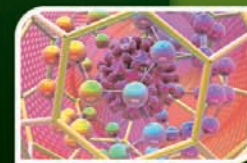


GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES MINISTRY OF HEALTH

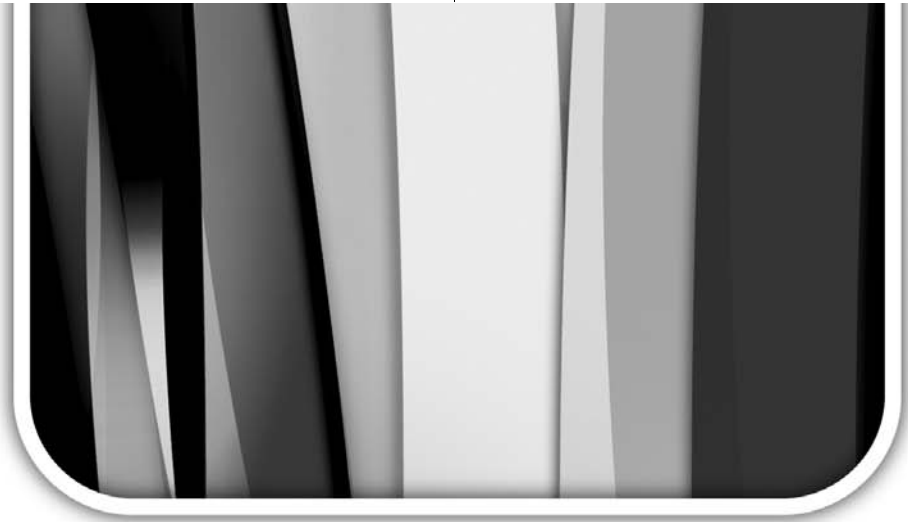


Medical Staff Safety and Health Unit
Quality in Medical Care Section
Medical Development Division
Ministry of Health Malaysia

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MINISTRY OF HEALTH



**Medical Staff Safety and Health Unit
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Ministry of Health Malaysia**

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FOREWORD BY THE DIRECTOR-GENERAL OF HEALTH, MALAYSIA



Occupational health and safety are concerned with protecting the safety, health and welfare of people at work. The main goal is to foster a safe and healthy working environment, thus preventing workers from sustaining work-related injuries and illnesses. In health care facilities, the work force is a prime asset of the organisation. The workers' health and safety have a very serious impact on the organisation, not only on job performance but also on the quality of services that these workers deliver to the *rakyat* and patient safety, all of which will affect the credibility of the organisation. Cost will also increase due to lost work time, sickness absences, medical care and medical compensation paid out to injured and ill workers. It is the responsibility of the employer and employees to comply with the Occupational Safety and Health Act, 1994 and its Regulations and Occupational health and safety should therefore be an important part of clinical governance in all Ministry of Health (MOH) facilities.

Chemical hazards are some of the more dangerous and common hazards faced by many workers in health care facilities, especially those who work in laboratories, operating theatres, radiology suites, pharmacies, dialysis units, Central Supply Sterile Departments and mortuaries. Proper management of chemicals is essential as improper handling and uncontrolled exposure to chemicals can cause safety incidents such as spills, splashes and explosions as well as occupational diseases ranging from contact dermatitis, systemic and end-organ damage to teratogenicity and cancers. Workers dealing with chemicals must know how to handle and manage chemicals appropriately, in line with the prevailing regulations, to protect themselves as well as others.

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

Recognising the importance and complexity of chemical management, the Ministry of Health has taken the initiative to produce the “Guidelines on Chemical Management for the Health Care Facilities”. It serves as a quick and practical guide, as well as a reference on chemical safety, its health effects, control measures, relevant laws and safe work practices in a concise and user-friendly manner for all health care workers throughout the country. I am confident that the guidelines will be a valuable resource for our Hospital Directors, District Health Officers, doctors, dentists, allied health professionals and other stakeholders.

I would like to congratulate the Technical Committee responsible for the guidelines and the Quality in Medical Care Section of the Medical Development Division of MOH for their commendable efforts in developing this guideline. It is the product of a collaborative effort of a number of experts from various disciplines in the Ministry of Health, Department of Occupational Safety and Health, Academy of Occupational and Environmental Medicine Malaysia and the private sector. I hope the guidelines will be utilised by all our health care providers to ensure their own safety and health and those of others in the health care profession.

**TAN SRI DATO' SERI DR. HJ. MOHD ISMAIL MERICAN**

Director-General of Health, Malaysia

6th September 2010

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SCOPE OF THE GUIDELINES

These guidelines were produced to meet the needs of health care facilities under the Ministry of Health which include hospitals, health clinics and dental clinics.

OBJECTIVES OF THE GUIDELINES

General Objective

To improve the management of chemicals in health care facilities under the Ministry of Health, Malaysia.

Specific Objectives

- To increase the knowledge and awareness of personnel on chemical management.
- To educate the personnel on the potential adverse health effects of chemical exposure.
- To educate the personnel on the existing laws pertaining to handling of hazardous chemicals.
- To promote safe and healthy work practices among personnel during chemical handling.
- To guide the personnel on transportation, storage and disposal of hazardous chemicals.

1.0 INTRODUCTION

The use of chemicals is seen in many occupations including health care. Poor management of chemicals can cause safety incidents such as spills, splashes and explosions; and also lead to occupational diseases, poisoning and cancers.

A study on "Self Assessment of Safety and Health Aspects in the Ministry of Health Hospitals" in 2007 by the Quality in Medical Care Section, Medical Development Division, MOH which involved 134 hospitals showed that only a small percentage of hospitals fulfilled all the safety and health criteria related to safe management of chemicals. The results are as follows:

- Provision for Personal Protective Equipment (PPE) (37.1%)
- Proper disposal of chemical waste (25.2%)
- Compliance to PPE usage (17.6%)
- Correct signage (17.6%)
- Proper storage of chemical (9.7%)

Personnel working in the Pathology, Pharmacology and Radiology Departments are at a higher risk of exposure to chemicals.

2.0 HAZARDOUS CHEMICALS

2.1 Definition of Hazardous Chemicals

Hazardous chemicals are substances or preparations that are capable of causing harm either through its physical and chemical properties or its toxicity. It can be in the form of dust, gas, liquid, compound or mixtures; natural or synthetic.

2.2 Common Chemicals Used In Health Care Facilities and the Health Effects (Refer Appendix I)

3.0 PRINCIPLES OF TOXICOLOGY

3.1 Mode of Entry

Chemicals can enter the body via various routes which are the skin, nose, mouth, mucous membrane and placenta.

3.1.1 Inhalation

Chemicals in the workplace have the potential to be dispersed into the air in the form of droplets, gas, vapour or mist; that when inhaled, reach the alveoli of the lungs and have the capacity to enter the blood and be distributed throughout the body.



Inhalation

3.1.2 Skin and Mucous Membrane Absorption

Workers handling chemicals are at risk of chemical absorption via skin and/or eyes.

Organic and caustic (alkaline) chemicals penetrate the skin by softening the keratin cells, then pass into the dermis and may even enter the blood stream.

Other causes of chemical entry through the skin:

- Dryness and cracking of the skin caused by frequent contact with detergents or organic solvents.
- Cuts, punctures and scrapes through which the chemical may pass into the body.

3.1.3 Eye Absorption

Chemicals in the form of liquid, vapour, gas, aerosol and mist can enter the eyes. Chemical solvents like toluene can penetrate through the outer layer of the eye and may pass into the blood via the blood vessels of the eye.

Depending on the corrosive nature of the chemical, the eye maybe damaged leading to conditions like keratitis.



Eye Absorption

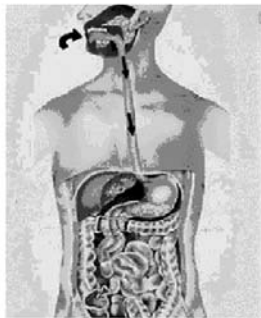


Skin Absorption

3.1.4 Ingestion

Chemicals can enter the body via:

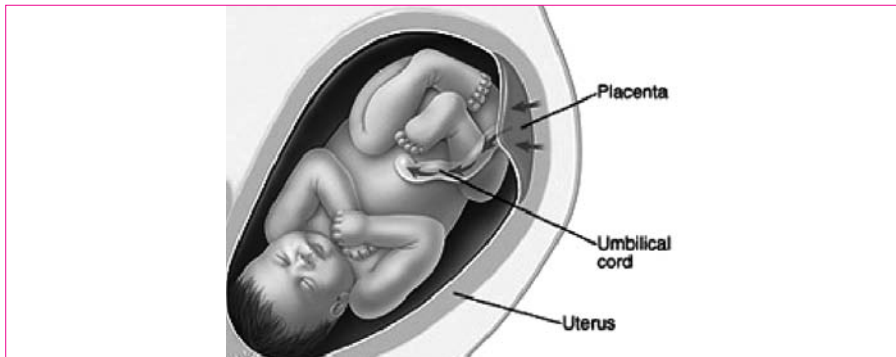
- The gut when food and/or drinks contaminated with chemicals are consumed.
- The mouth when smoking cigarettes contaminated with chemicals.



Ingestion

3.1.5 Transplacental

A fetus maybe exposed to chemicals through transplacental transfer via the bloodstream of a pregnant mother.



Transplacental

3.2 Dose-Response Relationship

The toxicity (harmful action) of a substance will manifest only when it comes in contact with a living biological system. The toxic potency of a chemical is the relationship between the dose (the amount) of the chemical and the response that it produces in the biological system.

3.3 Toxic Effects of Chemicals

- Generally, higher doses of chemicals and longer exposure will cause more harm.
- Acute poisoning is commonly caused by a single large exposure with rapid absorption of the substance, e.g. carbon monoxide or cyanide poisoning.
- Chronic poisoning is commonly caused by prolonged or repeated exposure to chemicals and the symptoms may not be immediately apparent, e.g. lead or mercury poisoning and pesticide exposure.
- Local effect refers to the effect of the chemical at the site of contact which may be the skin, mucous membranes, respiratory tract, gastrointestinal system and/or the eyes.
- Systemic effect refers to the effect of the chemical following distribution of the chemical throughout the body. For example, an

inhaled material may act on the liver or even on the bone marrow as in inhaled benzene.

- Cumulative effect means the chemical has accumulated in the body as a result of numerous chronic exposure. The effects are not seen until a critical body burden is reached.
- Synergistic effect means the effect of two or more chemicals is greater than the effect of the individual chemical, e.g. exposure to both alcohol and chlorinated solvent is greater than the effect of alcohol or solvent individually.

3.4 Factors Affecting Toxicity

- The rate of entry (how fast the toxic dose is delivered) and route of exposure (by what means) affects the amount of the substance entering the workers body.
- Age can affect the capacity to repair tissue damage.
- State of health, physical condition, and life style, can affect the toxic response. Pre-existing diseases can result in increased sensitivity to the chemicals.
- Environmental factors such as temperature and pressure may also affect the chemical exposure to the individual.
- Genetic predisposition.
- Gender of the exposed individual.

4.0 LAWS AND REGULATIONS RELATED TO HAZARDOUS CHEMICALS

4.1 Occupational Safety and Health Act 1994

The Act states that it is the duty of every employer and self-employed person to ensure as far as practicable, to provide a safe and healthy work environment for all workers.

The Act applies throughout Malaysia to the industries specified in the First Schedule (*Refer Appendix II*).

The Act does not apply to:

- Work on board ships governed by the Merchant Shipping Ordinance 1952, the Merchant Shipping Ordinance 1960 of Sabah (Sabah Ord. 11/60) or Sarawak (Sarawak Ord. 2/60).
- The armed forces.

The list of Regulations pertaining to chemicals under this Act are:

1. Occupational Safety and Health (Classification, Packaging and Labeling of Hazardous Chemicals) Regulations 1997.
2. Occupational Safety and Health (Prohibition of Use of Substance) Order 1999.
3. Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000.
4. Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004.

4.2 Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemical) Regulations 1997

4.2.1 Scope

These Regulations apply to suppliers of hazardous chemicals except hazardous chemicals which are -

- (a) Radioactive material
- (b) Pesticides

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

- (c) Listed as poisons in the Poisons List Order 1993, except for chemical which are classified therein as industrial and laboratory poisons;
- (d) Drugs under the Sales of Drugs Act 1952;
- (e) Scheduled wastes in the First Schedule of the Environmental Quality (Schedule Wastes) Regulations 1989;
- (f) Foodstuff.

These Regulations shall not apply to -

- (a) The transportation of hazardous chemicals by rail, road, inland waterway, sea or air.
- (b) Hazardous chemicals in transit which are stored at a bonded warehouse.

4.2.2 Duty of Supplier

It is the duty of supplier to:

- Classify hazardous chemicals based on physicochemical properties (explosive etc), health effects (very toxic, corrosive etc).
- Pack hazardous chemical according to the requirement of Classification, Packaging and Labelling of Hazardous Chemical Regulations 1997.
- Label the chemical container according to the requirement of Classification, Packaging and Labelling of Hazardous Chemical Regulations 1997.
- The label should both be in Bahasa Malaysia and English.



Example of a chemical container with labeling

- The label should contain:
 - the name of hazardous material.
 - the name, address and telephone number of the supplier.
 - danger symbol (schedule 2).
 - nature of special risk (schedule 3) - eg: R45 may cause cancer.
 - safety measures (schedule 4) - S25 avoid contact with eyes.
- Supply Chemical Safety Data Sheet (CSDS):
 - Chemical product, ingredients, first aid, toxicological info, handling, storage.
- According to the Occupational Safety and Health (Classification, Packaging and Labeling of Hazardous Chemical) Regulations 1997, the CSDS shall contain the following information:
 - i) The chemical product itself including the trade or common name of the chemical and company identification with the detail of the supplier.
 - ii) Composition of ingredients that clearly identifies the hazardous chemical for the purpose of conducting a hazard evaluation.
 - iii) The hazard identification.
 - iv) The first aid measures.
 - v) The fire fighting measures.
 - vi) The accidental release measures.
 - vii) The handling and storage.
 - viii) The exposure control and personal protection (including the possible methods of monitoring workplace exposure).
 - ix) The physical and chemical properties.
 - x) The stability and reactivity.
 - xi) The toxicology information (including the potential routes of entry into the body and the possibility of synergism with other chemicals or hazards encountered at work).
 - xii) The ecological information.
 - xiii) The disposal information.
 - xiv) The transport information.
 - xv) The date of preparation of the CSDS.

The CSDS should contain all fifteen elements described above although there may be a variation in the order. Do not assume that if a section is left blank, there is no risk.

4.2.3 Procurement of Chemicals

The procurement officer must ensure that the chemicals are properly labelled and the CSDS is supplied along with the chemicals. This should be stated in the contract with the supplier. Chemicals that are supplied without a CSDS or label should not be accepted.

4.3 Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000

4.3.1 Definition

Hazardous chemicals are substances or preparations that are capable of causing harm either through its physical and chemical properties or its toxicity. It can be in the form of dust, gas, liquid, compound or mixtures; natural or synthetic.

However, according to the USECHH Regulations 2000, "chemicals hazardous to health" is defined as any chemical or preparation which:

- Is listed in Schedule I and II.
- Possesses any of the properties categorised in Part B of Schedule I of the CPL Regulations 1997.
- Comes within the definition of 'pesticide' under the Pesticides Act 1974.
- Is listed in the First Schedule of the Environmental Quality (Schedule Wastes) Regulations 1989.

These regulations apply to all places of work which use (production, processing, handling, storage, transport, disposal or treatment) chemical hazardous to health except:

- Substances defined as radioactive materials under Atomic Energy Licensing Act 1984.
- Foodstuffs
- Substance hazardous to health solely by explosive or flammable properties or solely because they are at high or low temperature or a high pressure.
- Pharmaceutical products.

4.3.2 Chemical Register (*Refer Appendix III*)

An employer is required to identify and register all chemicals hazardous to health used at the workplace in a register known as the Chemical Register.

The content of the Chemical Register:

- List of all the chemicals used in the workplace.
- Current Chemical Safety Data Sheet (CSDS) for all chemical hazardous to health.
- The average monthly or yearly amount of chemicals hazardous to health handled, stored, transported, disposed or treated at the work area.
- The name, address and contact number of the supplier (local or foreign) of each of the hazardous chemical.
- The chemical register must be updated when a new chemical is added to the work place.

Chemical Register:

- Must be accessible to all employees who are exposed or likely to be exposed to chemical hazardous to health at the workplace.
- Useful to the safety and health officers, chemical health risk assessors, firemen and rescuers and doctors who manage patients with chemical poisoning.
- Must be properly maintained and updated from time to time.

4.3.3 Chemical Health Risk Assessment (CHRA)

- It is mandatory for the employer to perform an assessment of health risks arising from the use of chemical hazardous to health at the workplace.
- Employers are not permitted to use any chemical hazardous to health unless the assessment (CHRA) has been conducted.

The CHRA must contain the potential risk to employees resulting from exposure to chemical hazardous to health, method and procedure adopted in chemical use, nature of hazard, degree of exposure, measures of control of exposure, exposure monitoring programme, necessity for health surveillance programme and requirement for the training.

4.3.4 Workplace Exposure Monitoring

Workplace exposure monitoring is divided into environmental and personal monitoring.

a) Environmental Monitoring

Environmental Monitoring is a validated method used to monitor a wide variety of airborne chemical substances in the workplace environment.

b) Personal Monitoring

Personal monitoring is a technique that is used to measure the level of exposure experienced by the individual worker through sampling of the air from the worker's breathing zone.

4.4 Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004

4.4.1 Scope

According to this Regulation any accidents, dangerous occurrence, occupational poisoning or occupational disease that has occurred in the place of work should be notified by the employer to the Department of Occupational Safety and Health (DOSH).

The importance of incidence notification by the medical practitioners to DOSH on suspected or diagnosed occupational diseases and occupational poisoning is to:

- Determine the underlying cause so that remedial actions can be taken in order to prevent similar incidences.
- Monitor trend of occupational accidents, poisoning and diseases as a basis for planning and new policy/program establishment; and law enforcement.

The reporting is done using the DOSH gazetted JKKP 6 and JKKP 7 forms.

The Ministry of Health has been using the WEHU forms for the notification of accidents, dangerous occurrences, occupational poisoning or occupational diseases that occur in the health facilities under the MOH. DOSH has agreed that the MOH should continue to use these form for this purpose with the adaptation of JKPP forms.

4.4.2 Notification Forms for MOH Facilities

- WEHU L1 & L2 (JKPP 7) - for occupational lung diseases
- WEHU S1 & S2 (JKPP 7) - for occupational skin diseases
- WEHU E1 & E2 (JKPP 7) - for occupational noise induced hearing loss (NIHL)
- WEHU D1 & D2 (JKPP 7) - for occupational poisoning and other occupational diseases
- WEHU A1 & A2 (JKPP 6) - for occupational accidents

4.5 Environmental Quality (Scheduled Wastes) Regulations 2005

Any waste that falls within the categories of waste listed in the First Schedule (**Refer Appendix IV**) of the Regulations is known as Scheduled Waste.

According to the Regulations, the Scheduled Waste can only be disposed in predetermined premises only. The waste must be rendered innocuous before disposal.

Examples of waste generated in the health care facilities

- Used developer and fixer from the Radiology Department.
- Waste containing formaldehyde.

5.0 CONTROL OF HAZARDOUS CHEMICALS

5.1 Elimination

Elimination is the process of removing the chemical hazard from the workplace. It is the most effective way to control a risk because the hazard is no longer present and should be used whenever possible.

e.g. Replacing X-rays machines that use chemicals to develop the X-ray film with X-ray machines that produce digital images.

5.2 Substitution

Substitution occurs when a new chemical or substance is used instead of the original chemical. The aim is to choose a new chemical that is less hazardous than the original.

e.g. Replacing Cidex with Hemoclean (Peracetic Acid).

5.3 Enclosure & Isolation

These methods aim to keep the chemical isolated from the worker. An enclosure keeps a selected hazard "physically" away from the worker. For example, an enclosed equipment is sealed away and is typically 'opened' only for cleaning or maintenance. Isolation places the hazardous process "geographically" away from the majority of the workers and hence minimizing the exposure of the chemical to the workers.

e.g. Preparation of cytotoxic drugs in an isolated room.

5.4 Administrative Control

5.4.1 Commitment and Responsibility

a) Management Commitment (*Refer Appendix V*)

The initiation of a chemical protection program can only be carried out successfully with commitment from the top management such as the Ministry of Health, hospital directors, heads of department and medical officers of health.

b) Management Responsibility

- Establish a Chemical Management Program in the organization.
- Assign an individual to be in charge of the chemical management.
- Notify occupational accidents, diseases and poisonings related to chemicals to the Department of Occupational Safety and Health (DOSH) and the State Health Department.
- Take the necessary corrective action.
- Monitor and evaluate the program.

Management must ensure:

- Workers:
 - understand and follow the safe operating procedures.
 - wear/use the appropriate personal protective equipment (PPE).
 - have undergone the necessary training required to ensure the safe use of chemicals.
- Adequate supply and maintenance of PPE.
- All equipment and machines are in good working order and properly maintained.
- A chemical registry is established for all chemicals.

c) Workers Responsibility (*Refer Appendix VI*)

Workers who are exposed to chemicals must ensure that:

- All work processes are planned and conducted according to the standard operating procedures.
- Appropriate PPE are worn when handling hazardous chemicals in the laboratory.
- Daily compliance with proper safe practices.
- Unsafe act or practices are reported to the supervisor/Head of Department.

d) Care for High Risk Workers

These are workers who are more susceptible to develop symptoms and/or illnesses due to exposure to chemicals, e.g. pregnant women should not be exposed to lead. The Occupational Health Physicians are responsible for providing recommendations that will protect these high risk workers including workers with hypersensitivity to chemicals, chronic diseases and those with certain disabilities.

This may include selection of a job that minimizes adverse chemical effects, provision of special equipment or protective devices or medical removal.

5.4.2 Safety and Health Policy

All health care facilities must have a Safety and Health Policy which all staff must adhere to.

5.4.3 Safety and Health Committee

According to the Occupational Safety and Health Act 1994, a Safety and Health Committee should be established where there are forty or more workers employed at the workplace.

This committee must consists of employer and employees representatives. The main function is to discuss issues pertaining to safety, health and welfare of workers and take appropriate remedial measures.

5.4.4 Safe Operating Procedures (SOP)

- Safe operating procedures are a set of written procedures explaining how to work safely with hazardous chemicals.
- When writing a SOP for a work procedure, the steps for safety precautions/preventive methods should be included, e.g. appropriate PPE required for the work procedure.
- There should be a SOP for a particular work procedure /process which should be adopted by all hospitals.
- The SOP should be easily accessible to all staffs involved in the work process.

5.4.5 Modification of the Work Process.

Making changes in the work process to make it safer and less hazardous to health and safety.

5.4.6 Training

a) Law and Training

According to the Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000, it is the duty of the employer to ensure that employees who may be exposed or likely to be exposed to chemicals hazardous to health is provided with relevant information, instructions and training to create awareness and enable the workers to take the necessary precautions.

The employer must review and conduct the training program every 2 years; when there is a change in the hazard information on the chemicals hazardous to health, standard operating procedure or control measures; and each time employees are assigned to a new task or new work area.

Information and training may be done either by:

- Individual chemical or
- Categories of hazards

If there are only a few chemicals in the workplace, discussion can be based on each individual chemical. Where there are a large number of chemicals or the chemicals change frequently, discussion can be based on the hazard categories (e.g flammable liquids, corrosive materials, carcinogens).

b) Content of the Training

The training programs should include the following:

- Relevant laws and regulations
- Health effects of the chemical
- Personal protective equipment
- Interpreting labels and CSDS

- Chemical registry
- Storage of hazardous chemicals
- Safe handling and disposal procedures
- Monitoring of chemical exposure
- Spillage & clean up procedures
- First aid measures
- Proper/safe use of equipment (e.g fume hood)
- Notification of occupational accident, diseases and poisoning related to chemicals
- Medical surveillance and medical removal

5.4.7 Hazard Communication

Employees have the right and the need to know the chemicals they are exposed to when working, its potential adverse effects; and protective measures available to prevent these potential adverse effects from occurring.

Knowledge acquired under the hazard communication will help:

- Employers to provide safer workplaces for their employees.
- Employees to take steps in reducing exposure to potentially hazardous chemicals, substitute with less hazardous materials, and establish proper work practices.

5.4.8 Medical Surveillance Program

Appropriate Medical Surveillance program is necessary for workers exposed to 35 chemicals (**Refer Appendix VII**) mentioned in the Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000. Medical Surveillance can only be conducted by registered occupational health doctors.

Medical Surveillance involves complete history taking (medical and occupational history), clinical examination, workplace and biological monitoring. The purpose of Medical Surveillance is to identify changes in health status of workers due to occupational exposure to chemicals and for early diagnosis, treatment and intervention.

Examples of chemicals used in Ministry of Health facilities which require Medical Surveillance are:

- Mercury
- Phenol
- Xylene
- Organophosphates

5.4.9 Medical Removal

According to the Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000, a worker needs to be removed from a workplace if the Medical Surveillance shows evidence of significant exposure to chemicals. More stringent rules are applicable to female workers of reproductive age, pregnant/lactating mothers and workers with certain health conditions.

5.4.10 Adequate Staffing

Employer shall provide adequate staff per shift. Lack of staff can cause overwork, exhaustion and errors; leading to accidents and mishaps.

5.4.11 Work Rotation

Work rotation is one method of minimizing the duration and frequency of exposure of workers to chemicals.

5.5 Engineering Control - Ventilation

Ventilation is a method of control that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly.

5.5.1 Types of Ventilation

- **General Ventilation** - This is a system of ventilation consisting of either natural or mechanically induced fresh air movements to mix with and dilute contaminants in the workroom air. This is not the recommended type of ventilation to control contaminants that are highly toxic, when there may be corrosion problems from the contaminant, when the worker is close to where the contaminant is being generated, and where

fire or explosion hazards are generated close to sources of ignition.

- **Local Exhaust Ventilation** - A ventilation system that captures and removes the contaminants at the point where they are being produced before they escape into the workroom air. The system consists of hoods, ducts, a fan and possibly an air-cleaning device. Advantages of local exhaust ventilation over general ventilation include: it removes the contaminant rather than diluting it; it requires less air flow and thus is more economical over the long term; and the system can be used to conserve or reclaim valuable materials. However, the system must be properly designed with the correctly shaped and placed hoods, and correctly sized fans and ductwork.

5.5.2 Maintenance of Local Exhaust Ventilation (LEV)

Local Exhaust Ventilation should undergo regular inspection and maintenance during which the LEV is checked for leaks in the extraction system and blockages in the filters. Blocked filters will affect the efficiency of the extraction system. LEV must be thoroughly examined and tested at intervals according to the manufacturer's instructions.

5.5.3 Laboratory Fume Hoods

Fume hoods are designed to remove chemical fumes and aerosols away from the work area.

a) Principle

The Laboratory Fume Hood uses local exhaust ventilation to prevent hazardous, offensive, or flammable gases and vapours from mixing with the general room air. Fume hoods are designed to remove chemical fumes and aerosols away from the work area.

The air is drawn from the front/face of the cabinet using a fan; which then either expels the air outside the building or made safe through filtration, and recirculated back into the room. The ventilation requirements for a specific chemical can be obtained from the CSDS, appropriate SOP or chemical label.



Examples of Fume Hood

b) Guide to Fume Hood Usage

- Ideally, the hood should be evaluated before the beginning of a work process to ensure adequate face velocities (typically 60-100 fpm) and the absence of excessive turbulence.
- During fume hood usage, keeping the face opening small (keeping the sash low) improves the hoods overall performance.
- Place the chemicals and apparatus 5-10 cm behind the front edge of the hood. This can reduce the vapor concentration at the user's face by 90%.
- Do not use the hood to store chemicals.
- Factors such as placement of equipment in the hood, room drafts from open doors or windows, persons walking by can disrupt the airflow pattern; and thus the performance of a hood.
- Do not allow solid objects or materials (such as paper/tissue) to enter the exhaust system as it can get lodged in the ducts or fans and affect operations.
- Be prepared for emergencies such as ventilation failure (power failure) or fire/explosion in the hood.
- A fume hood must be used when handling toxic chemicals.

5.6 Control of Chemical Hazards in Dental Facilities

5.6.1 Engineering Control

Devices to capture amalgam which include chair side trap, vacuum pump filter or amalgam separator. Amalgam sludge is a mixture of solid and liquid amalgam captured by these devices and is sent for recycling.

5.6.2 Administrative Control

Dental best practice management - it is a series of amalgam waste handling and disposal practices.

This includes:

- Proper collection of amalgam sludge, contact amalgam (amalgam that was in contact with a patient, extracted tooth containing amalgam), empty amalgam capsules, non-contact dental amalgam (leftover amalgam from procedures).
- Storage of amalgam.
- Recycling of the disposed amalgam.

5.7 Signages

Each laboratory has to have signage's that provide the appropriate hazard warnings and safety information to visitors and housekeeping personnel.



Examples of signage's

5.8 Personal Protective Equipment

Personal Protective Equipment are equipment used or worn to protect individual workers from safety and health hazards at the workplace. Examples of PPE for chemical exposure are respirators, gloves, eye protection, apron, body suit and safety foot wear. According to the law, PPE must be made available to employees by the employer at no cost to them (employees). It is the responsibility of the employees to use the PPE.

5.8.1 Conditions where PPE may be necessary:

- When adequate control cannot be instituted using engineering and administrative controls alone.
- When temporary control is needed to safeguard health until adequate control by other methods is instituted (e.g. when urgent control is needed during a chemical spillage).

5.8.2 Personal Protective Equipment Requirement

The PPE chosen must be from a list approved by the Department of Occupational Safety and Health (DOSH) which are categorized as below:

- Respiratory protection using certain apparatus such as air-purifying respirators.
- Eye protection using face shields, goggles and safety glasses which is of international standards.
- Skin protection using apron and gloves which is of international standards.

The employer must ensure that the PPE chosen is:

- Appropriately chosen for the individual and task.
- Used appropriately.
- Well maintained, clean and can function well.

Employees should undergo training on the proper use, storage and maintenance of the PPE.

Examples of PPE according to chemical exposure in Ministry of Health Facilities is shown in **Appendix VIII**.

5.8.3 Types of Personal Protective Equipment Used In Chemical Handling

a) PPE for Skin Protection - Gloves

- Workers should familiarize themselves with the permeation rate and breakthrough time for the chemical resistant gloves provided by the manufacturer's test data.
- Disposable nitrile gloves provide adequate protection against small quantities of accidental hand contact with most laboratory chemicals.
- In cases of chemical spillage on their gloves, lab workers should immediately remove them, wash their hands and use new gloves.
- Used gloves shall not be used outside the lab.

b) PPE for Eye Protection

The use of safety glasses with side shield provides eye protection but does not provide face protection during a chemical splash. It is recommended to use the face shield for face and neck protection against the hazard of chemical splashes.

Gloves (Refer to *Appendix VIII*)



Laminate Film



Nitrile



Supported Polyvinyl Alcohol



Polyvinyl Chloride (PVC)



Natural Rubber



Unsupported Neoprene



Neoprene

Safety Goggles/Glasses



Safety glasses



Safety glasses with side shield



Face shield

c) PPE for Lung Protection - Respirators

The design of respirators is such that it protects the user against specific types of substances and within specific concentration ranges only. The user should not use a respirator unless assigned one, and before use, the user must be fit tested and trained on how to use the respirator.

The selection of respirator is based on:

- The hazard (chemical)
- The protection factor required

The types of respiratory protective equipment:

- Particle-removing air purifying respirators (N95, N100)
- Gas and vapor-removing air purifying respirators

The user should be familiar with the limitations of each type of respirator and also the signs for respirator failure such as odor



Particle-removing air purifying respirators

Respirators



N95 Facemask



Dual Cartridge Respirator

breakthrough and filter clogging. Ideally, respirators must be used in conjunction with a written respiratory protection program.

d) PPE for Body Protection

During routine lab work, the skin and body should be protected against contact with laboratory chemicals. Lab coats must be worn when handling hazardous chemicals to avoid body contact which may result from splashes and accidental spills. Other forms of body protection may also be used, such as

disposable work suits. These suits are used against toxic chemicals. Lab coats which have been exposed to chemicals shall not be used outside the lab.

e) PPE for Foot Protection

During chemical handling, workers should wear boots or closed shoes that are made of rubber, PVC or neoprene (depending on the chemical).

6.0 CHEMICAL STORAGE

6.1 Principles of Chemical Storage

Departments using chemicals should store the chemicals according to compatibility and not in alphabetical order. The space between chemical classes will depend on the storage area available. All the chemicals used in a one room should be arranged into classes.

The segregation of chemicals used in a single work process into separate rooms should be avoided as frequent transport of chemicals between rooms/labs increases the probability of a chemical spill.

Strong corrosive reagents should be kept in spill trays. Liquid chemicals should never be stored above eye level as chemical spillage may occur during handling.

Store flammable solvents away from strong oxidising agents such as chromic acid and hydrogen peroxide.

All storage cabinets located in hallways (outside the lab) must

- Contain the name of the owner.
- List the name of the chemicals in the cabinets.

This information is critical during emergencies such as fires, chemical spillage or poisoning that take place after office hours where emergency personnel have to respond.

6.2 Storage of Flammable Liquids

All flammable and combustible liquids must be stored in a flammable-liquid storage cabinet.

Flammable-liquids storage cabinets are not intended for the storage of:

- i. Materials that are highly toxic
- ii. Acids or bases
- iii. Compressed gases
- iv. Pyrolytic chemical



Flammable-liquid Storage Cabinet

6.3 Chemical Stability

The stability of a chemical will depend on its susceptibility to dangerous decomposition. Chemicals such as ethers and olefins can form peroxides when exposed to air and light which occurs during packaging; which allows the chemical to undergo dangerous decomposition even when the containers are not opened.

7.0 HANDLING AND TRANSFERRING OF HAZARDOUS CHEMICALS

The greatest potential for exposure to hazardous chemicals is during transferring of chemicals. Chemical spillage occurring outside the store rooms and labs can lead to the release of hazardous concentrations of vapour and gases into the atmosphere affecting the building occupants.

The following is a guide during the transfer of chemicals outside the laboratory:

- Flammable liquids in glass containers should not be more than 20 Litres when transported on the freight elevator unless the original shipping carton (box) is used and the substance is on an appropriate cart.
- Chemicals that are incompatible, for example chromic acid (oxidizing acid) and ethyl acetate (flammable liquid), should not be transferred on the same cart.
- During transfer, the chemical substances must be clearly labeled with the correct chemical name. The labels maybe hand-written provided it contains the chemical name and not the chemical formula or structural formula.
- The transfer carts used must have sides for each shelf which are high enough to retain the chemical containers. The wheels of the cart must be large enough to prevent it from being caught in floor cracks, door and elevator thresholds.
- During the transfer of chemicals, personnel must wear the appropriate PPE (disposable gloves and safety glasses).
- Hazardous chemicals should be transferred in freight elevators. Passenger elevators should not be used to transfer hazardous materials if freight elevators are available.
- The CSDS provides information required for the transportation of chemicals.

8.0 DISPOSAL OF HAZARDOUS CHEMICALS

All hazardous chemicals must be disposed of in accordance with the Environmental Quality (Scheduled Waste) Regulation 2005 and by the authorized waste management companies.

Guide on Waste Collection

- Unless you have written approval from the Department of Environment, disposal of chemicals by way of the sanitary sewer system is prohibited.
- All lab personnel must be familiar with the location and composition of all wastes produced in the lab.

- Waste containers must remain closed except when adding more waste into them. Open containers can lead to the release of toxic chemical into the atmosphere in the form of vapour, aerosol or gases. It also increases the chances of spillage.
- Waste chemicals must not be placed or left for removal in hallways.
- Only specific non-hazardous chemicals can be disposed through the sink.
- Chemical affluent should be treated before being disposed off into the sink.
- Biological specimens should be separated from the chemical before being disposed off separately. Formalin should be disposed as scheduled waste whereas biological specimens as clinical waste.

9.0 CHEMICAL SPLASH

9.1 Chemical Splash Into The Eye(s)

Toxic chemical splash into the eye(s) can cause serious injury that may lead to blindness.

Treatment

- Forcibly keep eye lids open.
- Wash eyes gently using clean cold water or normal saline from an Eyewash Station/water source.
- Keep washing steadily for at least 20 minutes.
- Rinse/wash hands/body thoroughly using a Shower to remove chemical.
- Remove contact lens if you are wearing one.
- Do not rub eyes.
- Do not use eye drops until seen by a doctor.
- Seek medical help immediately.
- Remember the name of the chemical and take its CSDS (*Refer Appendix IX*) along with the worker to the treating doctor.

9.2 Chemical splash on skin

- i. Remain calm.
- ii. Quickly remove all contaminated clothing.
- iii. Immediately wash away contaminant using the safety shower or other available source of water.
- iv. Allow water to run over the affected body area for at least 15 minutes. Do not use neutralizing chemicals, creams or lotions.

- v. Do not move an injured person unless they are in further danger.
- vi. Remember the name of the chemical and take its CSDS (*Refer Appendix IX*) along with the worker to the treating doctor.

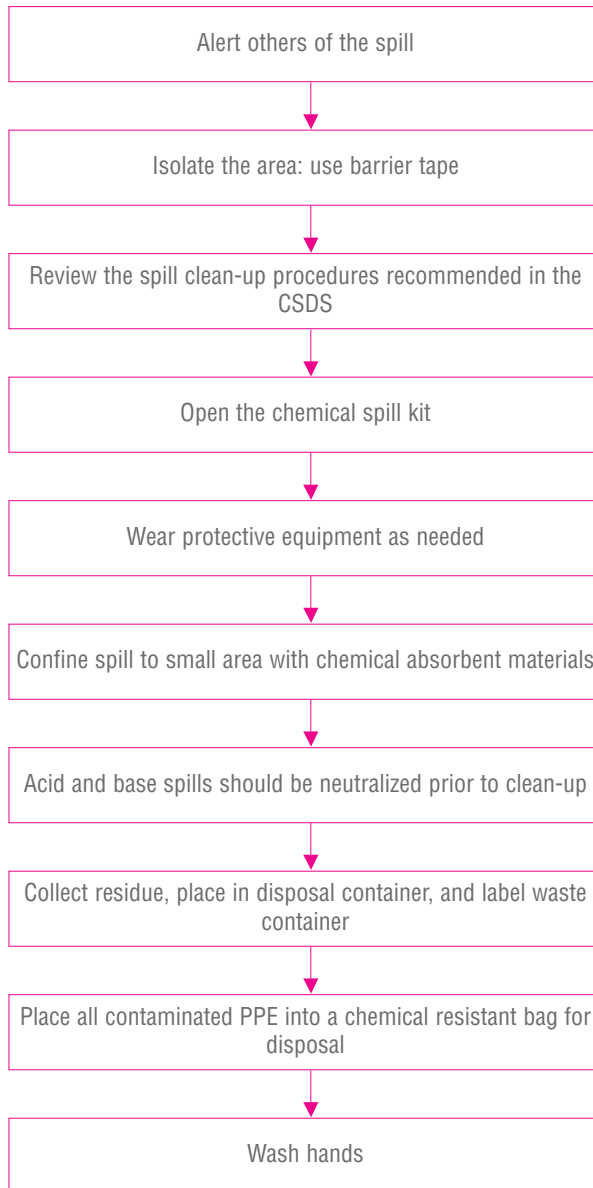
Shower and Eyewash



10.0 CHEMICAL SPILLAGE

10.1 Definition of Chemical Spillage

Chemical spillage is defined as the uncontrolled release of hazardous chemicals which maybe solid, liquid or gas. Worksite measures to reduce the potential for spills and plans for responding to chemical spillage is necessary; regardless of the type or quantity of hazardous chemical. Preparations for chemical spillage include safety equipment for spills and emergency procedures.

Steps in Handling Chemical Spillage (Refer to 10.2 and 10.3)

10.2 Immediate Action After Spillage of Hazardous Chemicals While Awaiting Trained Personnel

- i) Alert the workers around the area immediately.
- ii) Workers should be highly cautious if the spillage involves corrosives, highly toxic or reactive chemicals.
- iii) Call for assistance as it could threaten the health of the health care workers, patients and others in the vicinity.
- iv) Put up a warning sign to indicate the area where the spillage has occurred. This is to limit access to the area.
- v) Cleaning of chemical spillage must be undertaken by trained personnel.

10.3 Handling of Chemical Spillage

All chemicals should be deemed as dangerous during handling.

- i) Read the chemical label carefully before proceeding.
- ii) Do not inhale or taste chemical.
- iii) Use PPE such as goggles, gloves, lab coat, apron when handling chemical.
- iv) Skin that comes in contact with chemical should be washed immediately with soap and water.

Chemical spillage should be cleaned up according to the CSDS. Example: during the spillage of concentrated acids, pour sufficient amounts of sodium bicarbonate on top of the spillage and leave the room till the carbon dioxide released from the reaction has dispersed. The spillage can then be cleaned and put into a strong chemical resistant container.

10.4 Chemical Spillage Kit

Laboratories should be equipped to handle small amounts of low hazard chemical spills. The Chemical Spillage Kit is required for handling chemical spills. These kits may sometimes vary according to the chemical.

Chemical Spillage Kit should consists of absorbents, PPE, clean-up material.

Personal Protective Equipment (PPE)

- Goggles and Face Shield
- Heavy Neoprene Gloves
- Disposable Lab Coat and Corrosive Apron
- Plastic Vinyl Booties
- Respirators (All lab personnel must be properly fit tested before using a respirator.)

11.0 CHEMICAL FIRES

Flammable chemicals can cause accidental fires which is a major hazard. Special precautions should be taken during chemical handling such as adhering to the safe operating procedure to prevent such incident.

Keep flammable chemicals away from heat or direct sunlight.

The health care facilities must also supply adequate portable fire extinguishers which are easily identified, located and readily accessible to the health care workers. The fire extinguishers must be properly maintained and kept in their designated places at all times except during use. Fire extinguishers should be checked for its validity by looking at the expiry date. Fire extinguishers which have expired should be replaced with a new one.

Fire drill should be conducted at least once a year.

12.0 EMERGENCY RESPONSE PLAN

All health care facilities must have their own Emergency Response Plan which outline the steps needed to handle any emergencies and provide appropriate guidance on what to do during emergency situations. Example of an emergency is explosion and fire due to explosive chemicals. Emergency exits must be clear at all times. These exits should not be blocked, locked or hidden. The Emergency Response Team should be updated regularly (e.g every six month) and properly trained to handle emergency situations. Evacuation exercises should be conducted regularly, if possible once a year.

13.0 HAZARDOUS DRUGS

Hazardous drugs were included in this guideline even though it is classified as a drug and not as chemical due to its frequent use in tertiary hospitals and its toxic nature.

Examples of hazardous drugs are cytotoxic drugs used for cancer chemotherapy, antiviral drugs, hormones, certain bioengineered drugs and other miscellaneous drugs.

The health effects of hazardous drugs on health care workers depends on the exposure and its toxicity; and may manifest in the form of skin diseases, infertility, miscarriage, birth defects, leukaemia or other cancers.

13.1 Conditions for Exposure

Exposure to these drugs can occur during manufacture, transport, distribution and disposal. Health care workers that may be at risk of exposure are:

- Pharmacists and pharmacy technicians
- Nurses
- Doctors handling cytotoxic drugs
- Operating room staff

Workers can be exposed to hazardous drugs through its presence in the air, work surfaces, clothing, medical equipment, patient urine or faeces.

During handling (preparation, administration or disposal of hazardous drugs), health care workers may be exposed when the drugs create aerosols or generate dust. Exposure can also happen during cleaning up of spills or when touching surfaces contaminated with these drugs.

The activities that may result in exposure through inhalation, skin contact, ingestion, or injection are:

- During reconstitution of powdered or lyophilized drugs and dilution.
- Expelling the air from syringes containing hazardous drugs.
- During the administration of hazardous drugs to patients through the intramuscular, subcutaneous, or intravenous (IV) routes.
- When counting out individual, oral doses and tablets that are uncoated from multidose bottles.
- Using a unit-dose machine on uncoated tablets.
- Crushing tablets to make oral liquid doses.

- Making custom-dosage capsules by compounding potent powders.
- Skin contact with measurable amount of drugs present on exterior of drug vial, work surfaces, floors, and final drug products (bottles, bags, cassettes, and syringes).
- The production of aerosols either by direct IV push or by IV infusion when administering hazardous drugs.
- Bed side procedures like priming the IV set containing hazardous drugs. Handling body fluids or body-fluid-contaminated clothing, dressings, linens, and other materials.
- Handling contaminated wastes generated at any step of the preparation or administration process.
- During specialized procedures such as intraoperative or intraperitoneal chemotherapy in the operating room.
- When handling unused hazardous drugs or hazardous drug contaminated waste.
- Decontaminating and cleaning areas contaminated with hazardous drugs.
- Transporting waste containers contaminated with hazardous drug.
- During the removal and disposal of personal protective equipment (PPE) used for handling hazardous drugs or waste.

13.2 Factors Affecting Exposure

The factors affecting exposure of workers are:

- Drug handling circumstances (preparation, administration, or disposal)
- Amount of drug prepared
- Frequency and duration of drug handling
- Potential for absorption
- Use of ventilated cabinets
- Use of personal protective equipment
- Work practices

The chance of experiencing adverse effects of the hazardous drug increases with the amount and frequency of exposure. The other contributing factors are the lack of proper work practices or non-compliance to the SOP.

13.3 Control Measures in Handling Hazardous Drugs

13.3.1 Engineering Control

- a) Use ventilated cabinets – example: cytotoxic drug safety cabinet
- b) General Ventilation

The storage area must have sufficient general exhaust ventilation to dilute and remove any airborne contaminant.

A dedicated emergency exhaust fan large enough to quickly purge airborne contaminants from the storage room in an event of a spill.



Cytotoxic Drug Safety Cabinet

13.3.2 Personal Protective Equipment

- a) Respirators

Surgical masks do not provide adequate protection. Use NIOSH-certified respirators.

b) Gloves – example for cytotoxic drugs

- Wear chemotherapy gloves
- Make sure that gloves are labeled as chemotherapy gloves and make sure such information is available.
- Wear double gloves
- Consider using chemotherapy gloves for hazardous drugs that are not chemotherapy drugs or for which no information is available.
- Change gloves every 30 minutes or when torn, punctured, or contaminated.

c) Aprons

- Use disposable aprons made of polyethylene-coated polypropylene (which is non-linting and non-absorbent).
- Make sure gowns have closed fronts, long sleeves, and elastic or knit closed cuffs.
- Dispose of protective gowns after each use.

APPENDIX I**Common Chemicals Used In Health Care Facilities and the Health Effects****a) Common Chemicals Used In Hospitals****i) Ethylene oxide**

Ethylene oxide is used as a sterilant and a disinfectant in the cardiac catheterization laboratory and outpatient surgical clinics. Exposure to this chemical can occur when improper control (ventilation) measures are used during/after the sterilizing process.

Acute effects

Irritation to the eyes and respiratory system. There maybe vomiting and diarrhoea.

Chronic effects

Secondary respiratory infections, skin sensitization, altered behaviour, anemia, miscarriages, and reproductive problems. Ethylene oxide also has carcinogenic effect.

ii) Nitrous oxide, Halothane, Enflurane

Exposure to these gases can occur from poor work practices where waste gases are released into the environment during the administration of anesthesia. It can also occur post operatively where patients exhale anesthetic gases during recovery and from poor maintenance of anesthetic machines which may cause waste gases to escape.

Acute effects

These gases effect the central nervous system which may lead to drowsiness, irritability, depression, headaches, nausea, poor coordination and judgement.

Chronic effects

Embryotoxicity, liver and kidney disease, and cancer.

iii) Methyl methacrylate (MMA)

It is used in orthopedic surgery to secure the prostheses to the bone. HCW are exposed to this acrylic cement-like substance during the mixing and preparation of this chemical in the operating room.

Acute effects

Irritation to the eyes, skin and mucous membrane.

Chronic effects

Liver degeneration, mutagenesis and teratogenesis.

iv) Formaldehyde

Formaldehyde is used as a fixative in histopathology specimens in most laboratories. It is also used in morgues to preserve dead bodies.

Acute effects

Irritation to the eyes and respiratory system when exposed to the liquid and vapour forms. Ingestion of large amounts can lead to severe abdominal pains, nausea, vomiting and possible loss of consciousness.

Chronic effects

Laryngitis, bronchitis or bronchial pneumonia from inhalation of high concentration vapor for long periods of time. Prolonged exposure may also lead to conjunctivitis.

Formaldehyde is a human carcinogen (Group 1, IARC Classification of Carcinogen) with the ability to cause nasopharyngeal carcinoma.



Formalin - chemical carcinogen



Use of Incorrect PPE (facemask) - the correct PPE is a F(form) respirator

v) Toluene or Xylene

Toluene or Xylene is a solvent used to fix tissue specimens and rinse stains. It is found primarily in the histology, hematology, microbiology, and cytology laboratories.

Acute effects

Irritation to the eyes and respiratory system when exposed to the liquid and vapour forms. Central Nervous System symptoms such as dizziness, headache, and mental confusion from inhalation of the vapour. Ingestion and skin contact can lead to poisoning by absorption through the skin and gut. The chemical is extremely flammable and can cause thermal burns.

Chronic effects

Chronic or prolonged skin contact can lead to dermatitis. Repeated prolonged inhalation of xylene containing benzene impurities may cause leukaemia. Toluene has also been suspected to cause reproductive disorders.

vi) Acrylamide

A resin used in research labs to produce gels for biochemical separations.

Acute effects

Irritation of the eyes and the skin.

Chronic effects

Central nervous system disorders such as polyneuropathy. The resin is also a mutagen and a suspected carcinogen.

Chemicals Used in the Radiology Department

The sign and symptoms of exposure to fixer and developer may defer between different fixers and developers.

vii) Fixer

Irritation of the respiratory tract in asthmatics or persons with known respiratory problems.

viii) Developer

Irritant to the skin. Can cause corrosion to the mucous membrane and the eyes. Repeated or prolonged skin contact can cause irritation and sensitization. Respiratory irritation can be caused by inhalation of the vapour.

b) Common Chemicals Used in Vector Control**i) Resigen**

It is a pyrethroid which is used in insect control such as mosquitoes. The decline in use of organophosphate pesticides in the past decade due to its side effects has caused an increase in the use of pyrethrins and pyrethroids.

Local effects

Parasthesia to the skin and eyes which maybe severe. Usually resolves within 24 hours.

Systemic effects

Dizziness, headache, nausea, anorexia, fatigue, listlessness, vomiting, epigastric pain, muscular fasciculation and convulsions.

ii) Sumithion

It is a organophosphate and synthetic pyrethrum derivative used in insect control such as mosquitoes. Harmful if swallowed or by inhalation and skin contact. Causes irritation to eyes, respiratory system and skin.

iii) Malathion

It is an organophosphate insecticide. Entry into the body is commonly by skin contact and the eyes. Other modes of entry are through the lungs and gastrointestinal tract. It is non irritating to the eyes but causes slight skin irritation.

Malathion is a cholinesterase inhibitor which gives rise to the health effects.

Acute effects

Central Nervous System : Anxiety, dizziness, headache, sleeplessness, confusion, coma, convulsions.

Respiratory	:	Dyspnoea, chest tightness, bronchospasm, bronchial hypersecretion, pulmonary oedema.
Gastrointestinal	:	Salivation, nausea, vomiting, abdominal colic, diarrhoea, pancreatitis.
Ocular	:	Lacrymation, miosis, blurring of vision
Muscular	:	Fasciculation, cramps

Chronic effects

Non-specific : Headache, quick onset of fatigue, disturbed sleep, anorexia

Central and Autonomic Nervous System : Nystagmus, tremors, failing memory, disorientation.

Peripheral Nervous System : Paresis, neuritis, paralysis

c) Common Chemicals Used in Dental Facilities

Mercury is a Metallic Silvery liquid that evaporates at room temperature.

i) Inorganic Mercury

Dental amalgam is used for tooth filling due to its strength, durability and low cost. Amalgam is an alloy that is made up of mercury, silver, tin, copper and zinc. A person maybe exposed to mercury through ingestion and inhalation when small amounts of mercury vapour are released over time.

Exposure to mercury may also occur when mercury reaches the water through human activity, eg combustion of fuel for energy production (53%) and combustion of waste (34%). Dental amalgam is a stable form but when incinerated it releases mercury vapour into the atmosphere. The vapour eventually collects in the waterways.

Acute effects of Inorganic and Elemental Mercury

Chemical pneumonitis -chest pain,dyspnea, cough.

Gastrointestinal tract irritation, circulatory collapse, acute renal failure

Chronic effects of Inorganic and Elemental Mercury

Weight loss, insomnia, erythrism, tremor, dysarthria, gingivitis, stomatitis, excessive salivation and metallic taste. Dental amalgam should not be disposed into the infectious waste bags, sharps container or ordinary garbage bags. Neither should it be flushed down the drain. Some communities incinerate their medical waste, ordinary garbage bags and/or sludge from waste water treatment plants.

The best method for amalgam control is to recycle it.

ii) Plaster of Paris in Dental Facilities.

Plaster of Paris is a nuisance particulate which causes irritation of the eyes, skin, mucous membranes and respiratory system.

Ingestion: Acute: Gastrointestinal blockage if material hardens.

d) Common Chemicals used in Research Labs**Chloroform***Acute effects*

Inhalation of chloroform causes depression of the central nervous system. Initially the body and face may have a warm feeling, irritation of the skin, eyes and mucous membrane. This may be followed by excitation, loss of reflexes, sensation and consciousness. Prolonged inhalation can lead to paralysis, cardiac and respiratory failure, and death. Other symptoms include digestive upset, mental dullness, dizziness; eye and skin irritation. Liquid chloroform splash can cause burning of the eyes and corneal injury, burning and redness of the skin. Pregnant women who are exposed to chloroform may result in fetal malformation or death. (based on animal studies).

Chronic effects

Chronic chloroform exposure leads to neurological and gastrointestinal sign and symptoms resembling chronic alcoholism. The skin maybe red, dry and cracked.

APPENDIX II

Occupational Safety and Health Act 1994

First Schedule

1. Manufacturing
2. Mining and Quarrying
3. Construction
4. Agriculture, Forestry and Fishing
5. Utilities:
 - a. Electricity;
 - b. Gas;
 - c. Water; and
 - d. Sanitary Services
6. Transport, Storage and Communication
7. Wholesale and Retail Trades
8. Hotel and Restaurants
9. Finance, Insurance, Real Estate and Business Services
10. Public Services and Statutory Authorities

Appendix III

Template of a Chemical Register

Section A: Company Information

<p>Name of company:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>S</td><td>Y</td><td>A</td><td>R</td><td>I</td><td>K</td><td>A</td><td>T</td><td>X</td><td>Y</td><td>Z</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <p>Address:</p> <table border="1" style="width: 100%; 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GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

Section B: List of Chemicals Hazardous to Health

<input type="text"/> <input type="text"/>		No. of Hazardous Chemicals: <input type="text"/>		No. of Workers: Males: <input type="checkbox"/> Females: <input type="checkbox"/>						
No. of Workers Exposed	Type of Control Measures		Usage of Chemical		CAS No.	Name of active Ingredient	Comply with Classification, Packaging and Labelling Regulation 1977			Name, address of supplier and Contact number (Tel No/email)
	Engineering Controls	PPE	Type	Quantity			CSDS (Y/N)	Class	Label (Y/N)	
3		PVC Gloves	P	200m ² /month		Gasoline Benzene	Y Y	Y Y	Y Y	XYZ Malaysian Sdn. Bhd, 27 Jln Ipoh K.Lumpur Tel No. 03-309876
2		Respirator	P	320m ² /month		Xylene	Y	Y	Y	

Section C: Name of Person Who Prepared the Review

<input type="text"/> <input type="text"/> <input type="text"/>	Reviewed By: Location: <input type="text"/> Title: <input type="text"/> Date: <input type="text"/>
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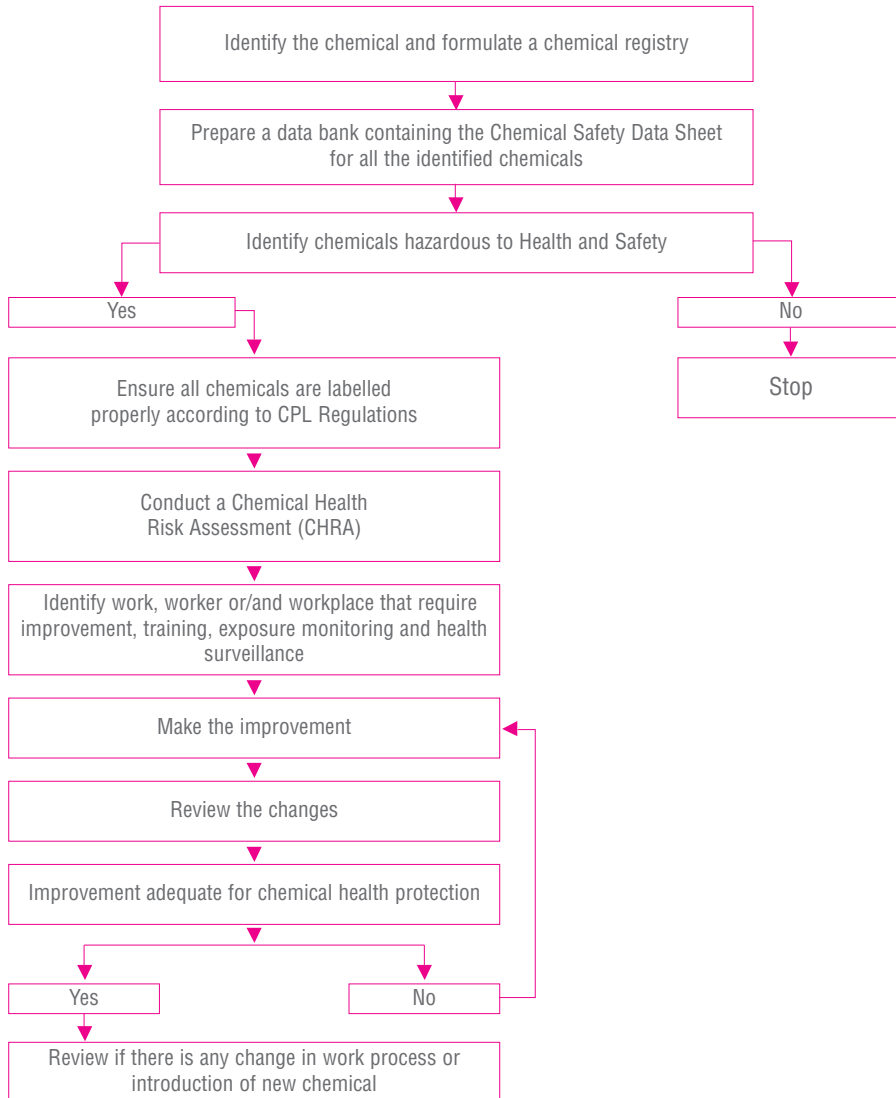
APPENDIX IV**Environmental Quality (Scheduled Waste) Regulations 2005**

First Schedule

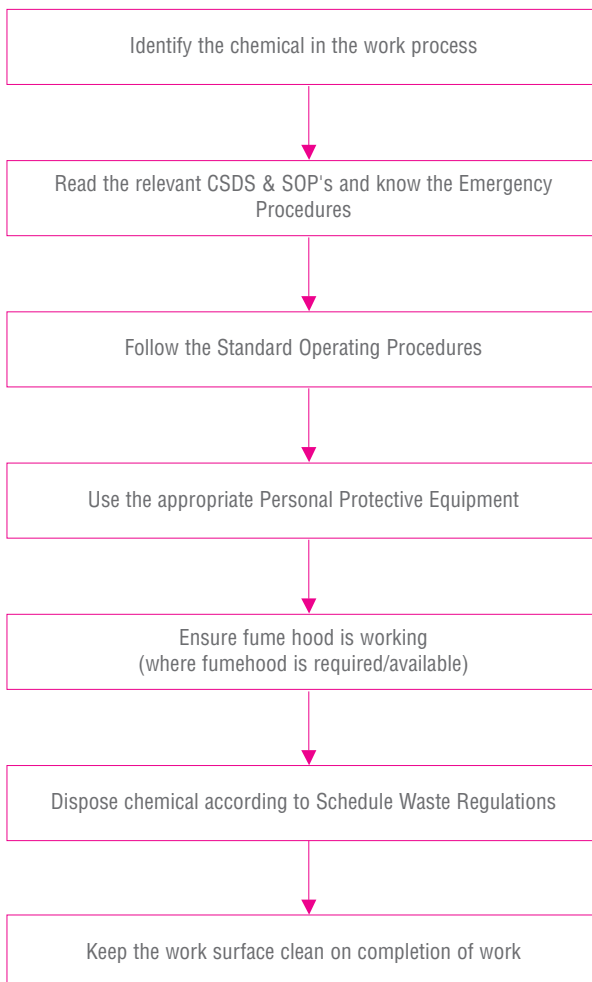
- i) Metal and metal-bearing wastes
Example: arsenic from arsenic containing compounds, lead from lead acid batteries, cadmium and nickel or mercury and lithium from batteries, waste containing mercury.
- ii) Wastes containing principally inorganic constituents which may contain metals and organic materials.
Example: sludge containing asbestos, sludge containing metals such as chromium, copper, nickel, zinc, used inorganic acids.
- iii) Wastes containing principally organic constituents which may contain metals and inorganic materials.
Example: waste containing formaldehyde, waste of phenol or phenol compounds, rubber or latex wastes or sludge containing organic solvents or heavy metals.
- iv) Wastes which may contain either inorganic or organic constituents.
Example: discarded drugs containing psychotropic or harmful substances such as carcinogens, mutagens or teratogens, pathogenic wastes, clinical wastes or quarantined material, waste arising from the preparation and production of pharmaceutical products.
- v) Other wastes
Any residues from treatment or recovery of scheduled wastes.

APPENDIX V

Steps in the Management of Hazardous Chemicals in Health Care Facilities



APPENDIX VI

Workflow for Workers Working with Chemicals

APPENDIX VII

Hazardous Chemicals That Require Medical Surveillance

1. 4- Aminodiphenyl
2. Arsenic and any of Its compounds
3. Asbestos
4. Auramine
5. Benzidine
6. Beryllium
7. Cadmium and any of Its compound
8. Carbon Disulphide
9. Disulphur Dichloride
10. Benzene Including Benzol
11. Carbon Tetrachloride
12. Trichloroethylene (Tce)
13. N-hexane
14. Bis (Chloromethyl) Ether (Bcme)
15. Chromic Acid
16. Chromium Metal and Its Compounds
17. Free Crystalline Silica
18. Isocyanates
19. Lead (Including Organic Lead Compounds)
20. Manganese
21. Mercury
22. Mineral Oil Including Paraffin
23. B-naphthylamine
24. 1- Naphthylamine & Its Salts
25. Orthotolidine and Its Salts
26. Dianisidine and Its Salts

27. Dichlorobenzidine & Its Salts
28. Nitrodiphenyl
29. Nitro or Amino Derivatives of Phenol and of Benzene or Its Homologues
 - 29.1 Nitrobenzene
 - 29.2 Aniline
 - 29.3 Toluene
 - 29.4 Xylene
30. Nitrous Fumes, Chromate or dichromate of potassium, sodium, ammonium or zinc
31. Pesticides (Organophosphates Only)
32. Pitch
33. Tar, Bitumen & Creosote
34. Vinyl Chloride Monomer (VCM)
35. Nickel Sulfide Roasting, Fume and Dust as Nickel

APPENDIX VIII

Choice of PPE According To Chemicals used In The MOH Health Care Facilities

Chemical Name	Chemical used in Hospital	Department	Respirator / mask	Glove
Aluminium - soluble salts	Aluminium Sulphate	Radiology	N95	-
Mercury - inorganic compound	Mercurous Chloride	Radiology	Hg/N95	Nitrile PVC (Polyvinyl chloride) Natural rubber
Ethylene glycol (aerosol) Synonyms: - Glycol - Ethylene alcohol	Ethylene glycol	Radiology	OV/N95	Laminate film Unsupported neoprene Nitrile PVC Natural rubber
Hydroquinone (saturated) Syn: - Quinol - Dihydroxy benzene	Hydroquinone	Radiology	(F)OV/N95	Nitrile PVC Neoprene Natural rubber
Formaldehyde Syn: - Formalin - Methylene oxide	Formaldehyde Pathology	Radiology	F(Form) Nitrile	Laminate film
Hydrochloric Acid Syn: - Hydrogen chloride - Muriatic Acid	Hydrochloric Acid	Radiology Pathology	AG	Laminate film Unsupported neoprene Nitrile Neoprene PVC Natural rubber
Chlorine (gas)	Effervescant chlorinated tablet (Presept)	Endoscopy	F(AG)	Nitrile
Gluteraldehyde	Gluteraldehyde	Endoscopy	F(OV)	Unsupported neoprene PVC Natural rubber
Phenol	Liquid phenol	Dermatology	OV/N95	Nitrile

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

Chemical Name	Chemical used in Hospital	Department	Respirator / mask	Glove
Trichloroacetic acid	Trichloroacetic acid 30%	Dermatology	OV/AG	-
Ethyl ether Syn: - Diethyl ether - Ethyl oxide - Ether	Ether	Dermatology	OV	Laminate film Nitrile
Sodium hydroxide Syn: - Caustic soda	Sodium hydroxide solution	Pathology	N95	Laminate film Unsupported neoprene Nitrile Natural rubber Neoprene PVC
Chloroform Syn: - Trichloromethane	Chloroform	Pathology	OV	Supported polyvinyl alcohol
Methyl alcohol Syn: - Methanol - Carbinol	Methyl alcohol	Pathology	SA	Laminate film Nitrile
Xylene Syn: - Xylol - Dimethylbenzene	Xylene	Pathology	OV	Laminate film Supported polyvinyl alcohol
Potassium hydroxide Syn: - Potassium Hydrate	Potassium Hydroxide	Pathology	N95	Unsupported neoprene Nitrile PVC Natural rubber Neoprene
Ethyl alcohol Syn: - Ethanol	Ethyl alcohol	Pathology	OV	Laminate film Nitrile Unsupported neoprene
Hydrogen peroxide Syn: - Hydrogen dioxide - Peroxide	Hydrogen Peroxide	Pathology	SA(F)	Unsupported neoprene Nitrile PVC Natural rubber Neoprene

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

Chemical Name	Chemical used in Hospital	Department	Respirator / mask	Glove
Methyl metacrylate Syn: - Metacrylic acid - Methyl ester	Methyl metacrylate	Oral Surgery	OV	Laminate film Supported polyvinyl alcohol
Isopropyl alcohol Syn: - Isopropanol - 2-propanol	Isopropanol	Pharmacy	(F)OV	Laminate film Nitrile PVC Neoprene
Titanium dioxide Syn: - Anatase - Brookite	Titanium dioxide powder	harmacy	N95	-
Acetone Syn: - 2-propanone - Dimethyl ketone - Ketone propane	Acetone	Pathology	OV	Laminate film
Paraffin wax fumes	White soft paraffin Yellow soft paraffin Liquid paraffin	Pharmacy	N95	-
N-propanol Syn: - N-propyl alcohol - 1-propanol - Ethyl carbinol	Desmanol	Endoscopy	F(OV)	Laminate film Nitrile Unsupported neoprene
Formic acid Syn: - Hydrogencarboxylic acid - Methanoic acid	Formic acid	Pathology	OV	Laminate film Unsupported neoprene PVC Neoprene
Ammonia Syn: - Anhydrous ammonia	Ammonia solution	Pathology	(F)AM	Nitrile Unsupported neoprene
Cyclohexane Syn: - Hexahydrobenzene - Hexamethylene	Cyclohexane	Pathology	F(OV)	Laminate film

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

Chemical Name	Chemical used in Hospital	Department	Respirator / mask	Glove
Ethyl acetate Syn: - Acetic ester - Acetic ether - Ethyl ethanoate	Ethyl acetate	Pathology	F(OV)	Laminate film
Ammonium chloride	Ammonium chloride	ENT	N95 AM/N95	Unsupported neoprene Nitrile
Sulphuric acid Syn: - Hydrogen sulphate	Sulphuric acid (SA)	ENT	N95	SA 95% - Laminate film SA 120% - Laminate film SA 47% - Unsupported neoprene
Oxalic acid Syn: - Oxalic acid dihydrate - Ethane dioic acid	Oxalic acid	Pathology	OV/N95	Unsupported neoprene Nitrile PVC Natural rubber Neoprene
Ferric chloride	Ferric chloride	Pathology	N95	-
Heptane Syn: - N-heptane - Normal heptane	Heptane	Pathology	OV	-
Ethyl chloride - Chloroethane - Hydrochloric ether	Ethyl chloride	Pharmacy	SA	
Picric acid Syn: - 2,4,6 trinitrophenol	Picric acid	Pathology	N95	
Boric acid Syn: - Orthoboric acid - Hydrogen orthoborate	Boric acid	Pathology	N95	
Phosphoric acid Syn: - o-phosphoric acid - m-phosphoric acid	Phosphoric acid	CSSU	N95	Laminate film Unsupported neoprene Nitrile PVC

APPENDIX IX

Example of Chemical Safety Data Sheet

BAHAGIAN 1 : PENGENALPASTIAN PRODUK KIMIA DAN SYARIKAT
SECTION 1 : CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
1.1 Maklumat Produk / Product Details

Nama Produk / Product Name	:	
Nama Dagangan / Trade Name	:	
Nama Kimia	:	Adunan pasir, simen, "superplasticizer" & bahan tambahan
Chemical Name	:	Powdered blend of sands, cement, superplasticizer & additives
Huraian Produk / Product Description	:	"Grout" berasaskan simen Cement based grout
Berat Molekul / Molecular Weight	:	Tiada / N/A
Kumpulan Bahan Kimia	:	Tiada kaitan
Chemical Family	:	Not applicable
Kegunaan	:	Rujuk kepada risalah data produk
Use	:	Refer to product data sheet

1.2 Pengenalpastian Syarikat / Company Identification

Nama dan alamat pengilang /	:	
Manufacturer's Name and Address	:	
Nombor telefon / Telephone No.	:	
Nombor telefon kecemasan /	:	
Emergency Telephone No.	:	
Nama dan alamat pengimport / pengeluar tempatan	:	
Importer's / Distributor's Name and Address	:	
Nombor telefon / Telephone No.	:	
Nombor telefon kecemasan /	:	
Emergency Telephone No.	:	

1.3 Titik Hubungan / Contact Point

Gelaran Jawatan / Designation	:	Pengurus Persekitaran, Keselamatan & Kesihatan / Environmental, Health & Safety Manager.
Nombor telefon / Telephone No.	:	

Nota / Note : **Titik hubungan yang diberikan hendaklah terus kepada seseorang yang boleh memperjelas maklumat lanjut dan / atau bibliografi sesuatu produk / bahan kimia.**
The contact point given should direct a caller to someone who can clarify information or provide further information and / or a bibliography of the product. The titles of a position or section should be inserted.

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

BAHAGIAN 2 : KOMPOSISI / MAKLUMAT BAHAN
SECTION 2 : COMPOSITION / INFORMATION ON INGREDIENT

Nama Kimia / Chemical Name	No. CAS / CAS No.	Had Pendedahan / Exposure Limit	Kadaran / Proportion	Data Ketoksikan / Toxicity Data
Simen Portland Biasa / Ordinary Portland Cement	65997-15-1	TWA 10mg/m ³ (total) TWA 5mg/m ³ (resp)	< 50%	N / A

BAHAGIAN 3 : SIFAT - SIFAT FIZIKAL DAN KIMIA
SECTION 3 : PHYSICAL AND CHEMICAL PROPERTIES

Rupa / Aspect	: Serbuk berwarna kelabu / Grey coloured powder		
Bau / Odour	: Tiada bau / Odourless		
Kebolehlarian dalam air / Solubility in water	: Separa larut / Partially soluble		
Takat Didih / Boiling Point	: Tiada data/ N/A	Takat lebur / Melting Point	: Tiada data/ N/A
Tekanan wap / Vapour pressure	: Tiada data/ N/A	Nilai pH / pH value	: Tiada data/ N/A
Peratusan bahan mudah meruap / Percentage volatiles	: Tiada / N/A	Kadar penyejatan / Evaporation rate	: Tiada / N/A
Ketumpatan pukal / Bulk density	: ~ 1000 kg/m ³	Ketumpatan wap / Vapour density	: Tiada data / N/A
Suhu pengautocucuhan / Autoignition temperature	: > 350°C	Takat kilat / Flash point	: Tiada / N/A
Had kemudahbakaran (%) / Flammable limit (%)	: Tiada / N/A	Sifat - sifat lain jika berkenaan / Other properties if applicable	: Tiada / N/A

BAHAGIAN 4 : PENGENALPASTIAN BAHAYA
SECTION 4 : HAZARD IDENTIFICATION

Bahaya - bahaya paling utama / Main Hazards
 : Apabila dicampur dengan air, larutan alkali yang kuat dihasilkan. Sentuhan pada mata atau kulit mungkin menyebabkan kakis dan lecuran kulit yang serius / When mixed with water, strong alkaline solution is produced. Contact with eyes or skin may cause serious burns and ulceration.

BAHAGIAN 5 : LANGKAH - LANGKAH PERTOLONGAN CEMAS
SECTION 5 : FIRST AID MEASURES

Sentuhan mata / Eye contact	: Jikalau terkena mata, basuh mata dengan air bersih yang banyak dengan segera selama 15 minit. Dapatkan rawatan perubatan secepat mungkin. : If eyes are contaminated, flush them immediately without delay with large amount of clean water for at least 15 minutes. Seek medical attention immediately.
Sentuhan kulit / Skin contact	: Tanggalkan pakaian dan kasut yang tercemar - basuh terlebih dahulu sebelum memakainya semula. Bilaslah kulit yang terkena dengan air bersih selama 15 minit. Gunakan sabun untuk mencuci kulit yang terkena. : Remove contaminated clothes and shoes - launder before reuse. Wash all splashes immediately with plenty of water for 15 minutes. Use soap to clean the contaminated skin.
Sedutan / Inhalation	: Bawalah cepat-cepat pesakit terkena sedutan ke tempat berudara bersih. Dapatkan rawatan perubatan jikalau terdapat simpton - simpton kelihatan. Remove the affected patient to fresh air place. Obtain medical assistance if symptoms persist.
Tertelan / Ingestion	: Jangan masukkan apa jua bahan ke mulut mangsa yang pitam atau menggeletar. Jika tertelan, beri mangsa yang dalam keadaan sedar, minum 4-8 oz susu atau air. Hubungi doktor dengan segera. : Never give anything by mouth to an unconscious or convulsing person. If ingested, have the conscious victim drink 4-8 oz of milk or water, Contact a physician immediately.
Nota untuk pegawai perubatan / Note to physician	: Tiada / N/A

GUIDELINES ON CHEMICAL MANAGEMENT IN HEALTH CARE FACILITIES

M I N I S T R Y O F H E A L T H

BAHAGIAN 6 : LANGKAH - LANGKAH PEMADAMAN KEBAKARAN
SECTION 6 : FIRE - FIGHTING MEASURES

Media pemadaman / Extinguishing media	: Tiada / N/A
Arahan pemadaman api / Fire - fighting instruction	: Tiada / N/A
Bahaya-bahaya utama / Special hazards	: Tiada / N/A

BAHAGIAN 7 : LANGKAH- LANGKAH PENGAWALAN PELEPASAN TIDAK SENGAJA
SECTION 7 : ACCIDENTAL RELEASE MEASURE

Kebocoran / tumpahan	: Sapu dan masukkan ke dalam bekas untuk pembuangan khusus menurut "Environmental Quality (Scheduled Waste) Regulation 2005" dan lain - lain panduan yang diisu oleh pihak DOE dan / atau pihak tempatan.
Leak / Spill	: Sweep & pack into containers for special waste disposal in accordance to Environmental Quality (Scheduled Waste) Regulation 2005 and other guidelines issued by DOE and / or local authorities.

BAHAGIAN 8 : PENGENDALIAN DAN PENYIMPANAN
SECTION 8 : HANDLING AND STORAGE

Pengendalian	: Elakkan daripada kelembapan, terkena pada kulit dan mata. Praktikkan cara pengurusan industri yang baik.
Handling	: Avoid moisture. Avoid contact with skin and eyes. Observe good industrial practice.
Penyimpanan Storage	: Simpan di tempat kering dan mempunyai pengudaraan yang baik. : Keep in dry and well ventilated area.

BAHAGIAN 9 : KAWALAN PENDEDAHAN DAN PERLINDUNGAN DIRI
SECTION 9 : EXPOSURE CONTROL AND PERSONAL PROTECTION

Had pendedahan / Exposure limit	: Tiada / N/A
Perlindungan diri / Personal Protection	
Perlindungan mata / kulit	: Pakailah pelindung mata dan muka. Pakai juga pakaian perlindungan yang sesuai.
Eye / skin protection	: Wear eye / face protection. Wear also suitable protective clothing.
Perlindungan pernafasan	: Perlu. Pakailah topeng pelindung habuk di tempat yang mempunyai pengudaraan yang baik. Di tempat tertutup yang kedap udara, topeng pernafasan separuh atau lengkap diperlukan.
Respiratory protection	: Required. Wear dust protection mask in well ventilated area, half-face or full face respirators in enclosed area.
Pengudaraan Ventilation	: Pastikan tempat bekerja mempunyai pengaliran udara yang baik : Make sure always work in a well ventilated area

BAHAGIAN 10 : KESTABILAN DAN KEREAKTIFAN
SECTION 10 : STABILITY AND REACTIVITY

Keadaan yang perlu dielak / Conditions to avoid	: Tiada / N/A
Bahan tak serasi / Incompatibilities	: Asid dan bahan pengoksidaan yang kuat / Acids and strong oxidising agents
Produk penguraian / Decomposition products	: Dalam bentuk asid sahaja / In the event of acid only.
Pempolimeran berbahaya / Hazardous polymerisation	: Tiada / N/A

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BAHAGIAN 11 : MAKLUMAT TOKSIKOLOGI
SECTION 11 : TOXICOLOGICAL INFORMATION

Data ketoksikan / Toxicity data	: Tiada data : N/A	Organ sasaran Target organs	: Tiada data : N/A
Kekarsinogenikan Carcinogenicity	: Tiada data : N/A	Kesan pembiakan Reproductive effect	: Tiada data : N/A
Kesan kronik Chronic effects	: Tiada data : N/A	Kesan pendedahan berlebihan Effects of overexposure	: Tiada data : N/A
Kadaan perubahan yang secara umum menjadi bertambah buruk akibat pendedahan Medical conditions generally aggravated by exposure			: Tiada data : N/A

BAHAGIAN 12 : MAKLUMAT EKOLOGI
SECTION 12 : ECOLOGICAL INFORMATION

Keboleherakan Mobility	: Tiada data : N/A	Pembiotumpukan Bioaccumulation	: Tiada data : N/A
Kebolehbiorotan Biodegradability	: Tiada data : N/A	Ketoksikan akuatik Aquatic toxicity	: Tiada data : N/A

BAHAGIAN 13 : MAKLUMAT PEMBUANGAN
SECTION 13 : DISPOSAL INFORMATION

Pembuangan Produk	: Ianya haruslah dibuang menurut "Environmental Quality (Scheduled Waste) Regulation 2005" & lain-lain panduan yang diisu oleh DOE dan / atau pihak tempatan.
Product Disposal	: It must be disposed off in accordance with the Environmental Quality (Scheduled Waste) Regulation 2005 and other guidelines issued by DOE and / or local authorities.
Pembuangan Bekas	: Bekas - bekas yang tidak boleh dibersihkan haruslah dibuang sebagai sisa buangan produk.
Container Disposal	: Packaging that cannot be cleaned should be disposed off as product waste.

BAHAGIAN 14 : MAKLUMAT PENGANGKUTAN
SECTION 14 : TRANSPORT INFORMATION

IMDG	: -	UN No.	: -	ICAO / IATA	: -
GGVE / GGVS	: -	RID / ADR	: -	ADNR	: -

BAHAGIAN 15 : MAKLUMAT PENGAWALAN
SECTION 15 : REGULATORY INFORMATION

Maklumat label Labelling information	: Merengsa : Irritant
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Ungkapan Risiko / Risk Phrases

R36/37/38	Merengsa kepada mata, sistem pernafasan dan kulit / Irritating to eyes, respiratory system and skin.
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Ungkapan Keselamatan / Safety Phrases

S36/37/39	Pakailah pakaian perlindungan, sarung tangan dan pelindung mata / muka yang sesuai / Wear suitable protective clothing, gloves and eyes/face protection.
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