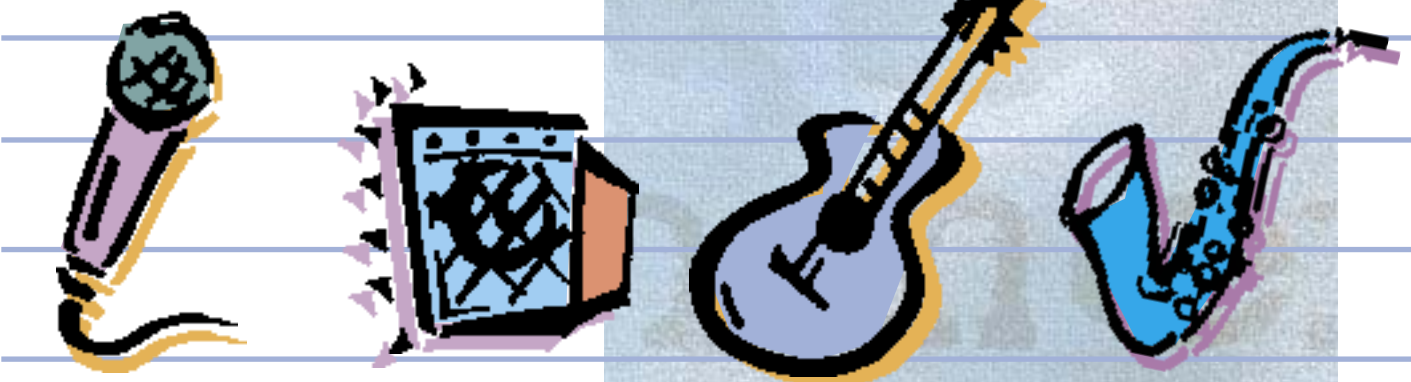


code of practice

Control of Noise in the Music Entertainment Industry

2003



AUTHORITY

On 5 August 2002, the Minister for Consumer and Employment Protection pursuant to section 57 of the Occupational Safety and Health Act 1984

- approved this code of practice; and
- revoked the approval given on 27 July 1999 of the Code of Practice Control of Noise in the Music Entertainment Industry July 1999.

SCOPE

This code applies to venues, where employees or the self-employed are present, where live (whether amplified or not) or recorded music is being played for entertainment purposes at levels which are likely to exceed the exposure standard for noise.

Table 1 lists examples of music venues and activities in which excessive noise may be created. It also lists categories of people who may be exposed to excessive noise.

WHO SHOULD USE THIS CODE OF PRACTICE

This code will help:

- Venue owners
- Venue designers and builders
- Venue operators and managers
- Employers of service staff
- Suppliers of sound equipment
- Technical and service staff
- Performers and entertainers
- Promoters

Appendix A explains the role of each of the above in terms of the *Occupational Safety and Health Act 1984*.

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INTRODUCTION

The music entertainment industry is unique in many ways, one of which is that high sound levels and special effects loud enough to cause noise-induced hearing loss are often regarded as essential ingredients in appealing to patrons.

Permanent hearing loss from excessive noise exposure, and in some cases tinnitus (ringing in the ears), are often suffered by people who have worked in or with the industry over a number of years. Hearing damage diminishes quality of life no matter how it is caused.

The general duty of care embodied in the Occupational Safety and Health Act places responsibilities on employers, persons in control of workplaces, musicians and people who work with or near musicians, such as sound mixers and bar staff, to ensure as far as practicable that they themselves and others in the area are not exposed to hazards.

While the ear can respond to sounds as loud as a raging rock band or as quiet as a distant harp, sustained high levels of sound, over a period of years, can cause permanent damage to the ear. Perhaps even worse, short sharp impulse sounds can cause instant permanent damage if loud enough. The effect is a dulling, or muting of the sounds we hear, causing a loss of enjoyment of music, difficulty in understanding people talking in a crowd and general sound isolation. Hearing aids are of limited benefit in these cases and there are no transplant operations for this condition. Some people suffer long term problems from 'ringing in the ears', or tinnitus, as a result of exposure to loud sounds. In many types of entertainment venues, music is being played at levels likely to cause damage to those present, with repeated exposure.

People involved in the entertainment industry need to develop preventative strategies in relation to workplace noise whenever the 'exposure standard for noise' is exceeded (See Appendix B). Recognising the unique

nature of the music entertainment industry, this code of practice forms part of an overall strategy for occupational noise control in Western Australia, which is contained in the Code of Practice for Managing Noise at Workplaces (hereinafter referred to as the 'Principal Code'). This code should be read in conjunction with the Principal Code, particularly in relation to the following general aspects:

- consultation - the Principal Code explains the need for consultation and co-operation at all stages between employers, employees and safety and health representatives;
- noise control strategies - the Principal Code emphasises the primary role of engineering noise controls in reducing noise levels, followed by administrative measures to reduce the time employees are exposed to noise. Provision of personal hearing protectors is an interim measure which does not remove the obligation to reduce noise exposure as far as is practicable; and
- information, training and education - the Principal Code lists training objectives and topics to be covered.

This code provides practical advice on developing preventative strategies to enable people in the music entertainment industry to act to minimise the risk of hearing damage resulting from the performance of live or recorded music. These strategies provide a means for employers as well as service and technical staff and others in various types of venues, to meet their legal obligations in terms of workplace noise, as defined in the *Occupational Safety and Health Act and Regulations*.



While this code mainly emphasises the duty of the employer to employees, the strategies presented here will also benefit others in the workplace, such as performers and members of the audience.

This code does not set specific limits for music sound levels. Rather it places an emphasis on providing sufficient information on music levels and venue

acoustics, so that everyone involved with the performance reaches agreement that noise exposure is as low as practicable for the style of entertainment required.

Detailed explanatory information and guidance is provided in Appendices to the code.



Table I
Music Venues, Activities and People Affected

Type of workplace	Activities producing excessive noise	People affected
Hotels, taverns, nightclubs, and bars	<ul style="list-style-type: none"> Bands playing loud music. Disc jockeys playing loud music through PA system. Karaoke performances. 	Bar staff, waiting staff, kitchen staff, performers, disc jockeys, technical staff, security staff, customers.
Clubs (Hospitality), Discos and Casinos	<ul style="list-style-type: none"> Floor shows which include loud music. Bands playing loudly in entertainment area. Disc jockeys playing loud music. 	Restaurant staff, waiting staff, bar staff, performers, technical staff, cashiers, security staff, customers.
Concert halls and theatres (usually not movie theatres)	<ul style="list-style-type: none"> Bands, orchestras and music groups playing loudly during rehearsals and performance. Recorded music for dance played loudly. 	Producers, directors, venue staff, performers, technical staff, audience, security staff, first aiders, catering staff.
Outdoor concert venues (stadiums, music bowls)	<ul style="list-style-type: none"> Bands and orchestras playing loudly. Loud special effects (eg fireworks) 	Performers, technical staff, audience, security staff, first-aiders, catering staff.
Cafes and restaurants	<ul style="list-style-type: none"> Theatre restaurant performances. Bands playing loud music. Loud recorded music. 	Catering staff, bar staff, kitchen staff, waiting staff, performers, technical staff, customers.
Performing arts venues	<ul style="list-style-type: none"> High sound levels during rehearsals and performances. 	Performers, technical staff, house staff, audience.
Education establishments	<ul style="list-style-type: none"> School bands playing loudly during training periods and performances. Recorded music or live bands playing loudly at school dances. 	Teachers, other staff, students, performers, disc jockeys.
Recorded music retail establishment	<ul style="list-style-type: none"> Playing tapes, CDs and records loudly through store PA systems. 	Sales staff, managers, customers.
Recreation venues	<ul style="list-style-type: none"> Loud recorded music during aerobics classes. 	Aerobics instructors, students.

EXPLANATION OF TERMS

In order to be in a position to use the strategies in this code effectively, it is necessary to understand a few basic terms:

- music level
- received noise
- 8 hour exposure
- reference position
- room loss
- exposure standard for noise
- competent person
- practicable



Explanations of these terms are given in Appendix B.

STRATEGIES FOR THE ENTERTAINMENT INDUSTRY

Music noise is best managed by using an appropriate strategy. Table 2 lists the strategies appropriate to the different people likely to be involved in music venues.

It is important to know when music levels become music noise. After all you will not know when control measures are needed unless you can measure the noise. Measuring music noise can be a complex operation, and people in entertainment venues are not normally experienced in this field. Even so, you will need to have some knowledge of how noise is

measured, so that you can understand music noise control strategies. Appendices C and D have been included in this code to help you.

Appendix E of this code contains a number of examples of how the strategies can be used in different venues, both for measuring music noise and implementing controls. Select the one which is most appropriate for your situation.

Table 2
Music noise management strategies

Class of person	Venue Owner (not operator)	Venue Operator	Entertainment provider	Employer of non-music employees	Supplier and Installer of Sound Equipment	Employee
Strategy	1	2	3	4	5	6

STRATEGY NO. 1: FOR AN OWNER

EXPLANATION:

You are a person who owns, but does not operate an entertainment venue. Owners may lease the workplace to someone else who conducts the business, eg., you own a suburban shopping centre and lease a shop to another person who retails recorded music. In this case you are the owner and the person running the store is the operator.

NOTE: An owner may be an operator. For example the owner of a casino may also operate the casino in which music noise is generated. In this case you will need to follow Strategy No. 2.

WHAT TO DO:

As an owner you are responsible for ensuring the practicable architectural changes which may be needed to reduce the noise exposures of people in the venue are implemented.

Whilst you have no direct responsibility to provide advice or information about safety and health, it may be advisable to bring the following matters to the attention of the operator:

- Your safety and health policy
- The legal requirements of the *Occupational Safety and Health Act and Regulations*
- The Principal Code
- The contents of this code

NOTE: The Environmental Protection Act 1986 and the Environmental Protection (Noise) Regulations 1997 may also apply in these circumstances.



STRATEGY NO. 2: FOR OPERATORS OF ENTERTAINMENT VENUES

EXPLANATION:

You are the person who operates an entertainment venue listed in Table 1. You will normally be the person who directly engages the services of an entertainment promoter or music performer. Most likely you will be a hotel licensee, nightclub or disco proprietor, music store operator or a live theatre manager. For example, you are operating a hotel and engage the services of a rock band to play 3 nights a week in a part of the hotel. This also includes the situation when you engage the services of a promoter to provide the rock band. You may also employ other non-music workers such as sales people and catering staff.

WHAT TO DO:

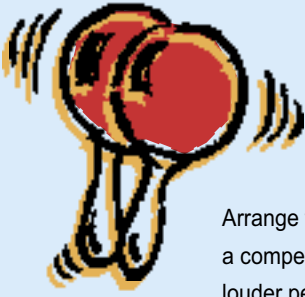
1. General considerations

As an operator, employer or person in control of a workplace you would normally be expected to:

- ensure your safety and health information, policy and/or procedures include preventing risks from excessive music noise;
- communicate this information to employees, music promoters and/or performers;
- be familiar with the requirements of the *Occupational Safety and Health Act and Regulations*;
- be familiar with the contents of the Principal Code and this Code and follow the strategies in it; and
- communicate these matters to the performers you engage and to your employees;

2. Noise Assessment

Identify situations and areas of the venue where noise is likely to be above the exposure standard. As a rule of thumb, if a person needs to speak in a raised voice to be understood 1 metre away, the A-weighted sound level is likely to be above 85 decibels.



Arrange for a noise assessment to be carried out by a competent person during a performance typical of louder performances in the venue.

Document the 'room loss' between the 'reference position' and staff locations (see Appendix C for guidance on carrying out noise measurements).

Use the following approach to account for variations in 'music levels' from one performance to the next:

- determine the 'music level' prior to each new performance by requesting this information from the entertainment provider. If this is not available arrange to have the 'music level' monitored;
- estimate the 'received noise' at each staff location by subtracting the 'room loss' from the 'music level'; and
- estimate the '8 hour exposure' at each staff location by adjusting the 'received noise' according to the duration of the performance, using Table B1 (see Appendix B).

3. Noise Reduction

If '8 hour exposures' exceed the exposure standard for noise:

- consider reducing the noise at source, ie reduction of the 'music level'. This may be approached through a process of consultation with the entertainment providers, relevant safety and health representatives and committees, if any, at the workplace. Also find out if there are any restrictions on the 'music level' needed to comply with the Environmental Protection (Noise) Regulations 1997. When a maximum 'music level' is decided on, this can be included in contractual agreements with the entertainment providers;
- consider reduction of noise through increasing the 'room loss'. This may be achieved through a range of architectural and other means, including:
 - moving the stage and/or loudspeakers to increase the distance between the performers and staff;

- re-orienting the stage and/or loudspeakers to direct less sound towards staff locations and installing sound limiters where appropriate;
 - where there are multiple speaker arrays, such as discos, concerts halls or music stores, reducing the sound levels of those speakers nearest staff locations;
 - increasing acoustic absorption in the room, through the addition of an acoustic ceiling, acoustic wall linings or carpet. This needs to be done with consideration for the overall environment desired eg. wood panelling has little absorption, so to increase absorption while retaining the visual effect the panels could be spaced slightly apart from each other and out from the wall with acoustic material behind;
 - using local screening adjacent to the bar, kitchen or door staff locations may be feasible in some situations;
 - applying sound absorption materials applied in some bar, servery or door staff areas. There are special requirements for washable, impervious facing materials in any food processing or serving area; and
 - ensuring adequate acoustic separation of the box office, kitchen, staff rest rooms, etc. from the entertainment area by means of doors with appropriate acoustic performance;
- seek professional assistance from architects, acoustic consultants and sound engineers in evaluation of the most cost-effective options;
 - in any major renovations or alterations to the layout of the venue, brief the architect or designer to consider ways of maximising 'room loss';
 - reduce '8 hour exposure' by reducing the amount of time staff are exposed to the noise. This may involve an agreed arrangement for rotating staff between noisy and quiet areas, if a workable system can be achieved; and
 - identify areas where peak noise levels exceed 140 decibels and instruct staff to avoid these as far as practicable.

STRATEGY NO. 3: FOR ENTERTAINMENT PROVIDERS

4. Personal hearing protectors/Education

If it is not practicable to avoid exposing persons at the workplace to noise above the exposure standard, provide appropriate personal hearing protectors to all affected people. This includes other employers' employees visiting the venue as part of their work eg., catering staff, performers. Consideration should also be given to whether personal hearing protectors should be available for members of the audience if they request them.

NOTE: Providing personal hearing protectors does not remove the duty to reduce noise as far as practicable.

For each new performance with a different 'music level', advise all affected staff of their likely '8 hour exposure', and ensure the personal hearing protectors provided are adequate.

Use appropriately placed signs to remind staff that the venue is a 'hearing protection area' and the audience that hearing protectors are available.

Arrange training sessions on the risk of Noise-Induced Hearing Loss for regular and seasonal employees. Topics to be included in training are given in the Principal Code.

Have relevant information on the risks of noise to hearing available for new, visiting or casual employees

Arrange hearing tests as required by legislation administered by WorkCover WA.

EXPLANATION:

You will most likely be a self-employed person who:

- is engaged by an operator or person in control of an entertainment venue to supply or provide music entertainment;
- promotes musical performances and engages the services of performers and/or technical staff; or
- leads a band or orchestra or other musical performing group and employs the musicians who perform in that group.

NOTE: Performers who are employees should refer to Strategy No. 6.

WHAT TO DO

1. General

As a promoter, or performer in this situation you should:

- ensure your safety and health information, policy and/or procedures include preventing risks from excessive music noise;
- be familiar with the requirements of the *Occupational Safety and Health Act and Regulations* and the Principal Code;
- be familiar with the contents of this code and follow the strategies in it; and
- communicate these matters to the performers and technical staff you engage and your employees.

2. Music Level

Identify if your performance is likely to produce exposures above the standard. As a rule of thumb, if a person needs to speak in a raised voice to be understood by another 1 metre away, the A-weighted sound level is likely to be above 85 decibels.

If so, find out the 'music level' of a typical performance under typical conditions. You may wish to combine



your efforts with a venue operator to have the 'music level' and the 'room loss' measured on one typical occasion.

Re-measure the 'music level' when there is a significant change in the musical instrument line-up, personnel, amplifier/speaker system, or musical performance.

Find out from the operator or person in control of the entertainment venue whether there is an agreed maximum 'music level' or assessment of excessive noise in the venue in which you are to perform, or the performers you have engaged are to perform.

Obtain the assessment and see if it provides any useful information which will help you plan your musical performance.

Inform the venue operator of your 'music level' prior to the performance.

Ensure that means are available to monitor the 'music level' during the performance. You could use direct measurement of the noise levels or refer to markings on a 'master volume' scale (see Appendix C).

Adhere to the stated or agreed 'music level'.

No person should be allowed to enter an area with music noise above a peak level of 140 decibels to minimise the risk of instantaneous permanent hearing loss.

See Appendix C 'Measuring music noise' for suggestions about carrying out noise measurements.

3. Duty to employees

If you employ workers such as sound mixer/engineer, lighting/road crews or musicians, you will need to consider the following to prevent excessive noise damaging their hearing:

- increase the distance between non-performing employees and the stage area or loudspeakers;
- reduce the 'music level' within the workable range;
- reduce the 'foldback' levels on the stage to lower (but still workable) levels; and
- reduce sound output from individual instruments, eg. damping drums, using smaller amplifiers to reduce sound levels on stage.

Assess '8 hour exposures' and peak noise levels of performers and technical staff during a typical performance (see Appendix B - Table B1).

Inform employees of their likely noise exposure.

Provide appropriate hearing protectors where exposures exceed the exposure standard for noise. Musicians' earplugs are now available which give more uniform reduction across the frequency spectrum.

Provide training sessions on noise as described in the Principal Code.

Provide specialised training in noise/noise control for sound mixers (both front of house and backstage).

Arrange for hearing tests as required by legislation administered by WorkCover WA.



STRATEGY NO. 4: FOR EMPLOYERS OF SERVICE STAFF VISITING AN ENTERTAINMENT VENUE

EXPLANATION:

Most likely you will be an employer of catering staff, security staff, promotions and media personnel, police, or first-aiders.

WHAT TO DO:

1. General

Ensure your safety and health information, policy and/or procedures include preventing risks from excessive music noise.

Be familiar with the requirements of the *Occupational Safety and Health Act and Regulations* and the Principal Code.

Be familiar with the contents of this code and follow the strategies in it.

Communicate these matters to your employees.

2. For each venue

Consult with the venue operator.

Find out if your employees are likely to be exposed above the exposure standard for noise.

Instruct staff in administrative measures to reduce noise exposure such as avoiding noisy areas, rotating staff between noisy and quiet positions.

Provide staff with appropriate personal hearing protectors as advised by the venue operator.

Provide training sessions on noise as described in the Principal Code.

Arrange hearing tests as required by legislation administered by WorkCover WA.

STRATEGY NO. 5: FOR SUPPLIERS AND INSTALLERS OF SOUND EQUIPMENT

EXPLANATION:

Most likely you will be a supplier and/or installer of sound systems for discos, concert halls or bands, either hiring or selling the equipment. You may also operate the system at the venue. You may be self-employed and/or employ other people to do this work.

WHAT TO DO:

1. General

Be familiar with your responsibilities under section 23 of the *Occupational Safety and Health Act*.

Be familiar with the contents of this code and follow its strategies.

2. Information

Provide information to customers at point of supply on potential noise hazards including:

- operation conditions likely to result in a noise hazard;
- the need to monitor 'music level'; and
- any areas where the peak noise level is likely to exceed 140 decibels.

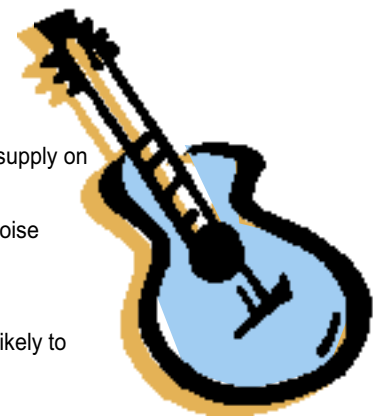
This could take the form of:

- verbal advice to the receiver of the equipment;
- written information accompanying the equipment; and /or
- a hazard warning sign affixed to a prominent part of the system, eg. the mixing desk.

3. Installation

Arrange the placement and orientation of the loudspeakers to minimise as far as practicable the sound directed to employee locations.

Arrange the placement of loudspeakers to enable restriction of access where peak noise levels are likely to exceed 140 decibels.



4. Operation

Find out if there is an agreed maximum 'music level' for the venue and don't exceed it.

Arrange for the 'music level' to be monitored (see Appendix C) and advise venue operator.

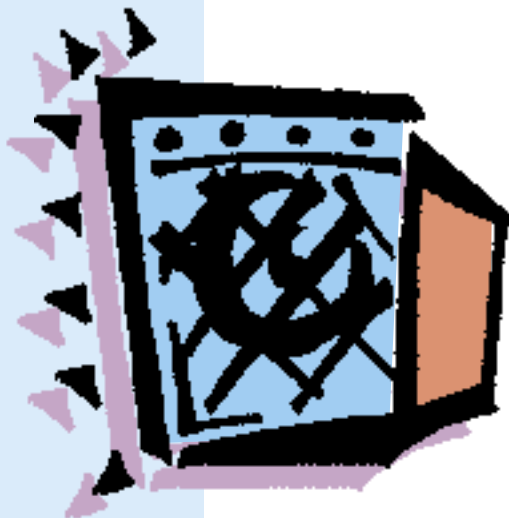
Arrange training for employees in monitoring and methods of achieving specified levels.

5. Duties to employees

Provide employees with appropriate personal hearing protectors where exposures exceed the exposure standard for noise.

Provide training sessions on noise as described in the Principal Code.

Arrange hearing tests as required by legislation administered by WorkCover WA.



STRATEGY NO. 6: FOR EMPLOYEES IN ENTERTAINMENT VENUES (EITHER PERFORMERS OR NON-PERFORMERS)

EXPLANATION:

Most likely you will be:

- an employee of a catering company providing food and beverage services during a musical performance such as a rock concert;
- an employee in an entertainment venue, working as a waiter, cashier, security officer, first-aider, police officer, chef, kitchen hand, or promotions and media personnel;
- a performer or sound engineer who is employed by someone else, such as a promoter, band leader or venue operator; or
- an employee who works in a retail store which sells recorded music.

WHAT TO DO:

Find out if your noise exposure is likely to be excessive.

Follow your employer's or the venue operator's instructions on control strategies including:

- instructions relating to achieving any agreed 'music level'; and
- abiding by any agreed arrangements for job rotation or restriction of access to noisy areas.

Do not wilfully misuse or damage any equipment provided to reduce noise in the venue.

Use the personal hearing protectors provided in the manner instructed.

Report any new hazardous noise situations or any hearing loss or tinnitus (ringing in ears) resulting from exposure to noise in the venue to your employer.

Request annual hearing tests.

Appendices



ROLE IN TERMS OF THE OCCUPATIONAL SAFETY AND HEALTH ACT 1984

EMPLOYERS

An employer is defined by the Act as a person by whom an employee is employed under a contract of employment, apprenticeship or industrial training agreement. An employer in the entertainment industry may be:

- the licensee of licensed premises;
- the theatre management or drama company in a venue where a musical production is being staged;
- a promoter;
- the management of a venue in which concerts are given;
- a caterer employing food service staff at a venue; or
- any other person who employs someone under a contract of employment, apprenticeship or industrial training agreement.

Various other contractual relationships may occur within the industry eg. the band may employ a 'roadie' or a sound engineer, or the suppliers of sound systems may employ their own road crews. These employers owe a similar duty of care to their own employees. Under section 19(4) of the Act, where a principal employer engages a contractor, he/she is deemed to be the employer of both the contractor and the contractor's employees in relation to the aspects of their work over which he/she has management or control.

The duties of employers to employees are outlined in section 19 of the Act.

EMPLOYEES

An employee is a person who works under a contract of employment, apprenticeship or industrial training agreement. In the music entertainment industry a employee may be:

- an entertainer, such as a singer in a musical, a musician, a disc jockey or a sound engineer who may have some degree of control over the sound level produced;
- technical and ancillary assistants to those producing the entertainment, such as a 'roadie', a lighting person or a stage hand;
- an employee who performs duties in conjunction with, but not related to, the production of the music, such as a bar/food service employee, glass collector or door person;
- supervisor/manager eg. bar manager, stage manager; or
- any other person in the workplace who is employed under a contract of employment, apprenticeship or industrial training agreement.

The duties of employees to themselves and others are outlined in section 20 of the Act.

SELF-EMPLOYED PERSON

Many of the categories of persons listed under employers and employees above may at times be self-employed persons. Section 21 of the Act requires self-employed persons to take reasonable care to protect their own safety and health and to ensure that the safety and health of others is not adversely affected as a result of their work or the work of their employees.

A self-employed person in the entertainment industry may be:

- an entertainment provider whose work may result in a noise hazard to themselves and/or others at the workplace;
- a technical or service contractor whose work does not involve the production of music; or
- a promoter.



EXPLANATION OF TERMS

PERSONS WHO HAVE CONTROL OF WORKPLACES

A person who has control of a workplace may be:

- the owner of a venue; or
- a person who is in a position to make arrangements for architectural and administrative changes to reduce noise exposure.

Section 22 of the Act sets out the duties these people have to all people at the venue.

DESIGNERS, MANUFACTURERS, IMPORTERS, SUPPLIERS, ERECTORS AND INSTALLERS OF PLANT AND DESIGNERS AND CONSTRUCTORS OF BUILDINGS

In the music entertainment industry, these may be:

- designers and builders of venues;
- manufacturers of musical instruments and sound amplification equipment;
- persons who provide or hire public address or other sound systems or supply and/or install permanent sound systems in entertainment venues; or
- others, such as sound engineers, who may be regarded as suppliers in their capacity as technical support to the entertainment providers.

Section 23 of the Act sets out the duties of these people.

‘competent person’ means a person engaged to carry out a noise assessment who meets the competency requirements in Appendix A of Part 1 of Australian/New Zealand Standard AS/NZS 1269.

‘exposure standard for noise’ means a noise level above which, as far as practicable, people at a workplace must not be exposed. It is defined in Regulation 3.45 as follows:

- an $L_{Aeq,8h}$ of 85 dB(A); or
- an $L_{C,peak}$ of 140 dB(C),

measured at the position of the person’s ear without taking into account any protection which may be provided to the person by personal hearing protectors.

‘music level’ means the average noise level ($L_{Aeq,T}$) of a representative portion of a typical performance, measured at a nominated ‘reference position’ in a venue;

‘practicable’ means reasonably practicable having regard to:

- the severity of any injury or harm to health that may occur;
- the degree of risk of that injury or harm occurring;
- how much is known about the hazard and ways of eliminating, reducing, or controlling it; and
- the availability, suitability and cost of the safeguards.

‘received noise’ means the average noise level ($L_{Aeq,T}$) measured at the employee’s ear during a representative portion of a performance;

‘reference position’ means a nominated measurement position within the venue sufficiently close to the stage area that the sound level is dominated by the music.

NOTE: For venues which have live bands performing regularly the reference position should be 5 metres from the front of the main loudspeakers, at least 1.8m above floor level and centrally located in front of the performers. For other venues the reference position may be any nominated monitoring point where the music dominates the sound levels;

‘room loss’ means the average drop in sound levels from the reference position back to the locations occupied by



employees, measured during a typical performance with a typical crowd in attendance; and

'8 hour exposure' means 'received noise' when averaged over an 8 hour period. This can be estimated by adjusting the 'received noise' according to the duration of the performance using Table B1.

Table B1
Estimation of '8 Hour Exposure'

Duration of Performance	Decibels to be Subtracted from 'Received Noise'
8 hours	0
6 hours	1
5 hours	2
4 hours	3
3 hours	4
2 ½ hours	5
2 hours	6
1 ½ hours	7
1 hour	9

NOTE: The assessment of 'received noise', '8 hour exposure' and peak noise level should not take into account any protection which may be provided by personal hearing protectors.

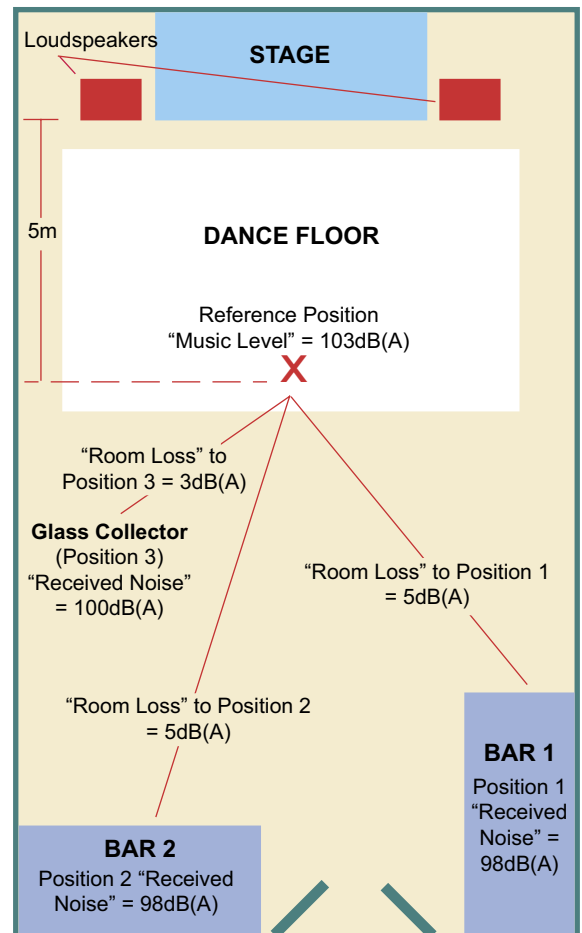
Measurement procedures are detailed in Appendix C of this code.

The measurement and proper use of these parameters enable all parties to develop strategies for reducing exposure levels. The 'music level' defines the overall sound level of the performance. A rock band will tend to produce a fairly constant 'music level' from performance to performance, while an orchestra or theatre company will produce different 'music levels' from performance to performance, depending on the musical work.

The 'room loss' is a characteristic of the room acoustics and room size, and is independent of 'music level'. It defines the extent to which employees are separated from the sound source and can be increased by architectural means in many cases.

'Received Noise' can be estimated for any performance where the 'music level' is known, by subtracting the 'room loss' from the 'music level'. This 'received noise' value can then be converted to an '8 hour exposure' by means of a simple table, by knowing the duration of the performance (see Table B1). The '8 hour exposure' can be compared with the exposure standard for noise.

Diagram B1
Example of Application of Terms to a Hotel with a Live Band



MEASURING MUSIC NOISE

COLLECTING MUSIC NOISE DATA

This section outlines the procedures to be used when conducting noise level measurements in an entertainment venue for the purpose of defining 'music level', 'room loss', 'received noise', '8 hour exposure' and levels exceeding the exposure standard, where the data is to be used to form the basis of 'noise assessment'.

This data should be collected by a competent person. A list of competent persons is available in the Noise Assessors section of the Directory of Noise and Vibration Control Services, as are details on courses to give the basics of the required competency. (Available via the Internet Service on Safetyline, www.safetyline.wa.gov.au/sub30.htm).

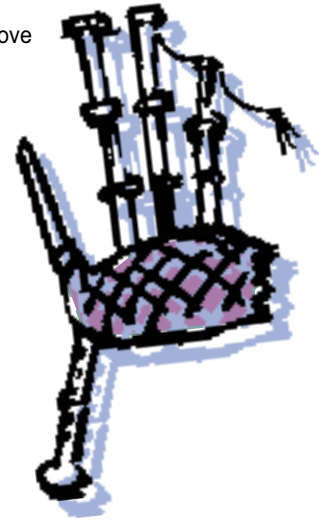
The complexity of noise assessment may vary according to the type of entertainment venue, the number of persons at risk from noise exposure and the information on noise levels already available at the venue. If there is no prior information available, an assessment should establish if excessive noise levels are produced at the venue.

In collecting data for the preparation of a noise assessment the competent person should:

- conduct sound level measurements in accordance with section 4 of the Principal Code and the relevant Australian Standards;
- arrange to conduct sound level measurements during a performance or rehearsal for which the 'music level' is within 5 dB of the highest 'music level' likely to be generated within the venue, with an average crowd in attendance, under typical conditions;
- establish a 'reference position' within the venue from which point the 'music level' of any future performance can be measured for comparative purposes;
- measure the 'music level' of the performance over a representative portion of the duration of the performance and simultaneously measure

'received noise' at employee locations where this is likely to be above 85 dB(A);

- calculate 'room loss' for each employee location where 'received noise' is above 85 dB(A) by arithmetically subtracting 'received noise' from 'music level';
- calculate '8 hour exposure' ($L_{Aeq,8h}$) for each employee location where 'received noise' is above 85 dB(A);
- delineate all areas where $L_{C,peak}$ exceeds 140 dB(C);
- assess the adequacy of the noise reduction provided by any personal hearing protectors already in use and if inadequate, recommend alternative protectors which are adequate; and
- document the results (see Appendix D for suggested format).



PRACTICAL CONSIDERATIONS IN CONDUCTING NOISE MEASUREMENTS

Choosing a 'reference position'

Refer to the description and examples given in Appendices B and E.

NOTE: A reference position selected for occupational noise purposes may also be used effectively for environmental noise control purposes.

Measuring 'music level' and 'received noise' simultaneously

The suggested procedure is to use five minute $L_{Aeq,T}$ measurements. One measurement system would be set up at the reference position, and set to print out continuous five minute $L_{Aeq,T}$ levels over a representative portion of the performance. A second measurement system would be used to conduct simultaneous five minute $L_{Aeq,T}$ sample measurements at the affected locations. Provided a representative number of five minute $L_{Aeq,T}$ samples (say three) can be taken at each affected location, and provided the five minute levels do not vary markedly at the continuous

measurement station, the sampled levels can be used to estimate $L_{Aeq,T}$ levels over the performance duration.

Calculation of 'room loss'

When calculating 'room loss', use the 'music level' and 'received noise' levels determined for the full duration of the performance. The 'room loss' is the value obtained by arithmetic subtraction of 'received noise' level from the 'music level' for each affected employee location.

Measurement for moving employees

In the case of glass collectors and door staff in licensed premises, for example, the measurement of 'received noise' may be carried out using a personal noise dosimeter. The start and stop times should be set to coincide with the start and stop times of the five minute samples at the continuous sampling position, unless the dosimeter is to be worn for at least a representative portion of the performance duration.

Crowd noise effects

In some locations at some venues, it may be found that crowd noise is equivalent to or predominates over music in overall sound level. In this case, while the 'room loss' should still be calculated as above, the influence of crowd noise should be noted. If this is considered to be an unusual circumstance, it may be more appropriate to repeat the measurement under typical conditions. If however, these conditions are typical, the use of a slightly higher 'music level' on another occasion, combined with the same crowd noise would provide a slightly conservative result in terms of estimation of '8 hour exposure'.

In the unlikely case where crowd noise dominates completely, a 5 dB increase in 'music level' would not cause any significant increase in 'noise exposure', in which case the $L_{Aeq,8h}$ results define the employees' noise exposure for all likely situations.

Other action

A sketch should be made of the venue showing stage position, loudspeaker positions (and orientation) and employee locations.

Details of architectural finishes which may influence 'room loss' should be noted.

A detailed description of the location of the 'reference position' should be provided.

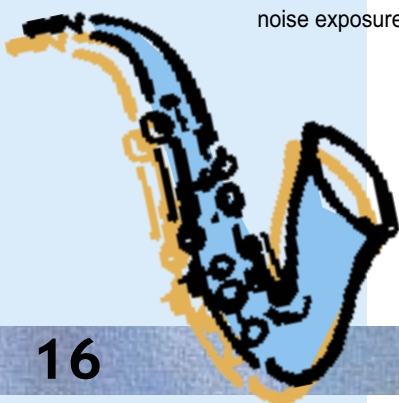
Any relevant settings of amplification equipment of significance in the setting of the 'music level' during the tested performance should be noted.

The name of the performing group/performance should be noted with a brief description of musical instruments used.

CONDUCTING NOISE MEASUREMENTS FOR ENTERTAINMENT PROVIDERS

When determining 'music level' for entertainment providers who move from venue to venue, such as rock bands and mobile DJs, the following procedure is recommended:

- (a) arrange to conduct sound level measurements during a performance at a venue for which the 'music level' is within 5 dB of the highest likely to be produced by the performer, with an average crowd in attendance under typical conditions;
- (b) where practicable, the person conducting the measurements should be a competent person;
- (c) the measurement procedures and instrumentation should be in accordance with section 4 of the Principal Code and the relevant Australian Standards;



- (d) the measured quantity is $L_{Aeq,T}$ over a representative portion T of the performance duration:
- at the 'reference position', eg. 5 metres from the front of the main loudspeakers, and at least 1.8 metres above floor level; and
 - the performer's position;
- (e) if it is desired to relate the 'music level' to the sound level at the console or mixing desk, then simultaneous $L_{Aeq,T}$ measurements should be made at the 'reference position' and at the desk/console over a period of about 15 minutes of varied typical program;
- (f) similarly, if relating 'music level' to a 'Master Volume' setting on the desk or console, the 'music level' should be measured over several periods of about five minutes of typical program, repeated with the 'Master Volume' setting being changed between five minute segments and the setting noted. The steps in 'music level' between settings should be no greater than 3 dB(A);
- (g) delineate all areas where $L_{C,peak}$ exceeds 140 dB(C); and
- (h) the results should be presented to the entertainment providers on the suggested proforma given in Appendix D of this code.
- (b) run through a typical program in the form of a series of varied records/compact discs for a period of about 15 minutes;
- (c) measure $L_{Aeq,15\ min}$ at the 'reference position' 5 metres from the stage and simultaneously at the door, kitchen or any areas likely to be occupied by employees during a function. **NOTE:** These may be employees of a catering company, police, or security personnel;
- (d) calculate 'room loss' by subtracting $L_{Aeq,15\ min}$ at the likely employee locations from the $L_{Aeq,15\ min}$ level at the 'reference position';
- (e) where there is an environmental noise constraint it may also be appropriate to conduct simultaneous external measurements to ascertain the appropriate internal 'music level'; and
- (f) provide information to hirers of the venue, (possibly in the form of an information sheet or notice in the hall), indicating the 'room loss', any limits on 'music level', or possible need for noise reduction strategies to be put in place during the performance.

MEASUREMENT OF 'ROOM LOSS' IN OCCASIONALLY USED VENUES

Where it is desired to determine the 'room loss' for venues which are only occasionally used for music likely to be above the exposure standard eg. in halls administered by local government, the following procedure could be used:

- (a) set up a typical sound system in the empty hall with two large 'disco' loudspeakers on the stage;



MUSIC NOISE RESULTS FORMS



Appendix D1 Suggested Results Table for Noise Levels in Music Entertainment Venues

Test Location: _____

Date of Tests: _____

Type/Title of Musical Work: _____

Name of Performing Group: _____

'Music Level', dB(A) _____

Duration of Performance:hr _____

Location of 'Reference Position': _____

Area Where Peak Noise Level Exceeds 140 dB(C): _____

Employee Location or Occupation	'Received Noise' dB(A)	'Room Loss' dB(A)	'8 Hour Exposure' dB(A)	C-Weighted Noise Level L _{Ceq, T} dB(C)	Recommended Hearing Protectors	Attenuated Noise Level dB(A)

Measuring Equipment: _____

Date of Last Calibration: _____

Laboratory Name: _____

Competent Person's Name: _____

Signature: _____

Date: _____

This information should be made available to all employees.



Appendix D2 Suggested Proforma for Results of Measurement of 'Music Level' for Entertainment Providers

Name of Performer/Group: _____

Test Location: _____

Date of Tests: _____

Type/Title of Musical Work: _____

Musical Instruments Used: _____

Description of PA System: _____

Location of 'Reference Position': _____

Performer's '8 hour exposure' _____

'Music Level',: dB(A) _____

Duration of Measurement: hr _____

Area Where Peak Noise Level Exceeds 140 dB(C): _____

'Master Volume' Scale Check

Scale Indication	'Music Level' dB(A)

Measuring Equipment: _____

Date of Last Calibration: _____

Laboratory Name: _____

Measurements by (Name): _____

Signature: _____

Date: _____

This information should be made available to all employees.

MUSIC NOISE SOLUTIONS

EXAMPLE 1: HOTEL WITH LIVE BAND

A hotel owner/manager engages live bands on four nights a week and arranges for a competent person to conduct a series of sound level tests on a typical night, in consultation with the relevant safety and health representatives and committee.

A 'music level' of 103 dB(A) is measured at the 'reference position' at the edge of the dance floor 5 metres from the loudspeakers. At the same time 'received noise' levels of 98 dB(A) at the bar, 97 dB(A) at the door and 100 dB(A) at the glass collector's ear are measured. The 'room loss' values are calculated: $103-98=5$ dB(A) for the bar, $103-97=6$ dB(A) for the door and $103-100=3$ dB(A) for the glass collector.

The normal performance lasts two hours (consisting of three forty-minute sets with quieter breaks in between). The adjustment to calculate '8 hour exposure' (from Table B1) is -6 dB(A) for a two-hour performance.

The '8 hour exposures' on the night of tests were therefore $98-6=92$ dB(A) for bar staff, $97-6=91$ dB(A) for the door staff and $100-6=94$ dB(A) for the glass collector.

The owner/manager now knows that for a 'music level' of 103 dB(A), the staff are exposed above the exposure standard.

Following consultation with the safety and health representatives and committee, the following architectural changes are initiated (see Diagram E1):

- changing the location of the stage;

- putting acoustic absorption material on the ceiling and upper part of the walls opposite the stage and on the wall behind the bar;
- placing an acoustic screen at the end of the bar nearest the stage; and
- replacing the doors to the kitchen and office with acoustic doors.

A further series of tests show the 'room loss' values are now 8 dB(A) for the bar, 10 dB(A) for the door and 4 dB(A) for the glass collector. The owner/manager introduces an agreed job rotation scheme for the glass collector to minimise his/her exposure time, thus reducing his/her '8 hour exposure' by a further 2 dB(A). A joint policy decision is made not to employ bands with a 'music level' above 103 dB(A) as a workable level for this venue.

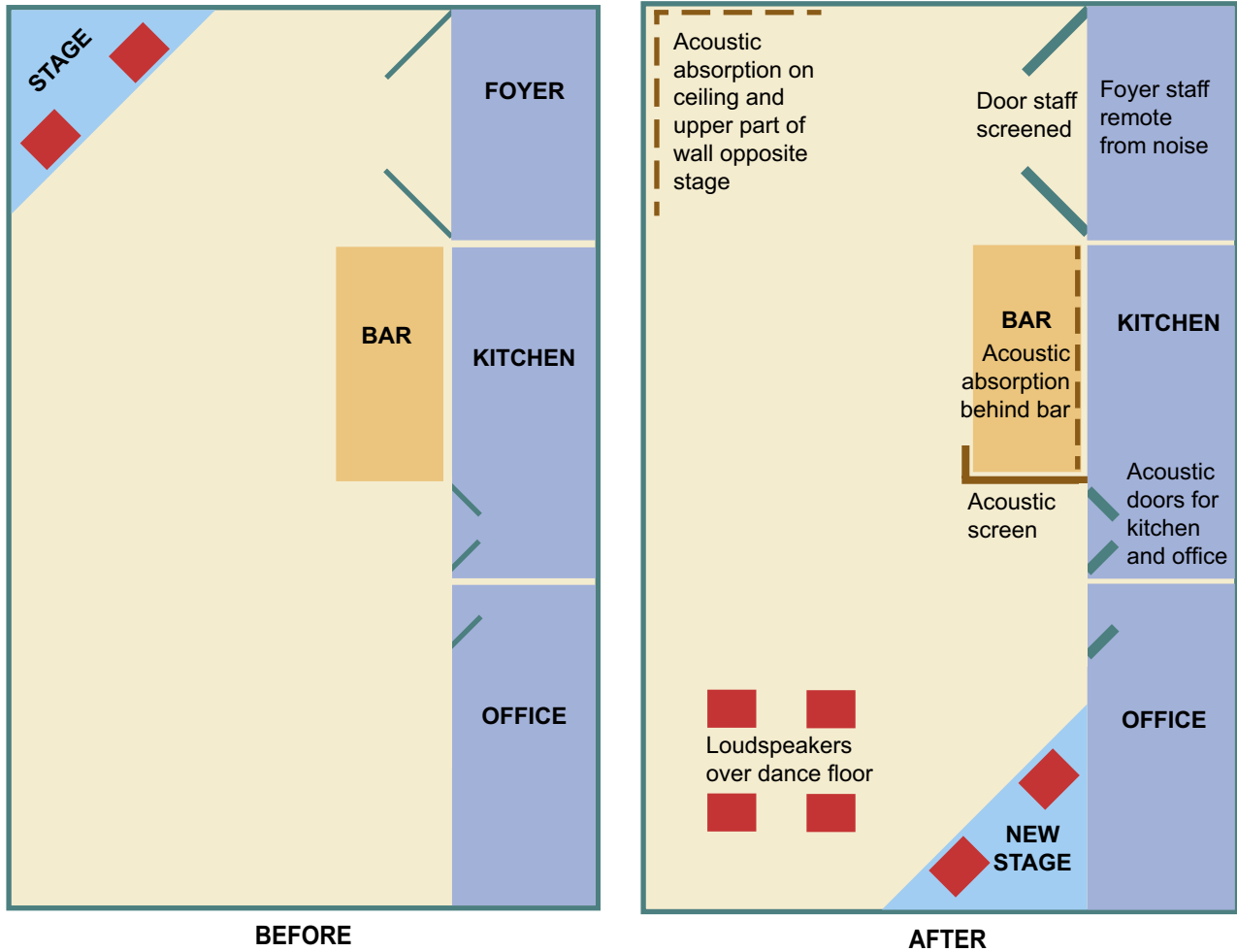
Each new band informs the owner/manager of their expected 'music level' prior to starting the performance. The owner/manager then knows what the '8 hour exposures' of staff will be. For example, a band with a 'music level' of 100 dB(A) will cause an '8 hour exposure' of 86 dB(A) for bar staff, 84 dB(A) for the door staff, and 88 dB(A) for the glass collector.

As the glass collector, bar and door staff still receive noise above the exposure standard on nights when the louder bands play, the owner/manager needs to develop further long-term plans for noise reduction, including a review of the policy on 'music levels'. As an interim measure, the owner/manager provides suitable personal hearing protectors and an education program on the effects of exposure to excessive noise levels.



Diagram E1

Possible Noise Control Measures for Increasing 'Room Loss' in a Hotel/ Club with Live Music



EXAMPLE 2: DISCOTHEQUE/CABARET VENUE

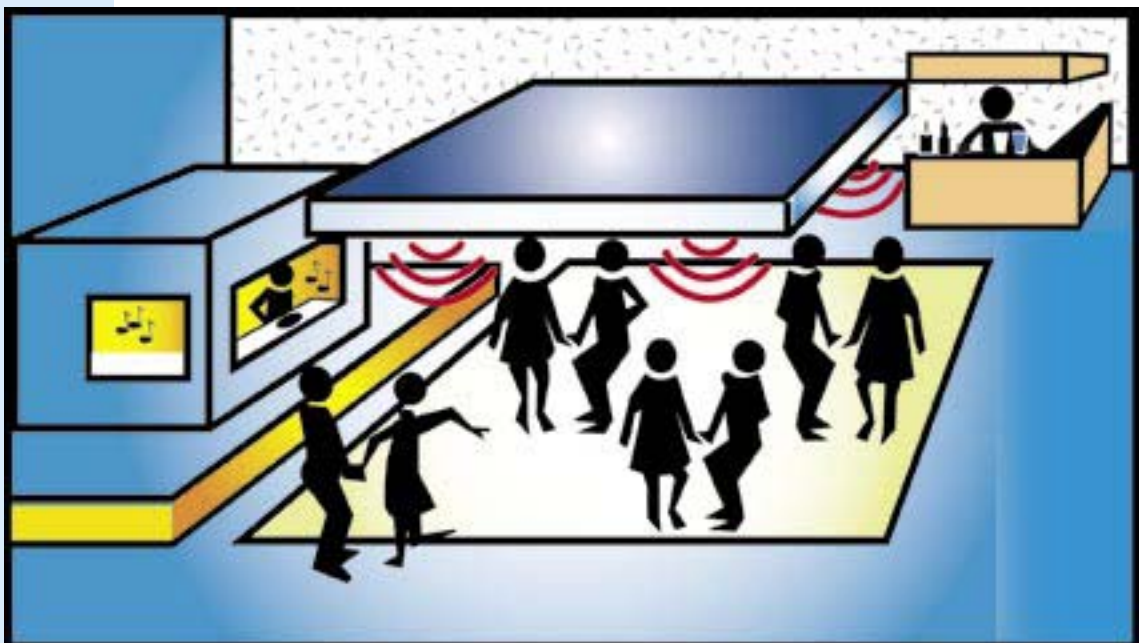
A discotheque owner presents recorded music via a different disc jockey (DJ) every night. The sound system is a fixed installation with the main loudspeakers near the dance floor and others throughout the room. The disco owner, in consultation with relevant safety and health representatives and committee, selects a CD of music typically played and defines a 'reference position' at the DJ's desk. A competent person is engaged to measure the 'room loss' from that point back to the positions occupied by the bar staff, glass collector and door staff. With a reasonably practicable 'music level' of 98 dB(A) at the 'reference position', the 'received noise' at the employee locations ranges between 90 and 95 dB(A) (room loss of 3 to 8 dB(A)). For an exposure of 5 hours, the adjustment to calculate '8 hour exposure' is - 2 dB. The '8 hour exposures' therefore range between 88 and 93 dB(A). The owner now knows which staff are exposed above the exposure standard on a typical night.

In consultation with safety and health representatives and committee, the owner plans to introduce a 'sound ceiling' above the dance floor when the discotheque is renovated in six months' time. This is a system where a ceiling with built-in speakers is suspended above the dance floor, resulting in a high sound level on the dance floor, whilst the sound propagated sideways into the rest of the room is lowered around 10 dB(A).

These changes will increase 'room loss' with a view to reducing all staff exposures below the exposure standard:

In the interim the owner provides personal hearing protectors and an education program for affected staff. In order to maintain the 'music level' at or below 98 dB(A), she installs a sound level meter at the DJ's desk and discusses with the DJ the procedures required to keep the sound level below this level.

Diagram E2
Sound Ceiling in a Discotheque



EXAMPLE 3: THEATRE FOR STAGE PRODUCTIONS

A large theatre is used as a venue for staging performances ranging from opera to rock musicals and modern dance programs. For rock musicals the band may perform in the orchestra pit or a special platform above the stage, using a public address system brought in for the performance. Modern dance programs usually use pre-recorded music played back through the in-house PA system. For musicals, operas or ballets, the orchestra may perform from the pit, and on some occasions vocalists may be amplified slightly through the in-house PA system. The theatre management employ door staff, ushers and technical crew, some of whom work backstage.

The theatre management takes a policy decision, in consultation with the relevant safety and health representatives and committee, to prepare a noise assessment for each new show. A 'reference position' is selected at the pit conductor's position about 3 metres from the front of the stage. The 'music level' for the show is measured at this position, while sound levels are simultaneously monitored at employee locations. The results of the tests for the first few shows indicated that it is only during rock musicals, modern dance productions and the louder operas that there is any likelihood of the exposure standard being exceeded. It is found that the 'room loss' is about the same during these types of productions. For future productions, the 'music level' is monitored during a dress rehearsal from the 'reference position'. The 'received noise' of employees is calculated from the measured 'music level' by subtracting the 'room loss' values and the '8 hour exposure' is determined by adjusting for the duration of the performance. Staffing rosters are then devised to minimise exposure and personal hearing protectors and education are provided for those still exposed above the exposure standard.



EXAMPLE 4: MUSIC RETAIL STORE

An operator has two retail music stores catering to customers with differing tastes in music. Store 1 specialises in heavy metal music while Store 2 retails classical music and jazz. One of the marketing strategies is to entertain customers by playing current selections and requests via an in-house PA system, with speakers throughout the store.

The operator, in consultation with the safety and health representatives, defines a 'reference position' in the middle of each store and selects CDs of typical music played. A competent person is engaged to conduct measurement of 'music level' and 'room loss' from those points back to the staff positions at the sales desks.

'Music levels' of 94 dB(A) and 75 dB(A) are found in Stores 1 and 2 respectively. 'Room losses' of 3 dB(A) are found in both cases. As sales staff work 8 hour shifts their '8 hour exposures' are above the exposure standard for noise in Store 1, but well below it in Store 2.

In consultation with the safety and health representatives and committees, the operator makes changes to the sound system in Store 1, enabling the volume of the speakers to be controlled independently. Those adjacent to sales desks are fixed at a low level, whilst the others are adjusted to give a 'music level' of 90 dB(A) at the central 'reference position', giving a 'received noise' of 87 dB(A) at the sales desk. Sales staff are then rostered to work 4 hours each day in each store, resulting in '8 hour exposures' of 84 dB(A).

For further information on the matters covered in this code of practice, contact the Chamber of Commerce and Industry of Western Australia (Tel. (08) 9365 7415), UnionsWA (Tel. (08) 9328 7877), or WorkSafe - (Tel. (08) 9327 8777).

In respect to hearing test requirements contact WorkCover WA (Tel. (08) 9388 5555).

OTHER PUBLICATIONS ON OCCUPATIONAL SAFETY AND HEALTH

Occupational Safety and Health Act 1984

Occupational Safety and Health Regulations 1996

WorkSafe Western Australia Commission codes of practice approved for application in Western Australia in accordance with section 57 of the *Occupational Safety and Health Act 1984*:

- Abrasive Blasting
 - Excavation
 - First Aid, Workplace Amenities, Personal Protective Equipment
 - Legionnaires Disease
 - Manual Handling
 - Management of HIV/AIDS, and Hepatitis at Workplaces
 - Managing Noise at Workplaces
 - Prevention of Falls at Workplaces
 - Safety and Health of Children and Young People in Workplaces
 - Spraypainting
 - Styrene
 - Workplace Violence
-

Guidance Notes published by the WorkSafe Western Australia Commission:

- Alcohol and Other Drugs at the Workplace
 - Asbestos Materials in the Automotive Maintenance & Repair Industry
 - Controlling Hazards in the Electroplating Industry
 - Controlling Isocyanates Hazards at Work
 - Controlling Wood Dust Hazards at Work
 - Election of Safety and Health Representatives, Representatives and Committees and Resolution of Issues
 - Electricity: Residual Current Devices
 - General Duty of Care in Western Australian Workplaces
 - Guidelines for the Development of Industry Codes of Practice Approved under the *Occupational Safety and Health Act 1984*
 - Mobile Phones
 - Plant Design - A Guide for Designers, Manufacturers, Importers, Suppliers and Installers of Plant
 - Plant Design - A Guide for Employers, Self Employed Persons and Employees
 - Prevention of Carbon Monoxide Poisoning from Petrol and Gas Powered Plant
 - Reducing the Risk of Fatigue at Workplaces
 - Safe Movement of Vehicles at Workplaces
 - Safe Use of Woodworking Machinery(Guarding)
 - Soldering in the Workplace: Rosin Fluxes
 - Working Alone
-

National Occupational Health and Safety Commission (NOHSC) publications approved as codes of practice for application in Western Australia in accordance with section 57 of the *Occupational Safety and Health Act 1984*:

- Safe Removal of Asbestos [NOHSC: 2002 (1988)]
- Safe Use of Vinyl Chloride
- Safe Use of Synthetic Mineral Fibres [NOHSC: 2006 (1990)]
- Safe Use of Ethylene Oxide in Sterilisation/Fumigation processes [NOHSC: 2008 (1992)]
- Prevention of Occupational Overuse Syndrome [NOHSC: 2013 (1994)]
- Control and Safe Use of Inorganic Lead at Work [NOHSC: 2015 (1994)]
- Control of Scheduled Carcinogenic Substances [NOHSC: 2014 (1995)]
- Workplace Hazardous Substances [NOHSC: 2007 (1994)]
- Preparation of Material Safety Data Sheets [NOHSC: 2011 (1994)]
- Labelling of Workplace Substances [NOHSC: 2012 (1994)]

Australian Standards and industry codes of practice approved as codes of practice for application in Western Australia in accordance with section 57 of the *Occupational Safety and Health Act 1984*:

Standards Australia

- AS/NZS 4576:1995 Guidelines for scaffolding
- AS 3610-1995 Formwork for concrete
- AS 4024.1-1996 Safeguarding of machinery Part 1: General principles

Welding Technology Institute of Australia

- Health and Safety in Welding Technical Note 7 (TN 7-98)

Department of Transport

- Fatigue Management for Commercial Vehicle Drivers

The following publications have been endorsed by the WorkSafe Western Australia Commission for the purposes of section 14(f) of the Occupational Safety and Health Act 1984:

- Competencies for Health Surveillance [NOHSC, June 1998]
- National Guidelines for Occupational Health and Safety Competency Standards for the Operation of Loadshifting Equipment and Other Types of Specified Equipment [NOHSC: 7019 (1992)].

All approved codes of practice and guidance notes published by the WorkSafe Western Australia Commission and the National Occupational Safety and Health Commission are also available free of charge on the internet service (www.safetyline.wa.gov.au). Safetyline is a service provided by the Department of Consumer and Employment Protection www.docep.wa.gov.au).

