
Kingdom of Swaziland

Ministry of Health

# National Health Care Waste Management Guidelines

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**Kingdom of Swaziland**

Ministry of Health

# National Health Care Waste Management Guidelines

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# Abbreviations & Acronyms

| | |
|---|---|
| CMS | Central Medical Stores |
| EHD | Environmental Health Department |
| GKoS | Government and Kingdom of Swaziland |
| HCF | Health Care Facility |
| HCW | Health Care Waste |
| HCRW | Health Care Risk Waste |
| HCRWM | Health Care Risk Waste Minimization |
| HCRWMC | Health Care Risk Waste Minimization Committee |
| HCWM | Health Care Waste Minimization |
| IPC | Infection Prevention Committee |
| M&E | Monitoring & Evaluation |
| MoH | Ministry of Health |
| MSDS | Materials Safety Data Sheet |
| PEPFAR | President's Emergency Plan for AIDS Relief |
| PPE | Personal Protective Equipment |
| SABS | South African Bureau of Standards |
| SANS | South African National Standard |
| SCMS | Supply Chain Management Systems |
| SEA | Swaziland Environmental Authority |
| SOP | Standard Operating Procedure |
| USAID | United States Agency of International Development |
| USG | United States of America Government |
| WHO | World Health Organization |

# Glossary

| Term | Definition |
|---|---|
| **Anatomical Waste / Pathological Waste** | Anatomical Waste (also often referred to as pathological waste) consists of tissues, organs, body parts, blood and bodily fluids from patients, human foetuses and animal carcasses, but excludes teeth and hair. |
| **Ancillary or Auxiliary Workers** | Refers to all support staff in the health care facilities, aside from those in the ancillary services, e.g. facility workers, nursing attendants, dental aides, laboratory aides, groundsmen, orderlies, etc. |
| **Autoclaving** | Refers to the method of sterilizing items, e.g. surgical instruments or laboratory waste, using an apparatus that creates steam under pressure for effective sterilization. |
| **Biohazard Symbol** |  A symbol that is universally recognized as a warning against substances that pose a threat to the health of living organisms, primarily that of humans.<br>*This symbol is required on the side of all infectious and sharp waste containers.* |
| **Calorific Value** | Means the same as heating value. It refers to the quantity of heat that is produced when a unit mass of a material undergoes complete combustion under certain specified conditions and is expressed in terms of calories or joules per kilogram (MJ/kg for solids and liquids and $MJ/m^3$ for gases). |
| **Capacity** | Refers to the optimal quantity of waste that can be processed in a given time under specified conditions, usually expressed in terms of mass per 24 hours. |
| **Carcinogenic** | Having the potential to cause cancer. |
| **Cleaning** | Removal of contamination from an item to the extent necessary for the further processing or for the intended use. |
| **Clinical Staff** | This includes all staff involved in and related to the observation and treatment of actual patients rather than theoretical or laboratory studies.<br>*Examples: nurses, doctors, phlebotomists, dentists, etc.* |
| **Chemical Waste** | Consists of discarded solid, liquid and gaseous products that contain dangerous or polluting chemicals, for example from diagnostic and experimental work and from cleaning, housekeeping and disinfecting procedures. Chemical waste from health care may be hazardous or non-hazardous.<br>*Examples: pharmaceutical waste, cytotoxic / genotoxic waste and radioactive waste.* |
| **Colour-coding System** | A system for relating the contents of packaging / containers by using different colours. |
| **Containerization** | Often used interchangeably with the word packaging. Refers to the materials used to wrap and safely contain the relevant waste streams to prevent exposure during transport till final disposal. |

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| | *Examples: rigid plastic containers, flexible plastic bags, lined fibre-board box sets, etc.* |
| **Contingency Plan** | Means a process of planning ahead for an event which may, or may not, occur; whereby scenarios and objectives are agreed, managerial and technical actions are defined, and potential response systems put in place to prevent or respond effectively to an emergency or unforeseen circumstances. |
| **Contaminated** | State of having been actually or potentially in contact with a contaminant. *Examples: pollutant, radioactivity, chemical, blood, etc.).* |
| **Culture** | In microbiology, 'culture' is the cultivation of bacteria, tissue cells, etc., in an artificial medium containing nutrients. Hence, a culture plate is when bacteria, for example, are cultivated in a petri dish containing a nutritive agar, and a culture broth is when the same are cultivated in a liquid medium. |
| **Cytostatic** | Refers to a substance causing suppression of growth and/or multiplication of cells. |
| **Cytotoxic** | Refers to a substance possessing a specific destructive action on certain cells; used in particular in referring to the lysis (disintegration or dissolution) of cells brought about by immune phenomena and to antineoplastic drugs that selectively kill dividing cells. |
| **Decontamination** | Process or mode of action to reduce contamination to a safe level. |
| **Decontamination Area** | Area of a health care facility designated for collection, retention and cleaning of soiled and/or contaminated items. |
| **Disinfection** | Refers to the process of killing infectious agents or other harmful organisms by the application of chemical agents or though physical means. |
| **Disposal** | Means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into or onto the environment. |
| **Genotoxic** | Refers to a substance that is capable of interacting directly with genetic material, causing DNA damage that can be assayed. The term may refer to carcinogenic, mutagenic or teratogenic substances. |
| **Ground Water** | Is water that occupies pores in the soil and cavities and spaces found in the rocks, which are situated in the saturated zone of the profile by rising from a deep magmatic source or by the infiltration of rainfall. |
| **Hazard** | Intrinsic potential property or ability of any agent, equipment, material, or process to cause harm. |
| **Hazardous Waste** | Means any waste that may, by circumstances of use, quantity, concentration or inherent physical, chemical or toxicological characteristics, have a significant adverse effect on public health and/or the environment. |
| **Hazchem** | Means hazardous chemical information system used so that in the event of an accident the emergency services will be aware of the correct action to take in order to minimize risk to people or property. |

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| **Health Care Facility** | Place or site where professional health services are dispensed to human or animal patients or where biological research is carried out.<br>*Examples: laboratory, hospital, clinic, free-standing operating theatre, mobile clinic and health centre.* |
| **Health Care General Waste** | Comparable to domestic/municipal/household waste, this type of waste does not pose special handling problems or hazards to human health or to the environment. |
| **Health Care Risk Waste** | All waste generated by health-care establishments, research facilities, and laboratories that could pose a health risk to health workers, the public or the environment. |
| **Health Care Waste** | Represents all the waste streams generated in any health care facility, small or large. |
| **Identification** | The process of visually recognizing relevant health care waste streams at the point of generation. |
| **Infectious Waste** | Waste that may have been in contact with human blood or bodily fluid and may have the ability to spread disease.<br>*Examples: gauze, cotton, dressings, laboratory cultures, IV fluid lines, blood bags, gloves, anatomical waste, surgical instruments and pharmaceutical waste.* |
| **Infection Prevention Control (IPC) Committee** | A group of hospital health professionals composed of infection control staff, with medical, nursing, administrative, and occasionally dietary and housekeeping department representatives, who plan and supervise infection control and health care waste management (HCWM) activities. |
| **Microorganism** | Entity of microscopic size, encompassing bacteria, fungi, protozoa and viruses. |
| **Minimum Recommended Concentration (MRC)** | Minimum concentration at which a liquid chemical sterilant is suitable for the decontamination procedure. |
| **Monitoring** | The continuous or non-continuous measurement of a concentration or other parameters for purposes of assessment or control of environmental quality or exposure, and the interpretation of such measurements. |
| **Municipal Waste** | Waste that includes durable goods, non-durable goods, containers and packaging, food and garden wastes, and miscellaneous inorganic wastes produced from activities within local government units, which include a combination of domestic, commercial, institutional, and industrial locations. |
| **Mutagenic** | An agent, such as radiation or a chemical substance, that causes genetic mutation. |
| **Packaging** | Often used interchangeably with the word ‘containerization’. Refers to the materials used to wrap and safely contain the relevant waste streams to prevent exposure during transport till final disposal.<br>*Examples: rigid plastic containers, flexible plastic bags, lined fibre-board box sets, etc.* |
| **Pathogen** | A bacterium, virus or other microorganism that can cause disease. |

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| **Personal Protective Equipment (PPE)** | Specialized clothing or equipment worn by an employee for protection against a hazard. |
| **Pyrolysis** | Refers to the thermal decomposition of substance and materials in the absence of supplied molecular oxygen in the destruction chamber in which the said material is converted into a gas, liquid, or solid form. |
| **Radioactive Waste** | Refers to material that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels and for which no use is foreseen. |
| **Recovery** | Means the controlled extraction or retrieval of energy from waste. |
| **Recycle** | Means to separate and process materials from waste for further use as new products or resources. |
| **Re-use** | Means to utilize articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles. |
| **Sanitary Landfill** | A waste disposal site designed, constructed, operated and maintained in a manner that exerts engineering control over significant potential environmental impacts arising from the development and operation of the facility. |
| **Segregation** | Systematic separation of health care waste into designated categories. |
| **Sharps Waste** | This is waste that may puncture the skin and cause disease.<br>*Examples: needles, infusion sets, scalpels, knives, blades, lancets, and broken glass.* |
| **Service Provider** | Means an institution, agency or company that has been awarded a contract via the Health Care Facility in question to provide any arm of health care risk waste management services – service provision has a corresponding meaning. |
| **Special Waste** | Comprised of hazardous and non-hazardous waste, which has physical and/or chemical characteristics that are different from anatomical / pathological, chemical, radioactive, and general waste that requires special packaging and/or handling.<br>*Examples: lead, batteries, mercury, pressured containers, infectious laundry, microbiological waste, infectious food waste, amputated limbs and electronic waste.* |
| **Sterilization (Relative)** | Refers to the reduction in the concentration of viable microorganisms by more than 10e6 (i.e. more than 99.9999% of the micro-organisms are killed), achieved by physical, chemical or mechanical methods or by irradiation. |
| **Teratogenic** | An agent or factor that causes malformation of an embryo. |
| **Treatment** | Means any method, technique or process that is designed to change the physical, biological or chemical character or composition of waste, or to remove, separate, concentrate or recover a hazardous or toxic component of waste, or to destroy or reduce the toxicity or infectiousness of the waste in order to minimize the impact of this waste on the environment. |

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| **Waste** | Is undesirable or superfluous by-product, emission, residue or remainder, or any process or activity, any matter, gaseous, liquid or solid or any combination thereof which:<br>• Is discarded by any person;<br>• Is accumulated and stored by any person with the purpose of eventually discarding it with or without prior treatment connected with the discarding thereof;<br>• Is stored by any person with the purpose of recycling, reusing or extracting a usable product from such matter. |
| **Waste Management** | Means measures, including the avoidance of the generation of waste, that are necessary to prevent or, where prevention is not possible, minimize the amount of waste that is produced and the risk posed by the waste to public health and/or the environment. These measures are applied from source of waste generation to the ultimate disposal of waste. |
| **Waste Treatment Facility** | Means any facility that treats waste. |

# Foreword

Improper management of health care waste poses a considerable danger to public health and the environment. It is worth noting that not all waste generated from health care facilities is infectious and hazardous, but only 10-15% of the wastes would be classified as such. Given the heightened international attention to environmental and health issues, ensuring proper health care waste management is of paramount concern for environmentalists, members of the health sector and broader societies worldwide.

The Environment Management Act of 2002, Waste Regulations of 2000 and the Public Health Act of 1969 established required reforms for the management of health care waste. In order to disseminate knowledge on the proper use of technology to carry out the appropriate reforms, the National Health Care Waste Management guidelines were conceived and produced in close collaboration with experts and with the involvement of the wider community of stakeholders.

The National Health Care Waste Management Guidelines provide practical information regarding safe, efficient and environment-friendly waste management options. In addition, the guidelines detail safety procedures for the collection, handling, storage, transport, treatment and disposal of health care waste, while recognizing the escalating costs incurred by health care waste management.

Since the costs of waste disposal continue to increase, the practices described in the National Health Care Waste Management Guidelines - such as appropriate segregation and minimization of waste - aim to significantly reduce the cost of waste disposal. Economic and environmental considerations should be balanced with the need to safely manage materials which may present public and workplace risk, potential risk or public offence.

The National Health Care Waste Management Guidelines document will serve as a useful guide in the planning, implementation, monitoring and evaluation of the health care waste management programs of all health care facilities and other health related establishments.

In adherence to the measures contained in this document, the Ministry of Health aims to promote the health and welfare of our people and protect them from the risks and hazards of exposure to health care risk waste.

Dr. Simon M. Zwane

DIRECTOR OF HEATLH SERVICES
MINISTRY OF HEALTH

# 1. Introduction

## 1.1 Scope

These *National Guidelines on Health Care Waste Management* apply to all institutions/facilities generating health care waste and also outline procedures for the classification, segregation, safe packaging (containerization), colour-coding and labeling, storage, transport, treatment/destruction and disposal of health care and related waste.

## 1.2 Aim of the Guidelines

These Guidelines aim to provide a step-by-step guide for managers and generators of health care waste in order to ensure that it is handled and managed in such a manner that it has no adverse effects on human health or the environment. The specific objectives of the Guidelines are to:

- protect human health by reducing exposure of employees, patients, visitors and/or entire communities to HCRW in the workplace,
- protect the environment from hazardous properties emanating from waste generated in health care facilities,
- enhance community relations by demonstrating a commitment to public health and environmental protection,
- improve regulatory compliance and avoid long-term liability.

## 1.3 Application

The *National Guidelines on Health Care Waste Management* shall apply to all health care institutions/facilities, including premises owned or occupied by the Government of the Kingdom of Swaziland, private entities, research facilities, veterinary facilities, home care and traditional and religious care givers. The major target groups of these guidelines are individuals responsible for managing the relevant health care waste streams. The unit-in-charge of health care waste management should be the first to become familiar with these guidelines in order to oversee implementation of the programme throughout the institution/facility.

Save where otherwise expressly stated, these guidelines shall be in line with the Waste Regulations of 2000 and other related guidelines and legislation.

# 2. Health Care Waste

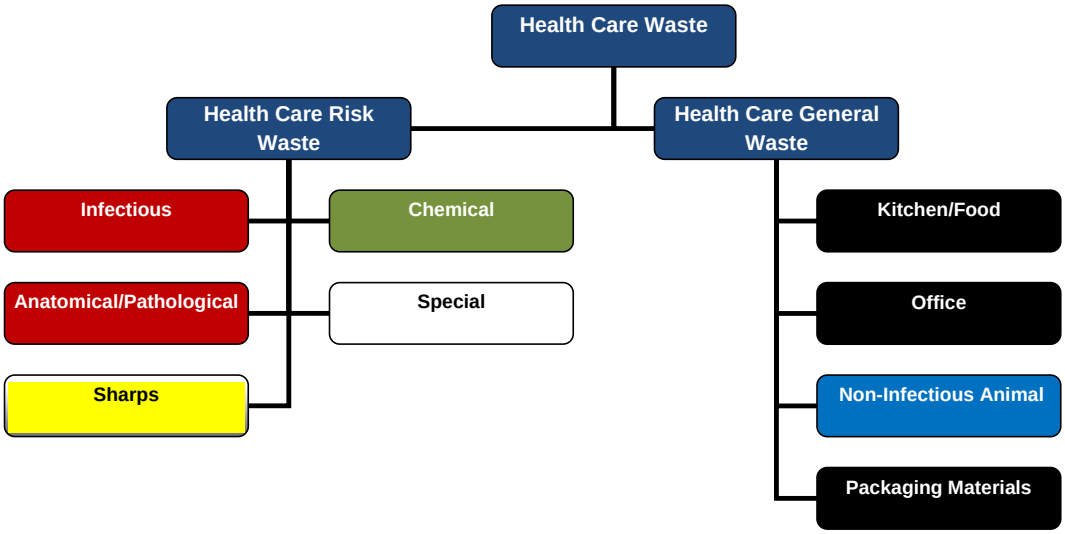
## 2.1 Definition

For purposes of the guidelines, health care waste (HCW) is all waste that is generated as a result of any of the following activities:

- diagnosis, treatment or immunization of human beings or animals
- research pertaining to the above activities
- production or testing of biologicals or pharmaceuticals
- wastes arising from home-based care and traditional and religious healing facilities
- as also defined in the Waste Regulations of 2000.

Figure 1 shows the different types of waste that may be generated in a health care facility. The larger the facility is, the greater the quantity and diversity of the waste stream.

Figure 1: Categories of Health Care Waste




## 2.2. Health Care General Waste

Comparable to domestic/municipal/household waste, this type of waste does not pose special handling problems or hazards to human health or to the environment. It comes mostly from the administrative and housekeeping functions of health care facilities and may also include, but not be limited to, packaging materials, kitchen waste, office waste and building demolition waste, general waste from public and patients (e.g. fruit juice bottles, crisp packets, etc.), non-clinical glass, non-infectious animal waste (e.g. roadkill), disposable curtains, extracted teeth, nail clippings, hair and decontaminated waste, and garden or park refuse.

General waste should be dealt with by the local municipal waste disposal system (city council).

***IMPORTANT: When health care RISK waste is mixed with General Waste, ALL the waste is considered health care RISK waste as the general waste will be contaminated and therefore rendered hazardous.***

## 2.3 Health Care Risk Waste

Health care risk waste (HCRW) includes all the streams of waste generated from all health care facilities that pose a significant RISK and are not *general waste*. Health care risk waste is further subdivided into categories based on the nature of the waste, the risk posed and the unique packaging requirements warranted:

### 2.3.1 Infectious Waste (excluding sharps)

This type of waste is suspected to contain pathogens (bacteria, viruses, parasites or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. It can be generated from humans or animals.

### 2.3.2 Anatomical/Pathological Waste

*Anatomical waste* (also often referred to as *pathological waste*) consists of tissues, organs, body parts, blood and bodily fluids from patients, human foetuses and animal carcasses, but excludes teeth and hair. This category should be considered a subcategory of infectious waste, even though it may also include healthy body parts. Animal carcasses generated by the public are not covered in this definition. Anatomical waste is characteristically wet and heavy, which is why it is separated from general infectious waste.

### 2.3.3 Sharps Waste

Sharps include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, nails and any other items that have come into contact with patients and can cause cuts or puncture wounds. Whether or not they are infected, such items are usually considered as HCRW. Sharps waste is characteristically dry, light and sharp.

### 2.3.4 Chemical Waste

Chemical waste consists of discarded solid, liquid, and gaseous products that contain dangerous or polluting chemicals, for example from diagnostic and experimental work and from cleaning, housekeeping and disinfecting procedures. Chemical waste from health care may be hazardous or non-hazardous.

Since there are several different kinds of chemicals available on the market, some compatible with each other and others not, it is near impossible to give explicit guidelines with regards to handling chemical waste. It remains the responsibility of the person or department procuring specific chemicals for particular functions to ensure that they acquire from the manufacturer, supplier or the internet a Materials Safety Data Sheet (MSDS) for each chemical, and investigate, educate and display handling and spill management procedures accordingly.

Chemical waste is dealt with in different ways, depending on the chemical in question. In some cases chemicals can be returned to the manufacturer; some are rendered inert or encapsulated; in other cases certain chemicals can be diluted and disposed via a suitably equipped sewerage system; some chemicals can be destroyed in a specialized high temperature incinerator with appropriate controls to limit air pollution; and in other cases chemicals may be buried in Hazardous Waste landfill sites *(refer to Swaziland Laboratory Waste Management Guidelines for further information*).

***Pharmaceutical waste***. This sub-category of chemical waste includes expired, unused, spilt and/or contaminated pharmaceutical products; and drugs, vaccines and sera that are no longer usable as medication and need to be disposed of appropriately. This category also includes discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing and drug vials.

***Cytotoxic/Genotoxic waste*** may include certain cytostatic/chemotherapeutic drugs, or bodily fluids (i.e., vomit, urine or faeces) that may contain metabolites of these drugs from patients treated in the

hospital or at home. This type of waste is highly hazardous and may have mutagenic, teratogenic or carcinogenic properties; that is, it is capable of interacting directly with genetic material, causing DNA damage that can be assayed for analysis and DNA damage that can be passed on to offspring.

### 2.3.5 Radioactive Waste

This category includes disused sealed radiation sources, liquid and gaseous materials contaminated with radioactivity, excreta of patients who underwent radionuclide diagnostic and therapeutic applications, paper cups, straws, needles, syringes, test tubes and tap water washings of such paraphernalia. Radioactive waste is produced as a result of procedures such as in vitro analysis of body tissues and fluids, in vivo organ imaging, tumor localization and treatment and various clinical studies involving the use of radioisotopes. Radioactive health care waste generally contains radionuclides with short half-lives, which lose their activity in a relatively short amount of time. However, the half-life of certain radionuclides, e.g. C-14 contaminated wastes, is much longer - more than a thousand years. These radionuclides need to be specially managed in a centralized radioactive waste treatment facility. The same is required for the management of disused sealed radiation sources used for cancer treatment.

### 2.3.6 Special Waste Categories

Special waste is hazardous and non-hazardous waste that has physical and/or chemical characteristics that are different from infectious, anatomical / pathological, chemical, radioactive and general waste, and that requires special packaging and/or handling. This section covers extraordinary items that don't fit into mainstream packaging, and 'grey area' waste streams as well. Although special wastes are often a small part of the total quantity of wastes disposed of, they represent an endless variety.

The following are examples of special waste categories:

#### *2.3.6.1 Heavy Metals Waste*

Waste with high heavy-metal content represents a subcategory of hazardous chemical waste, and is usually highly toxic. Some examples include, but are not limited to:

***Mercury (Hg)*** waste is typically generated by spillage from broken mercury-containing devices (thermometer, blood pressure gauges, etc.) or broken fluorescent tubes. Whenever possible, spilled drops of mercury should be recovered. Residues from dentistry can also have high mercury content.

***Batteries***. There are several kinds of battery containing different metals or combinations of metals, including alkaline, Ni-Cd (nickel-cadmium), lithium-ion, silver-oxide and lead acid batteries. Some of these battery types are considered hazardous waste and require specialized handling, recovery and/or disposal procedures. Refer to your facility-specific SOP to know how to package and dispose of your batteries.

***Lead***. Certain 'reinforced wood panels' containing lead are still being used in radiation proofing of x-ray and diagnostic departments.

#### *2.3.6.2 Pressurized Containers*

Many gasses used in health care are often stored in pressurized cylinders, cartridges and/or aerosol cans. Many of these are reusable, but even those of no further use once empty may still contain residues. Certain types, notably aerosol cans, must be handled and disposed of with care, for gases in pressurized containers, whether inert or potentially harmful, may cause them to explode if incinerated or accidentally punctured.

#### *2.3.6.3 Infectious Laundry*

Health care facilities that provide laundry services are responsible for the safe and effective management of the facility's laundry. For those using external laundry contractors, efficient control of

the contractual arrangement is paramount in achieving levels of quality that safeguard the health and safety of patients and employees.

The hospital should have access to managed facilities for the laundering of linens and other items. The following table illustrates the proper segregation of laundry items into three different categories to ensure the safety of patients and employees. Please note that Category A does not get laundered and re-used – it gets destroyed together with the mattress and pillows as well, usually, due to the high risk factor.

Figure 2: Categories and Colour-coding of Laundry

| Category | Description | Colour-coding |
|---|---|---|
| A | High risk infectious linen (isolation / outbreak / contagion, etc., which is treated & disposed of, and not re-used) | **Red Bags** |
| B | Contaminated blood or bodily fluid textiles (normal, day-to-day hospital linen internally rotated) | Yellow Bags or Identification tags |
| C | Chemically contaminated textiles | Yellow Bag or Identification tags with appropriate hazard label, e.g. Radioactive, etc. (See Annex A) |
| D | Normal soiled linen (non-infectious) | White Bag |

Reference: SABS 0146: Laundry Processes and Management – Linen and hospital bedding.

#### *2.3.6.4 Microbiological Waste*

This special waste category includes cultures and stocks of infectious agents and other specimens generated in high volumes from diagnostic or pathology laboratories. It also includes culture plates and other growth media and devices used to transfer, inoculate and mix, as well as discarded live and attenuated vaccines. It is also considered infectious waste but is isolated as a special waste category due to the special handling, packaging and treatment procedures warranted.

#### *2.3.6.5 Food Waste from Isolation Patients*

Food waste from patients in general wards can go into the general waste stream. However, food waste from highly infectious patients in isolation wards should be treated as infectious HCRW and be packaged in red colour-coded packaging accordingly.

It is preferable to package the food waste separately from other infectious HCRW because:

- it is not ideal, microbiologically speaking, to mix food waste with other general infectious health care risk waste because food waste will provide more of a nutritive substrate for pathogens and so drive their proliferation,
- food waste also attracts maggots and other pests and vermin that considerably increase the risk of disease transfer,
- the wet and heavy nature of this waste makes it unsuitable for conventional red bag and box set packaging. It will compromise the integrity of conventional, non-liquid-proof HCRW packaging,

defeating the object of safe containment. The exacerbation of odour is another consequence to contend with. Package food waste wisely and ensure a high collection frequency.

#### *2.3.6.6 Amputated Limbs*

Amputated limbs can be large and clumsy and therefore difficult to fit into mainstream HCRW packaging. It is important to adhere to recommended storage times for anatomical waste (Figure 9) and visually unpalatable to most people, hence the need for special packaging and handling. The most economical packaging option is a box set, following the proposed procedure below:

- the amputated limb is first placed in a 100 micron red bag and sealed with tape or cable tied
- the red bag with the limb inside is then placed into another 100 micron red bag and cable tied
- the bag is then placed into a box set appropriate for the size of the body part
- the box is then sealed with adhesive tape
- the box must be clearly marked as anatomical waste products. The writing on the lid must be legible and clear to identify (in most scenarios, all anatomical waste is incinerated)
- once the waste is placed into the transport vehicle it should not be handled again until it reaches the central storage area.

On certain occasions or in some cultures, a patient or his/her family member will want to take an amputated limb or removed organ home. It is still important that it is well packaged before issue, and it is advisable for the facility to have the patient or family member sign a receipt for the amputated limb or organ, thereby documenting an end to the facility's responsibility for the limb or organ and confirming the transfer of responsibility for it from the facility to the recipient.

#### *2.3.6.7 Electronic Waste*

Electronic waste (also known as e-Waste or Waste Electrical & Electronic Equipment) describes discarded electronic and electrical devices. Some electronic scrap components, such as cathode ray tubes, may contain contaminants such as lead, cadmium, beryllium or brominated flame-retardants, and informal processing or incineration of electronic waste can cause major health and pollution problems. In Swaziland's public health care facilities, electronic waste is collected and returned to central government stores where it is routed for specialized recovery, disposal and/or recycling.

## 2.4 Sources and Composition of Health Care Risk Waste

Figure 3: Source and Composition of HCRW

| Source | Composition |
|---|---|
| Health Care Facilities: hospitals, health centres and clinics, and veterinary clinics | Blood soaked dressings, bandages, plasters, gloves, packaging, hypodermic needles, intravenous sets, bodily fluids, anatomical waste and sharps, chemicals, radioactive waste, expired pharmaceutical waste, heavy metals, mercury waste, pressurized containers. |
| Laboratories and Research Centres | Microbiological cultures and stock, tissue samples, pathological wastes, blood and bodily fluids, contaminated gloves, tubing and containers, sharps, radioactive materials and chemicals. |
| Drug Manufacturers, Pharmacies and Drug Stores | Expired drugs, improperly manufactured drugs and spoiled drugs. |

| | |
|---|---|
| Mortuary Centres | Human tissue, wastewater and bodily fluids. |
| Ambulances and Emergency Care | Bodily fluids, blood soaked dressings, sharps and gloves. |
| Home-Based Care Treatment | Bodily fluids, expired drugs, disposable napkins, sharps, gloves and blood soaked dressings. |
| Cosmetic Body Piercing and Tattoo Sites | Bodily fluids and sharps. |
| Traditional and Religious Healing Sites | Sharps, bodily fluids and gloves. |
| Family Planning Activity | Sharps, condoms and expired contraceptives. |
| Self-Injector Activity | Needles and syringes from diabetics. |

# 3. Health Care Risk Waste Management Best Practice

## 3.1 Persons at Risk

All individuals exposed to HCRW are potentially at risk, including those within the health care institutions/facilities that generate hazardous waste, and those outside these sources who either handle such waste or are exposed to it as a consequence of careless waste management. The main groups of people who are at risk of exposure to health hazards associated with health care risk waste include, but are not limited to:

- staff of health care facilities such as doctors, nurses, health care auxiliaries and hospital maintenance staff
- patients in health care facilities or receiving home care
- visitors, occupants and caregivers in health care facilities
- staff and workers providing support services to and allied with health care facilities, such as laundry, waste handling and transportation
- persons transporting HCRW
- workers and operators of waste treatment and disposal facilities such as sanitary landfills, including waste pickers
- workers in mortuaries, funeral parlours and autopsy centres; and
- the general public.

## 3.2 Exposure to Health Care Risk Waste

### 3.2.1 Hazards from Infectious Waste and Sharps

Infectious waste may contain any of a great variety of pathogenic organisms. Pathogens in infectious waste may enter the human body by a number of routes:

- through a puncture, abrasion or cut in the skin (*needle-stick* or *scratch*),
- through the mucous membrane (*splash*)
- by inhalation
- by ingestion.

The presence of concentrated cultures of pathogens and contaminated sharps (particularly hypodermic needles) in the waste stream represents the most acute potential hazards to health. Sharps may not only cause cuts and punctures, but can also infect the wounds if they are contaminated with pathogens. Because of this double risk of injury and disease transmission, sharps are considered particularly hazardous.

The principal concerns are infections that may be transmitted by subcutaneous introduction of the causative agent, such as viral blood infections. Hypodermic needles constitute an important part of the sharps waste category, and are predominantly hazardous because they are often contaminated with patients' blood.

The consequences of improper handling and disposal of infectious and sharps waste are serious. For example, the re-use of improperly discarded needles or accidental needle-stick injuries to recyclers sifting through waste dumps can lead to the spread of hepatitis, HIV and other blood-borne diseases. Epidemiological studies show that exposure to pollutants from HCW incinerators increases the risk of various types of cancers and heart diseases.

A variety of elements are associated with infection in the context of infectious waste:

- some components of infectious waste are potential reservoirs of disease-causing microorganisms (e.g. culture plates, liquid blood, pathological waste, etc.)
- the infective dose depends on the virulence of the microorganisms, the portal of entry and the susceptibility of the host
- modes of transmission are contact (e.g. contaminated needles or blood splatter), vehicle-borne (e.g. contaminated wastewater), airborne (e.g. aerosolized pathogens from broken culture dishes or the rupture of bags), and vector-borne (e.g., rodents in a medical waste storage area).
- portals of entry include breaks in the skin and mucous membranes (e.g. needle-stick injuries or blood splashes into the mucous membranes) and the respiratory tract (inhalation of pathogenic aerosols)
- potential susceptible hosts include health care workers, waste handlers, patients and visitors of the health care facility, landfill operators, waste pickers and the public in general.

### 3.2.2 Hazards from Chemical and Pharmaceutical Waste

Although chemical and pharmaceutical products may be found in HCW in small quantities, these substances are hazardous. They may cause intoxication either by acute or by chronic exposure, and injuries such as burns. Intoxication can result from absorption of a chemical or pharmaceutical substance through the skin or the mucous membranes, or from inhalation or ingestion. Injuries to the skin, eyes, or mucous membranes of the airways can be caused by contact with flammable, corrosive or reactive chemicals (e.g. formaldehyde and other volatile substances). The most common injuries are burns. Disinfectants such as chlorine and sodium hypochlorite are particularly important members of this group; they are used in large quantities and are often corrosive and/or irritants. It should be noted that reactive chemicals might form highly toxic secondary compounds.

### 3.2.3 Hazards from Genotoxic/Cytotoxic Waste

Inhalation of dust or aerosols, absorption through the skin, ingestion of food accidentally contaminated with cytotoxic drugs, chemicals or waste are the main pathways of exposure to genotoxic/cytotoxic substances. The severity of the hazards also depends on the mode of exposure (e.g. inhalation, dermal contact, etc.). Exposure to genotoxic/cytotoxic substances may also occur during preparation of a treatment with particular drugs or chemicals, or through contact with bodily fluids and secretions of patients undergoing chemotherapy.

Many cytotoxic drugs are extremely irritating and have harmful local effects after direct contact with skin or eyes. They may also cause dizziness, nausea, headache or dermatitis. Special care in handling genotoxic/cytotoxic waste is therefore essential; any discharge of such waste into the environment could have disastrous ecological consequences.

### 3.2.4 Hazards from Radioactive Waste

Health effects caused by exposure to radioactive substances or materials contaminated with radioactivity can range from reddening of the skin and nausea to more serious problems such as cancer induction and genetic effects on succeeding generations of the exposed individual. The handling of high activity sources, e.g. certain sealed and unsealed radiation sources used in cancer therapy, poses higher health risks such that adequate protection measures have to be established to minimize these risks. The health hazards from low activity contaminated wastes may arise from external and internal exposures to an undetected contaminated working environment, and improper handling and storage of radioactive wastes and of spent/unused radiation sources. Both workers and other staff are at risk from this health hazard.

### 3.2.5 Impacts of Health Care Waste to Public Health and the Environment

Apart from the risk to patients and health care staff, HCW also impacts the general public and the environment. The major risks are possible pollution of the air, water and soil, as well as aesthetic damage. Minimizing risks to public health and the environment will require actions to address HCRW within health care facilities, ensuring sound management thereof from 'cradle-to-grave'.

While hospital staff is at greater risk of infection through injuries from contaminated sharps, other hospital workers and waste management operators outside of the health care facility are also at risk. Certain infections, spread via vectors or fomites or caused by more resistant agents, may pose a significant risk to the public. For example, uncontrolled discharge of sewage from field hospitals treating cholera patients is a potential source of a cholera epidemic. Faeces and urine from patients in isolation wards should be disinfected before disposal in the sewer.

Chemicals used in health care facilities are a potential source of water pollution via the sewer system. A chemical waste survey is a prerequisite for developing an effective waste management programme. Any hazardous chemical waste generated should be dealt with by a proper chemical waste management system. Substituting chemicals with less noxious, more environmentally friendly alternatives is recommended practice.

In addition, the public is very sensitive about the visual impact of anatomical waste, that is, recognizable body parts, including foetuses. The country's culture does not accept the inappropriate disposal of anatomical waste, such as on a landfill.

## 3.3 Waste Handling, Collection, Storage and Transport

The practical management of waste involves several key steps, namely:

- identification of relevant categories / streams
- segregation, colour-coded and packaging/containerization
- storage
- transportation
- treatment/destruction
- final disposal.

The process is illustrated in Figure 4.

Figure 4: Key Steps to Waste Management

| Step | Location | Health Care Waste Stream | Key Points |
|---|---|---|---|
| 0 | | Waste Minimization | Purchasing policy, stock management and recycling of certain types of waste |
| 1 | Medical Unit, Ward or Department | Generation | |
| 2 | | Segregation, Colour-Coded Packaging / Containerization | One of the most important steps to reduce risks and amount of hazardous waste |
| 3 | Inside Health Facility | Collection | Protective equipment, sealed containers and specific easy to wash trolleys |
| 4 | | Storage | Adequate and lockable, easy to clean storage room. Storage time limited to 24-48 hours |
| 5 | | Treatment / Disposal | Overall time in storage room limited to a maximum of 48 hours |
| 6 | Outside Health Facility | Off-site Transportation | Appropriate vehicle and consignment note, HCF is informed about final destination |
| 7 | | Off-site Treatment / Disposal | Appropriate vehicle and consignment note to ensure proper handling and transport |

### 3.3.1 Waste segregation and storage

The effective management of HCW considers the basic elements of waste minimization, proper identification, and segregation of the waste. In the past, there were no incentives to separate, recycle or reduce waste. Appropriate handling, treatment and disposal of waste by category results in cost savings and also helps protect public health. Segregation at the source remains the responsibility of the waste producer. Segregation should take place as close as possible to where the waste is generated, and should be handled, stored, packaged/containerized and transported correctly and carefully along its journey from *cradle-to-grave*.

Segregation is the process of separating different categories of waste at the point of generation, keeping them isolated from each other for specific reasons and in suitably designed, labeled and colour-coded containers/packaging for visual identification. Appropriate resource recovery and recycling techniques can be applied to each separate waste stream. Proper segregation will minimize or reduce the amount of health care risk waste (HCRW) that needs to be treated, thereby prolonging the operational life of the treatment and disposal facility and conserving resources.

HCRW should be placed in clearly marked containers that are appropriately labeled and suitably designed for the type, nature of and weight of the waste. Except for sharps and fluids, infectious waste

is generally put in good quality red plastic bags. Receptacles or leak-proof containers for the different categories should meet specific performance standards.

To improve segregation efficiency and minimize the incorrect use of containers, it is essential for them to be properly placed and labeled. Placing general waste containers beside those for infectious waste may result in better segregation.

## 3.4 Colour Coding

### 3.4.1 Colour Coding Scheme for Health Care Waste

The most appropriate way to identify the categories of HCW is to sort the waste into colour-coded plastic bags or containers for visual identification (refer to Annex C.1 for a Visual Packaging Guideline which is aligned with the colour-coding scheme related in Figure 6 below). Mainly for procurement reasons, the colour-coding implemented in this revision of the Guidelines has been aligned with the South African National Standard for Health Care Waste Management for Health Care Facilities (SANS 10248). Stock deficiencies of the appropriate packaging/containers can result in compromised segregation and should be avoided wherever possible. If, for whatever reason, red bags are not available, as a contingency plan use black bags and mark them with stickers bearing the universal biohazard waste symbol (figure 5) so that it is obvious by visual inspection that these particular black bags do NOT contain general waste, but rather hazardous waste.

Figure 5: Universal Biohazard Symbol

The recommended SANS 10248-aligned colour-code scheme for HCW is shown in Figure 6 below.

Figure 6: Waste Category and Colour-Coding Table

| Waste Category | Waste sub-category | Colour – coding | Label/Symbol | Container/ Packaging | Treatment/ Disposal/ Destruction |
|---|---|---|---|---|---|
| Infectious Waste (non-anatomical, non-sharps) | None | RED | Biohazard symbol (see Figure 5) | Heavy duty, leak-proof red plastic bag | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| Infectious Anatomical/ Pathological waste (a) | Infectious Human | RED | Biohazard symbol (see Figure 5) | Heavy duty, leak-proof red plastic bag or lined fibre-board box or red, leak proof, rigid plastic specibin. | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| | Infectious Animal | ORANGE | Biohazard symbol (see Figure 5 or Annex A) | Heavy duty, leak-proof orange plastic bag | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| Sharps Waste | None | No colour specified (yellow/ white/red /clear) | The words: "Danger Contaminated Clinical Sharps" in RED text with Biohazard symbol (see Figure 5 or Annex A) | Puncture-proof, rigid plastic, sealable container for sharps | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| Chemical Waste | Chemical | DARK GREEN | Use appropriate hazard label (see Annex A) | Sealable, puncture-proof green rigid plastic container | Transport to CMS for Incineration/ Hazardous Waste Landfill |
| | Pharmaceutical | DARK GREEN | Use appropriate hazard label (see Annex A) | Sealable, puncture-proof green rigid plastic container | Transport to CMS for Incineration/ Hazardous Waste Landfill |
| | Genotoxic/ Cytotoxic | DARK GREEN | Use Appropriate hazard label (see Annex A) | Sealable, puncture-proof green rigid plastic container | Transport to CMS for Incineration/ Hazardous Waste Landfill |
| Radioactive Waste | None | None | Use Appropriate hazard label (see Annex A) | Contact the Swaziland Environmental Authority for further information. | Radioactive waste disposal site |

| | | | | | |
|---|---|---|---|---|---|
| **General Waste** | None | BLACK or TRANSPARENT | None (b) | Good quality black or transparent bag.(c) | Landfill |
| **Special Waste** | Heavy Metal | None | Use Appropriate hazard label (see Annex A) | Refer to facility-specific, element-specific SOP | Transport to CMS for specialized recovery or disposal / Hazardous Waste Landfill |
| | Pressurized Containers | Black | Use Appropriate hazard label (see Annex A) | Good quality black bag labeled 'waste pressurized containers' or 'waste aerosol dispensers'. | Transport to CMS for specialized recovery/ Hazardous Waste Landfill |
| | Highly Infectious Laundry | RED(see Figure 2) | See Figure 2 | Heavy duty leak-proof bag or rigid plastic container | Dedicated Secure Waste Pit/ Incineration |
| | Microbial Waste | RED | Biohazard symbol (see Figure 5) | Fibre board box set lined with heavy duty, leak-proof red plastic bag | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| | Food Waste from Isolation Ward | RED | Biohazard symbol (see Figure 5) | Double-bagged and put into a Fibre board box set lined with heavy duty, leak-proof red plastic bag | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| | Amputated Limbs | RED | Biohazard symbol (see Figure 4) | Double-bagged and put into a Fibre board box set lined with heavy duty, leak-proof red plastic bag | Dedicated Secure Waste Pit/ Incineration/ Approved Alternative Technology |
| | Electronic Waste | None | Labeled E-WASTE | Put into boxes sealed and labeled accordingly. | Sent to CGS or suitable alternative collection facility for recovery, recycling and/or specialized disposal. |

(a)Chemical or radioactive solutions containing human or animal anatomical and infectious wastes are considered as chemical or radioactive waste respectively.
(b)Black, white or transparent packaging can be used.
(c)Transparent bag is recommended for HCF so that if hazardous waste slips into the general waste stream it can be easliy identified by visual assessment before handling

**CONTINGENCY PACKAGING:**

Should the facility run out of the correct colour-coded packaging for relevant waste streams (and this should be avoided at all costs) then the following rules should be applied:

- if black bags are used as an alternative for infectious waste, ensure that the contents are labeled on the packaging and apply the international symbol for biohazardous waste (refer to table under Annex A under Other) as a sticker so that all can see it is NOT general waste and must be handled and treated as HCRW
- if the facility runs out of the correct sharps containers and uses a puncture-proof, rigid container alternative, ensure that the contents are identified on the label and apply the international symbol for biohazardous waste
- if the facility runs out of correctly colour-coded rigid plastic containers for other streams of waste, ensure that the contents are labeled accordingly and apply the international symbol for biohazardous waste
- the key consideration in ALL cases is SAFE CONTAINERIZATION. One does not want to have to open the container again to see what is inside. The contents must be protected from spillage, and the handler should be protected from the contents whilst handling and transferring the waste from point A to point B. The handler should know, from visual inspection, what is inside the packaging and how it must be handled, where it must go, and how it will be finally disposed of
- investigate the reason for poor stock control and correct to prevent further incidents.

*See 4.3: Re-use regarding utilization of other containers for sharps collection and storage.

## 3.5 Packaging

The packaging for health care risk waste shall be clearly marked with the appropriate colour-code and the appropriate international hazard label(s) illustrated in the table above.

Further to these stipulations, the following things should be considered with discretion in relation to the health care facility's unique waste generation profile:

- Is the waste stream in question generated in high or low volume?
- Is the waste stream in question wet or dry?
- Is the waste stream in question heavy or light?
- Is the waste stream in question potentially sharp?
- Does the packaging procured meet minimum standards of quality?

Figure 7: Packaging Considerations

| Waste is: | Challenges for packaging/ containerization | Packaging considerations |
|---|---|---|
| Potentially sharp when broken | Plastics or glassware can crack or break during transit rendering sharp edges, which can penetrate conventionally used bags and poor quality rigid plastic containers, risking spillage. | In most cases, anything that is potentially sharp should be treated a sharps waste, warranting a puncture-proof, sealable rigid plastic container.<br>If volumes are too high to warrant the use of sharps containers, then improvise – for example, by double bagging and using lined box sets so that the contents are protected from breakage during transit and the likelihood of sharp edges poking |

| | | |
|---|---|---|
| | | through is minimized.<br>Labels clearly indicating the contents of the packaging inform waste handlers how to handle it. |
| Heavy (example glassware or liquids in high volumes, limbs, etc.) | Packaging/container can break under load risking spillage.<br>Waste handlers can injure themselves trying to lift and carry the waste from point A to point B. | Use good quality but smaller capacity containers that can sustain the particular load. Smaller containers are also easier to lift and carry.<br>Improvise with double-bagging, etc. |
| Light | No additional risk posed if packaged correctly. | Can use larger volume containers or bags. |
| Wet | Liquid poses the risk of seeping or spilling out the container.<br>Liquid waste in high volumes can also be heavy. | Container / packaging needs to be leak-proof and obviously should be liquid-proof (a cardboard box would not be suitable, for example, as it would fall apart when wet unless well-lined and protected from liquid.) |
| Dry | No additional risk posed if packaged correctly. | Can use lightweight packaging or bags as no risk of leakage or seepage. |
| Clumsy, Large or Oddly-shaped | Waste stream in question is too large or oddly shaped to fit into conventional HCRW packaging. | Examples include long sharps like trochars or amputated limbs. Choose the right sized container for the waste stream. If the waste does not fit properly, do not try to force it in; if the container cannot close and seal properly, the object of safe containment is defeated, and handlers downstream will be put at risk.<br>Improvise where necessary, taking into account the nature of the waste and prescribed colour-coding and labeling requirements. |

### 3.5.1 Minimum Requirements for the Packaging of HCRW

HCRW packaging should meet minimum quality standards as follows, but not necessarily be limited to them:

(a) Plastic bags with a capacity of 60 (sixty) litres or more must be at least 80 (eighty) microns in thickness.

(b) Plastic bags with a capacity of less than 60 (sixty) litres must be at least 60 (sixty) microns in thickness.

(c) Plastic bags used as barriers in puncture resistant containers that are at no time removed from the containers, other than for the contents' final treatment, must be at least 40 (forty) microns in thickness.

(d) Plastic bags which are used as smaller intermediate barriers within a single ward or similar, and that are subsequently placed in puncture and leak resistant containers or within further plastic bags, must be at least 40 (forty) microns in thickness.

(e) All plastic bags and disposable containers must be manufactured from polypropylene or polyethylene polymers, or from polymers whose maximum environmental impact is no greater than that caused by polypropylene or polyethylene polymers when disposed of by incineration, or treated by means of any available alternative technology.

(f) Final outer packaging used in the external transport of HCRW from a health care risk waste generator must be puncture resistant and able to retain liquids.

(g) Rigid puncture resistant containers shall be leak resistant, have fitted covers, and be kept clean and in good repair.

(h) Any container used for the storage of anatomical/pathological waste must be manufactured from suitable materials able to withstand the low temperatures at which such pathological waste is stored.

(i) Lids used for disposable sharps containers must be secured in such a way that they cannot be reopened once closed without major structural damage to the container.

(j) Lids used for anatomical/pathological waste containers must provide an airtight seal to prevent the emission of odours.

(k) Plastic bags may not be used as final outer containers.

## 3.6 Storage Requirements

All HCRW should be collected and stored in a temporary waste storage area until it is transported to a designated treatment and disposal facility. The storage area should be marked with a warning sign (Figure 8).

Figure 8: HCW Storage Area Warning Sign

All health care facilities should designate a HCRW central storage area. Waste generated from different units should be collected daily and transported to the designated storage site.

The central storage area for HCRW should be located within the health care facility, and situated so as to minimize the risk of contamination to other operations in the area, and to medicines, foodstuffs, textiles, employees, patients and visitors. The facility's waste management plan should indicate the times and routes for the collection of HCRW from each temporary waste storage area. Collection frequency should be determined relative to the waste streams generated the quantity thereof and recommended storage times.

An intermediate storage area should be designated in each ward, department or unit of the health care facility. In a home setting where HCRW is generated, a safe holding point should be identified for safe storage of the waste.

## 3.7 Requirements for HCRW Storage Facilities

- The storage area should be clearly demarcated as such.
- The storage area should have an impermeable, hard-standing, slip-resistant floor with good drainage. It should be easy to clean and disinfect as needed.
- There should be a proximal water supply for cleaning purposes.
- The storage area should allow easy access for staff in charge of handling the waste.
- It should be possible to lock the storage area to prevent access by unauthorized persons.
- Easy access for a waste collection vehicle is essential.
- The storage area must be protected from sun, rain, strong winds, floods, etc.
- The storage area should be inaccessible to animals, insects and birds.
- There should be good lighting and adequate ventilation.
- The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
- A supply of cleaning equipment, protective clothing and waste bags or containers should be located conveniently close to the storage area.
- Floors, walls and ceilings of the storage area must be kept clean in accordance with established cleaning procedures that, at a minimum, should include the daily cleaning of floors.
- The storage area shall have sufficient capacity to accommodate the volume of waste to be stored in accordance with facility's unique generation profile and the collection frequency.
- For recommended waste storage times for the relevant streams of waste, refer to the table below. Depending on the nature of the waste, one should prevent the proliferation of microorganisms and concomitant odour.
- The storage area should be checked on a daily basis to ensure it is secure, clean and organized, i.e. waste receptacles/containers are not overflowing or leaking.

Figure 9: Recommended Waste Storage Time Limits as per SANS 10248

| Waste[a] | Time Limits |
|---|---|
| Anatomical / Pathological[b] | 24 hours |
| Infectious[b] | 72 hours |
| Sharps Container | 30 days |
| Pharmaceutical | 90 days |

[a] Containers shall be sealed. [b] The waste may be stored at -2°C for 90 days.

## 3.8 Quantification of Waste

The quantification of waste is necessary for budgetary and logistical projections. A metric is needed for statistical capture and comparisons. Furthermore, and especially if contractors are used for various functions such as waste transport off-site and/or treatment and disposal, most billing schemes are based on weight in kilograms.

It is the responsibility of the health care facility to record daily waste volumes. The daily record should include, at least the following:

A. Waste generator (ward, unit, department)
B. Quantity of containers, capacity/volume of containers, and weight in kg.
C. Category (waste stream)
D. Date of collection from the source

Scales are used to determine weights and come in different forms (hanging, platform, etc.) Scales should always be calibrated so that weights are accurate. When temporary storage vessels or reusable containers are used, the scale should be zeroed to exclude the weight of the vessel or container such that it only reflects the weight of the actual waste being treated or disposed of.

For an example of a daily record sheet refer to Annex B.2.

## 3.9 Collection and Transportation of HCW

Proper collection and transport is an important step in HCRW management, and requires the direct involvement of the health care facility's maintenance services, housekeeping services and motor pool service staff, as well as the cooperation of all health care staff.

HCRW collection practices should be designed to achieve an efficient movement of waste from points of generation to storage or treatment while minimizing the risk to all staff and the general public.

### 3.9.1 On-site Collection

Waste should not be allowed to accumulate at the point of generation. A programme for collection and transportation of waste should be established as part of the facility's HCW management plan. Health care workers and other clinical staff should ensure that waste bags are securely closed or sealed when they are about three-quarters full. Light-gauge bags can be closed by tying the neck, but heavier-gauge bags probably require plastic sealing tags of the self-locking type (such as cable ties). Bags should never be closed by stapling. Sealed sharps containers should not be placed in a labeled red infectious bag.

The following are recommendations that should be followed by health care staff directly involved in waste handling and collection:

- Waste should be collected daily (or more frequently, as required) and transported to the designated central storage site or waste transfer station.
- No bag should be removed unless it is closed off correctly (and not overfilled), correctly labeled with the point of generation identified (hospital ward or department) as well as the contents.
- Bags or containers should be replaced immediately with new ones of the same type. Replacement packaging/container stock should be readily available at all locations where waste is produced.

### 3.9.2 On-Site Transport

Transportation of waste within the facility may involve trolleys, wheeled containers or carts (see Photo 1) that are dedicated solely for this purpose. On-site transportation vehicles should meet the following specifications:

- easy to load and unload
- no sharp edges that could damage waste bags or containers during loading and unloading
- easy to clean
- lined with impervious and durable materials
- marked with 'fill limit' indicators, to prevent toppling as a result of over-filling leading to possible breakage and/or spillage
- be properly maintained and replaced when necessary.

Photo 1: Example of a wheelie bin

The on-site collection vehicles should be cleaned and disinfected daily with an appropriate cleaning agent. All waste bag seals should be in place and intact at the end of transportation.

Workers transporting the waste should be issued with appropriate personal protective equipment (PPE), including heavy-duty gloves, coveralls and thick-soled, steel-tipped safety boots/shoes, and be suitably trained in how to use their PPE.

### 3.9.3 Off-site Transportation of Health Care Waste

The HCW generator is responsible for the safe packaging and correct labeling of waste to be transported off-site for treatment and disposal. Packaging and labeling should comply with the national regulation governing the transport of special wastes (Waste Regulations [2000], Part 6, Section 14) and must present no danger to the public during transportation. Likewise, waste generators are ultimately responsible for ensuring that their wastes are properly treated and disposed of in an approved and fully compliant treatment/disposal facility.

Transporters or waste transport contractors shall be suitably equipped for the proposed activities in line with the Waste Regulations (2000), Part 6, Carriage of Waste.

Tracking of wastes can be done with the implementation of a consignment system. The transporter or generator transporting the waste should have a consignment note as stated in Waste Regulations (2000), Part 7, Section 15. The following data shall be recorded for off-site collection of waste:

- signatures of the responsible person at the facility's central waste storage area and of the waste transport contractor's representative
- time and the date
- amount of waste collected for the different categories (number of containers and their capacities; type of container; weight of container [usually measured in kilograms])

The waste transport contractor should provide documentary evidence of the above mentioned data to the waste management officer at the final treatment/disposal site for the health care risk waste. For an example of a recommended Waste Collection Document, refer to Annex E.2.

#### *3.9.3.1 Transboundary Transportation*

Hazardous waste, including HCRW, may occasionally need to be transported to another country for treatment and disposal due to lack of appropriate and compliant facilities in the home country. This is permissible provided the receiving country has such compliant facilities to deal with the waste in question and there is documentation to demonstrate that the receiving country is willing to receive it. Refer to the Basel Convention for further information and guidance; see http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf

#### *3.9.3.2 Requirements for Packaging and Labeling for Off-site Collection*

Waste should be packaged in correctly sealed bags or containers so that waste categories can be visually identified and to prevent spillage during handling and transportation. The bags or containers should be sufficiently robust to hold their contents safely (e.g. puncture-proof for sharps, resistant to aggressive chemicals, etc.) and to endure normal conditions of handling and transportation, such as vibration or changes in temperature, humidity or atmospheric pressure.

All waste bags and containers should be labeled with basic information about their contents and about the waste generator. This information may be written directly on the bag or container or on pre-printed labels, securely attached. Basic information should include, but is not limited to, the following:

- type of HCRW
- waste category/stream
- date of collection
- volume and quantity of waste
- producer/generator of the waste and source/origin (ward, unit, department, etc.)
- destination of the waste.

#### *3.9.3.3 Requirements for Off-site Collection Vehicles*

Collection vehicles used to transport HCW should not be used for any other materials that could be seriously affected by contamination, such as food, livestock, people or retail goods. The vehicle should have an enclosed leak-proof body, separate from the cab where the driver and/or load assistant sit, that can be locked to secure the waste. Waste can be loaded directly into a specially designed vehicle, but it is safer to place the waste first in containers (eg, wheeled, rigid, lidded plastic or galvanized bins) and then to load those into the vehicles.

All waste should be bagged in appropriate colored-coded bags or other special containers when transported. Each package should be marked or coded for easy identification. Containers should be

leak-proof and fitted with self-sealing lids, where applicable, to prevent spillage. The design of the collection vehicle should conform to the following (See also Photo 2):

- The body of the vehicle should be of suitable size commensurate with the design of the vehicle and the waste that will be carried in whichever type of packaging.
- The vehicle should have a completely enclosed car body or cab, with the driver's seat separated from the waste / goods compartment to prevent coming into contact with waste in the event of collision/accident.
- There should be a suitable system for securing the load during transport to prevent toppling and subsequent breakages or spills.
- The vehicle should be easy to clean and the internal surface of the body should be smooth enough that it may be steam cleaned, with all corners/angles rounded. The vehicle should be cleaned at the end of each working day and in the event of any spillage.
- The vehicle should be marked with the name and address of the waste carrier as well as at least two emergency contact numbers, guaranteed to be answered when called.
- The international biohazard sign should be displayed on the vehicle or container, as well as the emergency telephone number. Refer to *Annex D*.
- A spill kit and first aid kit should be carried on board in a separate compartment in the vehicle (refer to Annex E.1). For general procedures in case of spills, refer to annex E.3. The vehicle should have an emergency light and a fire extinguisher on board.

For further information on transport of HCRW contact the Swaziland Environmental Authority.

Photo 2: Waste collection vehicle


### *3.9.3.4 Routing*

HCW should be transported via the quickest or shortest possible route, which should be planned before the trip begins. After departure from the source, every effort should be made to avoid further handling of the waste. If handling cannot be avoided, it should be pre-arranged and take place in authorized and adequately designed premises. Handling requirements may be specified in the contract established between the waste generator and the transporter.

An efficient and effective collection system route should consider the following:

- Collection schedule either by route or zone.
- Assignment of staff responsible for the zone or area.
- Logical planning of the route (should avoid congested areas).
- Transport scheduled during off-peak hours wherever reasonably practicable.

# 4. Health Care Waste Minimization

Health Care Waste Minimization (HCWM) is a method that helps health care facilities reduce the bulk or amount of HCW, whilst cutting costs for running the waste management system and for final treatment/disposal.

## 4.1 Principles of Waste Minimization

HCWM is, first and foremost, a management issues rather that a technical one, and therefore completely depends on the commitment of both the administrative and political authorities as well as the entire staff within each health care facility.

It is important for management or administration to keep records of waste generated and to ensure the availability of data on waste management in health care facilities/institutions, with written/documented policies to guide waste minimization and the proper training of employees on HCWM. In keeping with these goals, the waste hierarchy (Figure 10) will be used as a guiding principle for these guidelines.

Figure 10: Waste Hierarchy


## 4.2 Reduction at Source

Waste generation can be managed or reduced at the source by carefully controlling the procurement of supplies and waste receptacles (green procurement) with a focus on waste minimization opportunities as well as increased waste awareness for the staff involved.

Reduction at source focuses on eliminating the use of material with bulk waste so as to result in fewer waste generation products. Examples include replacing mercury thermometers with digital thermometers (elimination of mercury waste), working with suppliers to reduce the use of waste-generating materials in product packaging, etc.

## 4.3 Re-use

Reusable items should be selected over disposable items whenever it is clinically appropriate, environmentally sound and practical. Re-use entails quality assurance, ie, enforcing reliable standards for disinfection and sterilization of equipment and materials. After use, reusable items should be collected separately from non-reusable items and carefully washed and sterilized by MoH-approved methods such as autoclaving. Containers that once held detergents or other liquids may be re-used as containers for sharps waste, provided that they are puncture-proof and clearly marked on all sides.

## 4.4 Recycling

Recycling means collecting waste and processing it into something new. Many items in health care facilities can be recycled. Facilities should critically examine current waste streams and determine what products can be separated at the point of generation for effective recycling. Recycling of non-hazardous paper, metal, glass and plastics can result in savings for facilities either through reduced disposal costs or through payments made by a recycling company.

## 4.5 Segregation

Segregation is the process of separating different wastes at the point of generation/source and keeping them apart during handling, accumulation, intermediate storage and transportation. There are several reasons to undertake waste segregation:

- Segregation minimizes the amount of waste that needs to be managed as infectious or hazardous waste (since mixing non- infectious waste with infectious or hazardous waste renders the combined amount as infectious or hazardous).
- Segregation facilitates waste minimization by generating a solid waste stream, which can be easily, safely and cost-effectively managed through recycling or composting.
- Segregation reduces the amount of toxic substances released into the environment in the disposal of general waste (e.g. removing mercury from general waste).
- Segregation makes it easier to assess the quantity and composition of different waste streams, thereby allowing health care facilities to obtain baseline data, identify options, determine waste management costs and assess the effectiveness of waste minimization strategies.

## 4.6 Composting

Composting is another important strategy to minimize waste streams such as food discards, kitchen waste, cardboard and yard waste. Sufficient land space is required for on-site composting, located far enough from patient care and public access.

Food scraps can provide most of the nitrogen for the compost, while bulk agents commonly found in hospitals, such as cardboard and wood chips, can provide carbon. Composting techniques range from simple un-aerated static piles, to aerated windrows, to vermicomposting. The resulting rich compost can be sold or donated to local farmers and gardeners or used for plants around the health care facility grounds.

# 5. Health Care Risk Waste Treatment Technology

## 5.1 Factors in the Selection of Treatment Technology

The factors to consider when selecting treatment technology are as follows:

- Treatment efficiency
- Occupational, health & safety and environmental considerations (QSHE – Quality, Safety health and environment)
- Volume and mass reduction
- Types and quantity of waste for treatment and disposal/capacity of the system
- Infrastructure and space requirements (investment & operational costs)
- Locally available treatment options for final disposal
- Training requirements for operation of the method (availability of skills)
- Operation and maintenance considerations
- Location of the treatment site and disposal facility
- Social and political acceptability
- Regulatory requirements.

## 5.2 Technologies/Processes of HCW treatment

### 5.2.1 Types of treatment technology

- Thermal
- Chemical
- Irradiation
- Biological processes
- Encapsulation
- Inertization
- Pulverization
- Shredding
- Compaction/baling.

### 5.2.2 Definitions of technologies applicable in the Swaziland context

The following definitions include information specific to the Swaziland context, including affordability and availability in local markets, as well as the advantages and disadvantages of each method.

***Thermal (Incineration)*:** The method of combusting waste in a multiple- chamber device that has mechanisms for closely monitoring and controlling the combustion parameters (temperatures between 800$^{o}$C and 1200$^{o}$C, Air Pollution Control [APC] Equipment, capacity).

***Autoclaving*:** Use of steam sterilization to render waste harmless is an efficient wet thermal process. This technique has been used for many years in hospitals for the sterilization of reusable medical equipment. Autoclaves come in a wide range of sizes. A typical autoclave designed for infectious waste treats about 100kg per cycle per hour. Autoclaves used in centralized treatment facilities can handle as much as 3,000kg per cycle.

***Chemical disinfection*:** Includes physical maceration (shredding and grinding) and is a suitable treatment for small amounts of clinical and related waste. This treatment usually involves the grinding and shredding of waste, which is then soaked in a liquid disinfectant. Agents used include sodium hypochlorites, aldehydes, chlorine compounds, phenolic compounds and lime. Chemical disinfection is

most suitable in treating blood, urine, stools and sewage. Care should be exercised in the use of chemicals as they pose an occupational hazard, e.g. formaldehyde is a suspected carcinogen.

***Encapsulation*:** It involves the filling up of containers with waste, adding an immobilizing material and sealing the containers. The process uses either cubic boxes made of high density polyethylene or metallic drums, in both cases 75% filled with HCRW and then topped up with a medium such as plastic foam, bituminous sand or cement mortar. After the medium has dried, containers are sealed and disposed of in a special landfill site. The process is particularly appropriate for the disposal of sharps and chemical residues. The main advantage of this process is that it is very effective in reducing the risk of scavengers gaining access to HCW.

***Microwave*:** This technology typically incorporates some type of size reduction device. Shredding of waste is being done either before disinfection or after disinfection. In this process, waste is exposed to microwaves that raise the temperature to 95–100°C (212.0°F) for at least 30 minutes. Microorganisms are destroyed by moist heat, which irreversibly coagulates and denatures enzymes and structural proteins.

The efficiency of microwave disinfection should be checked routinely through bacteriological tests using bacterial spore. The microwave process is widely used in several countries and is becoming more popular.

***Biological Processes*:** The process uses an enzyme mixture to decontaminate HCW, and the resulting by-product is put through an extruder to remove water for sewage disposal. The technology is suited for large applications and is also being developed for temperature, pH, enzyme levels and other variables. Design application is mainly for regional HCW treatment centres.

***Radiation Technology*:** Ionizing radiation technologies are available to treat certain HCRW. Attention must be given to the type of radiation and to protective measures to mitigate exposure of workers to the radioactive source. Consideration must also be given to the disposal of radioactive material.

**Inertization**: The process of 'inertization' involves mixing waste with cement and other substances before disposal in order to minimize the risk of toxic substances contained in the waste migrating into surface water or groundwater. It is especially suitable for pharmaceuticals and for incineration of ashes with a high metal content (in this case the process is also called "stabilization").

For the inertization of pharmaceutical waste, the packaging should be removed, the pharmaceuticals ground, and a mixture of water, lime and cement added. A homogeneous mass is formed and cubes (~ $1m^3$) or pellets are produced on site and then can be transported to a suitable storage site. Alternatively, the homogeneous mixture can be transported in a liquid state to a landfill and poured into municipal waste. The following are typical proportions for the mixture:

- 65% pharmaceutical waste
- 15% lime
- 15% cement
- 5% water

The process is reasonably inexpensive and can be performed using relatively unsophisticated equipment. Other than staff, the main requirements are a grinder or road roller to crush the pharmaceuticals, a concrete mixer and supplies of cement, lime and water.

***Note on Management of Heavy Metals: Items containing heavy metals can be managed in a number of ways. In limited resource settings, devices/materials should be identified and segregated. When no treatment or recycling is available, they may be disposed of via inertization/encapsulation or stored in a secure area until treatment is available***

***Certain recycling/recovery methods are available for many items containing heavy metals. Lead acid batteries are the most common type of batteries recycled. Mercury can be recovered from thermometers. Spent silver can be recovered from X-ray processing solutions. Contact local authorities to determine the best management practice for your location.***

## 5.3 Siting of Waste Treatment Facilities

There are different requirements for each type of treatment technology in terms of space, foundation, utility service connections, ventilation and support equipment. In determining a safe location for the facility, one must take into account the safe transfer routes, average distances from waste sources and temporary storage requirements, as well as space needed by workers to manoeuvre safely around the treatment unit. The location of the facility should not cause traffic problems as waste is brought in and out. Odour, noise, visual impact of HCW operations on patients and visitors, public access and security should also be considered.

By taking a team approach and involving engineers, environmental services, housekeeping, safety or industrial hygiene, infection control and occupational health, important aspects such as occupational safety and health become part of the decisions relative to the siting and installation of a treatment facility.

## 5.4 Licensing of Health Care Waste Treatment

Licensing conditions and authority lie with the Swaziland Environmental Authority (SEA) in accordance with Waste Regulations (2000), Part VIII, Sections18, 19 and 20.

# 6. Waste Disposal Systems

## 6.1 Sanitary landfill

A sanitary landfill is engineered to keep waste isolated from the environment. Appropriate engineering preparations should be completed before the site is allowed to accept waste. There should be trained staff present on site to control operations and organize deposits and daily coverage of waste. Some essential elements for the design and operation of a sanitary landfill are:

- Location away from human habitants (residents), appropriate soil type and adequate distance away from water sources.
- Waste delivery and site vehicles have access to the site and its working areas.
- Presence of site staff capable of effective control of daily operations.
- Division of the site into manageable phases, appropriately prepared, before the landfill starts.
- Adequate sealing of the base and sides of the site to minimize the movement of wastewater (leachate).
- Adequate mechanisms for leachate collection and treatment systems.
- Organized deposit of waste in a small area, allowing wastes to be spread, compacted and covered daily.
- Surface water collection trenches around site boundaries.
- Construction of final cover to minimize rainwater infiltration when each phase of the landfill is completed.

## 6.2 Pit Management

In remote locations and rural areas, the safe treatment and disposal of HCW on the health care facility's premises may be the only viable option. However, certain rules need to be followed for proper HCW management. The Ministry of Health - Environmental Health Department is responsible for assessing and indicating a safe location for both an Open and/or Closed Pit.

### 6.2.1 Open Pit

***Construction of an open pit*:** This method treatment and disposal is especially suitable for the disposal of untreated general waste and dry infectious waste. The following procedure is recommended for the safe construction of an open pit:

1. Dig a pit 1 - 2m wide and 2 - 5m deep
2. Line the bottom and walls of the pit with 100mm thick concrete
3. Construct an earth mound around the mouth of the hole to prevent surface water from entering the pit, and
4. Construct a fence or barrier around the area to keep out animals, scavengers and children.

***When the pit has been filled to within about 50cm below the ground surface, cover the waste/ ash with soil and permanently sealing it with cement. While the preferred method of sealing is to use cement, another alternative is to embed a sheet of wire mesh within a final 50cm layer of soil cover. The burn pit should only be used for infectious waste, and not domestic waste, to keep it from filling up quickly.***

***Disposal Procedures:*** The following procedure is recommended for the safe burning of waste within an open pit.

1. Put on the appropriate PPE including leather gloves, leather aprons, goggles, helmet, safety shoes and mask
2. Carefully place non-sharp waste into the pit
3. Sprinkle waste with fuel
4. Carefully light using a lighting stick
5. Monitor burning until fire goes out.

***When the pit is about 50 cm below the ground surface, cover the waste/ash with soil and permanently sealing it with cement. While the preferred method of sealing is to use cement, another alternative is to embed a sheet of wire mesh within a final 50cm layer of soil cover. The burn pit should only be used for infectious waste, and not domestic waste, to keep it from filling up quickly.***

### 6.2.2 Closed Pit

This method is especially suitable for the disposal of untreated used sharps and placentas.

***Construction of a closed pit*:** The following procedure is recommended for the safe burial of sharps and placentas through a closed pit:

1. Dig a pit (minimum size of 1m x 1m x 1.8m) estimated to be large enough to accommodate sharps and placentas for a specific period of time without reaching the ground water level. The site must be isolated and at least 30m away from ground water supply sources and dwelling units.
2. Construct 100mm thick concrete walls, bottom and cover for the pit. Provide slab with an opening or manhole for easy deposition. The manhole should be raised a few centimeters above the soil surface to overcome infiltration of surface water, and
3. Install a security fence around the site.

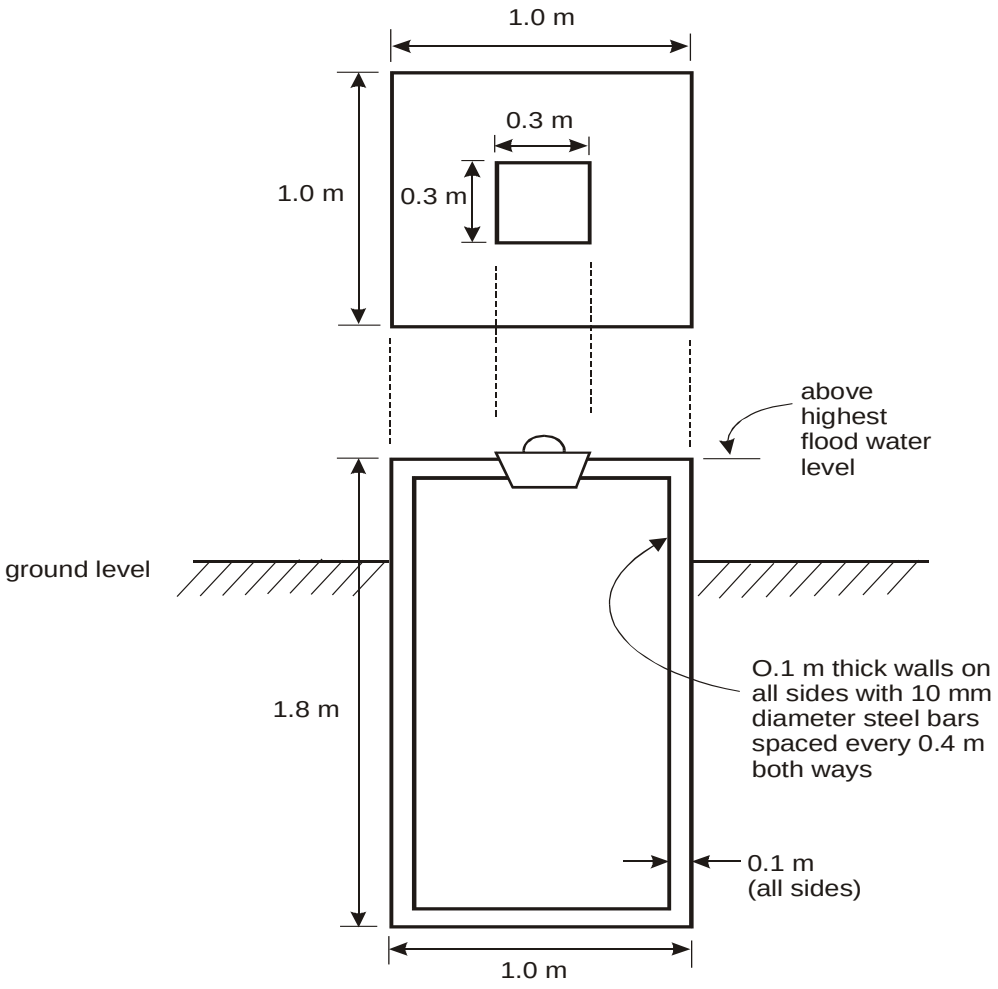
***When the pit's contents have reached about 50 cm below the ground level, cover them with soil and permanently seal the pit with cement.***

***Disposal Procedures*:** The following procedure is recommended for the safe burning of waste within a closed pit.

1. Put on the appropriate PPE including leather gloves, leather aprons, goggles, helmet, safety shoes and mask
2. Carefully remove the pit's cover
3. Carefully place sharps and placenta waste into the pit, and
4. Carefully place the cover back onto the pit.

***When the pit is about 50 cm below the ground surface, cover the sharps and placenta waste with soil and permanently sealing the pit with cement.***

Figure 11: Sample Closed Pit Design

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# 7. Wastewater Treatments and Disposal

## 7.1 Characteristics of Wastewater from Health Care Facilities

The basic principle underlying effective wastewater management in health care facilities is a strict limit on the discharge of hazardous liquid to sewers. Wastewater from health care facilities contains potentially hazardous elements, including:

- Microbiological pathogens (bacteria, viruses and helminthes), which are easily transmitted through water
- Small amounts of hazardous chemicals from cleaning and disinfection operations
- Hazardous chemicals and pharmaceutical waste generated from other business facilities (clinics, laboratories and research centres, drugs manufacturers, mortuary and autopsy centres, cosmetics and tattoo parlors); trace amounts of radioactive effluents from nuclear medicine laboratories.

Wastewater or sewage from health care facilities can be discharged into domestic (municipal or city) sewers without pre-treatment, provided that the following requirements are met:

- The municipal sewers are connected to an efficiently operated sewage treatment plant that ensures at least 95% removal of bacteria
- The sludge resulting from the sewage treatment plant is subjected to anaerobic digestion, leaving no more than one helminth (parasite) egg per litre in the digested sludge
- Hazardous wastewater with significant quantities of toxic chemicals (e.g. formaldehyde, pharmaceuticals, radionuclides, cytotoxic drugs and antibiotics) coming from laboratories, research centres, clinics, mortuary and autopsy centres, should be discharged to a pre-treatment/neutralization tank for sewage (toxic) neutralization and disinfection by chlorination prior to discharge or connection to the sewage treatment plant
- Excreta from patients being treated with cytotoxic drugs are collected separately and adequately treated (as with other cytotoxic waste). Refer to national guidelines on cytotoxic waste management.

## 7.2 On-Site Treatment of Wastewater

It is recommended that health care facilities/institutions that do not have access to municipal wastewater (sewage) treatment should have their own wastewater treatment facilities. In the case of septic tanks, health care facilities are expected to follow a building engineer plan for septic tanks design, in accordance with the Building Act of 1968.

A septic tank provides primary treatment, comprising a primary sedimentation tank and digestive chamber. This action results in partial biodegradation for organic pollutants.

Septic tanks must be occasionally serviced by a vacuum tanker for final treatment and disposal of the sewage in a sewage treatment plant.

## 7.3 Off-Site Treatment of Waste Water

Heath care facilities situated where there is a main sewer line should connect to an approved off-site treatment facility, as stipulated by the Water Services Cooperation, Act of 1992, Part III, and Section 20.

Health care facilities should have an inventory or database of all chemicals, disinfectants and detergents used. Each chemical should have a material safety data sheet. Health care facilities must set out comprehensive policy and procedures for handling and usage of the chemicals.

## 7.4 Emergency procedures

Since untreated wastewater has the potential to be contagious due to the high concentration of organisms, facilities/institutions should have a contingency plan for dealing with spillages/failures of wastewater treatment systems.

# 8. Health and Safety Practices in Health Care Waste Management

Health and safety practices should be guided by the provisions of the Occupational Safety and Health Act of 2001.

## 8.1 Policy

The health and safety policy should:

- be specific to the organization and the nature of the health risks identified
- be available in a written format, signed by the employer, and displayed
- include commitments to the protection of the health of the employees
- ensure compliance with legislation and other organizational requirements
- be communicated to all employees and interested and affected parties
- be reviewed regularly to ensure relevance.

## 8.2 Elements of a Proper Health and Safety Programme

### 8.2.1 Risk assessment

Risk assessments need to be done at least every six months. The assessment needs to follow the following basic steps: 1) Hazard identification; 2) Exposure assessment: who might be harmed and how; 3) Dose response assessment: evaluate the risk and decide on proper precautions; and 4) Risk characterization: create or review and update the assessment, as necessary.

### 8.2.2 Medical Surveillance Programme

A medical surveillance programme is the systematic approach to protect employees exposed or potentially exposed to occupational hazards. This programme monitors individuals for adverse health effects (pre- and post-employment) and determines the effectiveness of exposure prevention strategies. A medical surveillance programme includes the analysis of both individual and aggregate surveillance data over time, with the goal of reducing and ultimately preventing occupational illness and injury.

The primary purpose of the medical surveillance programme is to identify conditions that could lead to occupational disease. Secondarily, the programme provides compliance with country regulations that require medical monitoring.

For this programme to be in place, three stages need to be followed when setting it up:

**(i) Baseline/replacement medical examination**

- Helps in selecting the right person for the right job.
- Protects the company against future compensation claims.
- Provides important medical baseline data for any future treatment of the employee.

**(ii) Periodic medical examination**

A periodic medical examination provides valuable information on the health status of the employee that can be evaluated against his/her baseline medical examination. It is recommended that staff be offered counseling and immunization for certain diseases (e.g. hepatitis B and tetanus). Counseling and treatment should also be offered to staff after occupational exposure to blood-borne pathogens (e.g. HIV). It is furthermore recommended that employees who decline immunization, or who do not seroconvert, be advised in writing about the occupational risk associated within their unique work environment.

**(iii) Exit medical examination**

This examination should be done when a person is leaving his/her current job, for whatever reason, prior to leaving such that health status is profiled at time of departure.

### 8.2.3 Training

Include orientation (induction) of new employees and employees redeployed to other departments and training in waste management for health care workers.

### 8.2.4 Personal Protection Programme

This programme needs to be set up because it will encourage involvement in the selection of personal protective equipment (PPE). Maintenance of the equipment is to be clearly defined, and the wearers must be trained.

The HCW management programme requires that the following PPE be made available to all health care staff who collect and handle health care waste. This is not an exhaustive list, and the necessity for the items below will depend on the nature of the operation:

- hard hats with or without visor
- face masks/shields
- eye protectors/safety goggles if face shields not offered
- respirators or dust masks
- gloves (hand protection)
- fire-fighting equipment (refer to the legislation)
- protection against radioactive waste.

The following items are mandatory for all health care staff:

- appropriate uniform/work clothes
- closed protective shoes/footwear.

### 8.2.5 Response to Injuries

All health care staff must be trained to deal with occupational injuries and exposure. A programme prescribing the actions to be taken in the event of an incident, injury or exposure must be put in place and should include (but not be limited to) the following:

- immediate first aid measures
- an immediate report of the incident to a designated responsible person
- retention, if possible, of the item involved in the incident, with details of its source for identification of possible infection
- additional medical attention in an accident and emergency or occupational health department as soon as possible
- medical surveillance
- blood or other test if indicated
- recording of the incident
- investigation of the incident, and identification and implementation of remedial action to prevent a similar incident in the future.

### 8.2.6 Reporting Accidents and Incidents

Accidents or incidents, including near-misses, spillage, damaged containers, inappropriate segregation and any incidents involving sharps, should be reported to the waste management committee or to another designated person. The report should include the following details:

- the nature of the accident or incident
- the place and time of the accident
- the staff who were directly involved
- any other relevant circumstances.

The waste management officer or other responsible officer should investigate the cause of the accident or incident, and also take all possible action to prevent recurrence.

# 9. HCWM Monitoring and Evaluation

## 9.1 M&E System Overview

A monitoring and evaluation (M&E) system is a critical component in any successful, comprehensive HCWM programme. Information is needed to assess and guide policy and programme strategy, ensure effective operations, meet internal and external reporting requirements and inform future programming and improvement initiatives.

Figure 12: Purpose and Benefits of Monitoring and Evaluation

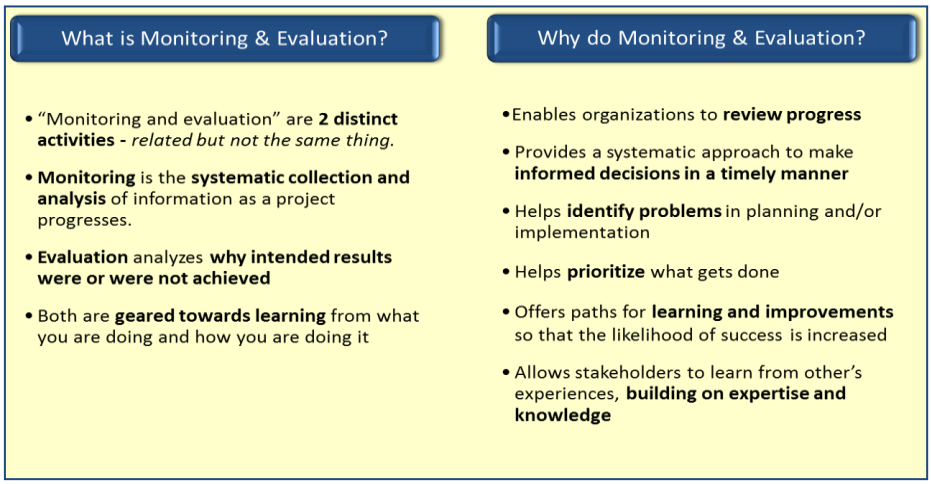
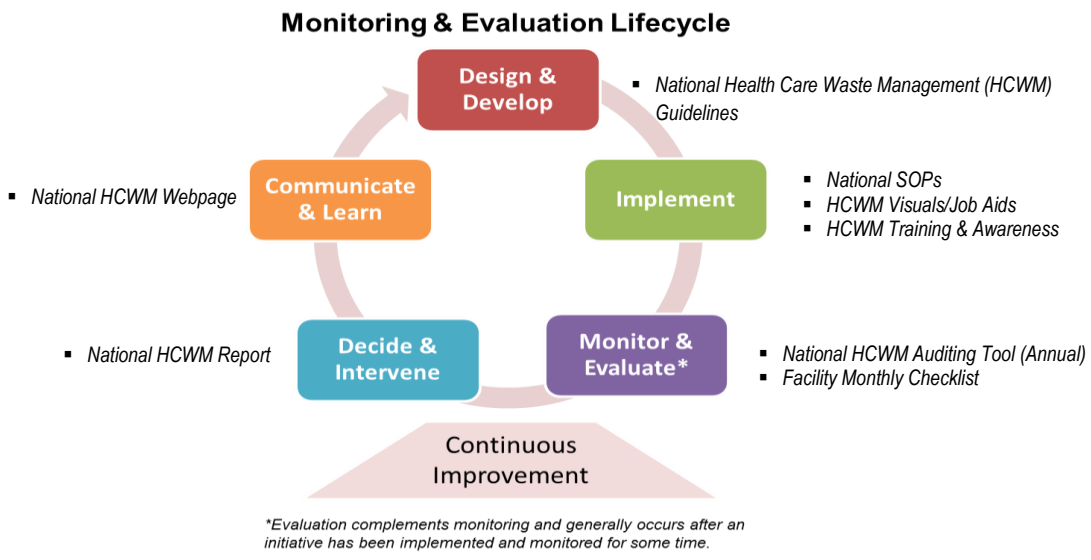



Figure 13 shows the effects of the M&E cycle, as well as where key tools identified in these guidelines fit and support the process. It is important to note that while M&E is a very valuable tool, it is not a solution. M&E helps identify problems and their causes; suggests possible solutions; raises questions about assumptions and programmatic decisions/direction; encourages evidence-based decision-making; and increases the likelihood of replicating good HCWM practices by applying lessons learned. Stakeholder actions should be informed by the findings, conclusions and recommendations generated by the M&E process.

Figure 13: Monitoring and Evaluation Lifecycle



## 9.2 National HCWM M&E Tools

Two monitoring tools were developed to collect data and information on how health care facilities are implementing their HCWM programmes and activities countrywide—the National HCWM Monitoring Tool and the Health Care Facility Monthly Checklist (refer to Annex B.1 for the latter). Brief descriptions of these tools are included below.

The Ministry of Health is responsible for the implementation, administration and maintenance of these tools. To support successful implementation and institutionalization of these tools and the M&E processes, it is recommended that an M&E plan be developed which contains:

- HCWM programme goals and objectives
- indicator matrix linked to specific objectives or results
- indicator reference sheets which include indicator definitions, data sources and responsible entities for data collection and reporting
- data collection and reporting plan that captures how information will flow through the system up to final analysis and reporting, plus definitions of general roles and responsibilities and a reporting schedule.

### 9.2.1 National HCWM Monitoring Tool

The National HCWM Monitoring Tool is a comprehensive questionnaire to be administered annually across all health care facilities and biohazard waste transporters. It is designed to:

- Measure progress in the implementation of the National HCWM Guidelines across health facilities and biohazard waste transporters;
- Assess the performance of health facilities and biohazard waste transporters in maintaining good HCWM standards and practices; and
- Improve regulatory compliance and avoid long-term liabilities.

The tool monitors HCWM programme compliance and performance from point of generation to point of ultimate treatment or disposal. In addition, the questionnaire captures facility compliance with policy, management, document, and occupational health and safety requirements.

### 9.2.2 Health Care Facility Monthly Checklist

The Health Care Facility Monthly Checklist is to be administered at health care facilities on a monthly basis. It will enable the Ministry of Health to collect key HCWM performance data that will be routinely compiled and analyzed by its Monitoring and Evaluation Department. The Monthly Checklist captures critical programmatic information currently not available to the Government, such as quantification of waste generated at health care facilities. Information collected via this tool will complement that collected by the National HCWM Monitoring Tool.

# 10. HCWM Training and Awareness

Raising awareness and providing good training are among the most important actions that need to be undertaken to reduce the risk that HCRW poses both to public health and the environment.

Training and awareness are essential for health care staff, but decision makers and the general public (with an emphasis on children) also needs to be well informed. Promoting appropriate handling and disposal of HCW is important for community health, and everyone has the right to be informed about the potential health hazards of HCW.

## 10.1 Training of Health Care Facility Staff

All staff should receive training appropriate to their work. The overall aim of the training is to develop awareness of health, safety and environmental issues relating to HCW, and how these can affect employees in their daily work. It should also highlight the roles and responsibilities of health care staff in the overall waste management programme.

Separate training activities should be designed for each of the following targeted categories of health care staff:

- health care facility managers and administrative staff responsible for implementing regulations governing HCWM
- medical doctors
- environmental health officers, waste regulators and health assistants
- nurses and assistant nurses
- laboratory staff
- cleaners, porters, orderlies, auxiliary staff and waste handlers.

The training needed for those producing the waste is as important as the training needed for waste handlers. Medical doctors may be trained through senior staff workshops, and general hospital staff through formal seminars. The training of waste managers and regulators, however, could take place outside hospitals, at public health schools or university departments.

Basic education for health care staff should include:

- information on, and justification for, all aspects of the HCW policy
- information on the role and responsibilities of each health care staff member in implementing the policy
- technical instructions, relevant for the target group, on the application of waste management practices.
- All staff must receive initial and annual training. The trainer/instructor should have experience in teaching and training in HCWM.

### 10.1.2 Suggested Training Package for Target Group

The training packages developed should be suitable for the various types of healthcare facilities in the country, including government, private, teaching, dental and veterinary clinics, polyclinics, health centres, health care research facilities, clinical laboratories and similar establishments. Each package will have certain elements in common, but with additional information for their group's specific needs.

### 10.1.2 Training for Staff Providing Health Care

The training course should provide an overview of the waste management policy and its underlying rationale, and information on practices relevant to the trainees' responsibilities. Waste segregation is a key element; all staff that produce HCW should be responsible for its segregation, and should therefore receive training in the basic principles and practical application of segregation, being made aware of the potentially serious implications of waste mismanagement for the health of waste handlers and patients.

Staff should receive an overview of the fate of waste after collection and removal from wards, and understand the importance of proper segregation.

### 10.1.3 Training for Waste Handlers

Topics covered may include the waste management policy, health hazards, on-site transport, storage, safety practices and emergency response. For staff that routinely handles HCRW, awareness of the need for safety may diminish overtime, increasing the risk of injury. Periodic refresher courses are therefore recommended.

### 10.1.4 HCWM Operators (downstream of the HCF)

The training course should include:

- information on the risks associated with the handling of health care waste
- procedures for dealing with spillage and other accidents
- correct use of protective clothing.

### 10.1.5 Staff who Transport Waste

In carrying out the responsibility of waste transportation, drivers and waste handlers should be aware of the nature and risk of the transported waste. Transport staff should be able to carry out procedures for:

- handling, loading and unloading of waste bags and containers
- dealing with spillage or accidents
- the correct use of PPE
- documentation and recording of HCRW, for example by means of a consignment note which allows waste to be traced from the point of collection to the final place of disposal.

### 10.1.6 Treatment Plant Operators

Health care facilities should make arrangements to provide training to treatment plant operators in the following areas where needed:

- general operation of the treatment facility
- health, safety and environmental implications of treatment operations
- technical procedures for plant operation
- emergency response in case of equipment failure, e.g. alarms
- maintenance of the plant and recordkeeping
- surveillance of the quality of emissions and discharges according to specifications.

### 10.1.7 The General Public

The need to promote appropriate handling and disposal of HCW in home-based care is important for the households involved, as well as for community members who have the right to be informed about the potential health hazards associated with HCW.

Public education plays an important role in HCW management. The three objectives of public education related to HCW are to:

1. Inform the public about the risks associated with HCW, focusing on people living or working near to health care institutions/facilities, or visiting them, plus home-based care, traditional healers, the families of patients being treated at home, and scavengers on waste dumps.
2. Create awareness and foster responsibility among hospital patients and visitors to health care institutions/facilities regarding hygiene and HCW management.
3. Prevent exposure to HCW and related health hazards. This exposure may be voluntary, as in the case of scavengers, or accidental as a consequence of unsafe disposal methods.

In communicating the hazards of HCW to the public, the following methods maybe considered:

- Information, education and communication (IEC) campaigns, including materials development, reproduction and dissemination. Campaigns could focus on various HCW issues, such as the risks involved in scavenging discarded syringes and hypodermic needles.
- Policy dissemination: responsible staff of the healthcare facility should be able to explain to incoming patients and visitors the HCW management policy.
- Information posters in healthcare facilities, at strategic points such as waste bin locations that provide instructions on waste segregation. Posters should be explicit, using diagrams and illustrations to convey the message to the largest audience possible, including those who cannot read.

# 11. Administrative Requirements

## 11.1 Organizational Structures and Functions

Appropriate HCWM practices depend largely on the facility's unique organizational structure and require adequate legislative and financial support, as well as the active participation of trained and informed staff. The entire organizational structure and services of the health care facility must be clear on the roles each staff member plays in managing HCRW correctly from point of generation to final disposal.

### 11.1.1 Health Administrator and/or Management

The management of the health care facility will have overall responsibility for ensuring that HCW is managed in accordance with national policies and guidelines. The hospital administrator or health care facility manager shall:

- form and develop the health care facility's waste management system (or delegate this task to a suitable candidate)
- form and adequately resource a waste management committee. In the event of a waste management committee member leaving, appoint/designate a successor immediately, or temporarily assign their responsibilities to another staff member until a successor can be appointed/designated
- ensure adequate training for key staff members, allocating responsibility for coordinating and implementing training courses
- attend to complaints and legal matters regarding existing and unforeseen problems arising from the implementation of the HCWM programme
- establish good working relationships with other related agencies by proper referral, consultation and cooperation concerning HCWM.

### 11.1.2 Health Care Waste Management Committee (HCWMC)

Management is required to form a waste management committee to comprise members from all departments such that all departments are represented. The committee should have clear assignment of responsibilities, including:

- promulgation of a policy formalizing the HCF's commitment to the proper management of its waste, with the goal of protecting health and the environment
- including a minimization plan, training and written guidelines on HCWM
- ensuring that procedures are incorporated into the plan to monitor the efficacy of the disposal system so that it can be updated and improved when and where necessary
- designating a waste management focal point, i.e. a Waste Manager, to supervise and coordinate implementation of the plan
- allocating sufficient financial and human resources to ensure efficient operation of the plan. For example, the Waste Manager should have sufficient staff to ensure the plan's efficient implementation.

### 11.1.3 Health Care Waste Management Plan

A comprehensive health care waste management plan is the key ingredient to a successful waste management within a health care facility. It is important that the plan should be understood and followed in order to be of value to the facility. Training of staff to ensure that they understand the plan and their specific roles and responsibilities within it is critical to the plan's successful implementation.

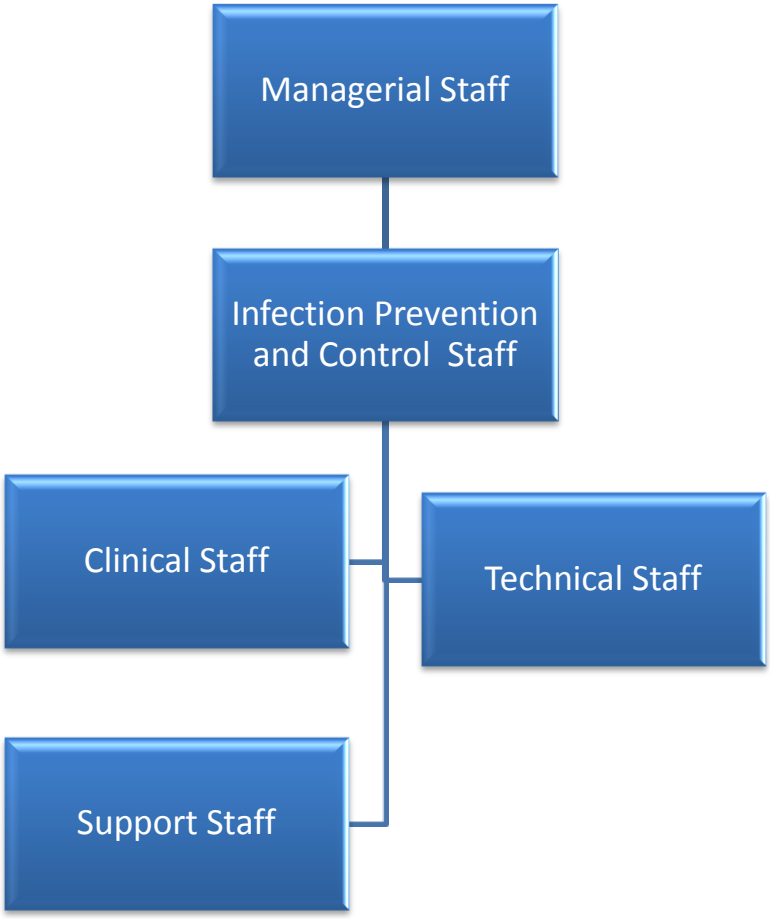
The plan must comply with relevant requirements and regulations under current national legislation, and should take account of all the HCF's SOPs related to or relevant to all aspects of HCWM. It must cover policy and implementation, include procedures for monitoring the efficacy of the disposal system so that it can be updated and improved when necessary, as well as contingency procedures for dealing with potential implementation failures (suitably trained staff must be made aware of the actions they must take in such circumstances).

An initial step is for the designated HCWMC to make an assessment of all the HCRW generated in their facility before developing the management plan. The assessment should include estimates of future changes or growth of the HCF's departments. Data from this survey will form the basis of the waste management plan.

***Delineation of Responsibilities***

Management of HCW is the responsibility of all individuals within an HCF. It is the responsibility of departments and/or units to work in harmony to manage HCW from cradle to grave.

Figure 14: Delineation of Responsibilities for the Management of HCW




**Managerial Staff** *(administrator, manager, senior matron, senior medical officer, etc)* are responsible for:

- obtaining and being familiar with national waste management policies
- implementing and maintaining an effective and functional HCWM system
- establishing and enforcing a facility waste management plan (goal, budget, staff, roles, supervision, training, reporting)

- budgeting for adequate supply of HCWM products and commodities
- ensuring staff segregate HCW using an appropriate colour-coding scheme
- advocating for health worker safety.

**Infection Prevention and Control Staff** *(members of the Infection Prevention Control Committee)* are responsible for:

- obtaining and being familiar with national waste management policies and procedures
- following and enforcing facility waste management policies and procedures
- managing the facility's waste management plan (goal, budget, staff, roles, supervision, training, reporting)
- training staff on the proper procedures of HCWM
- conducting quality audits and verify compliance with HCWM SOPs
- properly segregating HCW using an appropriate colour-coding scheme
- practicing safe operating procedures and wearing appropriate PPE
- advocating for health worker safety.

**Clinical Staff** *(nurses, doctors, phlebotomists, laboratory staff, pharmacists, dentists, etc.)* are responsible for:

- following waste management policies and procedures
- practicing safe operating procedures and wearing appropriate PPE
- properly segregating HCW using an appropriate colour-coding scheme
- notifying relevant staff of spills and when to conduct on-site collections of HCW
- managing waste containing mercury.

**Technical Staff** *(accounting, finance, stores, biomed, maintenance, etc.)* are responsible for:

- follow waste management policies and procedures
- practicing safe operating procedures and wearing appropriate PPE
- properly segregating HCW using an appropriate colour-coding scheme
- procuring supplies and products for the proper management of HCW
- maintaining medicine stocks and minimizing expired stock
- properly treating and disposing of HCW
- managing the off-site collection and/or disposal of HCW
- maintaining a safe operating environment when treating HCW
- notifying administration/management to procure fuel for the incinerator.

**Support Staff** *(cleaners, orderlies, housekeepers, groundsmen, drivers, etc.)* are responsible for:

- following waste management policies and procedures
- practicing safe operating procedures and wearing appropriate PPE
- properly segregating HCW using an appropriate colour-coding scheme
- properly collecting, handling and storing HCW
- cleaning spills in accordance of facility SOPs
- notifying administration/management of supplies to be procured and any other needs.

***Final note: The above are guidelines. The crux of the matter is to get a team together and to delineate responsibilities clearly right down to specific individuals. Never assume that someone else will do a job. Make sure that relevant people know exactly what is expected of them.***

## 11.3 Documentation Requirements

### 11.3.1 Documents

The HCWM documents used in an HCF should include, but not be limited to:

- SOPs that are documented, implemented and maintained
- a training programme incorporating all SOPs in a comprehensible format
- quality control procedures (audit tools)
- a document setting out service level agreements between different departments
- operating manuals for all equipment
- Material Safety Data Sheets (MSDS) for all chemicals
- safety instructions and precautions for the handling and storage of HCRW
- an emergency and response policy and strategy to deal with spills of bio-hazardous (infectious) and chemical wastes
- procedures for dealing with non-compliance and the corrective actions to be taken
- a list of the documents to be retained as proof of the proper treatment, destruction and disposal of HCRW by the waste management contractor or HCF responsible for this
- a document describing the procedures for record keeping for waste management.

Documents should be available at their points of use.

### 11.3.2 Document Control

The HCWMC shall establish a procedure for the control of ALL documents pertaining to the approved waste management plan. The controls shall accord with HCF policy, and provide for the following:

- approval of documents prior to dissemination, with periodic reviews for update and improvement
- a filing system to make identification, accessibility and retrieval of relevant documents user-friendly and manageable
- a system whereby obsolete or out-of-date documents are withdrawn or replaced with current versions. A master list of all control documents indicating the location and revision status of each document
- retention of all documents and certificates as required by relevant and current national legislation, including that pertaining to employment issues.

# 12. References


1. Waste Regulations 2000 - Swaziland
2. Occupational Safety &Health Act, 2001 – Swaziland
3. Environment Management Act, 2002 - Swaziland
4. Building Act 1968, Swaziland
5. Water Services Cooperation Act of 1992, Swaziland
6. Management of Waste from Health care Activities - WHO - 2012 Pending publication
7. SANS 452: 2008 – Minimum product specifications for non-reusable and reusable sharps containers
8. SANS 10248 - Management of health care waste in health care facilities
9. SABS 0146: Laundry Processes & Management – Linen and Hospital Bedding.

# Annexures

## Annex A: Hazards Classification and Labels

### A.1 Hazard Classes

**Class 1: Explosives**. Explosives of class 1 are regulated by the current relevant national legislation. The classification, transportation and disposal of explosives shall be approved by the relevant competent authority.

***NOTE: Class 1 is included for the sake of completeness; it is unlikely that class 1 waste will be generated from a health care facility.***

**Class 2: Gases**. This class is subdivided as follows:

a) division 2.1: flammable gases
b) division 2.2: non-flammable and non-toxic gases, and
c) division 2.3: toxic gases.

**Class 3: Flammable liquids.** This class comprises liquids with a closed-cup flash point not exceeding 60.5°C.

**Class 4: Flammable solids; substances liable to spontaneous combustion; substances that, on contact with water, emit flammable gases**. This class is subdivided as follows:

a) division 4.1: flammable solids
b) division 4.2: substances liable to spontaneous combustion, and
c) division 4.3: substances that, on contact with water, emit flammable gases.

**Class 5: Oxidizing substances and organic peroxides**. This class is subdivided as follows:

a) division 5.1: oxidizing substances, and
b) division 5.2: organic peroxides.

**Class 6: Toxic and infectious substances**. This class is subdivided as follows:

a) division 6.1: toxic substances, and
b) division 6.2: infectious substances.

**Class 7: Radioactive material.** This class comprises materials that spontaneously emit ionizing radiation.

**Class 8: Corrosives**. This class comprises substances that, by chemical action, cause damage to living tissue, to commonly used metals or to other packaging.

**Class 9: Miscellaneous dangerous substances.** This class comprises any substance not covered by all the other classes, but that has been or could be shown by experience to be of such dangerous character that the provisions of this class should apply to it.

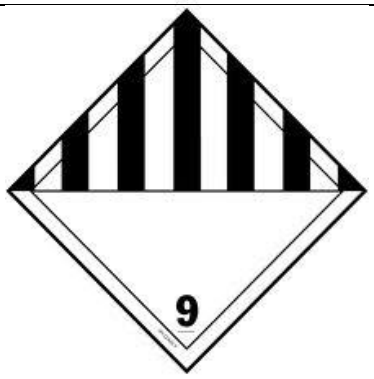
## A.2 Table showing Hazard Label Symbols

Table 1: Hazard Label Symbols

| Class, Division or Subsidiary Risk | Description | Hazard Label |
|---|---|---|
| **1.1, 1.2, or 1.3** | Explosives |   |
| **1.4** | | |
| **1.5** | | |
| **1.6** | | |
| **2.1** | Flammable Gases |   |
| **2.2** | Non-flammable non-toxic Gases |   |
| **2.3** | Toxic Gases |   |

| | | |
|---|---|---|
| **3** | Flammable Liquids<br>This class comprises liquids with a closed-cup flash point not exceeding 60.5°C. |  |
| **4.1** | Flammable Solids |  |
| **4.2** | Substances liable to spontaneous combustion |  |
| **4.3** | Substances that, on contact with water, emit flammable gases. |  |
| **5.1** | Oxidizing substances |  |

| | | |
|---|---|---|
| **5.2** | Organic Peroxides |  |
| **6.1** | Toxic Substances |  |
| **6.2** | Infectious Substances |  |
| **7** | Radioactive Material. This class comprises materials that spontaneously emit ionizing radiation. |  |
| **7** | |  |

| | | |
|---|---|---|
| **7** | |  |
| **8** | Corrosives.<br>This class comprises substances that, by chemical action, cause damage to living tissue, to commonly used metals or to other packaging. |  |
| **9** | Miscellaneous dangerous substances.<br>This class comprises any substance not covered by all the other classes, but that has been or could be shown by experience to be of such dangerous character that the provisions of this class should apply to it. |  |

| Other Symbols and Labels | |
|---|---|
| The internationalsymbol for **biological hazards** is: |  |
| The international hazard symbol for **cytotoxic or genotoxic waste** is: |  |

# Annex B. Basic Health Care Waste Management Tools

## B.1 Facility Monthly Checklist

Table 2: Facility Monthly Checklist

| | | | |
|---|---|---|---|
| **Auditor name:** | | **Date of audit:** *e.g. 05-Jun-2012* | |
| **Name of facility:** | | **Location:** | |
| **Type of facility:** *(check one box only)* | ☐ Hospital<br>☐ Health Center | ☐ Clinic<br>☐ Public Health Unit | ☐ Other, specify: |
| **Number of patients:** *(average monthly load)* | | | |

| No. | Indicators/Variables/Activities | Answer | | | Details/Justifications /Recommendations |
|---|---|---|---|---|---|
| | | # | Yes | No | |
| **TOPIC: ON-SITE COLLECTION & TRANSPORT OF WASTE** | | | | | |
| 1 | Waste is routinely collected | | | | *on a daily basis and/or once waste bags are three-quarters full* |
| 2 | Proper on-site collection modes of transport are available to transport health care risk waste only | | | | *eg trolleys, carts, containers* |
| **TOPIC: TEMPORARY WASTE STORAGE ROOM MANAGEMENT** | | | | | |
| 3 | Storage area is secured | | | | *Inaccessible to unauthorized persons, animals and insects; clearly identified with signage; protected from the sun* |
| 4 | Storage area is routinely cleared | | | | *Waste is not piling up or sitting in storage area for extended periods of time* |
| 5 | Segregation of waste is maintained in storage area | | | | *Waste segregated into infectious and non-infectious waste; infectious waste bags and sharps containers properly labeled* |
| **TOPIC: WASTE TREATMENT & DISPOSAL (FOR FACILITIES WITH INCINERATORS ONLY)** | | | | | |
| 6 | Incinerator is fully functional | | | | |
| **No.** | **Indicators/Variables/Activities** | **Answer** | | | **Details/Justifications /Recommendations** |
| | | **#** | **Yes** | **No** | |

| | | | | | |
|---|---|---|---|---|---|
| **TOPIC: OCCUPATIONAL SAFETY** | | | | | |
| 7 | Number of needle stick incidents recorded in the past month as a result of poor waste management | | | | |
| 8 | Waste handlers and clinical staff use the appropriate personal protective equipment (PPE) when handling waste | | | | *eg gloves, apron, boots, masks* |
| **TOPIC: QUANTIFICATION OF WASTE** | | | | | |
| 9 | Waste is routinely weighed and volumes recorded in waste log | | | | |
| 10 | Total monthly weight of **sharps** waste generated (kg) | | | | |
| 11 | Total monthly weight of **infectious** waste generated (kg) | | | | |
| 12 | Total monthly weight of **general** waste generated (kg) | | | | |
| 13 | Total monthly weight of **other** waste generated (kg) | | | | Specify waste: …….. |
| **TOPIC: LOGISTICS MANAGEMENT** | | | | | |
| 14 | Supply of **sharps containers** are sufficient in number | | | | |
| 15 | Supply of **reusable waste containers/bins** are sufficient in number | | | | |
| 16 | Supply of **colour-coded liners** are sufficient in number | | | | |
| 17 | Reserve stocks are available in the store for the above mentioned materials | | | | |

## B.2 Daily Record Sheets

Table 3: Daily Record Sheets

**Waste Log Sheet for Main Streams that go for Incineration / Burning (Infectious, Sharps, Anatomical/Pathological)**

Name of Health Care Facility / Institution:

Are you a Hospital / Health Centre / Clinic? Circle the correct one.

| | Waste Stream | Source / Origin | Container Description (packaging) | Capacity / Volume of Container | Quantity of Containers | Total Weight (in kg) | Date | Person who weighed / captured. |
|---|---|---|---|---|---|---|---|---|
| | *Infectious (non-sharps); Sharps; Anatomical / Pathological* | *(Where did the waste come from? Outpatients? Maternity Ward?)* | *(Red bag, sharps container, Red Specibin, etc)* | *(140 litre red bag, 25 litre red specibin, 5 litre sharps container, etc)* | *1, 2, 3, etc.* | | *(Date weighed, captured and removed from site to go for burning or incineration - dd/mm/yyyy)* | *(Name and Surname - clearly put)* |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |

*NOTE: Specibins / rigid plastic containers routed for incineration are ideally made of polypropylene.*

*NOTE: Label all containers correctly to reflect the contents. Make sure they are well-sealed.*

*NOTE: Ensure that your scale is calibrated for accurate weights.*

## Waste Log Sheet for Other Streams which get stockpiled until further direction

Name of Health Care Facility / Institution:

Are you a Hospital / Health Centre / Clinic? Circle the correct one.

| | Contents of Container | Source / Origin | Qty of Items | Container / Description | Capacity / Volume of Container | Waste Classification | Physical Nature | Total Weigh t (kg) | Date | Person who weighed / captured | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Unit / Department: Outpatients; Maternity Ward, Lab, etc.* | | *Green Bag; Green Specibin; Black Bag; Cardboard Box; etc.* | | *C=Chemical; P=Pharmaceutical ; CG=Cytotoxic / Genotoxic; R=Radioactive; PC=Pressurized Containers* | *S=Solid; L=Liquid; G=Gas* | | *Date weighed and removed from site / captured / put into storage - dd/mm/yyyy.* | | |
| *E.g .* | *Ranmoxy 500 capsules (brown / yellow) Exp: 06/2012 popped out of blister packs* | *Pharmacy* | *5000* | *Green Bag* | *40 litres* | *P* | *S* | *4.5* | *24/10/2012* | *Joe Soap* | *Capsules removed from foiled blister packs with latter sent to general waste.* |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |

*NOTE: Specibins / rigid plastic containers routed for incineration are ideally made of polypropylene.*

*NOTE: Label all containers correctly to reflect the contents. Make sure they are well-sealed.*

*NOTE: Ensure that your scales are calibrated for accurate weights.*

# Annex C. Packaging Guideline Visual

Herewith follows a quick visual guide for packaging of HCW.

Products can vary in form depending on the supplier/manufacturer, but wherever possible please stick to the colour-coding scheme, and always label your containers correctly with words indicating the content and the appropriate hazard symbol. For those items not covered in this table (special waste categories such as empty pressurized containers, mercury, etc.) there is no specific colour-coding. Please refer to your facility's SOP, use discretion when choosing the appropriate packaging, and label correctly displaying the relevant hazard symbol as per Annex A.

## C.1 Visual Packaging Guideline Table

Table 4: Visual Packaging Guidelines

| Colour-coding | Type of Waste | Description |
|---|---|---|
| **CONTAINMENT - FLEXIBLE PLASTIC** | | |
| *A plastic bag with the capacity of 60 litres or more must be at least 80 microns thick.*<br>*A plastic bag with the capacity of less than 60 litres must be at least 60 microns thick.*<br>*A plastic bag used as a barrier in a health care risk waste container must be at least 60 microns thick.* | | |
|  |  | **Black Bags / Clear bags:**<br>**For all general waste**<br>*Plastic, paper wrappers, disposable plates, paper towels, tins, empty aerosol cans.* |
|  |  | **Black Bags / Clear bags:**<br>**For all general waste**<br>*Plastic, paper wrappers, disposable plates, paper towels, tins, empty aerosol cans.* |

| | | |
|---|---|---|
|  |  | **Red Bags:**<br>For everything that was in contact with blood, tissue or body fluids. ALSO for high risk infectious linen (isolation / outbreak / contagion, etc.) which is treated & disposed of, and not re-used.<br>The 50, 90 and 142 litre 100micron red plastic bags are used for DRY, LIGHT infectious waste e.g.<br>*Sanitary pads, dressings, swabs, bandages, tongue depressors, baby napkins, incontinence pads, soiled surgical drapes, plastic soaked disposables, soiled gloves and aprons.*<br>Do not push down on any red bag and always carry them away from your body to prevent needlestick injuries should anyone have erroneously disposed of needles in the bag. |
|  | **Picture of contaminated / soiled hospital linen** | **Yellow Bags:** Contaminated blood or bodily fluid textiles (normal, day-to-day hospital linen internally rotated) or chemically contaminated linen. This bag is only used within the hospital and does not leave the premises. |

| CONTAINMENT - BOX SETS | | |
|---|---|---|
|  |  | **Fibre Board Box set (large)** Issued with red plastic bag as liner, and a cable tie.<br>Used for any **anatomical waste, which** cannot fit into a specibin e.g. amputated limbs.<br>The following procedure must be followed:-<br>• The amputated limb is first placed into a 100micron red bag and sealed with tape or cabled tied.<br>• The red bag with the limb is then placed into another 100 micron red bag and cable tied.<br>• The bag is then placed into a box set (size of the box set will depend of the body part).<br>• The box is then sealed with adhesive tape.<br>• The box must be clearly marked as anatomical waste products. The writing on the lid must be legible and clear to identify. (All anatomical waste is incinerated)<br>• Once the waste is placed into the transport vehicle it should not be handled again until it reaches the central storage collection point.<br><br>*PLEASE NOTE: THE WHOLE BOX GETS TAKEN AWAY FOR DESTRUCTION AND IS NOT RE-USED! These box sets are not designed to replace reusable waste receptacles.* |

**Assembling a Fibre Board Box Set**

Preparation plays an important role for assembling a box set. Incorrect preparation can lend itself to environmental risk and accidents.

1. Collect the correct size box for your area.
2. Put the box together and make sure all the open ends of the cardboard fibre have been sealed with adhesive tape.
3. Place the correct size red plastic liner into the box, making sure the outer edges of the box are covered (overlapping the plastic liner) over the outer rim of the base of the box. This will prevent soiling the cardboard rim.
4. To make the lid, apply the tape to the overlapping pieces securely.
5. Place the lid on the box and position it into the correct area for depositing the HCRW products.
6. The box must only be filled ¾ full.
7. Put on your PPE e.g. gloves and mask.
8. Turn your face away from the box but keep your eye on what you are doing.
9. When full, gather the liner together. The top of the liner is then ready to be closed securely with a cable tie.
10. The top of the red liner now presents with a handle for handling the bag.
11. The lid is placed onto the box.
12. Seal the outer rim of the lid with adhesive tape. No red inner liner should be showing. The box is now ready for collection. Place it in the designated collection area.

| CONTAINMENT - RIGID PLASTIC CONTAINERS | | |
|---|---|---|
|  |  | **Disposable** *(a.k.a. single-use or non-reusable)* **Sharps Container**.<br>**Examples of Sharps to be placed into the sharps container:-**<br>• needles, vials and ampoules<br>• scalpel blades<br>• stitch cutters<br>• disposable syringes<br>• razors<br>• amnio-hooks<br>• trochars<br>• any contaminated item that could puncture the red plastic bags or cardboard boxes.<br>**Rules when using all forms of sharps containers: -**<br>• never put hands into sharps containers<br>• never put sharps into waste bags or general bins<br>• never put healthcare general waste into sharps containers<br>• never throw your sharps into sharps containers, always place it carefully<br>• stabilize with suitable bracketry whilst in use<br>• never dispose of reusable sharps containers into a fibre box or likewise<br>• obey the fill line, and once full – close off correctly.Ensure sound stock control. |

| | | |
|---|---|---|
|  |  | **Red Specibins**<br>Red Specibin containers or similar alternatives are used to contain and store anatomical (a.k.a. pathological) waste which includes the following:<br>• placentas<br>• organs<br>• amputated limbs<br>• blood and blood products<br>• fetuses.<br>Anatomical waste should be pre-packaged before being placed into the container to minimize bodily fluid leakage or seepage.<br>The container must have an appropriate red bag liner sufficiently durable to hold the waste. The red inner bag containing the products must be closed with a cable tie before the lid is placed on the container. |
|  |  | **Green Specibins**<br>Green Specibins or similar alternatives are used for the containment of expired pharmaceuticals.<br>A registered pharmacist is responsible for the handling of the expired stock.<br>The handling, transportation and treatment of pharmaceuticals are highly regulated and there is a special standard operating procedure, which is to be followed.<br>*Note: Dark green bags used to be used, but it was noted that unsupervised bags could be easily accessed by unauthorized persons given how easy it is to tear a bag open, hence the move to rigid plastic containers which can be locked or sealed by way of cable ties or similar.* |

<table>
<tr>
<td> 
</td>
<td>  </td>
<td>Green Specibins<br>Green Specibins or similar alternatives are used for the containment of cytotoxic waste.<br>The appropriate hazard symbol and label must be applied to the container so that the contents are known.</td>
</tr>
<tr>
<td colspan="3">Rules for disposing of waste into bags and boxes:<br>• Do not discard general waste into the red bags or boxes.<br>• Do not place sharps into bags – use only the rigid plastic sharps container.<br>• Always use a cable tie to secure the bag when ¾ full. This will prevent waste from spilling out when being transported.<br>• Do not overfill bags and boxes – fill only ¾.<br>• The 142L box is designed for 15kg weight and for light health care risk waste.<br>• The 50L box set is designed for 7kg of HCRW.<br>• Avoid wetting the outer box as it will collapse.</td>
</tr>
</table>

# Annex D. Hazard Labeling

D.1 The international hazard labels for transportation should be in the form of a square set at an angle of 45 degrees (diamond-shaped) with minimum dimensions as given in the table below. A 100mm$^2$ label should have a line of the same colour 5mm inside the edges of the label and parallel with them. For labels of other sizes, the distance from the line to the edge shall be reduced or increased proportionately.

Table 5: Hazard Label Specifications

| Net contents of packaging[a] | Minimum size of label (mm) |
|---|---|
| **> 0.5** | **15 x 15** |
| **> 0.5 ≤ 5** | **20 x 20** |
| **> 5 ≤ 20** | **30 x 30** |
| **> 20** | **100 x 100** |
| A litres in the case of liquid or gas, and kilograms in the case of a solid substance | |

D.2 The hazard labels are divided into halves (see Annex A) with the exceptions of divisions 1.4, 1.5 and 1.6. The upper half of the label is reserved for the pictorial symbol and the lower half for text, class or division number and the compatibility group, as appropriate.

D.3 The colours of the hazard labels should visually match colour reference numbers (in case of a dispute, the NCS colours shall take precedence):

Table 6: Hazard Label Colour Referencing

| | |
|---|---|
| Orange | Pantone 151 or NCS S 0570-Y50R |
| Red | Pantone 192 or NCS S 0580-Y90R |
| Blue | Pantone 300 or NCS S 2065-B |
| Green | Pantone 361 or NCS S 1565-G |
| Yellow | Pantone 109 or NCS S 0570-G90Y |

# Annex. E Waste Transport Resources

## E.1 Transport Vehicle Spill Kit

Table 7: Transport Vehicle Spill Kit

**Recommended Vehicle Spill Kit**

| Item | Quantity* |
|---|---|
| **PPE** | |
| Elbow-length heavy-duty plastic gloves | |
| Dust Mask | |
| Protective Visors / Goggles | |
| Plastic Apron | |
| Gumboots | |
| First Aid Kit | |
| | |
| **Tools** | |
| Dustpan | |
| Long-handled Broom | |
| Forceps / Tweezers | |
| Chevron / Red-&-White Barrier Tape | |
| Orange Cones / Red Reflector Warning Triangles | |
| Red Flag (for waving down traffic) | |
| LED Torch | |
| Cylaume Light Stick | |
| | |
| **Spare HCRW Packaging / Containers** | |
| Sharps Containers | |
| Red Bags | |
| Cable Ties | |
| Black Permanent Marker | |
| | |
| **Cleanup / Decontamination Products** | |
| Suitable Disinfectant (ready-to-use) | |
| Absorbent Paper Towel or suitable alternative (absorbent product) | |
| Sand (for diesel or petrol spills) | |
| Jerry-can or suitable vessel filled with water (at least 10 litres). | |
| | |
| **Documentation** | |
| Emergency Response SOP | |
| Incident / Injury Report Form | |

**Quantity depends on size of vehicle and average daily waste load (quantity & type)*

## E.2 Waste Collection Document Example

Table 8: Waste Collection Document Example

# Waste Collection Document

**Waste Management Contractor's Letterhead and Details**

**Address:**

**Telephone Number:**

**Fax Number:**

| | |
|---|---|
| **Generator's Name:** | **Generator's Address:** |
| **Telephone Number:** | |
| **Fax Number:** | |
| **Cell Number:** | |

| **Date:** | **Driver's Name:** | **Order Number:** |
|---|---|---|

| **Shipping Name** | **UN No.** | **Hazard Class** | **Packing Group** | **Vehicle Registration No.** |
|---|---|---|---|---|
| *Health Care Waste* | *3291* | *6.2* | *II* | *SD 999 XX* |

**SPECIAL INSTRUCTIONS:**

| **COLLECTION:** | | | | | **DISPOSAL:** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ITEM** | **VOLUME** | **TYPE OF PACKAGING** | **QTY** | **TOTAL WGHT** | **ITEM** | **VOLUME** | **TYPE OF PACKAGING** | **QTY** | **TOTAL WGHT** |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |

| **GENERATOR'S CERTIFICATE** | **WARNING** |
|---|---|
| I hereby declare that the contents are properly described, packaged, marked and labeled before transportation in accordance with all relevant legislation. | Failure to comply in all respects with the regulations on the transportation of dangerous goods (refer to SEA) will constitute a criminal offence. |
| NAME:<br><br>SIGNED: | **TRANSPORTER'S ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS**<br><br>NAME:<br><br>SIGNED: |

**DESTRUCTION VERIFICATION**

**DISPOSAL**

| | |
|---|---|
| Received: | Disposed by: |
| Signature: | |
| Date: | Date: |

## E.3 General Procedures In Case Of Spills

1. **EVACUATE** the contaminated area of non-cleanup staff.
2. **DECONTAMINATE** the eyes and skin of exposed staff immediately. Provide **FIRST AID** and medical care to injured individuals.
3. **INFORM/COMMUNICATE** with the person designated to coordinate the necessary actions.
4. Determine the **NATURE** of the spill.
5. **SECURE** the area to prevent exposure of additional individuals.
6. Provide adequate **PROTECTIVE CLOTHING** to staff involved in cleaning up.
7. **LIMIT** the spread of the spill.
8. **NEUTRALISE or DISINFECT/DECONTAMINATE** the spilled or contaminated material based upon the type of spill (e.g. blood/biological agent v. chemical). A spill kit may be available. Spills can be managed by wiping with absorbent cloth. To minimize the spread of contamination, always wipe surfaces with the clean side of the cloth. Flip the cloth over to the clean side to continue wiping; the decontamination should be carried out by working from the least to the most contaminated part, with a change of cloth at each stage. Dry cloths should be used in the case of liquid spillage; for spillages of solids, cloth impregnated with water (acidic, basic or neutral as appropriate) should be used.
9. **COLLECT** all spilled and contaminated material. **SHARPS SHOULD NEVER BE PICKED UP BY HAND**: brushes and pans or other suitable tools should be used. Spilled material and disposable contaminated items used for cleaning should be placed in the appropriate waste bags or containers.
10. **RINSE** the area and wipe dry with absorbent cloths.
11. Decontaminate or disinfect any tools that were used.
12. Remove protective clothing and decontaminate or disinfect it if necessary.
13. **SEEK MEDICAL ATTENTION** if exposure to hazardous material has occurred during the operation.

***Note: The points above serve as an example. Based upon the nature of the hazards of the material spilled, more specific clean-up and decontamination may be necessary. Seek guidance from supervisory staff.***