HEALTH AND SAFETY AUTHORITY

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The Noise of Music

Sound advice for the music and entertainment sectors

Guidance on how to comply with the Safety, Health and Welfare at Work (General Application) Regulations 2007

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This Guidance is intended to provide practical guidelines to help workers and employers in the music and entertainment sectors to protect their hearing and meet their legal obligations. These obligations are laid down in the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007) as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (S.I. No. 732 of 2007) relating to the control of noise at work; hereinafter referred to as the Noise Regulations.

This Guidance supersedes 'A Guide to Exposure to Noise in the Entertainment Industry', which is hereby revoked.

Contents

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Introduction

The Noise Regulations transpose Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise). On 1 November 2007, these Noise Regulations replaced the Safety, Health and Welfare at Work (Control of Noise at Work) Regulations 2006 (S.I. No. 371 of 2006), which were revoked from that date.

The Noise Regulations apply to the music and entertainment sectors from 15 February 2008.

The 'music and entertainment sectors' are defined as 'all workplaces where live music is played, or recorded music is played in a restaurant, bar, public house, discotheque, or nightclub, or alongside live music or a live dramatic or dance performance'. This definition has a wide application, including orchestras, bands, concert halls, theatres, rock concerts, marching bands, pubs, clubs etc. It encompasses not just musicians, but also, for example, sound engineers and security and bar staff.

Music is perceived as pleasurable and is sometimes loud to produce its effect. The sound of a pneumatic drill is not regarded as pleasurable, but both music and pneumatic drills cause pressure fluctuations (noise) and if this noise is too high, or carries on for too long, people's hearing may be damaged. **This Guidance aims to help prevent damage to workers from the noise of music.**

Noise measurement

The basic instrument for measuring noise is a sound level meter. A dosemeter (personal sound exposure meter) worn by the worker can also be used. A calibrator to check the meter and a windshield to protect the microphone against air movement and dirt are essential accessories.

Noise is measured in decibels (dB). To address the way the human ear responds to sounds of different frequencies, an A-weighting is commonly applied, and the measurements are expressed in dB(A). To measure peak, impact or explosive noises, a C-weighting is applied, which is a wide-band-frequency-weighting, and the measurements are expressed in dB(C).

Noise is a measure of pressure on the ear – a 3 dB increase in noise represents a doubling of that pressure, so what seems like a small difference in numbers can be quite significant.

The risks of noise

The effect of noise on hearing can be temporary or permanent. Temporary deafness is often experienced after leaving a noisy place. Although hearing recovers within a few hours, this should not be ignored as it is a sign that continued or regular exposure to such noise could cause permanent damage.

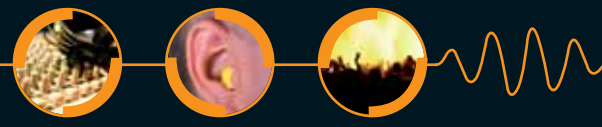
Hearing loss is usually gradual due to prolonged exposure to noise. It may only be when damage caused by noise over the years combines with normal hearing loss due to ageing that people realise how deaf they have become. Hearing damage can also be caused immediately by sudden, extremely loud noises (from, for example, electric arcs, foundry fettling machines, guns or cartridge-operated machines), though this is not common.

Exposure to noise may also cause tinnitus, which is a sensation of noises (such as ringing or buzzing) in the ears. This can occur in combination with hearing loss.

There is good evidence that a risk to hearing from prolonged exposure to noise exists at levels down to 85 dB(A) and there is some evidence of such a risk down to 80 dB(A).

Workers who are regularly exposed to noise above 85 dB(A) will be at increased risk of damage to their hearing resulting in noise-induced hearing loss. Noise-induced hearing loss is the most common reported occupational disease in the EU.

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 and schools to orchestra pits and bars.

The music and entertainment sectors are unique in that they often regard high sound levels and extremely loud special effects as essential elements of an event. However, loud sounds can damage hearing. Hearing damage is permanent, irreversible and causes deafness. Hearing aids cannot reverse hearing damage. Serious risks of hearing damage exist for those in the music and entertainment sectors who regularly work in noisy environments such as clubs and discotheques or at live concerts.

The range of affected workers includes musicians and other performers, disc jockeys, service staff, technical staff, security staff, first-aid workers, cashiers and others. These workers are often exposed to daily noise exposure levels exceeding the *exposure action values and exposure limit values* indicated in Regulation 123 of the Noise Regulations.

As it first affects the precision of hearing, noise-induced hearing loss and other disorders not only affect the worker's enjoyment of music, but may threaten his or her career. Hence, what is a pleasure and almost harmless for consumers at a single event may be an occupational hazard for workers due to their repeated long-term exposure.

Noise exposure levels

The following table sets out the noise exposure action or limit values, and the actions required if they are reached.

	Level	Actions
Lower exposure action values	80 dB(A) daily or weekly personal average noise exposure or 135 dB(C) peak sound pressure	• Undertake risk assessment. • If any employees are identified as being particularly susceptible to noise, health surveillance should be implemented. • Make hearing protection available. • Provide training.
Upper exposure action values	85 dB(A) daily or weekly personal average noise exposure or 137 dB(C) peak sound pressure	• Establish and implement a programme of control measures. • If these measures are not sufficient to reduce exposure below 85 dB(A), suitable hearing protection must be worn and a health surveillance programme must be implemented.
Exposure limit values	87 dB(A) daily or weekly personal average noise exposure or 140 dB(C) peak sound pressure	• Reduce to below the exposure limit value (this value is, for any worker, the level of daily exposure or peak sound pressure that must not be exceeded).

When applying the exposure limit values, the determination of a worker's effective exposure must take account of the attenuation provided by individual hearing protectors worn by the worker. It should be noted that the exposure action values shall not take account of the effect of any such protectors.

The attenuation provided by individual hearing protectors worn by a worker may be estimated using a number of different methods. The three principal methods for passive hearing protectors are defined by international standard EN ISO 4869-2:1995

Normally, average noise exposure is calculated on a daily basis. However, the Noise Regulations allow the calculation of exposures over a week rather than over a day in circumstances where noise exposure varies markedly from day to day. This is only likely to be appropriate where:

- Daily exposure on one or two working days in a week is at least 5 dB higher than it is on the other days.

- The week comprises three (or fewer) days of exposure.

When considering whether to use weekly averaging it is important to:

- Ensure there is no increase in risk to health. It is not acceptable to expose workers to very high noise levels on a single day without providing them with hearing protection.
- Reduce the risk to as low a level as is reasonably practicable.
- Consult with the workers concerned and their safety or employee representatives on whether weekly averaging is appropriate.

The daily noise exposure is a measure of the total noise 'dose' received during the working day. It is an average over the working day. It takes account of both the sound level and its duration.

Sound level measured in decibels has a logarithmic scale. Each 3 dB added doubles the sound energy (but this is only just noticeable to a listener). When 10 dB is added, the energy (and therefore the risk of hearing loss) is increased tenfold; adding 20 dB is a hundredfold increase. Thus:

- If the sound energy is doubled, the sound level increases by 3 dB.
- Two instruments of the same loudness of 85 dB will together produce 88 dB.
- A sound reduction of 3 dB halves the sound energy (and its propensity to cause damage).

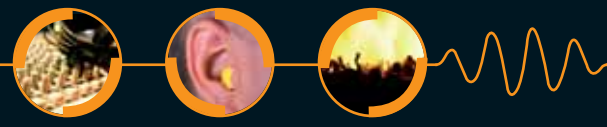
The following noise exposures are identical:

80 dB for 8 hours
83 dB for 4 hours
86 dB for 2 hours
89 dB for 1 hour
92 dB for 30 minutes

Typical daily sound exposure levels found in the music and entertainment sectors include:

- In the case of orchestra musicians, the most directly affected from music sound are the musicians themselves. Depending on the instrument and the location and taking into account the additional exposure arising from an individual's training, rehearsal and warm-up sessions, a typical daily sound exposure level of an orchestral musician reaches 80 to 95 dB(A).
- In the case of rock and pop musicians, high sound pressure levels are predominantly desired and expected by the audience and therefore significant on-stage sound levels are commonplace. Sound exposure levels for rock and pop musicians are in the range of 95 to 110 dB(A).
- In the case of jazz and folk musicians, sound exposure levels are usually within a span of 90 to 98 dB(A).
- In the case of other workers, sound exposure levels similar to those of the musicians have been measured for sound engineers and security or other service staff at live concerts.
- Workers at nightclubs or comparable live events are also exposed to high sound exposure levels. The sound levels on dance floors are often over 100 dB(A). While disc jockeys are exposed to levels of 95 to 100 dB(A), the sound levels to which the service staff are exposed are 90 to 95 dB(A). Despite working times of less than twenty hours per week, daily sound exposure levels of 96 dB(A) for disc jockeys and 92 dB(A) for service staff have been assessed.

A combination of different measures may be required in order to find the best way to avoid or reduce noise exposure levels in the particular circumstances being encountered. When examining possible measures, factors such as types of instruments being played, number and positions of players, use of amplification, whether workers are or have been working already at other premises that day (at home, in a rehearsal studio, teaching in class etc.), acoustics of the venue and the noise associated with stunts and effects should all be considered. Several different controls or combinations may have to be tried to find the best way to avoid or reduce sound exposure levels as each measure may itself have implications for others in a variety of ways.



Responsibility for noise management

Everyone involved in the music and entertainment sectors has a responsibility to assist with noise management, from the promoter or venue operator through to the performers and technicians. Under the Safety, Health and Welfare at Work Act 2005, 'employers are required to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his or her employees'. Also 'every employer shall manage and conduct his or her undertaking in such a way as to ensure, so far as is reasonably practicable, that in the course of work being carried on, individuals at the place of work (not being his or her employees) are not exposed to risks to their safety, health or welfare'. In most cases, employers will need to exchange information and collaborate to ensure that they fulfil their duties without unnecessary duplication. Where contractors, fixers and freelancers engage extras, they should ensure that information on the risks and control measures in place are communicated to them.

Many performers and sound operators in the music and entertainment sectors are self-employed. However, they have the same responsibilities as employers and employees for their own health and safety arising from exposure to noise and for other people whose hearing might be damaged by their acts or omissions.

Notwithstanding the above, the primary responsibility for noise control rests with the employer. Employers in the music and entertainment sectors may include, for example, concert promoters, venue owners, theatrical producers, contractors and publicans. Under the Noise Regulations, an employer is required to:

- Assess the risks to employees from noise at work.
- Take action to reduce the noise exposure that produces those risks.
- Make sure the legal limits on noise exposure are not exceeded.
- Provide employees with information and training.
- Carry out health surveillance where there is a risk to health.
- Provide employees with hearing protection if the noise exposure cannot be reduced enough by other methods.

Employees also have responsibility for complying with the Noise Regulations. Employees in the music and entertainment sectors may include, for example, musicians and other performers, disc jockeys, service staff, technical staff, security staff, first-aid workers and cashiers. Under the Noise Regulations, employees have a duty to:

- Use control measures in accordance with their employer's instructions.
- Wear hearing protection according to their employer's instructions.
- Take care of hearing protectors and noise control equipment.
- Report faults and difficulties in using noise control equipment.
- Be available for health surveillance.

Noise risk assessment

Event planning needs to ensure that health and safety requirements are considered. The degree of planning will depend on the complexity of the event but every event will benefit, be it a pop concert, a gig in a pub, an orchestral concert or a club with a guest DJ.

An initial assessment of the likely noise levels should be carried out, by a competent person, during the planning of the event. This initial assessment should be undertaken at the earliest opportunity in order to identify any potential periods of noise risk and should be carried out well before any music is played in rehearsal or performance. The assessment should, where appropriate, consider:

- The nature of the event and the music.
- The site/venue layout.
- The noise footprint/map (the area covered by the sound).
- Where there may be a risk from noise and who will be affected.
- A reliable estimate of expected noise levels and expected durations.
- Selection of loudspeaker types.
- Suitable control measures available for noise hazards.

The assessment process should involve the exchange of information with people who may be affected by the event, for example promoters, venue operators, contractors, local authorities and recording companies.

This initial assessment of noise levels should be carried out as

part of the overall risk assessment for the particular event or location. The results of the initial assessment should be retained as a written record. If this assessment indicates that potential hazardous noise levels may be produced, a formal risk assessment by a competent person should be carried out to determine the exact nature of the risk.

The formal noise risk assessment will establish whether the exposure is at or above the lower exposure action value of 80 dB(A). However, it involves more than just taking measurements of noise, indeed sometimes measurements may not even be necessary. Its aim is to help decide what measures are necessary to ensure the health and safety of workers who are exposed to noise.

Formal noise risk assessments should:

- Be carried out by a competent person. The level of competency required will vary depending on the complexity of the situation; a competent person should suggest cost-effective and appropriate control measures.
- Identify where there may be a risk from noise and those likely to be affected.
- Contain a reliable estimate of the noise exposure and compare the exposure with the exposure action and limit values.
- Identify what needs to be done. If noise control measures are needed, which and where. If hearing protection is required, what and for whom.
- Identify any employees who need to be provided with health surveillance and whether any employees are at particular risk.
- Become part of a knowledge database for future assessments and, within reason, be shared with others.
- Be monitored to ensure their effectiveness.

It is essential that the estimate of a worker's noise exposure is representative of the work being carried out. It needs to take account of:

- The work being carried out or likely to be carried out.
- The ways in which the work is being done.
- How the work varies during the day (for instance, in a nightclub or bar the loudest noise will be when it is crowded and music is being played).
- How the work may vary from one day to the next.
- How long the work will take.
- All sources of noise at work, including, for instance, the noise from patrons and machinery, not just the music.

If there is any doubt, it is sensible to assume that control measures are necessary when noise is present and that hearing protection will be required until the control measures are sufficient to reduce the worker's noise exposure to below the upper exposure action values.

The Noise Regulations require specific action when noise exposure reaches certain action values. To assess a worker's noise exposure, reliable information is needed on:

- The average noise level to which the worker is exposed.
- The amount of time the worker spends in the noisy environment.

The noise level is combined with the duration of exposure to determine the noise exposure. Noise exposure is based on the mathematical relationship between the average noise level and the duration of the noise. Daily and weekly exposure can be calculated (see above).

The estimate of the noise level must be based on reliable information. This may include:

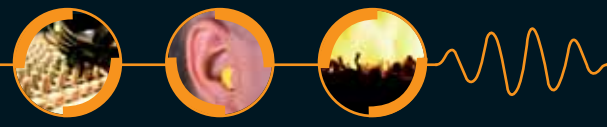
- Noise measurements in the workplace.
- Information from other similar workplaces.
- Information from other sources.

Measurements will be necessary when a reliable estimate of a worker's exposure cannot be made in other ways. Measurements may also be used to demonstrate that the noise exposure is below a particular value so that the employer, and others, can be assured that the requirements of the Noise Regulations have been met, and, where confirmation is necessary, to verify that the control measures in place have reduced exposure sufficiently.

Reliable estimates or an actual measurement of the noise level should be made for each task undertaken. For instance, noise levels in rehearsal and performance may well be different and noise levels for different performers can also vary. If any information used is not based on noise measurement in the work situation, then it will be necessary to demonstrate that the estimate is representative.

One way of determining how long a person is exposed to levels of noise is to observe the work going on and discuss it with workers, supervisors etc. If the noise level varies during the day, the duration of a worker's exposure to each noise level needs to be recorded or estimated.

See also the step guide to noise risk assessment in Appendix 1.



Noise control measures

Where the risk assessment shows that workers are likely to be exposed to noise at or above the upper exposure action values, the employer must put in place a planned programme of noise control. In addition to providing information on the risks, the risk assessment should have produced an action plan for controlling noise.

There are many ways of reducing noise and noise exposure and often a combination of methods works best. Means that protect all the exposed people should always be preferred to individual protection measures. Indeed, the use of collective measures is the preferential approach for controlling any risk. In broad terms the approach for the control of noise should be, in order of preference, to:

- Eliminate the hazard altogether.
- Control the risk:
  - reduce the volume;
  - physically separate people from the hazard;
  - reduce the number of people exposed;
  - reduce the duration of exposure.
- Provide personal protection equipment (PPE) in the form of personal hearing protection. Personal hearing protection is always the last resort as it is merely protective rather than preventive.

Even extremely short exposure to very loud noise is dangerous. Some sounds such as percussive or explosive reports are of very short duration but of such a level that hearing damage can occur. Exposure to such noises is uncommon in the normal environment. However, pyrotechnics and even loud sound systems can deliver peak noise levels in excess of the 140 dB(C) exposure limit value set by the Noise Regulations.

Extreme care needs to be taken to protect workers against such noise levels and a range of strategies may be required to ensure that hearing damage does not result. Unlike lower noise hazards where damage accumulates over time, sounds peaking above 140 dB(C) are liable to cause immediate and lasting damage. Thus, it is essential to ensure that a thorough noise control strategy is in place before any exposure is liable to occur. Where it is necessary to implement control measures, the resulting sound levels should be assessed to ensure that the risk has been sufficiently diminished.

Eliminate the hazard altogether

Wherever practicable, do not generate hazardous levels of sound in the first place. Turn amplified sound down. This is simple and highly effective.

Amplified music may not be needed for the entire duration of the event.

Think of ways of eliminating unnecessary exposure. For example, avoid noisy activities such as sound system checking whilst riggers and others are working adjacent to loudspeakers.

Consider tailoring the programme to the venue. Avoid reverberant or unsuitable spaces.

Noise can be controlled by the careful design of the premises, for example through the use of acoustic absorption panels. The addition of an acoustic ceiling, wall linings or carpeting may increase acoustic absorption in the location.

Great care is needed in the use of pyrotechnic and other sound effects. The manufacturers should be contacted for advice on noise levels where pyrotechnics are to be used, as the noise levels produced by pyrotechnics can exceed the exposure limit values.

Reduce the volume

Consider how the noise level can be reduced. Reducing the sound output from individual instruments by, for example, damping drums or closing piano lids, will lead to an overall reduction in volume.

Look at the possibility of substituting quieter instruments and smaller amplifiers. Bear in mind that using quality amplification and speakers that operate without distortion is preferable to driving inferior systems at higher rates.

Consider altering the drum kit set-up to ensure cymbals etc. are not at ear height. Experiment with raising or lowering the cymbals as necessary to protect the hearing of everyone who is close by. Damping drum kits can reduce overall noise levels, especially in rehearsals.

Control of sound levels can be more readily carried out where amplification is used. However, the risk of excessive noise increases because of the ease of amplification so it is essential that sound levels are monitored. Electronic noise limiters can be useful in controlling amplified noise levels.

There are two basic types of entertainment noise limiter:

(1) Microphone controlled – these control the noise level at the venue via a microphone and either trigger a warning light or cut the power supply to sound systems if pre-set noise level thresholds are exceeded.

(2) Electronic in-circuit devices – these are incorporated into the sound system and operate by monitoring the electrical power output of the amplifiers. If the pre-set amplifier power output threshold is exceeded, whereby noise levels become too high, the device automatically attenuates the amplifier power output so that noise levels are reduced to below the pre-set limit.

Physically separate people from the hazard

It is sometimes possible to separate people from the hazard by physically isolating the noise source (for example by the use of booths for noisy instruments in recording studios).

Where possible, increase the distance between non-performing workers not on stage and the stage area and loudspeakers. For instance, try using suspended instead of ground-stacking speaker systems as this introduces a natural separation for other workers and the audience, making it impossible to get too close to the sound source. A similar effect can be achieved by means of barriers around speaker positions.

In live music situations, limited separation can be achieved by a number of means. For example, stage risers of suitable height and width can be used to elevate performers (such as the brass, woodwind and percussion sections) thereby reducing exposure to other performers; acoustic screens can reduce the exposure to sound from particular loud sound sources.

Reduce the number of people exposed and the duration of exposure

If people (for example pit crews and monitor engineers) have to work in high sound level environments, measures should be undertaken to reduce the duration of exposure. This could include shortening sound and system checks and rotating staff between noisy and quieter duties. This may not make sense for a specialist such as a monitor engineer at an individual concert, but in the context of reducing an overall weekly exposure level, task variation may well be a useful strategy. Show days might be balanced with office/warehouse work to achieve a safe weekly exposure level.

Technical staff and working crews etc. should be protected from unnecessary exposure to high sound levels; for example, by ensuring lighting desks are not placed near loudspeakers.

Where possible, stages and loudspeaker positions should be arranged to avoid excessive sound levels for bar staff, stewards and other workers. Where a venue has a number of speaker positions around the building, consideration must be given to the direction and volume from each group of speakers. Those that are close to staff and other noise-sensitive locations such as the bar should be individually controllable.

For outdoor events and festivals, consideration must be given to the noise impact on stewards, security staff, first-aiders, concession holders and so on, not just stage production staff and performers.

It should be ensured that the above measures do not create higher levels of noise for the general public.

Personal hearing protection

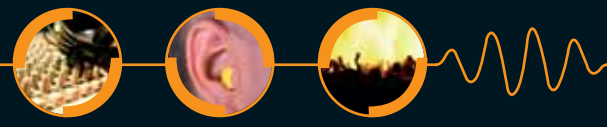
The Noise Regulations require that personal hearing protection is selected, where necessary, to eliminate the risk to hearing or to reduce the risk to the lowest level reasonably practicable. The selection process must take account of consultation with workers or their representatives.

The use of personal hearing protection to control noise exposure should be considered only as a last resort, when all other methods of control have been explored. However, personal hearing protection must be used as an interim measure to alleviate immediate risks whilst other, more permanent solutions – technical, engineering or organisational – are being sought.

Where the daily or averaged weekly exposure to noise is likely to reach 80 dB, the employer must provide hearing protection to any worker who requests it. Where the daily or averaged weekly exposure to noise is likely to reach 85 dB, the employer must provide personal hearing protection and ensure that it is used.

Employers must also provide sufficient protection against impulse noise, such as gunfire or pyrotechnic effects, to reduce the C-weighted peak sound pressure level at the ear to below the peak exposure limit value of 140 dB.

Where exposure to noise varies, employers should ensure that their employees have protectors adequate for the worst situation likely to be encountered and that they know when and where to use them. It might be that the use of more than one type of hearing protector is an appropriate solution for people whose work varies significantly during



the day or from day to day.

All users should receive appropriate instruction, information and training in the use of the selected protection.

In order to be of value, hearing protection needs to:

- Control the risk.
- Not over-protect.
- Be the right type.
- Be comfortable and suitable for the environment.
- Be properly used. Improper use is sometimes worse than no protection at all because the user assumes he or she is being shielded.
- Be worn at the right time, i.e. whenever there is a noise hazard present.
- Be readily available to all who require it.
- Be properly maintained.

People using personal hearing protection must, at all times, be able to hear any safety alarms and warning signals such as fire alarms, evacuation alerts, reversing vehicles, stage announcements concerning strobe effects etc. Where any doubt exists about the ability of a worker to hear such warnings, alternative means of communication must be provided.

Great care is needed when selecting hearing protection. There are many different kinds of hearing protector available. Whichever type of protector is used, it will provide its best protection only if it is in good condition, is the correct size and is worn properly. All hearing protectors should carry the CE mark, which indicates that they meet essential requirements in accordance with the Personal Protection Equipment Regulations.

When there is no concern about sound quality, hearing protection can be both simple and inexpensive.

Workers exposed to high levels of mechanical or background noise generally need to block out as much of that noise as possible, keeping in mind that the worker may still need to communicate with others or hear warning signals.

Musicians should avoid using over-protective personal hearing protection, as this can cause them to compensate for the perceived hearing loss by playing louder music and thus actually increasing their risk of hearing damage.

Music typically contains a lot of mid to high frequencies. Performers and sound engineers need to hear specific information that is often contained in the higher frequencies. Their protectors need to reduce sound levels, whilst maintaining an even frequency response, i.e. be physically suited to offer protection of a suitable attenuation and at appropriate frequencies.

Where patterns of exposure to excessive noise are likely to be repeated and short term, earmuffs may be preferred, as they are quick and easy to fit and remove, and therefore more likely to be fitted when exposure occurs.

Earplugs could also be used. These fit into the ear or cover the ear canal to form a seal. They sometimes have a cord or neckband to prevent loss.

Inserting something into the ear canal alters the ear's natural acoustic properties, which is a problem for musicians and vocalists. Conventional earplugs tend to reduce higher frequencies more than lower frequencies. A compressible foam plug that reduces sounds in the 125 Hz range by 25 dB may reduce sounds in the 4000 Hz range by almost 40 dB. Fortunately, hearing protection technology has evolved to the point where specialised products can reduce sound levels while maintaining even frequency response.

Even so, all earplugs alter the listening experience, and it can take a long time to get used to them. The acclimatisation process should be managed; if not, people will give up and their hearing will become increasingly damaged. Musicians should avoid wearing earplugs for the first time in a performance. A typical sequence for a musician might be:

- Wear earplugs at home.
- Wear them at home and get used to speaking whilst wearing them.
- Wear them around and about and get used to conversation whilst wearing them.
- Wear them whilst practising.
- Wear them at rehearsal.
- Wear them in performance.

Some players who might find it unacceptable to perform wearing hearing protectors are quite comfortable using them during rehearsal. Hearing protection during rehearsal might be particularly useful if loud passages are being played repeatedly.

With sufficient time to acclimatise to using the right hearing protection, communication with other people should not be a major problem. The problem of distinguishing what people are saying or playing is as a result of the high noise environment, not the attenuation of the hearing protection.

Hearing protection zones

If any employee is likely to be exposed to noise at or above either upper exposure action value, the employer must ensure that the area is designated a hearing protection zone. Signs have to be put up to identify the area and the use of appropriate hearing protection enforced. For example, stages, front stage pits and PA wings (public address wings) are often high noise areas at concerts. Access to these high noise areas should be restricted to essential personnel only and all workers must be adequately protected.

In situations where temporary concert stages are established (for example at outdoor festivals or concerts in marquees), the constraints of time may not allow a detailed noise exposure assessment to be carried out. Nevertheless, noise control measures are still required. In such instances the organisers should assume that the entire stage area, the pit area, the front-of-house control position and any locations adjacent to speakers are liable to remain high noise areas even if a range of control measures have been enacted. Such areas should be specified as hearing protection zones and clearly signed; workers in hearing protection zones should be required to adopt suitable personal hearing protection.

Once hearing protection zones have been identified, it is possible to determine who will have to work in those areas. Careful planning may mean that some tasks can be completed when the noise hazard is not present, for example ensuring that lighting focusing and sound checking are carried out at different times.

Provision of information and training

If any worker is likely to be exposed to noise at or above 80 dB, the employer must provide suitable and sufficient information and training relating to risks resulting from exposure to noise, including:

- The nature of the risks.
- Measures to avoid or reduce exposure.
- Results of risk assessments and noise measurements.
- Correct use of individual hearing protectors.
- Entitlement to and purpose of health surveillance.
- Safe working practices.

People in the music and entertainment sectors have to be made aware of the potential for permanent hearing damage associated with working in a high noise environment. Such awareness may require a considerable shift in both personal attitudes and collective culture. However, it is a necessary precursor to achieving long-term protection of hearing.

Understanding the risks from high sound levels should form part of the basic education of performers and technicians, which will mean that people coming into the industry are aware of how to protect themselves and thus become part of the solution rather than the problem. On a more immediate level, information and instruction should also include the posting of warning notices around designated high sound level areas and the briefing of crews regarding the noise reduction strategies adopted for the event.

Employers should ensure that employees understand the need to follow their or the venue operator's instructions on control measures. For example, employees must abide by any agreed arrangements for job rotation or restriction of access to noisy areas, follow any instructions relating to achieving agreed noise levels, and wear hearing protection when required.

Promoters should consider the possibility of sanctions against performers who do not abide by the 'house rules'.

Health surveillance

Health surveillance is about putting in place systematic, regular and appropriate procedures to detect early signs of work-related ill health, and then acting upon the results. The aims are primarily to safeguard the health of workers, including identifying and protecting individuals at increased risk, and to check the long-term effectiveness of measures to control risks to health. Employers are required to ensure that appropriate health surveillance is made available to those employees for whom a risk assessment reveals a risk to their health.

Preventive audiometric testing, carried out by an occupational health professional, shall be made available for employees whose exposure exceeds the lower exposure action levels.

Where the risk assessment indicates exposure above the upper exposure action levels, the employer must make available the services of a registered medical practitioner to carry out, or have carried out on his or her responsibility, a hearing check.

Health surveillance for noise-induced hearing loss will involve a system of audiometric testing to measure the sensitivity of hearing over a range of sound frequencies. The employer will need to appoint a suitable occupational health professional to be in charge of the testing programme. This person should be fully conversant with the technical and ethical aspects of the conduct of audiometry, and in particular be responsible for:

- The quality of the service provided.
- Ensuring that appropriate standards are maintained during testing.
- Record keeping.
- Referring individuals for further advice.

Hearing tests can be a matter of concern for those whose employment depends on their ability to hear. Musicians and sound engineers rely on good hearing and they may worry that any deterioration will affect their ability to carry out their work activities. Whilst recognising this concern, matters will only get worse if no action is taken and workers should be encouraged to view health surveillance programmes as a positive contribution to preserving their hearing. For some, the test will show that there is no problem, whilst others may find that their hearing is in the early stages of damage. Some may already suspect that their hearing is deteriorating and test results may confirm these fears. Whatever the outcome, the test should be viewed as an opportunity to identify any deterioration at an early stage and to ensure that appropriate measures are taken to prevent any further harm.

APPENDIX 1

Step guide to noise risk assessment

Noise risk assessments should:

- Identify where there may be a risk from noise and who is likely to be affected.
- Contain a reliable estimate of the noise exposure and compare this with the exposure action and limit values.
- Identify what noise control measures are needed and whether hearing protection is needed and, if so, where and what type.
- Be regularly monitored and reviewed.

STEP 1. Is it noisy?

In many cases it should be possible to answer this question quite quickly using what is known about the event going on or by making simple observations. The following 'listening checks' may be useful in deciding whether there are likely to be noise risks. As a simple guide you will probably need to do something about the noise if any of the following apply:

- The work involves lengthy exposure to music, either live or recorded, (for example in pubs, clubs, live music venues, orchestras) or using headphones.
- The noise is intrusive – similar to a busy street – for most of the working day.
- People have to raise their voices to carry out a normal conversation when about two metres apart for at least part of the working day.
- Noisy tools are used, such as during rigging, for more than half an hour a day.
- There are any loud effects such as pyrotechnics.

All workers who are likely to be affected by the noise should be identified. Consider not just people who are exposed to noise in relatively fixed locations, but also people who move between different jobs or types of work, and make sure to understand their patterns of noise exposure. Remember to include people who are not direct employees but who may be affected by the noise, for example visitors or subcontractors.

STEP 2. Estimate the noise exposure

The daily personal noise exposure of workers at risk should be estimated and compared with the exposure action and limit values. Exposure estimates take account of both the level of the sound and how long it lasts. Often a worker's daily noise exposure is made up of a number of periods of time exposed to different levels of noise, so this needs to be taken into account when estimating exposure.

It is essential that an estimate of a worker's exposure to noise is representative of the work that the person does. It should take account of:

- The work the person does or is likely to do.
- The ways in which the work is done.
- How the work may vary during the day or from one day to the next.

The estimates of the noise levels must be reliable enough to be able to assess whether any exposure action values are likely to be exceeded. Reliable information may include:

- Noise measurements in the actual work situation.
- Information from other similar work situations.
- Information from other sources, for example on typical noise levels and noise exposures, which may be helpful.

When in any doubt, assume that control measures are necessary and that hearing protection will be required until the control measures are sufficient to reduce the worker's exposure to below the upper exposure action values. If music is to be played, especially loud amplified music, it would be good to assume that there is a risk and therefore some noise controls will be necessary.

STEP 3. Identify what needs to be done to control the risks

An essential outcome of the noise risk assessment is to control the risks. In carrying out a noise risk assessment, the employer should:

- Record the significant findings of the risk assessment and record in an action plan anything identified as being necessary to comply with the law.
- Prepare an action plan, including a timetable, setting out what has been done, what is planned, who will be responsible for the work and how this is to be communicated to those affected.
- Be aware of current good practice and consider the advice on noise control measures in other parts of this guidance.

As well as covering any ways of organising the work and/or technical measures needed to eliminate risks from noise or to reduce noise exposure, the action plan should cover issues such as:

- The provision of personal hearing protection to workers to deal with immediate and ongoing risks.
- Arrangements for providing information, instruction and training.
- Arrangements for making health surveillance available.

In developing an action plan to deal with noise, employers should consider what management arrangements are needed to ensure that the control measures put in place are working and being followed in practice. They should also consider how to adapt or modify the control measures, for example where a music event may be undertaken in different venues, where differences are anticipated between rehearsal and performance, or where changes are likely to the layout of the working environment that could affect the risks from noise exposure.

STEP 4. Regular monitoring and review

Risk assessment is an ongoing process and regular checks are essential to make sure that the control measures continue to be effective. These checks may also identify any further actions that are necessary. Any incidents, for example where it is found that control measures are ineffective or are not being used or followed, should be investigated to find out why; and appropriate action should then be taken.

Specific noise measurements conducted in the working environment can help identify the main sources of noise and make it easier to assess where further controls are necessary and when periods of wearing compulsory hearing protection are required.

It may be helpful to have one or two sound-level meters or noise dosemeters to estimate noise exposure, for example within the orchestra/band or on the dance floor. It may also be useful to establish reference position(s) to enable quick measurements to be made, using a simple meter, to verify that sound levels are under control. This information can be recorded and compared with the assessment and any relevant findings can be applied to future assessments.

The noise risk assessment should be reviewed regularly. There are various reasons why this should happen, including where:

- There is any reason to think that the risk assessment does not reflect the current noise risks, for example changed working methods, set design or seating layout.
- Health surveillance shows that workers' hearing is being damaged.
- Control measures that could not be justified when originally considered (for example on cost or practicability grounds) become reasonably practicable due to some changed circumstances.

Even if it appears that nothing has changed, the risk assessment should not be left for more than about two years without checking whether a review is needed.

APPENDIX 2

Sources of further information and bibliography

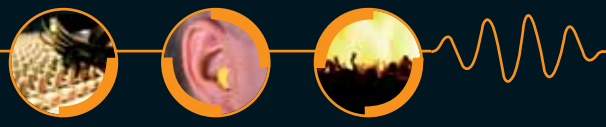
'Noise in figures', Risk Observatory Thematic Report, published by the European Agency for Safety and Health at Work, available online at http://osha.europa.eu/OSHA/?

Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (Chapter 1 of Part 5 – Control of Noise at Work), available online at www.hsa.ie

Guidelines to the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (Chapter 1 of Part 5 – Control of Noise at Work), available online at www.hsa.ie

Guidelines on Hearing Checks and Audiometry, available online at www.hsa.ie

I.S. EN ISO 4869-2:1995, Acoustics – Hearing Protectors – Part 2: Estimation of Effective A-weighted Sound Pressure Levels when Hearing Protectors Are Worn



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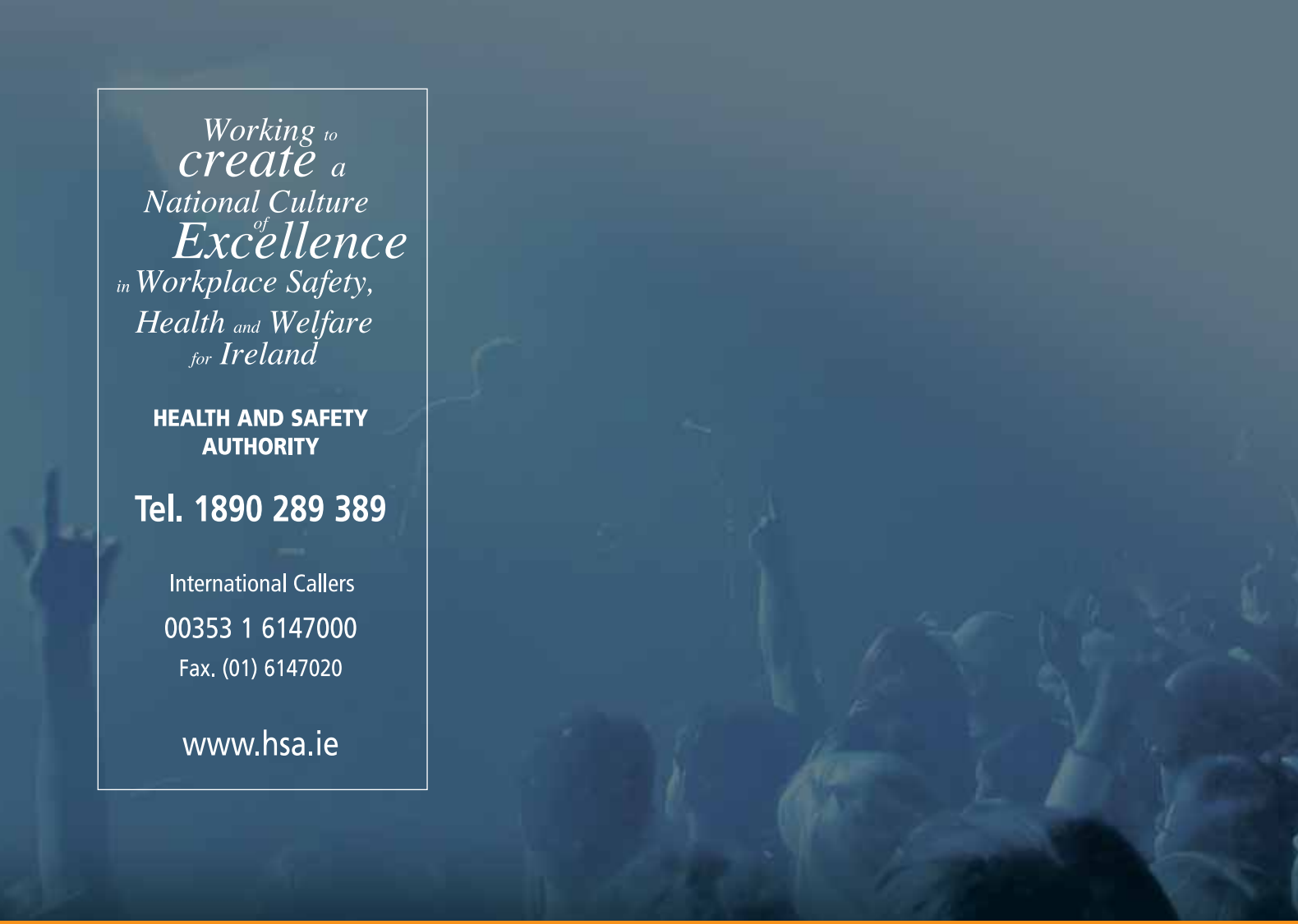

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