

**PERSONAL PROTECTIVE EQUIPMENT
PROGRAM HANDBOOK-
SMALL INDUSTRY**

**A THESIS SUBMITTED AS PART OF THE REQUIREMENTS FOR
MASTER OF APPLIED SCIENCES
(OCCUPATIONAL HEALTH AND SAFETY)**

BY

PAMELA H ESTREICH

FACULTY OF SCIENCE AND TECHNOLOGY

UNIVERSITY OF WESTERN SYDNEY, HAWKESBURY

NOVEMBER, 1994

DISCLAIMER

The following work has been completed by the author, a coursework Masters student in the Faculty of Science, School of Applied and Environmental Science at the University of Western Sydney, Hawkesbury under the supervision of Sue Reed.

I certify that this work has not been submitted to another university or institution for any degree or other qualifications. All assistance received on preparing this thesis and all sources used have been acknowledged.

ACKNOWLEDGMENTS \ DEDICATIONS

TO MY EMPLOYER AND FELLOW WORK COLLEGES,

WHO PLACED THIS WITHIN REALMS OF POSSIBILITY:

TO MY SUPERVISOR, SUE REED

FOR SUPPORT, GUIDANCE AND

WHO HELPED KEEP IT THERE:

TO MY HUSBAND: RAY

CHILDREN

AND

FRIEND DEBRA FOR HER SUPPORT

CONTENTS

I. INTRODUCTION.....	8
2. PROJECT AIM.....	11
3. METHODOLOGY.....	12
3.1 DATA COLLECTION:.....	12
3.2. CURRENT LITERATURE REVIEW:.....	12
3.3. DEVELOPMENT OF A HANDBOOK FOR SMALL INDUSTRY:	12
3.4. TRIAL OF THE HANDBOOK FOR SMALL INDUSTRY.	13
4. LITERATURE REVIEW.....	13
4.1. STATE/TERRITORY LEGISLATION.....	13
4.1.1 <i>New South Wales</i>	15
4.1.2. <i>Victoria</i>	20
4.1.3. <i>Queensland</i>	21
4.1.4. <i>Australian Capital Territory</i>	22
4.1.5. <i>South Australia</i>	23
4.1.6. <i>Tasmania</i>	24
4.1.7. <i>Western Australia</i>	25
4.1.8. <i>Northern Territory</i>	26
4.2. GOVERNMENT PUBLICATION	26
4.3. NON GOVERNMENT ORGANISATIONS.....	27
4.4. SCIENTIFIC PUBLICATIONS.....	31
4.5 OCCUPATIONAL HEALTH & SAFETY JOURNALS	34
4.6 MANUFACTURER PUBLICATIONS.....	39
4.7 OVERSEAS EXPERIENCE.....	42
5. RESULTS & DISCUSSION.....	47
5.2. HANDBOOK TRIAL PARTICIPANTS CHARACTERISTICS:.....	49
5.3. INDUSTRY COMMENTS ABOUT THE HANDBOOK:.....	50
5.4. KEY ISSUES RELEVANT TO SMALL INDUSTRY:	51
5.5. LEGISLATION REVIEW:.....	54
5.6. OCCUPATIONAL HEALTH AND SAFETY PUBLICATION REVIEW:	54
6. CONCLUSION.....	55
7. RECOMMENDATIONS:.....	57
8. REFERENCED MATERIAL.....	58

LIST OF TABLES

Table	Type	Appendix Page
2.1	Types of particulate filters	3
2.2.	Gas Filters	4
2.3.	Non-powered air-purifying respirators	5
2.4.	Types of supplied air-respirators and examples	6
3.1.	Selection and guide on selection of gloves for workplace hazards	9
4. 1.	Example of eye protection	12
5.1.	Types of hearing protection	14
6.1.	Classification of protection suits	15
7.1.	Recommended application of occupational protection footwear with example of hazards	17
 Automobile Industry Hazard Management Plan		
1.	Examples of chemical hazards and possible health effects	45
2.	Example of work process and personal protective equipment requirements	49

LIST OF DIAGRAMS

Figure	Diagram	Appendix Page
1.	Disposable, half-face particulate respirator	4.
2.	Half-face filter (cartridge) respirator	5.
3.	Full-face filter (cartridge) respirator	5.
4.	Examples of protective clothing	16.
5.	Material Safety Data Sheets	38.

ABSTRACT

This study reviews current literature on the principles of hazard management in the workplace, the use of personal protective equipment as a hazard control measure and its relevance to small industry. Particular attention is given to the automobile industry. Reviewed were the major issues in a personal protective equipment program. For example, the selection, types of equipment, the care, maintenance requirements and common problems associated with personal protective equipment. As a result, a Personal Protective Equipment Program Handbook for Small Industry was developed.

The Handbook was trailed in three small industry environments to determine its relevance and usefulness to industry. The industries consisted of automobile repairing, a small window manufacturing and the building trade. Whilst there was no recommendation for changes to the Handbook, it did serve to illustrate some common problems in small industry and its relationship with occupational health and safety.

As a result of this study, it is suggested that, education institutes develop an occupational health and safety module for each academic program and the occupational health and safety industry and education institutes should take up the challenge and develop industry specific occupational health and safety publications. These would focus on the hazard management principles and the use of personal protective equipment in the workplace. In addition, legislation needs to be prescriptive because small industry rely on being told in detail, what needs to be done.

I. INTRODUCTION

The impact of poor occupational health and safety performance on the Australian economy, industries and those employees who are affected by unnecessary injury or disease is enormous. Indicators give a compelling case for finding an effective method of dealing with workplace hazards and develop integration of occupational health and safety into management systems. Industry should no longer have the view that workplace injuries and disease are just part of the job or act of god.

Current legislative framework with the emphasis on health and safety was driven by the industrial relation approach and acceptable community standards. This legislation is characterized by a single, concise Act which states the general duty of care on employers. This Act, clearly Places the responsibilities on the employer to provide a safe and healthy workplace. It promotes the development of safe work systems, training, supervision, safe equipment and the identification, prevention and management of workplace hazards. Employees also have a responsibility to work in a safe manner, use personal protective equipment provided to them by the employer and not to cause harm to any persons.

Failure to provide a safe workplace results in work related injuries, illness and diseases. The cost of poor occupational health and safety performance to the Australian community has been estimated at \$9.7 billion (Worksafe, 1994) Financially, this is the tip of the iceberg. Indirect costs of accidents/disease, not estimated in workers compensation costs, is lost-time, cleaning up, repairing and replacement of equipment, replacing employees, failure to meet contracts and overheads, as well as other significant factors including morale, pain and suffering for the employee. Worksafe Australia estimate the total costs could be

at least \$15 billion annually and perhaps as high as \$37 billion. (Worksafe1992/93).

The WorkCover Authority of NSW, Workers Compensation Statistics (1991/92) shows that for NSW, there were 5 1,077 new claims for that period of which "9, 792 were for occupational disease which represents 19% of all workrelated injuries ". (WorkCover Authority 1991/92) In defining occupational disease, the WorkCover Authority of NSW, Workers Compensation Statistics (1 99 1/92) describes it as being distinguished by one of the following:

- slow and protracted nature of its cause
- Continuous contact with one or more hazard, such as, mechanical. physical or chemical
- uncertain of its beginning

WorkCover Authority of NSW state "that due to the problem with data quality it is not possible to publish statistics on the types of occupational diseases" (WorkCover Authority 1992/93) However, occupational disease is identified by the WorkCover Authority as industrial deafness, mononeuritis, dermatitis, infectious and parasitic, neoplasm (skin cancer and others). Not included in these statistics is lung diseases such as asbestos, silicosis, miners lung, lung cancer and mestholima. These occupational diseases are recorded in a separate data collection either with the Dust Disease Board or with the Mining Industry. These cancers can be related direct to hazardous work environments and incorrect or no use of personal protective equipment.

Statistics indicate that 65% of occupational diseases result in **permanent disability**, of which 92% are **industrial deafness** claims with the cost incurred

exceeding \$33 million dollars for NSW alone. (WorkCover Authority NSW 1992/93).

WorkCover Authority of NSW reported that tradespeople such as, metal fitting and machining, plant and machine operators, assemblers, industrial spray painters and cleaners have a high incidence rate and costs in occupational diseases. Industrial deafness is high in the above occupations. Across occupations, " *incidence of work related injuries was the highest amongst tradespeople employed in metal fitting and machining, with 134 injuries per 1,000 workers* "(WorkCover Authority 1992/93)). The highest ten industry costs of workers compensation claims per employee for 1991/92 range from the leather and leather products manufacturing the highest, basic iron and steel the second, motor vehicles and parts being the fifth and electricity production the tenth.

The working environment with its increasing classification of chemical, biological, physical, noise and radiation hazards places greater challenges on the human body's natural defence systems. Consequently, employers and employees need to recognise hazards and the means by which they can be controlled. Employers in small industry fail to recognise the principles of hazard identification, assessment and control relevant to their workplace. It is important that the required protection is designed to the specific workplace environment, to minimise the health risks. Employers believe that if they issue their employees with personal protective equipment they are protecting their employees. The personal protective equipment may not be providing the protection required due to either incorrect fitting and procedures, incorrect selection or limited protection time.

Employers may be provided information by the manufacturers/suppliers of

personal protective equipment regarding the technical detail and suitability of personal protective equipment for protection against hazards. Little information is available on the method of hazard identification, assessment and control, the selection process, training/education and legislative requirements of record keeping. These being the major components of a effective personal protective equipment program.

In NSW there are some statutory requirements in regards to the use of personal protective equipment in the workplace, but many employers fail to see the relevance to their industry, such as the use of hearing protection, appropriate respirators when working with asbestos or with a two pack sprays. Part of the reason may be the information presented is in a different format and sometimes confusing, and there are minimal guidelines for the employer to follow. Small industry unknowingly expose their employees to potential health risks due to lack of knowledge and need for specific personal protective equipment to match specific workplace environmental hazards.

2. PROJECT AIM

The project aims to review the relevance of current literature on personal protective equipment as a hazard control measure, and to develop a Personal Protective Equipment Program Handbook for Small Industries on the selection of correct personal protective equipment for use when working in hazardous work environments.

3. METHODOLOGY

3.1 Data collection:

To determine the extent of occupational diseases for small industry, the Worksafe Australia and WorkCover Authority of NSW statistics on occupational diseases, deaths, incidence rates and the high risk industries and occupations were reviewed.

3.2. Current literature review:

To outline the extent of current information available for the small employer on the use of personal protective equipment as hazard control measure relevant state and territory acts, regulations and codes of practice were reviewed. Publications from scientific and occupational health and safety journals, Standards Australia and State/Territory Occupational Health and Safety Authorities, such as the WorkCover Authority of NSW, were critically reviewed about its relevance and usefulness to the small employer in meeting their legislative requirements.

3.3. Development of a Handbook for Small Industry:

A Personal Protective Equipment Program Handbook for Small Industry was developed. The handbook provides the small employer with guidelines for the implementation of a personal protective equipment program. For example, outlined are the selection factors, various types of equipment, the care, maintenance requirements and common problems. Guidelines for a safety management system, including hazard management and accident reporting requirements are discussed. A sample automobile industry hazard management plan was developed.

3.4. Trial of the Handbook for Small Industry.

To determine the handbook's relevance and usefulness to small industry, it was trialed in three small industry environments: automobile repairs, a small window manufacturer and the building trade.

4. LITERATURE REVIEW

4.1. State/Territory Legislation

Although the legislation differs in each state and territory, employers are required to provide, so far as it is reasonable, a safe work environment, safe systems of work, equipment and materials in safe condition and with adequate facilities. Employers are also required to provide information, instruction, training and supervision to enable work to be performed safely and without harm.

Health and safety in the work environment can be measured by achieving improved performance of safe work practices and the degree to which the risks (hazards) are reduced or eliminated. Each state and territory is empowered to legislate for occupational health and safety. These Acts create a legal administrative framework and allow for the development of regulations for specific work environments and workplace hazards. Acts for example, Occupational Health and Safety Act (all states and territory); Factories, Shops & Industries Act 1962 for NSW; and Dangerous Goods Act (all states and territory).

Each state and territory, specific work environments and industries are covered by statutory measures and requirements. Overall, each state and territory with

their Occupational Health and Safety Acts have regulations that cover the wearing of personal protective equipment, whilst working in a hazardous work environment. For example, Occupational Health and Safety (Asbestos) Regulation 1992 (Victoria); Occupational Health and Safety (Confined Spaces) Regulation 1990 (NSW); and in the Health (Harmful Gases, Vapours, Fumes, Mists, Smokes and Dusts) Regulations 1984 (Victoria).

Codes of practice in occupational health and safety, serve as guide to employers for uniform safety procedures in the work environment. Codes of practice do not possess the same powers as legislation, but are used to determine whether an employer has breached the duty of care to maintain the health and safety of employees. Queensland have developed several codes of practice relating to the use and compliance of personal protective equipment i.e. Code of Practice for Noise Management at Work (1993); Code of Practice for the Selection, Provision and Use of Personal Protective Equipment (1991) and Code of Practice for Personal Protective Equipment in Building Work (1993).

Generally, states and territory have codes of practice relating to specific work hazards which identify the personal protective equipment requirements for safe systems of work. In NSW the Code of Practice on Safe Removal of Asbestos 1989 is an example. Except for Queensland, other states and territory have failed to develop a specific code of practice for the use of personal protective equipment as a control strategy and the legal requirements for a personal protective equipment program for the workplace.

Standards are developed and published by Standards Australia. They are accepted as guides to best safe work practices. Worksafe Australia (The National Occupational Health and Safety Commission) which was established

by a federal Act of parliament in 1985 is responsible for the development of national standards in occupational health and safety. These standards are designed to be passed as state law. The National Occupational Health and Safety Commission, Sydney, published a booklet on the prevention of eye damage. The booklet refers to Australian Standards relating to eye protection. The booklet identifies the hazards relating to eye injuries, the need for assessment and engineering controls and personal protective equipment. The only criticism is that the booklet is not readily available to the general public and employers. Some states, (except for Queensland who has a code of practice), have developed and published booklets for the use of personal protective equipment in the workplace. These will be critically reviewed in the following government subsection: Government Publication.

4.1.1 New South Wales

The Occupational Health and Safety Act 1983 (NSW) is administered by the WorkCover Authority of NSW. Section 15 requires employers to ensure the health, safety and welfare of employees. To achieve this, employers are to provide a number of activities. Such as: safe plant and equipment; safe systems of work; ensure the use, handling and storage of plant and substances is safe; provide information, training and supervision to ensure health and safe work practices. Section 16 refers to the employer and self-employed individuals to ensure the health and safety of persons other than employees, this covers such individual as contractors and visitors.

The Act itself, does not specify requirements for hazard control and in particular the use of personal protective equipment and the requirements for health monitoring, record keeping etc. Individual regulations under the Act specify appropriate requirements for the use of personal protective equipment.

Procedures, health monitoring, program development and monitoring for the use of personal protective equipment comes from the standards and national Codes of Practice. The Factories, Shop and Industries Act 1962 calls up regulations such as the Factories (Health and Safety - Asbestos Processes) Regulations, Lead (Medical Examination) Regulations and the Noise Regulations which have specific requirements for testing or monitoring of employees exposed to these hazards.

The WorkCover Authority of NSW, Personal Protective Equipment Section, published a booklet describing personal protective equipment such as safety helmets, gloves, eye protection, respiratory protection and hearing protection. The booklet outlines the Industrial Safety Legislation in NSW, Australian Standards and the process for approvals of protective equipment. It separately identifies the types of personal protective equipment, the need for a workplace personal protective equipment program and gives an example program for the introduction of an eye protection program. NSW has failed in this booklet on personal protective equipment, to approach personal protective equipment in line with risk management principles.

Information on risk management approach to hazard control by the WorkCover Authority, is fragmented and written in various formats. The employer is required to read several documents eg. Act. regulations, standards and WorkCover Authority Safety Notes to enable them to identify all requirements in placing a personal protective equipment program into the workplace. For many small employers this process is too difficult even if they knew the material was available.

WorkCover Authority Health and Safety Note (1990) on personal protective equipment, describe a workplace personal protective equipment program as a

set of routine procedures that should be followed in workplaces. It asks such questions as

"could the workplace be made safe so that you don't need to use PPE ?; is the PPE designed to provide adequate protection against the hazards at your workplace and have you checked that the PPE comfortably fits all workers who have to wear it and that it is always worn by people at risk".

What it doesn't do is give the employer guidelines in answering these questions. How would an employer know if the personal protective equipment is designed to provide adequate protection against the hazards if no information or guidelines are given. NSW failure to approach personal protective equipment in line with hazard management and has made it difficult for many employers to identify the appropriate personal protective equipment to meet hazard control strategies.

WorkCover Authority NSW has extensive literature on general hazard and hazard control. Literature on the hierarchy of hazard control being defined as, design the hazard out of the work practice, eliminate or substitute the hazard for a less hazardous work practice, change the process, enclose or isolate the process, or provide effective ventilation. Other forms of hazard control highlights the importance of providing, training, housekeeping, provide personal protective equipment and administrative procedures. Yet again, these are presented in a format that is not necessarily identified with small industry and their obligation in developing a hazard management program which may include personal protective equipment.

WorkCover Authority has developed a series of WorkCover Authority Health

and Safety Notes. These include:

- Occupational Health and Safety Aspects of Spray Painting (Nov. 1990)
- Toxic Gas in Confined Spaces (May 1992)
- Working with Fibreglass Reinforced Plastics (March 1992)
- Spray Painting Booth Construction(Nov. 1991)
- A Guide to Dust Hazards (Nov. 1991);
- Quiet, Please!, How Employers can prevent Noise-Induced Hearing Loss (June 1992)
- Respiratory Equipment for Asbestos Removal Work (Nov. 1991).

These health and safety notes are designed to assist employers in their obligations under the legislation to meet specific hazards. The standard information supplied outlines briefly the definition of the subject, the regulation that the safety note is referring to, some guidelines, the possibility of appropriate work procedures and a list of approved personal protective equipment such as respirators.

This information varies according to the subject matter in health and safety note, such as, the Guide To Dust Hazards tells the employer there is a need for a respirator if other control measures are unsuccessful. No technical information is given. The Health and Safety Note on Working with Fibreglass Reinforced Plastics informs the employer of the need for personal protective equipment, some principles of selection, care and types of personal protective equipment. This information could not be used to successfully develop a personal protective equipment program for the workplace. The Asbestos Health and Safety Note extensively describes the types of personal protective equipment required for the individual work process, gives examples and their Approval No. This information will assist the employer with appropriate personal protective

equipment for asbestos removal work, however, it fails to provide information of the selection issues, maintenance and care of respirators, record keeping and the need for appropriate procedures.

It should be noted that each Health and Safety Note, has a list of additional information sources for the employer to contact for further assistance. Two recent codes of practice developed and published by the WorkCover Authority include, Safe Work On Roofs Part I - Commercial and Industrial Buildings and Mono-strand Post-Tensioning of Concrete Buildings. The need for the use of personal protective equipment is identified as a separate section in each of these codes. The personal protective equipment section of the Safe Work On Roofs Part 1 - Commercial and Industrial Buildings, identifies the employers responsibilities by stating the employer must *"assess conditions likely to affect the health and safety of employees and arrange for the provision and use of appropriate personal protective equipment"*: The code of practice outlines the employer's responsibilities such as, the provision of suitable eye protection, footwear, sunburn prevention and ensuring that all personal protective equipment provided for employee's use is regularly inspected, cleaned and repaired or replaced as necessary. The code of practice for safe work on roofs has identified appropriate standards for the provision of personal protective equipment and safety equipment.

The Industrial Buildings and Mono-strand Post-Tensioning of Concrete Buildings Code of Practice has failed to provide a similar list. Both codes of practice do not provide a guideline for employers to follow in establishing a personal protective equipment program, principles of risk management for hazard identification, assessment and control strategies and steps in meeting their full legislative responsibilities which include record keeping and possible medical examination.

The WorkCover Authority of NSW has published a list of approved respiratory protective devices. This booklet contains an overview of the legislative background and the list of approved respiratory devices. These are divided into specific company brands with their relevant Approval No. This would assist the employer in confirming that a particular piece of respiratory protective equipment has the standards approval. The WorkCover Authority of NSW, Workers Compensation Statistics (1991/92) indicate that hearing loss is the major occupational diseases for workers compensation claims for 1992/92 and yet they have no similar publication on hearing protection as with the respiratory protective devices.

4.1.2. Victoria

The Occupational Health and Safety Act 1985 (Vic) is administered by the Minister of Industry Services through the Occupational Health and Safety Authority of Victoria. The Act requires employers to provide and maintain, so far as is practicable, a working environment that is safe and without risk to health.

The working environment can be described as everything an employee comes into contact with during their working day. This includes workplace design, plant, equipment, fumes, gases, dusts, liquids. Section 21(2) (a) requires the employer to provide and maintain plant safe systems of work. This requires employers to establish and enforce safety procedures such as the wearing of personal protective equipment.

Section 21(3) extends to the employer who manages and controls his own premise and that they are also responsible for the health and safety of any contractors working on the premise. Section 21(4)(a) requires the employer to

monitor employee's health. This Section fails to define or give guidance on what is appropriate health monitoring and time frames. However, regulations such as the Asbestos (Medical Examination) Regulations, Lead (Medical Examination) Regulations and the Noise Regulations have specific requirements for testing or monitoring of employees exposed to these hazards.

The Occupational Health and Safety Authority, has published a booklet, Personal Protective Equipment, (July 1992). This booklet, defines personal protective equipment *"as any item of clothing or equipment worn by workers to limit their exposure to hazard"* (Personal Protective Equipment July 1992) and is limited to ear protection, headwear, respiratory protection, eye protection, body protection hand protection and feet protection. This booklet describes simply the principles of controlling hazards at work and the relationship to personal protective equipment. However it fails to quantify the impact of hazard control within the workplace and the reduction of hazards on the human body.

4.1.3. Queensland

The Workplace Health and Safety Act 1989 (Old) is administrated by the Workplace Health and Safety Council. The Workplace Health and Safety Act 1989, includes the major features of other state legislation. The general duty of care to maintain a healthy and safe work environment is placed on employers, self- employed, manufacturers of plant and equipment as well as employees. Section 34 requires the development of codes of practice to be approved by the Minister.

The Queensland's Division of Workplace Health and Safety, have developed a Code of Practice for Selection, Provision and Use of Personal Protective Equipment 1991. This booklet has adopted a broader definition of personal protective equipment, this is *"clothing equipment and/or substances which is*

worn or used correctly protect part or all of the body from foreseeable risks of injury or disease at work or in the workplace " (Division of Workplace Health and Safety, 1991, p1).

Personal protective equipment is defined as protective footwear, headwear, gloves, hearing protection, high visibility garments, breathing apparatus, thermal wear and eye protection. This publication views personal protective equipment in the contexts of risk management and hazard reduction through the use of personal protective equipment. Risk management is described as hazard control through design substitution, redesign, separation and administrative controls. It has developed hazard categories with the explanation and information on the types of risks associated with the particular hazard and the appropriate personal protective equipment required to reduce/ minimises the risks.

The code of practice has risk management charts that have been designed for the employer to identify not only hazards but other factors such as occupation, job tasks, number of employees affected, body parts exposed to the hazards, time span as in frequency and duration. Queensland's approach to personal protective equipment encumbers all aspects of workplace hazards and the methods of control as a practical approach in the work environment.

4.1.4. Australian Capital Territory

The Occupational Health and Safety (Commonwealth Employment) Act 1991, is administrated by the ACT Occupational Health and Safety Office. The Act requires the employer to take all reasonable practicable steps to protect the health and safety at work of the employees. This is defined as the provision of a safe working environment including plant and systems, provide adequate

facilities and to ensure the absence of risks at work to health of the employees in connection with the use, handling, storage or transport of plant and substances.

Section 16 (5) requires the employer to take appropriate action to monitor the employee's health and safety and conditions at work; maintain appropriate information and records relating to the employees health and provide appropriate first aid and medical services.

The ACT Occupational Health Safety Office, (1993), has developed appropriate safety procedures/guidelines in an information sheet on personal protective equipment. This information sheet describes the duty of care that employers have to provide with a health and safe work environment; safe plant and equipment; health and safety information and training and adequate safety clothing and equipment. This information sheet has a checklist for employers to complete. This checklist covers such areas as selecting the correct personal clothing and equipment, taking care of protective clothing and equipment and maintenance of respirators. The negative aspect of this information sheet is that it is the simplest approach to risk management and hazard identification, assessment and control.

The overall approach to a personal protective equipment program for the workplace is superficial and the employer would need to seek additional information on issues such as, selection, problems relating to the use of personal protective equipment, maintenance and care of equipment and record keeping.

4.1.5. South Australia

The Occupational Health Safety and Welfare Act 1986 (SA), is administered by the South Australian Occupational Health and Safety Commission. Section 19

of the Act requires the employer to provide a safe working environment, safe systems of work and safe practice in working with any plant and handling substances. Policy making in South Australia is more extensive than the other states and territory. It requires the employer to consult with employees and their representatives and to have written statements of practice and procedures for the protection of employees health and safety. These procedures must be brought to the attention of all employees. Part III of the Act places a duty of care on the employer to provide a safe work environment not only to employees but other employees at the workplace. Section 19(3) requires the employer, as far as it is practicable, to monitor the health and welfare of employees, to keep records and to provide information about health and safety matters.

Section 63 of the Act makes provision for codes of practice which specify the required standard of care. These codes of practice include, Safe Removal of Asbestos and Safe Use of Synthetic Mineral Fibres and specifies the necessity for the provision of personal protective equipment.

Separate legislation outlining the responsibility for the provision of personal protective equipment in the workplace includes: Industrial Code 1967, which regulates the activities of factories, offices, shops and warehouses and the Noise Control Act 1976 which regulates deals with maximum noise levels in factories and requirements to test and conserve the hearing of employees. South Australia does not have literature on specific personal protective equipment and the requirements for a program of risk management.

4.1.6. Tasmania

The Industrial Safety Health and Welfare Act 1977 is administrated by the state Department of Employment, Industrial Relations and Training. Section 32 of the Act requires the occupiers of a workplace and people carrying on an industry to

protect and ensure the health and safety of their workers. This extends to contractors and sub-contractors. Section 33 of the Tasmanian Act requires the employees to follow safety procedures, to wear any required protective clothing and to use any safety equipment provided.

Regulations under the Industrial Safety Health and Welfare Act cover a wide range of specific issues which include noise protection and machine safety. Separate legislation outlining the responsibility for the provision of personal protective equipment in the workplace includes the Dangerous Goods Act 1976 and the Public Health Act 1962. Tasmania does not have literature on specific information for employers on personal protective equipment program for the workplace. It therefore can be assumed that employers will be required to understand relevant regulations and acts, as well as the national codes of practice, regulations and standards.

4.1.7. Western Australia

The Occupational Health, Safety and Welfare Act 1984 (WA) created the Western Australia Occupational Health, Safety and Welfare Commission. The Western Australian Regulation (1988) extends detailed controls over noise protection, fire safety, workplace amenities and first aid. The Minister under the Act has the power to approve codes of practice which are used as guide and directions for the employer in health and safety matters. Section 19 requires the employer to provide a safe workplace, safe plant, safe systems of work and give information and training. Wherever a hazard in the workplace cannot be controlled, the employer is required to provide employees with adequate personal protective clothing and equipment. Western Australia does not have specific literature on personal protective equipment and its requirements, but is covered under different legislation and codes of practices, These include, Safe

Work on Roofs and Noise Control in the Workplace.

4.1.8. Northern Territory

The Work Health Act 1986 (NT) is administrated by the Northern Territory Work Health Authority. The Northern Territory Act, Section 29 provides for the employer to provide and maintain, so far is practicable, a working environment that is safe and without risks to the health of employees. The provisions under this Act is largely based on the Victorian Act with the employer providing safe plant and systems of work, safe handling and providing all necessary information and instruction. It covers the provisions for monitoring the health of employees and conditions at work. The literature research found no publications by the Northern Territory Work Health Authority in relation to specific information and responsibilities for employers on the provision of a personal protective equipment program in the workplace.

It therefore can be assumed that the national codes of practice and Australian standards are used as guidelines and requirements for employers in the provision of personal protective equipment.

4.2. Government Publication

Worksafe (NIOSH), has published a booklet on Prevention of Eye Damage, 1989. This booklet identifies workplace hazards as foreign bodies, chemicals and radiation. Prevention and control measures are detailed covering both engineering, process modification and the use of personal protective equipment. Personal protective equipment is described in detail with the relevant Australian standards. Its a concise 13 page booklet that focuses exclusively on eye protection and gives employers an extensive overview of hazard identification and control using eye personal protective equipment. Yet this information is not readily available to industries, due to lack of appropriate marketing of the

publication and its relevance to industry.

4.3. Non Government Organisations

Standards Association of Australia (SSA) is the national standards body in Australia. The Australian Standard mark scheme has been developed so as to have a set of acceptable Australian standard of quality products that meet safety requirements for the workplace and all appropriate equipment. Manufacturer may apply for and obtain a license from the Standard Australia and then use the "AS" mark of goods being manufactured to an appropriate Australian standard. This guarantees that the goods comply with that standard. The Standards Australia inspectors regularly inspect the manufacturing process and further samples may be taken for further testing.

Standards Australia have developed an extensive range of standards for personal protective equipment. Standards for head protection, eye protection, hearing protection, respiratory protection, whole body protection and hand and foot protection. Standards Australia produced an handbook on Occupational Personal Protection (1994). This handbook is structured into two general sections. The first section deals with a number of issues, firstly the principles of hazard identification, assessment and the hierarchy of control. If the hazard control is personal protective equipment, the steps for a personal protective equipment program are detailed. This is followed by the selection of personal protective equipment, training and responsibility and legislation.

The chapter on hazards extend to discussion on general issues and control of the following hazards: electrical, mechanical, noise, ionizing radiation, non-ionizing radiation, lasers, hazards on and under the water, chemicals and extremes of temperature. The second section of the handbook is made up of separate chapters covering protection of affected organs and parts of the body.

The Standards Australia Occupational Personal Protection Handbook 9 (1994), p 9, outlines *"general and specific information on the rationale for using various items of personal protective equipment and protective clothing, together with significant aspects of their selection, use, fit and comfort, care and maintenance, and appropriate instruction and training strategies"*: (Standards Australia Handbook 9 1994)

The publication of this booklet has been a considerable advancement in the use of personal protective equipment for hazard control within the workplace. The publication presented in a user-friendly format and should be easily accessible to all employers. For this reason, the promotion of the book is vital so that employers are aware of its existence and its relevance to their industry and industry hazards.

The only criticism of the publication is on the principles of hazard identification, assessment and control. The employer requires more assistance in hazard risk management for establishing the appropriate personal protective equipment program, a checklist is required for a workplace inspection to identify hazards; assessment factors and then control strategies. The small employer who does not have the internal resources of a large corporation may need a concise, user friendly method for identifying hazards, assessing and the information required to control the hazards.

Commercially, generally personal protective equipment program have been promoted within general occupational health and safety training sessions for management of occupational health and safety committees. Safety Concepts (1993) introduced personal protective equipment program within a training module for a large organization. This module stands alone and fails to cover risk management and the principles of hazard identification, assessment and control

and although this was discussed in a previous training session there is no referencing back to that session. It highlights the necessity for good engineering and proper maintenance of any plant and equipment to minimise the exposure and risk to employees.

The training package fails to address the issues that include personal protective equipment selection, program, record keeping and maintenance. Scriptographics, (Safety Concepts) have a series of publications on personal protective equipment. These include:

- Breathing Protection at Work (1991);
- Foot Protection at Work (1992);
- Head Protection at Work (1987); and
- Eye Protection at Work (1981)

These booklets are simplistic in their format, easy to read with plenty of diagrams. The presentation of these booklets are useful to complement a comprehensive training session on the use of personal protective equipment and should be aimed at the individual who may have a literacy problem. The information supplied in these booklets is not technical or detailed sufficiently to give the employer, all the required legislative background, requirements for an effective personal protective equipment program in the workplace, or the information on Australian standards for personal protective equipment. The booklets can give at times, incorrect messages to both the employer and employee regarding workplace hazards and the use of personal protective equipment as a control strategy. It should be noted that these booklets are produced in America and not necessarily focused on Australian workplace conditions and specific Australian/state legislative requirements. The promotion of these booklets can indicate to employers that this is a comprehensive

guideline for personal protective equipment in the workplace and hence they are meeting their legislative requirements.

The concerns raised by this type of promotion, is that employers who purchase and implement the Scriptographic publications in their workplace, believe that they are meeting their full responsibility in implementing an effective personal protective equipment program. This is misleading for employers. The safety industry should develop a standard on products/publications for personal protective equipment, so that employers who purchase these products can feel secure in the knowledge that the information they are paying for, will allow them to meet their legislative requirements, moral obligation and/or provide advice on where to locate specific technical detailed information on personal protective equipment.

TAFE NSW Occupational Health and Safety and Workers Compensation Unit, has developed a Personal Protective Clothing and Equipment Policy, Guidelines and Procedures Manual (1993). This manual covers all aspects of a personal protective equipment program within the TAFE working environment. The policy and guidelines are clearly defined with responsibilities outlined for managers, staff and students. The manual utilises the hazard risk management principles that are detailed in the Queensland's Code of Practice on Personal Protective Equipment and the WorkCover Authority NSW's hierarchy of control.

Issues such as selection, use of and common problems are discussed as well as a personal protective equipment program checklist for managers and supervisors to use as a guide to assess the workplace and the safe use of personal protective equipment. A list of the suitable types of personal protective equipment is provided for both teachers and students. This is outlined in sections according to

either the course or curriculum.

This Manual encumbers aspects of an effective and efficient personal protective equipment program and gives an outline for both employer, employees and students to follow in establishing such as program. It is well presented and user friendly. The only criticized that can be made, is that there is little to no guidelines for the care and maintenance of personal protective equipment and it is one industry specific, that is, the TAFE trade courses only.

4.4. Scientific Publications

Turnbull, (1993), states that "*the provision of protection against hazardous substances should be always be regarded as a last resort, when other control measures are not reasonable practical. Consequently, a poor personal protective equipment program may result in worker exposure to hazardous substances, possibly with fatal consequences.*" (P137) He maintains that an important part of a program for the routine use of personal protective equipment, is training and hazard appreciation are vital to the success of any program. He also states: *suitable support system for purchase, supply, storage, maintenance and disposal are necessary to complete an effective personal protective equipment program*" (Turnbull, p 137). Turnbull's summary of a personal protective equipment program is the rational for establishing a personal protective equipment program for small industry.

Hammer, (1989) emphasis the importance of management and their responsibilities for an effective, integrated and coordinated safety policies and procedures within the workplace. In particular, managers must ensure that "undue exposure of personnel to physiological, psychological, or physical stresses will be avoided because of condition that are unsafe due to inadequate design, improper operating instructions, faulty equipment, or lack of suitable

protective equipment" (Hammer 1989). Hammer additionally outlines management requirements for personal protective equipment in the workplace. These requirements outlined as *"approved protective equipment are suitable to guard against the specific hazard, location of personal protective equipment must be easily accessible and readily distinguishable, all workers being familiar with the capabilities, limitations and proper method of fitting, testing, using and caring for protective equipment... courses in instructions, training and practical sessions; devices are available to detect, warn, and protect against an impending or existing adverse environmental condition"*(Hammer 1989) and correct detection and warning procedures that specify appropriate action to be taken if a warning signal is activated. Hammer clearly outlines the managers responsibilities in the use of personal protective equipment, but fails to give a systematic approach on how to implement such a program into the workplace. Grantham, (1992) defines personal protective equipment "as eye protection, hearing protection, hand protection, protection from heat and cold, hard hats, safety shoes, skin and respiratory protection equipment".(p78) He further explains the need for personal protective equipment when there is any chance of an employee being in contact with a hazardous substance which may cause harm to their health, whether this contact is by skin contact, breathing a contaminated atmosphere or noise levels. Grantham concentrates his literature around the need for respiratory protective equipment.

He outlines the need for a program, administrative procedures, the importance of knowing the respiratory hazard, workplace assessment and the selection of the correct respiratory protection and protection factors. Grantham describes the categories of respiratory protective equipment and the various types of respiratory devices. This review of respiratory protective equipment is intended for advice to the organizations safety officer, not the small industry employer.

Ferry (1990), believes that management think of personal protective equipment as fundamentally separate from engineering controls where as, Ferry views personal protective equipment as *"one more engineering control device to be combine with other devices"*. (p219) Engineering controls are designed to eliminate the hazard at its source, but whenever there is a need for an extra measure of protection, workers will the be required to wear personal protective clothing or equipment. Ferry highlights the need for adequate protection by providing appropriate personal protective equipment from the particular hazard; to be maintained in good order; properly stored when not in use to prevent damage or loss and kept clean. Ferry defines personal protective clothing as hard hats, caps, protective overalls, jackets, aprons and full body suits. Hand protection with special sleeves and gloves, safety boots and shoes for feet protection and face shields, goggles, glasses can protect the face from splashes and other objects. Ferry notes that protective clothing can in itself create a hazard and for that reason all clothing should be properly fitted and selected for the right protection. Supervision is also required when personal protective equipment and clothing are used. Ferry relates engineering controls, which includes personal protective equipment, to cost/benefit in accident analysis, accident classification system and the cost/effectiveness analysis and compares the cost of alternate means for effective control of workplace hazards to the use of engineering controls, personal protective equipment or a combination of both.

This theoretical approach forms the basis of an effective management system of workplace hazards.

Mathew (1985) states that for some managers and workers, "health and safety begins and ends with workers using protective clothing and equipment. "(p454) He indicates that personal protective equipment places the burden on the worker

and that it represents "a failure of management to control the hazard".(p454) Mathew strongly believes that "in a properly controlled working environment, a worker should not need any personal protective equipment at all". (p454) However, he goes on to define personal protective equipment as clothing - overalls, helmets, gloves, boots, as well as equipment such as earplugs, respirators, safety glasses, welders masks and shields. He further highlights the problems of wearing personal protective equipment, the regulations, standards applying to personal protective equipment and the principles of a personal protective equipment program. Matthew's, whilst taking the union point of view on workplace hazards and protection, he has highlighted some important issues and concerns that employers as well as employees should take note when developing a personal protective equipment for the workplace.

A comprehensive reference on occupational epidemiology written by R. Monson (1990), looks at the types of information that can be used and methods of collection of data. He describes epidemiological studies that are common such as; heart disease, lung cancer and kidney diseases. He details specific working groups, with cases studies on coke ovens, beryllium, lung cancer, benzene and leukaemia and dioxin. These being the most common work related occupational diseases. He further deals with a range of issues such as; occupational studies and cancer; lung heart, neurological and psychological diseases and noise-induced hearing loss.

4.5 Occupational Health & Safety Journals

Occupational Health and Safety journals, aim to present up-to-date information to the Australian workplace and occupational health and safety professionals, so that they may develop informed opinions on a broad range of occupational health and safety issues. These publications emphasises personal protective

equipment as the last in the priority of hazard controls, but still an important control to minimise hazard risks. They discuss in depth the problems in the use of this equipment with a major focus on noise management and respirators.

Gardner, (1992), in the Health and Safety at Work journal, discusses the various types of disposable dust masks highlights the concerns that personal protective equipment despite the best intention of providing protection it often fails as a solution to workplace hazards problems. Gardner states that "personal protective equipment is issued and worn in a decorative fashion or kept stuffed in a pocket somewhere to be instantly put on the minute the boss appears".(p5) Gardner suggests that personal protective equipment should be suitable for the job; fit correctly; comfort, taking into account the thermal comfort; properly trained and finally can the employer afford the program and be committed to keeping it properly maintained. Gardner highlights the importance of thermal comfort in the Australian climate, suitable frequent rest breaks should be scheduled and adequate liquid is available. Gardner finally points out that the "employer should not expect the same level of productivity in the summer months as in the cooler times of the year from workers who have to wear personal protective equipment". (p5)

Catlin (1993), in Health and Safety at Work? outlines the current national moves towards greater accountability in the selection and use of personal protective equipment and the role of the supplier of this equipment. Government authorities with the development of various Codes of Practice, for example, Queensland's Code of Practice, Plant published April 1993 and the WorkCover Authority of NSW's publication of the draft Occupational Health and Safety regulation (Hazardous Substances) makes the suppliers of personal protective equipment accountable for both correct supply and training of the user in its use. Standards Australia personal protective equipment publications also pays

particular attention ensuring the suppliers and users of equipment are adequately informed of the selection criteria, use and care of the equipment. New standards include: Care, Selection and Use of Occupational Safety Footwear: Industrial Safety Gloves and Mittens.

All journals devote a section to provide up-to-date information and data on all products in the safety field. For example, the Australian Journal of Workplace Health and Safety up-date on new products in the May/June 1994 (p14-15) journal describes a product from MSA that allows for the monitoring of fibres, dust and toxic gases and is light enough to be handled in one hand. These articles give the opportunity for readers to have the new information and contact phone numbers for further details if they require. The publisher of this journal also undertakes occupational health and safety training for both committees and managers, and, as part of the training follow up, participants receive regular copies of the journal. For this reason, this journal has a wide and varied audience.

Biro (1993), in the Occupational Health Magazine outlines the problems associated with safety footwear and highlights the needs for AS Standard 2210 to be revised. The suggested changes to the AS Standard 2210 are in the area of a greater emphasis on comfort. The article highlights the difficulties in sizing of footwear especially taking into consideration anatomical differences between the European and Asian body sizing and features. Biro suggests that employers should consider what they want safety footwear to achieve as part of the workplace hazard assessment. It further suggests that suppliers should come and fit individual employees for the footwear. Comfort, good fitting footwear is essential for employees to wear this protection. Concerns are recognised when some industries such as mining and kitchens with their particular work environment can cause the safety boots/shoes to be wet, damp and mouldy. This

in turn will cause problems such as tinea and infections. In the metal industries, housekeeping is important because if shavings are not removed they can penetrate footwear and in turn impair protection against slipping. Finally, there is a very useful simple checklist for healthy feet. This checklist covers the safety shoes themselves, exercise and daily foot care.

Waugh (1993) in *Health and Safety at Work*, reviews where the occupational noise regulations are heading and looks at the changes in the regulations as well as the lower exposure standard. Waugh supports the importance of a noise management program in the workplace, with managers being trained to see the value of engineering controls. This may mean the purchase of new machinery and the overall design of the working environment being reviewed.

A systematic approach to hazard identification is suggested with methods such as noise surveys to measure the noise output accurately; determine short and long term plans to reduce the noise hazard with the replacing of noisy equipment; appropriate safety policies; training and finally the use of personal protective equipment. Waugh advises that employers should not look at personal protective equipment as the primary solution to noise problems and if personal protective equipment is to be used then it should be realistic and "*exceptionally well-managed program*". (p8) This factor is the underlying principle for the management of a personal protective equipment program. An effective management program should cover factors such as selection, care, safe practices and use of, maintenance program and training.

Another view of Waugh's work into hearing protection and noise management was discussed in the April 1993 *Occupational Health Magazine*. Waugh's paper discussed the effectiveness of hearing protection programs based on the use of hearing protection equipment alone. Waugh suggests "there was disturbing

evidence of the wide spread failure" (p8) of hearing protection based on personal protective equipment only. Waugh suggests that hearing protection programs can fail and can be placed into two broad groups. Firstly, the protection does not provide enough sound attenuation to reduce noise exposure due to a number of factors such as: incorrect fit, poor maintenance and inadequate instruction. Secondly, individuals do not wear protection during the entire time of their noise exposure which may be due to discomfort, difficulty in communication and psychosocial factors. Waugh suggests that the average wearing time of protection is 50% and that industry should not look at personal protection equipment as the prime solution to noise hazards in the workplace.

Waugh in this paper cites seven international research which concludes that there is ample evidence to support the majority of industrial hearing protection programs are not effective. Noise control should now be shifted from protection to noise management.

Ross Hampton, Australian Safety News October 1994, reports on a new standard and regulation covering the welding process for the assessment and control of welding fumes. The national hazardous substances regulation expected to come into place mid-1995, will require the employer to assess and control the risks arising from welding. These risks include hazardous airborne contaminants (dusts, gases or fumes) that include zinc oxide from gas metal arc welding of galvanized steel, ozone from aluminum, chromium from manual metal arc welding of stainless steel and organic fume from oil and residues on steel. Hampton describes the assessment steps and exposure levels of individuals depending on the work process, time spent in the affected area and effectiveness of ventilation. He highlights the need for occupational sampling by a competent person such as an occupational hygienist. To keep the exposure to hazardous substances as low as possible, Hampton calls upon the hierarchy of

control with the use of personal protective equipment the last measure. He also highlights the importance of training in the use and maintenance of control measures. Annette Hoskin of Unisearch, explains the necessity for setting standards for eye protection. In her article published in the Australian Safety News, August 1994, she outlines several problems relating to the use of eye protection. Educating the wearer in the importance of eye protection, the need for comfort, fit and adjustable to their needs.

Ultraviolet radiation has been known to affect the eye and cause such problems as 'welder's flack' and painful red eye complaint. Hoskin goes on to say that ultraviolet radiation may cause greater harm and affect the black surface of the eye or retina. Recent changes to the standard for eye protection gives a much higher level of protection for the wearer. Welding curtains and active welding filters are two recent developments in welding eye protection. A successful eye safety management plan must include hazard assessment and measures to contain these hazards, vision screening and the wearing of eye protectors by those people who are risk.

4.6 Manufacturer Publications

In Australia, MSA is involved in manufacturing of personal protective equipment, research in product development to meet Standards Australia and many products have been designed to suit Australian conditions and work practices. MSA provide an extensive customer service with quantitative facial fit testing for full and half face mask respirators; hydrostatic high pressure cylinder testing and information for employers including videos, films and mini-seminars and training facilities with on- site training seminars by trained staff on product use and product maintenance systems. MSA (1993) has a NATA certified Instrument Laboratory and "operates an Australian Standards

approved test facility covering head/eye/face/hand and respiratory protection devices" (p84). MSA has an extensive catalogue that contains general description of their products which includes miners' lamps; helmets; breathing apparatus; hearing protectors; protective clothing and eye and face protection. MSA acknowledges the catalogue describes some uses and performance capabilities of their products and is general information only. MSA further outlines the need for the products to be used by qualified, trained personnel and after training and full understanding of the instructions, labels and accompanying literature is read.

Blackwoods (1992), a distributor of safety products has a catalogue which includes a number of manufacturers products such as MSA for head protection, eye & face protection; Bilson, Norton, Cigweld and 3M for respiratory protection. Blackwoods catalogue is a display of products, with no advice on the performance capabilities and uses of individual products. This assumes that the employer has a level of expertise or knowledge.

GIG, The Commonwealth Industrial Gases Limited (1993), has a wide range of product and services which includes applications in gases, sophisticated gas technologies, welding and cutting techniques and see themselves as one of Australia's leading manufacturer and marketer of gases and gas related products. Their personal protective equipment range includes respiratory protection, hearing protection, protective clothing, foot and eye protection, face and hand protection and head protection. As an introduction to each subsection in their catalogue, CIG outlines some technical information regarding the specific personal protective product. This information sells their product to the buyer as the optimum product. Their catalogue does not address the issue of hazard risk management and personal protective equipment program to meet legislative requirements. CIG catalogue fails to acknowledge the need for the

employer to have training and full understanding of the instructions, labels and accompanying literature.

3M, Occupational Health and Environmental Safety Division (1993)? has developed an extensive respirator selection guide. This guide has detailed on the respirator selection criteria that includes, respirator program management, respirator fit, wear time, maintenance, protection factors, hazard ratio, effects from skin or eye contact worker activity, location of hazardous area, respirator characteristics, capabilities and limitations with finally covering issues as general use instructions and limitations. 3M-respirator selection guide has identified chemical/respirator listing that outlines the chemical name, respirator code that indicate the requirement for protection (i.e. eye) and other issues (i.e. organic vapour) followed by comments relating to the respirator code; synonyms and finally safe exposure standard relating to that chemical. This gives an extensive guide to respiratory protection, but assumes the reader who may be the employer to have a working knowledge of chemicals in their workplace. The employer remains reliant on the professionalism of the salesman. 3M offers training and support materials and service for the occupational health and safety industry. With training, they have considered the planning of not only the training strategies for the correct use and maintenance of their respirators, but, have examined general training issues such as information, styles of training and material presented. Individual needs of the organisation or workplace can be considered and training tailored to their industry. This is a positive service to assist the employer in developing a personal protective equipment program.

Norton describes themselves as a leading supplier of quality occupational health and safety products. They offer a comprehensive range of personal protective equipment which includes head, eye, face, hand and respiratory protection.

Norton produces a catalogue (1990) which has an extensive section on respiratory and hearing protection.

These sections outline program requirements, responsibilities, establishing written operating procedures, respirator selection, training of users, maintenance, storage, monitoring and evaluating the program. This approach to personal protective equipment does not take into account risk management of hazard identification, assessment and control and the program focused on Norton products only. Norton promotes their catalogue as a "*single reference source for safety needs. It covers an extensive range of safety products, all supported by Norton's expertise and dependability*". (P1) This type of promotion is aimed at ensuring the employer that in purchasing their products and utilizing their personal protective equipment program they will be meeting their legislative requirements. This is questionable, Norton's catalogue has a format that could be misleading to employer and employees, in the purchase of personal protective equipment. Norton displays their item no's with AS numbers that could indicate to inexperienced employers and employees that the item being purchased meets Australian standards. As stated previously, the safety industry needs to develop a standard for product information so that the employer is aware of all issues and factors.

4.7 Overseas Experience

If Australia is committed to being part of the wider overseas community and in particular the Asia-Pacific, it would stand to reason that we should learn and understand the occupational health and safety issues in these countries.

F. Gill, in his paper Occupational Hygiene Standards for Airborne Substances the European and UK Approach, discusses the need for occupational exposure standards having to protect the worker from being exposed to a hazardous

environment and contracting an occupational disease. Gill states that the setting of standards to protect the health of workers is difficult and that various approaches have been tried to achieve a reasonable result. The Council of the European Communities has established a Scientific Experts Group on Occupational Exposure Limits to determine various factors including "short-term limits of exposure, the eight hour weight averages and skin notation". (Gill 1992) As many countries have been setting their own standards for many years, notably: Sweden, Germany, Holland and United Kingdom, their documents and mechanisms for producing their own evidence has to be considered. Gill proposes "a unified advise at an international level is required": (Gill 1992)

Wiedner (1993), also discusses international standards and their inconsistencies. These standards apply to safety equipment and their use. The variety of standards range from DIN (Germany), AS (Australia), BSI (UK), ANSI (USA), CSA (Canada), JIS (Japan) and CEN the new European standard. Wiedner suggests that the next step should be the development of international standards which would be both logical and provide consistency in the manufacturing of personal protective equipment. The need to work towards more uniform standards in occupational health and safety in overseas countries is to reduce the opportunity for companies to export occupational hazards to some less developed country. Particular concerns are industries relating to asbestos, organic solvents, vinyl chloride monomer, lead, cadmium and other metals and pesticides. There is a need for substantial links between all occupational health and safety practisers to be proactive and work for commonality of standards.

Dr Niki Ellis in the Occupational Health Magazine (March 1994), gave an overview on the Hong Kong experience in the management of occupational diseases. She found that noise-induced hearing loss was not currently compensable in Hong Kong although they are investigation Australian

mechanisms for this occupational disease. Pneumoconiosis is one of the compensable diseases in Hong Kong and currently affecting over 2,000 workers. The diagnosis in most these cases was silicosis and the workers coming from the construction industry. Further to this, prevention strategies were being developed for the jewellery industry as this is a high risk industry being exposed to a number of hazards such as; benzene, cyanide and organic solvents in the plating process, noise and infra-red radiation and ergonomics.

New Zealand under the Health and Safety in Employment Act 1992 promotes excellence in the management of workplace hazards. The Act place responsibilities on the employer to provide a safe and healthy workplace. Employees have a responsibility to work in a safe manner and not to cause harm to any other persons. Publication on respiratory protection has been developed by the Occupational Safety and Health Service of the Department of Labour. This Guide to respirators and Breathing Apparatus (1992) gives general principles of respiratory protection; classification of hazards, contaminants, confined spaces; workplace exposure standards; protection factors; medical aspects; precautions for normal use; respiratory protection program; training and instructions; fitting, supervision, maintenance; storage; inspections and cleaning. This booklet provides a comprehensive guide for employers to following in the selection of respiratory protective equipment.

It also recognised that the booklet does not provide technical and detailed advise and that the employer should follow through with expert advice if necessary. What is interesting, Standard's Association of New Zealand has adopted Australian Standards AS 1716: 1991 and AS 1715:1991 for respiratory protection.

Generally, personal protective equipment literature falls in line with U.S.

Occupational Safety & Health Administration (OSHA) standards and NIOSH. Johnstone (1993) at the recent Australian Institute of Occupational Hygienists Annual Conference, explained the OSHA standard on OSHA protection (29CFR 1910.134). Johnson outlines in the introduction to respirator protection a standard description about when the use of respiratory protection should be considered. The standard states:

"In the control of those occupational diseases caused by breathing air contaminated with potentially harmful dusts, fumes, spray, mists ..., the primary objective shall be to minimise workplace contamination. This shall be accomplished as far as feasible by accepted engineering control measures...when effective engineering controls are not feasible, or while they are being implemented or evaluated, appropriate respirators shall be used pursuant to the following requirements".

The American Industrial Hygiene Association published a booklet on Respiratory Protection - A Manual and a Guideline (1991). The publication highlights the necessity for respirators to be properly selected, fitted, worn, maintained and presented to the workplace in a well designed personal protective equipment program. Then the provision of personal protective equipment for workers will provide effective protection.

Australian Safety News, (March 1994) outlines a study undertaken by the Mines Accident Prevention Association of Ontario. 95 % of confined spaces fatalities were caused by a hazardous atmosphere such as oxygen deficiency or toxic or flammable gases. In 25% of the fatalities the work process such as using solvents or welding change the atmosphere conditions causing it be hazardous.

Continuous monitoring is essential for any workplace that has the potential to become hazardous. The issue of personal protective equipment would not have an effect on the situation and hazard. Careful planning is essential before any work process commences. Confined spaces is a high-risk job and there is a wide variety of potential hazards especially oxygen deficiency. Oxygen levels that fall below 18% may result in impaired body functions and respiratory distress. Hazard assessment and control measures should be considered in depth and the use of personal protective equipment as part of an overall hazard management plan.

The Canadian Centre for Occupational Health and Safety have developed an extensive range of safety information sheets on a variety of personal protective equipment and programs. These include personal protective equipment checklist; PPE - Safety Glasses; PPE - Safety Footwear; PPE - Hearing Protection; PPE - Selection and Care of Headwear; PPE - Program; PPE - Chemical Protective Gloves; PPE - Hand Protection; PPE - Care of Respirators; Welding - Protective Clothing and Working in a Standing Position - Footwear and Floors. These information sheets, are a one page quick reference guide for employers to use. They are designed and recommended to be read in conjunction with the relevant standards - Canadian Standards Association. Unlike Safety Concepts Scriptographics publications, these are not promoted to be a comprehensive guide to a personal protective equipment and the information supplied in these information sheets meet a industry standard of appropriate information.

The Health and Safety Council Directive (1989), was established to give a minimum health and safety requirements for the use by workers of personal protective equipment program at the workplace. This directive was to come into force no later than 31 December 1992 and covers all sectors of work activity

and places on the employer the prime responsibility for the health and safety of workers. All personal protective equipment must comply with the PPE Product Directive. As part of this directive, a publication on personal protective equipment was written and to be use as a basic safety requirements in respect of the design and manufacture of personal protective equipment. This publication (1990), includes general requirements of design, levels of protection, suitable material, comfort and efficiency, lightness and strength, information on the storage, maintenance, accessories as well as ageing factors, personal protective equipment in explosive atmospheres, emergency situations and personal protective equipment for use in dangerous situations. This publications gives an insight into manufacture requirements in designing personal protective equipment.

Employers are required to provide a safe and health workplace. In meeting this obligation, the development of a personal protective equipment program may be required as one hazard control measure. Information on the requirements of a program may be provided by the manufacturers/ suppliers regarding the technical detail and suitability of personal protective equipment for protection against hazards. But little information is available on the method of the selection process, training/education and legislative requirements of record keeping. As the literature review highlights, there is no single document that assists employers to develop a method of selecting correct personal protective equipment for use when working in hazardous environments in small industry.

5. RESULTS & DISCUSSION

5.1 Statistics:

Worksafe Australia and WorkCover Authority of NSW provide statistics on the extent of work related occupational diseases and deaths in Australia. Both these

Authorities states that there are difficulties in collating an accurate picture of occupational diseases, due to the current recording systems and data quality. Currently the occupational diseases recorded, range from occupational overuse syndrome, hernia, industrial deafness, mononeuritis, dermatitis, parasitic, neoplasm (skin cancer and others). Lung diseases such as asbestos, silicosis, miners lung, lung cancer and mestholima are recorded in a separate data collection either with the Dust Disease Board or with the Mining Industry.

The WorkCover Authority of NSW, Workers Compensation Statistics (1991./92) shows that for NSW, there were 51,077 new claims for that period of which "9, 792 were for occupational disease which represents 19% of all workrelated injuries ". (WorkCover Authority 1991/92)

Statistics indicate that 65% of occupational diseases result in **permanent disability**, of which 92% are **industrial deafness** claims with the cost incurred exceeding \$33 million dollars for NSW alone. (WorkCover Authority NSW 1992/93).

From workers compensation statistics as reported by WorkCover Authority of NSW (1992/92), the overall occupational diseases incidence rate for the manufacturing industry, in particular the non-metallic mineral products, is 28.3 per 1,000 workers. Of which 24.6% relates to industrial deafness, this being the third highest, and 0.1 per 1,000 workers for skin diseases which is one of the lowest. In the metal products industry the incidence rate of 24.3 per 1,000 workers for occupational diseases, of which 21.9 per 1,000 workers for industrial deafness and 0.3 per 1,000 workers for skin diseases.

The building construction industry has an incidence rate of 7.2 per 1,000 per workers for all occupational diseases where as for the non- building

construction the incidence rate is 20.5 per 1,000 workers. Industrial deafness for the non- construction is 16.0 per 1,000 workers and 0.7 per 1,000 workers for skin disease.

The mining industry has the highest incidence rate for both industrial deafness and skin disease.

5.2. Handbook trial participants characteristics:

Although the sample was small, the trial of the handbook covered three small industry environments. The industries consisted of automobile repairing, a small window manufacturing and the building trade.

The sample for the building industry consisted of a self-employed carpenter and builder. Both use sub-contractors and worked on a variety of work sites. The education background of these small operators ranged from the trade course to a degree in architect/draftsman.

Selected was a window manufacture recently established. Four employees work in this factory along with the two employers (husband and wife). The employer plays an integral role in the work process. The education background of the employer is university based. The husband has two degrees in engineering and science and the wife is a registered nurse and has a degree in psychology. The employees have no formal tertiary qualifications.

The Automobile Industry trial focused on different types of work environments such as: the employer of a mobile car repair service and the employer of a well-established mechanical repair business. Each employer has trade qualifications and 20 or more year's experience. A fourth year motor mechanic from a separate

mechanical repair business participated and provided the employees view. This provided data on a range of industry concerns and current practices on the hazard management.

5.3. Industry comments about the handbook:

For this trial a questionnaire was not used. Participants were requested to comment on the language used, layout, information supplied and its relevance and usefulness to their industry.

Comments include:

5.3.1. Language: overall the language used was appropriate and easy to understand. There were two word changes required (egress and rhinitis), as two out of four participants did not understand the meaning.

5.3.2. Layout: the first reaction was the size of the handbook. The handbook consists of 55 single pages. It was noted that as participants began to read the handbook, the information enclosed became more of interest to them than the size of the handbook. However, it is visualized that any further development of industry specific personal protective equipment program handbook, will contain information relevant to that industry which in turn will reduce the size of the handbook.

All participants commented that the industry specific information should be in the front of the handbook. This allows this information to be used as a easy access guide for employers to follow. For employers to have an active interest in dealing with workplace hazards and the use of personal protective equipment, the handbook must be user friendly, clear concise informative and attractive to them.

5.3.3. Contents: very positive feedback on the information supplied. Generally, the participants were not aware of the specific information regarding the use of personal protective equipment as a hazard control and found the information both useful and practical to their specific needs. Interestingly, as participants worked through the handbook they actually used the information. For example, reading the maintenance requirements for respirators, one participant went and gathered up all their respirators, washed, dried and places them in a clean plastic bag until a permanent storage area could be constructed. Participants requested more information on the material safety data sheet for the various spray packs used in the manufacturing process, along with a discussion on new work practises when using these spray packs.

Whilst there was no significant changes to the handbook, the results of the trial revealed that occupational health and safety in small industry has a low priority and a number of key issues was highlighted.

5.4. Key issues relevant to small industry:

5.4.1. There was found to be a significant number of occupational health and safety risks such as: manual handling, occupational overuse syndrome, use of chemicals, solvents, dusts and gases.

5.4.2. Worksafe and WorkCover acknowledge that there is an insufficient database for small industry and in particulate occupational diseases. This insufficient database can be due to two problems, one of under reporting of workrelated injuries and diseases especially in small industry, and the current reporting system used by Worksafe and WorkCover Authority. It was highlighted in the trial of the handbook, that the participants were not aware of the accident reporting system. There is a need to educate and inform the small

employer that there is a legal requirement to report workrelated injuries and diseases.

5.4.3. Extreme parochialism within small industry to occupational health and safety resources is evident. This again supports the need for information and resources to be industry and work process specific. Information published by the WorkCover Authority of NSW on the Spray Painting Industry has been widely distributed and well known in the mechanical repair business.

5.4.4. Isolation of small industry in relating to other industries, occupational health and safety information and resources is a concern. For example, in establishing a small industry, the employer must meet local government regulations prior to the industry being open for business, but in contrast, the small employer takes out workers compensation with little to no knowledge of occupational health and safety management requirements. There are no similar regulations for the employer to meet occupational health and safety requirements prior to opening for business. For some medium to large industries an occupational health and safety officer is employed to facilitate the process of safety management. Small industries rely on the employer to be informed of all matters relating to occupational health and safety.

5.4.5. Small industry is productivity-orientated based with the emphasis on profit and business and not occupational health and safety. They view safety as second or third in the priority order and view it as an intrusion and a separate part of business and another example of government interference and control. Safety needs to be developed as a component of the overall management practice and not seen in isolation. Good management is good occupational health and safety. Safety needs to be marketed as a benefit to the business and results in a reducing of accident/ injury costs, hence increasing profits.

5.4.6. Although the participants had a reasonable level of education and literacy skills, there was an issue of occupational health and safety education beyond the apprenticeship course at TAFE.

The trial participants show no relevance to updating occupational health and safety knowledge as they do with new technology, such as the computerisation of cars. Comments from the automobile trade highlighted the fact that they were aware of some of the new regulations such as spray painting requirements, but showed no concern about their safety and the use of aerosols in the workplace.

5.4.7. Generally, it was found that the small employer was aware of some hazards in the workplace and the need for protection. For example, guards on machines, housekeeping and factory layout. Knowledge was extremely limited on the hidden hazards in the workplace. A hazard management plan incorporating environmental monitoring and the use of personal protective equipment was not considered important.

5.4.8. It was found that the use of personal protective equipment was widespread, although this use of personal protective equipment did not necessarily meet a satisfactory level of protection from the work hazards present. The small employer relies on the information and recommendation for hazard protection given by the suppliers of personal protective equipment, manufacturer's information supplied on the packaging, or the hardware store attendant about the equipment required to protect against workplace hazards.

5.4.9. It was found that the personal protective equipment used was dirty, required maintenance, repair and for some, replacement. The provision of storage was not available and the equipment was placed on either the bench or a

nail on the wall in the work process. All equipment was shared.

5.5. Legislation review:

Collected was information about legislation and in particular the principles of hazard management in the workplace, the use of personal protective equipment as a hazard control measure and its relevance to small industry. Reviewed were the major issues in a personal protective equipment program. For example, the selection, types of equipment, the care, maintenance requirements and common problems associated with personal protective equipment. It was found that existing supporting evidence was not available to give practical information for employers to follow.

5.6. Occupational Health and Safety Publication Review:

The occupational health and safety publications were found to have a bias towards two personal protective equipment types. This being: respirator and hearing protection. For example, it is estimated that for each article on footwear protection there would be 10 on hearing protection. This bias in the industry needs to be addressed and focus on all personal protection equipment as they all form a vital part of hazard management. Overall, there was little to no information for the small employer to assist them in developing a personal protective equipment program. These journals are written for the safety professional.

6. CONCLUSION

The handbook was trailed in three small industry environments to determine its relevance and usefulness to industry. The industries consisted of automobile repair, both employer and a fourth year mechanic, a small window manufacturer and the building trade. Results of the trial was that the handbook needed no significant changes. In addition, it served to illustrate some common problems in small industry and its relationship with occupational health and safety.

Small industry sees occupational health and safety as an intrusion, a separate part of business, and another example of government interference and control. Small industry is productivity-orientated with the primary emphasis on profit and business. They view safety as second or third in the priority order of business requirements. For example, local government regulations are required to be met prior to opening of a business, hence this has a higher priority. There are no similar regulations for the employer to meet occupational health and safety requirements, except for workers compensation.

Personal protective equipment was found to be used in small industry. However, the principles of hazard management, with an effective personal protective equipment program to meet these workplace hazards, was not in place.

The literature review suggested that information on hazard management and the use of personal protective equipment is available for employers to follow. Cross at the recent Industrial Commission Occupational Health and Safety Inquiry, stated that *"small business tend to see occupational health and safety as just more paperwork, and low priority paperwork as that."* (Cross 1994). The Commissioners agreed that legislation would be more useful to small industry if written in plain English. The Inquiry suggested that legislation was written for

legal purposes and not for practical information to allow employers to understand their obligations.

Knowledge of occupational health and safety was fragmented with little understanding on what needs to be done and how to achieve compliance with legislation.

There is a need for legislation to be prescriptive because small industry relies on being told in detail, what needs to be done to comply to legislation. Small industry rely on the employer to be informed of all matters relating to occupational health and safety. This requires the occupational health and safety information and resources to be industry and work process specific. Then the small employer can develop an effective occupational health and safety system for their workplace.

7. RECOMMENDATIONS:

The occupational health and safety industry need to address several issues:

7.1. Legislation, occupational health and safety information and resources available to employers needs to be prescriptive, because small industry rely on being told in detail, what needs to be done to comply with legislative requirements. These publications should be readily available with appropriate marketing and distribution through industry by the Associations, Unions, Local Government and State Government Authorities. Safety Inspectors have the expertise and knowledge to give employers on safety management and should be able to give this advice to employers without threatening a breach of legislation.

7.2. Education institutes need to develop an occupational health and safety module within each academic program. The emphasis of safety management at this stage will enhance the right understanding and attitudes of employees and employers.

7.3. The occupational health and safety industry, as well as education institutes take up the challenge and develop industry specific occupational health and safety publications, focusing on the hazard principles and the use of personal protective equipment.

8. REFERENCED MATERIAL

Relevant legislation is State Government sourced:

NSW: WorkCover Authority.

Occupational Health and Safety Act 1983

Occupational Health and Safety Regulation - Confined Spaces

Factories, Shops and Industries Act 1962

Factories, Shops and Industries Regulation - Factories (Health and Safety - Asbestos processes) Dangerous Goods Act 1975

VICTORIA: Victoria Occupational Health and Safety Commission.

Occupational Health and Safety Act 1985

Occupational Health and Safety (Asbestos) Regulation 1992 (Vic).

Occupational Health and Safety Health (Harmful Gases, Vapours, Fumes, Mists, Smokes and Dusts) Regulation 1984

Occupational Health and Safety (Lead Control) Regulations 1988

QUEENSLAND: *Division of Workplace Health and Safety, Department of Employment, Vocational Education, Training and Industrial Relations.*

Workplace Health and Safety Act J 989

Code of Practice, Personal Protective Equipment in Building work 1992

Code of Practice for Noise Management at Work 1993

Code of Practice, Selection, Provision and Use of Personal Protective Equipment 1991

SOUTH AUSTRALIA: *Occupational Health and Safety Commission.*

Occupational Health, Safety and Welfare Act, 1986

WESTERN AUSTRALIA: *Department of Occupational Health, Safety &*

Welfare. Occupational Health, Safety and welfare Act, 1984.

TASMANIA: *Department of Labour and Industry. Industrial Safety, Health and Welfare Act, 1977.*

ACT: *Occupational Health and Safety Office. Occupational Health and Safety Act, 1989.*

NORTHERN TERRITORY: *Work Health Authority. Work Health Act, 1986.*

ACT Occupational Health & Safety Office, 1993, *Personal Protective Clothing and Equipment*, Government Printers, Canberra.

ACTU, 1994, *Hazards of Work*, ACTU National Occupational Health and Safety Units and State/ Territory Trades & Labor Council Training Centre, Canberra.

Andrew, S., Ed., April 1993, *Hearing Protection Is It Effective*, Occupational Health Magazine, Issue No. 60, p8, Pub. Newsletter Information Service, Sydney.

Blackwoods, 1991, *National Safety Products Guide*, Blackwoods, Sydney.

Biro, G., October 1993, *Good Fit Key to Ensuring use of Safety Footwear*, Occupational Health Magazine, No 66, Pub. Newsletter Information Service, Sydney.

Biro, G., May 1993, *Better Testing of Respirators around the Corner*,

Occupational Health Magazine, No 61, Sydney.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *Personal Protective Equipment - Checklist*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Safety Glasses*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Safety Footwear*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Hearing Protection*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Selection and Care of Headwear*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Program*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Hand Protection*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *PPE - Care of Respirators*, Ontario Canada.

Canadian Centre for Occupational Health and Safety, January 1989, Safety Infogram, *Working in a Standing Position - Footwear and Floors*, Ontario Canada.

Catlin, F., June 1993, Personal Protective Equipment: The Case for Competent Suppliers, Health and Safety at Work, Vol. 11, Pub. Scriptographics Sydney.

CCH, 1991, *Planning Occupational Health Safety*, 3rd Edition, CCH Australia.

CIG Gas & Gear, 1993, Safety Products Manual, The Commonwealth Industrial Gases Ltd., Sydney.

GIG, 1992, Your Safety is Our Business - Guide to Personal Industrial Safety Products, GIG, Australia.

Cross, J., October 1994, Paper delivered to The Industry Commission Occupational Health and Safety Inquiry, Occupational Health Newsletter Issue No 333, Manly.

Department of Employment, Vocational Education, Training and Industrial Relations, Division of Workplace Health and Safety, 1992, Employers Guide to the Personal Protective Equipment Code, Department of Employment, Vocational Education, Training and Industrial Relations, Brisbane.

Department Training Industry, 1989, Personal Protective Equipment, Official Journal of the European Communities, No L393, London, pp 18 - 25.

Department of Labour, Occupational Safety and Health Information Centre, 1992, Guide to Respirators and Breathing Apparatus, Occupational Safety and Health Information Centre, New Zealand.

Ellis, N. Dr., March 1994, Lessons to be *Learned Hong Kong OHS Approach*,

Occupational Health Magazine, Issue No. 70, Pub. Newsletter Information Services, Sydney.

Ferry, T., 1990, *Safety and Health Management Planning*, Van Nostrand Reinhold, New York.

Gardner, S., 1992, *PPE. Last on the List but Vital to Effective OHS Management*, Health & Safety at Work Publication, Vol. 10 # 5, October 1992. Ed. Dean, J., Scriptographics Publications Pty Ltd., Sydney.

Gately, G., 1992, *Implementing Hazardous Substances Regulations*, Health & Safety at Work Publication, Vol. II # 2, April 1993 Ed. Dean, J., Scriptographics Publications Pty Ltd., Sydney.

Gill F.S. October 1992, *Occupational Hygiene Standards for Airborne Substances the European and UK Approach*, The 26th NSW Occupational Health and Safety Convention and Exhibition Proceedings, WorkCover Authority of NSW.

Gore, G., Ed., 1994 *New Products*, The Australian Journal of Workplace Health and Safety, Vol. 12 #3, p14-15, May/June 1994, Scriptographics Publication Pty Ltd., Sydney.

Gratham, D., 1992, *Occupational Health and Hygiene, Guidebook for the WHSO*, D. Grantham, Brisbane, p20

Hammer, W., 1989, *Occupational Health Safety Management and Engineering*, 4th Ed., Prentice Hall, Brisbane.

Hampton, R., October 1994, *What the Weld Needs Now*, Australian Safety News, Niche Pub. Victoria.

Hoskins, A., August 1994, *Setting Standards for Eyes*, Australian Safety News, Niche Pub. Victoria.

Industrial Foundation for Accident Prevention (WA), 1991, *Industrial Eye Accident prevention and Treatment*, Lions Eye Institute, Perth.

Jayjock, M. A., Levin, L., 1984, *Health Hazards in a Small Automotive Body Repair Shop*, Annual of Occupational Hygiene., Vol. 28 No 1, pp. 19 -29.

Gardner, S., 1992, *PPE: Last on the List but Vital to Effective OHS Management*, Health & Safety at Work Publication, Vol. 10 # 5, October 1992. Ed. Dean, J., Scriptographics Publications Pty Ltd., Sydney.

Johnston. A., CIH, Dec.1993, *Management of an Effective Respiratory Protection Program*, Plenary papers 1.4., Australian Institute of Occupational Hygienists, Twelfth Annual Conference, NSW Australia.

Joyjock, M. A., Levin, L., 1984, *Health Hazards in a Small Automobile Body Repair Shop*, Ann. of Occupational Hygiene, Vol. 28, No 1,p 10-29

Lewis, P., 1993, *Health Protection from Chemicals in the Workplace*, Ellis Horwood Ltd., England.

3M Occupational Health and Environmental Safety Division, 1993, *1993 Respirator Selection Guide*, 3M Australia, Pymble.

Mathews, J., 1985, *Health and Safety at Work*, Pluto Press, Sydney, pp 159 - 160.

Monson, R., 1990 *Occupational Epidemiology*, 2nd Ed. CRC Press USA.

MSA, 1993, *A Guide to Safety Equipment*, MSA (Australia) Pty Ltd., Sydney.

National Occupational Health and Safety Commission, *December 1989, Prevention of Eye Damage*, Australian Government Publishing Service Canberra, Sydney.

Norton, 1991, *Norton Safety for Personal Protection*, Norton Pty Ltd., Australia.

Scriptographic Booklet, *What you should know about Foot Protection at Work*, Scriptographic Publications Pty Ltd., Mass. U.S.A., 1982.

Scriptographic Booklet, 1957, *What you should know about Head Protection at Work*, Scriptographic Publications Pty Ltd., Mass. U.S.A.

Scriptographic Booklet, 1987, *What you should know about Hearing Conservation*, Scriptographic Publications Pty Ltd., Mass. U.S.A.

Scriptographic Booklet, 1984, *What you should know about Skin Protection at Work*, Scriptographic Publications Pty Ltd., Mass. U.S.A.

Scriptographic Booklet, 1981, *What you should know about Eye Protection at Work*, Scriptographic Publications Pty Ltd., Mass. U.S.A.

Shaw, A., 1992, *Personal Protective Clothing and Equipment Booklet*, Occupational Health and Safety Authority, Victoria.

Shaw, S., Chase, R., Moors, L., Toohey, J., 1994, *Occupational Health and Safety Best Management Practice*, Harcourt Brace, Sydney.

Smith, B., Ed. March 1994, *Confined Spaces: A North American Perspective*, Australian Safety News, p 37, Niche Pub. Vic.

Standards Australia, 1994, *Occupational Personal Protection*, Standards Australia, Homebush NSW.

TAFE NSW Occupational Health and Safety and Workers Compensation Unit, 1993, *Personal Protective Clothing and Equipment Policy, Guidelines and Procedures*, TAFE NSW Sydney.

Turnbull, P. J., 1993, *Personal Protective Equipment*, Health Protection from Chemicals in the Workplace, Pub. Ellis Horwood, England.

Waugh, D., August 1993, Where are occupational noise regulations heading?, Health & Safety at Work Publication, Vol. II # 4, Ed. Dean, J., Scriptographic Publications Pty Ltd., Sydney, 1992.

Wiedner, K., June 1993, *Personal Protective Equipment Markets get Bigger as the world Gets Smaller*, Health and Safety At Work, Vol. 11, Pub. Scriptographics, Sydney.

WorkCover Authority NSW., Nov. 1990, Occupational Health and Safety Bulletin No: 1 12387/70, *Occupational Health and Safety Aspects of Spray*

Painting, Sydney

WorkCover Authority NSW., October 1990, Health and Safety Notes, *A Workplace Personal Protective Equipment Program*, Sydney.

WorkCover Authority NSW., May 1992, *Toxic Gas in Confined Spaces*, Sydney.

WorkCover Authority NSW, March 1992, *Working with Fiberglass Reinforced Plastics*, Sydney.

WorkCover Authority NSW, Nov. 1991, *Spray Painting Booth Construction*, Sydney.

WorkCover Authority NSW, Nov. 1991, *A Guide to Dust Hazards*, Sydney.

WorkCover Authority NSW, Dec. 1991, Draft Code of Practice, Control of Workplace Hazardous Substances, Sydney.

WorkCover Authority NSW, June 1992, *Quiet, Please!, How Employers can prevent noise-induced hearing loss*, Sydney.

WorkCover Authority NSW, Sydney 1993, Health and Safety Notes, *Hierarchy of Hazard Controls*, Sydney.

WorkCover Authority NSW, October 1992, Health and Safety Notes, *A Workplace Personal Protective Equipment (PPE) Program*, Sydney, 2nd Ed.

WorkCover Authority NSW, April 1991, *List of Approved Respiratory Protective Devices*, Sydney.

WorkCover Authority NSW, November 1991, Health and Safety Notes, *Asbestos - Respiratory Equipment for Asbestos Removal Work*, Sydney.

WorkCover Authority NSW, Nov. 1993, *Code of Practice, Safe works on roofs Part I -Commercial and industrial buildings*, Sydney.

WorkCover Authority NSW, August 1993, *Code of Practice, Mono-strand post-tensioning of concrete buildings*, Sydney.

WorkCover Authority NSW., 1993, *Workers Compensation Statistics New South Wales 1991/92*, Sydney.

WorkCover Authority NSW, Dec. 1991 Draft Code of Practice, Control of Workplace Hazardous Substances, Sydney.

WorkCover Authority NSW, February 1993, *Providing First - Aid at Work*, WorkCover Authority, Sydney.

WorkCover Authority NSW, November 1991, *How to Prevent Silicosis - Dust in the Workplace*, WorkCover Authority, Sydney.

WorkCover Authority NSW, 1988, *Material Safety Data Sheets, How to find out about chemicals used at your Workplace*, WorkCover Authority, Sydney, September.

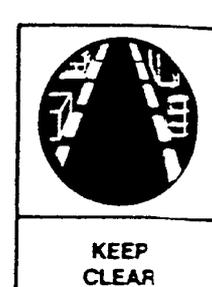
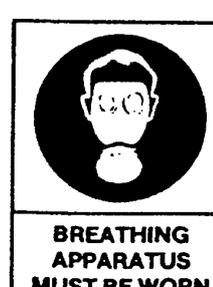
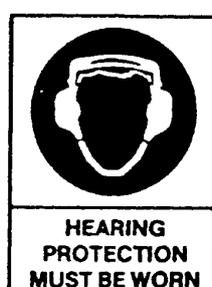
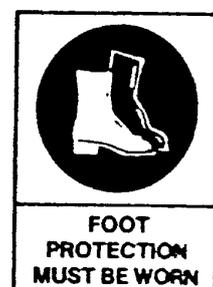
Workers Health Centre, 1988, *Work Hazards*, Workers Health Centre, Sydney.

Worksafe Australia, October 1991, Guidance Note for Completion of a Material Safety Data Sheet. 3rd Ed. Worksafe Australia, Canberra.

Worksafe Australia, 1991/92, *Estimates of National Occupational Health and Safety Statistics 1991-92*, Worksafe Australia, Canberra.

APPENDIX

PERSONAL PROTECTIVE EQUIPMENT



SPECIAL NOTE

This Handbook is a guide to the major components of workplace hazard identification, assessment, and control. It will examine the process of developing an industry based Personal Protective Equipment Program for small industries. This Handbook will further go into a Persons Protective Equipment Program for the Automotive Industry.

It should be recognized that this Handbook does not provide technical prescription- or highly detailed information about personal protective equipment. Employers are responsible to undertake a full assessment/ study and to refer to the manufacturer's instructions, the appropriate Australian Standards, and relevant Legislation / Code of Practices.

It is not possible to describe precise requirements for every industry situation, if in doubt, you should seek technical advice from your Occupational Health and Safety Authority in your State, manufactories and supplier of Personal Protective Equipment.

1. SELECTION CRITERIA

There are Australian Standards which provide detailed information on the design, selection and use of PPE, as well as technical details on the selecting, maintenance and repairing of personal protective equipment. These Standards are a useful source of information if further guidance is required. A list of relevant Australian Standards is contained in Appendix A,

1.1 GENERAL GUIDELINES

To be able to select the correct PPE for your employees you need to assess the potential hazards and level of risk in your workplace. This will mean that you will need to look at the following:

- You need to familiarize yourself with the potential hazards, eg. Chemical, biological and/or physical.
- A risk assessment will need to be undertaken to ensure that all the hazards of the work processes have been identified.
- Compare the potential hazards with the capabilities of the PPE that may be selected as appropriate. This will involve assessing the health effects of exposure to the hazard(s). The length of time that an employee is exposed to the hazardous environment and length of time that PPE will need to be worn must also be considered.
- A combination of PPE that may be required to protect the person from a combination of hazards, eg., respiratory (dust); and eye (flying chips, dust) and hearing protection (noise).
- The health of the person wearing the PPE must be considered when selecting personal protective equipment. Some employees may have a medical condition which limit/restrict the use of certain types of PPE, eg. a person who is an asthmatic may find difficulty wearing a respirator for long periods of time.
- You will need to check that the PPE selected fits the wearer correctly. The degree of mobility or flexibility that is required for the tasks being performed will need to be considered. You will need to consider the physical features of the employee. Facial hair such as a beard is considered unacceptable for half face respirators.
- You must take into account the wearers comfort.
- You must ensure that the use of PPE does not create a secondary health or safety risk, e.g., poor fitting gloves may get caught in machinery.

1.2 SUPPLY OF PERSONAL PROTECTIVE EQUIPMENT

Once PPE has been selected, procedures and training need to be designed and implemented. The methods of selection should be clear, concise and appropriate so that all employees will wear the equipment.

Issues involved in the selection methods

- All items of PPE should be issued to an individual rather than for general use whilst operating a particular piece of equipment or work process. No item of personal protective equipment should be shared
- Cleaning, storage and maintenance procedures need to be developed
- Training for the use of personal protective equipment
- Administration procedures for the management of the program need to be designed

2. RESPIRATOR PROTECTION

Respiratory protection is designed to give protection for an employee against inhalation hazards such as:

- lack of oxygen
- particulate contaminants - dust, fibres, mists, fumes or dirt
- hazardous gases, vapours and contaminants -solvents.
- Respiratory protection ranges from simple particulate dust masks to the supplied air respirators.

Guidelines are provided in AS 2215 (1991) and HB9 (1994) for the selection, use and maintenance of the respiratory protection devices. Other publications available from manufacturers and suppliers provide similar information.

2.1 TYPES OF RESPIRATORS There are two main types of respirators: air-purifying and supplied air:

2.1.1 Air-purifying respirators:

For most work environments air-purifying respirators are used. These consist of a disposable respirator (filtering type), half facepiece, or full facepiece, and a head covering with one or more replaceable filters. Filters for air-purifying respirators are sub-divided into particular filters and gas filters.

Particulate filters are used to filter finely divided solid and/or liquid particles from the inhaled air. Table 2.1 describes the three types of particulate filters commonly available.

Class	For use against	Examples
P1	mechanically generated particles	asbestos, metal and oxide dusts
P2	mechanically and thermally generated particulate	metal fumes, welding fumes, arsenic and soluble compounds fumes
P3	all particulate including highly toxic materials	beryllium and compounds, phosphoric acid

Table 2.1: Types of Particulate Filters
(source: Standards Australia, 1994)

Gas Fillers remove specified gases and vapours from inhaled air. These filters have a limited protective life which is determined by the concentration of the gases and vapours and the conditions of use. Table 2.2 outlines the basic types of gas filters.

Basic Types of Gas Filters:

Type	For use against	Examples
A	organic gases and vapours	solvents, cyclohexanol, toluene
B	inorganic gases and acid gases	hydrogen chloride
E	sulphur dioxide and other inorganic gases and acid gases excluding carbon monoxide	sulfur dioxide, metal cleaning, petroleum refining
G	low vapour pressure chemicals as specified by the manufacturer (vapour pressure less than 1.3 Pa (0.01mm Hg) at 25C)	agricultural chemicals, pesticides spraying
K	ammonia and ammonia derivatives	methylamine
MB	methylbromide	fumigation
AX	Low boiling point organic compounds	dimethyl ether, vinyl chloride
HE	mercury vapour	inorganic -organic mercury compounds, metallic mercury
NO	oxides of nitrogen	Oxides of nitrogen
Specific chemical type	Specific chemical name for use against chemicals not falling in the above types	Hydrogen fluoride

Table 2.2= Gas Filters
(source: Standards Australia, 1994)

2.2 EXAMPLES OF AIR-PURIFYING RESPIRATORS:

Table 2.3 outlines examples of different types of air-purifying respirators available. It gives general information regarding their suitability for different work situations and the protection they offer. *Please note, when selecting respiratory protection must be expert advice obtained to determine the correct respirator*

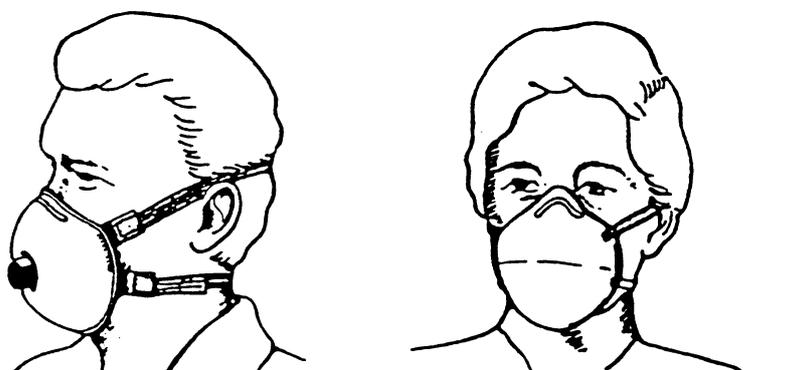


Figure 1. Disposal, half-face particulate respirator

Example of Air-purifying Respirators:

Respirator	Advantages	*PF	Disadvantages
Filtering facepiece (disposable mask) Half facepiece (disposable mask)	comfortable, low filter breathing resistance, lightweight and easy to use and cheap	Up to 10	not suitable for employees with beards or sideburns, does not provide eye protection
Half-face respirators	lightweight and easy to use and cheap	up to 10	not suitable for employees with breads or sideburns, often difficult to fit on 'non-standard' faces, requires maintenance
Full-face respirator	better fit, provides eye protection and a higher level of protection	up to 50	difficult when wearing glasses, as fogging can occur due to the warm moist air exhaled, very uncomfortable and difficult to wear with hard hats

*PF can be used with contaminant concentrations up to 100 or 50 times the threshold limit value.

Table 2.3"Non-powered air-purifying respirators

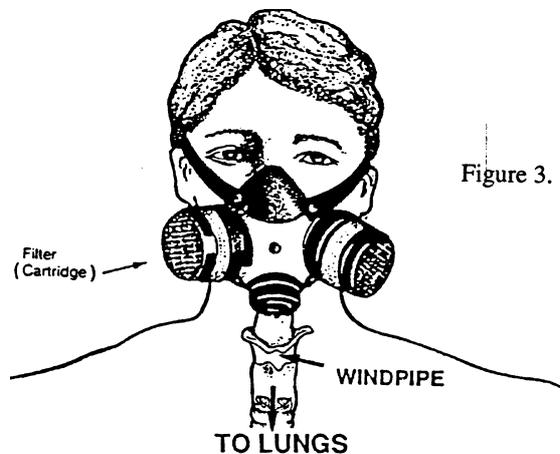


Figure 2. Half-face filter (cartridge) respirator

Figure 3. Full-face filter (cartridge) respirator

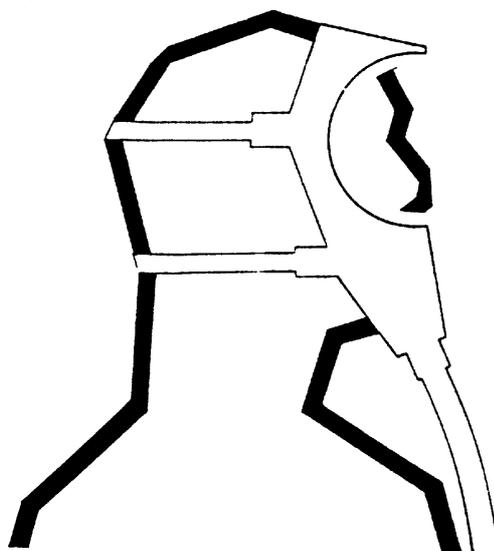


2.3 SUPPLIED AIR

Supplied air respirators deliver fresh air or oxygen to the employee from an independent source. There are three main types of supplied air respirators, air hose respirators, air-line respirators and self-contained breathing apparatus.

Types of supplied air respirators	Mode of delivery	Examples of respirators
Air-hose respirators - non pressurized	wide bore hose (natural either a full connected to a low breathing) or air-hose pressure blower	Either a full facepiece, half face piece or head covering
Air-line respirators	utilize a compressor or pressurized large compressed gas cylinders	facepiece, head covering
Self contained pressurized	Compressed air - open-circuit type Compressed oxygen - cylinders closed-circuit type Compressed air - open-circuit type Liquid oxygen- closed-circuit type Oxygen generating - closed-circuit type	facepiece, head covering cylinders with a pressure demand valve and breathing tube to a facepiece or head covering hood

Table 2.4 Types of supplied air-respirators and examples



2.4 CARE OF RESPIRATORS

The following information is provided for assisting in caring for respirators:

General Care

- inspect the respirator before and after each use and during cleaning
- replace all parts that are cracked, torn, broken, missing, worn or perished such as:

Facepiece

- ensure there are no holes or tears
- inspect for cracked, stretched or perished facepiece

- inspect for cracked, scratched or loose-fitting lens in full facepiece

Headstrap/harness

- check webbing for breaks
- look for deterioration of elasticity
- fit test excessively worn head harness

Inhalation/ Exhalation valves

- ensure valve and valve seat are free of detergent residue, dust particles, or dirt which may cause a poor seal or reduce efficiency
- replace missing or defective valve cover

Filter element

- Ensure that filter and mask are from the safe manufacturer and are certified for use together
- check filter to see that they are approved for the hazard
- inspect both filter threads and facepiece threads for wear
- check filter housing for cracks or dents
- check expiration date
- follow the manufacturer's instruction for care and maintenance
- emergency PPE equipment should be checked monthly

Repair, Cleaning and Storage

- wash with a mild detergent or a combination of detergent and disinfectant in warm water
- rinse thoroughly with clean water
- do not clean with solvents
- dry on a rack or a clean surface away from sunlight - position the respirator in a natural position
- store respirator after use to protect it from dust, sunlight, heat, extremes cold, excessive moisture and chemicals
- do not mix parts from different respirators
- record repairs and inspections
- check for distortion caused by improper storage

Disposal Respirators

- Disposal respirators have a clear advantage when adequate maintenance facilities are unavailable.

3 HAND PROTECTION

Industrial gloves designed in accordance with AS 2161 Industrial Safety Gloves and Mittens (excluding electrical and medical gloves), provide the hands and portions of the arms with protection against of common industrial hazard. Barrier creams may be used in limited circumstances. An appropriate occupational health professional should be consulted regarding the suitability and use of barrier creams. **Barrier creams only be used if protective gloves cannot be worn.** The cream chosen must provide adequate and safe protection for the skin. Remember, water-repellent creams offer no protection against oils or solvents. (Worksafe Guide, Nov. 1990) The selection of glove material and the style of the glove is dependent on a number of factors:

- hazard
- workplace
- chemical exposure

Information for the correct selection maybe obtained from the following sources:

MSDS from the manufacturers/suppliers of products
manufacturers/suppliers of gloves
occupational data service, Such as, ACEL
WorkCover

3.1 CARE OF HAND PROTECTION

- inspect gloves for defects, including degradation, before using
- ensure gloves fit properly
- follow manufacturer's instruction for care and maintenance
- wash off all chemical resistant protective gloves with water before removing them

Please note for more detailed information on Industrial Gloves refer to the standard AS 2161



3.2 GUIDE TO SELECTION OF GLOVES

Hazard/ chemical	work process	example of suitable gloves
Heat and abrasion	riveting, hot chipping	<ul style="list-style-type: none"> • heat/abrasive -resistant leather gauntlets and mitts
Sharp material or objects in an alkaline degreasing bath	cleaning automotive and machinery parts	<ul style="list-style-type: none"> • supported PVC gloves with granular finish • reinforced rubber gloves heavyweight
Glass or timber with splintered edges	glass handling, timber handling, building demolition	<ul style="list-style-type: none"> • leather gloves and mitts • loop pile gloves • supported PVC gloves - granular finish • reinforced rubber gloves heavyweight
Heat when a fair degree of sensitivity is required, splashes or splatter of molten metal may occur	welding, casting, galvanizing	<ul style="list-style-type: none"> • heat- resistant leather inseam mitts • heat-resistant leather gauntlets • heat-resistant leather inseam gauntlets with leather cuffs
Light abrasive	handling of packaged goods, general laboring	<ul style="list-style-type: none"> • leather wrist gloves and mitts • fabric gloves • fabric gloves with leather palms
solvents	spray painting, chemical manufacturer, printing	<ul style="list-style-type: none"> • PVA, rubber (synthetic or natural) - should only be used where there is little contact with water
Fats, oils, organic acids	food manufacture	<ul style="list-style-type: none"> • rubber • PVC coated fabric
Acids, alkalies and similar substances	plating shops, acid dipping, chemical manufacturer, dyeworks	<ul style="list-style-type: none"> • PVC coated fabric rubber (synthetic or natural) NOTE: protection may be limited

Table 3.1: Selection and Guide on Selection of Gloves for Workplace Hazards (source: Standard Australia 1994)

3. EYE PROTECTION

Eye protection is designed to give protection against one or more workplace hazards such as:

- chemical splash
- contact with flying objects
- exposure to ionizing or non-ionizing radiations

Eye protection such as spectacles with side protectors, goggles or face shields may be required in many hazardous situations including chipping, grinding, drilling, and chemical splashes. AS 1336 contains recommendations for the use of eye protection and AS 1337 outlines the requirements for industrial eye protection.

4.1 EYE PROTECTION CONSIDERATIONS

- Identify the types of eye hazards in the workplace
- The user should have a clear view of the work process when wearing eye protection
- Determine the visual capabilities of the potential users and determine the need for eye tests for the wearer
- Assess the working conditions/environment, layout and plan work areas including lighting levels

4.2 EYE PROTECTION ISSUES

4.2.1 Prescription Glasses

Generally, prescription glasses are inadequate against flying objects and can even prove to be a hazard in themselves. Suitable eye protection can be fitted with prescription lenses made from safety material. Safety goggles may be worn over the prescription glasses.

4.2.2 Contact Lenses

Contact lenses worn under eye protectors is satisfactory for most workplace. However, in situations where there is dust, harmful liquids, gases or vapours, eyes might be at a greater risk if contact lenses are worn. It is sound management practice to have a register of employees who wear contact lenses and the particulars of the types of lenses worn for appropriate emergency action in the event of an accident.

4.2.3 Fit

- Ensure that the safety glasses fit properly. Eye size, bridge size and temple length all vary, the glasses arms should fit comfortably over the ears. The frames should be as close to the face as possible and adequately supported by the bridge of the nose.
- Safety glasses should be exclusive issue to one employee.
- Some facial features are difficult to fit with safety glasses.

4.2.4 Hot working condition

- Suitable anti-fogging compound may need to be required for eye protectors. Sweat bands may be necessary for hot conditions.
- Anti-fog goggles are available commercially.

4.2.5 Chemical work procedures

- For specific chemical work process, eye protectors can be washed with soap and water. Cleaned by soaking equipment for two minutes in a mixture of 30 millilitres of chlorine bleach in four litres of water. Rinse thoroughly with clean water to remove soap and bleach, wipe with a clean cloth and allow to air dry.
- Pay particular attention to the eye protectors headbands as they are often made of absorbent material that requires regular replacement. Strict clean procedures should be in place as residual chemicals on the headband can affect the users skin in the next wear.

4.3 CARE OF EYE PROTECTORS

cleaning:

- Ensure daily cleaning of eye protectors.
- Avoid rough handling which can scratch lenses. Scratches impair vision and can weaken the glass lenses.

Inspection:

- Inspection of eye protectors at regular intervals after use and before reissue to the employee.
- Replace scratched, pitted, broken, bent or ill fitting eye protectors. Damaged eye protectors interfere with vision and do not provide adequate protection.
- Procedure for repairs and replacing damaged or faulty equipment.
- Knowledge of correcting or adjusting uncomfortable eye protectors.

Storage:

- Store eye protectors in a clean, dry place where they cannot fall or be stepped on.



4.4 EXAMPLES EYE HAZARDS & CONTROL METHODS

Hazards	Work process	Engineering control methods	Suitable types of eye protection
Flying objects with low velocity	chipping, riveting, hammering	fixed or mobile screens	<ul style="list-style-type: none"> • safety spectacles • safety spectacles with side shields • eye goggles • eye shields a face shields • hoods and helmets
Flying objects with medium velocity	scaling, grinding, machining metals	fixed or mobile screens exhaust fan, dust extractors	<ul style="list-style-type: none"> • face shield • wide-vision goggles • hoods and helmets
Gases, vapours	chemical process, spray painting, aerosols	enclosures and exhaust system	<ul style="list-style-type: none"> • hoods and helmets • goggles all types without ventilation • face shield
Non-ionizing radiation only	welding, cutting, brazing	fixed or mobile screens	<ul style="list-style-type: none"> • safety spectacles with filter lens and opaque side shields • goggles with opaque frames and individual ventilation • welding helmets all types and handshields
Non-ionizing radiation with hot solids	overhead cutting and welding, metal, gauging	fixed or mobile screens	<ul style="list-style-type: none"> • safety spectacles with filter lens and opaque side shields • goggles with opaque frames and individual ventilation • hoods and helmets (suitable for radiation protection)

Liquid splash harmful liquids corrosives	hot bitumen, metal cleaning, plating, handling corrosives	screens, splash trays catchment	<ul style="list-style-type: none"> • wide vision goggles • face shield or hood helmets
Airborne dust	timber sanding some chemical works	exhaust systems, dust extractors, suction conveyors	<ul style="list-style-type: none"> • goggles with indirect ventilation • goggles without ventilation

Table 4.1.Examples of Eye Protection (Source: Standards Australia 1994)

5. HEARING PROTECTION

All workplaces generate noise and for some employees, the level of noise may lead to temporary or permanent loss of hearing. Employees who are exposed to excessive noise must be provided with personal hearing protection. Hearing protection should provide a reduction in noise levels to below 85dB(A).

5.1 TYPES OF HEARING PROTECTION

There are two main types of hearing protection available: ear plugs and ear muffs.

5.1.1 Ear Plugs:

There are three main types of earplugs:

- **disposable** - are made from materials such as: waxed cotton wool; compressible plastic foam or glass-fiber. These earplugs are easily soiled, difficult to store in a hygienic condition after use and should be discarded after single use.
- **reusable** - premoulded earplug are made in standard shapes and in several sizes.
- It is recommended that earplugs are fitted correctly for an individual who may need a different size earplug in each ear.
- **individual moulded earplugs** -these earplugs require the services of an acoustic technician, who will take an impression of the ear canal. The individual moulded earplugs ensure that it will fit firmly and assist with cleaning. These ear plugs are generally reusable but manufacturers recommendation should be adhered to.

5.1.2 Earmuffs

Earmuffs enclose the ear within a hollow cup. Ear muffs are composed of sound absorbing material and soft ear cushions which fit around the ear and hard outer cups which are held together by a head band

5.2 SELECTION

The selection of hearing protection should be based on providing a reduction in the noise levels to a acceptable level. This will require an assessment of the noise level in the workplace to determine the attenuation required and then select a range of hearing protection.

Safety aspects - generally, the use of hearing protection devices will not affect the user's ability to listen to machinery and to heat warning devices. Visible warning devices (such as flashing lights) may need to be considered in situation that warrant *Communication devices are available in special cases.*

picture

5.3 TYPES OF HEARING PROTECTION

Types	Advantages	Disadvantages
Ear plugs	<ul style="list-style-type: none"> • small and easily carried 	<ul style="list-style-type: none"> • require more skill to fit
	<ul style="list-style-type: none"> • easier to use with other personal protective equipment 	<ul style="list-style-type: none"> • more difficult to insert and remove
	<ul style="list-style-type: none"> • considered more comfortable in hot, humid work areas 	<ul style="list-style-type: none"> • require good hygiene difficult to hear
	<ul style="list-style-type: none"> • convenient for use in confined work areas 	<ul style="list-style-type: none"> • may irritate the ear canal
		<ul style="list-style-type: none"> • easily lost
		<ul style="list-style-type: none"> • difficult to monitor usage
Ear muffs	<ul style="list-style-type: none"> • less attenuation variability among users 	<ul style="list-style-type: none"> • less portable and heavier
	<ul style="list-style-type: none"> • designed so that one size fits most head sizes 	<ul style="list-style-type: none"> • care has to be taken in selection when other personal protective equipment such as safety glasses and hard hats are to be used
	<ul style="list-style-type: none"> • not easily lost or misplaced 	<ul style="list-style-type: none"> • more uncomfortable in hot, humid work areas if earmuff socks are not worn
	<ul style="list-style-type: none"> • ease of fitting 	
	<ul style="list-style-type: none"> • may be worn with minor ear infections 	

Table 5.1 Types of Hearing Protection

5.4 CARE OF HEARING PROTECTORS

- earmuffs cushions should be wiped clean daily.
- once a week, disassemble ear muffs to clean, use a soft brush to remove body oil and dirt which can harden the ear cushions. Wash the hearing protectors with soap or detergent and warm water, and then rinse in clean warm water, ensure foam liner inside the cups does not get wet.
- check daily for signs of wear, tear and any deterioration, replace ear muffs if the plastic cups are damaged.
- replace ear cushions and acoustic foam that are no longer pliable.
- head bands tension requires checking occasionally to ensure that it is sufficient tension to keep the muffs sealed firmly around the ears.

5.5 FIT

- hearing protection should fit according to manufacturers instructions.
- ensure hearing protection devices fit tightly within the ear canal or against the side of the head.

6. BODY PROTECTION

Body protection includes work trousers, work shorts, bib and brace overalls, full length coveralls, sleeveless coverall, dust coats and industrial jackets. Body protection clothing should be worn close fitting around the wrist and trouser legs and produced from durable material. Worksafe Australia *Guidance Note on the Protection of Workers from Ultraviolet Radiation in Sunlight 1991*, outlines the type protection required for employees against sunlight, such as hats, sunglasses and the use of sunscreen. Body protection is designed to give protection against range of workplace hazards.

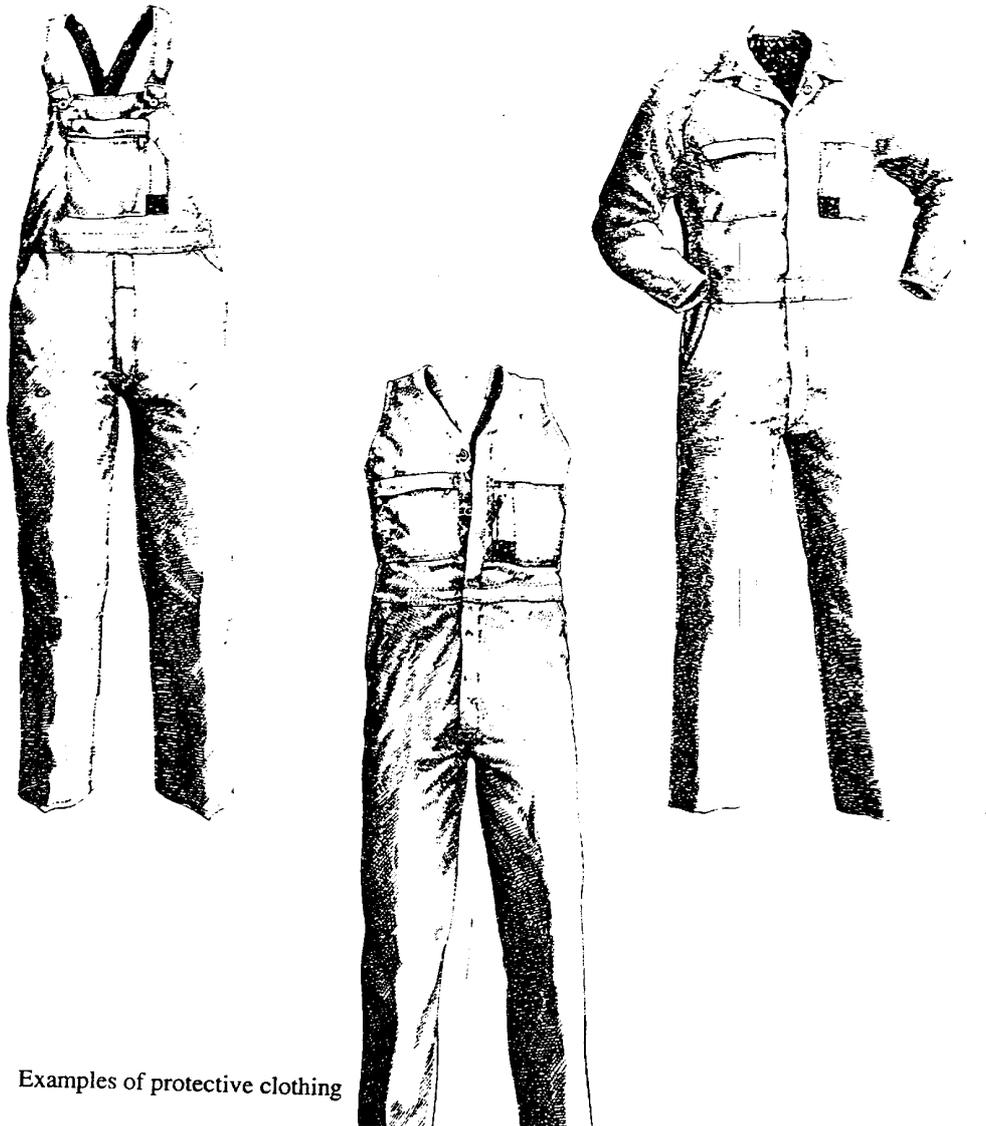
6, 1 CLASSIFICATION OF PROTECTIVE SUITS

(i) Primary	<p>(a) general purpose suit that provides protection for a minimum time against a range of chemicals listed in AS 3765.1</p> <p>(b) specific purpose suit that provides protection against chemicals for which the material of the suit has been designed. Refer to manufacturers recommendations.</p>
(ii) Secondary	<p>(a) Class 1 - Gaslight suit (full body encapsulating suits) which is worn with respiratory protection either by way of self contained or air-line type</p> <p>(b) Class 2 - Ventilated suits (one piece coverall). Air provided from a compressed air-line which provides both breathing air and positive pressure</p> <p>(c) Class 3 - Splash suits. These comprise of one or more components such as a hood, blouse and trousers, boots and gloves. The splash suit may either used a positive pressure hood supplied with an air line with a self contained breathing apparatus or of respiratory protective is not required the suit may use a full-face vision for protection</p>

**Table 6.1. Classification of Protective Suit
(source: Standards Australia 1994)**

6.2 CARE OF PROTECTIVE CLOTHING

- keep all items of protective clothing clean and maintained.
- protective clothing , other than protective suits, should be laundered in hot water, separately from the domestic clothing.
- protective suits need to be decontaminated, keep contaminated clothing in a sealed container not in general storage areas. A spare protective suit should be available.
- wash hats, boots, overalls, aprons at the end of each day or following a particular hazardous work process such as chemical sprays.



Examples of protective clothing

Figure 4. Examples of protective clothing

7. FOOTWEAR PROTECTION

Protective footwear should provide the wearer with protection against hazards in the workplace. The types of hazards that have occur include

- water , slip
- chemical
- hot splashes
- penetration to the underside of the foot
- ankle twist injuries from rough terrain

7. 1 TYPES OF FOOTVVEAR PROTECTION

Footwear is graded by the level of protection offered by the protective toecap. There are three grades of toecaps in four footwear types.

Footwear type	Recommended Use	Examples of types of Hazard
Type 1(grade 1 toecaps)	building and construction, heavy woodwork, heavy engineering, agriculture	<ul style="list-style-type: none"> • falling or rolling • flying objects • sharp materials underfoot • abrasive materials • chemical degradation
Type 2 (graded 2 toecap)	light engineering transport, light woodworking (cabinet making)	<ul style="list-style-type: none"> • falling or rolling objects • sharp materials underfoot • explosive atmosphere
Type 3 (graded 3 toecap)	light duty factory work, process work, delivery work.	<ul style="list-style-type: none"> • Falling or rolling objects • Sharp materials underfoot

Table 7.1: Recommended applications of occupational protection footwear with examples of hazards

(source:Standards Australia 1994)



7.2 FEATURES OF SPECIAL FOOTWEAR

Type	Recommended use
Fuel-resistant outsoles	where degradation of the outsole would occur through contact with organic solvents
Penetration -resistant midsoles	where foot injuries due to penetration through the sole
Electricity conductive properties	where it is necessary to minimise electrostatic build- up by dissipating electrostatic charges to earth through contact with the floor
Anti-static properties	where a slower rate of discharge is required when compared with electricity conductive properties

Table 7.2. Type of special footwear and recommended use
(source:Standards Australia 1994)

7.3 SELECTION AND WEAR OF FOOTWEAR

Feet can only be as comfortable as the footwear permits. Care should be exercised with the selection as well as the fitting of the correct and most suitable type of boot and shoe.

Footwear should be tried on for fit and comfort. Consideration:

- Select safety footwear according to Australian Standards and choose footwear according to the hazard in the workplace.
- Footwear should not change the shape of your feet and allow freedom to move the toes. Pain and fatigue results if footwear is too narrow or shallow. Footwear should have arch supports, lack of arch supports will result in flattening of the foot.
- Choose footwear that provide a firm grip for the heel. If the back of the footwear is too wide or too soft the foot will slip, causing instability and soreness.
- Use a shock-absorbing cushioned insole when working on metal or cement floors
- It is advisable not to wear flat footwear, but have heels higher than 5cm (2 inches).
- For wet or muddy condition, rubber boots fitted with a steel toe-cap and reinforced sole should be worn.
- Work process that involves climbing and working on structural steel, the more flexible rubber boots without steel toe-caps and soles may be preferred as to provide better foot hold.
- Wear shoes with lace-up fastenings and tighten the lace instep firmly, this will prevent the foot from slipping inside the footwear. The use of padding under the tongue will assist with tenderness over the bones at the top of the foot.

MANAGEMENT GUIDELINES

8. MAINTENANCE, STORAGE AND RECORD KEEPING

9. COMMON PROBLEMS

10. PPE PROGRAM CHECKLIST

11. PPE PROGRAM

**12. FIRST AID AND EMERGENCY
PROCEDURES**

**13. LEGISLATIVE REQUIREMENTS ON
ACCIDENT RECORDING**

14. WORKPLACE HAZARDS

15. SAFETY AUDITS

16. LEGISLATION AND REGULATIONS

8. MAINTENANCE, STORAGE AND RECORD KEEPING

8.1 MAINTENANCE PROGRAM

All PPE must be properly maintained to assure its effectiveness. Maintenance should, as a minimum, include inspection, care, cleaning and repair. PPE should be inspected before and after use to identify any damage or deterioration. Equipment which is damaged should not be worn. General information on the care and maintenance of PPE can be found in the previous sections.

8.2 STORAGE

Adequate provision should be made for the individual storage of PPE. In general, storage areas for PPE must be clean, dry and free from any hazardous situation.

Storage of PPE should be located as close as practicable to the work process, so that employees will use the equipment, **BUT NOT STORED IN THE WORK AREA.**

Emergency equipment should be stored close to the hazard area (**BUT NOT IN THE HAZARD AREA**) in a clearly marked location so that the recovery team can immediately find it.

The employer should ensure that PPE is stored in a clean and in a fully operational condition.

8.3 RECORD KEEPING

Certain Australian Standards require the keeping of records, for example, the use of eye filters to protect against radiation generated in welding. The PPE program should be documented and regularly reviewed. Records should be kept on the following:

- The type of personal PPE required in particular work areas.
- Individuals responsibilities assigned under the program.
- Individual issue of PPE, including information on selection criteria used, medical or other assessments undertaken and for testing.
- Maintenance and cleaning inspection schedule and the results of these inspections.
- Training schedule and register, including training in the use of emergency PPE use and any specific procedures and requirements.

9. COMMON PROBLEMS

PPE may not be a normal part of normal work routine. For these reasons, the use of PPE must be carefully monitored to make sure that the common problems relating to the use of personal protective equipment in the workplace do not occur:

- Level of protection not meeting what has been claimed by the manufacturer or supplier or specified on the equipment.
- False sense of security on hazard protection which may lead to other important procedures not being followed.
- PPE is not regularly maintained and stored in an appropriate location.
- Person wearing the personal protective may feel isolated with the inability to see or hear properly. Psychological effects with the person wearing personal protective equipment feeling different from others in the workplace.
- PPE frequently creates a secondary health or safety risk eg., eye protection misting over and making visibility difficult, skin reactions and wearing of hearing protection and ear muffs in hot environment causing ear infections.
- PPE may be uncomfortable after long periods of use, hot or cold work environments.
- Ill fitting/inappropriate personal protective equipment for the work tasks and work environment may cause discomfort and difficulty in working. This may also increase exposure time to the hazard because persons will be less likely to wear the equipment.
- Infection may occur from sharing of personal protective equipment and/or incorrect cleaning and maintenance routine.
- General acceptance of personal protective equipment by the workplace.
- Inappropriate workplace procedures.
- Inappropriate disposal procedures.

10. PPE PROGRAM CHECKLIST

The following checklist may be used as a guide for staff required to assess the personal protective equipment program in the workplace.

ITEM	YES	NO	COMMENT (further action)
1. Have work process/tasks been assessed for the need of PPE			
2. Does the PPE meet the requirements of: workplace hazards legislation and Standards			
3. Is the PPE suitable for the work tasks and hazard.			
4. Is there a workplace policy and program for proper use of PPE and takes into account: assigned responsibilities under the program , procedures for health and environmental monitoring, regular rest breaks from wearing PPE, maintenance and cleaning procedure, training program, individual issue of PPE, information.			
5. Are these policies and procedures being followed.			
6. Is the appropriate documentation on PPE freely available.			
7. Have all employees undertaken training on the need and use of PPE.			

8. Have PPE been assigned to individual employees for personal use only.			
9. Is the PPE is use been tested for proper fit and comfort.			
10. Is all PPE= adequately maintained and in good condition, inspected daily, cleaned daily, replaced as required, stored in an appropriate storage area, located in an assessable location and readily available.			
11. Supervision of work to maintain the correct use of PPE.			
12. Is the wearing of PPE enforced.			
13. Are discipline procedures in place for employees misusing PPE.			
14. Is the effectiveness of the PPE program monitored and evaluated.			
15. Audits records and corrective action are recorded and maintained.			
16. Any special procedures or requirements.			

11. PPE PROGRAM

11.1 INTRODUCTION TO THE WORKPLACE

It is important that a Personal Protective Equipment Program be developed and introduced into the workplace as part of the overall safety management plan for your workplace. This program should be developed in consultation with both employee and union representatives and take into consideration the following:

- Tripartite approach between management, employee and union will enable everyone to have a commitment to the program.
- Clear guidelines on how the PPE will be introduced into the workplace.
- Clear written procedures on the use of PPE
- Information/resources being available, latest updated information and appropriate language to all employees including minority groups.
- Consultation and evaluation process for employee concerns and problem.
- Regular reviews to ascertain if there are any changes in the workplace that may require updated or review of PPE.
- Training and education which should be ongoing and appropriate to the employees, their needs and PPE.

11.2 TRAINING PLAN

It is essential that all employees be trained to understand not only the use of PPE but the risks and hazards involved in their work. The training plan should cover:

- Employers' commitment to occupational health and safety a PPE program.
- Workplace hazard identification, assessment and control strategies, reinforcing that PPE is not a substitute for other means of hazard control.
- Specific PPE issues - how to select, fit, wear and usage of PPE, how to adjust it for maximum protection, and how to care for, store and maintenance. The need for PPE, basic design principles and its use and limitation should be identified and highlighted.
- New employees should be trained in the need for, use and maintenance of all PPE required in the work process. They should also be made aware of the potential health and safety hazards and risks of not wearing correct PPE.

11.3 TRAINING METHODS

Training is a matter of communicating with individuals. The success of any training depends on the skills of the trainer. Training methods should consider the following:

- level of work experience and skill
- gender

- physical disability (for example hearing)
- intellectual disability
- ethnicity and English skills
- literacy skills
- age

There are many training techniques, but training should meet the needs of the trainees. For example, it may be appropriate to:

- use of various teaching methods such as, lecture; small group discussion; practical experience with the hand on use of equipment and discussions.
- the use of lots pictures and simple diagrams.
- use of language other than English either written or verbal or both.
- selection of appropriate trainer of a particular language, culture or gender to suit trainees needs.

The employer should keep records of any training session and review training on a regular basis.

12. FIRST AID AND EMERGENCY PROCEDURES

12.1 FIRST AID

This section is designed to give general guidelines to you the employer, to meet your legal responsibilities in the provision of first aid facilities in the workplace. It is recommended that you obtain a copy of the First Aid Regulations to determine the specific first aid facilities to be provided, as such:

- State and territory laws and regulations
- Type of industry and specific hazards
- Number of employees at the workplace
- Is the workplace isolated and the availability of local services (doctors, hospital and ambulance)
- The size of the workplace and the number of basic occupational first aid kits are needed
- How many first aiders are needed
- The first aid room needed
- Who will be responsible for first aid administration and the first aid room

All first aid supplies must meet the workplace needs, hazards and injuries sustained.

Where required by the First Aid Regulation, you must appoint a First Aid Officer and they should be given the authority to maintain and be in charge of the first aid kit. The First Aid Officer must be readily available to give first aid treatment. All employees should know who the Officer is. The First Aid Officer should be trainee by a recognised first aid trainer, such as the St Johns Ambulance Brigade.

The First Aid Officer should:

- Be trained in specific workplace hazards
- Record all first aid treatment given, as required by the regulations
- Maintain all first aid facilities and supplies
- The location of the first aid boxes and facilities should be known to all employees and clearly marked.

12.2 EMERGENCY PROCEDURES

Emergencies: can include:

- fire and smoke
- chemical spills
- serious workplace accident
- toxic or flammable vapour emissions
- electrical

12.3 AN EMERGENCY PROCEDURE PLAN

A simple emergency plan for your workplace will reduce the potential for major injury and illness and avoid panic. The plan should be developed in consultation with all employees. The plan should be clear about evacuation procedures, identify responsibilities of various individuals and placed in a prominent position such as a notice board. All employees should be trained in the emergency procedures and the plan should be reviewed annually or following each emergency. This allows for any new or update in any work processes or new employees to be involved in the development of the new emergency procedure.

The emergency plan should cover:

- The need to stay calm.
- Direction and control - who to call to raise the alarm.
- How to notify emergency personnel - ambulance, fire brigade and police.
- Who is responsible for making decision during the emergency duties of the responsible person.
- Procedures for the immediate stop or to minimise the emergency - use of the fire extinguisher.
- Evacuation procedures.
- How to use the emergency personal protective equipment.
- Medical arrangements.
- Training of all employees in emergency procedures and equipment with regular
- Procedures should be discussed with external emergency personnel - Fire Brigade, Police.



13. LEGISLATIVE REQUIREMENTS ON ACCIDENT REPORTING

The Workplace Injury and Disease Recording Standard AS 1885.1-1990 recommends the minimum information that employers should record on workplace injury and disease. It provides a guide on how to establish an inexpensive and easy-to-use method of recording information. It allows employers to use this information to identify and/or assess hazards to develop preventative programs to control these hazards.

The standard uses four classification to describe the injury or disease:

- Nature (for example, dermatitis or fracture)
- Bodily location (for example, hands and fingers)
- Mechanism (for example contact with chemicals)
- Agency (for example, chemicals)

This information can be used to develop:

1. Remedial and preventative action can be implemented by employers to prevent further similar occurrences to other employees;
2. Accurate information can be provided on the frequency of different types of accidents and disease for analysing risk trends and developing preventative strategies;
3. Identify trends related to specific groups of employees, staffing levels, shift patterns, or the introduction of new work processes and equipment.

Procedures will need to be developed in consultation with employees to:

- Procedure for immediate action following an injury or accident.
- Injury/illness and incident investigation procedure.

AUTOMOBILE INDUSTRY

HAZARD MANAGEMENT

PROGRAM

AUTOMOTIVE INDUSTRY

The automotive industry has grown since World War 11, with thousands of small and large industries involved in repairs and refurbishing of motor vehicles. Few other industries can match this industry in the number of occupations with similarities in process, techniques and specialised skills in the areas of spray painting and plastics extrusion, some metal fabrication and welding, fibre glass moulding and panel beating. Associated with these work processes are a number of hazards, such as, chemicals, noise, vibration, fibres and dusts, manual handling, fire, explosion and accidents. The Statistics for 1986 showed that there was for that year 30,000 smash repair workers. (WorkCover Authority of NSW, 1989).

LEGISLATION

In NSW, the legislative requirements can be found in a number of Acts and regulations, such as, Occupational Health and Safety Act 1983 and the Factories, Shops and Industries Act, control of workplace hazardous substances is outlined in the Draft Code of Practice for the Control of Workplace Hazardous Substances by the WorkCover Authority of NSW. Other relevant requirements can be found in the following:

- Spray Painting Regulation
- Draft National Code of Practice for Spray Painting -Worksafe Australia
- Working with Fibreglass Reinforced Plastics -WorkCover Authority of NSW
- Spray Painting Booth Construction - WorkCover Authority of NSW
- A Guide to Dust Hazards - WorkCover Authority of NSW
- Occupational Health and Safety Aspects of Spray Painting - Discussion paper - WorkCover Authority of NSW
- Worksafe Australia Standards on Exposures for Noise and Hearing Protection: Chemical; Hand -Arm Vibration: Heat and Cold; Dust; Manual Handling and Fumes.

Standards Australia - Standards:

- Hearing protection: AS 1269; AS 1270;
- Respiratory protection: AS 1716; AS 1715
- Eye protection: AS 1337; AS 1336
- Head protection: AS 1808; AS 1800
- Hand protection: AS 2161
- Footwear protection AS 2210
- Clothing protection AS 3765

AUTOMOBILE INDUSTRY SAFETY AUDIT CHECKLIST

The following lists provide basic guides for the identification of workplace hazards in the automobile industry. Please note this list is not exhaustive:

HOUSEKEEPING

- Clean the workplace thoroughly and daily
- Not allowing waste and rubbish to accumulate
- Removal of spillage of oil, grease from floors, walls and work benches
- Appropriate storage of tools and equipment when not in use
- Keep floor areas, walkways, fire exits and stairs clear of rubbish
- Maintain work area, equipment and tools in good and safe working condition
- Maintain a clean reception area, toilets, lunch room and office
- Adequate ventilation
- Adequate lighting

FIRE HAZARDS

- Maintain access and egress
- Emergency procedures and evacuation plan
- Keep flammable materials stored
- Register all chemicals in line with local authorities requirements
- Areas identified

PERSONAL PROTECTNE EOUIPMENT

- Personal protective equipment program
- Hearing protection
- Respiratory protection
- Eye protection
- Body protection
- Emergency equipment

ELECTRICAL

- Emergency controls
- Maintenance program to identify defects
- Check electrical fitting and cabling

TOOLS AND EQUIPMENT

- Use the correct tool for the work process
- Carry the tools as they should be carried
- Maintenance procedure to identify defects
- Pinch points
- Cranes and hoist equipment
 - maintenance/repair program
 - authorized use
 - capacity
 - controls
 - safety devices (approx. slings, chains and other lifting tackle)
- Power/ pneumatic tools
 - trained employees
 - maintenance/repair program
 - use of
 - storage
 - safety devices
- Service bays and grease gun safety
 - good housekeeping
 - reduce fire risks
 - weekly maintenance /inspection schedule
 - replacement procedure
- safety devices Safe job procedures, job safety analysis, proper training, work procedure:
 - electric arc welding
 - gas welding and cutting
 - garage pits
 - machine guarding
 - steam cleaning
 - battery servicing and storage
 - compressed air

WORK ENVIRONMENT

- exposed to a range of toxic substances -
 - exhaust fumes (carbon dioxide, carbon monoxide)
 - solvents and degreasers (benzene)
 - antifreeze and hydraulic fluids (ethylene glycol, isopropyl, propylene glycol, methyl alcohol)
 - fuels and lubricants (kerosene, gasoline, tetraethyl
 - lead, propane petroleum distillates)
 - metal fumes and dusts (cadmium, copper, iron, nickel, zinc, and other compounds such as acetylene and ethylene are given off as a gas in the work process)
 - asbestos
 - battery acid (sulfuric acid)

SAFETY AUDIT -IDENTIFY POTENTIAL HAZARDS

CHEMICAL HAZARDS

In a small automobile smash repair shop, the employee can be exposed up to 36 solvents and irritant chemicals found in the paint, adhesives and those used to clean parts. These chemicals may be absorbed through the skin or inhaled as vapours. Inadequate ventilation whilst tuning a car engine can allow exhaust fumes to concentrate, creating a major hazard. Gasoline, battery acid and many other compounds have the capacity to cause serious health effects.

Some hazards are less obvious than others. Employees exposed to odorless, colorless gas might not be ware of these dangers. Similarly, breathing small amounts of toxic substances every day may not cause any immediate symptoms, but years later, an illness or disease may develop as the result of being exposed. Material Safety Data Sheets for specific products are available from the manufacturers and suppliers and must be available to all employees.

The following substances are encountered by automobile mechanics:

lead and its compound	oxygen
mercury and its compounds	kerosene
all chromate and dichromate's	zinc
reactive, uncombined epoxy resins	zinc oxide
reactive, uncombined isocyanates	hydrogen
trimethyl benzene	trichlorethylene
ethyle benzene	sulfuric acid
n-butyl acetate	sulfur dioxide
toluene	asbestos
acetate	acetone
xylene	acetylene
formaldehyde	cadmium
cellosolve	carbon dioxide
methyl cellosolve acetate	carbon monoxide
isocyanates	

Many of these are toxic and flammable and must be handled with care for reasons for personal health and safety.

DUST

Employees are exposed to toxic dusts from lead chromate and other metallic compounds in pigments in old paint. Inappropriate work practices and equipment will increase this hazard. Dust from body fillers, although not toxic, is also a hazard of a nuisance value. Dust from brake and clutch linings (often asbestos) is highly hazardous. Safe work practice is to wet brakes or clutches before working on them.

The evidence of dust exposure can come from the use of compressed air to blow excess dust off various surfaces; sanding, grinding of plastic body fillers is excessive. Research indicates that dust levels can be during a light to moderate work process 20-40L, min and sometimes reaches higher levels. (Jayjock, 1984). The standard level of exposure is TLV 10mg/m³.

NOISE

There are a number of tools and work processes that give excessive noise exposure, such as, pneumatic chisel with cutting sheet metal, air hoses blowing off dust pneumatic and electric grinder, grinding sheet metal and orbital finishing grinder sander, sanding polyester Filler.

Example noise levels:

- pneumatic chisels 110-15 dB(a)
- air hoses- 106 -10 dB(a)
- pneumatic and electric grinder - 103 - 105 dB(a)
- orbital finishing sanding - 95 - 8 dB(a)

The standard level of exposure is 80 dB(a)

VIBRATION

Research has indicated that pneumatic hand tools cause a considerable amount of vibration to the fingers and hands for the user.

The standard level is 8h/90 **dB**A

ULTRA-VIOLET RADIATION

The commonest source of electro-magnetic radiation is either the electric arc and gas welding. These emit a high level of ultra-violet light which is harmful to the eyes.

OCCUPATIONAL OVERUSE SYNDROME (RSI)

The commonest cause of occupational overuse syndrome is repetitive actions, such as, hammering, pulling, pushing levers and twisting.

HEAT AND COLD

Whilst generally this is not a major within the automobile industry, it should given some attention. The Vehicles Builders' Employees' Federation reached an agreement that employees should have a10 minute breaks every hour when the temperature exceeds 36°C.

MANUAL HANDLING

Manual handling is one of the highest causes of lost time in all industries. These injuries can vary from short term pain to severe and/or permanent disability. The exposure to manual handling can be describes as:

- lifting or lowering
- carrying, pushing, pulling, rolling, sliding, and wheeling loads
- operating mechanical devices
- difficult or awkward position sustained for long periods whilst conducting a work process

HAZARD ASSESSMENT

There are a number of potential causes of health problems. Assessment will not always detect enough evidence to highlight one or several potential causes that may be responsible, especially within the automobile industry where there are a number of hazardous substances with potentially dangerous health effects- In determining a health problem it may be necessary to conduct environmental monitoring. This monitoring and analysis should be conducted at regular intervals by qualified Occupational Health and Safety Authorities.

Exposure standards state that when an employee is exposed to organic airborne concentrates, it should be kept as low as possible and every attempt should be made to keep exposure levels below the acceptable standards. The National Commission publication, Exposure Standards for Atmospheric Contaminants in the Occupational Environment. Please note, that the "exposure standards do not represent 'no effect' levels which guarantees protection to every worker". (Worksafe Australia, Industrial Organic Solvents Guide, 1990)

HEALTH EFFECTS

Work Process	Chemical Example	Health Effects
Exhaust fumes	carbon dioxide carbon monoxide	Short term: headaches, irritability, weakness, confusion Long Term: fainting, unconsciousness, death
Solvents and degreasers	benzene	Short Term: lack of coordination drowsiness Long Term: damage to blood lung, liver, kidneys and digestive system, cancers-leukemia
Fuels and lubricants	kerosene, gasoline, propane, tetraethyl lead	Short Term: drowsiness, dizziness, nausea, drunk, vomiting, diarrhea Long Term: unconsciousness
Metal fumes and dusts (welding, cutting operations and grinding)	Cadium, copper, iron, lead, zinc, acetylene, ozone, nickel	Short Term: Flu like symptoms, aches in muscles and joints, fever, chills, nausea Long Term: severe lung irritation, lung and nasal cancer
Battery Acid	sulfuric acid	severe eye irritation -damage to eye and possible blindness, inhalation of acid fumes causes irritation of nose and throat, coughing and sneezing
Spray painting	polyurethane, epoxy systems, lead	

Table 1 Examples of chemical hazards and possible health effects.

HEALTH EFFECTS - DUST

- Irritant dust hazards - dust in the nose and in the tubes leading to the lungs can result in irritation on the nasal passages and lungs.
- Respiratory dust hazard - lung cancer (mesothelium), asbestosis, allergic reaction, asthma, breathlessness, skin rashes and kidney damage

HEALTH EFFECTS - NOISE

- Occupational deafness
- Noise induced stress which can lead to symptoms such as, irritability, tiredness and headaches. This in turn can lead to increase blood pressure, strain to the heart and vision impairment
- Dizziness and sense of loss of balance
- Temporary hearing loss
- Ringing in the ears which may be temporary or permanent

HEALTH EFFECT - VIBRATION

Raynaud's phenomenon stage I. will result in tingling or numbness in the fingers after work. Increase exposure the individual will enter stage 2 with balching of one or more fingers with numbness and slight interference with work, home and social activities.

HEALTH EFFECT - ULTRAVIOLET RADIATION

- Painful 'eye flash'
- Temporary blindness
- Cataracts
- Body burns to the exposed parts
- Aging of the skin
- Skin cancer

HEALTH EFFECT - OCCUPATIONAL OVERUSE SYNDROME (RSI)

- many conditions ranging from tenosynovitis, epicondylitis, tendonitis and neck syndrome, bursitis and carpel tunnel syndrome

HEALTH EFFECT - MANUAL HANDLING

- hernia, strains
- spinal and other fractures
- spinal damage such as disc bulge, disc protrusion

HEALTH EFFECT - HEAT AND COLD

- various kinds of heat illness
- increase in existing health problems
- increasing employee exposure to hazards by the removal of protective clothing which feel uncomfortable in hot or cold conditions
- frost -bite with blisters and burning

EXAMPLES OF HAZARD CONTROL

Control strategies should now be developed and implemented in the workplace to ensure that employees are not unnecessarily exposed to hazards. Control measures include, but are not limited to the following (placed in priority' order):

1. Elimination/ substitution and process modification

Organic solvents that give rise to harmful contaminants should be eliminated or substituted for a more suitable substance which is harmless or less harmful. Taking into consideration the suitability of the substance both technically and engineering properties.

Substitution, although being the most effective method of reducing the hazard, is it not always practicable. Engineering controls may then become necessary.

Performing or modifying the work task can maintain a less hazardous work environment, such as: to reschedule work tasks, for example, morning panel workt afternoon spray painting.

2. Engineering control

These may include:

- Mechanical handling methods
- Local exhaust ventilation, according to EPA standards
- Isolation, enclosure of work process
- Mechanical general ventilation
- Redesign the spray booth to meet standards
- Mobile or fixed screens
- Redesign work environment with contaminated areas and a clean area

Local exhaust ventilation can often be the most effective control of a hazard at the source.

The system can consist of:

- hood - captures the contaminant at the source
- duct system
- air cleaning system
- exhaust fan
- a stack

Further details can be obtained from three books, *Clean Air at Work; Industrial Ventilation -A Manual of Recommended Practice and Principles of local Exhaust Ventilation* (Worksafe Australia)

3. administration control

Procedures such as:

- sign-post confined spaces where solvents vapour concentrates may build up (AS 2865)
- personal hygiene practices (no eating, drinking, smoking in the workplace)
- workplace maintenance procedures
- safe work practices - (establish a personal protective equipment program planning of daily tasks to decrease hazards train and educate in understanding of correct work processes hazard recognition and reporting system)

4. Training and education

Develop a program for: induction package, safe systems of work, personal protective equipment program and legislation requirements.

PPE HAZARD CONTROL

Personal protective equipment may be used in conjunction with other control measures.

EXAMPLE OF PERSONAL PROTECTIVE EQUIPMENT

Work process	example of type of personal protective equipment required
Spraying other than toxic painting substances outside spray booth	<ol style="list-style-type: none"> 1. respirator with a P1 filter when spraying non hazardous substances 2. an air-purifying respirator (suitable for gases and particulate) when the paint contains hazardous substances 3. appropriate eye Protection
Spraying toxic painting substances outside a spray booth	<ol style="list-style-type: none"> 1. a full/hood continuous flow air-line respirator when spraying isocyanate containing paint, a full- face air purifying respirator (suitable for gases and particulate) 2. full length overalls, appropriate chemically-resistant glove 3. eye protection
Spray painting in a confined space	<ol style="list-style-type: none"> 1. a full-face /hood continuous flow air-line respirator 2. overalls and appropriate chemically-resistant gloves where the substances being sprayed can irritate, sensitise or be absorbed by the skin
Grinding and sanding of painted surfaces	<ol style="list-style-type: none"> 1. a respirator with dust filtering performance at least equal to a P1 filter 2. eye protection
Footwear	<ol style="list-style-type: none"> 1. Safety boots
Hearing protection	<ol style="list-style-type: none"> 2. appropriate to the levels of noise exposure and protection requirements

Table 2: Examples of work process and personal protective equipment requirements

APPENDIX

- **REFERENCED MATERIAL**
 -
 - **FURTHER READINGS**
 -
- **AUSTRALIAN STANDARDS**
 -
- **CONTACT ORGANIZATIONS**

REFERENCED MATERIAL

Joyjock, M. A., Levin, L., 1984, *Health Hazards in a Small Automobile Body Repair Shop*, Ann. of Occupational Hygiene, vol. 28, No 1, p10-29.

Standards Australia, 1994, Handbook 9, *Occupational Personal Protection*, Pub. Standard Australia, Sydney.

WorkCover Authority of NSW, Nov. 1993, Health and Safety Notes, *Hierarchy of Hazard Controls*, Sydney.

WorkCover Authority of NSW, 1989, *Workers Compensation Statistics*, Sydney.

WorkCover Authority of NSW, 1983, *Occupational Health and Safety Act NSW 1983*, Sydney.

Worksafe Australia, 1990, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, Pub. Worksafe Australia, Sydney.

FURTHER READINGS

ACTU, National Occupational Health and Safety Unit, 1992, *identifying the Hazards of Work*, Pub, ACTU Canberra.

Alberti, P.W., (Ed). 1982, *Personal Hearing Protection in Industry*, Pub. Raven Press, New York ISBN No. 08 004 6980.

Booth, R., Bousfield, G., Douglas, G., Niven, A., 1990, *Health, Safety and Welfare in the Australian Workplace*, TAFE Student Learning Publication, TAFE (NSW), Sydney.

Department of Employment, Vocational Education, Training and Industrial Relations, Division of Workplace Health and Safety, 1993, Code of Practice, *Selection. Provision & Use of Personal Protective Equipment*, Pub. Department of Employment, Vocational Education, Training and Industrial Relations, Queensland.

Standards Australia, 1994, Handbook 9, *Occupational Personal Protection*, Pub. Standard Australia, Sydney.

WorkCover Authority of NSW, Sept, 1990, *WorkCover Authority of New South Wales- Personal Protective Equipment Section*, Sydney.

WorkCover Authority of NSW, Sept. 1993, *Material Safety Data Sheets, How to find out about chemicals used at your workplace*, Sydney.

WorkCover Authority of NSW, May 1992, *Toxic Gas in Confines Spaces*, Sydney.

WorkCover Authority of NSW, Nov. 1991, *Health and Safety Notes, Asbestos*, Sydney.

WorkCover Authority of NSW, Nov. 1991, *How to Prevent Silicosis, Dust in the Workplace*, Sydney.

WorkCover Authority of NSW, Nov. 1991, *A Guide to Dust Hazards*, Sydney.

WorkCover Authority of NSW, Nov. 1991, *Spray Painting Booth Construction*, Sydney.

WorkCover Authority of NSW, *Working with Fibreglass Reinforced Plastics*, Sydney.

WorkCover Authority of NSW, April 1991, *List of Approved Respiratory protective Devices*, Sydney.

WorkCover Authority of NSW, March 1993, *Principles of machine guarding*, Sydney.

Worksafe Australia, ACTU, 1993, *Occupational Health and Safety, Everyone's Business: A Joint Approach, Information Manual*, Pub. Worksafe Australia, Sydney

Worksafe Australia, Sydney Worksafe Australia, ACTU, 1993, *Occupational Health and Safety, Everyone: Business, A Joint Approach, Information Manual*, Pub. Worksafe Australia Sydney.

AUSTRALIAN STANDARDS

- Handbook 9 Occupational Personal Protection
AS 1067 Sunglasses and Fashion Spectacles Non Prescription Types
- AS 1223 - 1982 Safety requirements for Industrial Hand Cleaners
- AS 1269 - 1983 Hearing Protectors, Selection, Use are detailed.
- AS 1270 - 1988 Acoustics - Hearing Protectors.
- AS 1319.- 1983. Safety Signs for the Occupational Environment
- AS ~336 - 1982, Eye protection in the Industrial Environment.
- AS 1337 - 1984, Eye Protectors for Industrial Applications.
- AS 1338, Parts 1 to 3 - 1981 Filters for Eye Protectors.
- Part I: Filters for protection against radiation generated in welding and allied operation .
- Part 2: Filters for protection against ultraviolet radiation.
- Part 3: Filters for protection against infrared radiation.
- AS 1715-1991 Selection, Use and Maintenance of Respiratory Protective
- AS 1716-1991 Respiratory Protective Devices.
- AS 1800 - 1981. The Selection, Care and use of Industrial Safety Helmets
- AS 1801 - 1981. Industrial Safety Helmets.
- AS 1891 - 1983 Industrial Safety Belts and Harnesses
- AS 2161 - 1978 Industrial Gloves and Mittens.
- .AS 2210 - 1980. Safety Footwear.
- AS 2211 - 1981. Code of Practice for Laser Safety.
- AS 2225 - 1978. Rubber Gloves for Electrical Purposes.
- AS 2375 - 1980 Guide to the Selection, Care and Use of Clothing for Protection Against Heat and Fire
- AS 2604 Sunscreen Products -.Evaluation and Classification
- AS2711 Washers/Disinfectors for Respiratory Apparatus

AS 2919 - 1987 Industrial Clothing.

AS 2626 - 1983. Industrial Safety belts and Harnesses -Selection, Use and Maintenance.

AS 3765.1 - 1990 Clothing for protection against hazardous chemicals.

Part 1: Protection against general or specific chemicals.

AS 3765.2 - 1990. Clothing for protection against hazardous chemicals.

Part 2: Limited protection against specific chemicals.

CONTACT ORGANISATIONS

NEW SOUTH WALES

WorkCover Authority of NSW
400 Kent St
SYDNEY NSW 2000

Telephone: (02)3705000
Fax: (02) 3705999

AUSTRALIAN CAPITAL TERRITORY

Private Sector

Telephone: (06) 205 0791
Fax: (06) 205 0797

ACT OHS Office
First Floor, North Building
London Circuit
CIVIC ACT 2601

Public Sector

Telephone: (06) 205 0338
Fax: (06) 205 03 27

OHS Unit
ACT Government Service
North Building
London Circuit
CIVIC ACT 2601

NORTHERN TERRITORY

Work Health Authority
Minerals House
66 The Esplanade
DARWIN 0800

Telephone: (089) 89 5010
Fax: (089) 89 5141

QUEENSLAND

Department of Employment, Vocational
Education, Training and Industrial Relations
Division of Workplace Health and Safety
Level 3
Forbes House
30 Makerston St
BRISBANE QLD 4000

Telephone: (07) 227 4876
Fax: (07) 220 0143

SOUTH AUSTRALIA

South Australian Occupational Health
and Safety Commission
100 Waymouth Square ADELAIDE SA 5000

Telephone: (08) 226 3120
Fax: (08) 212 1864

TASIMANIA

Department of Employment, Industrial
Relations and Training
Occupational Health and Safety
81-89 Brisbane St
HOBART TAS 5000

Telephone: (002) 33 7694
Fax: (002)311387

VICTORIA

Occupational Health and Safety Authority
Building B, Level 1.
World Trade Centre
Spencer St
MELBOURNE VIC 3000

Telephone:(03) 628 8111
Fax: (03) 628 8555

WESTERN AUSTRALIA

Department of Occupational Health, Safety
and Welfare
1260 Hay St
WEST PERTH
WA 6005

Telephone: (09) 327 8777
Fax: (09) 321 8973

FEDERAL GOVERNMENT AGENCIES

Worksafe Australia
92 Parramatta Rd
CAMPERDOWN NSW 2050

Telephone: (02) 565 9555
Toll free number: (00S) 252 226
Fax: (02) 565 9202

EMPLOYER ORGANISATIONS

Australian Chamber of Commerce and Industry
4th Floor
55 Exhibition St
MELBOURNE VIC 3000

Telephone: (03) 289 5289
Fax: (03) 289 5250

UNION OR GANISATI ON

Australian Council Of Trade Unions
National OHS Unit
ACTU House
393 - 397 Swanston St
MELBOURNE VIC 3000

Telephone: (03) 663 5266
Fax: (03) 663 8220