University of St Andrews

Noise at work

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University of St Andrews

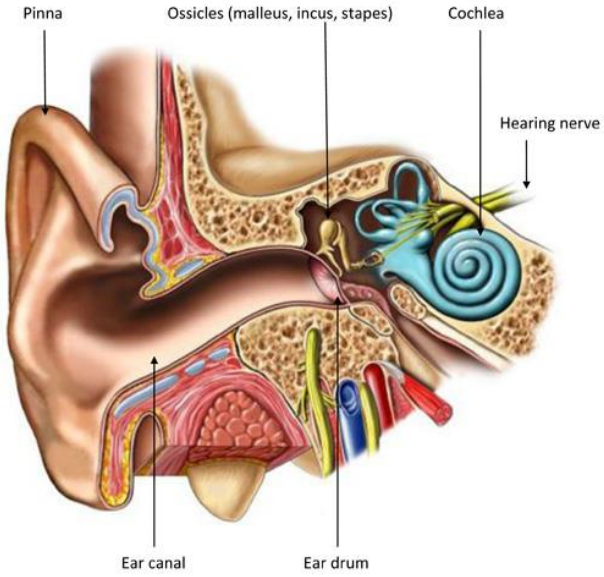
Guidance on Managing Noise at Work

(Control of Noise at Work Regulations 2005)

Introduction

There have been approximately 22000 new cases of noise induced hearing problems (eg from total deafness, tinitus) reported to the HSE in 2010 / 2011 (http://www.hse.gov.uk/statistics/lfs/swit3w12.xls). Research has shown that approximately 2 million workers are exposed to to noise levels which may be potentially harmful. As a consequence noise is a major cause of injury to workers.

The ear picks up sound waves through the ear canal. The sound is then transferred from the eardrum to the Cochlea which is the inner ear (through the bones of the middle ear). The cochlea is lined with very fine hairs (called stereocilia) which are set in motion by the sound wave as it moves through the fluid of the cochlea. The motion of the sound waves is then transmitted to the brain via the auditory nerve.



If the sound is very loud, it causes to much motion of the cochlea hairs causing damage to the hairs.

Noise can cause acute injury eg perforated ear drum where the noise levels are extremely loud. There are times when there is temporary hearing loss but the hearing comes back. In such situations although the hearing has returned, there is often permanent damage to the cochlea hairs. In most noise induced hearing loss case, the damage is due to cumulative damage to the cochlea hairs over many years of exposure to loud noise.

Effects of Noise Induced Hearing Loss

The effects of noise induce hearing damage include:

- Lack of hearing in one or both ears
- Failing to hear the telephone ring or hold a conversation over the telephone
- Missing sentences in a conversation
- Struggling to hear when there is background noise
- Having to turn the television or radio up loudly in order to hear it

- Failing to hear the doorbell
- Constant ringing/buzzing or hissing noises, which is due to tinnitus.

The effects of noise are not always noticeable at the time of the exposure thus it is very important that managers and workers are aware of the hazard and potential risks and put in place appropriate control measures.

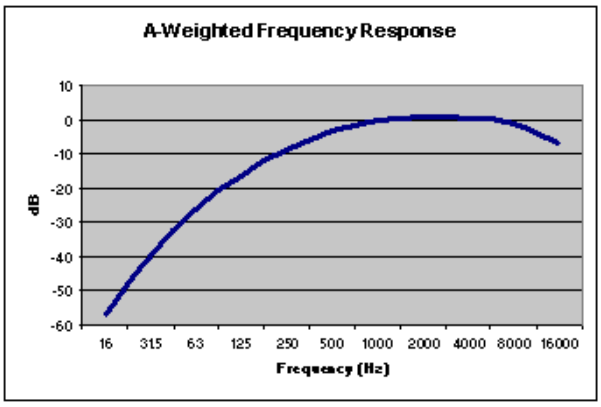
Noise Measurement

Noise is measured using a scale called deciBels (dB) which is a logarithmic scale. As dBis a logarithmic scale, a change in approximately 3 dB(A) is double the noise levels

As the human ear is particularly sensitive to specific frequencies , the measurement is weighted according to the specific ranges that are, on average, more sensitive to noise. The usual weighting used is the A Weighting Scale.

A Weighting

The most common weighting that is used in noise measurement is *A-Weighting*. Like the human ear, this effectively cuts off the lower and higher frequencies that the average person cannot hear.



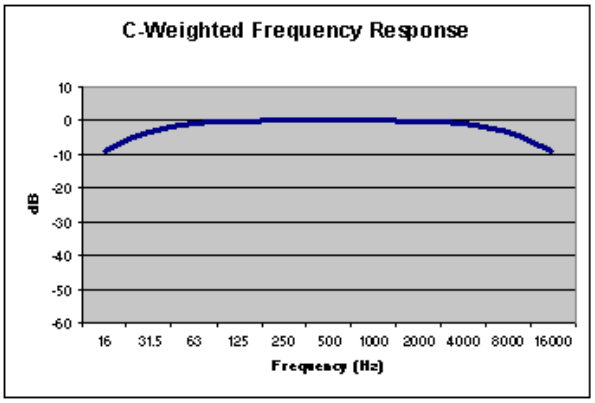
From: Noise Meters Ltd.
URL: http://www.noisemeters.co.uk/help/faq/frequency-weighting.asp

C Weighting

The response of the human ear varies with the sound level. At higher levels, 100 dB and above, the ear's response is flatter, as shown in the C-Weighted Response to the right.

Although the A-Weighted response is used for most applications, C-Weighting is also available on many sound level meters. C Weighting is usually used for Peak measurements and also in some entertainment noise measurement, where the transmission of bass noise can be a problem.

C-weighted measurements are expressed as **dBC** or **dB(C)**.



From: Noise Meters Ltd.
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NOTE: It is extremely important that sound level measurements are made using the correct frequency weighting - usually A-weighting. For example, measuring a tonal noise of around 31 Hz could result in a 40 dB error if using C-weighting instead of A-weighting.

Examples of the levels of noise are:

(From HSE Document -**Noise at work** Guidance for employers on the Control of Noise at Work Regulations 2005 INDG362(rev1) 2011 - http://www.hse.gov.uk/pubns/indg362.pdf)

Legislation

The Control of Noise at Work Regulations 2005 place duties on employers and employees with regard to identifying noise risks and then implementing appropriate controls to eliminate or minimise the risks of noise.

Other legislation may also be involved on the management of noise at work for example the Provision and Use of Work Equipment Regulations 1998, Control of Vibration at Work Regulations 2005.

Requirements of the Control of Noise at Work Regulations 2005

Where it is thought that there may be an issue with noise (for example you have to shout at somebody to be heard when standing 1 metre apart) then a noise survey must be done on the workplace. This will be organised by the Director of Environmental, Health and Safety Services.

Noise Risk Assessment Process

Once the noise survey has been completed, then a risk assessment should be undertaken using the noise survey data as the basis of the noise hazard of the workplace. The risk assessment should be based on the standard principles of such assessments which is to

- Identify the hazards and the causes of the noise hazard (eg the machines etc);
- Who is at risk
- Determine the risk - which could dependent on many factors, For Example
    - Does the noise level exceed the Maximum Exposure Limit of 87 dB(A)
    - Does the noise level exceed the Action levels of 80 or 85 dB(A)
    - Noise levels (8 hour working day and peak sound levels);
    - Time of exposure
    - The equipment generating the noise;
    - The activity generating the noise
    - Location of equipment eg noise from a piece of machinery in a very enclosed space will be louder than if operated outside,
    - How far away will the worker be from the source of the noise,

Once the risks have been determined, then appropriate control measures must be implemented. There is a prioritisation of controls which is as follows:

- **Eliminate -** Do you really need to do the operation generating the noise? If not, replace it with a technique which does not generate high noise levels.

- **Substitute -** If you cannot eliminate the noise, then substitute the noise generating equipment with equipment that generates less noise. An example of this type of control would be to substitute old pieces of equipment with newer equipment of a higher standard which generates less noise.

- **Engineering Controls -** Where it is not possible to eliminate or substitute to minimise noise risks, then appropriate engineered control measures should be put in place. This is to stop noise being transmitted to the workers and others in the locality. This type of control will include
    - workers working from acoustic chambers to keep noise out or
    - undertaking the activity in an area which will not reverberate or
    - Covering equipment to dampen noise levels
    - Putting equipment onto shock absorbing materials to reduce noise generation
    - Putting equipment onto no vibrating surfaces thus reducing noise generation

- **Procedural Controls** - This is often used with engineering controls for example restricting the time workers use a particular piece of machinery or otherwise may be exposed to high noise levels.

- **Personal Protective Equipment (PPE)** - PPE should always be issued as a last resort as a control measure as it only protects the worker concerned and is only limited in its

effectiveness. (see section on Ear Protectors). Before ear protection is issued, it is important to determine the noise levels at the workplace and if possible determine the frequency of the noise as well. The type of ear protection will reduce the noise levels down to about 70 dB(A) and also deal with the particular frequency of the noise being produced. It is very important not to over suppress hearing as workers still need to be able to hear the fire alarm and any other warning messages shouted at the worker.

Action Levels

The Control of Noise at Work Regulations have set specific Noise Maximum Exposure Limits and Action Levels (Upper and Lower Action Levels) where specific actions must be undertaken. These limits are

Noise Action Level	Noise Level
First Action Level	80dB(A) - Over an 8 hour working day
	135 dB(C) Peak sound pressure
Upper Action Level	85 dB(A) over a 8 hour working day
	137 dB(C) Peak Sound Pressure
Noise Exposure Limit	87dB(A) over a 8 hour working day
	140 dB(C) Peak Sound Pressure

It is a criminal offence to expose any worker to a noise level greater than the Maximum Exposure Limit. If it is considered that this level of noise will be reached then it is very important to stop the work and get the Director of Environmental, Health and Safety Services to measure the noise levels.

To determine the noise dose level for an 8 hour working period from a spot noise measurement, you will need to use the HSE Noise calculator (http://www.hse.gov.uk/noise/dailycalc.xls). From this the noise dose for 8 hours can be worked out even if many different noisy machines are used.

The following actions are required under the above regulations:

TABLE 1- Control measures to be implemented at specific Action Levels

Actions Required	Noise Dose Less than 80 dB(A)	Noise level between 80-85dB(A)	Noise Level Between 85 and 87 dB(A)	Noise Level Above 87 dB(A)
EMPLOYERS DUTIES				
General Duties - Risk of hearing damage to be reduced to the lowest level reasonably practicable	**X**	**X**	**X**	**X**
Assessment of Noise Exposure				
Noise assessment to be made by a 'Competent Person'	**------**	**X**	**X**	**X**
Record of assessment to be kept until a new one is performed	**------**	**X**	**X**	**X**
Noise reduction				
Reduce noise exposure as far as reasonably practicable by means other than ear protectors	**-----**	**X**	**X**	**X**
Provision of Information to workers				
Provide adequate information, instruction and training about the risks to hearing, what the School / Unit should do to minimise the risk of high noise and how they can obtain ear protection if they are exposed to noise of greater than 80 dB(A) and other obligations under the regulations	**X**	**X**	**X**	**X**
Mark 'Ear Protection Zones' with appropriate notices	**-------**	**-------**	**X**	**X**

Actions Required	Noise Dose Less than 80 dB(A)	Noise level between 80-85dB(A)	Noise Level Between 85 and 87 dB(A)	Noise Level Above 87 dB(A)
Ear Protectors				
The Head of School/Unit should ensure that, so far as reasonably practicable, ear protectors are:				
• Provided to all employees who as for them	------	X	-------	-------
• Provide to all employees exposed to the Upper Action level and above	------	------	X	X
• Maintained and repaired	------	X	X	X
• Ensure all those entering a 'Ear protection Zone' are wearing appropriate hearing protection to reduce noise to below the Lower Action Level	------	--------	X	X
Maintenance and Use of Equipment				
The Head of School/Unit should ensure that, so far as reasonably practicable:				
• All equipment provided under these regulations is appropriately used	------	X	X	X
• is suitably maintained and records kept of such maintenance	-------	X	X	X
EMPLOYEES DUTIES				
Use of Equipment				
So far as is reasonably practicable, employees must wear ear protection	----	------	X	X
Use any other equipment supplied	-----	X	X	X
Report any defects discovered to the relevant person in the School/Unit	-----	X	X	X
MACHINE MANUFACTURER AND/OR SUPPLIER				
Provide information on the nosie likely to be generated by machinery supplied	------	X	X	X

Hearing Protection Zone

Where the noise levels exceed the Upper Action Levels (85 dB(A) or 135 dB(C)) then the area must be deemed to be a Hearing Protection Zone and labelled with the following sign

In such areas, all reasonably practicable means must be made to reduce the levels of noise other than using personal protection. Where these controls still do not reduce the noise levels to below 80 dB(A), then in such areas, appropriate ear protection **must** be supplied by managers and **MUST** be worn by workers.

All staff who work in a 'Hearing Protection Zone' should undergo appropriate health surveillance of their hearing. This should be part of the risk assessment for the work activity. Advice on such health surveillance can be obtained from the Occupational Health Adviser.

Ear Protectors

Where noise levels cannot be reduced by other means then consideration should be given to issuing ear protection.

There are many different types of ear protection including ear muffs, ear plugs:

It is very important however that the correct type of ear protection is used. Firstly you need to have a measurement of the level of noise that a worker will be exposed to over an 8 hour period. You should then determine what level of protection is required. This can be done using either the HSE Hearing Protection Calculator (URL: http://www.hse.gov.uk/noise/hearingcalc.xls) or a similar calculator provided by ARCO (URL: http://www.arco.co.uk/features/Hearing_Protection_Calculator). This will provide you with the information to reduce the noise levels to about 70 dB(A) over a 8 hour working day.

The supplier of the equipment will provide details of the protection provided by the ear protection which is the SNR (Single Number Rating). You should then pick the appropriate hearing

protection with a SNR number equal to the required protection using the HSE Hearing protection Calculator.

When issuing hearing protection it is very important to take into account the activity and the length of time the protection will be worn. Uncomfortable PPE will tend not to be used, sot eh equipment must be as comfortable as possible. Where other personal protection needs to be worn with hearing protection (eg with a hard hat and or a visor), you should ensure that the equipment is compatible.

It is vital that hearing protection is worn continuously while undertaking high noise level activities. As noise is measured in a logarithmic scale if the equipment is not worn continuously, then the effectiveness of the equipment is drastically reduced very quickly - See Table 2.

TABLE 2 - Effect of removing hearing protection on the reduction in noise dose received

Percentage time ear protection is worn	Time ear protection is worn during the day	Actual noise reduction afforded by the ear protection
0%	Not Worn	0
50%	4 hours	3
75%	6 hours	6
87%	7 hours	9
94%	7 hours 30 minutes	12
97%	7 hours 45 minutes	15
97.9%	7 hours 50 minutes	16.6
99.0%	7 hours 55 minutes	18.5
99.6%	7 hours 58 minutes	23
100%	8 hours	30

As a reduction in dB(A) of 3 is about half the noise level, by taking ear protection off for 2 minutes reduced the effectiveness by about 25%. It is vital that workers are made aware of this.

All non-disposable ear protection must be suitably maintained at regular intervals, and a record kept of the maintenance.

Where non-disposable ear protection is damaged it should be taken out of service and either repaired or disposed. A record should be kept of all repairs to such equipment.

Training

All staff that need to wear hearing protection should receive appropriate training in the effects of noise, potential risks of noisy activities and on choosing the correct ear protection. This training should include the correct use of ear protection and that continuous wearing is required.

Version number	Purpose / changes	Document status	Author of changes, role and school / unit	Date
V1.0	Revision	Draft	Paul Szawlowski	26/06/2019
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