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# **Noise Awareness and Hearing Protection Training for the NSW Coal Industry**

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Prepared For

Joint Coal Board Health and Safety Trust  
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## 1. INTRODUCTION

Noise levels in the Coal Industry of New South Wales are typically 94 to 99 dBA [1] with 8-hours or more exposure time. In a recent study carried out for the Joint Coal Board Health & Safety Trust [2] it was found that for 8-hour noise exposures over 94 dBA some hearing loss is to be expected even with the use of hearing protection.

Deafness as a percentage of all occupational diseases was 85% for the mining industry (in 1993/94) [3] rising to a staggering 88% in (1989/99) [4]. Mining has the greatest proportion of deafness than any other industry in NSW.

This document is a final report covering the background to occupational noise training and the findings of the research surveys. It also covers recommendations for improving the quality of noise awareness training for the NSW coal industry.

## 2. HIERARCHY OF NOISE CONTROL

Noise should be reduced to provide a safe working environment. The Hierarchy of control is provided by NSW WorkCover [5]. In order of preference, noise control should be treated:

### *"Engineering Controls*

1. *DESIGN - design out noise hazards when new materials, equipment and work systems are being planned for in the workplace.*
2. *REMOVE – the noise hazard by the substitution of better (i.e quieter) working practices.*
3. *ADOPT A SAFER PROCESS – modify or alter equipment, tools or work systems to make them less noisy.*
4. *ENCLOSE OR ISOLATE THE HAZARD – only where modification is impracticable enclose a noisy machine.*

### *Administrative Controls*

5. *ESTABLISH appropriate administrative procedures such as:*
  - *job rotation (note: half the time spent in noisy areas only reduces the noise exposure by 3 dBA and 6 hours in the noise only reduces the 8 hour exposure by 1 dBA!).*
  - *routine maintenance and housekeeping procedures;*



- *training on hazards and correct work procedures.*

### ***Personal Protective Equipment***

6. *PROVIDE suitable and properly maintained personal hearing protection equipment and training in its use."*

Even if hearing protectors are worn there is a risk of hearing damage [2]. To minimise this risk noise levels should be reduced by engineering means to below 94 dBA. Unfortunately it is unlikely that any of the any practical steps (1 to 5 above) can be applied in the coal industry to achieve significant noise reduction within the foreseeable future. Hence the last resort (step 6) of hearing protection must be relied upon at the present time.

Directly connected to the effective use of hearing protection is detailed and ongoing training. Training is required, not only in the fitting of hearing protection, but also in the need to protect hearing from damage (noise awareness). Without detailed noise awareness education it is unlikely that the majority of workers will take hearing management with adequate seriousness for the programs to be effective.

## **3. REVIEW OF NOISE TRAINING REQUIREMENTS**

This section reviews noise training requirements given in official documents from NSW, Australia and overseas. They are reviewed and compared with the type of training received by coal miners in NSW.

### **3.1 Training Requirements given by WorkCover NSW**

WorkCover NSW has developed a training package for Noise in the Workplace [6]. The course is based on the 'Core Training Elements for the National Standard for Occupational Noise (August, 1995) produced by Worksafe, Australia. The duration of the Employees' Course is four hours and is suitable for employees from all industries who require a general understanding of the problems associated with noise. The time frame is shown in Table 1 below.

**TABLE 1. RECOMMENDED TIME FRAMES FROM WORKCOVER NSW**

<b>Time Frame (minutes)</b>	<b>Session</b>
15	Introduction
45	1. Noise and the Workplace
45	2. Noise and the Law
30	3. Effects of Noise
45	4. Noise Identification, Assessment and Control
20	5. Warning Signs, Exposure Monitoring and Audiometric Testing
20	6. Personal Hearing Protection
20	Employees' Course Conclusion and Evaluation
<b>4 hours</b>	<b>Total Time</b>

The Supervisors' Course continues for an additional 2.5 hours.

### **3.2 Training Requirements Recommended in Australian Standards**

The Australian Standard (AS/NZS 1269.3:1998) [7] gives details of an education program for training in the use of hearing protectors. It is stated that *“Education of all personnel is necessary, particularly to gain the necessary level of understanding and acceptance of the hearing protection program and its goals. The education program should commence with management-supported talks to provide expert advice on the importance of protecting hearing and the correct use of hearing protectors.*

*Instruction should include a description of hearing, the harmful effects of noise, the desirability of noise control, the role of audiometry and the purpose, use, care and maintenance of hearing protectors. Emphasis should be placed on the social handicaps of noise-induced hearing loss.*

*It is important to encourage free discussion so that any doubts, misconceptions or objections may be expressed openly and answered immediately.*

*These talks should be prepared by a competent [in noise assessments] person”.*

### **3.3 Training Requirements Recommended by the EEC**

As a comparison noise training overseas is reviewed. The Directive of the European Parliament and the Council on the minimum health and safety requirements regarding the exposure of workers to the risks arising from noise provides details on worker information and training [8] as outlined below.



*“Without prejudice to Articles 10 and 12 of Directive 89/391/EEC, the employer shall ensure that, when workers are exposed to noise at work at or above the lower exposure action values, they and/or their representatives receive information and training relating to such risks concerning, in particular:*

- (a) the nature of risks resulting from exposure to hazardous noise;*
- (b) the measures taken to implement this Directive in order to eliminate or reduce to a minimum the risks from noise, including the circumstances in which the measures apply;*
- (c) the exposure action values and the exposure limit values laid down in Article 3 of this Directive;*
- (d) the results of the assessment and measurement of the noise carried out in accordance with Article 4 together with an explanation of their significance and potential risks;*
- (e) training in the correct use of hearing protectors;*
- (f) why and how to detect and report signs of hearing damage;*
- (g) the circumstances in which workers are entitled to health surveillance and the purpose of health surveillance;*
- (h) safe working practices to minimise exposure to noise.”*

### **3.4 Training Requirements Recommended by the US Department of Health and Human Services**

The US Department of Health and Human Services and the National Institute for Occupational Safety and Health (NIOSH) have provided details of noise training in the Criteria for a recommended standard for Occupational Noise Exposure, 1998 [9]. The details of training are outlined below:-

*“The employer shall institute a training program in occupational hearing loss prevention for all workers who are exposed to noise at or above 85 dBA as an 8 hour time weighted average; the employer shall ensure worker participation in such a program. The training program be repeated annually for each worker included in the hearing loss prevention program. Information provided shall be updated to be consistent with changes in protective equipment and work processes.*

*The employer shall ensure that the training addresses, at a minimum, (1) the physical and psychological effects of noise and hearing loss; (2) hearing protector selection, fitting, use and care; (3) audiometric testing; and (4) the roles*

*and responsibilities of both employers and workers in preventing noise induced hearing loss.*

*The format for the training program may vary from formal meetings to informal on-the-spot presentations. Allowances shall be made for one-on-one training, which would be particularly suitable for workers who have demonstrated a significant threshold shift. Whenever possible, the training should be timed to coincide with feedback on workers' hearing tests.*

*The employer shall maintain a record of educational and training programs for each worker for the duration of employment plus one year. On termination of employment, the employer should provide a copy of the training record to the worker. The employer may wish to keep the training record with the workers' exposure and medical records for longer durations. "*

### **3.5 Training Given by the Coal Industry in NSW**

In a recent study [2] it was found that, on average, 50% of the coal miners surveyed reported no training in noise hazards or how to fit hearing protection.

Training is particularly important for users of earplugs as the test results found an increase of up to 90% (i.e 10 dB) in protection can be obtained with proper fitting instructions. Even a 4 dB increase in the use of hearing protection is effectively equivalent to more than halving the risk of noise-induced damage. Training in noise hazard awareness can also increase wear rates which should substantially reduce the reported 88.5% of the coal miners surveyed [2] who gave an affirmative answer to the questions relating to hearing loss warning signals.

Training is also very important for people who wear earmuffs. This is to ensure that they realise the effect of taking off their hearing protectors in the noise even for very short time periods [10]. The previous study [2] found that just over 20 minutes was the average time reported that coal miners took off hearing protection. For typical exposure levels of 100 dBA, this 20-minute exposure alone will result in 'in-ear' levels that exceed an eight-hour equivalent of 85 dBA. This is the legal limit given in the Occupational Health and Safety (Noise) Regulation 1996 [11] for New South Wales (and the Occupational Health and Safety Regulation 2000 [12]).

It was concluded from the responses to the questionnaires [2] that for approximately 50% of those interviewed, the training in noise hazard and the fitting of hearing protectors is non-existent, forgotten or inadequate.



#### **4. RESEARCH QUESTIONS**

This research aims to find out and quantify:

- a) what noise training is given to miners, who does the training, how long are the training sessions, how regularly are they carried out, and what specific training the trainers themselves have received in noise and hearing; and
- b) how can the training be improved, what extra training do the trainers require, what audio/visuals are required and what type of training will be most effective for miners (eg preferred time periods, regularity, use of video's, slides, lectures and practical demonstrations).

An example of the survey form used in this research is shown in Appendix A of this report.

#### **5. METHOD**

Interviews have been conducted to cover JCB Health Occupational Health Co-ordinators, and Coal Companies Human Resources Managers, Safety Managers, Safety Co-ordinators and other personnel within the coal companies in NSW. Interviews were by personal visits and telephone. Information has been gathered to establish what systems are in place for noise hazard training and hearing protection training. We have established what audio/visuals are available and what training the 'noise' trainers have received.

#### **6. RESULTS**

From our questionnaires it was found that noise training for coal miners is mainly carried out in two ways:-

- 1) By JCB Health Occupational Health Co-ordinators (Registered Nurses); and
- 2) Coal Companies In-House by Human Resource Managers /Coordinators.

On rare occasions other external organizations are brought in to carry out noise training (only one coal company reported that this occurred).



## 6.1 JCB Health Occupational Health Nurse Training

JCB Health has Occupational Health Co-ordinators who are registered nurses based in Singleton, Lithgow and Corrimal. The Co-ordinators carry out noise training for the local coal mining industry.

### 6.1.1 *The Presenters*

From our interviews the JCB Health and Safety Co-ordinators seemed to be highly motivated and dedicated to providing efficient training. However the Co-ordinators are required to cover a wide range of services, which are primarily, concerned with carrying out medical examinations for the coal-mining employees.

The Health and Safety Co-ordinators are the first to admit that they are not specialists in technical aspects of noise and have no specific training in acoustics. On initial thoughts it may be assumed that such specific training is not essential. However even the scale used to describe noise - the decibel - is not intuitive to understand and one of the crucial parts of training is to dispose of common misconceptions. For example, wearing a 30 decibel (dB) hearing protector for half the time in noise gives 15 dB protection. In fact it only gives 3 dB protection and to get 15 dB protection the hearing protector cannot be removed in the noise for more than a total of 15 minutes in an eight-hour day. This is regardless of how good the hearing protector may be.

### 6.1.2 *Audio/Visual Aids*

The JCB Health and Safety Co-ordinators have access to at least one 'PowerPoint' presentation. This comprises of a laptop computer, projector and screen. This system is based at Singleton and can be used at other centres. The other centres have overheads with a similar presentation.

### 6.1.3 *Length of Presentation*

The JCB Health and Safety Co-ordinators carry out training sessions of approximately one hour. Most of the Co-ordinators reported that they thought that this was too short and one and half hours would be better. They reported that they were restricted to one hour by the mine managers. In fact in many cases the mine managers thought one-hour was far too long. This highlights a lack of knowledge by the mine managers.

## 6.2 Human Resource Managers/Co-ordinators, In-House Training.

There are approximately 60 coal operations in the NSW area. All coal companies have personnel responsible for health and safety training. These are usually the Human Resource Manager or the Training Co-ordinator.

Approximately 82% reported that they carried out short noise awareness or hearing protection training in the last two years. Some of the coal companies (about 16%) Human Resource Managers and Training Co-ordinators reported that no training in noise awareness or hearing protection had been carried out.

One Training Co-ordinator even reported that "*anyone knows how to fit earplugs or ear muffs, so training is not required*". This lack of knowledge in those who are supposed to be carrying out noise awareness training is surprising and disappointing.

### 6.2.1 The Presenters

The in-house trainers have long experience (typically 5 to 20 years) with the coal industry but not one person interviewed reported that they had received any specific training in noise awareness or noise training (e.g. the WorkCover NSW 'train the trainer' noise course). Again a lack of knowledge in what needs to be covered in a good quality noise awareness-training package was evident in the replies to the survey.

### 6.2.2 Audio/Visual Aids

It was reported that no audio/visual aids were used (or even required).

### 6.2.3 Length of Presentation

The In-house trainers reported that they carry out training sessions of approximately 5 minutes to 15 minutes. Most of the trainers reported that they thought that this was not too short even though they felt that the training was not highly effective in preventing hearing damage. Again a lack of knowledge by the mine managers was apparent from some of their remarks.



## **7. DISCUSSION**

The results of the survey have revealed that the standard of training in noise awareness and hearing protection use for the coal industry in NSW is inadequate particularly for an industry with such high noise exposures and record of occupational disease. It is below the standard where hearing damage risks are likely to be significantly reduced.

From these results it is not surprising that mining has the greatest proportion of deafness than any other industry in NSW. It is also apparent why deafness as a percentage of all occupational diseases was 85% for the mining industry in 1993/94 [3] and this had risen to 88% in 1998/99 [4].

It is envisaged that the training session guidelines (see Appendixes B and C) will be of use to every coal board workplace trainer and employee where noise and potential hearing damage are problems. Its use will ensure that every worker has the knowledge and education to be fully aware of the noise hazards and the correct way to fit hearing protectors. The guidelines will encourage every trainer to become well equipped for noise training. To have a significant impact on the reduction of this occupational disease, management must be fully supportive and the training must be of the highest practicable standard. The training must also be consolidated and uniform throughout the coal industry in NSW.

## **8. IMPROVED TRAINING**

It has been established that the type of training being carried out in the NSW coal-mining industry could be substantially improved. The improvements to the training of employees who are exposed to high levels of noise will only be achieved if those giving the training are fully aware of the hazards and the limitations of hearing protection. The lack of this type of awareness and training is one of the reasons that hearing damage is still such a common occurrence in the NSW coal mining industry.

It is recommended that a standard noise awareness and hearing protection training program is adopted for all mining employees who are likely to be exposed to eight-hour equivalent noise levels over 85 dBA. The training must only be carried out by personnel who have received specific training in noise. Records must be kept for all those who have received noise awareness and hearing protection training.



### **8.1 Noise Awareness and Hearing Protection Training Program for Exposed Employees**

A proposed example training session for noise-exposed employees is shown in Appendix B. It is anticipated that the formal training will last for a period of two hours followed by a half-hour session for questions if required. The training must be as interactive as practicable using audio-visuals such as tape (or CD) recordings to explain tinnitus and the effects of industrial deafness, a signal generator to explain the frequency (tones) of sound and to carry out a 'mass' audiogram. A simple instruction to the decibel scale and a '*jargon busting*' session is important to enable workers to appreciate the hazards, risks and effects of long term noise exposure. Only a brief session is recommended on the legal regulations and aspects.

The practical session on hearing protection must include '*real*' examples of fitting earplugs and earmuffs together with the '*real world*' effects of removing muffs for short periods in the noise and incorrect fitting of plugs. The session is concluded with an explanation of the audiogram to enable workers to detect for themselves early signs of noise hearing loss as opposed to other forms of hearing loss such as presbycusis and conductive deafness.

### **8.2 Noise Awareness and Hearing Protection Training Program for Trainers**

A proposed training session for noise trainers is shown in Appendix C. This, by necessity, follows a very similar format to the training program for exposed employees. However more time is allowed and a greater emphasis is placed on attendee feedback. This is to enable the trainers to be more confident when answering the employee's questions.

## 9. SUMMARY AND CONCLUSIONS

This research has surveyed those responsible for carrying out noise awareness training and hearing protection training for noise in the NSW coal industry. It found that in the main, noise training is carried out by either the JCB Health Occupational Health Co-Ordinators (Registered Nurses) or Coal Company's In-House Human Resource Managers/Coordinators.

The JCB Health Occupational Health Co-Ordinators were found to be knowledgeable and dedicated but restricted in carrying out detailed training for coal employees by the coal companies. It is recommended that they utilise the noise program proposed for the coal industry employees given in Appendix B. However this will be unlikely to be accepted by the coal companies unless they are better informed in the seriousness of the problem. It is recommended that all those concerned attend a noise trainer's session and they also need regular updates from a noise specialist. This is to update their knowledge and give them even greater confidence to train others.

The coal company's In-House Human Resource Managers/Coordinators were found to be lacking in the required knowledge to carry out competent noise training. It is recommended that they utilise the noise program proposed for the coal industry employees given in Appendix B. This is, however, unlikely to be readily accepted unless they are updated in noise awareness themselves. It is, therefore, strongly recommended that all personnel responsible for carrying out noise training attend a training course from a noise specialist as shown in Appendix C.

Date	Prepared by:	
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## REFERENCES

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- [5] *WorkCover New South Wales* – “Six Steps to Occupational Health and Safety - Duty of Care in Occupational Health and Safety” - January 1996.
- [6] *WorkCover New South Wales* – “Train the Trainer – Noise in the Workplace” - November 1997.
- [7] *Australian/New Zealand Standards* – “Occupational noise management Part 3 Hearing protector program” – AS/NZS 1269.3:1998.
- [8] *The Directive of The European Parliament and of the Council on the Minimum Health and Safety Requirements Regarding the Exposure of Workers to the Risks Arising from Physical Agents (Noise) (n<sup>th</sup> Individual Directive Within the Meaning of Article 16(1) Of Directive 89/391/EEC), Article 8, Worker Information And Training.*
- [9] *U.S. Department of Health and Human Services* – ‘Occupational Noise Exposure – Revised Criteria 1998.
- [10] *Scannell, K* – ‘Noise Awareness and Competency Training’, Proceedings from Futuresafe 2000, Sydney Convention and Exhibition Centre, Darling Harbour Sydney - May 2000.
- [11] *Australian Parliamentary Counsel Office* – ‘Occupational Health and Safety (Noise) Regulation 1996.
- [12] *Australian Parliamentary Counsel Office* – ‘Occupational Health and Safety Act 2000 N0 40.



The names of those answering these questions will remain confidential.

QUESTIONS		ANSWERS	
1	Name		
2	Job Title		
3	How long have you been involved in training?		
4	How long have you been involved in noise training? Eg other safety computer, etc		
5	What other types of training do you do?		
6	What instruction have you had in (a) training people? (b) noise training?		
7	<b>Noise Training Sessions</b> How long are the noise training sessions?		
8	What is the content of the noise training? (Fax or e-mail details?)		
9	How often are they carried out?		
10	How many in a noise training group?		
11	How do you ensure that everybody has been trained in noise awareness? Do you have records of noise training?		
12	What audiovisuals are used?	Videos Slides Overheads Tape Recordings Other (specify)	
13	What handouts are given out?	Notes. Leaflets (Fax or e-mail details?) Other (specify)	
14	What practical demonstrations are carried out?	Eg Fitting of ear plugs                      fitting of ear muffs	
15	Do you carry out training with others?	No Yes	Go to 17 Go to 16
16	Who are the others?	Name                      Company Phone Number	
17	Do you feel that the training given in noise is adequate?	Yes No	Go to 18 Go to 19
18	But how could it still be improved?		
19	How can the noise training be improved?		
20	Is the training put into practice by the coal miners?	Yes No	Go to 21 Go to 22
21	%		
22	%		
23	<b>Thanks for you help</b>	<b>End</b>	
	Other Comments		
	Date of Contact		

Appendix B - Employees Training Session

NOISE & SOUND SERVICES  
**OCCUPATIONAL NOISE TRAINING SESSION**  
**For Coal Industry Employees**

**P R O G R A M**

**Duration Approximately 2.5 Hours**

***THE EFFECTS OF NOISE ON PEOPLE***

The Physical Effects of Noise – *Tape Demo of Tinnitus & Hearing Loss*  
Measuring Hearing Damage – *Mass Audiogram using a Signal Generator*  
The Risk of Deafness  
How Damage Occurs  
How the Ear Works - *Microscopic Views of Noise Damaged Inner Ears*

***NOISE SCALES***

Decibels and the 'A' Weighting  
Average Noise Level ( $L_{eq}$ )  
The 'Peak' Noise Level  
Typical Noise levels in the Coal Industry

***NOISE AT WORK REGULATIONS AND NOISE MANAGEMENT***

Noise at Work Regulations  
The Occupational Health & Safety Act (2000)  
Australian Standard AS/NZS 1269 (1998)  
National Standard on Occupational Noise  
NSW Regulations & Noise Management

***HEARING PROTECTION AND AUDIOLOGY***

Types of Hearing Protection – *Examples*  
Hearing Protectors in Practice – *Examples*  
Muff or Plugs – which are best? - *Examples*  
The Selection of Hearing Protectors - *Practical Demonstrations*  
Audiometry and hearing test – how to 'read' audiograms

**OPEN FORUM – Evaluation and Conclusion**

Appendix C - Trainers Training Session

**NOISE & SOUND SERVICES  
OCCUPATIONAL NOISE TRAINING SESSION  
For Coal Industry Noise Trainers  
P R O G R A M**

**Duration Approximately 6 Hours**

***THE EFFECTS OF NOISE ON PEOPLE***

The Physical Effects of Noise – *Tape Demo of Tinnitus & Hearing Loss*  
Measuring Hearing Damage – *Mass Audiogram using a signal generator*  
The Risk of Deafness  
How Damage Occurs  
How the Ear Works - *Microscopic Views of Noise Damaged Inner Ears*

***Questions***

***Coffee Break***

***NOISE SCALES***

Decibels and the 'A' Weighting  
Average Noise Level ( $L_{eq}$ )  
The 'Peak' Noise Level  
Typical Noise levels in the Coal Industry

***Questions***

***Lunch***

***NOISE AT WORK REGULATIONS AND NOISE MANAGEMENT***

Noise at Work Regulations  
The Occupational Health & Safety Act (2000)  
Australian Standard AS/NZS 1269 (1998)  
National Standard on Occupational Noise  
NSW Regulations & Noise Management

***Questions***

***HEARING PROTECTION AND AUDIOLOGY***

Types of Hearing Protection – *Examples*  
Hearing Protectors in Practice – *Examples*  
Muff or Plugs – which are best? - *Examples*  
The Selection of Hearing Protectors - *Practical Demonstrations*  
Audiometry and hearing test – how to 'read' audiograms

**OPEN FORUM – Evaluation and Conclusion**