Australian Capital Territory

Occupational Health and Safety (Codes of Practice for Noise) Approval 2004*

Disallowable Instrument DI2004–178

made under the

Occupational Health and Safety Act 1989 – section 206 – Codes of Practice

Pursuant to section 206 of the *Occupational Health and Safety Act 1989* I revoke Instrument No. 27 of 2001 and approve the National Standard for Occupational Noise [NOHSC:1007(2000)] and National Code of Practice for Noise Management and Protection of Hearing at Work [NOHSC:2009(2004)] as attached.

Katy Gallagher
Minister for Industrial Relations

9 August 2004

*Name amended under Legislation Act, s 60

Australian Government

National Occupational
Health and Safety Commission

NATIONAL STANDARD FOR OCCUPATIONAL NOISE

[NOHSC: 1007(2000)]

2nd Edition

Canberra
July 2000

NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

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ISBN 1 920763 41 4

FOREWORD

In seeking to achieve Australian workplaces free from injury and disease NOHSC works to lead and coordinate national efforts to prevent workplace death, injury and disease.

We seek to achieve our mission through the quality and relevance of information we provide and to influence the activities of all parties with roles in improving Australia's OHS performance.

NOHSC has five strategic objectives:

- improving national data systems and analysis;
- improving national access to OHS information;
- improving national components of the OHS and related regulatory framework;
- facilitating and coordinating national OHS research efforts; and
- monitoring progress against the National OHS Improvement Framework.

This publication is a contribution to achieving those objectives.

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PREFACE

Occupational noise-induced hearing loss (NIHL) is a major compensable industrial disease in Australia and entails substantial economic costs. Exposure to exc essive noise also entails largely unrecognised costs to organisations by way of increased employee turnover and absenteeism, lowered performance and possible contribution to accidents.

As well as the economic cost for employers, NIHL imposes a severe burden on health and social services, and the Australian economy as a whole.

To the individual affected, the social handicaps of NIHL are also severe. NIHL is irreversible and leads to communication difficulties, impairment of interpersonal relationships, social isolation and a very real degradation in the quality of life. The family and others close to the affected person often experience secondary consequences of the condition. While NIHL[1] cannot be fully restored the advancement in hearing aid technology can overcome some of the problems . Of those people affected, 20 per cent or more also suffer from tinnitus (ringing in the ears), in some cases to a severe degree.

The National Occupational Health and Safety Commission (NOHSC) is concerned about noise-induced hearing loss as a major occupational disease. In December 1988, NOHSC endorsed its strategy for the prevention of NIHL1 and followed this up with the development of a national standard and code of practice. Drafts of these documents were released for public comment in November 1989. Having considered public comment on the draft document, NOHSC declared the *National Standard for Occupational Noise* [NOHSC:1007(1993)] and the *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC:2009(1993)] in March 1992.

In 2000 NOHSC amended the national standard and code of practice to update the measurement of peak noise from an unweighted (linear) peak sound pressure level, Lpeak, to a C-weighted peak sound pressure level, LC,peak. C-weighting measurement is a more reliable form of measurement when compared to the linear response to impulse noise.

The latter may vary according to different sound measuring instruments.

The national standard for exposure to noise in the occupational environment is an average daily exposure level of 85 decibels. This is consistent with overwhelming scientific evidence which indicates that exposure levels above 85 decibels represent an unacceptable risk to the hearing of those exposed. Many other developed countries have introduced legislation based on this standard. For peak noise, the national standard is a peak sound pressure level of 140 decibels.

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[1] National Occupational Health and Safety Commission, *National Strategy for the Prevention of Occupational Noise-induced Hearing Loss* [NOHSC:4004(1989)], Australian Government Publishing Service, Canberra, 1989.

The *National Code of Practice for Noise Management and Protection of Hearing at Work* provides practical guidance on how the national standard can be achieved. The national code of practice is intended to assist employers, employees, unions, management, health and safety committee representatives, safety officers, occupational health and safety professionals and others requiring guidance on understanding and reducing workplace noise exposure.

The levels specified in the national standard are the maximum acceptable exposure levels for noise in the workplace. However, over long periods, repeated noise exposure at between 75 and 85 decibels may be a small risk to some people. With progressively increasing levels, the risk becomes greater. Workplace noise levels lower than 85 decibels are, therefore, desirable, if practicable.

1. TITLE

1.1 This national standard may be cited as the *National Standard for Occupational Noise* [NOHSC: 1007(2000)].

2. OBJECTIVE

2.1 The objective of this *National Standard for Occupational Noise* [NOHSC: 1007(2000)] is to reduce significantly the incidence and severity of occupational noise-induced hearing loss.

3. NATIONAL STANDARD FOR OCCUPATIONAL NOISE

3.1 The national standard for exposure to noise in the occupational environment is an eight-hour equivalent continuous A-weighted sound pressure level, $L_{Aeq,8h}$, of 85dB(A). For peak noise, the national standard is a C-weighted peak sound pressure level, $L_{C,peak}$, of 140dB(C).

3.2 The exposure to noise is taken to be that measured at the employee's ear position without taking into account any protection, which may be afforded by personal hearing protectors.

4. INTERPRETATION

4.1 In this National Standard for Occupational Noise [NOHSC: 1007(2000)]:

' $L_{Aeq,8h}$ ' (eight-hour equivalent continuous A-weighted sound pressure level in dB(A) referenced to 20 micropascals) means that steady noise level which would, in the course of an eight-hour period, cause the same A-weighted sound energy as that due to the actual noise over an actual working day. $L_{Aeq,8h}$ is to be determined in accordance with Part 1 of Australian/New Zealand Standard AS/NZS 1269[1].

' $L_{C,peak}$ ' (peak noise level) means C-weighted peak sound pressure level in decibels measured by a sound level meter with a peak detector-indicator characteristic complying with Australian Standard AS 1259.1[2].

'Noise' means any unwanted or damaging sound.

'Personal hearing protectors' means a device, or pair of devices, worn by a person or inserted in the ears of a person to protect the person's hearing.

REFERENCED DOCUMENTS

1. Standards Australia, AS/NZS 1269 *Occupational noise management Parts 0-4*, Standards Australia, Sydney.
2. Standards Australia, AS 1259.1 *Acoustics – Sound Level Meters*, *Part 1: Non-integrating,* Standards Australia, Sydney.

Australian Government

National Occupational
Health and Safety Commission

National Code of Practice for Noise Management and Protection of Hearing at Work [NOHSC: 2009(2004)]

3rd Edition

Canberra

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FOREWORD

In seeking to achieve Australian workplaces free from death, injury and disease the National Occupational Health and Safety Commission (NOHSC) works to lead and coordinate national efforts to prevent workplace death, injury and disease.

We seek to achieve our mission through the quality and relevance of information we provide and to influence the activities of all parties with roles in improving Australia's OHS performance.

NOHSC has identified five national priorities to achieve the vision:

- reduce high incidence/severity risks;
- strengthen the capacity of business operators and workers to understand and manage OHS effectively;
- prevent occupational disease more effectively;
- eliminate hazards at the design stage; and
- strengthen the capacity of government to influence OHS outcomes.

This publication is a contribution to achieving those objectives.

CONTENTS

PREFACE

Occupational noise-induced hearing loss (NIHL) is a major compensable industrial disease in Australia and entails substantial economic costs. Exposure to excessive noise also entails largely unrecognised costs to organisations by way of increased employee turnover and absenteeism, lowered performance and possible contribution to accidents. As well as the economic cost for employers, NIHL imposes a severe burden on health and social services and the Australian economy as a whole.

To the individual affected, the social handicaps of NIHL are also severe. NIHL is irreversible and leads to communication difficulties, impairment of interpersonal relationships, social isolation and a very real degradation in the quality of life. The family and others close to the affected person often experience secondary consequences of the condition. Hearing aids may be of benefit in overcoming some of the problems of NIHL but normal hearing can never be fully restored. Of those people affected, 20 per cent or more also suffer from tinnitus (ringing in the ears), in some cases to a severe degree.

The National Occupational Health and Safety Commission (NOHSC) is concerned about noise-induced hearing loss as a major occupational disease. In December 1988, NOHSC endorsed its strategy for the prevention of NIHL[1] and followed this up with the development of a national standard and code of practice. Drafts of these documents were released for public comment in November 1989. Having considered public comment on the draft document, NOHSC declared the *National Standard for Occupational Noise* [NOHSC: 1007(1993)] and the *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC: 2009(1993)] in March 1992.

In 2000, NOHSC amended the national standard and code of practice to update the measurement of peak noise from an unweighted (linear) peak sound pressure level, L_{peak}, to a C-weighted peak sound pressure level, $L_{C,peak}$. C-weighting measurement is a more reliable form of measurement when compared to the linear response to impulse noise. The latter may vary according to different sound measuring instruments.

The national standard for exposure to noise in the occupational environment is an average daily exposure level of 85 decibels. This is consistent with overwhelming scientific evidence which indicates that exposure levels above 85 decibels represent an unacceptable risk to the hearing of those exposed. Many other developed countries have introduced legislation based on this standard. For peak noise, the national standard is a peak sound pressure level of 140 decibels.

In 2004, NOHSC revised the *National Code of Practice for Noise Management and Protection of Hearing at Work* to achieve consistency with national best practice. The national code of practice provides practical guidance on how the national standard can be achieved and is intended to assist employers, employees, unions, management, health and safety committee representatives, safety officers, occupational health and safety professionals and others requiring guidance on understanding and reducing exposure to workplace noise.

The levels specified in the national standard are the maximum acceptable exposure levels for noise in the workplace. However, over long periods, repeated exposure to noise between 75 and 85 decibels may be a small risk to some people. With progressively increasing levels, the risk becomes greater. Workplace noise levels lower than 85 decibels are, therefore, desirable, if practicable.

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[1] National Occupational Health and Safety Commission, *National Strategy for the Prevention of Occupational Noise-induced Hearing Loss* [NOHSC:4004(1989)], Australian Government Publishing Service, Canberra, 1989.

1. TITLE

1.1 This national code of practice may be cited as the *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC: 2009(2004)], 3rd Edition.

2. PURPOSE

2.1 This *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC:2009(2004)] provides practical guidance on how the *National Standard for Occupational Noise* [NOHSC:1007(2000)] can be achieved.

3. SCOPE

3.1 This *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC:2009(2004)] applies to all workplaces where there is potential for exposure to excessive noise, the plant and processes in those workplaces, and all persons in those workplaces (consistent with relevant State/Territory legislation) with potential for exposure to excessive noise.

4. DEFINITIONS

4.1 In this *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC:2009(2004)]:

Acoustic (or acoustical) means containing, producing, arising from, actuated by, related to, or associated with, sound.

Acoustic calibrator means a device for applying a sound pressure of known level to the microphone of a sound measuring system, for the purpose of calibration.

Administrative noise control measures are work systems designed to substantially reduce exposure to noise, including the time exposed to noise and the time at which noise is produced. Examples are job redesign or rosters which are designed to reduce exposure to noise. Engineering noise control measures and the use of personal hearing protectors are not included.

Attenuation means a reduction in the magnitude of sound.

Audiogram means a chart or table relating a person's hearing threshold levels for pure tones to frequency.

Audiometric test (or testing) means the measurement of the hearing threshold levels of a person by means of monaural pure tone air conduction threshold tests.

A-weighting refers to a standardised frequency response used in sound measuring instruments as specified in Australian Standard AS 1259.1[1].

Note: Historically it was developed to model the human ear response at low sound levels. However A-weighting is now frequently specified for measuring sounds irrespective of level and studies have shown a relationship between the long-term exposure to A-weighted sound pressure levels and hearing damage risk.

C-weighting refers to a standardised frequency response used in sound measuring instruments, specified in Australian Standard AS 1259.1[1].

Note: Historically it was developed to model the human ear response at high sound levels. It is now used to measure peak noise levels.

Competent person, in the context of supplying information on noise levels generated by plant, means a person whom the manufacturer or supplier ensures has acquired knowledge and skills, through a combination of training, education and experience, enabling that person to correctly perform a specified task.

Consultation means the sharing of information and exchange of views between employers, employees and/or employee representative(s) on health and safety issues. It includes the opportunity to contribute to decision making in a timely fashion to minimise the risk(s) of exposure to excessive noise.

Daily noise exposure level see definition for **'$L_{Aeq,8h}$'**.

dB means the abbreviation for decibel. Also *see* definition for **decibel**.

dB(A) means A-weighted sound pressure level in decibels. Also *see* definition for **A-weighting**.

dB(C) means C-weighted sound pressure level in decibels. Also *see* definition for **C-weighting**.

Decibel is the unit used to indicate the relative magnitude of sound pressure level and other acoustical quantities. The range of sound pressures commonly encountered is very large so a logarithmic scale is used. The decibel is the unit used

on this scale and is abbreviated to 'dB'. On the decibel scale, the threshold of hearing occurs at a sound pressure level of about 0 dB and the threshold of pain occurs at about 120 dB. As the decibel is also used to describe the level of other quantities, such as sound power and vibration acceleration, it is always necessary to refer to the specific quantity being measured, for example, $L_{Aeq,8h}$ or $L_{C,peak}$.

Employee means an individual who works under a contract of employment, apprenticeship or traineeship.

Employee representative(s) includes an employee member of a health and safety committee where established in the workplace, or a person elected to represent a group of employees on health and safety matters.

Employer means a corporation or an individual who employs persons under contract of employment, apprenticeship or traineeship.

Note: The definition of employer includes the *self-employed,* which means a person who works for gain, other than under a contract of employment, apprenticeship or traineeship, whether or not that person employs others.

Engineering noise control measures means 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.

Excessive noise means noise that exceeds those levels defined in the *National Standard for Occupational Noise* [NOHSC:1007(2000)].

Hazard means anything that may result in harm to the hearing of a person.

Hearing protector areas means areas where persons may be exposed to excessive noise. During normal operations, no person should enter such an area without wearing appropriate personal hearing protectors. Hearing protector areas should be clearly defined and sign-posted according to Australian Standard AS 1319[2].

Impulse sound means sound consisting of a single pressure peak, or a sequence of such peaks, or a single burst with multiple pressure peaks whose amplitude decays with time, or a sequence of such bursts.

Integrating/averaging sound level meter (ISLM) means a sound level meter equipped with an integrating function which enables the meter to process a continuous, variable, intermittent or impulsive sound to give a single, integrated level or L_{eq} for the sampling period.

$L_{Aeq,8h}$(eight-hour equivalent continuous A-weighted sound pressure level in dB(A) referenced to 20 micropascals) means that steady noise level which would, in the course of an eight-hour period, cause the same A-weighted sound energy as that due to the actual noise over an actual working day. $L_{Aeq,8h}$ is to be determined in accordance with Part 1 of Australian/New Zealand Standard AS/NZS 1269[3].

$L_{C,peak}$ (peak noise level) means C-weighted peak sound pressure level in decibels (dB(C)) referenced to 20 micropascals determined in accordance with. Part 1 of Australian/New Zealand Standard AS/NZS 1269[3].

Noise means any unwanted or damaging sound.

Noise control policy means a written policy, developed by the employer, in consultation with employees and/or employee representative(s) that should aim to minimize the generation and emission of noise from plant and/or processes and set goals for exposure to peak and daily noise exposure levels at work and strategies to achieve them.

Occupational noise-induced hearing loss means hearing impairment arising from exposure to excessive noise at work. Occupational noise-induced hearing loss is also commonly known as industrial deafness.

Octave band analysis means analysis of the frequency content of noise into octave bands.
Octave band filter means a filter that attenuates all noise except that falling between two frequencies an octave apart. Octave band filters are used to measure which frequencies are present in a given noise.
Peak noise level see definition for $L_{C,peak}$.
Personal hearing protection program means a program for personal hearing protection and, where required, regular hearing testing, which is adopted where technical or economic problems delay, or make impracticable, the reduction of exposure to excessive noise by engineering or administrative noise control measures.
Personal hearing protectors means a device, or pair of devices, worn by a person or inserted in the ears of a person to protect the person's hearing.
Plant means any machinery, equipment, appliance, implement or tool, and anything fitted or connected to them.
Practicable means 'practicable' in Victoria, Queensland, Western Australia and the Northern Territory, 'reasonably practicable' in New South Wales, South Australia, the Australian Capital Territory and Commonwealth jurisdiction, and a 'reasonable precaution' in Tasmania.
Reverberation means the persistence, by echo or reflection, of sound in an enclosure after the emission by the source has stopped.
Risk means the probability of harm occurring to the hearing of a person.
Sound means small fluctuations in the air pressure that result in a wave capable of exciting in a listener the sensation of hearing.
Sound exposure meter (SEM), or noise dosemeter, means an instrument for measuring a person's daily noise exposure level by automatically integrating sound energy over a measurement period. The person concerned wears the instrument.
Sound level meter (SLM) means an instrument consisting of a microphone, amplifier and indicating device, having a declared performance, and designed to measure a frequency-weighted and time-weighted value of the sound pressure level.
Sound power means the total sound energy radiated per unit time. The standard units are watts (W).
Sound power level means the relative magnitude of sound power, customarily expressed in decibels referenced to 1 picowatt.
Sound pressure means the varying component of the pressure at a point in a sound field. The standard units are pascals (Pa).
Sound pressure level (SPL) means the relative magnitude of sound pressure, customarily expressed in decibels referenced to 20 micropascals.
Tinnitus means ringing or other noises in the head or ears that can be caused by exposure to excessive noise. Tinnitus can become permanent and when severe may disrupt sleep, reduce concentration and lead to irritability and depression. Tinnitus may lead to increased absenteeism and decreased productivity. It can also affect general job satisfaction and contribute to adverse health effects, such as, stress.
Tonal noise means noise that produces in a listener a definite pitch sensation.
Workplace means any place, whether or not in an aircraft, ship, vehicle, building or other structure, where employees or self-employed persons work, or are likely to be in the course of their work.

5. IMPLEMENTING THE CODE

5.1 This *National Code of Practice for Noise Management and Protection of Hearing at Work* [NOHSC: 2009(2004)] provides a framework for the management of exposure to noise at work and for minimising the risk of the effects of such exposure. It also provides guidance, which will assist employers and employees to understand and conform to the *National Standard for Occupational Noise* [NOHSC: 1007(2000)].

OBJECTIVES

5.2 The objectives of this national code of practice are to:

(a) minimise occupational noise-induced hearing loss and tinnitus by an approach that emphasises the reduction of noise levels at work by engineering noise control measures;

(b) promote the recognition and understanding of the effects of exposure to noise;

(c) promote the adoption of a systematic approach to reducing and managing exposure to excessive noise; and

(d) promote implementation through consultation between employers, employees and/or employee representatives.

STRATEGIES

5.3 The most effective way of controlling exposure to workplace noise is through the reduction of noise at its source.

5.4 A comprehensive approach using hazard identification, risk assessment and risk control should be adopted to effectively manage the risk of noise-induced hearing loss and other noise-related health effects. Measures could include equipment and job redesign and training.

CONSULTATION

5.5 Consultation and cooperation between employers, employees and employee representative(s) and the free exchange of information pertaining to health and safety, are essential to the effective implementation of this national code of practice.

5.6 This national code of practice should be implemented by employers in consultation with employees and employee representative(s). This defines the consultation process referred to throughout the document.

5.7 Where they exist, occupational health and safety committees or representatives should review all existing processes involving exposure to excessive noise, and participate in the development of systematic programs of equipment and job redesign. The introduction of changes in the workplace or in job design should only occur following full consultation with employees and employee representative(s) through consultative processes.

PROVISION OF INFORMATION

5.8 Information should be provided by the employer taking language and literacy into account, to familiarise employees with:

(a) what noise is;

(b) the effects of noise on hearing;

(c) the social handicaps of noise-induced hearing loss and tinnitus;

(d) the exposures to noise in their particular workplace;

(e) the reasons for, and nature of, the general noise control measures which are used to protect them and other persons who might be affected by their work;

(f) the specific control measures which are necessary in relation to each employee's own job (these measures may include instruction in the correct use and maintenance of noise control equipment and correct methods of operation for minimising noise levels);

(g) the noise control policy and program of action and timetable for future improvements;

(h) the arrangements for reporting plant or process defects which are likely to cause excessive noise;

(i) when and how to use personal hearing protectors provided and their proper care and maintenance; and

(j) statutory responsibilities of employers, employees and self-employed persons.

RESPONSIBILITIES OF EMPLOYERS

5.9 The prime responsibility for ensuring that a safe working environment is established, and safe work practices are implemented and maintained, resides with the employer. Employers should ensure that:

(a) statutory requirements are complied with;

(b) a noise control policy and program of action are developed and implemented;

(c) all levels of management and employees are aware of the control measures to reduce exposure to noise;

(d) all employees and contractors are encouraged to cooperate in using agreed safe work practices;

(e) information on noise, the risks of exposure to noise and the appropriate control measures are disseminated in a manner appropriate to the workplace;

(f) a comprehensive personal hearing protection program, including the selection of personal hearing protectors, and instruction of employees in their correct use and maintenance, is implemented; and

(g) employees receive appropriate training when it is required.

5.10 Employers should recognise the role of the supervisor in the management of noise and the protection of hearing at work and there should be close liaison between supervisors and employees.

RESPONSIBILITIES OF EMPLOYEES

5.11 Employees should comply with all statutory requirements and established workplace procedures and cooperate in all activities that have as their objective the

protection of hearing at work and the minimisation of occupational noise-induced hearing loss.

RESPONSIBILITIES OF SELF-EMPLOYED PERSONS

5.12 Employers and self-employed people should take reasonable care to ensure their own safety and health in relation to workplace noise and avoid adversely affecting the hearing or safety and health of others who may be affected by their operations.

RESPONSIBILITIES OF MANUFACTURERS, IMPORTERS AND SUPPLIERS OF PLANT FOR USE IN A WORKPLACE

5.13 Manufacturers, importers and suppliers should ensure that plant is designed and constructed so that its noise emission is as low as practicable when properly installed and used. Where necessary, research and development work should be carried out to reduce noise emission.

5.14 In deciding whether plant is likely to be noisy enough to require consideration of noise reduction, it will be necessary to take into account the range of uses for which it is sold, available information on the conditions under which it is likely to be used and the foreseeable methods of using it.

5.15 If operation of the plant is likely to create a noise hazard, the manufacturer, importer or supplier should ensure that adequate information is made available to the employer, if possible prior to the supply of the plant, about:

(a) its noise emission; and

(b) the means of installation, maintenance and use of the plant that will enable it to generate the lowest practicable noise levels.

5.16 Guidance for manufacturers, importers and suppliers on the presentation of information for noise levels generated by plant is provided in **Appendix 1**.

6. NOISE CONTROL PLANNING

6.1 Where excessive noise may exist the employer, in consultation with employees and employee representative(s), should develop a written noise control policy and program of action to implement noise control and manage exposure to noise. Copies of the policy and program of action should be available to all employees and employee representative(s) on request, and form a basic part of the information, induction and training activities.

POLICY

6.2 A noise control policy should aim to minimise the generation and emission of noise from plant and/or processes and set goals for exposure to peak and daily noise exposure levels at work and strategies to achieve them.

6.3 The policy should be reviewed at appropriate intervals and updated as necessary.

6.4 A noise control policy should cover the following issues, where they are applicable to the workplace concerned:

(a) goals for minimising daily noise exposure levels and peak noise levels in existing work areas;

(b) design goals for new work areas (both for the building and plant);

(c) the selection and purchase of quiet plant;

(d) noise controls to be used in temporary work areas and situations;

(e) agreements with contractors in terms of responsibilities for noise control and provision of information on noisy processes;

(f) audiometric testing and availability of records;

(g) the funding for the noise control program; and

(h) the period of review of the noise control program.

PROGRAM OF ACTION

6.5 The specific steps in the program of action should be implemented in agreed timeframes. Steps should include the following:

(a) assign a member of management to have overall responsibility for implementing and monitoring the program;

(b) conduct a preliminary noise hazard identification check to determine whether problems with exposure to noise are likely to exist;

(c) decide the type and detail of the noise assessments needed to be carried out, the period between them and the persons carrying them out;

(d) develop a program for the selection of new or replacement plant that can minimise exposure to noise;

(e) decide whether or not engineering noise control measures are practicable and the priorities to be given to different noisy situations;

(f) decide on suitable administrative noise control measures;

(g) select, provide and maintain suitable personal hearing protectors;

(h) identify, with the use of appropriate signs, hearing protector areas;

(i) provide on-going training to employees;

(j) provide voluntary audiometric testing;

(k) develop monitoring procedures which should include the following:

(i) check that measures used to control noise levels, such as silencers or enclosures, are maintained in good order and in position during the operation of noisy machines,

(ii) check, where necessary, the noise level to ensure that hidden defects are not causing high exposure to noise,

(iii) monitor the use of personal hearing protectors, and

(iv) check that personal hearing protectors are maintained in good condition.

(l) maintain relevant records and make them available to all employees and employee representative(s) on request. (The records should be kept in a form easily understood by those likely to be exposed); and

(m) provide for periodic management review.

7. NOISE IDENTIFICATION AND ASSESSMENT

NOISE IDENTIFICATION

7.1 Identification of noise hazards in a workplace enables people who may be exposed to excessive noise to be identified so that their exposures can be assessed. It also enables situations where immediate control measures are possible to be recognised and acted on and provides information for the person carrying out the detailed assessment.

7.2 No special skills are needed to conduct noise identification, but it should be done in consultation with those who understand the work processes, affected employees and/or their employee representative(s). One way is to conduct a walkthrough of the workplace, identifying noisy processes and tasks. As an informal guide, when a raised voice is needed to communicate with someone about one metre away, a workplace noise assessment is needed. Other information can be gathered from plant manufacturers and suppliers (see **Appendix 1).**

7.3 A noise identification checklist is provided in **Appendix 2** to help with the process.

7.4 When no prior information is available a noise assessment should be made to establish if exposure to noise is acceptable or not.

NOISE ASSESSMENT

7.5 All workplaces where it is considered that employees may be exposed to noise exceeding the *National Standard for Occupational Noise* [NOHSC: 1007(2000)] should be assessed, unless the exposure to noise can be reduced below the national standard immediately. Workplaces where exposure is marginally below the national standard should be re-assessed whenever any changes are made that may increase exposure.

7.6 People employed to carry out a noise assessment should meet the competency requirements in Appendix A of Part 1 of Australian/New Zealand AS/NZS 1269[3].

7.7 A noise assessment may be simple or quite complex, depending on the type of workplace, the number of employees and the information already available regarding noise exposure levels. The detail and accuracy needed will depend on individual circumstances.

7.8 The time intervals between noise assessments should be determined by management in consultation with employees through established consultative processes. Assessment should be repeated at intervals not exceeding five years or whenever there is:

(a) installation or removal of machinery likely to cause a significant change in noise levels;

(b) a change in workload or equipment operating conditions likely to cause a significant change in noise levels;

(c) a change in building structure likely to affect noise levels; or

(d) modification of working arrangements affecting the length of time employees would spend in noisy workplaces.

7.9 Noise assessment records should be made in a consistent format and, where practicable, should be kept at or near the premises to which they apply. Where this is not practicable, for example, because of the itinerant nature of the work, such as

construction work, the records should be kept available at a designated office. Assessment records should be made available to management, employee representative(s) and relevant authorities.

OBJECTIVES

7.10 The general objectives of these assessments are to:

(a) Identify all employees likely to be exposed to noise above the national standard. This will generally involve the evaluation of $L_{Aeq,8h}$ and measurements of peak noise levels where relevant;

(b) Obtain information on noise sources and work practices that will help employers decide what measures should be taken to reduce noise;

(c) Check the effectiveness of measures taken to minimise exposure. (Provided that a base-line has been established in a more comprehensive assessment, it might be possible to restrict such surveys to measurement of noise levels at a few defined positions and under a restricted range of working or loading conditions of the equipment involved);

(d) Assist in the selection of appropriate personal hearing protectors;and

(e) Delineate hearing protector areas.

HOW TO CARRY OUT A NOISE ASSESSMENT

7.11 In some cases, more complex measurements are required in order to determine employees' exposure to noise with acceptable accuracy, or for the selection of personal hearing protectors. For example, octave band analysis of the noise may be desirable if it contains intense tonal, high frequency or low frequency components.

7.12 More detailed guidance on noise measurement and recording is available in Part 1 of Australian/New Zealand Standard AS/NZS 1269[3].

INSTRUMENTS

7.13 Sound level meters (SLM) have four principal grades of precision:

Type/Description	Tolerance
0 —Laboratory reference meter	± 0.4dB
1—Precision	± 0.7dB
2—General purpose	± 1.0dB
3 — Survey	± 1.5dB

7.14 Noise assessments should be performed with Type 2 general purpose meters, or better. Type 3 survey meters are usually inexpensive but may have wide precision tolerances and some models cannot be calibrated. Type 3 survey meters are only suitable for preliminary noise checks to find out whether more accurate assessments are needed.

7.15 The sound level meter may be equipped with an integrating/averaging function that enables the meter to process a continuous, variable, intermittent or impulsive signal to give a single integrated level or L_{eq} for the sampling period. A meter with this function is an integrating/averaging sound level meter (ISLM).

7.16 The sound level meter may have a peak detector-indicating characteristic. This is necessary to measure the C-weighted peak noise level. The C-weighted peak noise level should not be confused with the maximum sound pressure level.

7.17 Sound exposure meters (SEM), or noise dosemeters, can be worn by employees for a given period, for example, a working day. The SEM records the personal noise exposure of the employee. Some SEMs are capable of recording a time-history of an employee's noise exposure level for the measurement period. A typical time-history report will provide a histogram of minute by minute noise exposure levels. This is a great advantage in identifying major contributors to the average daily noise exposure level that can then be further investigated with a hand-held meter.

7.18 The following points should be considered when using a SEM:

(a) Reflection of sound from the clothes and body can cause an increase of about 1 - 3 dB.

(b) The microphone should be attached as close as possible to the ear. Other inappropriate positioning of the microphone may give higher or lower results. For example, if the microphone is attached to the lower part of the collar or pocket, it may be much closer to a noise source than the ear and an unduly high result will be recorded. Also, the body may shield a noise source.

(c) The assessment of exposure over just one day may not give a representative sample. If possible, it is best to take measurements over a few days.

(d) It is advisable to check the SEM results with a hand-held sound level meter.

(e) Some SEMs do not measure impulse sound adequately.

7,19 Sound exposure meters should comply with Australian/New Zealand Standard AS/NZS 2399[4].

7.20 All SLMs and ISLMs should comply with the specifications laid down in Australian Standards AS 1259.1[1] and AS 1259.2[5] respectively. Octave band filters should comply with the specifications laid down in Australian Standard AS/NZS 4476[6].

7.21 A full calibration of measuring systems should be performed at regular intervals not exceeding two years by a laboratory that produces calibration test reports that are recognised by the National Association of Testing Authorities, Australia, covering the relevant accredited tests.

7.22 Meters should be checked with an acoustic calibrator immediately before and after the measurements.

8. ENGINEERING NOISE CONTROL MEASURES

NEW PLANT AND WORKPLACES

8.1 The purchase of new plant, the design of the area in which it is to be installed, and the design of new workplaces generally, provide opportunities for cost-effective noise control measures.

8.2 Invitations to tender for the supply of new plant should specify a maximum acceptable level of noise emission. If plant is to be purchased directly, without tender, noise emission data should be obtained from suppliers to enable the plant with the lowest practicable noise level to be selected. Guidance for manufacturers, importers and suppliers on the presentation of information about noise levels emitted by plant is provided in **Appendix 1**.

8.3 For guidance on interpreting suppliers' noise emission data, employers purchasing new plant can refer to the section 'Using Suppliers' Noise Information' in Module 8 'Buy Quiet' of the NOHSC publication *Noise Management at Work: Control Guide* [NOHSC: 12004(1991)] [7].

8.4 New workplaces, and installation sites for new plant in existing workplaces, should be designed and constructed to ensure that exposure to noise is as low as practicable.

8.5 If new plant is likely to expose people in the workplace to excessive noise, design features should incorporate effective engineering noise control measures to reduce noise to as low a level as practicable.

8.6 Where plant is to be designed for a particular workplace, designers should:

(a) obtain agreement with the client on goals for noise, be aware of the noise control policy for that workplace and establish a budget that will allow for effective noise controls at the design stage;

(b) consider the effect on overall noise levels of building reverberation, the building layout and the location of workstations relative to plant;

(c) consider the transmission of noise through structures and ducts;

(d) design for acoustical plant rooms and control rooms where appropriate; and

(e) design acoustic treatments for external environmental control in a way that will reduce internal noise and vice versa.

EXISTING PLANT AND WORKPLACES

8.7 Once a noise assessment has been carried out and the need to reduce exposure to noise is established, the task of controlling the noise can be addressed. Priority should be given to those noise sources that expose employees to peak noise levels above the *National Standard for Occupational Noise* [NOHSC: 1007(2000)] (national standard) and to those that contribute to the highest exposures affecting the largest number of people. Noise exposure levels should be reduced to, or below the national standard whenever practicable. Even if the national standard cannot be met, any practicable reduction in noise levels should be carried out. The need for noise control should be taken into account when deciding on production methods or processes. There are two basic engineering noise control measures for controlling noise levels:

engineering treatment of the source; and

engineering treatment of the noise transmission path (including enclosure of the operator).

For guidance on comparing the effectiveness and cost of various noise control measures, refer to Module 9 'Evaluating Options' in the NOHSC publication *Noise Management at Work: Control Guide* [NOHSC:12004(1991)][7]. For guidance on using in-house resources for noise control work, especially in the course of plant maintenance and modification, refer to Module 3 'In-house Control' in the same publication.

ENGINEERING TREATMENT OF THE SOURCE

8.8 Engineering treatment of the source is the preferred method of permanently removing the problem of excessive noise due to machinery or processes at the workplace. Since all noise-emitting objects generate airborne energy (noise) and structure-borne energy (vibrations), the treatment of these noise problems may require modification, partial redesign or replacement of the noise-emitting object. Subjective inspection or acoustical measurement of the device can identify how and where the noise is generated. Some problems can be solved by relatively inexpensive and simple procedures, although some are difficult. Advice from specialists may help achieve the best results. This national code of practice includes reference to some of the simpler methods of noise control recommended for workplaces.

8.9 When seeking to treat noise at the source, it is necessary to understand how a machine or process works. Engineering noise control measures can be targeted at the machine and its parts, or towards the processes, including material handling systems.

8.10 General noise control solutions, and examples of particular engineering noise control measures which can be carried out on machines, are provided below:

(a) Eliminate or replace the machine or its operation by a quieter operation with equal or better efficiency, for example, by replacing rivets with welds.

(b) Replace the noisy machinery by installing newer equipment designed for operating at lower noise levels. Machinery power sources and transmissions can be designed to give quiet speed regulation, for example, by using stepless electric motors. Vibration sources can be isolated and treated within the machine. Cover panels and inspection hatches on machines should be stiff and well damped. Cooling fins can be designed to reduce the need for forced airflow and hence fan noise.

(c) Correct the specific noise source by minor design changes. For example, avoid metal-to-metal contact by the use of plastic bumpers, or replace noisy drives with quieter types or use improved gears.

(d) Provide a high standard of plant and equipment maintenance to reduce noise levels to as low as practicable. Badly worn bearings and gears, poor lubrication, loose parts, slapping belts, unbalanced rotating parts and steam or air leaks all create noise which can be reduced by good maintenance. Plant and equipment resulting in excessive noise levels should be repaired immediately.

(e) Correct the specific machine elements causing the noise rather than considering the entire machine as a noise source. For example, consider adding noise barriers, noise enclosures, vibration isolation mountings, lagging to dampen vibrating surfaces, mufflers or silencers for air and gas flows, or reducing air velocity of free jets.

(f) Separate the noisy elements which need not be an integral part of the basic machine. For example, move pumps, fans and air compressors that service the basic machine.

(g) Isolate the vibrating machine parts to reduce noise from vibrating panels or guards.

8.11 In addition to engineering changes to machinery and parts, processes can be modified to reduce noise. Specific means of modification include the use of processes which are inherently quieter than the alternatives, for example, mechanical pressing rather than drop forging. Metal-to-metal impact should be avoided or reduced, where possible, and vibration of the surfaces of the machine or the material being processed should be suppressed. This can be achieved, for example, by the choice of suitable materials, by adequate stiffness and damping or by careful dynamic balancing where high speed rotation is used.

8.12 Material handling processes, in particular, can also be modified to ensure that impact and shock during handling and transport are minimised as far as possible. This may be achieved by:

(a) minimising the fall height onto hard surfaces of items collected by tables and containers;

(b) fixing damping materials to, or stiffening, tables, walls, panels or containers where they are struck by materials or items during processing;

(c) absorbing shocks through the provision of wear resistant rubber or plastic coatings;

(d) using conveyer belts rather than rollers, which are more likely to rattle; and

(e) controlling the speed of processes to match the desired production rates, thereby obtaining a much smoother work flow and less likelihood of noise generation due to stop-start impact noise.

ENGINEERING TREATMENT OF THE NOISE TRANSMISSION PATH

8.13 If it is not possible to change or modify the noise-generating equipment or processes by engineering treatment of the source, engineering treatment of the noise transmission path between the source and the listeners, in this case the employees, should be investigated.

8.14 Engineering treatment of the noise transmission path includes isolating the noise-emitting object(s) in an enclosure, or placing them in a room or building away from the largest number of employees, and acoustically treating the area to reduce noise to the lowest practicable levels.

8.15 Alternatively, it may be desirable to protect the operator(s) instead of enclosing the sound sources. In this case, design of the sound-reducing enclosures should still follow the same principles.

8.16 The principles to be observed in carrying out engineering treatment of the noise transmission path are listed below:

(a) Distance is often the cheapest solution, but it may not be effective in reverberant conditions.

(b) Erect a noise barrier between the noise source and the listener, in some instances a partial barrier can be used to advantage. In cases where either area has a false ceiling, care should be taken to ensure that the dividing wall extends to the true ceiling and that all air gaps in the wall are closed and airtight.

(c) Once the acoustical barrier is erected, further treatment, such as the addition of absorbing material on surfaces facing the noise source, may be necessary.

(d) Materials which are good noise barriers, for example, lead, steel, brick and concrete, are poor absorbers of sound. The denser and heavier the material, the better the noise barrier.

(e) Good sound absorbers, for example, certain polyurethane foams, fibreglass, rockwool and thick pile carpet, are very poor barriers to the transmission of sound.

(f) Walls and machine enclosures should be designed to minimise resonances which will transmit acoustical energy at the resonant frequency to the protected area. This can be achieved by placing reinforcement or bracing in strategic areas during construction or modification.

(g) Reduce, as far as possible, the reverberation of the room where noise is generated, by the introduction of acoustically absorbent material(s). The presence of reverberation in a room shows the need for absorbing material. Excessive reverberation produces unpleasant and noisy conditions which can interfere with speech communication.

Note: Reducing the reverberation of a room is unlikely to significantly reduce the noise exposure level (i.e. by more than 1dB(A)) of people close to noisy machines.

8.17 These principles can be utilised in the following way:

(a) using a sound-reducing enclosure which fully encloses the machine(s);

(b) separating the noisy area and area to be quietened by a sound-reducing partition;

(c) using sound-absorbing material on floors, ceiling and/or walls to reduce the sound level due to reverberation; and

(d) using acoustical silencers in intake and exhaust systems associated with gaseous flow activity, for example, internal combustion engine exhaust systems or air conditioning systems.

FURTHER GUIDANCE

8.18 More detailed guidance on engineering noise control in new and existing workplaces is available in Part 2 of Australian/New Zealand Standard AS/NZS 1269[3].

8.19 Further information on the effects of noise and noise control solutions is available from **www.nohsc.gov.au/OHSInformation/OHSSolutions/noise/contents.htm**.

9. ADMINISTRATIVE NOISE CONTROL MEASURES

9.1 Where it is not practicable to comply with the *National Standard for Occupational Noise* [NOHSC: 1007(2000)] solely through engineering noise control measures, administrative noise control measures may also be used.

9.2 Administrative noise control measures reduce the noise to which a person is exposed by means of work arrangements, including:

(a) organising schedules so that noisy work is done when as few people as possible are present;

(b) notifying people in advance when noisy work is to be carried out so they can limit their exposure to it;

(c) keeping people out of noisy areas if their job does not require them to be there;

(d) sign-posting noisy areas;

(e) providing quiet rest areas for food and rest breaks; and

(f) limiting the time employees spend in noisy areas by moving them to quiet work before their daily noise exposure levels become excessive.

9.3 Administrative control measures should be established to ensure regular inspection and maintenance of engineering controls such as vibration mountings, impact absorbers, gaskets, seals, silencers, barriers, absorptive materials and other equipment used to control noise.

9.4 If administrative controls are relied on, there should be regular checks to ensure that they are fully and correctly complied with.

9.5 More detailed guidance on administrative noise control is available in Part 2 of Australian/New Zealand Standard AS/NZS 1269[3].

FURTHER INFORMATION

9.6 Further information on the effects of noise and practical noise control solutions is available on the NOHSC Internet site:
(www.nohsc.gov.au/OHSInformation/OHSSolutions/noise/contents.htm).

10. PERSONAL HEARING PROTECTORS

10.1 When engineering and administrative noise control measures do not reduce the exposure to noise to or below the *National Standard for Occupational Noise* [NOHSC: 1007(2000)] employees should be supplied with, and wear, effective personal hearing protectors.

10.2 Personal hearing protectors should not be used when noise control by engineering or administrative noise control measures is practicable. They should normally be regarded as an interim measure while control of excessive noise is being achieved by these other means.

10.3 The removal of personal hearing protectors for even short periods of time can significantly reduce their effectiveness and result in inadequate protection. For example, taking off personal hearing protectors in a noisy environment for a total of just 15 minutes in an eight hour day reduces the protector performance to just 15dB regardless of how good the protector is in theory. Due to the difficulties of wearing personal hearing protectors for long periods of time in certain environments, regular brief periods in quiet areas, without personal hearing protectors, should be included as part of the personal protection program.

HEARING PROTECTOR AREAS

10.4 Areas where people may be exposed to excessive noise should be sign-posted, as 'hearing protector areas', and their boundaries should be clearly defined. No person, including a visitor, employee, manager, supervisor, contractor or self-employed person should enter a hearing protector area during normal operation, unless wearing appropriate personal hearing protectors. This is regardless of how long the person spends in the hearing protector area.

10.5 The signs used to identify these areas should conform to specifications in Australian Standard AS 1319[2]. Additional signs within the hearing protector areas may also be necessary.

10.6 Where sign-posting is not practicable, alternative arrangements should be made in consultation to ensure that employees and others can recognise circumstances in which personal hearing protectors are required. Methods of achieving this include:

(a) attaching prominent warning notices to tools and equipment indicating that personal hearing protectors must be worn when operating them;

(b) providing written and verbal instructions on how to recognise circumstances in which personal hearing protectors are needed; and

(c) effective supervision of identified 'hearing protector areas'.

SELECTION OF PERSONAL HEARING PROTECTORS

10.7 It is important to ensure that personal hearing protectors will provide wearers with reliable adequate protection. Personal hearing protectors should be selected in accordance with Part 3 of Australian/New Zealand Standard AS/NZS 1269[3] and should comply with the requirements of Australian/New Zealand Standard AS/NZS 1270[8]. The attenuation values used in all selection procedures should be derived from attenuation measurements made in accordance with Australian/New Zealand Standard AS/NZS 1270[8]. Suppliers should be asked to provide full information on the attenuation likely to be provided including the SLC_{80} ratings, Class (see

Appendix 3) and octave band attenuation values. Suppliers' reports should be made available to employees and employee representative(s). Additional information is available in the National Acoustic Laboratories' publication *Attenuation and Use of Hearing Protectors*[9].

10.8 Provided the same performance criterion is met, users should be allowed a reasonable choice from a range of personal hearing protectors.

10.9 Individual selection of personal hearing protectors should be based on:

(a) Compliance with the requirements of Australian/New Zealand Standard AS/NZS 1270[8];

(b) The degree of attenuation required in the employee's environment. Personal hearing protectors with unnecessarily high attenuation (noise reduction) may cause communication difficulties and ultimately be unsuitable because of discomfort and inconvenience;

(c) Suitability for use in the type of working environment and the job involved. For example, earplugs are difficult to use hygienically in work that requires them to be inserted with dirty hands. For such jobs, earmuffs might be better. On the other hand, earmuffs tend to be more uncomfortable in hot environments, or may make it difficult for the wearer to enter a confined space or to wear a helmet;

(d) The comfort, weight and clamping force of the hearing protector;

(e) The fit to the user. Individual fitting of the wearer is necessary for optimum protection. This should be checked while the user is wearing other regularly used items which might affect the performance of the protector. For example, spectacle wearers should be fitted with earmuffs while wearing their normal spectacles. Disposable plugs do not need individual fitting, but the ability of the material to conform to the user's ear canal should be taken into account, as this is difficult for a supervisor to observe in the workplace; and

(f) The safety of the wearer and others working nearby, for example, the suitability for use in conjunction with any other personal protective equipment that might be required, such as safety helmets or respiratory protective equipment. The wearing of personal hearing protectors should not mask warning sounds. The use of personal hearing protectors may make it more difficult for employees to hear sounds if they already have a hearing loss. Particular care may need to be exercised in such cases.

INSPECTION AND MAINTENANCE

10.10 Employers should ensure that personal hearing protectors are regularly inspected and maintained. Employees should also inspect personal hearing protectors regularly to detect and report damage or deterioration.

10.11 Adequate provision should be made for clean storage of protectors when not in use. Facilities should be readily available for the cleaning of reusable protectors.

10.12 For further information on inspection, maintenance and storage of personal hearing protectors, refer to Part 3 of Australian/New Zealand Standard AS/NZS 1269[3] or the National Acoustic Laboratories' publication, *Attenuation and Use of Hearing Protectors*[9].

TRAINING AND SUPERVISION

10.13 Before personal hearing protectors are issued, the need for their use and limitations should be fully explained. Employees should be given guidance in the selection of appropriate personal hearing protectors. Instruction in their use, fitting, care and maintenance should be repeated at regular intervals. Employers, managers and supervisors should encourage the use of personal hearing protectors by explanation and personal example. For further information on a training program refer to Appendix D, Part 3 of Australian/New Zealand Standard AS/NZS 1269[3].

10.14 Particular care is needed with the fitting of earplugs, which if poorly fitted may provide little protection. For example, foam earplugs need to be held in place for about 10 seconds while they expand to fit the ear canal.

10.15 Employers, managers and supervisors should ensure that personal hearing protectors are used correctly where and when required.

10.16 Employees who have been properly instructed in the use of personal hearing protectors, should wear them where and when required.

11. TRAINING

11.1 Training is an integral part of a preventive strategy, and is in addition to the provision of information outlined in Section 5.8 of this national code of practice. The target groups requiring training are:

(a) managers and supervisors of employees considered at risk of noise-induced hearing loss and tinnitus;

(b) employees who may be exposed to excessive noise at work;

(c) workplace health and safety committees and employee representative(s); and

(d) staff responsible for the purchasing of plant, noise control equipment, personal hearing protectors and for the designing, scheduling, organisation and layout of work.

TRAINING OBJECTIVES

11.2 The training objectives are:

(a) to minimise noise-induced hearing loss and tinnitus by an approach that emphasises engineering noise control measures;

(b) to recognise and promote an understanding of the nature of noise-related health effects, including the cumulative effects of workplace noise and other exposures to noise such as domestic and leisure activities; and

(c) to promote the adoption of a systematic approach to the management of exposure to excessive noise.

PROGRAM CONTENT

11.3 The needs of each target group are different, and the content and methods of presenting training material should be tailored to meet the specific needs of each group.

11.4 Handouts, prepared as simple guidelines related to the needs of the group being trained, should be provided for all participants. The workplace noise control policy and program of action should be readily available to all participants.

11.5 Advice on suitable publications is available from the National Occupational Health and Safety Commission, State and Territory governments, and employer and employee groups.

11.6 Topics that should be included in a training program aimed at prevention of noise-induced hearing loss and tinnitus include:

(a) what is noise and what is excessive noise;

(b) the effects of noise on hearing;

(c) the social handicaps of noise-induced hearing loss and tinnitus;

(d) the rationale for the *National Standard for Occupational Noise* [NOHSC: 1007(2000)] (*see* the Preface to this publication);

(e) the statutory responsibilities of employers, employees and self-employed persons;

(f) an overview of the workplace noise control policy and program of action;

(g) the nature and location of noise hazards in the workplace associated with the technology, plant and/or work practices employees use in the course of their jobs;

(h) the nature of the general noise control measures which are in use or are planned;

(i) the specific control measures which are necessary in relation to each employee's own job. (As appropriate, this should include instruction in the correct use and maintenance of exhaust silencers, enclosures and other measures which minimise noise levels.);

(j) when and how to use personal hearing protectors provided, including selection, fitting, proper care and maintenance;

(k) the arrangements for reporting defects in plant or the workplace which are likely to cause exposure to excessive noise; and

(l) the purpose and nature of audiometric testing.

12. AUDIOMETRIC TESTING

PURPOSE

12.1 The hearing of employees exposed to noise can be monitored through regular audiometric examinations. Such testing in itself is not a preventive mechanism, and is only relevant in the context of a comprehensive noise management program. Any changes in hearing levels over time revealed by audiometry should be thoroughly investigated as to their cause(s) and the need for prevention.

12.2 An audiometric testing program should be available to any employee likely to be regularly exposed to excessive noise even if they regularly use personal hearing protectors.

TESTING SCHEME

12.3 All testing should be undertaken by appropriately trained and experienced persons, selected by management in consultation with employees and employee representative(s).

12.4 People who carry out audiometric testing should ensure that procedures and equipment used are in accordance with the specifications in Part 4 of Australian/New Zealand Standard AS/NZS 1269[3].

12.5 The audiometric testing scheme should include an initial reference test with periodic monitoring audiometric tests to follow. The initial reference audiogram should be taken as soon as the employee commences work, or before any exposure to workplace noise occurs. Monitoring audiometry should be carried out within 12 months of initial work exposure for comparison with the results of reference audiometry. In the absence of significant threshold shift or change in the work situation, it may then be sufficient to repeat the test at yearly intervals.

Note: At high $L_{Aeq,8h}$ (daily noise exposure levels) more frequent audiometric testing may be desirable

Monitoring audiometry should be scheduled well into the work shift so that comparison with the reference audiogram will reveal any temporary threshold shift due to inadequacies in the use of personal hearing protectors.

12.6 Each employee's hearing, and the best type of personal hearing protectors for the job, should be discussed with that employee. Proper fitting of the personal hearing protectors should be ensured at the completion of the examination. Instructions on their use should be repeated at each subsequent attendance for audiometric testing.

ASSESSMENT OF AUDIOGRAMS

12.7 Audiograms should be assessed and action taken in accordance with Section 9 of Part 4 of Australian/New Zealand Standard AS/NZS 1269[3]

12.8 When employees are found to have sufficient hearing loss to interfere with the safe performance of their jobs, all practicable steps should be taken to modify the work environment such as volume-control telephones, acoustically treated meeting areas with low noise and low reverberation, and supplementary visual warning signals. Where these cannot remedy the situation, employees should be offered alternative work.

12.9 Results should be given to employees within two months of the audiometric testing. All results should be accompanied by a written explanation, in lay terms, of their meaning and implications. Individual results should be released to other parties

only on the written authority of the employee. Unidentifiable individual results and group data should be accessible to the relevant employer, the employee representative(s) and the relevant authority.

ACTION TO BE TAKEN WHEN THRESHOLD SHIFT DETECTED

12.10 When temporary or permanent threshold shifts are revealed by audiometry or new tinnitus reported, action should be taken to inform the responsible manager to arrange to:

(a) review the employee's job to identify any changes that may have caused an increase in exposure to noise;
(b) re-determine exposure to noise if necessary;
(c) determine whether anything can be done to reduce the levels of noise to which the employee is exposed and the durations of exposure;
(d) verify the nominal performance of the employee's personal hearing protector is adequate for the level of exposure to noise;
(e) examine the protector carefully and ensure it is not worn or damaged;
(f) check the employee is able to fit the protector properly;
(g) check the protector fits the employee closely and there are no leakage paths for noise;
(h) ask the employee if they have any difficulty using the protector;
(i) check the employee actually uses the protector correctly and consistently on the job; and
(j) deal with any problems revealed by the above procedure, calling on expert advice as necessary.

UPDATING OF REFERENCE AUDIOGRAMS

12.11 The reference audiogram should be updated whenever a significant permanent threshold shift has occurred or every 10 years, whichever occurs sooner. After a significant permanent threshold shift has been found and medically assessed, the employer should ensure that an updated reference audiogram is obtained for the employee. Subsequent monitoring audiograms should then be compared with this most recent reference audiogram. Records of previous reference audiograms should be retained.

RECORDS

12.12 Audiometric test records of employees, where released to the employer, should be kept during the employee's period of employment and longer as necessary, as they may provide a useful reference for workers' compensation. The records must be kept in a safe, secure place and held as confidential documents.

GUIDANCE FOR MANUFACTURERS, IMPORTERS AND SUPPLIERS ON THE PRESENTATION OF INFORMATION ABOUT NOISE LEVELS GENERATED BY PLANT

INTRODUCTION

A1.1 The purposes of this guidance material are:

(a) To assist manufacturers, importers and suppliers in providing 'appropriate and adequate' information on noise levels generated by plant (*see* under the heading '*Appropriate and Adequate*' *Information on Noise* elsewhere in this Appendix).

(b) To assist purchasers to make an informed choice when purchasing plant, by being able to assess and, where possible, compare suppliers' noise level information. This information will usually be obtained from tests under standardised conditions. The plant may, however, generate different noise levels in the workplace and it is the responsibility of the employer purchasing the plant to assess noise levels in the workplace. The purchase of plant should occur through the consultative mechanisms in the workplace, as part of a strategy to reduce noise levels in the workplace.

A1.2 The reasons for providing information on noise levels prior to purchase are:

(a) noise levels are a significant factor in making decisions on the purchase and hire of plant, since 'buying quiet' is a highly cost effective way to control workplace noise;

(b) providing the information 'up-front' encourages manufacturers to produce quieter products; and

(c) comparing noise levels will encourage local manufacturers and suppliers to move towards compatibility with information obtained/required overseas and in other parts of Australia.

'APPROPRIATE AND ADEQUATE' INFORMATION ON NOISE

A1.3 For information on noise levels to be considered 'appropriate' and 'adequate', it should be:

(a) Collected by a competent person according to good measurement practice as defined in relevant general international standards, or Australian Standards such as AS 2659[10]. This ensures a reasonable standard of accuracy,

(b) Presented in a clear, understandable format,

(c) Technically complete and unambiguous,

(d) Representative of noise likely to be emitted by plant under typical conditions of usage.

A1.4 The minimum testing information that should be supplied to the purchaser is listed in Table A1. Where relevant information on test procedures is contained in a test standard or a test report, reference to the standard or the report should be included. Information should be provided on peak noise levels, where relevant, as well as on continuous noise levels. The manufacturer/supplier should be able to provide a full test report when requested.

A1.5 Where there is a selection of noise measurement results available, the preferred measurement, for the purpose of this national code of practice, is the sound pressure level at the operator's ear position.

TABLE A1: MINIMUM NOISE TESTING INFORMATION TO BE SPECIFIED BY THE MANUFACTURER/SUPPLIER

. **Supplier's details** (for example, name, local address, telephone and/or facsimile number , email).

. **Manufacturer's details** (for example, name, address, telephone and/or facsimile number ,email).

. **Details of the plant tested** (including any noise controls, for example, make, model, serial number, relevant capacity/rating).

. **Title or number of specific test standard or code followed** (if any) and details of any departures from the standard. For example, if a machine needed to be mounted differently to the method given in the standard, the alternative mounting should be described.

. **Details of operating conditions** if not specified in the standard, or if no specific test standard is available for the type of plant being tested. For example, test machine load, speed, type of material processed, details of installation and mounting of test machine, details of test environment, description of measurement instrumentation and procedure. Reference to a test report containing this information will suffice.

. **Measurement position(s)** (for example, operator's ear or 1 metre from machines).

· **Index measured** (for example, sound pressure level or sound power level).

· **Frequency weighting** (for example, A, C or linear).

· **Time weighting** (for example, slow, fast or peak), or **Leq**

· **Sound level or levels determined in testing**.

· **Units of measurement** (for example, dB re: 20 micropascals).

· **Date issued**.

SUGGESTED PROFORMA FOR PRESENTATION OF INFORMATION ON NOISE LEVELS GENERATED BY PLANT

A1.6 A suggested proforma for the presentation of information on noise levels generated by plant is shown below. However, the information may be presented in any convenient way that will bring it to the purchaser's attention. For example, a catalogue or operating instructions would be suitable, provided the information is complete.

SUPPLIER/MANUFACTURER

Supplier:

Name .....

Address .....

.....

Phone ..... **Facsimile** .....

Email .....

Manufacturer:

Name .....

Address .....

.....

Phone ..... **Facsimile** .....

Email .....

DETAILS OF PLANT TESTED

Description of item .....
.....

Make .....

Model ..... **Serial Number**……..

Noise reducing attachments fitted .....
.....

.....

TEST PROCEDURES

Operating conditions .....

.....

Test environment .....

.....

Test standard followed: Number .....

Title.....

Clauses .....

Departures from standard .....
.....

Measurement method if no standard followed
.....
.....
.....
.....

RESULTS

Measurement position .....

.....

Time weighting (fast, slow, or peak) or L_{eq} .....

	Range	**Mean**
A-weighted	..... **to**	..... **dB(A)**
C-weighted	..... **to**	..... **dB(C)**
C-weighted, peak	.....…..…**to**	..... **dB(C) Peak**

Sound power level ..... **dB(A)**

Date issued.....

APPENDIX 2

NOISE HAZARD IDENTIFICATION CHECKLIST

Description of work location: _____

Task at workstation: _____

Assessed by: _____

Employee Representative: _____Date:_____

Yes to any of the following indicates the need for a detailed noise assessment.

1. Is a raised voice needed to communicate with someone about one meter away?	Yes ☐	No ☐
2. Do workers complain that there is too much noise?	Yes ☐	No ☐
3.Do workers say that they can't hear each other or hear instructions or warning signals?	Yes ☐	No ☐
4. Do people working in the area notice a reduction in hearing over the course of the day? (This reduction might not be noticed until after work.)	Yes ☐	No ☐
5. Do employees experience any of the following:		
(a) ringing in the ears (tinnitus);	Yes ☐	No ☐
(b) the same sound having a different tone in each ear;	Yes ☐	No ☐
(c) blurred hearing?	Yes ☐	No ☐
6. Are any long-term employees hard of hearing?	Yes ☐	No ☐
7. Are personal hearing protectors provided?	Yes ☐	No ☐
8. Are signs, indicating that personal hearing protectors should be worn, posted at the entrance or in the work area?	Yes ☐	No ☐
9. Have there been any workers' compensation claims for noise-induced hearing loss?	Yes ☐	No ☐
10. Does any equipment have manufacturer's noise information (including labels) that indicates noise levels equal or greater than any of the following:		
(a) 80dB(A) $L_{Aeq,T}$	Yes ☐	No ☐
(b) 130dB peak noise level,	Yes ☐	No ☐
(c) 88dB(A) sound power level?	Yes ☐	No ☐
11. Do the results of audiometry indicate that past or present employees have hearing loss?	Yes ☐	No ☐
12.Does the noise in any part of the workplace sound as loud or louder than 85 decibels using the scale Decibel Levels of Common Sounds?	Yes ☐	No ☐

DECIBEL LEVELS OF COMMON SOUNDS

	Examples	Sound Pressure Level dB(A)
	30m from a jet aircraft	140
	Threshold of pain	130
		120
		110
	Chainsaw	
	Night Club	100
		90
	Kerbside of busy road	80
		70
	Conversational speech	60
		50
	Quiet bedroom at night	40
		30
		20
	Background in TV studio	10
	Threshold of hearing	0
		
		

APPENDIX 3

HEARING PROTECTOR CLASSIFICATION

Class	SLC_{80} range	$L_{Aeq,8h}$ dB(A)
1	10 to 13	Less than 90
2	14 to 17	90 to less than 95
3	18 to 21	95 to less than 100
4	22 to 25	100 to less than 105
5	26 or greater	105 to less than 110

Australian/New Zealand Standard AS/NZS 1269[3]

REFERENCED DOCUMENTS

1. Standards Australia, AS 1259.1 *Acoustics – Sound Level Meters*, *Part 1: Non-integrating,* Standards Australia, Sydney.
2. Standards Australia, AS 1319 *Safety Signs for the Occupational Environment*, Standards Australia, Sydney.
3. Standards Australia, AS/NZS 1269 *Occupational Noise Management Parts 0-4* Standards Australia, Sydney.
4. Standards Australia, AS/NZS 2399 *Acoustics - Specifications for Personal Sound Exposure Meters*, Standards Australia, Sydney.
5. Standards Australia, AS 1259.2 *Acoustics – Sound Level Meters*, *Part 2: Integrating – Averaging,* Standards Australia, Sydney.
6. Standards Australia, AS/NZS 4476 *Acoustics – Octave Band and Fractional Octave Band Filters,* Standards Australia, Sydney.
7. National Occupational Health and Safety Commission, *Noise Management at Work: Control Guide* [NOHSC:12004(1991)], 2nd Edition, Worksafe Australia, Sydney, 1991. http://www.nohsc.gov.au/PDF/Standards/Guidelines/noise_control.pdf
8. Standards Australia, AS 1270 *Acoustics – Hearing Protectors*, Standards Australia, Sydney.
9. National Acoustic Laboratories, *Attenuation and Use of Hearing Protectors*, 8th Edition, Commonwealth of Australia, Sydney, 1998.
10. Standards Australia, AS 2659 *Guide to the Use of Sound Measuring Equipment*, Standards Australia, Sydney.