



Noise at Work
Compliance Code

Reviewed: December 2023

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Annex A - Employees who may be at Risk of Exposure to Workplace Noise

Annex B - Guidance to County Music Service on Noise

1. Introduction

This guidance document is intended to assist managers, in areas where high noise levels are generated, to meet the requirements of current legislation and help protect people from the damaging effects of such exposure.

Over and above the general duty of care owed to employees and others under the Health and Safety at Work Act, exposure to noise in all workplaces is specifically legislated for by the Control of Noise at Work Regulations 2005.

The Control of Noise at Work Regulations 2005 replaced the Noise at Work Regulations 1989 and introduced new requirements for action to be taken by employers. These require employers to act to protect workers at levels of noise 5 decibels lower than in the 1989 Regulations and now require health surveillance (hearing checks) for workers regularly exposed to above 85 decibels.

Three groups of employees working in school environments have been identified who may be exposed to potentially harmful levels of workplace noise:

- Technicians in Design and Technology workshops
- Some peripatetic music teachers
- Some swimming teachers/instructors

See Annex A for specific guidance in these areas.

This guidance applies to all schools where the peripatetic music service operates or that have swimming pools. Schools should work with peripatetic music teachers and swimming teachers/instructors, as appropriate, to put in place physical and organisational controls to manage the risk.

Music teachers on the staff of individual schools are unlikely to be routinely exposed to harmful levels of noise. However, schools should still actively consider implementing the physical controls referred to below as this will improve the quality of the working environment for music teachers in schools and pupils in their classes, as well as for peripatetic music teachers.

The HSE Noise at Work Site contains extensive general guidance for employers on reducing and controlling the risks from noise at work and can be read in addition to this guidance as a source of reference material.

2. Managers' Checklist

1. Where noise assessments have been carried out, ensure recommended actions are taken to reduce noise exposure for groups of staff involved
2. Headteachers should work with peripatetic music tutors and swimming teachers/instructors to put in place suitable physical and organisational controls in areas designated for those activities
3. In Design and Technology departments, put in place organisational and technical controls
4. Inform all at risk staff of the precautions required
5. Issue and record hearing protection to employees who ask for or need it
6. Ensure adequate signs are displayed where required
7. Ensure that groups of staff needing mandatory health surveillance are referred to your Occupational Health Adviser for audiometry checks as required.
8. Ensure that employees who believe their hearing is being affected are referred promptly to your Occupational Health Adviser

3. What is Noise?

Sound is essentially a form of energy. The energy is transmitted through the air as pressure waves. The ear is capable of detecting these pressure waves which it perceives as sound or noise. Noise usually means unwanted sound at an unnecessary volume.

There are two important qualities of sound: intensity (amplitude or loudness) and frequency (pitch).

Sound is measured in decibels (dB). A 3 dB change in noise level doubles the noise, so what might seem like small differences in the numbers can be quite significant. Sound is normally measured as dB(A), an average matching human hearing. The scale used ranges from a silent 0 dB(A) to 140 dB(A) in the noisiest situations.

4. Effects of Noise Exposure

While noise is most obviously a problem in industries such as manufacturing and construction, it can also be an issue in a wide range of other working environments, from call centres to schools, orchestra pits to bars.

In moderation sounds and noises encountered in everyday life are harmless, but if they are too loud, they can permanently damage our hearing. The danger depends on how loud the noise is and for how long we are exposed to it.

The damage usually builds up gradually and you may not notice the changes from one day to another, but once the damage is done there is no cure. The effects include:

- Sounds and speech becoming muffled so that it is hard to tell similar words apart, or to pick out a voice in a crowd
- Tinnitus (ringing, whistling, buzzing or humming in the ears), a distressing condition that can lead to disturbed sleep. This can be extremely annoying and frustrating to sufferers.
- A distorted sense of loudness. Sufferers may ask people to speak up, then complain that they are shouting
- The need to turn the television up too loud or finding it hard to use the telephone.

In addition to the above physical damage, noise can also interfere with communication and be the cause of distraction and annoyance leading to stress.

These physically damaging effects are normally associated with long term exposure to loud noise. Instantaneous damage can, however, be caused due to exposure to peak pressure of sound. This would normally be associated with the use of explosives, firearms or cartridge operated tools and is an unlikely risk in schools.

Hearing loss caused by exposure to noise at work continues to be a significant occupational disease. Some 170,000 people in the UK suffer deafness, tinnitus or other ear conditions as a result of exposure to excessive noise at work.

5. Is there a Noise Problem?

This will depend on how loud the noise is and how long people are exposed to it. As a simple guide you will probably need to do something about the noise if any of the following apply:

- Is the noise intrusive - like a busy street, a vacuum cleaner or a crowded restaurant - for most of the working day?
- Do 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 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?

Noise can also be a safety hazard at work, interfering with communication and making warnings harder to hear.

Some typical examples of noise levels that are common are:



To assist in determining noise levels a basic rule of thumb can be applied:

if you have to shout, or have difficulty being understood by someone around 2 metres away then the levels would be around 85 dB(A). If the same applies at a distance of 1 metre, then the level is likely to be around 90 dB(A).

See Annex A for areas of activity in school settings where noise is a potential problem.

6. Control of Noise at Work Regulations

The key requirement of the regulations is to prevent or reduce risks to the health of employees from exposure to noise at work. The risk of exposure to noise must be either eliminated at source or, where this is not reasonably practicable, reduced to as low a level as is reasonably practicable. Where the risks are low, the actions needed may be simple and inexpensive, but where the risks are high, they should be managed using a prioritised noise-control action plan.

6.1 Exposure Action Levels

If any employees might be exposed to noise at or above the lower exposure action value then a suitable and sufficient assessment must be made, and that risk assessment must identify the measures which need to be taken.

Lower exposure action value:

80 dB(A), daily or weekly
 [previously 85 - 89 dB(A)]
 a peak sound pressure of 135 dB(C)

If any employee is likely to be exposed to noise at or above the 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.

Upper exposure action value:

85 dB(A), daily or weekly [previously 90 dB(A)]
a peak sound pressure of 137 dB(C)

There are also levels of noise exposure which must not be exceeded:

87 dB(A), daily or weekly and
a peak sound pressure of 140 dB(C)

These exposure limit values take account of any reduction in exposure provided by hearing protection.

7. Risk Assessment

The risk assessment requires that the levels of noise to which workers are exposed are assessed by:

- Observing specific working practices
- Referring to relevant information on the probable levels of noise corresponding to any equipment used in the particular working conditions and
- Where appropriate, formal measurement and monitoring by a competent person

8. Required Actions

The risk assessment, carried out by the Health, Safety and Wellbeing Team, produced information on the risks and an action plan for controlling noise. This information should be used by schools to:

- Tackle the immediate risk, e.g. by providing hearing protection
- Identify what is possible to control noise; how much reduction could be achieved and what is reasonably practicable
- Establish priorities for action and a timetable
- Assign responsibilities to people to deliver the various parts of the plan
- Ensure the work on noise control is carried out

Lower exposure action values

The following actions are required where the assessment shows that the lower action level has been reached:

- Inform employees of the risks and precautions; ensure they read this document and the outcome of any assessments that have been carried out
- Make hearing protection freely available to those who wish to use it. (See below for types of hearing protection recommended.)
- Suggest employees seek medical advice (via a referral to your occupational health adviser) if they believe their hearing is being affected

Upper exposure action values

The following actions are required if the assessment shows that the upper action level has been reached:

- Establish and implement a programme of organisational and technical measures, i.e. do all you can to reduce exposure other than by providing hearing protection, e.g. reduce exposure, relocate/replace equipment etc.
- If it proves impossible to reduce the levels of noise to below the upper exposure action value, personal hearing protectors must be provided to any exposed employee.

If an employee is likely to be exposed to noise at or above an upper exposure action value in any area of the workplace:

- The area must be designated a Hearing Protection Zone
- The area must be outlined and identified by means of sign(s) indicating that ear protection must be worn and
- Access to the area is restricted where this is practicable and the risk from exposure justifies it, and
- So far as is reasonably practicable, allow entry only to people wearing hearing protection

Mark areas in which noise reaches this level as “Hearing Protection Zones” by floor marking and signs such as:



In these areas, ensure that:

- Hearing protection is provided and used
- Any other controls are properly used
- Information, training and health surveillance is provided. Health surveillance is organised by the Health, Safety and Wellbeing Team for the groups of employees mentioned above.

9. Noise Reduction

There are a number of ways to reduce noise. Firstly, think about removing the loud noise altogether. If that is not possible, then think about how the noise can be reduced.

- Use a different, quieter process or quieter equipment, e.g.:
 - can the work be done in a quieter way?
 - can whatever is causing the noise be replaced with something that is less noisy?
- Introduce engineering controls:
 - vibrating machine panels can be a source of noise – add material to reduce vibration ('damping')
 - isolate vibrating machinery or components from their surroundings, e.g. with anti-vibration mounts or flexible couplings
 - fit silencers to air exhausts and blowing nozzles

- Reduce the noise level by:
 - Putting enclosures around machines
 - Using barriers and screens to block the direct path of sound
 - Moving noise sources further away from employees or vice versa
- Limit the time people spend in noisy areas – every halving of the time spent in a noisy area will reduce their noise exposure by 3 dB
- Relocate noisy machines where possible to reduce the number of people exposed
- Reorganise the activity, for example in a swimming pool simply grouping the pupils together for instruction instead of shouting could make a considerable improvement
- In areas where there is nuisance noise the fitting of carpets or curtains to attenuate sound levels can reduce this
- Proper and regular maintenance of machinery and equipment is essential as it will deteriorate with age and can become noisier. Listen out for changes in noise levels - it may be time to replace worn or faulty parts.
- Employers have a duty to ensure that tools and machinery are suitable and the effects of noise emissions on employees is part of this duty. Noise emissions should be taken into account when equipment is purchased.
- When buying a new machine find out its noise output. Manufacturers must ensure good design and construction and are obliged to provide noise data on request.
- Investigate whether any other equipment is available that does the same job but has a lower sound output
- Keep a record of your decision process, to help show that you have met your legal duties to reduce workplace noise

10. Hearing Protection

Hearing protection, like all other forms of protective clothing and equipment, should always be considered as the last resort. More permanent solutions should be explored at the outset.

How can hearing protection be used effectively?

- Make sure the protectors give enough protection - aim at least to get below 85 dB at the ear
- Target the use of protectors to the noisy tasks and jobs in a working day
- Select protectors which are suitable for the working environment - consider how comfortable and hygienic they are
- Think about how they will be worn with other protective equipment (e.g. dust masks and eye protection)
- Provide a range of protectors so that employees can choose ones which suit them

What to consider when selecting hearing protection

These factors are likely to influence your selection of hearing protection:

- Types of protector and suitability for the work being carried out
- Pattern of the noise exposure
- The need to communicate and hear warning
- Environmental factors such as heat, humidity

- Cost of maintenance or replacement
- Medical disorders suffered by the wearer

The main types of hearing protection are:

- Earmuffs, which completely cover the ear
- Earplugs, which are inserted in the ear canal and
- Semi-inserts (also called 'canal caps'), which cover the entrance to the ear canal

Hearing protection should comply with BS EN 458:2004 and should carry the CE (European conformity) mark.

Hearing Protection (Ear Muff type)

These can either be issued personally or assigned to a particular machine. Preferably, only one individual should use a set of earmuffs. Where earmuffs are kept for the use of visitors, they should be hygienically cleaned for each new wearer. Alternatively, disposable covers may be used. If issued personally such issue should be recorded.

Employees issued with such equipment should be given instruction and training on:

- When and why they should be used
- How to look after them and how to get replacements

Ear Plugs

These come in many forms, the most common of which are the Disposable and Reusable types. These types are convenient to issue and are made from various compressible materials such as plastic foam, or mineral fibre down. They have the advantage of being able to fit most people without specialist fitting.

It is recommended that such ear plugs are available to employees who work in noisy areas such as reprographics rooms, boiler rooms or wherever there is a constant level of noise which may cause annoyance and stress.

Over-Protection

Protectors that reduce the level at the ear to below 70 dB should be avoided, since this over-protection may cause difficulties with communication and hearing warning signals. Users may become isolated from their environment, leading to safety risks, and generally may tend to remove the hearing protection and therefore risk damage to their hearing.

11. Health Surveillance

The employer must provide health surveillance (hearing checks) for all employees who are likely to be regularly 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.

The purpose of health surveillance is to:

- Warn you when employees might be suffering from early signs of hearing damage
- Give you an opportunity to do something to prevent the damage getting worse
- Check that control measures are working

The employees concerned and trade union safety representatives should be consulted before introducing health surveillance. It is important that your employees understand that the aim of health surveillance is to protect their hearing. You will need their understanding and co-operation if health surveillance is to be effective.

12. Information, Instruction and Training

Where employees are exposed to noise which is likely to be at or above a lower exposure action value, those employees must be provided with suitable and sufficient information, instruction and training that includes:

- The nature of risks from exposure to noise
- The organisational and technical measures taken to eliminate or control exposure to noise
- The exposure limit values and upper and lower exposure action values
- The significant findings of the risk assessment, including any measurements taken, with an explanation of those findings
- The availability, provision and the correct use of personal hearing protectors
- Why and how to detect and report signs of hearing damage
- The entitlement to, and purpose of, health surveillance
- Safe working practices to minimise exposure to noise and
- The collective results of any health surveillance undertaken

This information can be obtained through a thorough reading of this guidance document by employees and additional information available on the HSE Noise at Work Site.

2.

3. Annex A to WNAT Noise at Work Compliance Code

4. Employees who may be at Risk of Exposure to Workplace Noise

Through risk assessment by the Health, Safety and Wellbeing Team, three groups of employees in school settings have been identified as being at risk of exposure to potentially harmful levels of workplace noise:

- Technicians in High School/Special School Design and Technology workshops
- Some peripatetic music teachers (brass, woodwind and percussion teachers)
- Some swimming teachers/instructors

Brief guidance is also given in this section on other areas of activity which can be particularly noisy - sports halls and general site maintenance.

Design and Technology Workshops

A sample of Design and Technology workshops was monitored in 2007 for noise exposure levels. This showed that in most cases technicians are exposed to noise above the upper exposure action value of 85 dB(A). D&T teachers in most cases are exposed to noise above the lower exposure action value of 80 dBA.

Controls for D&T are reproduced here so that all noise control information is contained in this main noise guidance document.

- Establish and implement a programme of organisational and technical measures to reduce exposure other than by providing hearing protection. This could include:
 - engineering controls (e.g. 'damping' vibrating machine panels; fitting anti-vibration mounts or flexible couplings to vibrating machinery)
 - reducing the noise level (e.g. enclosing machines; blocking sound through barriers or screens)
 - limiting the time people spend in noisy areas
 - regular inspection and maintenance of machinery and equipment
 - taking noise emissions of equipment into account when purchasing new items
- If it proves impossible to reduce the levels of noise to below the upper exposure action value, personal hearing protectors must be provided to any exposed employee.
- Designate the technician's workshop as a Hearing Protection Zone, identifying it by floor markings and signs such as:



- Restrict access to the area and allow entry only to people wearing hearing protection
- Provide information and training to employees on the risk of Noise Induced Hearing Loss (NIHL), ways to reduce noise exposure and the proper use of hearing protection.

Health Surveillance

For information on health surveillance refer to the WNAT D&T Compliance Code

Other Sources of Information on Control of Noise

See also the HSE Noise at Work Site, in particular the section on noise good practice in woodworking.

Peripatetic Music Teachers

Practical guidance on measures to be taken to control the risk of exposure to noise by brass, woodwind and percussion teachers has been issued to the Head of the County Music Service – see Annex B 'Guidance to County Music Service on Noise' below.

Swimming Instructors/Teachers

Noise measurements carried out in school swimming pools showed that most pools reached levels close to, or slightly above the lower exposure action value (80 dB). This means that there is a requirement to carry out a risk assessment in all pool areas and implement any necessary changes.

As there are many highly reflective surfaces in a pool hall, any noise will reverberate and be amplified to higher levels, creating acoustic conditions that may have a significant impact on pupils' learning and employee performance. If instructions are difficult to hear, those supervising the lesson are likely to feel the need to raise their voices. Even more importantly, warning shouts for safety can go unheard.

Reorganisation of the activity, by simply grouping the pupils together for instruction instead of shouting could make a considerable improvement

Installing acoustic panels can reduce the travel and reflection of noise; in particular, sound absorbing panels can improve the intelligibility of speech.

Timetabling can also reduce the impact of these high noise levels, ensuring that swimming teachers/instructors spend time out of the pool area.

Other Activities:

Sports Halls

All the hard surfaces in sports halls can combine to produce an 'echo chamber' in the building. This can make conveying instructions to pupils difficult.

Employees working in these areas are not considered to be routinely exposed to levels of noise that require the controls set out in this guidance document. However, schools should consider the benefits of implementing noise reduction controls so that more comfortable and productive working environments can be achieved for employees and pupils.

The use hearing protection for these areas is not practical, so building modifications and timetable controls are the only practicable answers.

The installation of acoustic panelling can make for a better and safer work environment. Timetabling can also reduce an individual's exposure to the higher levels of sound.

Site Maintenance

Several activities that take place as a part of the maintenance of schools will involve the use of noisy equipment, e.g. tractors, chain saws and hedge trimmers. However, staff employed directly by schools doing this kind of work are not considered to be exposed to noise levels for long enough to be harmful or that require action under the legislation.

Effects on Young Persons

The levels of noise experienced by pupils and young persons is not considered to be hazardous due to the infrequency of exposure. However, they should be made aware of the adverse effects of noise exposure during teaching sessions.

Pre-Employment Assessment

If an individual has been selected for a job where noise is a known hazard (i.e. D&T technician or peripatetic brass, woodwind or percussion teacher), they should not be formally appointed until they have had a pre-employment health assessment and initial (or baseline) health surveillance, comprising of a questionnaire and a hearing test.

Programme for Hearing Surveillance if required

- Initial (baseline) assessment
- Annual assessments for the next 2 years
- 3 yearly assessments thereafter

5. Annex B to WNAT Noise at Work Compliance Code

6. Guidance to County Music Service on Noise

Health Surveillance and Other Controls

Employers must provide health surveillance (hearing checks) for all employees who are likely to be regularly exposed to 85 decibels or above, or are at risk for any reason, e.g. they already suffer from hearing loss or are particularly sensitive to damage.

Brass, woodwind or percussion teachers should not be formally appointed until they have had a pre-employment health assessment and initial (or baseline) health surveillance, comprising of a questionnaire and a hearing test.

Alongside health surveillance for identified instruments/tutors, the following general precautions should be taken for all tutors in brass, woodwind and percussion

1. Lesson Planning

- Revise structure of lessons to reduce numbers in class playing instruments at any one time
- Alternate loud and quiet sessions so that exposure to loud noise is limited
- The volume of any recorded music played in class should be reduced to a level below the first action value (80 decibels)
- Select music to practise so that there is a variety of sound levels over the week

2. Teaching Rooms

- The most common fault with teaching/rehearsal rooms is that they lack physical volume and have low ceilings. Rooms with low ceilings and reflective parallel walls result in excessive noise and reverberation.
- If possible, select a room appropriate for the activity being undertaken. Highly reverberant rooms should be avoided. Choose the largest room for the loudest instrument.
- Instruct students to maintain lowest volume, e.g. soft beaters for percussion, mutes on brass when practising and play only at the composed levels in main rehearsal and performance
- If using headphones for listening, make sure they are noise limited or noise cancelling

3. Layout and Position

- Allow a minimum of two square metres of space for each performer
- Use of risers (platforms, to raise musicians so that the sound from their instruments is not aimed directly into the ears of musicians in front) to separate performers from the sound of other players' instruments

4. Acoustic Controls

- Use acoustic controls such as screens, drapery and flooring
- Use a room that has been fitted with sound absorbent materials and other acoustic treatments
- Hard reflective surfaces cause sound waves to bounce or reverberate, adding to the direct path of the sound waves. It is generally a good thing to reduce reverberant noise since this can affect the exposure of those some distance from the source.
- Materials like wood, soft absorbent screens, acoustically absorbent foam, mineral fibre with foil and a decorative finish, and fabrics can be added to a building or placed strategically to reduce reverberant noise

Brief details on types of acoustic control:

Acoustic Panelling

Avoid reverberant or unsuitably small spaces. Install specially designed acoustic panelling, wall-linings and floor coverings in frequently used rehearsal and performance spaces. Low and medium frequency acoustic absorption in pits or rehearsal rooms reduces exposures and improves clarity too.

Acoustic Treatments

Install curtains, drapes and carpeting to achieve lower noise levels. Make sure, however, that the materials used do not create a fire hazard.

Acoustic Ceiling

Make use of existing acoustic panels, e.g. adjustable roof panels which may not be apparent.

Acoustic Screens

These may be small screens on stands or continuous absorbent screens. They can protect people from noisy sections in orchestras and bands and in amplified environments offer significant protection. Extreme care is needed in their positioning to avoid making things worse for other performers.

5. Information, Instruction and Training

- If employees understand the risks of noise exposure, they will be more likely to protect their own and their colleagues' hearing
- Awareness of noise risks and controls is very important, as people will then take notice of the risks and use any risk-reduction measures properly
- The role of management in developing and applying a successful noise policy is important. Training and instruction is a high priority. Managers should work with staff to try to embed these actions in day to day planning and practice and to back it up through supervision, one to one meetings and appraisals/review etc
- Distribute information such as posters etc to remind people to wear their hearing protection

6. Personal Hearing Protection

Provide basic ear plugs to all brass, woodwind and percussion tutors to begin the process of embedding controls into day to day work. However, consideration should be given to providing reusable or custom moulded earplugs.

Bear in mind the following general principles when selecting and using personal hearing protection:

- Personal hearing protection should be considered only as a **last resort** when all other methods of control have been explored, or while permanent solutions are being sought. Personal hearing protection should not be used as an alternative to controlling noise by technical and organisational means.
- Personal hearing protection must be used where necessary to eliminate or reduce the risk to hearing
- Users or their representatives should be involved in the selection
- Users must receive appropriate instruction, information and training in the use of the selected protection, and be monitored in its use

To be of value, hearing protection needs to:

- Control the risk. Choose protectors which will result in an effective personal noise exposure below 85 dB and reduce peak noise to below 137 dB. The more protection the better but beware of over-protection.
- Not over-protect. Cutting out too much noise can cause isolation or lead to an unwillingness to wear the protectors. Musicians may compensate by actually playing more loudly and increase their risk of playing injuries.
- Reduce the noise level to no less than about 70 dB
- Be comfortable and suitable for the working environment. Consider how comfortable and hygienic the protectors are, whether they will be worn with any other protective equipment, and how the activity of the user can be accommodated
- Be properly used
- Be worn at the right time - whenever there is a noise hazard present. Workers need to be told when and where to wear hearing protection.
- Be readily available to all who need it and actively supplied by the employer
- Be properly maintained, in good, clean and undamaged condition

Many music tutors need to hear sounds with as little distortion or colouration as possible, especially in the higher frequencies. This can cause problems when using personal hearing protection, as conventional hearing protectors tend to reduce higher frequencies more than lower frequencies. Specialised products are available that can reduce sound levels almost equally across a broad range of frequencies. This means that the user perceives the sound as being far more natural and positive than with ordinary earplugs.

These products are usually called 'flat' or '**uniform**' **attenuation** hearing protectors.

Compressible Earplugs (Disposable)

The advantages and disadvantages of compressible earplugs are:

Advantages

- Inexpensive and simple to use
- Effectively protect against high sound levels
- Smaller than earmuffs - can be carried in a pocket
- More comfortable than earmuffs in hot environments

Disadvantages

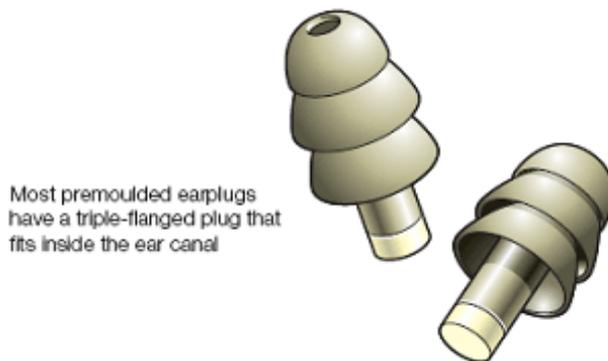
- Provide uneven frequency attenuation - remove more high frequencies than low
- Occlusion effect distorts sound perception for reeded woodwind and brass musicians
- Interfere with speech communication
- Require careful insertion to ensure effective protection
- Risk of infection from dirty hands

Useful for

- Emergency applications (such as forgetting or losing custom-moulded earplugs)

Pre-moulded Earplugs (Reusable)

Pre-moulded earplugs are generic-fit earplugs shaped for the average user's ear canal. Most have a triple-flanged plug that fits inside the ear canal. These plugs are generally reusable but require regular cleaning. Various types are available including uniform attenuation and amplitude-sensitive.



The advantages and disadvantages of pre-moulded earplugs are:

Advantages

- Less expensive than custom-moulded earplugs
- Easy to insert properly
- Last longer than compressible earplugs
- Do not require custom-fitting - available off-the-shelf
- Reusable - if kept clean

Disadvantages

- More expensive than compressible earplugs
- Uniform attenuation types generally not as 'flat' as custom-moulded uniform attenuation earplugs

Useful for

- Musicians who want a relatively inexpensive earplug with relatively uniform attenuation for practice and rehearsals

Custom-Moulded Earplugs

The silicone earplug is moulded to the shape of the user's ear canal and should be fit-tested. They are typically made by a laboratory that supplies local audiologists and hearing clinics. They can come in filtered or vented/tuned varieties. Each plug is fitted with an adjustable vent or capped with a button-sized filter attached to its outer end.

The advantages and disadvantages of custom-moulded earplugs (filter types) are:

Advantages (filter types)

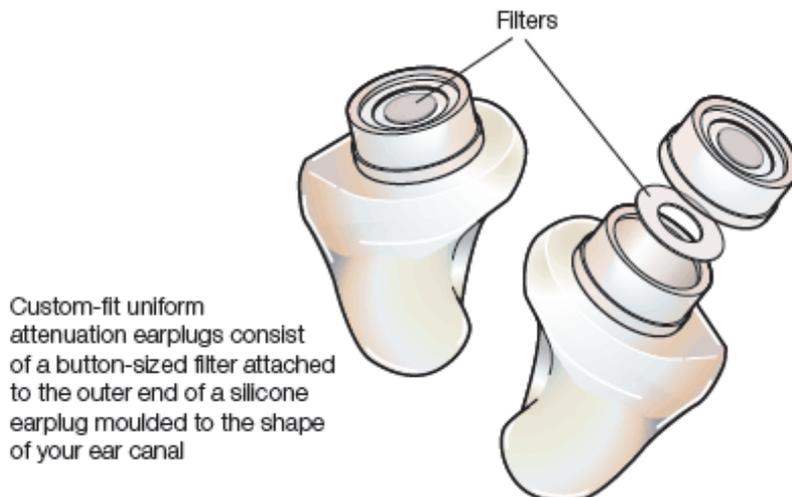
- Can provide even attenuation of frequencies up to about 6000 Hz
- Can be modified to adjust high-frequency attenuation
- May be flesh-coloured and unobtrusive

Disadvantages (filter types)

- Expensive
- Need custom-fitting by a qualified professional

Useful for

- Musicians playing or seated nearby to instruments that produce higher-frequency sounds (for example, violins, trumpets, piccolos, and pianos)
- Anyone who needs sound reduction with minimal distortion or colouration



The advantages and disadvantages of custom-moulded earplugs (vented/tuned types) are:

Advantages (vented/tuned types)

- Allow musicians playing lower-frequency instruments to hear themselves while screening out surrounding higher-frequency sounds
- Very little occlusion effect
- Right and left earplugs can be adjusted separately to compensate for right-ear hearing loss in flute and piccolo players

Disadvantages (vented/tuned types)

- Expensive
- Need custom-fitting by a qualified professional

Useful for

- Musicians playing bass and lower-frequency instruments (for example, lower strings, reeded woodwinds, and low brasses) who wish to shield themselves against high-frequency sounds from percussion or trumpet sections

Canal Caps/Semi-Insert Earplugs

Canal caps and semi-insert earplugs come on a headband. Canal caps (sometimes called semi-aural plugs) generally have rounded tips that cover the entrance to the ear canal, while semi-insert plugs generally have tapered tips that are pushed into the ear canal. Both types are convenient for situations where the hearing protection has to be taken on and off frequently. They are not designed for continuous use.

Semi-Insert Earplugs

Where patterns of exposure to excessive noise are likely to be repeated and short-term, earmuffs or canal caps (semi-aural/semi-insert earplugs) may be preferred because they are quick and easy to fit and remove, and therefore more likely to be fitted when exposure occurs.

Personal Hearing Protection: Wind and Brass Players

When blowing their instruments, wind and brass players experience their own sound aurally, but also via the skull-bones conducting the vibrations from the instrument to the ears, as they play. Using earplugs can affect this balance as the musician's ear hears less treble sound while experiencing more bass sound via bone conduction. The bass-treble distortion can be extreme. This will be strange for the player, can take some time to get used to and will vary from one individual to another.

Ordinary compressible earplugs are generally unsuitable for players of reeded woodwind and brass instruments because of the occlusion effect (singers also find compressible earplugs make the voice sound strange). There are two ways of dealing with the occlusion effect:

- Use deep-fitting custom-moulded earplugs which reach into the inner bony portion of the ear canal and so reduce potential vibration and jaw resonance; or
- Use earplugs with vents that allow the trapped low-frequency sound to escape

There is a misconception among some woodwind and brass players that it is not possible to wear earplugs due to the build-up of pressure in the ear and the risk of further damage to the ear canal. This has no basis in fact. With the correct earplugs, with patience and sufficient acclimatisation, brass and woodwind players will find they are able to wear appropriate earplugs and have no need to worry that they will suffer further damage to their ears.

Personal Hearing Protection: Large Dynamic Range and Impulsive Sounds

Some sources of noise have a large dynamic range (such as brass, percussion and much woodwind). In these situations, 'amplitude-sensitive' or 'level-dependent' hearing protection could be suitable. These use mechanical or electronic mechanisms to allow lower-level sounds to pass relatively unhindered, but 'clip' very high-energy noise. The type with mechanical mechanisms often uses the acoustic properties of carefully designed air ducts to give different protection at different noise levels. Amplitude-sensitive hearing protectors come in earplug and earmuff types.