# Noise Exposure Guidance

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## 1. Introduction

Swansea University holds a moral and legal obligation to ensure all staff and students are not exposed to noise levels in work that may be harmful. Unfortunately, hearing damage caused by excessive noise exposure at work can be permanent and incurable.

By its nature, hearing loss is typically a gradual process following prolonged exposure to noise. This combined with normal hearing loss that occurs over time due to ageing, can mean it may be difficult to identify how much damage has been done to someone's hearing before it is too late.

Serious damage can also occur because of short duration exposure to extremely loud noises.

Noise related hearing loss or damage at work is entirely preventable and this document will detail how you can identify, assess, and manage noise exposure at work safely.

## 2. Regulations

The Control of Noise at Work Regulations 2005 detail the legal requirements imposed on Swansea University as an employer to protect persons against risk to their health and safety arising from exposure to noise at work.

The legal duty applies to employers in respect of their employees. However, Swansea University will afford the same level of protection to students who may be involved in teaching or research activity where excessive noise exposure has been identified as a hazard.

These duties may also extend, so far as is reasonably practicable, to any other person at work who is affected by noisy work or activity under the control of Swansea University

The regulations do not apply to:

- members of the public exposed to noise from their non-work activities or making an informed choice to go to noisy places.
- low-level noise that is a nuisance but causes no risk of hearing damage.

## 3. The Health Effects of Noise Exposure

It is important to understand the consequences and signs and symptoms of noise exposure, to try and spot hearing loss as soon as possible.

The resulting health effects of noise induced hearing loss (NIHL) can include, but is not limited to:

- **Temporary Hearing Loss** – caused by exposure to noise over 85dB but below 100dB. This is the ears defence mechanism to an excessive noise exposure event. Usually hearing will recover within 1-2 hours depending on the level of exposure.
- **Permanent hearing loss or noise induced hearing loss** – this is a result of excessive and prolonged exposure to noise causing damage to the inner ear. The

impact is generally more subtle over time affecting the person ability to hear different frequencies.
- **Acoustic trauma or acoustic shock** – caused by extreme shorty bursts of loud noise such as an explosion. Hearing loss can be temporary, lasting months rather than days.
- **Other physical effects** – excessive noise can result in increased blood pressure, ear pain, nausea and an increase in stress. Exposure of high noise to pregnant workers can also affect an unborn child.

It is important to remember that NIHL does not only occur at work. Environmental exposure during hobbies such as carpentry, metalwork, or attending concerts and nightclubs where excessive noise is present may exacerbate any occupational noise exposure.

## 4. Exposure Action Values (Regulation 4)

Noise is measured using the decibel scale. So, all readings taken with sound level meters or information detailed on equipment data sheets will be displayed as **dB**.

The Control of Noise at Work Regulations define '**exposure action values (EAV)**' which are levels of noise which, if exceeded, require specific action to be taken. This can range from a risk assessment and provision of information to specific control measures.

| | **Lower exposure action value (decibels)** | **Upper exposure action value (decibels)** |
|---|---|---|
| **Daily or weekly personal noise exposure** (LEP, d or LEP, w) | 80 (A) | 85 (A) |
| **Peak sound pressure** (LCpeak) | 135 (C) | 137 (C) |

As we are principally concerned with how noise will affect our hearing, any noise level information or noise monitoring equipment is normally given in dB(A) or dB(C). These are frequency weightings applied to the noise measurements that attempt to replicate how noise is received in the human ear.

**'A' weighting** is a standard weighting for audible frequencies designed to be reflect the response of the human ear to noise.

**'C' weighting** gives more emphasis to low frequency sounds and is usually used to record peak sound pressures.

When risk assessing if an individual is close to hitting or exceeding an exposure action value, we must consider their daily and weekly dose of noise.
**LEP, d** – this is a worker's daily exposure to noise at work, normalised to an 8-hour day. Considering the average levels and time spent completing each task or working in each area.

**LEP, w** – if a worker's noise exposure varies from day to day, their personal exposure can be assessed over the period of a week rather than a day.

We will explain how to interpret and assess these values in the next section.

## 5. Risk assessment (Regulation 5)

If you have identified that an activity or workplace has the potential to reach the **lower exposure action value**, you must complete and document a risk assessment. This could be incorporated as part of an existing activity risk assessment, for example, using a leaf blower. Or as a standalone noise risk assessment of a noisy room or workplace.

Typical activities or noise sources at Swansea University may include:

- Working with noisy powered tools or machinery (mowing, cutting, blowing)
- High impact activity such as hammering or pneumatic tools
- Working around loud plant or equipment (generators, air handling, ventilation systems, wind tunnels)
- Working in loud social environments (nightclubs, bars, loud events an concerts)

Sometimes further investigation may be needed to ascertain whether a noise risk assessment is needed. The HSE provide the below table as a useful rule of thumb to assist in decision making. Taken from L108 (Third edition)

| Test | Probable noise level | A risk assessment will be needed if the noise is like this for more than: |
|---|---|---|
| The noise is intrusive but normal conversation is possible | 80 dB(A) | 6 hours |
| You have to shout to talk to someone 2m away | 85 dB(A) | 2 hours |
| You have to shout to talk to someone 1m away | 90 dB(A) | 45 minutes |

To complete a suitable and sufficient noise risk assessment, you must:

- Ensure the person completing the assessment is competent and familiar with the task or workplace.
- Base the assessment on advice and information from competent sources, such as professional bodies, manufacturers literature or surveys or sound readings from appropriate calibrated equipment.
- Consider a reliable calculation or accurate reading of the employees' noise exposure in comparison with the EAVs and ELVs
- Identify *all* persons who may be affected by the noise exposure
- Use the hierarchy of control to either eliminate the risk of exposure to noise or reduce to the lowest reasonably practicable level.
- Identify any employees who need to be provided with health surveillance plus any who are at particular risk, such as those with pre-existing hearing loss

The HSE provide some useful tools to help calculate daily and weekly noise exposure. These are the daily/weekly ready-reckoner, noise exposure calculator and hearing protection calculator. Examples of which can be found in the appendix or at the following link https://www.hse.gov.uk/noise/calculator.htm

Sources of information that can help inform your decision on whether noise exposure will pose a risk are manufacturers data sheets for tools or equipment, which will detail the noise output as tested by the manufacturer. If this is unavailable or the concern relates to an environment or workplace, then surveys or monitoring can be undertaken.

## 6. Managing and Controlling Risks from Noise Exposure (Regulation 6)

Once you have identified noise exposure as a hazard, you must review the existing control measures in place or identify actions which are required to reduce the risk of noise exposure as low as reasonably practicable to all involved.

As with any other risk assessment, the hierarchy of control should be followed, with elimination of the noise where possible as the best option. Examples of control measures can include:

Elimination

- Removing or altering the process so the exposure to noise is eliminated.
- Change the workplace layout so noisy activities are separated from quieter areas.

Substitution

- Substitute the tools or equipment being used for quieter alternatives.

Engineering Controls

- Introduce physical controls such as shielding, soundproof enclosures or insulation.
- Ensure all equipment is maintained in line with the manufacturer's recommendations.
- Use of sound dampening or attenuating equipment such as dampers or silencers

Administrative controls

- Reduce the amount of time employees are exposed to noise through regular breaks or job rotation.
- Clearly designate hearing protection zones.
- Use of hazard and mandatory signage.
- Restrict access to high-risk areas.
- Provide all those at risk with suitable information and training on the risk from noise exposure and the workplace or activity taking place.
- Personal and workplace noise monitoring to ensure action values are not being reached.
- Hearing tests and occupational health surveillance.

PPE

- Provide hearing protection (further information on this in the next section).

## 7. Hearing Protection (Regulation 7)

Hearing protection should be used:

- As an additional protection measure beyond what has been achieved by risk assessing and introducing control measures (if you have been unable to eliminate or reduce the noise to an acceptable level).
- As an interim measure while control measures are being developed.

Hearing protection is not an alternative to risk assessment, management, and control of noise exposure.

You must provide hearing protection to employees/students:

- Where they are exposed **between** the lower and upper EAVs and hearing protection has been requested. The use of hearing protection is not compulsory between this range.
- Where they are likely to be exposed **at or above an** upper EAV, you must provide hearing protection, ensure they are used and provide information and training on how to use them.

The use of hearing protection should be confined to those tasks or workplaces where the EAV is likely to be exceeded. Hearing protectors should be removed in areas where noise levels are low, or a noisy activity is not being carried out.

**Selection of hearing protectors**

Hearing protection must be rated appropriately to the noise exposure level, to bring the level down below the EAV, but to avoid over protection.

Reducing the noise level at the ear to below 70dB should be avoided as it can pose difficulties for users hearing warning signals or being able to communicate effectively. Overprotection can lead to the risk of users becoming unaware and isolated from their surroundings, increasing the tendency to remove the protection and damaging their hearing.

All hearing protection products will be given a Single Number Rating (SNR). The SNR is the amount of noise attenuation provided by that product, relative to the dB level. The HSE provide the indicative guidance below.

**Indication of protector factors**

| A-weighted noise level (dB) | Select a protector with the right SNR |
|---|---|
| 85 to 90 | 20 or less |
| 90 to 95 | 20 to 30 |
| 95 to 100 | 25 to 35 |
| 100 to 105 | 30 or more |

## Use of hearing protectors

To ensure hearing protection is used effectively, you must:

- Ensure they provide sufficient hearing protection for the task or workplace following your assessment, aiming to get below 85dB at the ear.
- Consider if any other personal protective equipment must be worn and how the hearing protection will interact with these (e.g. hard hats, dust masks, eye protection).
- Provide options so users can select ones that suit them.
- Consider the working environment and comfort for the users, for example, if it is a hot/cold environment or the duration they will be worn for.
- Make sure the hearing protection is kept in a good, clean condition, and not modified.
- Make sure seals are not damaged, tension not reduced, and earplugs remain soft pliable and clean.

Some examples of types of hearing protection are included in Appendix 5 of this document.

## 8. Safe Use of Headphones

The use of headphones is commonplace for recreational use, by front line customer service roles and increasingly more frequent use by everyone for video calls and online meetings since the COVID-19 pandemic.

Many headphones and headsets available to buy on the market will often have a maximum output up to or sometimes exceeding 100dB, which we know can be harmful to our hearing following prolonged or even short duration exposure.

Therefore, it is important that we consider their use, when headphones are identified as part of a task specific risk assessment, or, for more general users, as part of a Display Screen Equipment (DSE) assessment.

It is also acknowledged that headphone usage can be beneficial for personal use to aid concentration and productivity in a busy office or study environment.

Below are some dos and don'ts for proactive hearing management when using headphones:

**DO:**

- Consider headphone usage as part of your risk assessment or DSE assessment.
- Monitor the noise exposure of frequent headphone users.
- Provide appropriate and comfortable equipment for those users required to use headphones or headsets as part of their job role.
- Look to purchase equipment limited to 85dB where possible.
- Utilise software or app's that can monitor and limit exposure to excessive noise levels.
- Keep headphones clean, maintained and stored safely.
- Take regular breaks after prolonged use.
- Lower your device volume prior to plugging in or connecting headphones for the first time.
- Use one ear and keep one free, then alternate for comfort and reduced noise exposure.

**DON'T:**

- Don't use headphones at maximum volume.
- Don't use headphones in high-risk areas or during activities where communication and concentration is key to safety.
- Don't use headphones that will inhibit your situational awareness and increase risks in lone working situations.
- Don't inhibit your ability to hear fire alarms or other warning signals.
- Don't share headphones and headsets with others.
- Don't listen at noise levels that will disturb others and likely damage your own hearing too.

## 9. Information, Instruction, and Training (Regulation 10)

Employees and student must be given clear and informative information, instruction, and training on the noise exposure they may be exposed to, the procedures and control measures in place to protect them and the possible health effects and consequences of nose exposure.

The instructions given must cover:

- The findings of the risk assessment and why you have implemented control measures and the use of ear defenders.
- How to properly use and fit hearing protection.
- Where hearing protection must be used.
- How to avoid interference with hearing protection from other PPE, hats, glasses, hair etc.
- How to maintain, store and replace hearing protection if needed.
- The legal duties on all parties under the Control of Noise Regulations.
- The signs and symptoms of hearing loss they must be aware of.
- The health surveillance that will be provided to at risk people

The information, instruction and training provided can be in a variety of formats, such as verbal toolbox talks, written information sheets and via the documented risk assessment, structured training, or online delivery. The important factor is to make sure it is easy to understand and to ensure compliance with the risk assessment and use of hearing protection is reinforced and periodically monitored.

## 10. Noise Monitoring

In some cases, noise monitoring may be required to:

- Monitor and measure an individual's exposure to noise if they are at risk of exceeding an EAV.
- To establish the noise levels within the working environment.
- To assess or verify the true noise readings being emitted by a tool of equipment.

Noise monitoring should be caried out using a properly calibrated sound monitor or by a competent contractor that specialises in the field.

If as part of your risk assessment, you conclude that noise monitoring would be of benefit then please contact a member of the Health & Safety team to discuss further.

## 11. Occupational Health Surveillance (Regulation 9)

Health surveillance must be carried out, *'if the risk assessment indicates that there is a risk to health*'.

This means that health surveillance will be provided for staff or students who have:

- regular and frequent daily exposure or peak sound pressure levels at or above an upper EAV. This can also be indicated by weekly personal noise exposures that are mostly above the upper EAV.
- occasional exposure at or above an upper EAV where you have any reason to be concerned that your preventive measures may not be effective (e.g., if, on the day high noise exposures occur, the daily personal noise exposure or peak sound pressure is well above an upper EAV, making the worker highly reliant on personal hearing protection).

- exposure between the lower and upper EAVs, or exposure only occasionally above the upper EAV, where the employee's health may be at particular risk from this noise. Employees at particular risk include, for example, those with pre-existing hearing loss, those having treatment with certain medication, or those who have been exposed to certain chemicals, which can increase the risk of further damage to hearing in combination with noise.

At Swansea University, occupational health surveillance for noise exposure is managed and co-ordinated by the University Occupational Health team. Hearing tests will be undertaken as follows:

- For employees identified as at risk to noise exposure by risk assessment as above.
- Following an adverse event or injury that has impacted the persons hearing.
- For those who are at risk with pre-existing hearing loss.
- At a frequency identified by Occupational Health as part their assessment.

## 12. Appendices

### Appendix 1: Noise ready reckoner. Daily and Weekly.

| Sound pressure level, $L_{Aeq}$ (dB(A)) | Duration of exposure | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 min | 5 min | 15 min | 30 min | 1 h | 2 h | 4 h | 8 h | 10 h | 12 h |
| 120 | 1300 | | | | | | | | | |
| 110 | 130 | 330 | 1000 | 2000 | | | | | | |
| 105 | 42 | 105 | 315 | 625 | 1250 | | | | | |
| 100 | 13 | 34 | 100 | 200 | 395 | 790 | 1600 | | | |
| 98 | 8 | 22 | 60 | 125 | 250 | 500 | 1000 | 2000 | | |
| 97 | 7 | 17 | 50 | 100 | 200 | 395 | 790 | 1600 | 2000 | |
| 95 | 4 | 10 | 32 | 65 | 125 | 250 | 500 | 1000 | 1250 | 1500 |
| 94 | | 8 | 26 | 50 | 100 | 200 | 395 | 790 | 1000 | 1200 |
| 93 | | 7 | 20 | 40 | 80 | 160 | 315 | 630 | 790 | 950 |
| 92 | | 5 | 16 | 32 | 65 | 125 | 250 | 500 | 625 | 750 |
| 91 | | 4 | 12 | 26 | 50 | 100 | 200 | 400 | 500 | 595 |
| 90 | | | 10 | 20 | 40 | 80 | 160 | 315 | 395 | 475 |
| 89 | | | 8 | 16 | 32 | 65 | 125 | 250 | 315 | 375 |
| 88 | | | 6 | 12 | 26 | 50 | 100 | 200 | 250 | 300 |
| 87 | | | 5 | 10 | 20 | 40 | 80 | 160 | 200 | 240 |
| 86 | | | 4 | 8 | 16 | 32 | 65 | 125 | 155 | 190 |
| 85 | | | | 6 | 13 | 26 | 50 | 100 | 125 | 150 |
| 84 | | | | 5 | 10 | 20 | 40 | 80 | 100 | 120 |
| 83 | | | | 4 | 8 | 16 | 32 | 65 | 80 | 95 |
| 82 | | | | | 6 | 13 | 26 | 50 | 65 | 75 |
| 81 | | | | | 5 | 10 | 20 | 40 | 50 | 60 |
| 80 | | | | | 4 | 8 | 16 | 32 | 40 | 48 |
| 79 | | | | | | 6 | 13 | 26 | 32 | 38 |
| 78 | | | | | | 5 | 10 | 20 | 26 | 30 |
| 75 | | | | | | | 5 | 10 | 13 | 15 |

| Total exposure points (sum of points from individual exposure components) | Daily noise exposure $L_{EP,d}$ (dB(A)) |
|---|---|
| 320000 | 120 |
| 32000 | 110 |
| 10000 | 105 |
| 3200 | 100 |
| 2000 | 98 |
| 1600 | 97 |
| 1000 | 95 |
| 790 | 94 |
| 630 | 93 |
| 500 | 92 |
| 400 | 91 |
| 315 | 90 |
| 250 | 89 |
| 200 | 88 |
| 160 | 87 |
| 125 | 86 |
| 100 | 85 |
| 80 | 84 |
| 65 | 83 |
| 50 | 82 |
| 40 | 81 |
| 32 | 80 |
| 26 | 79 |
| 20 | 78 |
| 10 | 75 |

| | |
|---|---|
| | Above upper exposure action value ($L_{EP,d}$ 85 dB(A)) |
| | Above lower exposure action value ($L_{EP,d}$ 80 dB(A)) |
| | Below lower exposure action value ($L_{EP,d}$ 80 dB(A)) |

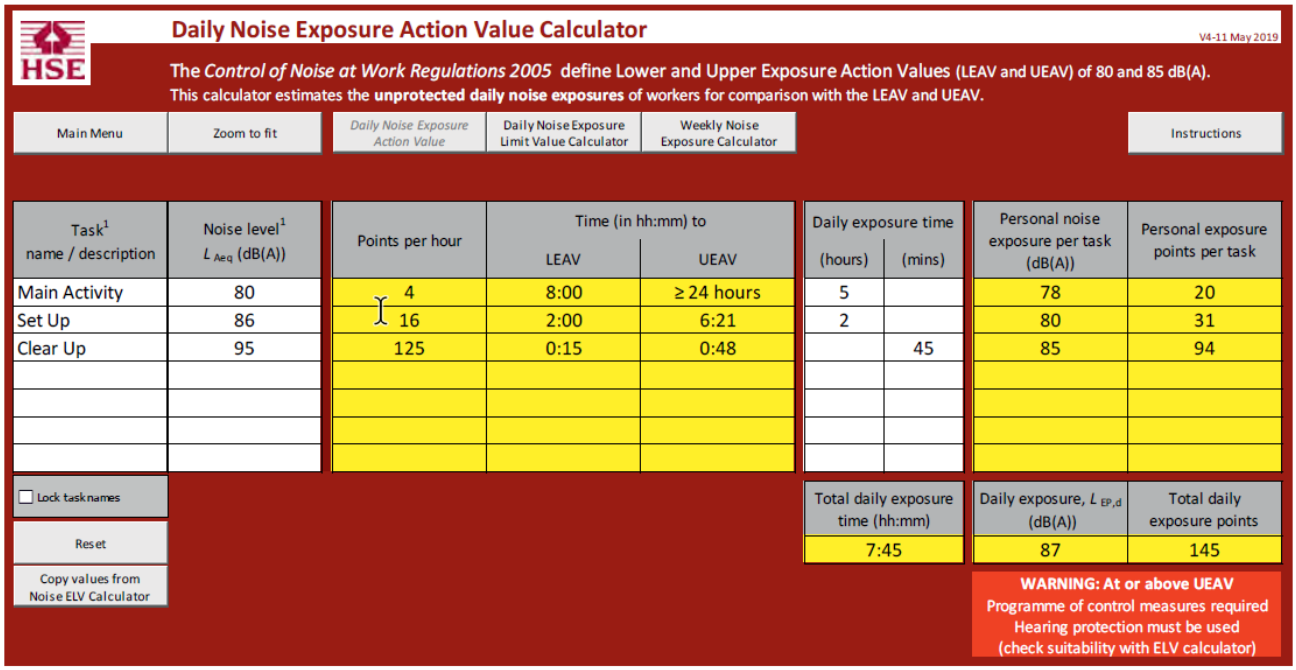
| Daily noise exposure $L_{EP,d}$ (dB(A)) | Daily exposure points | | | | | | |
|---|---|---|---|---|---|---|---|
| | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
| 95 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| 94 | 790 | 790 | 790 | 790 | 790 | 790 | 790 |
| 93 | 630 | 630 | 630 | 630 | 630 | 630 | 630 |
| 92 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| 91 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| 90 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| 89 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| 88 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| 87 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| 86 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| 85 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 84 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| 83 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 82 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 81 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 80 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| 79 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| 78 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

| Weekly total exposure points (sum of points from daily exposure component | Weekly noise exposure $L_{EP,W}$ (dB(A)) |
|---|---|
| 5000 | 95 |
| 4000 | 94 |
| 3200 | 93 |
| 2500 | 92 |
| 2000 | 91 |
| 1600 | 90 |
| 1250 | 89 |
| 1000 | 88 |
| 790 | 87 |
| 630 | 86 |
| 500 | 85 |
| 395 | 84 |
| 315 | 83 |
| 250 | 82 |
| 200 | 81 |
| 160 | 80 |
| 125 | 79 |
| 100 | 78 |

| | |
|---|---|
| | Above upper exposure action value ($L_{EP,d}$ or $L_{EP,W}$ 85 dB(A)) |
| | Above lower exposure action value ($L_{EP,d}$ or $L_{EP,W}$ 80 dB(A)) |
| | Below lower exposure action value ($L_{EP,d}$ or $L_{EP,W}$ 80 dB(A)) |

## Appendix 2: Noise Exposure Calculator

https://www.hse.gov.uk/noise/calculator.htm



**Daily Noise Exposure Action Value Calculator** V4-11 May 2019

The *Control of Noise at Work Regulations 2005* define Lower and Upper Exposure Action Values (LEAV and UEAV) of 80 and 85 dB(A).
This calculator estimates the **unprotected daily noise exposures** of workers for comparison with the LEAV and UEAV.

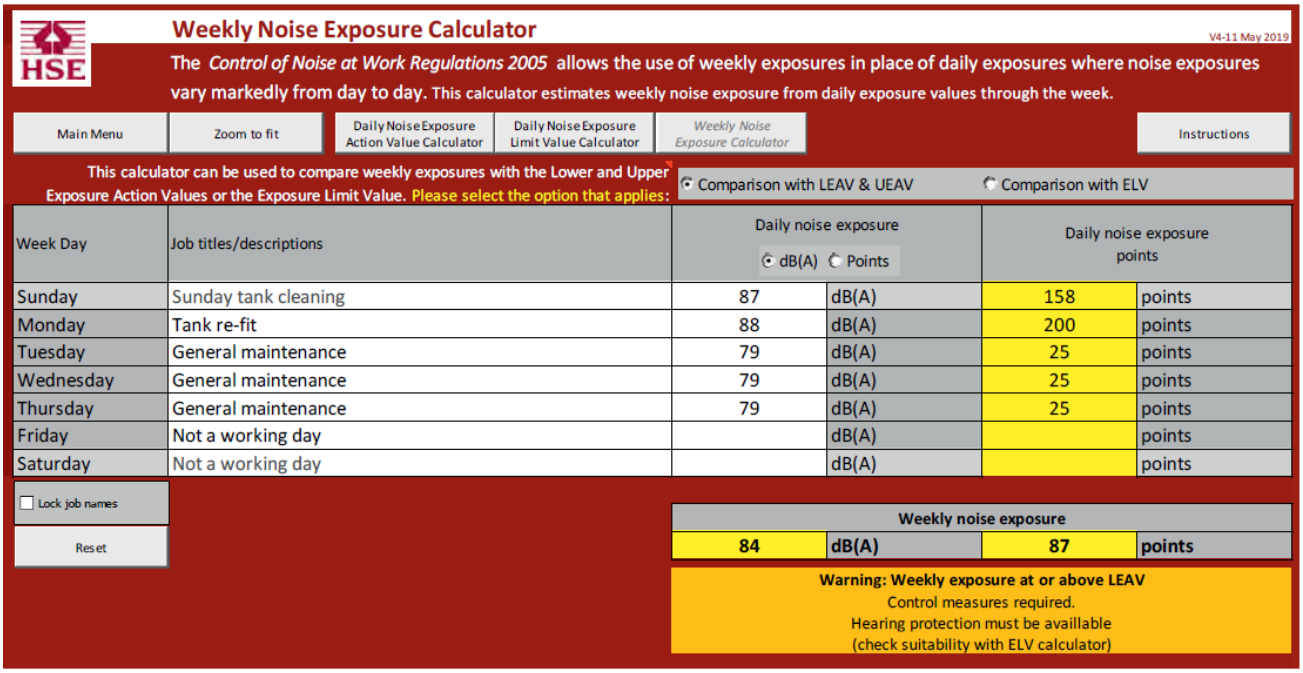
Main Menu | Zoom to fit | *Daily Noise Exposure Action Value* | Daily Noise Exposure Limit Value Calculator | Weekly Noise Exposure Calculator | Instructions

| Task[1] name / description | Noise level[1] $L_{Aeq}$ (dB(A)) | Points per hour | Time (in hh:mm) to LEAV | Time (in hh:mm) to UEAV | Daily exposure time (hours) | Daily exposure time (mins) | Personal noise exposure per task (dB(A)) | Personal exposure points per task |
|---|---|---|---|---|---|---|---|---|
| Main Activity | 80 | 4 | 8:00 | ≥ 24 hours | 5 | | 78 | 20 |
| Set Up | 86 | 16 | 2:00 | 6:21 | 2 | | 80 | 31 |
| Clear Up | 95 | 125 | 0:15 | 0:48 | | 45 | 85 | 94 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Lock task names | Reset | Copy values from Noise ELV Calculator

| Total daily exposure time (hh:mm) | Daily exposure, $L_{EP,d}$ (dB(A)) | Total daily exposure points |
|---|---|---|
| 7:45 | 87 | 145 |

**WARNING: At or above UEAV**
Programme of control measures required
Hearing protection must be used
(check suitability with ELV calculator)



**Weekly Noise Exposure Calculator** V4-11 May 2019

The *Control of Noise at Work Regulations 2005* allows the use of weekly exposures in place of daily exposures where noise exposures vary markedly from day to day. This calculator estimates weekly noise exposure from daily exposure values through the week.

Main Menu | Zoom to fit | Daily Noise Exposure Action Value Calculator | Daily Noise Exposure Limit Value Calculator | *Weekly Noise Exposure Calculator* | Instructions

This calculator can be used to compare weekly exposures with the Lower and Upper Exposure Action Values or the Exposure Limit Value. Please select the option that applies: (•) Comparison with LEAV & UEAV ( ) Comparison with ELV

| Week Day | Job titles/descriptions | Daily noise exposure (•) dB(A) ( ) Points | | Daily noise exposure points | |
|---|---|---|---|---|---|
| Sunday | Sunday tank cleaning | 87 | dB(A) | 158 | points |
| Monday | Tank re-fit | 88 | dB(A) | 200 | points |
| Tuesday | General maintenance | 79 | dB(A) | 25 | points |
| Wednesday | General maintenance | 79 | dB(A) | 25 | points |
| Thursday | General maintenance | 79 | dB(A) | 25 | points |
| Friday | Not a working day | | dB(A) | | points |
| Saturday | Not a working day | | dB(A) | | points |

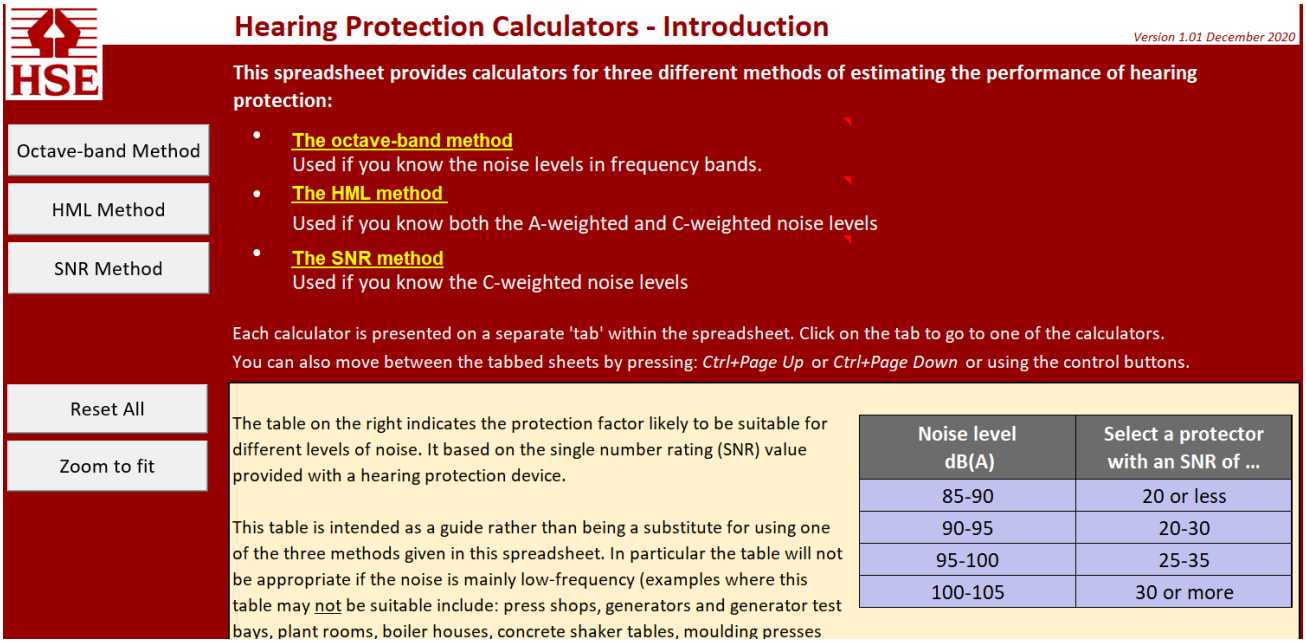
Lock job names | Reset

| Weekly noise exposure | | | |
|---|---|---|---|
| 84 | dB(A) | 87 | points |

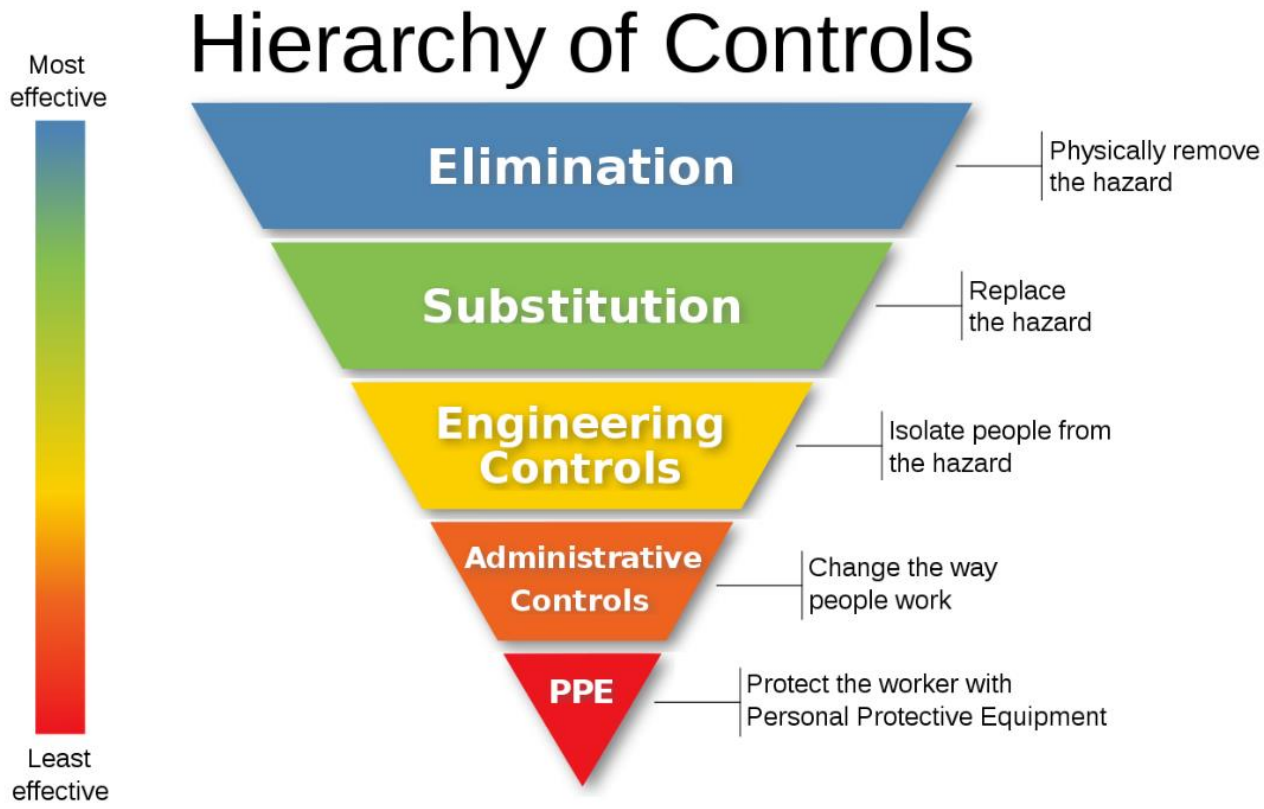
**Warning: Weekly exposure at or above LEAV**
Control measures required.
Hearing protection must be availlable
(check suitability with ELV calculator)

## Appendix 3: Hearing Protection Calculator

https://www.hse.gov.uk/noise/calculator.htm



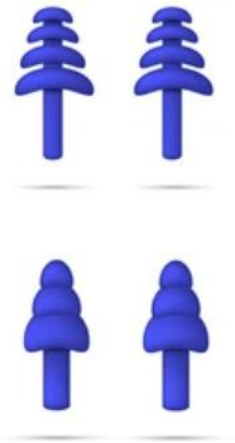
## Appendix 4: Hierarchy of Controls



## Appendix 5: Examples of Hearing Protection

*Protective Earmuffs*

*Formable foam earplugs*



*Molded earplugs*

*Canal caps*

*Custom molded earplugs*