# Chemical Safety in the Workplace

# Guidance Notes on Personal Protective Equipment (PPE)

*for*

# Use and Handling of Chemicals

Safety at work

Occupational Safety and Health Branch
Labour Department

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***Guidance Notes on***
***Personal Protective Equipment (PPE)***
***for Use and Handling of Chemicals***

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Occupational Safety and Health Branch
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# Contents

# 1 Preface

Dangerous chemicals are often used and handled in workplaces. The risk of injury or ill health upon exposure to the hazards of the chemicals at work depends on whether there are adequate safety measures in place.

Under the Occupational Safety and Health Ordinance (Cap. 509), the employer of a workplace is required to make necessary arrangements in ensuring the safety and health in connection with the use, handling, storage or transport of chemicals. These include the arrangements for assessing the risks of chemicals in the workplace and establishing appropriate safety measures. Readers should refer to the guidance notes, namely, *Chemical Safety in the Workplace: Guidance Notes on Risk Assessment and Fundamentals of Establishing Safety Measures* issued by the Labour Department for details.

Using personal protective equipment (PPE) is one of the safety measures, and is often regarded as the last resort, supplementary to control measures, in providing protection to the employees. Despite the use of PPE is often considered as a passive way to control risk, with thoughtful management, a very proactive PPE programme can be developed.

This guidance notes is roughly divided into two main parts. The first part (Chapters 2 to 7) explains the components of an effective PPE programme and the essential steps for developing such a programme. The latter part (Chapter 8) is a practical guide for the selection of suitable PPE for use and handling of chemicals.

This guidance notes is intended to provide employers, management personnel, professionals, safety personnel and supervising staff of a workplace with general practical guidance in: (1) developing an effective management programme of PPE; and (2) selecting suitable PPE, so as to ensure the safety and health of employees at work with chemicals. It is applicable to all types of workplaces where chemical substances are handled, used or produced during the process. However, protection against micro-organisms and radioactive substances requires different approaches and is outside the scope of this guidance notes. Nevertheless, the employers should at the same time observe specific requirements on PPE under the Occupational Safety and Health Ordinance (Cap. 509) and the Factories and Industrial Undertakings Ordinance (Cap. 59) and their subsidiary regulations which may be applicable to their workplaces. A list of the relevant legislation and Codes of Practice can be found in Appendix I.

# 2 Overview

## 2.1 Chemical hazards and risks in the workplace

2.1.1 In chemical safety term, "hazard" refers to the inherent hazardous properties of a chemical or a chemical operation, while "risk" means the likelihood of the hazardous properties of a chemical or the hazards of a chemical operation causing harm to people and the severity of that harm.

2.1.2 The risks associated with a chemical or a chemical operation depends on the inherent hazards, the physical form of the chemicals involved, the working environment, the method of handling as well as the operating procedures.

## 2.2 Risk assessment and safety measures

2.2.1 The guidance notes, namely, *Chemical Safety in the Workplace: Guidance Notes on Risk Assessment and Fundamentals of Establishing Safety Measures* issued by the Labour Department describes the fundamental principles and approach for assessing the chemical risks in workplaces and establishing appropriate safety measures.

2.2.2 In establishing the appropriate safety measures, the primary consideration is always in the following descending order of priority:

(a) Eliminate the risk, for example, by using other less dangerous chemicals or doing the job in a different way.

(b) Control the risk at source by various engineering control measures and systems of work, such as enclosure, exhaust ventilation.

(c) Only when the above measures cannot adequately control the risks, should the use of PPE be considered.

2.2.3 It is important to note that use of PPE should always be regarded as the "last resort" in the hierarchy of safety measures, and is a supplement to, not in lieu of, effective engineering control measures and safe system of work. The reasons are:

(a) PPE protects only the person wearing it, whereas measures controlling the risk at source can also protect other persons in the workplace.

(b) The theoretical maximum level of protection offered by a PPE is seldom achieved in practice. This may give the wearer a false sense of safety. The actual level of protection is usually difficult to be assessed. Effective protection is only achieved by a PPE that is appropriately selected according to the risks involved, and at the same time properly fitted and used, and well maintained.

(c) PPE may cause discomfort to the wearer due to perspiration problem, or limit his mobility or visibility to some extent, or restrict him by additional load to carry or additional effort to breathe. The effects need to be fully assessed. This problem is further discussed in Chapter 8.

2.2.4 Examples of situations where use of suitable PPE may be necessary are:

(a) where it is not technically feasible to achieve adequate risk control by other means (in this case, exposure shall be reduced as far as practicable by other measures and then, in addition, suitable PPE should be used to secure adequate risk control);

(b) where PPE is necessary to safeguard safety and health until such time as adequate risk control is achieved by other means, for example, where urgent action is required due to plant failure; or

(c) during routine maintenance operations where the infrequency and small number of people involved may make control measures not reasonably practicable.

## 2.3 What is PPE?

2.3.1 PPE in this guidance notes means an equipment that is intended to be worn or otherwise used by a person at work and that protects the person against one or more risks arising from chemical or chemical operation to the person's safety or health. It includes any addition or accessory to the equipment designed to meet a similar objective.

2.3.2 Examples of PPE for use and handling of chemicals include protective clothing, apron, gloves, footwear, eye protector, face shield, and respirator. They can be roughly classified into the following categories:

(a) protective clothing;

(b) hand and foot protective gears;

(c) eye and face protective equipment; and

(d) respiratory protective equipment.

## 2.4 PPE programme

2.4.1 Use of PPE as a safety measure for controlling risk is generally considered to be passive. However, with the application of thoughtful management techniques in developing an effective PPE programme, this passive safety measure can be made a very proactive one.

2.4.2 PPE programme is an integral part of a comprehensive safety management system. It is a systematic approach for selecting the appropriate PPE, as well as ensuring that the PPE is properly used and maintained. The basic components of a PPE programme and the essential steps for developing the programme include the following:

(a) PPE assessment and review (refer to Chapter 3);

(b) selection and provision of suitable PPE (refer to Chapter 4);

(c) provision of information, instruction and training to employees (refer to Chapter 5);

(d) monitoring the proper use of PPE and its effectiveness in controlling risks (refer to Chapter 6);

(e) maintenance and accommodation of PPE (refer to Chapter 7); and

(f) reviewing and revising the PPE programme regularly and if there has been a significant change in the work to which it relates.

2.4.3 The development, implementation and maintenance of a PPE programme, like other elements of a safety management system, require the commitment and active participation of the employer and employees at various levels in the organisation. Every member in the organisation has one's own role to play.

2.4.4 The employer and top management of a workplace should bear the ultimate responsibility and accountability for the development, implementation, maintenance and promotion of the programme. The responsibility for managing the PPE programme should be identified and allocated properly in a clear and logical way with the top management taking the lead. The arrangement should be made known to every employee in the workplace.

2.4.5 Employers often employ line management personnel and professionals to discharge their responsibilities for management or control of their workplaces. The line management and professionals are responsible for managing the programme on a day-to-day basis, and should take up a supervisory role in discharging their duties. The authority and responsibility of each member of the line management and professionals should be precisely set down and made known to all persons concerned.

2.4.6 The employees should act in accordance with the in-house safety rules and instructions. They should make full and proper use of the PPE, and report all equipment defects to the management.

## 2.5 Record keeping

2.5.1 A PPE programme cannot be effectively implemented and maintained in the absence of a good record keeping system. The benefits of record keeping are:

(a) Records facilitate more systematic and objective assessment.

(b) Keeping records of training, as well as distribution of PPE and instructions to employees enhance compliance with in-house safety rules regarding PPE.

(c) The rationales of the decision previously made on the PPE are traceable from the records. This greatly helps the subsequent review of the PPE programme.

2.5.2 In relation to the PPE programme, the employers should keep records of:

(a) PPE assessment and its review;

(b) decision for the selection of PPE;

(c) distribution record of PPE — employees' acknowledgement upon receipt of PPE;

(d) instruction and training record — written records containing the names of employees trained, the type of training provided and the dates when training occurred; record of the PPE identified and chosen for a task and when employees were given the instructions;

(e) records of non-compliance with in-house safety rules regarding PPE;

(f) reports of accidents/incidents involving PPE; and

(g) maintenance record of PPE.

# 3 PPE Assessment

## 3.1 PPE assessment

3.1.1 PPE assessment is a step following risk assessment of the chemical or chemical operation. After risk assessment and the consideration of necessary control measures, if the result reveals that PPE has to be used to control risk, the employer should conduct further assessment to ensure that suitable PPE is selected for the particular risk.

3.1.2 PPE assessment should be made by a person who has appropriate understanding of the chemicals and the operation involved as well as good knowledge of the safe practices and the PPE, including their uses and limitations. He should also know when he needs to call on specialist for expert advice. The assessment should include:

(a) an assessment of any risk to safety and health that has not been eliminated or reduced by other means such as engineering control measures;

(b) the definition or determination of the characteristics that a PPE must have in order to be effective for reducing the risks referred to in paragraph (a) above, taking into account any risk that the equipment itself may create; and

(c) a comparison of the specifications of the PPE that the employer intends to provide with the characteristics referred to in paragraph (b) above.

3.1.3 In assessing the risks to safety and health as outlined in paragraph 3.1.2(a) above, factors taken into consideration should include:

(a) hazards of the chemicals or chemical operation;

(b) physical nature of the chemicals and the routes of entry into the human body;

(c) the environmental conditions; and

(d) the effectiveness of the control measures in reducing the risk.

3.1.4 Information useful for the PPE assessment includes:

(a) legal requirements (refer to Appendix I);

(b) information on the hazards of the chemical or chemical operation, e.g., material safety data sheets;

(c) relevant hygiene standards;

(d) performance characteristics of various PPE stated in relevant international and national standards (refer to Appendix II);

(e) specifications of various PPE from manufacturers; and

(f) data from monitoring of air impurities in the workplace environment.

## 3.2 Review of the PPE assessment

3.2.1 The assessment should be reviewed and revised regularly or if:

(a) there is reason to suspect that the assessment is no longer valid; or

(b) there has been a significant change in the work to which the assessment relates.

3.2.2 The assessment may be suspected to be no longer valid as revealed by, for example:

(a) new legislation, codes of practice or industry standards on PPE or on other safety measures;

(b) advancement in technology such that better engineering control measures become reasonably practicable;

(c) the results of accident/incident rate analysis or health surveillance;

(d) new information on the risks of the chemical or chemical operation.

3.2.3 Significant changes in the work include:

(a) change in the chemicals used, including the physical form and source of the chemicals;

(b) plant modification, including the equipment used in the safety measures;

(c) change in the method or work procedures; and

(d) change in the scale of the operation.

# 4 Selection and Provision of PPE

## 4.1 Selection of suitable PPE

4.1.1 It is very important that suitable PPE is used. PPE should be selected with great care. Wrongly selected PPE may give a false sense of safety and the wearer may be at higher risk of injury or ill health than if no PPE is used.

4.1.2 Based on the results of PPE assessment, the employer of a workplace should select suitable PPE for use by employees. Suitable PPE should satisfy the following conditions:

(a) It complies with relevant legal requirements.

(b) It is appropriate for the risks involved and appropriate in the circumstances prevailing at the place where exposure to the risks may occur.

(c) It is effective to prevent or adequately control the risks involved without increasing the overall risk.

(d) It takes account of ergonomic requirements and the state of health of the person or persons who may use it.

(e) It is capable of fitting the wearer properly, if necessary, after adjustments within the range for which is designed.

(f) There is no compatibility problem with other pieces of PPE used simultaneously.

4.1.3 A general selection guide of PPE for safe use and handling of chemicals is discussed in Chapter 8. It is important to note that for specific cases, employers must comply with the requirements under relevant legislation and Codes of Practice (refer to Appendix I).

## 4.2 Provision of suitable PPE

4.2.1 Every employer of a workplace should provide suitable PPE to his employees who may be exposed to any risk to their safety and health while at work, except where such risks have been adequately controlled by other means which are equally or more effective. However, use of PPE should be in addition to and not in lieu of effective control measures in eliminating or reducing the risks.

4.2.2 The PPE provided should be appropriate for controlling the risks, and the PPE should fit individual size and shape. The employees should have the equipment readily available, or at the very least have clear instructions on where they can obtain it.

4.2.3 In many cases, the practice of providing PPE just to the employees performing work in connection with dangerous chemicals is not adequate. If nearby workers or visitors are likely to be exposed to the risks, they should also be provided with suitable PPE.

# 5 Information, Instruction and Training

## 5.1 General

5.1.1 After selecting suitable PPE, the employer should inform the employees what PPE has to be used for a particular risk, why to use it, when to use it and how to use it. Such messages are most appropriately conveyed to the employees through a component of the PPE programme: information, instruction and training.

5.1.2 This component of the PPE programme deals with many factors related to human behavior. To make the component successful, the employer should, after consulting their employees, develop an effective plan for the following:

(a) establishing in-house safety rules to provide instructions regarding use of PPE;

(b) providing access of necessary safety and health information to the employees, e.g. chemical hazards in the workplace and safety precautions; safety information about PPE;

(c) establishing appropriate training policy for his employees;

(d) reinforcing information, instruction and training by

(i) observation, supervision and inspection of employees in performing their jobs;

(ii) promotional activities to encourage the use of PPE;

(iii) use of signs and posters at various working zones that require the use of PPE.

(e) establishing commending and reprimanding mechanism for the PPE programme;

5.1.3 It is important that the information, instruction and training provided should be comprehensible to the employees. The form of presentation should take into consideration the literacy of the employees.

## 5.2 Information and instruction

5.2.1 Employees should be adequately informed and instructed to enable them to know:

(a) the kind of risks against which the PPE is capable of protecting the employee;

(b) limitations of the PPE;

(c) the purpose for which and the manner in which the PPE is to be used;

(d) action to be taken by the employees in ensuring that the PPE remains in an effective working state and in good repair.

5.2.2 Information and instruction can be provided to the employees by following means:

(a) Documentation in the form of safety manual, work procedures and emergency procedures is the primary means and the documents should be located in prominent locations in the workplace accessible by the employees.

(b) Other means such as notices, placards, posters, video show should also be used as appropriate in arousing the safety awareness of employees on using PPE.

## 5.3 Training of employees

5.3.1 Training helps employees in acquiring the necessary attitude, knowledge and skills in order to be competent in using PPE for handling and use of chemicals. Comprehensive training programme should be provided to everyone who is involved in the use or maintenance of PPE.

5.3.2 Users should be trained in the proper use of PPE, how to correctly fit and wear it, and what are the limitations. Managers and supervisors should also be aware of why PPE is being used and how it is used properly. Employees involved in maintaining, repairing and testing the equipment should also be trained. Training should include elements of theory as well as practice in using the equipment, and should be carried out in accordance with the recommendations and instructions supplied by the PPE manufacturer.

5.3.3 Theoretical training should include:

(a) explanation of the risks present and why PPE is needed;

(b) the operation, performance and limitations of the equipment;

(c) instruction on the selection, use and storage of PPE related to the intended use;

(d) written operating procedures such as permits to work involving PPE should be explained;

(e) factors which can affect the protection provided by the PPE such as compatibility with other protective equipment, personal factors, working conditions, inadequate fitting, as well as defect, damage and wear; and

(f) recognising defects in PPE and arrangements for repair or replacement.

5.3.4 Practical training should include:

(a) practice in putting on, wearing and removing the equipment;

(b) practice and instruction in inspection and, where appropriate, testing of the PPE before use;

(c) practice and instruction in the maintenance which can be done by the user, such as cleaning and the replacement of certain components; and

(d) instruction in the safe storage of equipment.

5.3.5 Theoretical and practical training should form an integral part of an induction training programme for new employees and subsequent on-the-job training programme.

5.3.6 The extent of the training that is required will depend on the type of equipment, how frequently it is used and the employees' need. In addition to initial training, users of PPE and others involved with the equipment may need refresher training from time to time. Circumstances when retraining is required include:

(a) changes in the workplace render previous training obsolete;

(b) changes in the types of PPE to be used render previous training obsolete; or

(c) signs indicating inadequacy in employee's knowledge in using the PPE, as revealed during monitoring of the use of PPE.

# 6 Monitoring the Use and Effectiveness of PPE

## 6.1 Monitoring the proper use of PPE

6.1.1 To ensure protection of employees against chemical hazards according to plan, the PPE must be properly used. An employer should take all reasonable steps to ensure that any PPE provided to his employees is properly used. Employees should not misuse or damage the equipment. The in-house safety rules should explicitly indicate circumstances under which should PPE be used.

6.1.2 Monitoring the proper use of PPE is effected by:

(a) observation, supervision and inspection of employees in performing their jobs;

(b) consultation with employees, so as to understand the underlying reasons of any non-compliance in using PPE.

6.1.3 In ensuring proper use of PPE, the following aspects should be monitored:

(a) The employees follow instructions as laid down in the in-house safety rules and use the PPE provided to them whenever required.

(b) The PPE is used only after adequate training has been given to the user.

(c) The PPE is in good working condition.

(d) The PPE is properly worn and correctly fitted to the wearer.

(e) The PPE is properly cleaned and stored after use.

(f) The maintenance schedule of the PPE is strictly followed.

## 6.2 Monitoring the effectiveness of PPE

6.2.1 Monitoring the effectiveness of PPE makes sure the PPE selected is of the right choice in that the safety and health of employees are adequately protected as planned.

6.2.2 The effectiveness of PPE can be monitored by:

(a) feedback from employees;

(b) accident/incident analysis;

(c) report of ill-health or health surveillance.

6.2.3 The feedback from employees is very important. After providing them with PPE, the employer should actively seek their views on the use of the PPE. On one hand it will improve compliance with using PPE and, on the other hand certain drawbacks of using PPE such as discomfort, fatigue, etc. can be revealed in the very early stage.

6.2.4 The primary objective of accident/incident analysis and the report of ill-health or health surveillance is to detect health effects at an early stage, thereby enabling further harm to be prevented. They also provide a means to:

(a) check the effectiveness of control measures;

(b) evaluate the accuracy of the risk assessment; and

(c) identify individuals who are exposed to the risks.

# 7 Maintenance and Storage of PPE

## 7.1 Maintenance of PPE

7.1.1 Using a defective PPE gives the wearer a false sense of safety, and may do more harm than good. All PPE should be regularly checked for performance and maintained in good working conditions so that the equipment can continuously offer the necessary degree of protection for which it is designed. In general, maintenance includes cleaning, disinfection, replacement, repair, examination and testing. A maintenance schedule should be established for each piece of equipment and assigned to persons competent to perform the maintenance work. The schedule should include:

(a) designation of personnel for maintenance of PPE and their responsibilities;

(b) performance checking, cleaning/disinfection and storage procedures;

(c) information on the expiry date or service lifetime of certain PPE such as safety helmets, gloves, canisters of respirators;

(d) training on correct maintenance of PPE at the workplace;

(e) time-table for performance check, cleaning/disinfection and other maintenance work; and

(f) criteria for replacement.

7.1.2 PPE should be examined to ensure that it is in good working order before being issued to the wearer. PPE should also be examined before it is put on and should not be worn if it is found to be defective, dirty or in unhygienic condition.

7.1.3 It is important that all PPE should be kept cleaned. Cleaning is particularly important for eye and face protective equipment where dirty or fogged lenses may hinder vision.

7.1.4 All defective equipment should be taken out of service immediately and should be repaired or disposed of as applicable. A procedure should be established to alert all staff that a certain piece of equipment is under maintenance or is defective and should not be used. The procedure should be made known to all staff. Equipment after repair or maintenance should be checked for performance before it is put into service again.

7.1.5 All PPE should be replaced,

(a) when it no longer provides the level of protection required to protect the wearer or user against the particular hazard;

(b) when the service lifetime, as specified by the manufacturer of the equipment, has expired; or

(c) when it is damaged and cannot be repaired.

## 7.2 Storage of PPE

7.2.1 All PPE should be provided with appropriate accommodation for the storage when it is not in use. The storage should be adequate to protect the PPE from contamination or damage by harmful substances, damp or sunlight. PPE should be returned after use to the storage place provided.

7.2.2 Where PPE becomes contaminated during use, it should be cleaned or disinfected, as far as practicable, before returning to its storage place. If this is not possible, the contaminated PPE should be separately accommodated to prevent cross-contamination and should be suitably labelled.

7.2.3 Where quantities of PPE are stored, PPE waiting for maintenance or repair should be clearly segregated from those ready-for-use ones and should be suitably labelled.

# 8 Selection Guide

## 8.1 Overall Strategy

8.1.1 This selection guide only provides practical guidance for selecting the appropriate PPE for general circumstances in which use and handling of chemicals are involved. For specific cases, the employer shall comply with the requirements specified in the relevant legislation and Codes of Practice listed in Appendix I.

8.1.2 Assessment and selection of suitable PPE are based on the risk assessment of the dangerous chemicals or chemical operations. The selection process should start off by considering which category of PPE is required. In this respect, how the dangerous chemical enters into the human body, i.e. the route of entry, is a major consideration.

8.1.3 In a workplace where chemical operation is conducted or where the environment is likely contaminated by dangerous chemicals, eating, drinking and smoking should be prohibited and a high standard of personal hygiene should be maintained. This can prevent chemicals entering the body by ingestion. In that case, the chemicals may enter the body through inhalation and skin contact. In determining the possible route of entry, the physical form of the chemical is a major consideration. Following is a selection guide for suitable category of PPE:

| Route of entry | Physical form of chemical | Category of PPE |
|---|---|---|
| skin contact | gas/vapour, fumes, aerosol, dust, airborne particulate, liquid, splashes of liquid | - protective clothing<br>- hand protective gears<br>- foot protective gears<br>- eye and face protective equipment |
| inhalation | gas/vapour, fumes, aerosol, dust, airborne particulate | - respiratory protective equipment |

8.1.4 Having decided on the category, the configuration and material of the suitable PPE should be selected according to the risks that may be encountered and the level of protection required.

## 8.2 Protective clothing

8.2.1 Protective clothing refers to the gear that protects the body or personal clothing from contact with dangerous chemicals and prevents the spread of contamination. This includes aprons, gowns and overalls. The chemical resistance properties affecting the quality of a protective clothing are:

(a) impermeability to the chemicals;

(b) resistance to degradation of the material due to contact with the chemicals; and

(c) ability to prevent leakage of chemicals through pinholes, cuts, edges or other imperfections in the protective gear.

8.2.2 Selection of suitable protective clothing against a dangerous chemical or a chemical operation depends on the risks involved and the protection required. The selected protective clothing should be made of suitable material and in an appropriate form in order to provide protection against the risks involved.

8.2.3 For small scale use and handling of chemicals of low risks, or where the risks have been controlled to a reasonably low level, protection can be achieved by clothing that prevents contamination of the body or personal clothing inside. This includes gowns and overalls made of cotton or synthetic material such as nylon or Terylene with a water-repellent finish.

8.2.4 If liquids in large quantities, gases/vapours, aerosol, dust or potent chemicals are involved, protective clothing which is woven, stitched or otherwise porous (not resistant to permeation) should not be used.

(a) For dangerous liquids, strong solvents, oils and greases, apron or overalls may be used depending on how the chemicals come into contact with the body. The clothing may be made of neoprene or polyurethane coated with nylon, or Terylene or natural rubber. It should be of sufficient length to prevent dripping of liquid from the clothing into the footwear worn by the user.

(b) To protect against splashes of liquid chemicals, liquid splash-resistant suit made of butyl rubber, polyvinyl chloride, viton or a combination of viton and butyl rubber or teflon may be used.

(c) Dangerous gases/vapours can be protected against by wearing a vapour-proof suit which is made of suitable material as in (b) above. It should be air-tested with the manufacturer's test kit before being stored in a protective case.

(d) In case of dust, air particulate or fibres, a protective suit made of bonded olifin may provide the necessary protection.

(e) Potent chemicals can be protected against by wearing a chemical-proof suit which is a totally encapsulated vapour-proof or liquid splash-resistant suit and is fed with breathing air.

8.2.5 If the chemicals or chemical operation pose explosion/fire risk, the protective clothing used should not be liable to increase the possibility of serious burns, such as avoiding those made of synthetic materials that may melt in a fire and thereby causing more serious burns.

8.2.6 Protective clothing may be of the reusable or disposable type. It should be noted that the materials mentioned in paragraph 8.2.4 may deteriorate due to the aging effect. The protective clothing should be inspected for signs of damage before wearing and taken off upon exiting the work area. Contaminated clothing should be properly treated or disposed of as appropriate.

8.2.7 *Problem with the use of protective clothing*

Wearing protective clothing may cause discomfort to the wearer due to the perspiration problem. As far as possible, protective clothing enclosing the parts of the body should be sufficiently ventilated to limit perspiration resulted from use; if this is not possible, it should be equipped with devices that absorb perspiration.

## 8.3 Hand protective gears

8.3.1 Hand protective gears protect the hand and arm from contact with dangerous chemicals and prevent the spread of contamination. Common gears are gloves. The chemical resistance properties affecting the quality of the gloves are similar to those for protective clothing stated in paragraph 8.2.1.

8.3.2 Selection of suitable gloves should be based on the hazards of the operation and the compatibility with the work, taking into consideration the chemical resistance and thermal protection capability as well as the mechanical strength of the gloves. Reference should be made to the information on the chemical resistance properties and physical characteristics of the glove material provided by the manufacturer.

(a) Chemical resistance

The degree of protection against a chemical depends on the glove material, the thickness and method of construction of the gloves. When selecting suitable gloves for handling dangerous liquids, the degradation rating and the permeation data stipulated by the manufacturer of the gloves for the chemicals concerned should be considered. It should be noted that the chemical resistance property of gloves may be adversely affected by heat and abrasion.

(b) Thermal protection

Gloves made of neoprene can be used for handling oils at low temperatures, while cotton gloves can protect against moderate heat but not for handling liquids. Gloves with materials such as Kelvar, glass fibre and leather provide protection at high temperatures. However, in general, chemical-resistant gloves should not be used at high temperatures.

(c) Mechanical strength

Gloves used for handling chemicals should possess the necessary mechanical strength to resist abrasion, wear and tear.

8.3.3 When selecting suitable gloves for use and handling of chemicals, glove material is the primary consideration. Dexterity should also be considered. Glove material should be selected according to the nature of the chemicals concerned. A general selection guide based on the chemical resistance properties of some common glove materials, viz. neoprene, polyvinyl chloride, polyvinyl alcohol, natural rubber, synthetic rubber and nitrile rubber, can be found in Table 1 (page 23). Following are some further remarks:

(a) The recommendations in this selection guide are based on the general chemical resistance properties of a material to different classes of chemicals. There may be small variation in the rating for individual chemicals within a class. Moreover, other factors such as the physical characteristics and the thickness of the glove material should also be considered. In this respect, the recommendations from the manufacturer of the gloves should be consulted.

(b) The physical characteristics of these materials are generally fair to good in resistance to abrasion, cut, puncture and tear as well as in terms of flexibility, except polyvinyl alcohol is poor in flexibility while polyvinyl chloride poor in cut resistance.

(c) Surgical gloves with natural rubber are designed for dexterity. They can protect against aqueous solutions for short periods of time, but have poor resistance to most organic chemicals. They should not normally be used for handling chemicals.

(d) Disposable gloves with natural rubber or polyvinyl chloride allow dexterity, convenience and low-cost. However, disposable gloves are not generally suitable for use with dangerous chemicals, as they are much thinner than the reusable ones.

(e) Nitrile rubber gloves have good dexterity with excellent puncture and abrasion resistance. They are recommended for general work involving chemicals (but not with lacquer thinners), such as cleaning.

(f) Other glove materials include viton for chlorinated and aromatic solvents; butyl rubber for aldehydes, ketones and esters.

(g) Cotton gloves or gloves with cotton and leather can protect against abrasion, sharp objects and moderate heat. However they offer no protection against liquids and may actually absorb chemicals, keeping the chemicals in contact with the skin. These gloves are not suitable for use with chemicals. Some natural rubber or synthetic rubber gloves may have cotton lining for moderate heat protection.

8.3.4 It should be noted that most glove materials may deteriorate due to the aging effect even during storage. Gloves should be inspected before and after use. Defective gloves should be replaced immediately. Gloves may be of the disposable or reusable type.

8.3.5 *Problems with the use of gloves*

(a) Wearing gloves may cause discomfort to the wearer due to the problem of perspiration. The gloves should have lining to absorb perspiration.

(b) Gloves may get caught in moving machinery parts, thereby drawing the hand and arm of the wearer into the machine. In such case, gloves should not be worn when working near moving parts of a machine.

# Table 1: General selection guide for glove materials based on the chemical resistance properties

| Glove Materials / Chemicals | Neoprene | Polyvinyl Chloride (PVC) | Polyvinyl Alcohol (PVA) | Natural Rubber | Synthetic Rubber | Nitrile rubber |
|---|---|---|---|---|---|---|
| Caustics | S | S | NR | S | S | S |
| Inorganic acids | S | S | NR | S* | S | S* |
| Organic acids | S | S | NR | S | S | S |
| Alcohols | S | S | NR | S | S | S |
| Ketones | S | NR | NR | S | S | NR |
| Esters | F | NR | S | NR | F | F |
| Chlorinated solvents | F | F | S | NR | F | F |
| Petroleum solvents | F | F | S | NR | F | F |
| Lacquer thinners | F | NR | S | NR | F | NR |
| Formaldehyde | S | S | NR | S | S | S |
| Acrylonitrile | S | S | NR | S | S | S |
| Carbon disulfide | NR | NR | S | NR | NR | F |

S Suitable

F Fair, offering minimum but adequate protection, but not for prolong contact with the chemical

NR Not recommended

S* Not suitable for use with nitric acid or sulphuric acid at high concentrations

*(Note: When selecting chemical-resistant gloves, be sure to consult the manufacturer's recommendations, especially if the gloved hand will be immersed in the chemical.)*

## 8.4 Foot protection gears

8.4.1 Foot protective gears protect the foot and leg from contact with dangerous chemicals and prevent the spread of contamination. Common gears are safety shoes or boots. The chemical resistance properties affecting the quality of the footwear are similar to those for protective clothing stated in paragraph 8.2.1.

8.4.2 Footwear for safe use and handling of chemicals is selected primarily based on the hazards involved and the working environment. Comfort, style and durability should also be considered. Following points should be noted:

(a) The type of footwear should be related to the risk of injury to the foot or leg. During use and handling of chemicals, the foot should at least be protected by well-made ordinary shoes even when there is no foreseeable hazards to the foot. Otherwise safety shoes should be used. In cases where protection to the legs is required, safety boots should be used. As to whether the footwear needs to cover the ankle, knee or thigh, it depends on the risk of these parts of the body being injured.

(b) The material of the footwear should be impermeable and resistant to the chemicals. Synthetic rubber is a suitable material. In cases where resistance to heat and molten metal is required, leather or other heat resistance materials should be used.

(c) Construction of the footwear should take into account the danger in the working environment, such as wet floor, or falling and rolling objects, or objects piercing the sole. Rubber or synthetic rubber outer soles with various tread patterns should be used to minimize or prevent the risk of slipping. In cases where the toes are most vulnerable to impact injuries, the footwear should have steel toe caps for protecting the toes.

(d) In the presence of flammable chemicals, anti-static footwear with electrically conductive rubber outer soles should be used to prevent electrostatic build-up, thereby avoiding the risk of spark ignition of flammable vapour in the work environment.

(e) The footwear should be without tongues. Fastenings on top of the footwear should be avoided as far as practicable; otherwise the fastenings should be pulled over the top of the footwear and not tucked inside.

(f) For protecting personal shoes from contamination by dangerous chemicals in form of dust, fibres or airborne particulate, disposable shoe covering may be used. However, use of shoe coverings creates danger of slipping and should be avoided as far as practicable.

8.4.3 *Problem with the use of foot protective gears*

Wearing safety shoes or boots may cause discomfort to the wearer due to the problem of perspiration. The footwear should have lining to absorb perspiration.

## 8.5 Eye and face protective equipment

8.5.1 In the course of a chemical operation, eye or face protective equipment provides protection to the eye and the face of the wearer against the hazards arising from the following:

(a) hot or dangerous chemicals in form of gas, vapour, fumes, aerosol, dust, fibre or airborne particulate;

(b) splashes of hot or dangerous liquid chemicals;

(c) flying objects, such as particulate or fragments from a bursting container; and

(d) intense light or other non-ionizing radiation (including heat) used in or emitted from the chemical process.

8.5.2 Selection of suitable eye or face protective equipment depends primarily on the risks of the chemical operation and how the chemicals come into contact with the eye or face. However comfort, style and durability should also be considered. Types of eye or face protective equipment for safe use and handling of chemicals include the following:

(a) safety goggles — consisting of one-piece wide vision lens, flexible plastic frame and an elastic headband with whole periphery in contact with the face providing total protection of the eyes from all angles; not suitable to protect against gases or vapours; prone to fogging thereby hindering vision;

(b) face shields with adjustable head harness — heavy and bulky; protect the face but not fully enclosing the eyes; may be worn over standard prescription spectacles; not suitable to protect against dusts, fumes or gases;

(c) hood type — generally used in conjunction with suitable respirator; very bulky and inconvenient for use; fully enclosing the head; used in very dangerous operation such as during clearing chemical spills.

Face and eye protective equipment is also available in various tints and shades for protection against intense light or other non-ionizing radiation used in or emitted from the chemical operation. In that case, the frequency of the radiation must be known since the absorbing media are frequency-specific.

8.5.3 The lenses or screens of the eye or face protective equipment must be transparent and provide clear vision. Suitable material for the lens or screen depends on the hazards that may be encountered. These materials include:

(a) polycarbonates — effective against impacts from flying objects, but not suitable to protect against corrosive chemicals;

(b) acrylic resins — suitable for protecting against chemical hazards, but weaker against impacts;

(c) fibre-based plastics — having the advantage of adding anti-fogging coating.

8.5.4 *Problems with the use of personal eye or face protective equipment*

The basic problems in wearing personal eye or face protectors include:

(a) causing discomfort — may not be acceptable for wearing over long hours of work;

(b) restricting vision — side frame limiting peripheral vision, nose bridge inhibiting binocular vision;

(c) fogging of lens or screen — hindering vision, particularly prominent in humid or hot working environment;

(d) incompatibility with other PPE, such as impairing the face-fit of the facepiece of respiratory protective equipment.

Therefore the first consideration should always be given to the improvement of the working environment rather than to use of personal eye or face protective equipment. These considerations include removal of fumes and dust by exhaust ventilation, screening of sources of heat or non-ionizing radiation, and screening of work area from which particles, or hot or dangerous liquid may be ejected. Other alternative means, such as use of transparent screen or partition of appropriate size and quality, to isolate the source of the hazards from the operator are preferred to the use of personal eye or face protective equipment.

## 8.6 Respiratory protective equipment

8.6.1 During use and handling of chemicals, the primary objective of wearing respiratory protective equipment (RPE) is to prevent dangerous chemicals from entering the respiratory system of the wearer. RPE is also used to provide breathing air when working in a dangerous environment where there is risk of oxygen deficiency or presence of dangerous chemicals in the air at high concentrations. There are three basic classes of RPE, viz. air-purifying respirators, air-supplied respirators and self-contained respirators. The following is a brief description of the types of RPE and the selection criteria. Please refer to other guidance notes on RPE issued by the Labour Department for details.

8.6.2 *Air-purifying respirators*

Air-purifying respirators are used to remove contaminants from the inhaled air. They are not suitable for use in an environment which is deficient in oxygen.

(a) Particulate-filter respirators

These consist of a facepiece and a filter unit. Filters of various pore sizes are available for different type and size of particulate matter. They do not offer any protection against gases or vapours and are generally used for non-emergency exposures.

(b) Chemical cartridge respirators

These consist of a facepiece normally fitted with an exhalation valve and connected directly to one or two chemical cartridges filled with a limited quantity of granular sorbent. They are useful for protecting against specific vapours and gases of low toxicity. Different types of contaminants require different types of chemical cartridge.

(c) Gas masks

These consist of a full-mask facepiece, which covers the eyes, nose and mouth, connected either directly or via a non-kink flexible hose to a canister containing a granular sorbent.

It should be noted that the filter, cartridge or canister has limited capacity for the specific contaminant. This limits the duration of protection offered by the respirator and its use in environment with high contaminant concentrations. Chemical cartridge or canister has a limited life. It should be replaced if the expiry date is reached.

8.6.3 *Air-supplied respirators*

In this class of RPE, the user is supplied with breathing air through a hose from an uncontaminated source. Air-supplied respirators can be used regardless of the type or physical state of the contaminant, provided that they are properly selected and adequately supplied with fresh air.

(a) Hose masks (with or without blower)

These consist of a full-mask facepiece, with inhalation and exhalation valves, connected by a flexible hose to a breathing air supply. The air may be blown in by the user's respiratory effort (without blower) or supplied under pressure by a hand-operated or power-operated blower (with blower). The hose mask with blower is considered safe for work in atmospheres where there may be dangerous concentrations of dust, fumes, vapour or gas.

(b) Airline respirators

These consist of a full-mask or half-mask facepiece supplied with air through a hose from a compressed-air source. Airline respirators may be used in atmospheres that are not immediately dangerous to life, and offer the most acceptable form of personal protection in operations requiring continuous use of respirator.

(c) Abrasive-blasting respirators

These are designed specifically to protect a person engaged in shot, sand or other abrasive blasting work where the air is contaminated with high-velocity particles. It is essentially an airline respirator with additional mechanical protection in the form of a full mask (with hood and cape) or a rigid helmet.

(d) Air-supplied hoods

These are similar to the hood-type abrasive-blasting respirator but are of lighter construction and have a larger viewing panel. They may be of the disposable type and are particularly suitable for spray painting and grinding work.

It is essential that air supplied from the compressor is not contaminated with carbon monoxide or other gaseous contaminants that may come for example from the exhaust system of the compressor.

8.6.4 *Self-contained respirators (breathing apparatus)*

Essentially they consist of a high pressure cylinder of air or oxygen connected to a facepiece via a tube with demand valve and regulator and a harness assembly for mounting the apparatus on the body. Breathing apparatus (BA) has the following characteristics:

(a) BA provides complete respiratory protection in any concentration of dangerous gases, and is the equipment of choice for use in emergency life-threatening situations.

(b) The movement of a person wearing BA is not restricted by the hose attachment as for the case of supplied-air respirators. However, the duration of use of BA is limited by the capacity of the gas cylinders.

(c) BA is heavy and bulky. A high level of operator training is required to ensure safe use.

8.6.5 *Selection of suitable respirator*

Suitable respirator should be selected according to the hazards associated with the chemical operation and the working environment. In evaluating the hazards, following information is required:

(a) Is the atmosphere deficient in oxygen?

(b) What are the nature and physical forms of the air contaminants?

(c) What is the concentration of the air contaminant?

  (i) Does the concentration exceed the respective occupational exposure limit?

  (ii) Does the concentration approach a level that is considered to be immediately dangerous to life?

(d) If the air contaminant is a gas, vapour or fumes, can it be absorbed by an available chemical?

(e) Will the air contaminant also cause irritation of the skin, nose and eyes or be easily absorbed through the skin?

A general selection guide is stated in Table 2 (page 31). For working with asbestos or in confined spaces, please refer to the specific requirements under the relevant legislation and Codes of Practice listed in Appendix I.

8.6.6 *Problems with the use of respirators*

(a) Respirators may affect the health of the person using the equipment because of added stress on the pulmonary system. Medical evaluation may be required to determine whether a person can wear the respirator without difficulty.

(b) Facepiece fit

It is essential that a good seal between the facepiece and the wearer's face is maintained in order for a suitably selected respirator to provide the intended level of protection to the wearer. A face-fit test of the respirator may be required.

(c) Compatibility with eyeglasses and safety goggles

Wearing eyeglasses or safety goggles with a respirator may interfere with the facepiece fit of the respirator.

# Table 2: General selection guide for respirator

| Hazard | Respirator |
|---|---|
| **Oxygen deficiency** | |
| Immediately dangerous to life or health | Positive-pressure SCR. Positive-pressure SAR with auxiliary self-contained air supply. |
| Not immediately dangerous to health | Positive-pressure SCR or SAR. |
| **Gas and vapour contaminants** | |
| Immediately dangerous to life or health | Positive-pressure SCR. Positive-pressure SAR with auxiliary self-contained air supply. |
| Not immediately dangerous to health | Positive-pressure SAR. Gas mask.<br>Chemical cartridge respirator. |
| **Particulate contaminants** | Positive-pressure SAR including abrasive blasting respirator. Powered SAR equipped with high efficiency filters.<br>Air-purifying respirator with a specific particulate filter. |
| **Gaseous and particulate contaminants** | |
| Immediately dangerous to life or health | Positive-pressure SCR. Positive-pressure SAR with auxiliary self-contained air supply. |
| Not immediately dangerous to health | Positive-pressure SAR. Gas mask.<br>Chemical-cartridge respirator. |
| **Escape from contaminated atmosphere that may be immediately dangerous to life or health** | Positive-pressure SCR.<br>Positive-pressure SAR with escape SCR. |

SCR: self-contained respirator

SAR: supplied-air respirator

# Appendix I
# Relevant legislation and Codes of Practice

Occupational Safety and Health Ordinance (Cap. 509)

Factories and Industrial Undertakings Ordinance (Cap. 59)

Factories and Industrial Undertakings (Electrolytic Chromium Process) Regulations

Factories and Industrial Undertakings (Dry Batteries) Regulations

Factories and Industrial Undertakings (Protection of Eyes) Regulations

Factories and Industrial Undertakings (Dangerous Substances) Regulations

Factories and Industrial Undertakings (Asbestos) Regulation

Factories and Industrial Undertakings (Confined Spaces) Regulation

Factories and Industrial Undertakings (Safety Management) Regulation

Code of Practice: Safety and Health at Work with Asbestos

Code of Practice: Safety and Health at Work for Gas Welding and Flame Cutting

Code of Practice: Safety and Health at Work in Confined Spaces

# Appendix II
# International and national standards for PPE

## A. Protective clothing

EN340:1993 Protective clothing – General requirement, 1993, European Standard, European Committee for Standardization

EN465:1995 Protective clothing against liquid chemicals. Performance requirements for protective clothing with spray-tight connections between different parts of the clothing (Type 4 equipment), 1995, European Standard, European Committee for Standardization

EN466:1995 Protective clothing against liquid chemicals. Performance requirements for protective clothing with liquid-tight connections between different parts of the clothing (Type 3 equipment), 1995, European Standard, European Committee for Standardization

EN467:1995 Protective clothing against liquid chemicals. Performance requirements for garments providing protection to parts of the body, 1995, European Standard, European Committee for Standardization

EN469:1995 Protective clothing for firefighters. Requirements and test methods for protective clothing for firefighters, 1995, European Standard, European Committee for Standardization

EN531:1995 Protective clothing for industrial workers exposed to heat (excluding firefighters' and welders' clothing), 1995, European Standard, European Committee for Standardization

## B. Hand protective gears

| | |
|---|---|
| EN420:1994 | General requirements for gloves, 1994, European Standard, European Committee for Standardization |
| EN388:1994 | Protective gloves against mechanical risks, 1994, European Standard, European Committee for Standardization |
| EN407:1994 | Protective gloves against thermal risks (heat and/or fire), 1994, European Standard, European Committee for Standardization |
| EN374-1:1994 | Protective gloves against chemicals and micro-organisms: Terminology and performance requirements, 1994, European Standard, European Committee for Standardization |
| EN374-2:1994 | Protective gloves against chemicals and micro-organisms: Determination of resistance to penetration, 1994, European Standard, European Committee for Standardization |
| EN374-3:1994 | Protective gloves against chemicals and micro-organisms: Resistance to permeation by chemicals, 1994, European Standard, European Committee for Standardization |
| AS2161 | Industrial safety gloves and mittens (excluding electrical and medical gloves), Standards Australia, Sydney |
| 29CFR1910.138 | Pertains to hand protection, Title 29, Code of Federal Regulations Subpart I, Parts1910.138, Occupational Safety and Health Administration, United States of America |

## C. Foot protective gears

| | |
|---|---|
| EN345-1:1992 | Safety footwear for professional use – Specification, 1992, European Standard, European Committee for Standardization |
| EN345-2:1996 | Safety footwear for professional use – Additional specifications, 1996, European Standard, European Committee for Standardization |

ANSI Z41-1991 American National Standard for Personal Protection – Protective Footwear, 1991, New York: ANSI

29CFR1910.136 Pertains to foot protection, Title 29, Code of Federal Regulations Subpart I, Parts 1910.136, Occupational Safety and Health Administration, United States of America

AS2210 Safety footwear, Standards Australia, Sydney

## D. Eye and face protective equipment

The standards shown below are the approved specifications for eye protectors, shields and fixed shields under the Factories and Industrial Undertakings (Protection of Eyes) Regulation:

Australian/New Zealand Standard (AS/NZS 1337:1992)
Eye Protectors for Industrial Applications

Australian/New Zealand Standard (AS/NZS 1338.1:1992)
Filters for Eye Protectors – Filters for Protection Against Radiation Generated in Welding and Allied Operations

Australian/New Zealand Standard (AS/NZS 1338.3:1992)
Filters for Eye Protectors – Filters for Protection Against Infra-Red Radiation

American National Standard (ANSI Z87.1 – 1989)
Practice For Occupational and Educational Eye and Face Protection

American National Standard (ANSI Z136.1 – 1993)
Safe Use of Lasers

British Standard (BS EN 166:1996)
Personal Eye-Protection – Specifications

European Standard (EN 166:1995)
Personal Eye-Protection – Specifications

British Standard (BS EN 169:1992)
Filters for Personal Eye-Protection Equipment Used in Welding and Similar Operations

European Standard (EN 169:1992)
Personal Eye-Protection – Filters for Welding and Related Techniques – Transmittance Requirements and Recommended Utilisation

British Standard (BS EN 171:1992)
Infra-Red Filters Used in Personal Eye-Protection Equipment

European Standard (EN 171:1992)
Personal Eye-Protection – Infra-Red Filters – Transmittance Requirements and Recommended Use

British Standard (BS EN 175:1997)
Personal Protection – Equipment for Eye And Face Protection During Welding And Allied Processes

European Standard (EN 175:1997)
Personal Protection – Equipment For Eye and Face Protection During Welding and Allied Processes

British Standard (BS EN 207:1994)
Filters and Equipment Used for Personal Eye-Protection Against Laser Radiation

European Standard (EN 207:1998)
Personal Eye-Protection – Filters and Eye-Protection Against Laser Radiation

British Standard (BS EN 208:1994)
Personal Eye-Protectors Used for Adjustment Work on Lasers and Laser Systems

European Standard (EN 208:1998)
Personal Eye-Protection – Eye-Protectors for Adjustment Work on Lasers and Laser Systems (Laser Adjustment Eye-Protectors)

British Standard (BS EN 379:1994)
Welding Filters with Switchable Luminous Transmittance and Welding Filters with Dual Luminous Transmittance

European Standard (EN 379:1994)
Welding Filters with Switchable Luminous Transmittance and Welding Filters with Dual Luminous Transmittance

Japanese Industrial Standard (JIS T 8141:1980)
Eye Protectors for Radiations

Japanese Industrial Standard (JIS T 8147:1994)
Eye Protector

## E. Respiratory protective equipment

ANSI Z88.2-1992 American National Standard for Respiratory Protection, 1992, New York: ANSI

29CFR1910.134 Pertains to respiratory protection, Title 29, Code of Federal Regulations Subpart I, Parts 1910.134, Occupational Safety and Health Administration, United States of America

AS1715 Selection, use and maintenance of respiratory protective devices, Standards Australia, Sydney

AS1716 Respiratory protective devices, Standards Australia, Sydney

***Face masks***

EN136:1998 Full face mask, 1998, European Standard, European Committee for Standardization

EN136-10:1992 Full face mask (pre-1998 equipment), 1992, European Standard, European Committee for Standardization

***Filters***

EN141:1990 Filters – gas or gas and combined, 1990, European Standard, European Committee for Standardization

EN143:1990 Filters – particles, 1990, European Standard, European Committee for Standardization

EN371:1992 Filters – AX gas and combined filters, 1992, European Standard, European Committee for Standardization

EN372:1992 SXgas and combined filters, 1992, European Standard, European Committee for Standardization

### *Simple filtering devices*

EN149:1991 Filtering facepieces against particles, 1991, European Standard, European Committee for Standardization

EN405:1992 Valved filtering half masks for use against gases or gases and particles, 1992, European Standard, European Committee for Standardization

EN1827:1999 Filtering half masks without inhalation valves, 1999, European Standard, European Committee for Standardization

### *Powered/assisted filtering devices*

EN146:1991 Powered particle filtering helmets / hoods, 1991, European Standard, European Committee for Standardization

EN147:1991 Power assisted particle filtering full, half or quarter mask, 1991, European Standard, European Committee for Standardization

EN12941:1998 Powered filtering device with helmet / hood, 1998, European Standard, European Committee for Standardization

EN12942:1998 Power assisted filtering device with full, half or quarter mask, 1998, European Standard, European Committee for Standardization

### *Hose/airline breathing apparatus*

EN138:1994 Fresh air hose with half of full facemask, 1994, European Standard, European Committee for Standardization

EN139:1994 Compressed air line BA full or half mask or mouthpiece, 1994, European Standard, European Committee for Standardization

EN269:1994 Powered fresh air hose with hood, 1994, European Standard, European Committee for Standardization

EN270:1994 Compressed air line BA with hood, 1994, European Standard, European Committee for Standardization

EN271:1995 Compressed air line / powered fresh air hose BA with hood for abrasive blasting, 1995, European Standard, European Committee for Standardization

EN1073-1:1998 Protective clothing against particulate radioactive contamination – Ventilated suits, 1998, European Standard, European Committee for Standardization

***Self-contained respirator***

EN137:1993 Self-contained open circuit compressed air BA, 1993, European Standard, European Committee for Standardization

EN145:1997 Self-contained closed circuit compressed oxygen or oxygen/nitrogen BA, 1997, European Standard, European Committee for Standardization

# Enquiries

If you wish to enquire about this guide or require advice on occupational safety and health, please contact the Occupational Safety and Health Branch of the Labour Department through:

Telephone : 2559 2297 (auto-recording after office hours)

Fax : 2915 1410

E-mail : enquiry@labour.gov.hk

Information on the services offered by the Labour Department and on major labour legislation can also be found by visiting our Home Page in the Internet. Address of our Home Page is http://www.labour.gov.hk.

# Complaints

If you have any complaints about unsafe workplaces and practices, please call th Labour Department's occupational safety and health complaint holtline on 2541 2172. All complaints will be treated in the strictest confidence.

Occupational Safety and Health Branch
Labour Department

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