



UNIVERSITY
OF WOLLONGONG
AUSTRALIA

UOW SAFE@WORK

NOISE MANAGEMENT AND HEARING CONSERVATION GUIDELINES

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1 Introduction

Exposure to noise can affect a worker's health in a variety of ways. Repetitive exposure to excessively loud noise levels can precede the development of the progressive condition, "Noise Induced Hearing Loss" (NIHL). As NIHL progresses, the affected person become increasingly isolated and unable to hear everyday sounds, making it difficult to communicate with other people, both at work and socially. Lower levels of noise may also pose a hazard to health. Such noise levels may create distractions, reduce concentration spans, increase frustration and limit communication with others, especially in groups, lecture situations or on the telephone.

In line with the [WHS Policy](#) and the statutory obligation under the [Work Health and Safety Act](#), the University of Wollongong is committed to the control of workplace noise and the reduction of noise related health problems amongst workers, students, contractors and visitors.

2 Scope

This document outlines the requirements for the management of noise and hearing conservation and applies to any University property or in a University controlled environment.

3 Definitions

Audiometric Testing	The testing and measurement of the hearing threshold levels of each ear of a person by means of pure tone air conduction threshold tests.
Decibel (dB)	The unit for measuring noise levels.
Exposure Standard for Noise	An $L_{Aeq,8h}$ of 85 dB(A), or An $L_{C,peak}$ of 140 dB(C)
Hazardous Noise	In relation to hearing loss means noise that exceeds the exposure standard for noise in the workplace. Hazardous noise can destroy the ability to hear clearly and can also make it more difficult to hear sounds necessary for working safely, such as instructions or warning signals.
$L_{Aeq,8h}$	The eight hour equivalent continuous A-weighted sound pressure level in decibels, referenced to 20 micropascals, determined in accordance with AS/NZS 1269.1. This is related to the total amount of noise energy a person is exposed to in the course of their working day. It takes account of both the noise level and the length of time the person is exposed to it. $L_{Aeq,8h}$ values above 85 dB(A) represent an unacceptable risk of hearing loss.
$L_{C,peak}$	The C-weighted peak sound pressure level in decibels, referenced to 20 micropascals, determined in accordance with AS/NZS 1269.1. It usually relates to loud, sudden noises such as a gunshot or hammering. $L_{C,peak}$ values above 140 dB(C) can cause immediate damage to hearing.

4 Responsibilities

4.1 Management

Managers of units including Executive Deans, Directors and Heads of Schools are responsible for ensuring:

- Risk control measures are implemented.
- Purchasing decisions for equipment take the noise exposure standards into account.
- The provision of appropriate PPE for noise; and,
- Workers exposed to noise above the exposure standards are receive the appropriate audiometric testing as outlined in these guidelines.

4.2 Supervisors

Supervisors are responsible for ensuring:

- Any activities conducted by workers that have the potential for exceeding the noise exposure standards are appropriately assessed and controlled.
- Any controls provided for controlling noise exposure are adhered to by workers.

4.3 Workers

Workers are responsible for:

- Complying with any procedures in place to control noise in the workplace.
- Wearing appropriate PPE provided to them for noise control.

5 Risk Management

5.1 Hazard Identification

The identification of noise hazards should take place in accordance with the [UOW Risk Management Guidelines](#). One way to identify noise hazards is via the UOW risk assessment process.

5.2 Noise Assessment

A noise assessment should be completed to assess risks associated with noisy activities that may expose workers or other people at the workplace to hazardous noise, unless the noise can be reduced below the exposure standard immediately. A noise assessment will help to:

- Identify which workers are at risk of hearing loss.
- Determine what noise sources and processes are causing that risk.
- Identify if and what kind of noise control measures could be implemented.
- Check the effectiveness of existing control measures.

A noise assessment may not always need noise measurement. For example, if only one activity at the workplace – the use of a single machine – involves noise above 85 dB(A) and the manufacturer has provided information about the machine's noise levels when it is operated in particular ways, then a sufficient assessment can be made without measurement. More complex situations may require measurement to accurately determine a worker's exposure to noise, such as workplaces with variable noise levels over a shift and jobs where workers move in and out of noisy areas.

The checklist in Appendix 3 can be used to determine if a noise assessment is required for an activity that presents hazardous noise levels.

A noise assessment should be completed 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. The WHS Unit should be contacted if a decision for a noise assessment has been confirmed.

Refer to the Code of Practice - Noise management and Protection of Hearing at Work - WorkCover NSW 2011 and AS/NZS 1269.1 Measurement and assessment of noise immission and exposure for more information on noise assessments.

5.3 Risk Control

Where noise levels exceed the exposure standard for noise, all practicable action must be taken to control and reduce noise emissions in that area in accordance with the [UOW Risk Management Guidelines](#). Areas where hearing protection is required must be clearly signposted in accordance with the [WHS Communication Guidelines](#).

5.4 Evaluation of Introduced Control

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.

6 Consultation

The WHS Act requires the University to consult, so far as is reasonably practicable with workers who carry out work who are (or are likely to be) directly affected by a work health and safety matter. Consultation on health and safety risks arising from hazardous noise needs to comply with the University's [WHS Consultation Statement](#).

7 Audiometric Testing

Audiometric testing must be provided to a worker who is carrying out work that frequently requires the use of personal hearing protection as a control measure for noise that exceeds the exposure standard. Audiometric testing and assessments of audiograms should be carried out by competent persons in accordance with the procedures in AS/NZS 1269.4:2005 - Occupational Noise Management - Auditory Assessment.

Workers should be given the results of audiometric testing accompanied by a written explanation of the meaning and implications. Results are to be treated as confidential unless consent is provided by the worker to share information concerning their hearing levels.

If results show changes to hearing levels, reasons for any changes over time should be thoroughly investigated. During the investigation the adequacy of current control measures that have been implemented to manage noise risks need to be reviewed and improved if necessary.

Further information on hearing tests including frequency specifications can be found in the [Air and Health Monitoring Guidelines](#).

8 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:

- Managers and supervisors of workers who are considered at risk of noise induced hearing loss.
- Workers who may be exposed to hazardous noise at work.
- Health and safety committee representatives.

- Workers 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.

The [Managing Noise and Preventing Hearing Loss at Work Code of Practice](#), also outlines that a system needs to be established in order to familiarise workers with the following:

- What noise is, the range of health effects due to noise and the social implications.
- The exposure to noise in their particular workplace.
- The general and specific control measures which are necessary to protect them and other persons who may be affected by their work.
- Arrangements for reporting defects likely to cause excessive noise.
- When and how to use personal hearing protection and their proper care and maintenance.
- The statutory responsibilities of managers, supervisors and workers.
-

Contact the WHS Unit for details of training sessions.

9 Review

In order to ensure that these guidelines continue to be effective and applicable to the University, it will be reviewed regularly by the WHS Unit in consultation with the WHS Committee. Conditions which might warrant a review of the guidelines on a more frequent basis would include:

- Reported hazards or injuries.
- Non-conforming systems.
- WHS Committee concern.

Following the completion of any review, the guideline will be revised/updated in

10 Related Documentation

- [AS1269.0 Occupational Noise Management](#)
- [AS1269.1 Measurement and assessment of noise immission and exposure](#)
- [AS1269.3 Occupational noise management - Hearing protector program](#)
- [AS1269.4:2005 - Occupational noise management - Auditory assessment](#)
- [AS1270 - Acoustics - Hearing protectors](#)
- [Code of Practice - Noise management and Protection of Hearing at Work - WorkCover NSW 2011](#)
- [UOW Risk Management Guidelines](#)
- [UOW Personal Protective Equipment and Clothing Guidelines](#)
- [UOW Air and Health Monitoring Guidelines](#)
- [UOW WHS Policy](#)
- [Work Health and Safety Act 2011 NSW](#)
- [Work Health and Safety Regulation 2011 NSW](#)

Appendix 1 – Noise Exposure (LAeq,8h) Calculations

The following steps represent a simple way of working out a worker’s LAeq,8h (eight-hour equivalent continuous sound pressure level) if you know the noise level and duration of each of the noisy tasks carried out by the worker during the work shift.

Step 1: Identify noisy tasks performed per shift and determine both the noise level and the duration of exposure to noise associated with each noisy task.

Step 2: Determine the ‘Noise Exposure Points’ (NEP) associated with each noisy task using Table 1 or Table 2.

Example

A task producing a noise level at the worker’s ear of 93 dB(A) that is done for two lots of 30 minutes in a shift (i.e. one hour total) produces 80 noise exposure points (Task 1).

Another task with a noise level of 120 dB(A) for one minute during the shift produces 670 points (Task 2).

NOTE: For durations of noise exposure not listed in the either Table 1 or Table 2, add together the points from two durations that together give the same duration.

Example

A task for three hours at 86 dB(A), add together the points for one hour at 86 dB(A) and two hours at 86 dB(A), i.e. 35 + 64, giving a total of 99 points (Task 3).

NOTE: For noise levels not listed in the either Table 1 or Table 2, extend the tables for higher and lower sound levels using the principle that a change of 10 dB(A) results in a tenfold change in the points.

Example

A task with a one hour exposure at 74 dB(A) will be 10 times less the points for one hour at 84 dB(A), i.e. 5 ÷ 10, 0.5 points (Task 4).

NOTE: For shift lengths of 10 hours or more (*), the adjustments listed in Table below should be added to the LAeq,8h before comparing the result with the exposure standard for noise.

Adjustments to LAeq,8h for extended work shifts

Shift length	Adjustment added to measured LAeq,8h dB(A)
10 hrs or more to less than 14 hrs	+ 1
14 hrs or more to less than 20 hrs	+ 2
20 hrs or more	+ 3

Step 3: Calculate the ‘Total NEP per Shift’ by adding the NEP for each noisy task together.

Step 4: Convert the NEP for each noisy task and for the shift into a LAeq,8h value using Table 3.

Step 5: Assign a ‘Hazard Rating’ to each noisy task and to the shift.

NOTE: If there is only one source of noise exposure, a quick glance at the background colour of the table cell corresponding to the noise level and duration of noise exposure (Hazard Rating) will indicate if the worker is:

- (a) **Above** the $L_{Aeq,8h}$ 85 dB(A) exposure standard - **Red**
- (b) Well **Below** the $L_{Aeq,8h}$ 85 dB(A) exposure standard - **Green**
- (c) **Marginal** (between $L_{Aeq,8h}$ 80 and 85 dB(A)) – **Yellow**

Step 6: Assign a control ranking to each noisy task (greatest to least contribution to the total noise exposure).

This can help prioritise any noise control action required to reduce the noise exposure level to below the $L_{Aeq,8h}$ 85 dB(A) exposure standard.

Example

Although Task 1 only lasts for one minute, it contributes more than eight times as much as any other task to the total noise exposure. Therefore, Task 1 should be given first priority.

Noisy Task	Noise Level (in db(A))	Duration of Exposure to Noise	Noise Exposure Points (NEP)	$L_{Aeq,8h}$ (in db(A))	Hazard Rating	Control Ranking
Task 1	93	(2 x 30 min =) 1 hour	80	84	Marginal	3
Task 2	120	1 min	670	93 to 94	Above	1
Task 3	86	3 h	(32 + 64 =) 96	84 to 85	Marginal	2
Task 4	74	(2 x 15 min =) 30 min	[(Value for 84 dB(A) ÷ 10) = 5 ÷ 10 =] 2	0	Below	N/A
...
TOTAL PER SHIFT-			(2 + 110 + 96 =) 208	88 to 89	Above	-

Table 1: Exposure points for 75-105 dB(A)/15minutes – 12 hours

Sound Level LAeq,T dB(A)	Duration of exposure per shift							
	15 min	30 min	1 h	2 h	4 h	8 h	10 h*	12 h*
105	320	640	1270	2530	5060	10120	12650	15180
104	250	500	1000	2010	4020	8040	10050	12060
103	200	400	800	1600	3200	6400	8000	9600
102	160	320	640	1270	2540	5070	6340	7600
101	130	250	500	1010	2010	4030	5040	6040
100	100	200	400	800	1600	3200	4000	4800
99	80	160	320	640	1270	2540	3180	3810
98	63	130	250	500	1010	2020	2520	3030
97	50	100	200	400	800	1600	2000	2410
96	40	80	160	320	640	1270	1590	1910
95	32	63	130	250	510	1010	1260	1520
94	25	50	100	200	400	800	1000	1210
93	20	40	80	160	320	640	800	960
92	16	32	63	130	250	510	630	760
91	13	25	50	100	200	400	500	600
90	10	20	40	80	160	320	400	480
89	7.9	16	32	64	130	250	320	380
88	6.3	13	25	50	100	200	250	300
87	5.0	10	20	40	80	160	200	240
86	4.0	8.0	16	32	64	130	160	190
85	3.2	6.3	13	25	50	100	130	150
84	2.5	5.0	10	20	40	80	100	120
83	2.0	4.0	8.0	16	32	64	80	96
82	1.6	3.2	6.3	13	25	51	63	76
81	1.3	2.5	5.0	10	20	40	50	60
80	1.0	2.0	4.0	8.0	16	32	40	48
79	0.8	1.6	3.2	6.4	13	25	32	38
78	0.6	1.3	2.5	5.0	10	20	25	30
77	0.5	1.0	2.0	4.0	8.0	16	20	24
76	0.4	0.8	1.6	3.2	6.4	13	16	19
75	0.3	0.6	1.3	2.5	5.1	10	13	15

Table 2: Exposure points for 95-125 dB(A)/5 seconds – 10 minutes

Sound Level LAeq,T dB(A)	Duration of exposure per shift							
	5 sec	10 sec	15 sec	30 sec	1 min	2 min	5 min	10 min
124	140	280	420	840	1680	3350	8370	16750
123	110	220	330	670	1330	2660	6650	13300
122	90	180	260	530	1060	2110	5280	10570
121	70	140	210	420	840	1680	4200	8390
120	56	110	170	330	670	1330	3330	6670
119	44	88	130	270	530	1060	2650	5300
118	35	70	110	210	420	840	2100	4210
117	28	56	84	170	330	670	1670	3340
116	22	44	66	130	270	530	1330	2650
115	18	35	53	110	210	420	1050	2110
114	14	28	42	84	170	330	840	1680
113	11	22	33	67	130	270	670	1330
112	8.8	18	26	53	110	210	530	1060
111	7.0	14	21	42	84	170	420	840
110	5.6	11	17	33	67	130	330	670
109	4.4	8.8	13	26	53	110	270	530
108	3.5	7.0	11	21	42	84	210	420
107	2.8	5.6	8.4	17	33	67	170	330
106	2.2	4.4	6.6	13	27	53	130	270
105	1.8	3.5	5.3	11	21	42	110	210
104	1.4	2.8	4.2	8.4	17	33	84	170
103	1.1	2.2	3.3	6.7	13	27	67	130
102	0.9	1.8	2.6	5.3	11	21	53	110
101	0.7	1.4	2.1	4.2	8.4	17	42	84
100	0.6	1.1	1.7	3.3	6.7	13	33	67
99	0.5	0.9	1.3	2.7	5.3	11	27	53
98	0.4	0.7	1.1	2.1	4.2	8.4	21	42
97	0.3	0.6	0.8	1.7	3.3	6.7	17	33
96	0.2	0.5	0.7	1.3	2.7	5.3	13	27
95	0.2	0.4	0.5	1.1	2.1	4.2	11	21

Table 3: Use to convert the total points to the LAeq,8h.

Conversion

Total exposure points	L _{Aeq,8h} dB(A)
32000	110
25420	109
20190	108
16040	107
12740	106
10120	105
8040	104
6400	103
5070	102
4030	101
3200	100
2540	99
2020	98
1600	97
1270	96
1010	95
800	94
640	93
510	92
400	91
320	90
250	89
200	88
160	87
130	86
100	85
80	84
64	83
51	82
40	81
32	80
25	79
20	78
16	77
13	76
10	75

Appendix 2 – Ototoxic Substances

Exposure to some chemicals can result in hearing loss. These chemicals are known as ototoxic substances. 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.

Table 4 below lists those ototoxic substances most commonly used in workplaces. Some of these can be absorbed through the skin and are considered particularly hazardous. Exposure standards for chemicals and noise have not yet been altered to take account of increased risk to hearing. Until revised standards are established, it is recommended that the daily noise exposure of workers exposed to any of the substances listed in Table 4 be reduced to 80 dB(A) or below. They should also undergo audiometric testing and be given information on ototoxic substances.

Control measures such as substitution, isolation and local ventilation should be implemented to eliminate or reduce chemical exposures. Personal protective equipment should be used to prevent skin and respiratory absorption when other controls are insufficient.

Table 4: Some common ototoxic substances

Type	Name	Skin Absorption
Solvents	Butanol	Yes
	Carbon disulphide	Yes
	Ethanol	No
	Ethyl benzene	No
	n-heptane	No
	n-hexane	No
	Perchloroethylene	No
	Solvent mixtures and fuels Stoddard solvent (white spirits)	Yes
	Styrene	No
	Toluene	Yes
	Trichloroethylene	Yes
Xylenes	No	
Metals	Arsenic	No
	Lead	No
	Manganese	No
	Mercury	Yes
	Organic tin	Yes
Others	Acrylonitrile	Yes
	Carbon monoxide	No
	Hydrogen cyanide	Yes
	Organophosphates	Yes
	Paraquat	No