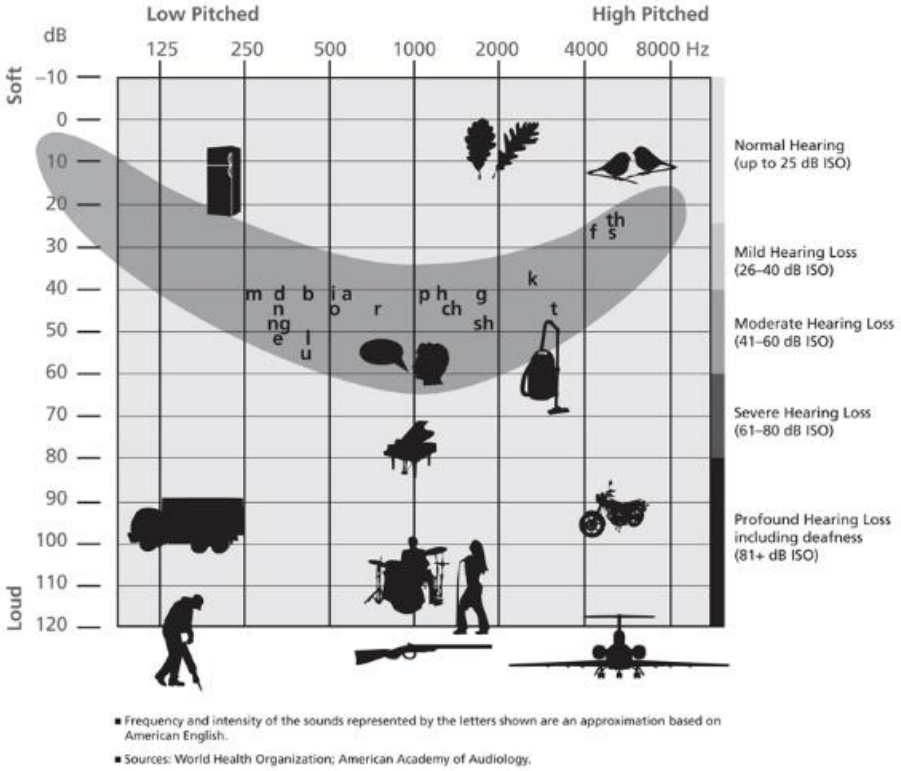
- Cochlea in the inner ear – coiled spiral tube 3.5cm long containing about 17,000 small hair cells which respond to sound and send electrical impulse to brain.
- https://www.youtube.com/watch?annotation_id=annotation_1362900087&feature=iv&src_vid=MXt_gX2Srgo&v=T8lKKlnnC6M



Picture: Canadian Academy

Hearing Loss

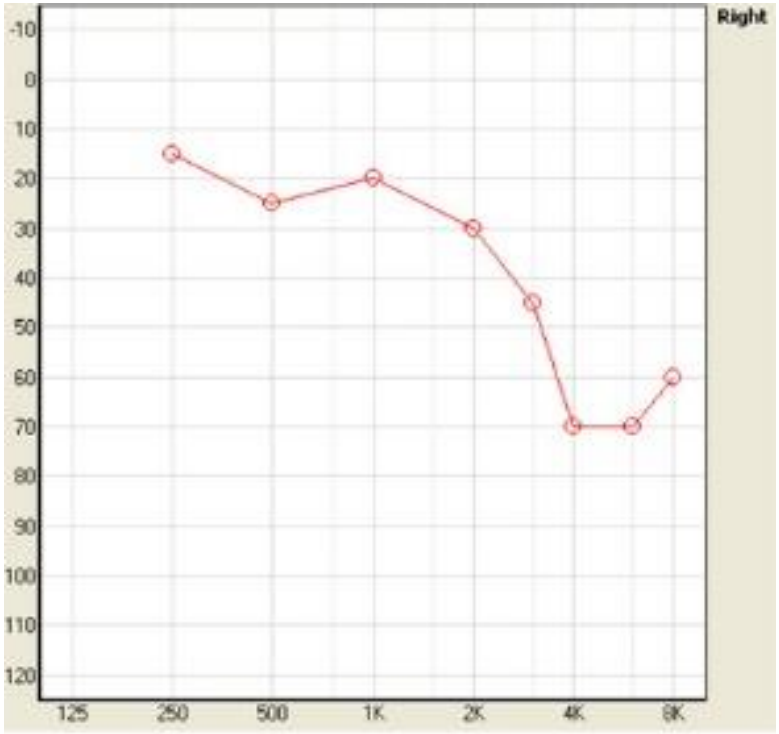
Speech banana (Hearing Link)

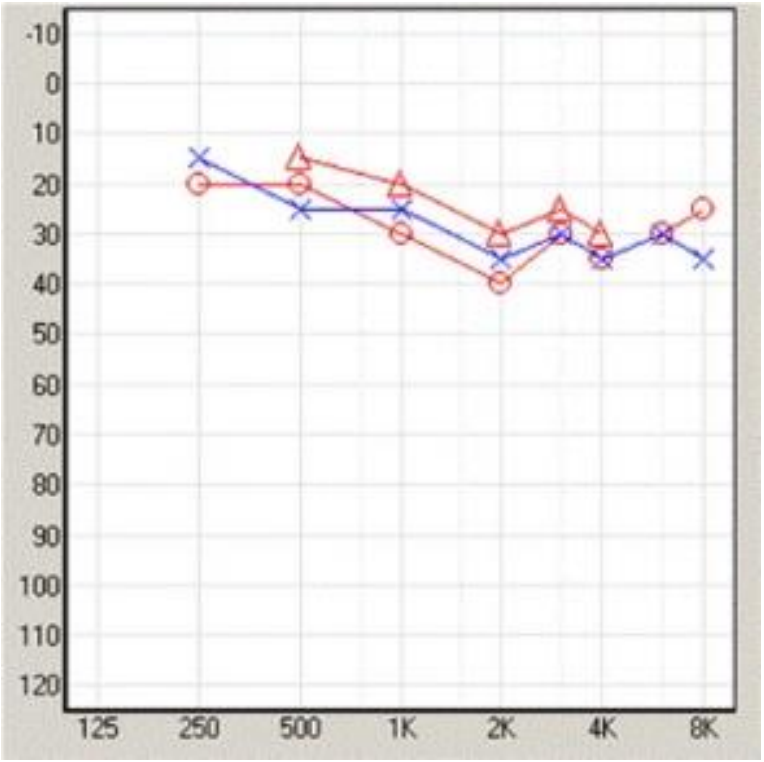


- Frequency and intensity of the sounds represented by the letters shown are an approximation based on American English.
- Sources: World Health Organization; American Academy of Audiology.

Hearing loss

Age –v- Noise Related





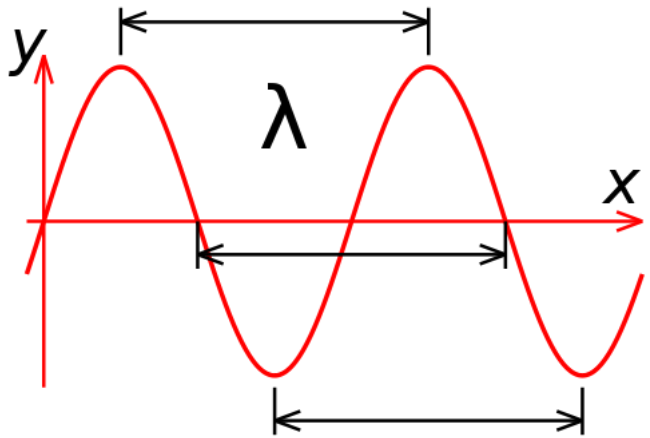
How is noise measured?

- Pressure {Pa}
- 20µPa (10^{-5}) threshold of hearing
- 100 Pa threshold of pain.
- Decibel dB (not db or Db):-
  - = Power ratio.
  - = equates to audible sound range 0 – 130dB.
  - = 30dB =100 x Greater than 10dB.

Frequency and wavelength

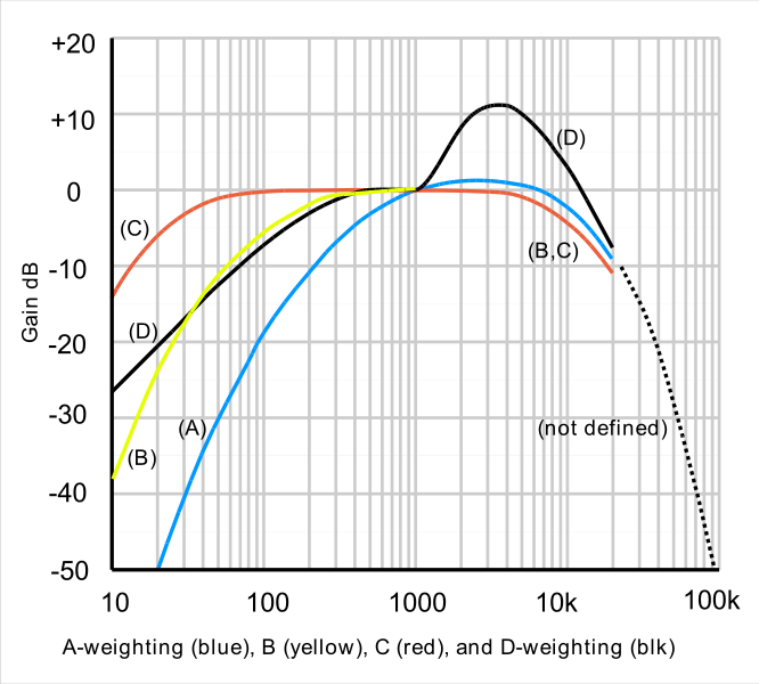
- The number of pressure fluctuations per second is called frequency measured in Hertz.
- Wavelength is the distance travelled by sound during one complete vibration.
- Velocity (C) = frequency (*f*) x wavelength (λ)
- Speed of sound in air 343m/s, so:-

λ of 1Hz = 343/1 = 343m.



A and C weightings.

- Many different weightings!
- Mainly use three.
- A weighting (40Phon),
- C weighting (100Phon)
- New Z weighting [L].
- Frequency range 20Hz to 20,000Hz



Filters

- Sound level made up of separate frequency bands.
- Middle C = 261Hz
- Octave Band. 16, 31.5, 63, 125, 250 etc.
- Third Octave.
- Narrow band,

Why is noise a problem?

- 2 million people exposed to noise at work which may be harmful.
- 1.1 million people relying on PPE to prevent harm.
- 500,000 with hearing loss due to noise at work.

(HSE)

Symptoms and early signs of hearing loss.

- Conversation becomes difficult or impossible
- Your family complains about the television being too loud
- You have trouble using the telephone
- You find it difficult to catch sounds like 't', 'd' and 's', so you confuse similar words
- Permanent tinnitus (ringing, whistling, buzzing or humming in the ears) can also be caused

Legislation

- Control of Noise at Work Regulations 2005.
- Came into force 6 April 2006 except for
  - Music and entertainment industry (6/04/08)
- Levels have changed:-
  - Lower exposure action values 80dBA over 8hrs and 135dBC Peak.
  - Upper exposure action values 85dBA over 8hrs and 137dBC Peak.
  - Exposure limit values 87dBA and 140dBC Peak.

- "Where the exposure of an employee to noise varies markedly from day to day (5dB), an employer may use weekly personal noise exposure in place of daily personal noise exposure for the purpose of compliance with these Regulations".

How significant is the change?

5 dB doesn't sound a lot but it is like going from this →

How significant is the change?

To this →

How do I know if I've got a problem?

- Do your employees have to raise their voices to carry out a normal conversation when about 2 m apart for at least part of the day?

- Do your employees use noisy powered tools or machinery for more than half an hour each day?

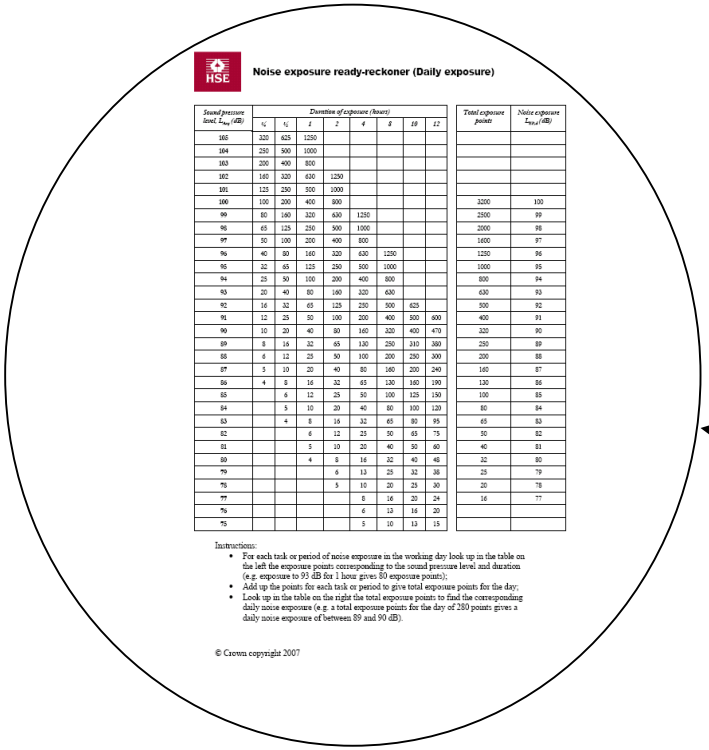
- Are there noises due to impacts (such as hammering, drop forging, pneumatic impact tools etc.), explosive sources such as cartridge operated tools or detonators, or guns?
- If you have answered yes to any of these you will need to assess the risks to decide whether any further action is needed, and plan how you will do it.

Risk assessment

- Identify where there may be a risk from noise and who is likely to be affected;
- Contain a reliable estimate of your employees' exposures, and compare the exposure with the exposure action values and limit values;
- Identify what you need to do to comply with the law, e.g. whether noise-control measures or hearing protection are needed, and, if so, where and what type; and
- Identify any employees who need to be provided with health surveillance and whether any are at particular risk.
- drawn up by someone who is competent to carry out the task; and is based on advice and information from people who are competent to provide it.

Exposure Calculators

Spreadsheets

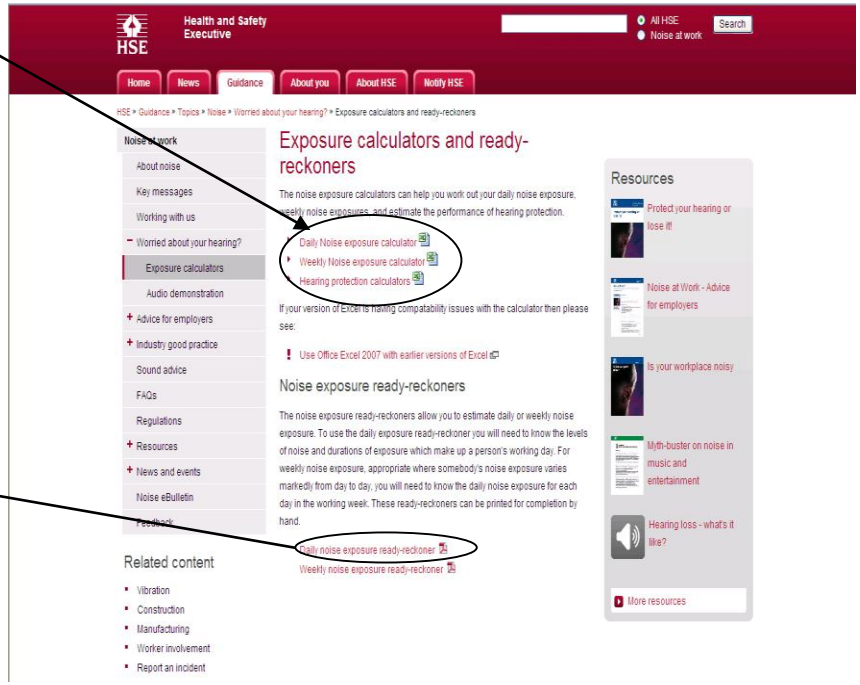


Noise exposure ready-reckoner (Daily exposure)

Sound pressure level, L_{eq} (dB)	Duration of exposure (hours)								Total exposure points	Noise exposure $L_{EP,d}$ (dB)
	¼	½	1	2	4	8	10	12		
105	320	625	1250							
104	250	500	1000							
103	200	400	800							
102	160	320	630	1250						
101	125	250	500	1000						
100	100	200	400	800					3200	100
99	80	160	320	630	1250				2500	99
98	65	125	250	500	1000				2000	98
97	50	100	200	400	800				1600	97
96	40	80	160	320	630	1250			1250	96
95	32	65	125	250	500	1000			1000	95
94	25	50	100	200	400	800			800	94
93	20	40	80	160	320	630			630	93
92	16	32	65	125	250	500	625		500	92
91	12	25	50	100	200	400	500	600	400	91
90	10	20	40	80	160	320	400	470	320	90
89	8	16	32	65	130	250	310	380	250	89
88	6	12	25	50	100	200	250	300	200	88
87	5	10	20	40	80	160	200	240	160	87
86	4	8	16	32	65	130	160	190	130	86
85		6	12	25	50	100	125	150	100	85
84		5	10	20	40	80	100	120	80	84
83		4	8	16	32	65	80	95	65	83
82			6	12	25	50	65	75	50	82
81			5	10	20	40	50	60	40	81
80			4	8	16	32	40	48	32	80
79				6	13	25	32	38	25	79
78				5	10	20	25	30	20	78
77					8	16	20	24	16	77
76					6	13	16	20		
75					5	10	13	15		

Instructions:

- For each task or period of noise exposure in the working day look up in the table on the left the exposure points corresponding to the sound pressure level and duration (e.g. exposure to 93 dB for 1 hour gives 80 exposure points);
- Add up the points for each task or period to give total exposure points for the day;
- Look up in the table on the right the total exposure points to find the corresponding daily noise exposure (e.g. a total exposure points for the day of 280 points gives a daily noise exposure of between 89 and 90 dB).



Question.

- **If an employee undertakes a noisy activity known to be 87dB(A) for 2 hours, then goes on to undertake further noisy activities of 82dB(A) for 4hours and a further activity of 84dB(A) for 1hour, what is the cumulative noise level?**

Exposure Points

87dB x 2hrs = 40

82dB x 4hrs = 25

84dB x 1hrs = 10

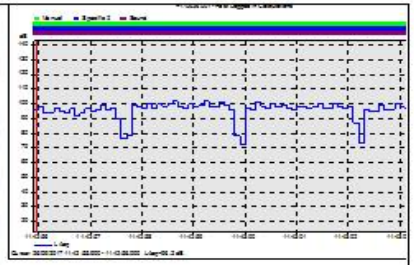
Total Noise Exposure points = 75

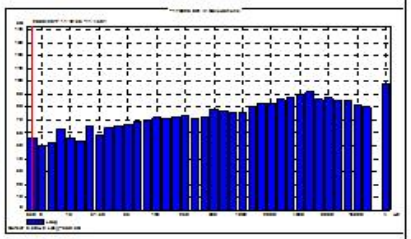
***L*EP, d = 83 to 84dB.**

Air Socket

3.0 MEASURED VALUES

3.1 MAC Air Socket.

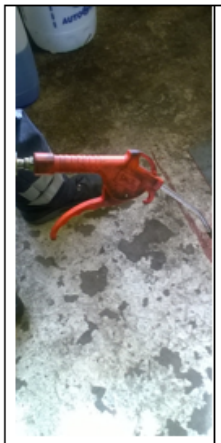


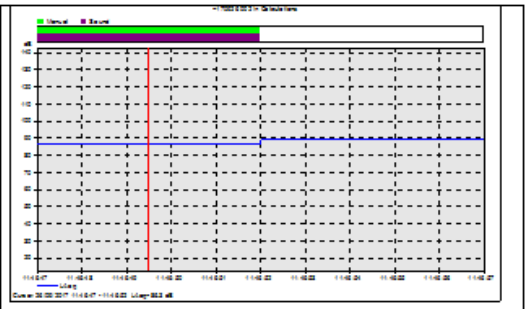


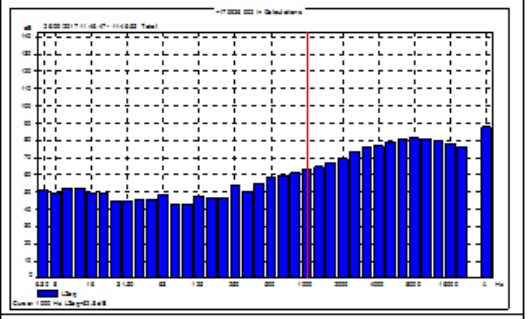
Specific Noise Level	**97.7dBLAeq.**
No Peaks over 135dB	**0**

Air Line.

3.2 Air Line.

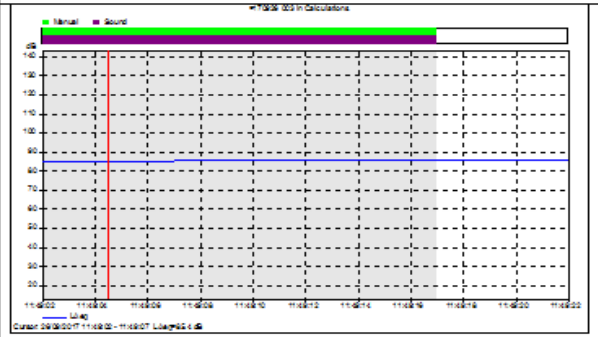
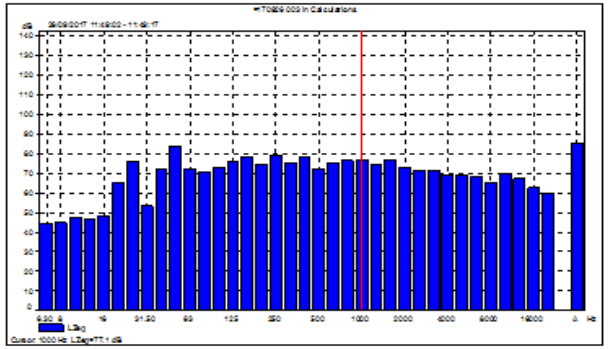




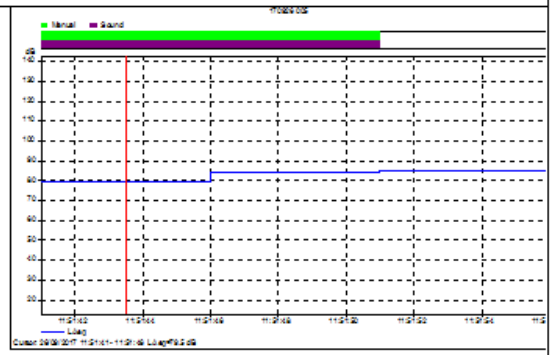
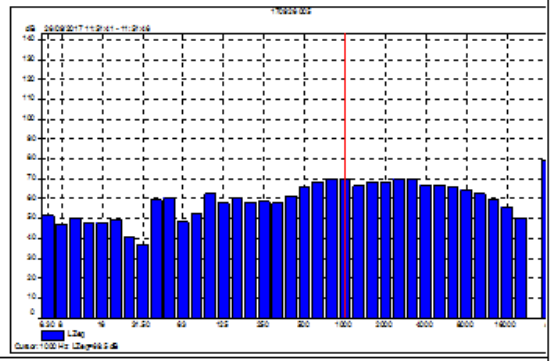


Specific Noise Level	**86.3dBLAeq.**
No Peaks over 135dB	**0**
Compressor	

Compressor

Compressor	
	 
Specific Noise Level	**85.5dBLAeq.**
No Peaks over 135dB	**0**

Bench Grinder

Bench Grinder	
	 
Specific Noise Level	**84.4dBLAeq.**
No Peaks over 135dB	**0**

Recycling Centre

It was agreed that the noise assessment would look at:-

- Noise exposures of individuals within generic groups.
- Specific tasks e.g. Glass handling.
- Areas required to be designated Hearing Protection Zones.
- Consider whether the current hearing protection offered was sufficient.
- D badges on the clothing of employees.
- Employees were provided with a form to record their activities throughout the day.
- 90.7dB Lepd and 143dB Cpeak
- **Halving of the time spent in a noisy area will reduce noise exposure by 3 dB.**

Regulation 6(2)

“If any employee is likely to be exposed to noise at or above an upper exposure action value, the employer shall reduce exposure to as low a level as is reasonably practicable by establishing and implementing a programme of organisational and technical measures, excluding the provision of personal hearing protectors, which is appropriate to the activity.”

Hearing Protection

Regulation 7(1) Without prejudice to the provisions of regulation 6, an employer who carries out work which is likely to expose any employees to noise at or above a lower exposure action value shall make personal hearing protectors available upon request to any employee who is so exposed.

Regulation 7(2) Without prejudice to the provisions of regulation 6, if an employer is unable by other means to reduce the levels of noise to which an employee is likely to be exposed to below an upper exposure action value, he shall provide personal hearing protectors to any employee who is so exposed.

Hearing Protection.

- Last resort because they rely on individual workers using them correctly, they can also fail and effectiveness of hearing protection is reliant on maintenance and whether it fits correctly.
- You should use the results from your noise assessment and the information from hearing protection suppliers to make the best choice of hearing protection. Aim to get below 85 dB at the ear.
- provide your employees with a suitable range of effective hearing protectors so they can choose ones that suit them.

Centurion (Aegean) Helmet mounted Ear Defenders (SNR 30dB)

Figure 2: Attenuation information for Centurion Aegean Ear Defenders.

Frequency Hz	63	125	250	500	1kHz	2kHz	4kHz	8kHz
Mean Attenuation (dB)	18.1	16.6	21.8	25.6	37.5	35.6	44	41.6
Standard Deviation.	3.3	3.5	2.9	3.8	2.6	2.9	6.6	7.2
Assumed Protection.	14.8	13	18.9	21.8	34.9	32.7	37.4	34.4

Table 3: Octave band attenuation for Centurion Aegean Ear Defender.

- the highest daily dose was 90.7dBA *L*EP, d and the Peak noise was 143.5dBC.
- Need to reduce these noise levels by 5.7dB and 6.5dB to reduce both noise levels to below the Upper Action Values.
- The various sources of noise at the site make it difficult to obtain a common frequency spectrum for all activities
- the lowest attenuation achieved by the ear defenders is 13dB at 125Hz. this is 6.5dB more than the required attenuation.
- with correct fitting, this ear defender choice would provide a reduction in noise levels at the Ear to below both the Upper Action Values and also the Lower Exposure Action Values of 80dBA *L*EP, d and 135dBC Peak.

Hearing Protection Zone

If in any area of the workplace under the control of the employer an employee is likely to be exposed to noise at or above an upper exposure action value for any reason the employer shall ensure that **THE AREA IS DESIGNATED A HEARING PROTECTION ZONE.** Regulation 7(3)(a)

What do you need to tell your employees?

- the likely noise exposure and the risk to hearing this noise creates;
- what you are doing to control risks and exposures;
- where and how people can obtain hearing protection;
- how to report defects in hearing protection and noise-control equipment
- what their duties are under the Noise Regulations 2005;
- what they should do to minimise the risk, such as the proper way to use hearing protection and other noise-control equipment, how to look after it and store it, and where to use it;
- your health surveillance systems.

Health Surveillance

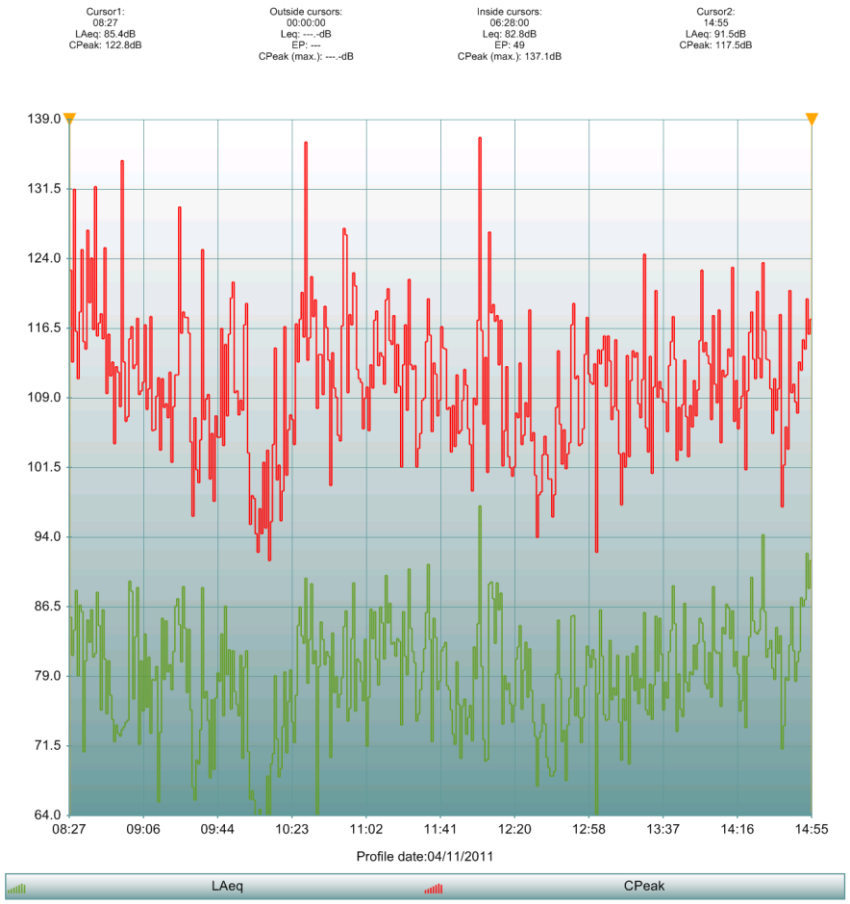
Regulation 9(1) If the risk assessment indicates that there is a risk to the health of his employees who are, or are liable to be, exposed to noise, the employer shall ensure that such employees are placed under suitable health surveillance, which shall include testing of their hearing.

i.e. You must provide health surveillance (hearing checks) for all your employees who are likely to be frequently exposed above the upper exposure action values, or are at risk for any reason, e.g. they already suffer from hearing loss or are particularly sensitive to damage.

Health Surveillance

- Ideally, you would start the health surveillance before people are exposed to noise (i.e. for new starters or those changing jobs), to give a baseline.
- Annually for the first two years of employment and then at three-yearly intervals (although this may need to be more frequent if any problem with hearing is detected or where the risk of hearing damage is high).

Example A



Waste handling site.

82.8dB LAeq.

137dB C Peak.

Above Upper Action value based on C Peak.

Example B

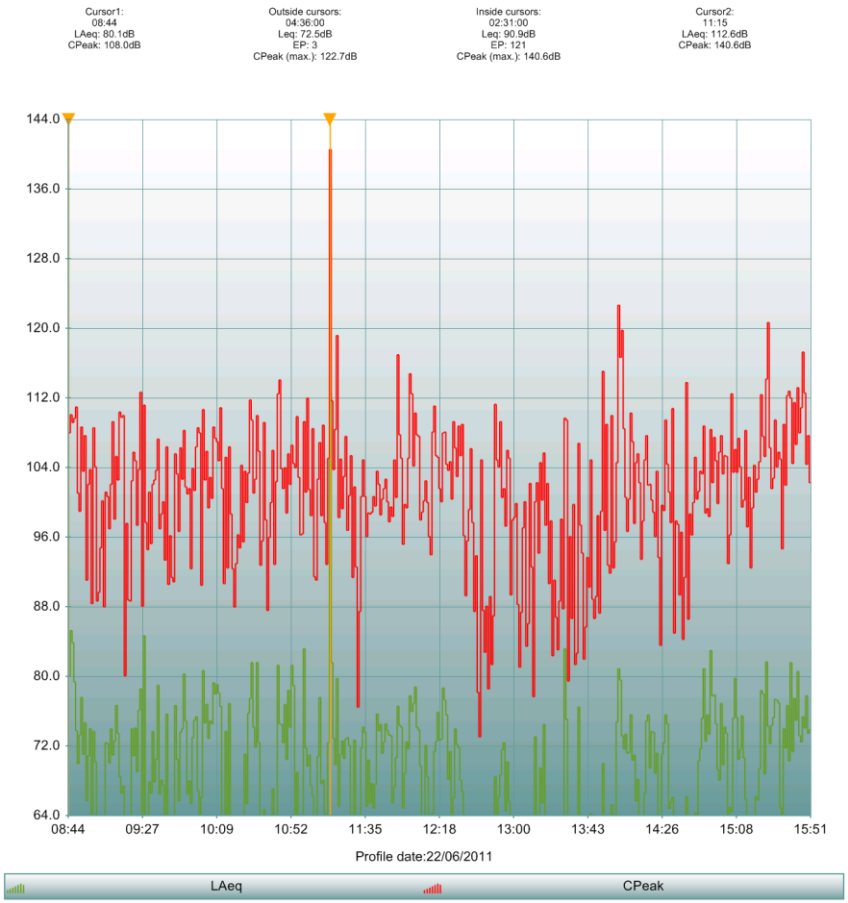
Amplified Music.

94dB LAeq

122.4 C Peak

What's your view?

Example C

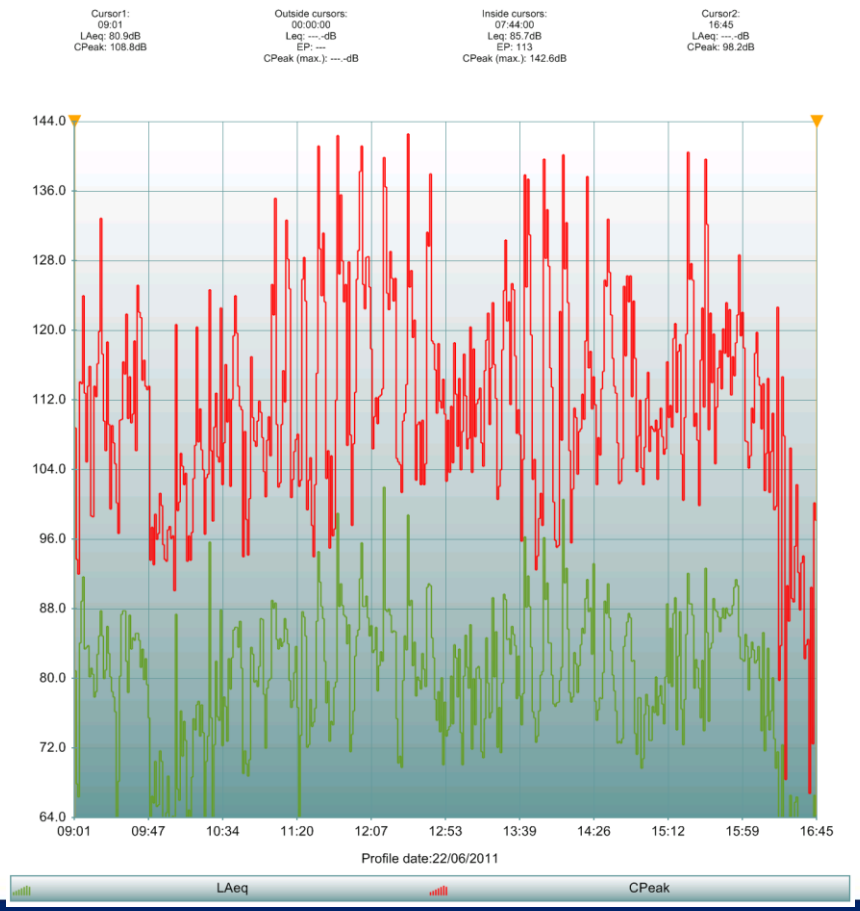


Office worker.

Straying into noisy area?

Do you think it's a problem if so why?

Example D



Factory.

85.7dBLAeq

142.6dB CPeak

Problem ?

Thank you for listening

Any Questions?