

Australian/New Zealand Standard™

**Occupational noise management**

**Part 0: Overview and general  
requirements**

## **AS/NZS 1269.0:2005**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee AV-003, Acoustics, Human Effects. It was approved on behalf of the Council of Standards Australia on 27 January 2005 and on behalf of the Council of Standards New Zealand on 11 February 2005.

This Standard was published on 6 April 2005.

---

The following are represented on Committee AV-003:

Association of Australian Acoustical Consultants  
Association of Consulting Engineers Australia  
Australian Acoustical Society  
Australian Chamber of Commerce and Industry  
Department of Consumer & Employment Protection, WorkSafe Division, W.A.  
Department of Labour, New Zealand  
National Acoustic Laboratories  
N.S.W. Rural Fire Service  
New South Wales Nurses Association  
New Zealand Audiological Society  
Royal Institution of Naval Architects  
Safety Institute of Australia (Incorporated)  
Victorian WorkCover Authority  
WorkCover New South Wales

---

### **Keeping Standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at [www.standards.com.au](http://www.standards.com.au) or Standards New Zealand web site at [www.standards.co.nz](http://www.standards.co.nz) and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

---

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

---

**RECONFIRMATION**  
**OF**  
**AS/NZS 1269.0:2005**  
**Occupational noise management**  
**Part 0: Overview and general requirements**

---

**RECONFIRMATION NOTICE**

Technical Committee AV-003 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 7 December 2015.

Approved for reconfirmation in New Zealand on behalf of the Standards Council of New Zealand on 18 May 2016.

The following are represented on Technical Committee AV-003:

Accident Compensation Corporation (New Zealand)  
Association of Australian Acoustical Consultants  
Australian Acoustical Society  
Australian Chamber of Commerce and Industry  
Australian Council of Trade Unions  
Department of Defence (Australian Government)  
Engineers Australia  
Ministry of Health (NZ)  
National Acoustic Laboratories  
New South Wales Nurses' Association  
New Zealand Audiological Society  
Worksafe Division, Department of Commerce, Western Australia  
WorkSafe Victoria

## NOTES

Australian/New Zealand Standard™

## **Occupational noise management**

### **Part 0: Overview and general requirements**

Originated in Australia as part of AS 1269—1976.  
Previous edition AS/NZS 1269.0:1998.  
Second edition 2005.

#### **COPYRIGHT**

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 6547 5

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee AV-003, Acoustics, Human Effects to supersede AS/NZS 1269.0:1998, *Occupational noise management, Part 0: Overview*.

This is Part 0 in a series of Standards as follows:

### AS/NZS

1269	Occupational noise management
1269.0	Part 0: Overview and general requirements (this Standard)
1269.1	Part 1: Measurement and assessment of noise immission and exposure
1269.2	Part 2: Noise control management
1269.3	Part 3: Hearing protector program
1269.4	Part 4: Auditory assessment

The objective of this series of Standards is to provide requirements and guidance on all facets of occupational noise management. It is recommended that the reader refer to all parts of the AS/NZS 1269 series to better understand all relevant terminology and objectives of occupational noise management.

The objective of this Part is to provide an overview to the series of Standards on occupational noise management and to give requirements and guidance on adopting an integrated approach to occupational noise management.

The main changes from the 1998 edition of the Standard are the inclusion of the informative appendices on ototoxic agents and acoustic shock. In addition, the key steps in a noise management program are set out as requirements.

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

Exposure standards for occupational noise in Australia are declared in the *National Standard for Occupational Noise* [NOHSC:1007(2000)] which is published by the National Occupational Health and Safety Commission. Commonwealth, State and Territory legislation provide the actual noise exposure standards in force in each jurisdiction. In New Zealand the *Health and Safety in Employment Act* (1992) and the *Health and Safety in Employment Regulations* (1995) Part 2: *Duties in relation to management of particular hazards* provide the relevant noise exposure standards.

## CONTENTS

	<i>Page</i>
1 SCOPE.....	4
2 REFERENCED DOCUMENTS.....	4
3 DEFINITIONS.....	4
4 OCCUPATIONAL NOISE MANAGEMENT .....	5
5 TRAINING .....	6
6 EXTENDED SHIFTWORK.....	6
7 INDUSTRIAL OTOTOXIC AGENTS.....	7
8 NON-OCCUPATIONAL NOISE EXPOSURE.....	7
9 ACOUSTIC SHOCK .....	7
10 IMPULSE NOISE.....	7
11 MEASUREMENT AND ASSESSMENT OF NOISE IMMISSION AND EXPOSURE.....	7
12 NOISE CONTROL MANAGEMENT .....	8
13 HEARING PROTECTOR PROGRAM.....	8
14 AUDITORY ASSESSMENT.....	9
 APPENDICES	
A NOISE EMISSION, IMMISSION AND EXPOSURE.....	11
B BIBLIOGRAPHY .....	14
C HEARING IMPAIRMENT DUE TO INDUSTRIAL OTOTOXIC AGENTS .....	15
D ACOUSTIC SHOCK.....	17

## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

---

**Australian/New Zealand Standard**  
**Occupational noise management**

---

**Part 0: Overview and general requirements**

---

**1 SCOPE**

This Standard provides an overview of the AS/NZS 1269 series and general requirements on occupational noise management. The series deals with noise as it affects hearing, but does not deal with other effects of noise. It also provides an integrated approach to establishing, implementing and evaluating an occupational noise management program.

The setting of occupational noise criteria is not within the scope of this series of Standards. Such criteria are set by regulations or organizational policy, not by Standards Australia or Standards New Zealand. Exposure standards may be found in the occupational health and safety or related regulations that are applicable for the workplace under assessment. Criteria lower than these exposure standards may be set by the organization's noise policy.

NOTE: Noise constitutes only one of many relevant workplace issues which should be considered for assessment as a component of an occupational health and safety survey. The AS/NZS 1269 series addresses the most relevant issues associated with occupational noise management. It does not deal with associated issues such as community noise and general environmental noise. Further advice on those issues should be sought from the Standards that deal with these issues.

In undertaking an overall occupational health and safety survey, the program should be carefully planned to ensure that the need for assessment of all other pertinent occupational health and safety issues is considered.

**2 REFERENCED DOCUMENTS**

The following documents are referred to in this Standard:

## AS/NZS

- 1269 Occupational noise management
- 1269.1 Part 1: Measurement and assessment of noise immission and exposure
- 1269.2 Part 2: Noise control management
- 1269.3 Part 3: Hearing protector program
- 1269.4 Part 4: Auditory assessment
- 1270 Acoustics—Hearing protectors

**3 DEFINITIONS**

For the purpose of this Standard, the definitions below apply.

**3.1 Emission**

The radiation of sound from a sound source.

NOTE: See Paragraph A2 of Appendix A.

**3.2 Excessive noise**

Noise above the noise exposure criteria as set by the relevant statutory authorities or by the organization's noise policy, whichever is the lower.

### 3.3 Exposure

The presence of a person at a point of immission.

NOTE: See Paragraph A4 of Appendix A.

### 3.4 Hazard

Anything that may result in harm to the hearing of a person.

### 3.5 Immission

The influx of sound at a point.

NOTE: See Paragraph A3 of Appendix A.

### 3.6 Noise

All sound in the workplace, whether wanted or unwanted.

NOTE: For the purposes of this Standard the words 'sound' and 'noise' are interchangeable.

### 3.7 Protected exposure

The presence of a person wearing hearing protectors at a point of immission.

NOTE: See Paragraph A5 of Appendix A.

### 3.8 Risk

The probability of harm occurring to the hearing of a person.

## 4 OCCUPATIONAL NOISE MANAGEMENT

This AS/NZS 1269 series provides guidance and requirements on how to manage workplace noise effectively and thereby minimize occupational noise-induced hearing impairment.

A cost-effective way to manage noise is to apply noise control measures to existing noisy equipment and processes and to purchase quieter equipment in future.

For some workplaces, reducing noise levels may require the application of noise management policies, planning and budgeting over a number of years.

While these control measures are being formulated and implemented, people need to be protected from the effects of excessive noise through hearing protector programs. To be effective, such programs should be carefully managed. AS/NZS 1269.3 therefore provides comprehensive guidance and requirements on how to conduct an effective hearing protector program as an interim measure for those people at risk.

A general policy in relation to occupational noise management should be incorporated into the organizations health and safety policy.

The key steps in a noise management program shall be as follows:

- (a) *Hazard identification* Senior management shall take responsibility for identifying all hazardous and non-hazardous areas. Areas can be identified as potentially hazardous by a preliminary assessment of the workplace (see AS/NZS 1269.1).
- (b) *Risk assessment* Where a potential noise hazard is identified the organization shall arrange for a competent person (see AS/NZS 1269.1) to carry out a detailed noise assessment. It shall also establish a specific noise policy which shall, as a minimum, embody relevant regulatory requirements.

The policy shall set noise exposure goals, specific responsibilities for managers, supervisors and employees and preferred methods of dealing with the problem.

Comparison of the results of the noise assessment (see AS/NZS 1269.1) with the organization's noise exposure goals shall indicate the extent of hazards and associated risk. It will also show the extent of the noise reduction work that needs to be carried out.

Employees shall be fully consulted in the development of the noise policy.

- (c) *Hazard and risk control* The noise control management strategy shall be tailored to the needs of the organization.

NOTE: Some of the factors influencing its design include—

- (a) the organization's noise policy;
- (b) existing noise levels;
- (c) the economic environment within the organization, that is, budget, production and resource constraints;
- (d) the availability and practicability of solutions for identified noise problems;
- (e) consultation with all stakeholders;
- (f) legislative requirements; and
- (g) future plans for the expansion or contraction of the organization's activities.

The consultative process shall play an important role in achieving a workable strategy.

- (d) *Program evaluation* Program evaluation shall enable the following assessments to be made:
- (i) The extent to which the program has met the targets, goals and objectives.
  - (ii) Whether resources are being effectively allocated.
  - (iii) The need for possible changes in the direction of the program.

The use of the AS/NZS 1269 series of Standards in this process of effective noise management in the workplace is illustrated in Figure 1.

## 5 TRAINING

Training of key people in relevant aspects of occupational noise management is essential to successful implementation of the AS/NZS 1269 series of Standards. Training needs and program outlines are mentioned at appropriate points in the series. Reference should also be made to relevant National Occupational Health and Safety Commission guidance booklets.

Employers should provide information and training on noise awareness to individuals in workplaces likely to be exposed to an  $L_{Aeq,8h}$  greater than 75 dB(A).

NOTE: Appendix B comprises a list of documents that provide further information.

## 6 EXTENDED SHIFTWORK

When the shift duration on a particular day is 10 h or longer, the adoption of an equal energy basis of assessment probably under estimates the potential damage risk. In such circumstances, it is recommended that organizations increase the normalized noise exposure level for the day (see AS/NZS 1269.1) before that level is compared with the noise exposure criterion.

For the same reason a risk adjustment should be made when the working week exceeds 5 days (see AS/NZS 1269.1, Appendix E, Paragraph E9).

## 7 INDUSTRIAL OTOTOXIC AGENTS

Workplaces may also contain ototoxic agents. Ototoxic agents are chemical substances that have a detrimental effect on an individual's hearing. Threshold shifts produced by these agents may compound those produced by excessive noise exposure.

NOTE: See Appendix C for a list of implicated substances and further explanation.

## 8 NON-OCCUPATIONAL NOISE EXPOSURE

People who have significant occupational noise exposure should be informed that noise exposures are cumulative and that it is in their interest to limit noise exposure and wear hearing protectors when exposed to noise outside working hours, as well as at work.

## 9 ACOUSTIC SHOCK

Over the last few years in workplaces where there is constant use of telephones, particularly in such places as the call centre industry, the phenomena of acoustic shock has been on the increase. While acoustic shock is not strictly a noise exposure problem, improved workplace acoustic conditions and suppression of telephone noises via an Acoustic Shock Protective Device are part of an acoustic shock preventative program.

NOTE: More details are provided in Appendix D.

## 10 IMPULSE NOISE

Impulse noise is noise that consists of a distinct single pressure peak, a sequence of single peaks, a single burst with multiple pressure peaks or a sequence of such bursts. Impulse noise may be the only noise present or may be superimposed on a background of a continuous noise. Impulse noise presents an additional noise hazard in that, if the peak level is sufficiently high an instantaneous injury may result.

## 11 MEASUREMENT AND ASSESSMENT OF NOISE IMMISSION AND EXPOSURE

AS/NZS 1269.1 describes the types of noise assessments which may be required and suitable noise measuring instruments to carry them out. The procedures for noise measurement are also included.

The general objectives of these assessments are as follows:

- (a) To determine the exposure to noise of all people likely to be exposed to excessive noise. For the purpose of AS/NZS 1269.1, the exposure to noise of each person is established in terms of—
  - (i) eight-hour equivalent continuous A-weighted sound pressure level ( $L_{Aeq,8h}$ ) or A-weighted noise exposure ( $E_{A,T}$ ); and
  - (ii) the peak sound pressure level ( $L_{peak}$ ,  $L_{C,peak}$ ).Exposure to noise is taken to be that determined at the person's ear position without taking into account any protection which may be afforded by personal hearing protectors.
- (b) To obtain more specific information that will help senior management decide what measures to take to reduce noise.
- (c) To check the effectiveness of any control measures which have been applied.
- (d) To assist in the selection of appropriate hearing protectors where other control measures are not practicable, or will take some time to plan and implement.

The type and detail of assessments carried out will depend on the use that is to be made of the information obtained.

The type of measuring instruments and procedures to be used for the measurement of noise levels will depend on such factors as the type of workplace, type of noise, work patterns and information required.

## **12 NOISE CONTROL MANAGEMENT**

### **12.1 General**

AS/NZS 1269.2 outlines noise control management strategies that should be implemented in both existing and proposed workplaces. AS/NZS 1269.2 is applicable to all workplaces and all types of noise, including those produced by human activity.

### **12.2 Strategies for noise control management**

Noise control management strategies should recognize that—

- (a) noise control is the most effective method of preventing noise injury in the workplace;
- (b) engineering noise controls are preferred over administrative controls;
- (c) employees and supervisors should be fully informed about noise problems and involved in the development of solutions; and
- (d) expert advice should be sought when dealing with technically complex situations.

### **12.3 Key elements of noise control management**

Key elements of the strategies are as follows:

- (a) Noise control planning for new workplaces, including clear consideration of noise when specifying—
  - (i) building requirements;
  - (ii) work processes;
  - (iii) workplace layout; and
  - (iv) machinery noise emission limits.
- (b) Management of noise in existing workplaces, including—
  - (i) defining responsibilities of managers, supervisors and other employees;
  - (ii) setting up a 'buy-quiet' purchasing system for future plant and machinery purchases;
  - (iii) providing information and training;
  - (iv) identifying and ranking existing noise problems;
  - (v) investigating treatment options;
  - (vi) formulating and implementing a noise control plan; and
  - (vii) monitoring and evaluating implementation of the plan.

## **13 HEARING PROTECTOR PROGRAM**

AS/NZS 1269.3 outlines the administrative responsibilities associated with a hearing protector program, discusses the selection, use and maintenance of various types of hearing protectors and gives information on training and motivation in regard to hearing protector programs.

The attenuation of hearing protectors is measured by the procedure specified in AS/NZS 1270. The extent to which laboratory attenuation is approached in real-world workplace conditions depends on factors including the degree of diligence in the implementation of a hearing protector program as described in AS/NZS 1269.3.

The enormous diversity of hearing protectors (both earplugs and earmuffs, their wide range of attenuation and variations in their correct fitting) necessitates close attention to one-on-one fitting instruction, supervision, motivation and evaluation under workplace conditions.

In reality, one-on-one fitting instruction may not always be possible. In such cases, *earmuffs* are considered more likely to approach laboratory performance than *earplugs*.

Where earplugs are the type of hearing protector supplied or desired, then frequent training, supervision and motivational one-to-one instruction appear to be required to increase real-world attenuation to values approaching laboratory results.

#### **14 AUDITORY ASSESSMENT**

AS/NZS 1269.4 specifies procedures and requirements for air conduction pure tone audiometry applicable to individuals whose hearing thresholds might be adversely affected by occupational noise exposure.

The procedures and requirements are restricted to air conduction pure tone threshold audiometry by earphones, without masking. Other forms of audiometry, such as bone conduction pure tone threshold audiometry and speech audiometry, are not specified. The procedures are not sufficient to diagnose the cause of an individual's threshold impairment or for the determination of percentage loss of hearing for compensation purposes.

Techniques for computer-controlled audiometry are not specified but may be used. If used, computer-controlled audiometry shall be shown to produce results equivalent to manual audiometry.

A procedure based on averaging of thresholds at the frequencies 3, 4 and 6 kHz across two tests is presented in AS/NZS 1269.4. These are the three frequencies most likely to be affected in the early stages of noise exposure. The procedure enables a change in average threshold of 5 dB at these frequencies to be detected.

AS/NZS 1269.4 (in Appendix H) also provides information on new procedures using evoked otoacoustic emissions that may provide an early warning of potential for hearing loss.

<b>HAZARD IDENTIFICATION</b>
Identify potential noise hazards (see AS/NZS 1269.1)
<b>RISK ASSESSMENT</b>
Conduct noise assessment (see AS/NZS 1269.1) Evaluate and rank noise sources (see AS/NZS 1269.2)
<b>HAZARD AND RISK CONTROL</b>
<b>Noise Control Management</b>
—Eliminate or control the amount of noise to which people are exposed (see AS/NZS 1269.2)
—Establish noise control policies and management systems
—Arrange information and training
—Identify options for controlling excessive noise emission, immission and exposure
—Evaluate options
—Select options
—Document noise control plan
—Implement plan and monitor progress
—Review monitoring data regularly
—Report formally to senior management
<b>Hearing Protector Program</b>
Reduce risk arising from unavoidable exposure to excessive noise (see AS/NZS 1269.3)
—Identify range of suitable protectors
—Establish information and training program
—Select protectors according to individual needs
—Signpost hearing protector areas
—Implement and monitor personal protector program
—Review monitoring data regularly
—Report formally to senior management
<b>Auditory Assessment</b>
Identify hearing impairments (see AS/NZS 1269.4)
—Conduct auditory assessment
—Arrange rehabilitation and compensation where appropriate
—Follow-up results
—Report formally to senior management
<b>PROGRAM EVALUATION</b>
Evaluate the overall occupational noise management program (see AS/NZS 1269.1, AS/NZS 1269.2, AS/NZS 1269.3 and AS/NZS 1269.4)
—Audit each part of the overall program at least annually

FIGURE 1 USE OF THE AS/NZS 1269 SERIES OF STANDARDS  
IN AN OCCUPATIONAL NOISE MANAGEMENT PROGRAM

APPENDIX A  
NOISE EMISSION, IMMISSION AND EXPOSURE  
(Informative)

### A1 GENERAL

The concepts of emission, immission and exposure underlie the approaches to noise measurement and assessment, noise control and personal protection described in AS/NZS 1269.1, AS/NZS 1269.2 and AS/NZS 1269.3 respectively. As shown in Table A1, these concepts and approaches are linked to the source-path-receiver model of noise control and to the hierarchy of hazard and risk controls (i.e. engineering controls, administrative controls and personal protector programs) prescribed in occupational noise regulations and codes of practice.

**TABLE A1**  
**HIERARCHY OF HAZARD AND RISK CONTROLS**

Hierarchy of hazard and risk controls	Point of application	Primary reduction	Secondary reductions
Engineering controls	Source of noise	Emission	Immission, exposure
Engineering controls	Transmission path or reception point	Immission	Exposure
Administrative controls	Organization of work practices	Exposure NOTE: Some administrative controls, e.g. increasing the distance between source and people, may reduce immission as well as exposure.	
Personal hearing protectors	Exposed person	Effective exposure (see Paragraph A5)	

The relationship between the emission of sound, the resulting immission of sound and exposure to sound is illustrated in Paragraphs A2 to A4.

### A2 EMISSION

Noise emission describes the sound radiated into the environment or to a defined position from a defined source such as a machine or equipment. Figure A1 provides a diagrammatic illustration of noise emission. Noise emission is—

- (a) machine or task related; and
- (b) specified by operating conditions.

### A3 IMMISSION

Noise immission describes the influx of sound at a particular location (e.g. a workstation) from all sources such as machines, equipment, activities and the environment. Figure A2 provides a diagrammatic illustration of noise immission. Noise immission is—

- (a) location related (e.g. a workstation);
- (b) related to normal operation;
- (c) dependent on the duration (except for peak values  $L_{\text{peak}}$ ); and
- (d) contributed to by all noise sources.

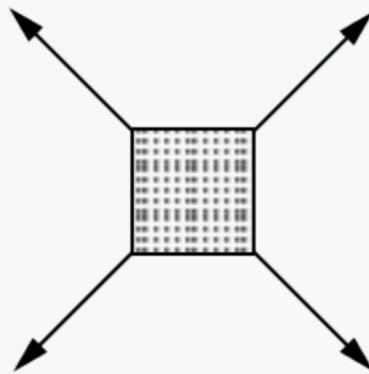


FIGURE A1 NOISE EMISSION OR SOUND RADIATION FROM A MACHINE

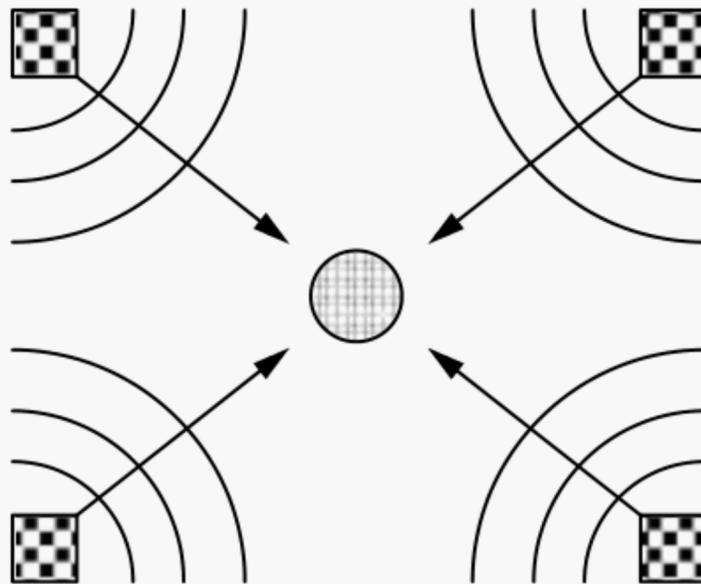


FIGURE A2 NOISE IMMISSION AT A PARTICULAR LOCATION

#### A4 EXPOSURE

Noise exposure occurs when a person is present at a location where noise immission is occurring. Figure A3 provides a diagrammatic illustration of the noise exposure of a person. The noise exposure is—

- (a) person related (may include different workstations);
- (b) related to typical operation;
- (c) dependent on the exposure duration (except for  $L_{\text{peak}}$ ); and
- (d) contributed to by all noise sources.

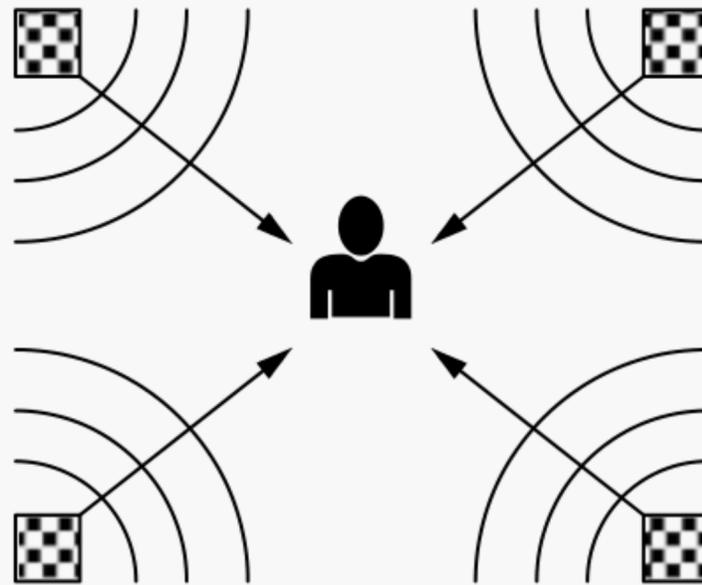


FIGURE A3 NOISE EXPOSURE OF A PERSON

#### A5 PROTECTED EXPOSURE

Personal hearing protectors reduce the risk of hearing damage caused by noise exposure. A quantity called ‘effective exposure level’, obtained by subtracting the attenuation of a hearing protector from the level of noise in which it is worn, is used to indicate the reduced risk (see AS/NZS 1269.3). Figure A4 provides a diagrammatic illustration of protected exposure.

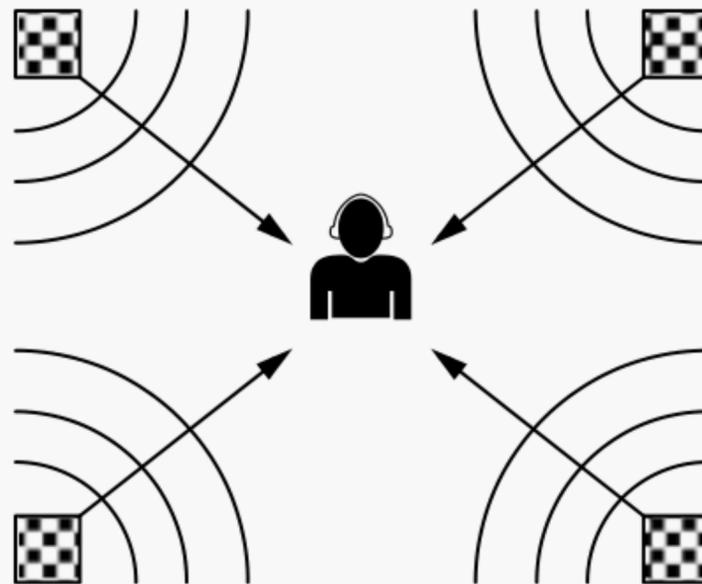


FIGURE A4 PROTECTED EXPOSURE

APPENDIX B  
BIBLIOGRAPHY

(Informative)

- Code of Practice for Noise Management and Protection of Hearing at Work*, WorkCover Authority of NSW, Sydney, 1996.
- Control of Noise in the Music Entertainment Industry—A Code of Practice*, WorkSafe Western Australia Commission, Perth, May 2003.
- Core Training Elements for the National Standard for Occupational Noise*, National Occupational Health and Safety Commission, Canberra, August 1995.
- DILLON, H & FISHER, M (2002), *Acoustic Shock*, Acoustics Australia, Vol 30, August 2002, No.2, pp67-69.
- FETCHER L (2004), *Promotion of Noise-Induced Hearing loss by Chemical Contaminants*, Journal of Toxicology and Environmental Health, Part A, 67: 727-740.
- Guide to Health and Safety in the Call Centre Industry*, Workplace Health & Safety Queensland, Department of Industrial Relations, 2003.
- MILHINCH, J & DOYLE, J (2000), *Acute Aural Trauma in Users of Telephone Headsets and Handsets*, Proceedings of Australian National Conference, June 2000.
- MILHINCH, J (2001), *Audiological Rehabilitation of Injured Workers*, Proceedings of Risking Acoustic Shock Seminar, Fremantle, WA.
- MORATA TC (1998), *Assessing Occupational Hearing Loss: Beyond Noise Exposures*, Scandinavian Audiology 27 Supplement 48:111-116.
- MORATA TC (2003), *Chemical Exposure as a Risk Factor for Hearing Loss*, J. Occup. Environ. Medicine, 45(7): 676-682.
- Noise Advisory Standard*, Department of Industrial Relations, Queensland Government, Brisbane, 2004.
- National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC:2009 (2004, 3<sup>rd</sup> Edition)], National Occupational Health and Safety Commission.
- Noise Management at Work—Control Guide*, National Occupational Health and Safety Commission, Second Edition, Sydney, August 1991.
- Noise Management in the Workplace*, a National Seminar conducted by the National Acoustics Laboratories and the Professional Education Program of Worksafe Australia, 1993.
- PATUZZI, R (2001), *Acute Aural Trauma in Users of Telephone Headsets and Handsets*, Proceedings of Risking Acoustic Shock Seminar, Fremantle, WA.
- SILWINSKA-KOWALKSA M (2004), *Effects of Coexposure to Noise and Mixture of Organic Solvents on Hearing in Dockyard Workers*, J. Occup. Environ. Medicine, 46(1): 30-38.
- Training Manual, Acoustic shock in call centres*, Occupational Health Unit, Workplace Health and Safety, Department of Industrial Relations Training and Industrial Relations, Queensland, 2003.
- WILLIAMS W. Noise Management in the Workplace. *Proceedings of the 1993 Annual Conference of the Australian Acoustical Society*, Glenelg, South Australia, 9–10 November 1993.

APPENDIX C  
HEARING IMPAIRMENT DUE TO INDUSTRIAL  
OTOTOXIC AGENTS  
(Informative)

### C1 GENERAL

Exposure to solvents, pesticides or toxic metals is capable of causing hearing impairment. These agents may damage the cochlea and/or the auditory neurological pathways. Impairment is more likely if an exposure to a single agent is combined with another agent or noise exposure.

Because of the multiplicity of confounding factors influencing the emergence of hearing impairment, human epidemiological studies are limited but they do show measurable effects. Animal studies have clearly shown hearing impairment, initially for large exposures and recently for much smaller exposures. Most interactions between chemicals and noise exposure cause additive effects on hearing. The possibility of synergistic effects is not excluded.

Human exposure-response relationships remain unclear and chemical exposure standards have not at this point been altered to reduce hearing impairment risks. Occupational noise management programs should take into account possible exposures to those agents for which there is human or animal evidence of ototoxicity. Other substances with similar molecular structures and other toxic metals are not to be assumed as without danger simply because no clear epidemiological evidence is available. When there is a co-existing noise hazard of even mild degree it should be assumed that the risk of hearing impairment is higher.

In particular when individuals are exposed to known or suspected ototoxic agents their noise exposure limit should be reduced as a precautionary measure.

Some examples of industrial ototoxic agents are solvents including toluene, styrene, trichloroethylene, carbon disulphide, hexane and butanol, and toxic metals including lead, mercury and trimethyltin. Also mixtures of solvents that include xylene, heptane and ethyl benzene have been implicated in some ototoxic studies.

### C2 FURTHER READING

JACOBSON P et al, *Mixed Solvent Exposure and Hearing Impairment: An epidemiological Study of 3284 men. The Copenhagen Male Study*, *Occupational Medicine* 43(4): 180-184.

JOHNSTON AC et al (1995), *Effects of Industrial Solvents on Hearing*, *Occupational Medicine*, 10(3): 623-40.

LATAYE R & CAMPO P (1997), *Combined effects of a Simultaneous Exposure to Noise and Toluene on Hearing Function*, *Neurotoxicology and Teratology* 19(5): 373-382.

MORATA TC et al (1994), *Occupational Exposure to Noise and Ototoxic Organic Solvent*, *Archives of Environment Health* 49(5): 359-65.

MORATA TC et al, *Toluene-induced Hearing Loss among Rotogravure Printing Workers*, *Scandinavian Journal of Work, Environment and Health* 23(4): 289-298.

NIALL PD (1998), *The Effects of Ototoxic Agents and Noise on Hearing*, Institute of Laryngology and Otology London, Kinetic (Australia's Library Network) Amicus No. 22093021.

SILWINSKA-KOWALKSA M et al (2001), *Hearing Loss among Workers exposed to moderate concentrations of Solvents*, Scandinavian Journal of Work, Environment and health 27(5): 335-342.

SILWINSKA-KOWALKSA M et al (2003), *Ototoxic Effects of Occupational Exposure to Styrene and Noise*, Journal of Occupational and Environmental Medicine 45(1): 15-24.

APPENDIX D  
ACOUSTIC SHOCK  
(Informative)

## **D1 ACOUSTIC SHOCK**

Acoustic shock is a term used to describe the physiological and psychological symptoms a person may experience after having a sudden, unexpected, loud sound, usually via a telephone headset or handset and usually does not result in hearing loss. It is not the same as acoustic trauma caused by peak noise levels greater than 140 dB.

Acoustic shock has been defined\* as ‘any temporary or permanent disturbances of the functioning of the ear, or the nervous system, which may be caused to the user of a telephone earphone by a sudden sharp rise in the acoustic pressure produced’. Exactly what may produce this sound is unclear, however, it is thought to be produced unintentionally, for example, by misdirected fax signals or electronic interference or intentionally by a telephone user making a sudden loud noise (e.g. blowing a whistle).

Acoustic shock is mostly frequently reported in call centres. Currently acoustic shock is not completely understood and those interested should refer to recent literature (Patuzzi: 2001, Milhinch and Doyle: 2000). However, it is now realized that acoustic shock is not due to one single cause.

While acoustic shock may be triggered by a single incident of any unexpected loud noise over the telephone line as mentioned above, it appears that this may simply be the culmination of various psychological and psychosomatic stressors in the workplace. These stressors may include work pressure; economic constraints, strict or unrealistic performance measures, anxiety concerning poor working conditions, or general stress from speaking to irate clients.

What is agreed is that when an event occurs, an individual may experience a shock or startled reaction. In extreme cases, individuals have been known to ‘fall’ to the floor (Tullio’s syndrome), experience nausea, vertigo, vomiting and sharp pain in the ear. Other symptoms include facial numbness, tingling or pain around the ear, face and/or neck and loss of balance.

In most cases there is no actual significant loss of hearing and as the symptoms diminish, the individual recovers and is able to return to work. Difficulties arise when secondary and tertiary symptoms arise that may severely disrupt the return to work process. Secondary symptoms are consistent with stress related problems and include headache, anxiety and fatigue. Tertiary symptoms include anger, hypersensitivity to loud sounds, depression, anger, anxiety concerning the use of a telephone or headphone and ‘phonalgia’ pain resulting from exposure to loud sound.

## **D2 MANAGEMENT OF THE ACOUSTIC ENVIRONMENT**

Organizations should have an effective policy regarding acoustic shock. Those interested should refer to Noise Advisory Standard provided by the Department of Industrial Relations, Queensland Government, Brisbane, 2004.

---

\* European Telecommunications Standards Institute, 2000.

While loud noise may not technically 'cause' acoustic shock, it may be the 'trigger' for an acoustic shock incident. For this reason, call centres or workplaces that involve the significant use of telephones should ensure that sound pressure levels capable of being generated by telephones are minimized.

Acoustic treatment and improved acoustic conditions in areas where telephone usage is high have been shown to reduce the incidents of acoustic shock through a number of factors. Basically, improved acoustic conditions reduce the need to turn up the volume levels on headsets and thus reduce the amplitude and overall sound pressure level under an operator's headset.

### **Standards Australia**

Standards Australia is an independent company, limited by guarantee, which prepares and publishes most of the voluntary technical and commercial standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. Through a Memorandum of Understanding with the Commonwealth government, Standards Australia is recognized as Australia's peak national standards body.

### **Standards New Zealand**

The first national Standards organization was created in New Zealand in 1932. The Standards Council of New Zealand is the national authority responsible for the production of Standards. Standards New Zealand is the trading arm of the Standards Council established under the Standards Act 1988.

### **Australian/New Zealand Standards**

Under a Memorandum of Understanding between Standards Australia and Standards New Zealand, Australian/New Zealand Standards are prepared by committees of experts from industry, governments, consumers and other sectors. The requirements or recommendations contained in published Standards are a consensus of the views of representative interests and also take account of comments received from other sources. They reflect the latest scientific and industry experience. Australian/New Zealand Standards are kept under continuous review after publication and are updated regularly to take account of changing technology.

### **International Involvement**

Standards Australia and Standards New Zealand are responsible for ensuring that the Australian and New Zealand viewpoints are considered in the formulation of international Standards and that the latest international experience is incorporated in national and Joint Standards. This role is vital in assisting local industry to compete in international markets. Both organizations are the national members of ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission).

### **Visit our web sites**

[www.standards.org.au](http://www.standards.org.au)

[www.standards.co.nz](http://www.standards.co.nz)

[www.standards.com.au](http://www.standards.com.au)



GPO Box 5420 Sydney NSW 2001

**Administration**

**Phone** (02) 8206 6000

**Fax** (02) 8206 6001

**Email** [mail@standards.com.au](mailto:mail@standards.com.au)

**Customer Service**

**Phone** 1300 65 46 46

**Fax** 1300 65 49 49

**Email** [sales@standards.com.au](mailto:sales@standards.com.au)

**Internet** [www.standards.org.au](http://www.standards.org.au)



Level 10 Radio New Zealand House

155 The Terrace Wellington 6001

(Private Bag 2439 Wellington 6020)

**Phone** (04) 498 5990

**Fax** (04) 498 5994

**Customer Services** (04) 498 5991

**Information Service** (04) 498 5992

**Email** [snz@standards.co.nz](mailto:snz@standards.co.nz)

**Internet** [www.standards.co.nz](http://www.standards.co.nz)

This page has been left intentionally blank.