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1. Purpose and Scope

This procedure is to assist in the control of workplace noise and the reduction of noise related health problems amongst staff, students and visitors.

This procedure applies to all UNSW-controlled work or workplace where there is the potential for exposure to noise that can contribute to hearing loss.

This procedure must be consulted where noise has been identified as a hazard in the workplace and requires control measures to reduce the risk.

2. Definitions

Hazardous noise in relation to hearing loss means noise that exceeds the exposure standard for noise in the workplace.

Exposure standard for noise is $L_{Aeq,8h}$ of 85 dB(A) or an $L_{C,peak}$ of 140 dB(C). There are two parts to the exposure standard for noise because noise can either cause gradual hearing loss over a period of time or be so loud that it causes immediate hearing loss.

$L_{Aeq,8h}$ of 85dB(A) is the 8 hour equivalent continuous A-weighted sound pressure level

$L_{C,peak}$ of 140dB(C) is the C-weighted peak sound pressure level

Nuisance Noise is that which is perceived as annoying, irrespective of daily exposure.

Administrative Noise Control Measures are work systems designed to substantially reduce noise exposure. Examples are job rotation, job redesign or rosters which are designed to reduce exposure to noise.

Audiometric Testing is the testing and measurement of the hearing threshold levels of each ear of a person by means of pure tone air conduction threshold tests.

Engineering Noise Control Measures is any engineering procedure that reduces the sound level either at the source of the noise or in its transmission, but does not include the use of administrative noise control measures or personal hearing protectors.

Ototoxic substance is one that can cause hearing loss or exacerbate the effects of noise on hearing. They consist of industrial chemicals and some medications. Ototoxic substances absorbed into the bloodstream may damage the cochlea in the inner ear and/or the auditory pathways to the brain, leading to hearing loss and tinnitus. Hearing loss is more likely to occur if a worker is exposed to both noise and ototoxic substances than if exposure is just to noise or ototoxic substances alone

Hand-arm vibration is vibration transmitted to the hand and arm during the operation of hand-held power tools and hand-guided equipment, or holding materials being processed by machines.

Plant is any machinery, equipment, appliance, implement or tool, and anything fitted or connected to them.

Worker: A person is a worker if the person carries out work in any capacity for a person conducting a business or undertaking (PCBU), including work as: an employee, contractor or subcontractor, an employee of a contractor or subcontractor, or an employee of a labour hire company assigned to work for a PCBU, an outworker, an apprentice or trainee, a student gaining work experience, volunteer.

Workplace: Is a place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work

3. Procedure

3.1 Hazard Identification

Hazardous noise can affect an individual's hearing and can make it difficult to hear sounds necessary for working safely e.g. warning signals and communication. It is essential that all sources of noise hazards are identified within the workplace by following a risk management approach. Appropriate controls should be developed to reduce the risk of the hazard on workers who are likely to be exposed to the noise hazard.

Potential noise hazards can be identified from:

- a) Information from manufacturers and suppliers who have a legal responsibility to provide appropriate information regarding the noise output of plant and equipment. Any information provided by a manufacturer or supplier is to be held by the work unit which has control of the area or plant to which it relates. This information is to be made available to workers within this area.
- b) Direct observation, inspections and records. Workplace inspections, audits, walkthrough surveys and direct observation of work tasks being performed will

assist in the identification of potential noise hazards. These inspections should be carried out in consultation between Managers and workers.

c) Consultation with the workforce

d) Hazard/Incident reports

3.2 Risk Management

Once the hazard identification is completed, a noise level assessment may need to be completed (see table below to help determine if one is needed). Once hazards are identified, control measures must be implemented and reviewed.

A 'Yes' to any of the following indicates the need to carry out a noise assessment if exposure to the noise cannot be immediately controlled.
• Is a raised voice needed to communicate with someone about one metre away?
• Do your workers notice a reduction in hearing over the course of the day? (This may only become noticeable after work, for example, needing to turn up the radio on the way home).
• Are your workers using noisy powered tools or machinery?
• Are there noises due to impacts (such as hammering, pneumatic impact tools) or explosive sources (such as explosive powered tools, detonators)?
• Are personal hearing protectors used for some work?
• Do your workers complain that there is too much noise or that they can't clearly hear instructions or warning signals?
• Do your workers experience ringing in the ears or a noise sounding different in each ear?
• Do any long-term workers appear to be hard of hearing?
• Have there been any workers' compensation claims for noise-induced hearing loss?
• Does any equipment have manufacturer's information (including labels) indicating noise levels equal or greater than any of the following: <ul style="list-style-type: none"> ○ 80 dB(A) LAeq,T (T= time period over which noise is measured)? ○ 130 dB(C) peak noise level? ○ 88 dB(A) sound power level?
• Do the results of audiometry tests indicate that past or present workers have hearing loss?
• Are any workers exposed to noise and ototoxins in the workplace?
• Are any workers exposed to noise and hand-arm vibration?

3.2.1 Noise Level Assessment

A noise assessment should be done by a competent person in accordance with the procedures in AS/NZS 1269.1 *Measurement and assessment of noise immission and exposure*. The more complex the situation, the more knowledgeable and experienced the person needs to be.

A competent person is one who has accurately calibrated noise measuring instruments and, through training and experience:

- understands what is required by the WHS Regulations for noise
- knows how to check the performance of the instruments
- knows how to take the measurements properly
- can interpret the results of the noise measurements.

The assessment can be used to determine the noise levels in an area, or the exposure to a person over a time period. The Noise Level Assessment Form (HS087) should be used to record this assessment. Any such assessment should only be used as a guide to assist in making decisions regarding the control of noise hazards.

The table below demonstrates the length of time a person without hearing protectors can be exposed before the standard is exceeded.

<p>Table 1: Equivalent Noise Exposures</p> <p>LAeq,8h = 85 dB(A)</p>
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Noise Level dB(A)	Exposure Time
80	16 hours
82	12hours
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 minutes
100	15 minutes
103	7.5 minutes
106	3.8 minutes
109	1.9 minutes
112	57 seconds
115	28.8 seconds
118	14.4 seconds
121	7.2 seconds
124	3.6 seconds
127	1.8 seconds
130	0.9 seconds

3.2.2 Nuisance noise

This can arise when noise chronically interferes with concentration and communication. Persistent noise stress can increase the risk of fatigue and cardiovascular disorders including high blood pressure and heart disease.

Although safe levels to guard against these effects have not yet been fully determined, as a guide, the risk of adverse health effects can be minimised by keeping noise levels below:

- 50 dB(A) where work is being carried out that requires high concentration or effortless conversation
- 70 dB(A) where more routine work is being carried out that requires speed or attentiveness or where it is important to carry on conversations.

3.3 Risk Control

Where the noise levels fail to meet the legislative requirements, all practicable action must be taken to control and reduce noise emissions in that area. Methods of noise control are prioritised below according to the hierarchy of risk control options. Workers who perform the work task should be consulted with regard to control measures.

1. **Elimination** - removing the hazard or its source from the workplace totally e.g. don't use noisy equipment or change the way work is done so it doesn't generate hazardous noise
2. **Substitution** - swapping to a hazard or source with a lower risk level
 - Buy quiet – ensure that you receive information from suppliers about noise emissions and choose the plant with the lowest noise design

- Change the way a job is done e.g. weld instead of rivet, bend metal instead of hammering

3. Isolation -removing the hazard from the worker or the worker from the hazard

- build enclosures or sound proof covers around noise sources
- use barriers or screens to block the direct path of sound
- locate noise sources further away from workers
- use remote controls to operate noisy plant from a distance.

4. Engineering - physically altering the work environment

- eliminate impacts between hard objects or surfaces
- change fan speeds or the speeds of particular components
- fit sound-absorbing materials to hard reflective surfaces
- turn down volume controls
- isolate a vibrating noise source to separate it from the surface on which it is mounted using rubber mounts and flexible connections
- minimise the drop height of objects or the angle that they fall onto hard surfaces
- use absorbent lining on surfaces to cushion the fall or impact of objects
- fit exhaust mufflers on internal combustion engines
- fit silencers to compressed air exhausts and blowing nozzles
- fix damping materials (such as rubber) or stiffening to panels to reduce vibration
- change the material the equipment or its parts are made of (change metal components to plastic components).

If all the control measures detailed above have been exhausted and the environment still does not meet the requirements then the following controls can be considered.

5. Administration

- organise schedules so that noisy work is done when only a few workers are present
- notify workers and others in advance of noisy work so they can limit their exposure to it
- restrict access to noisy areas to essential staff only
- sign-post noisy areas and restricting access
- Alternate noisy tasks with quiet ones
- provide quiet areas for rest breaks for workers exposed to noisy work
- limit the time workers spend in noisy areas by moving them to quiet work before their daily noise exposure levels exceed the exposure standard.

6. Personal protective equipment - using devices to protect the hearing.

These should only be used:

- when the risks arising from exposure to noise cannot be eliminated or minimised by other more effective control measures,
- as an interim measure until other control measures are implemented
- where extra protection is needed above what has been achieved using other noise control measures

3.3.1 Personal protective equipment

Personal hearing protectors should be selected and maintained in accordance with AS/NZS 1269.3 *Occupational noise management – hearing protector program*. When selecting personal hearing protectors you should consider:

- The degree of attenuation required in the worker's environment (see table below). Do not provide protectors that overprotect by cutting out too much sound – this can cause difficulties hearing verbal instructions or alarm sounds.

Recommended class of hearing protector	
Measured exposure L_{Aeq,8h} dB(A)	Class
Less than 90	1
90 to less than 95	2
95 to less than 100	3
100 to less than 105	4
105 to less than 110	5

- The suitability for the type of working environment and the work tasks. For example, ear-plugs are difficult to use hygienically if they are inserted with dirty hands. Ear-muffs can be uncomfortable to wear in hot environments and can make it difficult to enter a confined space or to wear a helmet/other PPE.
- Disposable hearing protection (earplugs) used in a PC2 lab must be disposed of as PC2 waste.
- Disposable ear plugs must NEVER be reused.
- If reusable hearing protection is used in a PC2 lab it must be decontaminated before leaving the lab.
- The frequency of use e.g. ear-plugs are single-use but ear-muffs are multiple use.
- The comfort, weight and clamping force of the personal hearing protector.

Areas where hearing protection is required must be clearly signposted and boundaries defined.

Personal hearing protectors must be regularly inspected and maintained to ensure they remain in good, clean condition. The inspections should check that:

- ear-muff seals are undamaged
- the tension of headbands is not reduced
- there are no unofficial modifications
- compressible ear-plugs are soft, pliable and clean.

3.3.2 Audiometric Testing

Audiometric testing is required for any worker who is frequently required to use personal protective equipment to protect from risk of hearing loss associated with noise that exceeds the exposure standard.

Testing must be carried out within 3 months of commencing work and at least every 2 years thereafter. Pre-employment audiometric testing is arranged through your HR manager. Once employed, responsibility for arranging ongoing testing rests with the manager /supervisor of the work area.

The test results and their implications should be made available to the employee and steps taken to ensure workers with work related hearing loss are able to work safely.

Audiometric testing may also be carried out on workers who are exposed to:

- any of the ototoxic substances listed in Appendix A where the airborne exposure (without regard to respiratory protection worn) is greater than 50 per cent of the national exposure standard for the substance, regardless of the noise level
- ototoxic substances at any level and noise with LAeq,8h greater than 80 dB(A) or LC,peak greater than 135 dB(C)
- hand-arm vibration at any level and noise with LAeq,8h greater than 80 dB(A) or LC,peak greater than 135 dB(C).

Refer to HS091 Health Monitoring Guideline for more information.

3.4 Training

Training is an integral part of a preventative strategy, and is in addition to the provision of information. The target groups requiring training are:

- a) Managers and supervisors of workers who may be exposed to hazardous noise or other agents that may contribute to hearing loss
- b) Workers who may be exposed to hazardous noise at work
- c) Health and safety consultation committee representatives, and
- d) Staff responsible for the purchasing of plant, noise control equipment, personal hearing protectors and for the designing, scheduling, organisation and lay out of work.

The objectives of the training are to promote an understanding of health effects caused by noise, including occupational, domestic and leisure activities. Training should also promote a systematic approach to the management of exposure to hazardous noise.

Under the Code of Practice, a system also needs to be established in order to familiarise workers with the following:

- a) What noise is, the range of health effects due to noise and the social implications
- b) The exposure to noise in their particular workplace
- c) The general and specific control measures which are necessary to protect them and other persons who may be effected by their work
- d) The noise management procedure and program
- e) Arrangements for reporting defects likely to cause hazardous noise
- f) When and how to use personal hearing protection and their proper care and maintenance
- g) The statutory responsibilities of employers and workers.

3.5 Evaluation of Introduced Controls

Evaluation and assessment of any controls introduced must be undertaken in consultation between managers, supervisors and workers directly involved in the work area identified as possessing a noise hazard. The results of this assessment should be communicated to involved parties.

3.6 Consultation

Consultation on noise hazards is to be undertaken between management, workers, Health & Safety Representatives and/or committees. This consultation is to occur:

- a) As early as possible in the planning/design phase of the introduction of new or modified work areas, plant or practices and procedures, or in the review of existing noise management strategies.
- b) When determining the approach and methods to be used in assessing noise hazards, and when decisions are being made on appropriate control measures.
- c) When the effectiveness of implemented control measures are being reviewed.

3.7 Responsibilities

3.7.1 Management

- Support for the hearing conservation program should come from the senior managers in each area of the University.

- Any person proposing to introduce new plant or equipment into the workplace must ensure that the noise implications are established prior. The supplier of the plant should be asked to provide the results of noise level assessment carried out on the particular item.
- Managers should give purchasing preferences to goods that do not exceed the general 85dB(A) limit or 50dB(A) for office and computing equipment. Where there is only one supplier and the noise emission of the goods is unacceptable, managers should place the onus on the supplier to provide and install acoustic insulation.
- Managers should ensure that all statutory requirements are complied with and a noise management implementation plan is developed.
- Staff must be made aware of control measures implemented to reduce exposure to noise and be encouraged to cooperate in using agreed safe work practices.
- Managers should ensure that workers receive appropriate training and education on the risks of exposure to noise and the appropriate control measures.
- Managers should implement a comprehensive personal hearing protection program, including the selection of personal hearing protectors, and instruction of Workers in their correct use and maintenance.
- Managers must ensure that identified workers attend audiometric monitoring.

3.7.2 Supervisors

- Supervisors have a responsibility to ensure that staff wear prescribed hearing protection and to provide an example to other staff by wearing hearing protection themselves when in designated areas.

3.7.3 Staff

- Staff must wear hearing protection in all areas where it is required and sign-posted.
- Staff and students are required to co-operate with Supervisors and Managers in terms of implementation of this procedure, as well as work in a manner consistent with safe working practices.

3.7.4 Designers and manufacturers

- A designer and manufacturers of plant must ensure that the plant is designed and manufactured so that its noise emission is as low as is reasonably practicable.
- Designers and manufacturers must provide information on noise emission values of the plan, operating conditions when noise is to be measured and methods used to measure the noise

4. Review & History

This Procedure will be reviewed in accordance with the HSMS Review Procedure (HS319).

Version	Authorised by	Approval Date	Effective Date	Sections modified
1.0	Director, Human Resources	2/07/2010	2/07/2010	New procedure
1.1	Director, Human Resources	05/11/2010	05/11/2010	Added section 4.8 Updated section 5
1.2	Director, Human Resources	22/04/2013	22/04/2013	All sections modified to reflect Code of Practice content. Added information on Ototoxic substances
1.3	Director, UNSW Safety and Sustainability	30 April 2014	30 April 2014	Reviewed for administrative updates
1.4	Director, UNSW Safety and Sustainability	24 February 2016	24 February 2016	Reviewed for administrative updates

5. References

- Work Health and Safety Regulation 2011
- Australian/New Zealand Standard 1269 Occupational Noise Management
- Code of Practice Managing noise and preventing hearing loss at work

Appendix A – Ototoxic substances

Exposure to some chemicals can result in hearing loss. These chemicals are known as ototoxic substances (see table below). Hearing loss is more likely to occur if a worker is exposed to both noise and ototoxic substances than if exposure is just to noise or ototoxic substances alone. Some medications have also been identified as ototoxic substances. These include some anti-cancer, anti-inflammatory, anti-thrombotic, anti-malarial, anti-rheumatic and antibiotic drugs. Quinine and salicylic acids (such as aspirin) are also considered to be ototoxic substances.

It is recommended that the daily noise exposure of workers exposed to any of the substances listed in the table be reduced to 80 dB(A) or below. They should also undergo audiometric testing and be given information on ototoxic substances. Refer to Health Monitoring Guideline for more information

Type	Name	Skin Absorption
Solvents	Butanol	√
	Carbon disulphide	√
	Ethanol	
	Ethyl benzene	
	n-heptane	
	n-hexane	
	Perchloroethylene	
	Solvent mixtures and fuels Stoddard solvent (white spirits)	√
	Styrene	
	Toluene	√
	Trichloroethylene	√
	Xylenes	
Metals	Arsenic	
	Lead	
	Manganese	
	Mercury	√
	Organic tin	√
Others	Acrylonitrile	√
	Carbon monoxide	
	Hydrogen cyanide	√
	Organophosphates	√
	Paraquat	