National Occupational Health and Safety Commission

NATIONAL CODE OF PRACTICE FOR THE SAFE USE OF VINYL CHLORIDE

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FOREWORD

The National Occupational Health and Safety Commission (NOHSC) is a tripartite body established by the Commonwealth Government to develop, facilitate and implement a national occupational health and safety strategy.

This includes standards development, the development of hazard-specific preventive strategies, research, training, information collection and dissemination and the development of common approaches to occupational health and safety legislation.

The National Commission comprises representatives of the peak employee and employer bodies - the Australian Council of Trade Unions (ACTU) and the Confederation of Australian Industry (CAI) - as well as the Commonwealth, State and Territory governments.

Consistent with the National Commission's philosophy of consultation, tripartite standing committees have been established to deal with issues relating to standards development and research. Expert groups may be established to provide advice to the standing committees on those issues with which the National Commission is concerned.

PREFACE

In 1975 the National Health and Medical Research Council (NHMRC) published *Vinyl Chloride - Australian Code of Safe Practice* which was updated by the NHMRC in 1976 and 1978.

With the establishment of the National Occupational Health and Safety Commission, some functions which were previously the responsibility of the NHMRC were transferred to the National Commission. One such function was the continuing development and review of national standards and codes of practice relating to matters of occupational health and safety. A further updating of the existing NHMRC code of practice became necessary principally to reflect current Australian legislation and current industrial needs and practices.

The proposed *National Code of Practice for the Safe Use of Vinyl Chloride* was considered by the Standards Development Standing Committee (SDSC) in October 1988. After evaluation by the SDSC, the national code of practice was forwarded to the December 1988 meeting of the National Commission where it was endorsed for release for public comment. The document, in its draft form, was released for public comment in March 1989.

The National Commission, having considered public comment on the draft document, now declares a final *National Code of Practice for the Safe Use of Vinyl Chloride* under s.38(1) of the *National Occupational Health and Safety Commission Act 1985*(Cwlth).

1. TITLE

1.1 This national code of practice may be cited as the *National Code of Practice for the Safe Use of Vinyl Chloride.*

2. PURPOSE

2.1 The purpose of this national code of practice is to provide practical guidance in the identification of health hazards, evaluation of risks and control of exposure associated with the manufacture of vinyl chloride and its subsequent polymerisation to polyvinyl chloride (PVC). Note that vinyl chloride is often referred to as vinyl chloride monomer (VCM).

3. SCOPE AND APPLICATION

3.1 This national code of practice applies to the manufacture, reaction, packaging, repackaging, storage, handling, transportation, use or disposal of vinyl chloride or PVC, but not to the handling or use of fabricated products made of PVC. In particular, it:

(a) covers the operations (including maintenance and emergency situations), control measures and monitoring of exposure to vinyl chloride in the manufacture of vinyl chloride and its subsequent polymerisation to PVC;

(b) is based on the principle that the exposure of workers to vinyl chloride should be reduced to as low a level as workable;

(c) is directed at the control of vinyl chloride emissions in the workplace in order to minimise personal exposure; and

(d) provides a guide to appropriate work practices required for vinyl chloride control.

4. ADMINISTRATION OF THE NATIONAL CODE OF PRACTICE AND RESPONSIBILITIES OF EMPLOYERS AND EMPLOYEES

ADMINISTRATION

4.1 This national code of practice should be administered by a formal system of joint consultation between management and employees, consistent with the relevant State or Territory occupational health and safety legislation. This would usually be achieved through a workplace health and safety committee.

4.2 The implementation of the vinyl chloride control policy should be regularly reviewed by the workplace health and safety committee. The membership of the committee should be consistent with the relevant State or Territory occupational health and safety legislation and include representatives of management, workers and unions.

4.3 Members of the committee should have access to all relevant technical or medical expertise available in the company, and to all registers and records (excluding personal medical records) required to be kept by this national code of practice. They should also have access to all plant areas covered by this national code of practice.

4.4 The proceedings of the committee should be fully documented and widely distributed so that every employee covered by the national code of practice has access to them.

4.5 A member of management possessing suitable technical and occupational health and safety expertise should be appointed with the prime responsibility of assisting the committee in administering the national code of practice.

4.6 All personnel on the site should comply with the national code of practice.

RESPONSIBILITIES OF EMPLOYERS AND EMPLOYEES

4.7 The prime responsibility for ensuring the control of vinyl chloride emissions resides with employers and management. It is the responsibility of management through established consultative processes to formulate a vinyl chloride control policy. The policy should detail programs which provide that:

(a) statutory requirements are complied with;

(b) all levels of management and relevant employees understand that work practices should be planned and, where necessary, redesigned to reduce exposure to vinyl chloride;

(c) information on vinyl chloride hazards and appropriate work practices is made available and disseminated;

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

(e) appropriate protective clothing and footwear are provided and maintained and employees should be trained in the correct use of all protective clothing or equipment.

5. DEFINITIONS

5.1 In this national code of practice, unless the contrary appears:

`Authorised medical practitioner' means a medical practitioner registered under the relevant State or Territory legislation and who has been approved in writing to carry out medical examinations under the relevant occupational health and safety regulations.

`Breathing zone' is the worker's breathing zone described by a hemisphere of 300 mm radius, extending in front of the face and measured from the midpoint of an imaginary line joining the ears.

`Competent authority' is the relevant State or Territory occupational health or environmental planning authority.

`Exposure standard' represents the time-weighted average airborne concentration of vinyl chloride in the worker's breathing zone for a normal eight-hour work day, for a five-day work week, exposure to which, according to current knowledge, should not cause adverse health effects to nearly all worker.

`May' indicates that a requirement is optional.

`Shall' indicates that a requirement is mandatory.

`Should' indicates a recommendation.

`Vapour' is the volatile form of vinyl chloride, which can be either gas or vapour. Vinyl chloride is a liquid when under pressure at room temperature and is a gas at room pressure at room temperature.

`Workable' means `practicable' in Victoria, Queensland, Western Australia and the Northern Territory, `reasonably practicable' in New South Wales, South Australia and the Australian Capital Territory and `a reasonable precaution' in Tasmania.

6. HEALTH HAZARDS

6.1 Vinyl chloride is a gas, or a liquid when under pressure, at room temperature, so the primary route of exposure is by inhalation (see Appendix 1 for physical and chemical properties of vinyl chloride). Vinyl chloride liquid and vapour are highly flammable. The vapour forms an explosive mixture with air.

6.2 At high vapour concentrations vinyl chloride depresses the function of the central nervous system (brain) causing dizziness, light headedness and unconsciousness.

6.3 As vinyl chloride can be a liquid when under pressure at room temperature, dermal(skin) exposure to liquid vinyl chloride is possible; skin burns may result by rapid evaporation of liquid vinyl chloride and consequent freezing of the skin.

6.4 On repeated exposure to vinyl chloride vapour, usually over many years, some workers have developed a type of cancer of the liver called angiosarcoma (ASL). The development of ASL reflects previous high exposure levels to vinyl chloride. There is generally a period of 20 years or more between the time of first exposure and the development of the tumour, which is called the latent period. ASL is rare among the general population.

6.5 Vinyl chloride has been given a Category l classification (Established Human Carcinogen). Established Human Carcinogens are substances for which there is sufficient evidence to indicate the existence of a casual association with occupational cancer in humans 1.

6.6 Other cancers such as brain and lung cancer and melanoma have been reported following exposure to vinyl chloride. These reports have not been confirmed.

6.7 Other health effects related to exposure to vinyl chloride may include:

- bone resorption, particularly of the finger tips (acro-osteolysis);
- Raynaud's syndrome, a condition which affects the circulation of the hands and feet;
- scleroderma, a degenerative condition which causes stiffness of the skin and soft tissues; and
- hardening (fibrosis) of the liver.

These effects are due to a previous history of high vinyl chloride exposure.

7. EXPOSURE STANDARD

7.1 The proposed national exposure standard for vinyl chloride, recommended by the National Commission, is given in Appendix 2. Since this value may be reviewed from time to time, the most recent publication of the National Commission's national exposure standards document should always be consulted[1]. At present, the Exposure Standards Working Group is reviewing vinyl chloride as a priority.

7.2 The national exposure standard does not represent a `no effect' level which guarantees protection to every worker and does not provide guidance to the drawing of fine dividing lines between satisfactory and unsatisfactory working conditions. The national exposure standard is best used to assess the quality of the working environment and indicate where appropriate control measures are required.

8. CONTROL MEASURES

8.1 All steps should be taken to keep atmospheric concentrations of vinyl chloride vapour as low as workable.

8.2 Exposure of workers to atmospheric concentrations of vinyl chloride vapour should conform with the recommended national exposure standard, on the understanding that exposure should be reduced to as low a level as workable. However, such exposure should not exceed the recommended national exposure standard.

8.3 Wherever workable, engineering and work practice controls shall be implemented to reduce the airborne vinyl chloride concentrations. Respiratory protective equipment, conforming to Section 11 of this national code of practice, shall be used when these controls are not sufficient to keep the concentrations below the recommended national exposure standard. Engineering and work practice controls shall also take into account the flammability and explosiveness of vinyl chloride.

8.4 No person shall regularly work in areas where vinyl chloride is manufactured, stored or handled, or any other areas where vinyl chloride concentrations could reasonably exceed the national exposure standard, unless they have been authorised in writing to do so. A register in accordance with Section l6 shall be kept of all persons so authorised. Areas which require an authorisation for vinyl chloride work to be undertaken should be clearly marked with signs detailing the nature of the hazard and available controls.

8.5 Where vent reliefs are essential, they should be positioned so that their outlets cause the least possible contamination to the working atmosphere or any neighbouring locations.

8.6 The competent authority shall be notified of proposals to install new plant and equipment to which this national code of practice will apply or to substantially modify existing plant and equipment in any way that might increase the possibility of leakages of vinyl chloride vapour. Such notification should be made six months before work commences on any installation or modification of plant and equipment. The competent authority shall also be informed when new or modified plant and equipment may affect dispersal of vinyl chloride vapour emissions.

8.7 Solid, liquid and solid/liquid waste materials containing significant levels of residual vinyl chloride should be transferred to special containers and pits in designated areas. The transport and storage of such materials should be in such a manner that vinyl chloride vapour concentrations in the immediate area do not exceed the national exposure standard. Where workable, the waste materials should be stripped of vinyl chloride, then disposed of in accordance with the relevant statutory requirements.

8.8 A suitable register should be kept listing the control measures operating in the vinyl chloride handling plant. This register will act as a record of maintenance of the control measures and as evidence of the employer's efforts to reduce the exposure as far as workable.

9. HAZARDOUS OPERATIONS

9.1 When a non-routine operation necessitates opening plant and equipment which may release vinyl chloride liquid or gas to the atmosphere, for example, as in the maintenance or repair of equipment, and where it is not workable to remove vapours by procedures such as local exhaust ventilation or nitrogen purging, then respiratory protective equipment shall be worn as outlined in Section 11 and Appendix 3. Precautions shall be taken to ensure that other personnel are not exposed to concentrations of vinyl chloride above the national exposure standard during this operation.

9.2 Entry into a confined space which may contain vinyl chloride should only occur when absolutely necessary and after every effort has been made to minimise the time of potential exposure to vinyl chloride. For the purpose of this national code of practice a `confined space' includes a reactor, autoclave, tank, chamber, vat, pit, pipe, flue, duct, bunker or underground room in which vinyl chloride vapour has been or may be present. Australian Standard AS 2865[2] covers safe working in confined space. It should also be noted that various State/Territory governments have special confined space entry procedures such as s. 42 of the *Factories, Shops and Industries Act 1962* (NSW).

9.3 Entry into a confined space shall be in accordance with the vinyl chloride control policy developed by management through established consultative processes (see also Sub-section 4.7).

9.4 A permit to work clearance from a qualified and competent management representative shall be obtained prior to any operation which could result in exposure to vinyl chloride, including entry into a confined space which may contain vinyl chloride. Entry into confined spaces and permits to work should be recorded on printed forms as indicated in Australian Standard AS 2865[2].

9.5 Before a person enters any confined space which may contain vinyl chloride, all workable measures shall be taken to reduce the vinyl chloride vapour concentration to below the national exposure standard, and the atmosphere shall then be analysed for vinyl chloride and oxygen content.

9.6 Where it is not workable to reduce and maintain the vinyl chloride vapour concentration below the national exposure standard, respiratory protective equipment and protective clothing recommended in Section 11 and Appendix 3 shall be worn. The standard of personal protection shall be specified by the person issuing the permit to work required by Sub-section 9.4.

9.7 Any permit to work allowing a person to enter a confined space without respiratory protection should clearly state that the person issuing the clearance is satisfied that:

(a) the vinyl chloride vapour concentration is below the national exposure standard; and

(b) no circumstances are foreseen whereby the worker may be exposed to vinyl chloride vapour concentrations above the national exposure standard.

9.8 A permit to work should list:

(a) a summary of safe working procedures;

(b) a list of safety equipment and protective gear required; and

(c) emergency contact details.

9.9 Sampling of vinyl chloride for analysis shall be via a closed system incorporating a vapour/liquid return line. Vinyl chloride liquid shall be handled in approved pressure cylinders.

10. MAINTENANCE

10.1 Maintenance work may involve exposure to high vinyl chloride vapour concentrations. Proper supervision shall therefore be exercised to ensure that the requirements of this national code of practice are applied to maintenance workers.

10.2 A high standard of maintenance of plant and equipment shall be provided to facilitate compliance with the national exposure standard. Defective plant and equipment resulting in atmospheric vinyl chloride vapour concentrations above the national exposure standard shall be repaired as soon as workable.

10.3 Likely areas of vinyl chloride leakage shall be regularly monitored to minimise the effects of, and then eliminate, leakage.

10.4 All ventilation equipment used to control vinyl chloride should be thoroughly examined and maintained at least once every six months, with the results recorded as required by Section 16.

10.5 A procedure should be established whereby remedial action is initiated immediately any faults or defects are identified in any control measures. All repairs and routine maintenance of control measures should be recorded in a maintenance register. This should include the date the fault or defect was found and the date of completion of remedial action or repair or replacement (see also Appendix 6).

10.6 Persons involved in the maintenance of vinyl chloride plant or control measures may be exposed to significantly elevated concentrations of vinyl chloride vapour. The maintenance procedures should be reviewed by competent persons to ensure that the precautions taken are appropriate to the likely level of risk involved.

11. PERSONAL PROTECTIVE EQUIPMENT

11.1 This section covers both respiratory protective equipment and protective clothing.

11.2 Respiratory protective equipment shall be provided for all persons employed in areas where the vinyl chloride concentration may exceed the national exposure standard.

11.3 Respiratory protective equipment shall be worn during operations or situations where the vinyl chloride vapour concentration may exceed the national exposure standard.

11.4 In this national code of practice, `suitable respiratory protective equipment' means full-face or half-face continuous flow airline respirators, or self-contained breathing apparatus, conforming to the requirements of Australian Standard AS 1716[3] or an equivalent approved by a State or Territory authority and should be used in accordance with Australian Standard AS 1715[4].

11.5 All respiratory protective equipment shall be inspected and maintained by a competent person at least once every 14 days and records of inspection and maintenance should be kept as outlined in Section 16 and Appendix 6.

11.6 All persons to whom Sub-section 8.4 applies shall complete a suitable training course in the use of respiratory protective equipment, as outlined in Appendix 3, at least once every year, with a record of such training to be kept as outlined in Section 16.

11.7 Protective clothing shall be available for, and worn by, all persons to whom Sub-section 8.4 applies. All forms of protective clothing and equipment shall comply with the relevant Australian Standards, as outlined in Appendix 3.

The new draft Australian Standard AS 1715 covers training in the use of respiratory protective devices in detail.

12. EMERGENCY SITUATIONS

12.1 A written operational plan for emergency situations shall be formulated by each plant or facility manufacturing, processing, storing, handling or otherwise using vinyl chloride to cater for any hazardous release of vinyl chloride vapour or liquid. The plan should be approved by the relevant authorities and should specifically provide for:

(a) raising the alarm;

(b) evacuation;

(c) control and containment of a vinyl chloride spill, leak or other release;

(d) fire-fighting procedures;

(e) personal protection of workers engaged in correcting the situation;

(f) assistance by emergency authorities (fire, police, ambulance and State or Territory emergency services) and site resources;

(g) contact points who should be contacted in case of an emergency; and

(h) a list of individuals and organisations to be provided with a copy of the written operational plan.

Appropriate parts of any such emergency plan may be implemented depending on the nature of any individual emergency.

12.2 The emergency plan shall take into consideration the welfare of residents and other personnel at nearby locations outside the workplace boundary.

12.3 All persons employed in such plants and facilities shall be adequately trained in the procedures for dealing with emergency situations. Personnel involved in emergency situations shall be equipped with appropriate protection; other personnel not so equipped shall evacuate the area until the conditions of the emergency are brought under control.

12.4 All incidents which require implementation of the emergency plan procedures should be recorded and reported to the local authorities.

13. MONITORING

13.1 A written plan for both fixed-point and personal monitoring should be developed for all areas where vinyl chloride vapour concentrations may exceed the national exposure standard.

13.2 All monitoring should be in accordance with established analytical procedures, and should be supported by approved calibration, checking and back-up procedures.

13.3 The location of sampling points and frequency of analysis shall be chosen so that they represent both the air breathed by workers and the areas most susceptible to vinyl chloride leakage.

13.4 The frequency of personal monitoring shall be such as to provide a reliable estimate of the degree of personal exposure to vinyl chloride on a time-weighted average basis.

13.5 All monitoring should be carried out or supervised by a person suitably qualified and trained in environmental monitoring and analytical procedures.

13.6 The results of monitoring should be recorded as outlined in Section 16 and Appendix 6. All results should be available for inspection by personnel working in the areas where vinyl chloride may be present.

13.7 All instances where fixed-point or personal monitoring results exceed the national exposure standard shall be investigated within 24 hours. The results of any such investigation shall be recorded as outlined in Section l6 and Appendix 6. A copy of the investigation report should be available to all employees concerned.

14. EDUCATION AND TRAINING

14.1 The employer shall provide information in writing about the possible health effects associated with vinyl chloride exposure to:

(a) every employee who is likely to be exposed to vinyl chloride; and

(b) every successful applicant for employment who is likely to be exposed to vinyl chloride during the course of their employment.

14.2 All persons in any vinyl chloride manufacturing, processing, storing or handling facility should be suitably instructed in the potential health risks and protective measures necessary.

14.3 In addition, they should have ready access to this national code of practice as well as a material safety data sheet (MSDS) for vinyl chloride. The MSDS should conform with the recommended National Commission format[5].

14.4 Such instruction should include the following:

(a) health hazards of vinyl chloride, including the hazards from chronic exposure, specifically the carcinogenic hazard, and the purpose of health assessment required by this national code of practice;

(b) fire hazard and other dangerous properties of vinyl chloride;

(c) the correct operation of the plant and equipment with which the employee is concerned;

(d) the role of the employee in safe working methods and personal hygiene;

(e) personal protective measures outlined in this national code of practice, including correct use of protective equipment;

(f) the purpose, description and significance of the vinyl chloride monitoring plan and results;

(g) procedures during emergency situations; and

(h) the role of joint consultation and procedures associated with administration of this national code of practice, and information on relevant provisions and requirements of State/Territory occupational health and safety legislation.

14.5 Initial instruction should be reinforced at regular intervals with a continuing retraining program.

15. HEALTH SURVEILLANCE

15.1 All persons to whom Sub-section 8.4 applies (that is, anyone who regularly works in areas where vinyl chloride is manufactured, reacted, stored or handled, or any other area where the vinyl chloride concentration could reasonably exceed the national exposure standard) should undergo a health assessment, with an emphasis on liver disease, prior to employment and then at two year intervals.

15.2 The health assessment should include:

(a) a full medical and occupational history;

(b) a clinical examination with particular reference to the abdomen, skin and extremities; and

(c) any other tests recommended in Appendix 5.

A statement for the guidance of the medical officer undertaking examinations of vinyl chloride employees is shown in Appendix 5.

15.3 An employee to whom Sub-section 8.4 applies and who reports symptoms which may be related to vinyl chloride exposure, or any such employee who has been absent on sick leave for 10 consecutive working days or more, should be seen by an authorised medical practitioner, preferably an occupational physician. Absences from work due to illness of such workers should be reviewed both as a group and on an individual basis, with additional health assessments to be conducted if necessary.

15.4 Full and confidential medical records shall be maintained for at least 30 years. These records are to be retained carefully by the medical practitioner. Employees should receive a certificate of fitness (or otherwise) from an authorised medical practitioner. All medical records shall remain confidential and be released to a third party only with the explicit consent of the individual involved.

15.5 The employee should be provided with a written report of his or her health assessment, together with a clear explanation of the results.

16. REGISTERS AND RECORDS

16.1 The following detailed records should be kept:

(a) names, addresses and dates of birth of persons who regularly work in areas where vinyl chloride is manufactured, reacted, stored or handled, or any other area where vinyl chloride concentrations could reasonably exceed the national exposure standard, that is, persons covered by Sub-section 8.4;

(b) permits to work (Sub-section 9.4);

(c) inspections of ventilating equipment (Sub-section 10.4);

(d) results of atmospheric monitoring of vinyl chloride (Sub-section 13.6);

(e) investigations of results which exceed the exposure standard (Sub-section 13.7); and

(f) inspections of respiratory protective equipment (Sub-section 11.5).

16.2 These records should contain at least the information listed in Appendix 6 and may be kept in any suitable form provided they can be readily accessed when requested.

16.3 Records should be kept for at least the following periods:

(a) names, addresses, dates of birth - 30 years;

(b) personal monitoring - 30 years;

(c) other atmospheric monitoring results - for at least 30 years. (If the original results are converted to monthly summaries, the originals should be kept for at least three years); and

(d) all other records - for at least three years.

Records of persons should be linked to personal monitoring results to enable an estimation of the probable concentration to which any person has been exposed.

16.4 Employees covered by Sub-section 8.4, and who are leaving their employment, shall be advised that, on request, they shall be given a signed statement indicating the period and nature of their employment, their employer and the address where the detailed records required by this section are kept.

APPENDIX 1

PHYSICAL AND CHEMICAL PROPERTIES OF VINYL CHLORIDE

Chemical formula:	$CH_2 = CHC_1$
Alternative chemical names:	Chloroethylene, Chloroethene, Vinyl chloride monomer, VC, VCM
CAS Number:	75-01-4
Description:	Colourless liquid or gas. Detectable by a slight sweet odour only at concentrations above 2500 ppm by volume in air.
Molecular weight:	62.5 g/mole
Boiling point at 1 atmosphere:	-13.6°C
Freezing point at 1 atmosphere:	-154°C
Vapour pressure at 20°C:	307 kPa
Latent heat of vaporisation at boiling point:	335 kJ/kg
Gas density relative to air at 20°C:	2.2
Liquid density relative to water at 20°C:	0.92
Solubility in water at 20°C:	1.0g/100g water (values down to 0.11g/100g water are often quoted in the literature).
Solubility in organic solvents:	Soluble in hydrocarbons, oil, alcohol, chlorinated solvents, and most common organic liquids.
Partition coefficient (n-octanol/water):	log P_{OW} 1.38
Flash point (open cup):	-78°C
Autoignition temperature:	470°C
Explosive limits in air:	4% - 22% by volume
Stability:	In presence of oxygen, may form peroxides, which in turn may form explosive polyperoxides.

APPENDIX 2

EXPOSURE STANDARD

The current national exposure standard for vinyl chloride recommended by the National Commission1 is as follows:

Time-weighted average (TWA)	5 ppm (by volume)*****

TWA: time-weighted average for an eight-hour work day, for a five-day work week.

***** This is an interim value pending priority review by the National Commission.

Note: Excursions above the TWA exposure standard should be restricted in accordance with the guideline on excursion limits recommended by the National Commission.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY EQUIPMENT - TRAINING OUTLINE

1 Principles of operation and use of equipment.

2 Practice in using equipment.

3 Limitations of equipment.

4 Common defects of equipment and action required.

5 Circumstances in which use is required.

6 List of officers responsible for training at the workplace, how to contact them and when they should be contacted for advice.

PROTECTIVE CLOTHING

7 The standard of protective clothing needed to comply with Sub-sections 9.6 and 11.7 will vary depending on the nature of the hazardous operation or other work being carried out. The recommended protective clothing shall be one of the following main types:

(a) gas-tight suits giving full body and respiratory protection;

(b) splash suits giving body protection and, where applicable, suitable respiratory protection;

(c) PVC or PVC-proofed overalls;

(d) terylene, cotton or similar overalls;

(e) industrial jacket or shirt and trousers; and

(f) other industrial wear recommended by draft Australian Standards for body protection (in SA HB9-1986[6]).

8 Eye protection recommended for operations requiring the handling of liquid vinyl chloride should conform to Australian Standard AS 1336[7] or an equivalent approved by a State/Territory authority. Chemically-resistant goggles are normally recommended.

9 In the handling of vinyl chloride containers, for example, during sampling, protection from the cold by fur-lined neoprene gloves is recommended. For all other situations, use gloves in accordance with Australian Standard AS 2161[8].

10 For all other personal protection, consult the relevant individual Australian Standards and SA HB9 - 1986[6].

MONITORING

MEASURING EQUIPMENT

1 In large-scale plants, fixed-point monitoring is more conveniently carried out by an automatic monitoring system equipped with an alarm function and direct-reading data output.

2 The sensitivity, range, selectivity and speed of response need to be considered when selecting appropriate analytical monitoring equipment. Electrical equipment in flammable atmospheres should be suitably constructed, protected and installed and used in accordance with the relevant Australian Standards (including AS 1825[9], AS 1826[10] and AS 2480[11]).

3 In the selection of suitable personal monitoring equipment, efficiency, precision and accuracy, selectivity, mechanical reliability and comfort of wearing should be considered.

4 Both passive monitors and monitors that use portable sampling pumps have been found to be suitable for vinyl chloride personal monitoring. These should be used in association with established analytical methods.

GUIDANCE FOR MEDICAL OFFICERS

1 The known health hazards of exposure to vinyl chloride vapour are listed in Section 6. An important aspect of prevention is to inform employees of the nature of the hazard and the need to present themselves for appropriate medical assessment at regular intervals and at times of illness.

2 The health surveillance procedures recommended in Section 15 are designed to have two functions. Firstly, the assessment of health prior to employment will assist in identifying a person with a pre-existing medical condition which may be aggravated by exposure to vinyl chloride and also provide a baseline should occupational health problems be suspected in the future. Secondly, it will allow the monitoring of the health experience of workers exposed to vinyl chloride.

3 The difficulty of detecting angiosarcoma of the liver reflects the fact that the liver tissue surrounding a neoplastic lesion is relatively normal. Therefore, unless the lesion compresses a vital bile duct it is unlikely to cause hepato-cellular dysfunction until it is well advanced. Unfortunately there is no simple test for angiosarcoma. Until more sensitive or appropriate investigations are available, those outlined below are suggested for routine screening.

4 Recommended tests are:

Haematology:	differential white cell count (blood film) platelet count
Serum biochemistry:	alkaline phosphatase Bilirubin aspartate transaminase (AST or SGOT) alanine transaminase (ALT or SGPT) gamma glutamyl transpeptidase (GGPT)

Changes in blood and liver function tests may be caused by many other factors and interpretation of any abnormal finding shall be made in the context of the history of exposure and the finding of physical examination.

REGISTERS AND RECORDS

1 The following is the minimum information required to be kept for the purposes of Section 16.

RECORD OF AUTHORISED PERSONS

2 For each person defined in Sub-section 16.1, the following information should be kept:

(a) name, address, and date of birth;

(b) normal place and area of work; and

(c) dates of work in particular places and areas, including dates of transfer to other work areas.

PERMIT TO WORK

3 These should be recorded in the form of copies of the original permits.

INSPECTIONS OF VENTILATING EQUIPMENT

4 The following information should be kept:

(a) location and type of plant;

(b) date of inspection;

(c) defects noted;

(d) action taken to correct defects and date of repair; and

(e) name and signature of person making examination.

Performance measures, such as measured flow rates or changes in duct pressures, should also be recorded.

RESULTS OF ATMOSPHERIC AND PERSONAL MONITORING AND INVESTIGATION OF RESULTS WHICH EXCEED THE NATIONAL EXPOSURE STANDARD

5 Where applicable, the following information shall be recorded:

(a) location;

(b) identification of person monitored;

(c) job description, including area of work and duties during shift;

(d) date, shift and duration of sampling period;

(e) time-weighted average vinyl chloride concentration;

(f) result of investigation;

(g) action taken; and

(h) name and signature of person making entry.

INSPECTION OF RESPIRATORY PROTECTIVE EQUIPMENT

6 The following information should be kept:

(a) name and description of equipment;

(b) person issued to, if on personal issue;

(c) date of inspection;

(d) description of any defect found;

(e) statement of steps taken to deal with defect; and

(f) name and signature of person making inspection.

STATE GOVERNMENT AUTHORITIES

NEW SOUTH WALES

Notification for New Plant and Equipment

Department of Industrial Relations and Employment
Industrial Health Section
93 George Street
PARRAMATTA NSW 2150
Phone (02) 895 8678

Disposal of Waste

State Pollution Control Commission
Chemical and Waste Branch
157 Liverpool Street
SYDNEY NSW 2000
Phone (02) 265 8888

Reporting of Major Incidents

Department of Industrial Relations and Employment
Industrial Health Section
93 George Street
PARRAMATTA NSW 2150
Phone (02) 895 8678

VICTORIA

Notification for New Plant and Equipment

Dangerous Goods Branch
Department of Labour
427 Spencer Street
MELBOURNE VIC 3000
Phone (03) 329 8344

Environment Protection Authority
240 Victoria Parade
EAST MELBOURNE VIC 3002
Phone (03) 651 4011

Local Government (councils)

Disposal of Waste

Environment Protection Authority
240 Victoria Parade
EAST MELBOURNE VIC 3002
Phone (03) 651 4011

Reporting of Major Incidents

Dangerous Goods Branch
Department of Labour
427 Spencer Street
MELBOURNE VIC 3000
Phone (03) 329 8344

Metropolitan Fire Brigades Board
456 Albert Street
EAST MELBOURNE VIC 3002
Phone (03) 11441

Country Fire Authority (listed under local fire brigades).

GLOSSARY OF TERMS

Fixed-point monitoring	An air monitoring procedure whereby fixed samplers are strategically located within a workplace; this method of sampling is preferred when evaluating engineering controls or determining sources of contamination.
Hazard	Is the potential for an agent or process to do harm.
Melanoma	A tumour made up of melanin-pigmented cells.
Monomer	A molecule or compound usually containing carbon and of relatively low molecular weight and simple structure, which is capable of conversion to polymers, by combination with itself or other similar molecules or compounds; vinyl chloride is the monomer from which polyvinyl chloride is made.
National code of practice	For the purposes of this document, the national code of practice is the National Commission's National Code of Practice for the Safe Use of Vinyl Chloride.
Osteolysis	Dissolution of bone; applied especially to the removal or loss of calcium in bone.
Passive monitor	A device which samples the atmosphere by molecular diffusion, with analyte being adsorbed by an adsorbent medium within the sampler; the total mass of analyte collected is proportional to both average analyte concentration in the air and the time for which the sampler is exposed.
Permit-to-work	Specifies details of the location and type of work to be done, confirms that identified hazards have been evaluated, and specifies the necessary protective measures.
Personal sampling	A method whereby air is sampled within the worker's breathing zone to evaluate personal exposure to airborne contaminants.
Polymerisation	A chemical reaction, usually carried out with a catalyst, heat or light, and often under high pressure, in which a large number of relatively simple molecules combine to form a chain-like macromolecule known as a polymer.
Polyvinyl chloride (PVC)	$(-H_2CCHCl-)_X$; a synthetic thermoplastic polymer made from vinyl chloride.
Risk	Is the probability that a potential harm may become actual.
Stripping	Removal of a substance using physical and/or chemical methods.
Vinyl chloride monomer (VCM)	The most important vinyl monomer; it is the starting material for manufacturing polyvinyl chloride (PVC).
Workplace	Includes all places where employees need to be, or to go, by reason of their work, and all places which are under the direct or indirect control of their employer.

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