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# WASTE MANAGEMENT STANDARD OPERATING PROCEDURES (SOPs)



# WASTE MANAGEMENT STANDARD OPERATING PROCEDURES

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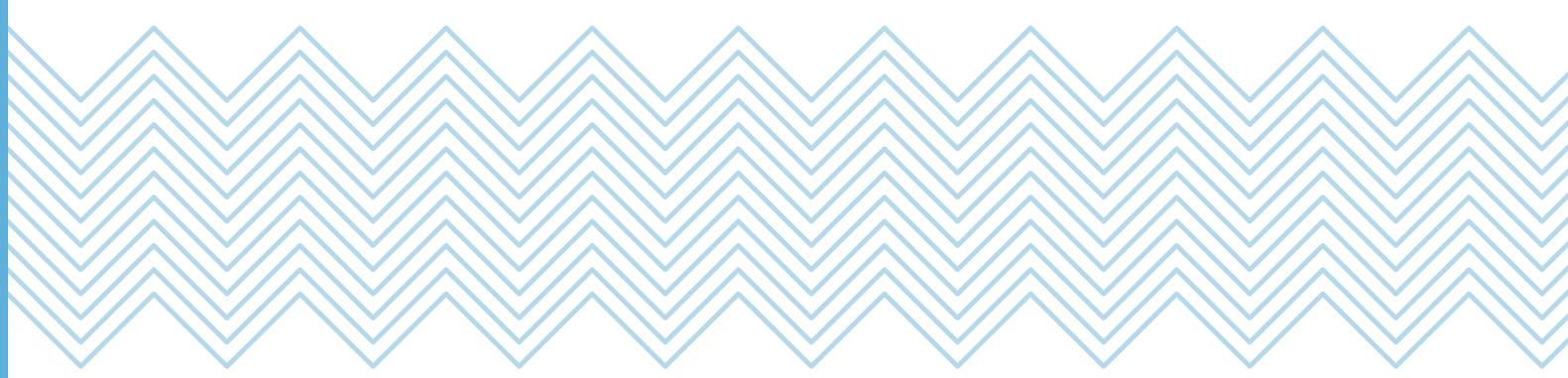
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Health care waste defines as infectious or physically dangerous medical or biological waste that because of its characteristics may cause, or significantly contribute to, an increase in mortality, or an increase in serious irreversible or incapacitating reversible illness; or pose a substantial present potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

In many countries, knowledge about the potential for harm from healthcare wastes has now become more prominent to governments, specifically with the vast volume of samples handled and tested during the COVID-19 pandemic. Managers and medical staff are expected to take more responsibility for the produced wastes from medical care and related activities within their respective settings. The indiscriminate and erratic handling and disposal of waste within healthcare facilities are now widely recognized as a source of avoidable infection as well as a synonymous of public perception for poor standards of health care.

Global Health Development| Eastern Mediterranean Public Health Network (GHD|EMPHNET) has long recognized the importance and the critical need for biosafety and biosecurity in the Eastern Mediterranean Region (EMR). In response, GHD|EMPHNET collaborated with the Libyan National Center for Disease Control (NCDC) to develop Standard Operating Procedures (SOP's) for medical waste management (MWM) to support the implementation of basic concepts in MWM.

These SOPs provide technical guidance to all personnel in biological laboratories that actively handle or manage biological agents and toxins.

This document describes procedures for medical waste collection, segregation, offsite transportation, safe treatment, and disposal.

On this occasion, I would like to thank the Libyan NCDC, MOH, and representatives from George Town University for their enormous efforts in developing and reviewing the materials especially with COVID-19 worldwide difficulties.



Executive Director  
**Dr. Mohannad Al- Nsour**



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# STANDARD OPERATING PROCEDURES (SOPs)

# Standard Operating Procedure (SOPs)

<b>Facility/Laboratory:</b>	
<b>SOP Title:</b> Collection and Segregation of medical Waste	
<b>Document Number:</b> 01	<b>Version Number:</b> 001
<b>Process Leader:</b>	<b>Effective Date:</b>
Other documents cross-referenced in this SOP (i.e., manuals, SOPs, forms, records):	

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## Collection and Segregation of Medical Waste

### 1. Definition

A waste-segregation system is used to separate different hazardous waste according to standard categories.

### 2. Scope

The scope of the document covers the collection and segregation of the generated medical waste and transport it to the on-site storage area.



### 3. Purpose

The purpose of the document is to ensure a safe segregation and storage of the solid medical wastes generated by the health facility.

### 4. Responsibilities

The correct segregation of health-care waste is the responsibility of the person who produces each waste item, whatever their position in the organization. The health-care facility management is responsible for making sure there is a suitable segregation, transport, and storage system, and that all staff adhere to the correct procedures.

### 5. Important definitions

- Medical waste: Solid or liquid wastes arising from medical health care activities such as diagnosing, monitoring, treating, or repairing disability in humans or animals, including related research conducted under the supervision of a health care provider or any other authorized person according to his professional qualifications.
- Non-medical waste (Household waste): All solid wastes that result from health activities and that do not contain hazardous or infectious waste and are similar in characteristics to household waste such as food waste, cans, paper, and others.
- Infectious waste: All medical waste defined by the medical practitioner as having the possibility of transferring infectious disease agents to humans or animals, including microbiological laboratory waste such as bacteriological cultures plates, viral and fungal laboratories waste, carcasses of sick animals and mortuaries, waste of infected patients in isolation departments and infectious waste in dialysis departments.
- Pathological waste: Pathological waste consists of tissues, organs, body parts, aborted fetuses, animal carcasses, blood, biological fluids, and pathogenic waste that can be recognized by the general public or medical health care personnel, and which for ethical reasons require special requirements.
- Sharps waste: All biomedical and health-care waste containing sharp instruments or pointed parts capable of causing wounds or penetrating the skin layer of the human body.
- Pharmaceutical waste: Waste generated from the production, preparation, and use of expired pharmaceutical products in all their forms.
- Chemical waste: Waste generated from the use of chemicals in sanitary procedures during sterilization, cleaning, and research operations. These wastes are characterized by one or more of the following characteristics: toxic, corrosive from acids and alkaline bases, flammable, volatile, and/or reactive.
- Radioactive waste: Any solid, liquid, or gaseous substance that is contaminated with radioactive isotopes resulting from the use of radionuclides in medicine or research,



and produced, for example, from nuclear medicine departments, radiological tests, and bacteriological procedures in laboratories.

- Genotoxic waste: Toxic cellular waste produced during the preparation of oncology treatments, and these wastes lead to severe problems related to safety, health, and the environment, whether inside or outside hospitals, they must be given special attention due to their seriousness.
- Heavy metal waste: Waste with a high content of heavy metals can be highly toxic, such as cadmium, lead, mercury, and silver.
- Compressed packs: Includes empty or damaged gas cylinders, cartridges and aerosols.

## 6. Sources of Medical Waste

### A. Primary sources

1. Hospitals of all kinds, such as university and central hospitals, and others.
2. Private clinics and centers, whether specialized or multidisciplinary.
3. Emergency services such as ambulance.
4. Dispensaries and primary health centers specialized in vaccinations.
5. First aid.
6. Pharmacies.
7. Blood banks.
8. Military medicine services.
9. Medical analysis laboratories.
10. Medical research institutions and centers.
11. Animal research centers and veterinary colleges and laboratories.
12. Elderly Care Center.
13. Departments of nuclear medicine.
14. Centers for the disabled and people with special needs.
15. Small dental clinics.
16. Pharmaceutical factories.
17. Cupping centers.
18. Stores and warehouses of medicines.

### B. Secondary sources

1. Separate and used doctors' offices for routine examination of patients.
2. Psychiatric clinics.
3. Home treatment.
4. Beauty centers.
5. Offices to provide health services.
6. Medical waste disposal companies.
7. Any other medical sources.



## 7. Medical waste collection

Proper medical waste collection entails the following conditions:

- A. Organizing the methods of collecting medical waste bags and containers and transporting them to the temporary collection point daily.
- B. To ensure safety and avoid danger, a unified classification system must be followed for marking and coding waste containers, in accordance with Annex 1.
- C. Providing male and female workers with personal protective clothing and tools necessary for the process of collecting medical waste (bags and boxes for medical waste) in addition to the materials used for cleaning and sterilization.
- D. Waste of communicable diseases departments, medical laboratories and the like must be sterilized from the source before being transported to the collection point.

## 8. Conditions to be met at the staged collection point (storage area)

### A. The staged collection point must meet the following conditions:

- 1. The size of the area shall be in agreement with the volume of waste produced in the facility.
- 2. The storage area is separate and far from the supply room or food preparation areas.
- 3. Be easy to access by health-care cleaners in the facility.
- 4. Its floor is solid, easy to clean and sterilize, with proper water sources and sewage facility.
- 5. It is a closed area and unauthorized persons are not allowed to enter.
- 6. It should be easily accessible to waste transport vehicles outside the health facility.
- 7. Animals such as dogs, cats, birds, and insects such as mosquitoes, etc. cannot reach them.
- 8. It should have good lighting and ventilation, and it should be provided with an air-conditioning device suitable for the temperature (15-18 °C).
- 9. It should be close to the room that contains the materials and means of cleaning (the housekeeping room).
- 10. If it is known to everyone as a staged collection point for hazardous and infectious wastes, it is indicated by the internationally recognized marks.
- 11. It is prohibited to store any materials other than waste at the temporary storage area.
- 12. The floor, walls and surfaces must be cleaned and sterilized regularly.

### B. Health facilities with low absorptive capacity, unless there is daily collection, temporary storage of infectious and biological waste may be carried out as follows:

- 1. Waste shall be stored in cooled places, provided that the temperature ranges



between 2-8 °C, taking into account placing warning signs on places, provided that the storage periods are as follows:

- a. A maximum of 72 hours in the winter.
  - b. A maximum of 48 hours in the summer.
3. Waste can be stored in places with freezing temperatures, provided that the freezing temperature is less than (-5 °C), taking into account placing warning signs on places and freezers, provided that the storage period does not exceed one week.

## 9. Medical waste sorting (system of segregation)

To ensure an efficient medical waste sorting system is in place, the directors of a health facility must ensure the following:

- A. Coordination with the director of the health facility and administrative affairs departments to ensure that all medical and paramedical staff and nursing staff understand and are aware of their responsibilities towards the process of sorting and classifying medical waste at the places of production in the “source” sections of the initial treatment and ensuring that it is not mixed with the general waste (household waste) of the health facility.
- B. Ensure that collection workers and cleaners are not involved in the sorting process of medical waste and that their task is only to collect and transport waste, to reduce accidents that may result from their lack of full knowledge of the types of such waste.

## 10. Separation of medical waste

- A. Separation is the process of separating medical waste from household waste inside health facilities. It is the effective management of medical waste. It ensures that the correct disposal methods are taken, that the safety of workers is taken into account, and that environmental damages are kept to a minimum.
- B. The producers must separate and collect medical waste in accordance with what is stipulated in this regulation for the specific requirements, provided that this process is carried out on the basis of the types of waste listed in the definitions section to this policy.
- C. The separation process must be applied from the point of waste generation through all the waste streams to the final disposal.
- D. Separated waste from the waste categories should be collected in easily identifiable plastic bags and containers according to the recommendation concern of colors coded and types of bags and plastic containers.



## 11. Medical waste collection master rules

- A. The medical waste collection unit is responsible for the medical waste management unit within the health facility.
- B. Waste must be collected daily from the laboratory and medical wards and transported to the temporary collection point.
- C. No type of bags should be transported without the international biohazard signs, which shows the type of waste and the place of its production.
- D. After completing the collection of medical waste, it must be kept at the interim (temporary) storage area, pending its transportation for the purpose of treatment and final disposal.

## 12. References

- Safe management of wastes from health-care activities world health organization
- Preparation of National Health-Care Waste Management Plans in Sub-Saharan Countries (Guidance Manual) Secretariat of the Basel Convention and World Health Organization

## ANNEX 1: Types of Waste Containers and Bags

- **Red Bag** - Syringes (without needles), soiled gloves, catheters, IV tubes etc. should be all disposed of in a red colored bag, which will later be incinerated.



- **Yellow Bag** - All dressings, bandages and cotton swabs with body fluids, blood bags, human anatomical waste, body parts are to be discarded in yellow bags.



- **Cardboard box with blue marking** - Glass vials, ampules, other glass ware is to be discarded in a cardboard box with a blue marking/ sticker.



- **White Puncture Proof Container (PPC)** - Needles, sharps, blades are disposed of in a white translucent puncture proof container.



- **Chemotherapy Sharps Container** - Cytotoxic and Genotoxic Waste include chemotherapy needles, syringes, iv catheter, sutures, broken glasses & scalpels

- **Black Bags** - These are to be used for non-biomedical waste. In a hospital setup, this includes stationary, vegetable and fruit peels, leftovers, packaging including that from medicines, disposable caps, disposable masks, disposable shoe-covers, disposable teacups, cartons, sweeping dust, kitchen waste etc.



Waste bags should be supported in bins in matching color to minimize damage and retain spillage. See chart below for biomedical waste segregation:

## IMAGE Bio-Medical Waste Segregation Chart

Category	Type of Waste
<p><b>YELLOW</b></p> 	<ul style="list-style-type: none"> <li>• Post Operative Body Parts</li> <li>• Placenta</li> <li>• Plaster of Paris (POP)</li> <li>• Pathological Waste</li> <li>• Cotton Waste</li> <li>• Dressing Materials</li> <li>• Beddings</li> <li>• Body Fluid Contaminated Paper and Cloth</li> <li>• Face Mask, Cap</li> <li>• Cytotoxic, Expired &amp; Discarded Medicines</li> <li>• Microbiology, Biotechnology Lab Waste</li> </ul>
<p><b>RED</b></p> 	<ul style="list-style-type: none"> <li>• Syringe with out needles</li> <li>• I.V.Set</li> <li>• Catheters</li> <li>• Gloves</li> <li>• Urine Bag</li> <li>• Dialysis Kit</li> <li>• IV Bottles</li> </ul>
<p><b>WHITE (Translucent)</b></p> 	<ul style="list-style-type: none"> <li>• Needles</li> <li>• Syringes with fixed needles</li> <li>• Blades</li> <li>• Scalpels</li> </ul> <p><small>* Use 1% Hypo Chloride Solution for disinfecting Glass &amp; Metal Sharps</small></p>
<p><b>BLUE</b></p> 	<ul style="list-style-type: none"> <li>• Glass             <ul style="list-style-type: none"> <li>- Broken Glass</li> <li>- Ampoules</li> <li>- Lab Slides</li> </ul> </li> <li>• Metals             <ul style="list-style-type: none"> <li>- Nails</li> <li>- Metallic Body Implants</li> <li>- Scissors</li> </ul> </li> </ul> <p><small>* Use 1% Hypo Chloride Solution for disinfecting Glass &amp; Metal Sharps</small></p>

# Standard Operating Procedure (SOPs)

<b>Facility/Laboratory:</b>	
<b>SOP Title:</b> Medical Waste off site transportation	
<b>Document Number:</b> 01	<b>Version Number:</b> 001
<b>Process Leader:</b>	<b>Effective Date:</b>
Other documents cross-referenced in this SOP (i.e., manuals, SOPs, forms, records):	

Revision Number	Sections Changed	Description of Change	Date	Approved By

## Off-site Transportation of Health-Care Waste

### 1. Definition

Off-site transport is the carriage of health-care waste (HCW) away from a health-care facility (HCF).

### 2. Scope

The scope of the document covers the collection of the generated medical waste from the point of collection at the health facility to the contractor treatment facility. Off-site transportation is required when hazardous HCW is treated outside the HCF. The transportation of liquid wastes is not addressed in this document.



### 3. Purpose

The purpose of the document is to ensure a safe off-site transportation of the solid medical wastes generated by the health facility to the contractor treatment facility.

### 4. Responsibilities

- A. The waste generator is responsible for the proper packaging and labelling of the containers that are transported.
- B. The contractor is responsible for providing all labor, tools, materials, supplies, equipment, supervision and personnel required to transport medical waste. The contractor shall adhere to these requirements in accordance with all terms, conditions, provisions, schedules, and specifications of this SOP, in addition to all local regulations and guidelines.
- C. Transporting staff should ensure that the following points are met before transporting waste:
  - 1. The staff handling waste must use PPE.
  - 2. The bags must be at a maximum  $\frac{3}{4}$ th full.
  - 3. The waste bag is tied up, and may be put in a larger bag of the same color with an appropriate label.
  - 4. The label must at least contain the following information: Date, Area, Floor, and Unit Shift.
  - 5. In case any bags have a cut or tear, ensure that double bagging is done before moving it.
- D. The housekeeping staff is to ensure that:
  - 1. All bags are tied when being transported and there is no spillage or leakage (In case of spill, refer to Infection Control Policy of the hospital).
  - 2. Weighing done at the central area and weight mentioned on a register maintained for this purpose.
  - 3. When the container/bags are to be transported from the premises where the bio-medical waste is generated to the authorized waste treatment facility outside the premises, the container/bag should be labeled accordingly and carry all necessary information.
  - 4. At the time of collection of bio-medical waste by the contracted waste removal agency, security supervisor or housekeeping supervisor must be present and ensure that there is no mixing of different types of waste.

### 5. Vehicle requirements

A fundamental requirement is for the vehicle transporting hazardous waste to be roadworthy and labelled to indicate its load, and its payload to be secured to minimize the risk of accidents



and spillages. Any vehicle used to transport health-care waste should fulfil several design criteria:

- A. The body of the vehicle should be of a suitable size commensurate with the design of the vehicle.
- B. There should be a bulkhead between the driver's cabin and the vehicle body, which is designed to retain the load if the vehicle is involved in a collision.
- C. There should be a suitable system for securing the load during transport.
- D. Empty plastic bags, suitable protective clothing, cleaning equipment, tools, and disinfectant, together with special kits for dealing with liquid spills, should be carried in a separate compartment in the vehicle.
- E. The internal finish of the vehicle should allow it to be steam-cleaned and internal angles should be rounded to eliminate sharp edges to permit more thorough cleaning and prevent damage to waste containers.
- F. The vehicle should be marked with the name and address of the waste carrier.
- G. An international hazard sign should be displayed on the vehicle and containers, as well as an emergency telephone number.

## 6. Staff (Drivers)

Logistic staff drivers of vehicles carrying hazardous health-care waste should have appropriate training about risks and handling of hazardous waste.

- A. Training on the following issues should be included:
  - 1. Relevant legal regulations.
  - 2. Waste classifications and risks.
  - 3. Safe handling of hazardous waste.
  - 4. Labelling and documentation.
  - 5. Emergency and spillage procedures.
- B. Drivers must abide by the following requirements:
  - 1. The driver should be provided with details of the waste being carried.
  - 2. Vehicles or containers used for transporting health-care waste should not be used for transporting any other material.
  - 3. Vehicles should be kept locked at all times, except when loading and unloading, and kept properly maintained.

## 7. Cleaning of container and vehicle

- A. Vehicles and transporting containers used for the transportation of waste should be cleaned and disinfected daily after use.
- B. Mechanical cleaning, combined with soaps and detergents, which act as solubility promoting agents, can be used.
- C. Cleaning and disinfection have to be carried out in a standardized manner or by



automated means that will guarantee an adequate level of cleanliness.

- D. A standard operating procedure for cleaning should be prepared and explained to cleaning staff.
- E. A schedule for preventive maintenance should be set up for all equipment and vehicles used in the transportation process.

## 8. Transport documentation

Before sending hazardous health-care wastes off-site, transport documentation (commonly called a “consignment note” or a “waste tracking note”) should be prepared and carried by the driver. A consignment note should be designed to take into account the control system for waste transportation in operation within a country.

The consignment note should include the following information in case of accidents or official inspection:

- A. Waste classes
- B. Waste sources
- C. Pick-up date
- D. Destination
- E. Driver name
- F. Number of containers or volume and weight
- G. Receipt of load received from responsible person at pick-up areas.

On completion of a journey, the transporter should complete a consignment note and return it to the waste producer.

## 9. References

- Safe management of wastes from health-care activities world health organization
- Preparation of National Health-Care Waste Management Plans in Sub-Saharan Countries (Guidance Manual) Secretariat of the Basel Convention and World Health Organization

# Standard Operating Procedure (SOPs)

<b>Facility/Laboratory:</b>	
<b>SOP Title:</b> Medical waste treatment and disposal	
<b>Document Number:</b> 01	<b>Version Number:</b> 001
<b>Process Leader:</b>	<b>Effective Date:</b>
Other documents cross-referenced in this SOP (i.e., manuals, SOPs, forms, records):	

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## Waste Treatment and Disposal

### 1. Instruction

A local waste management plan for the treatment and disposal of biohazardous waste should be developed. Standard operating procedures (SOPs) should include safe work procedures for waste handling and segregation, spill management, training of staff, and regular review and update of the waste management plan. All contaminated materials, solid or liquid, must be decontaminated before disposal or reuse. When treated correctly, waste materials are rendered non-infectious and may be discarded, either through the sewage in the case of liquids, or through the regular garbage disposal in the case of solid wastes.

## 2. Scope

The scope of the document covers the collection of the generated medical waste from the point of collection at the health facility to the contractor treatment facility. Off-site transportation is required when hazardous HCW is treated outside the HCF. The transportation of liquid wastes is not addressed in this document.

<b>SOP Title:</b> Collection and Segregation of medical Waste	
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Disposal occurs off-site, at a location that is different from the site of generation. Treatment may occur on-site or off-site. On-site treatment of large quantities of biohazardous waste usually requires the use of relatively expensive equipment and is generally only cost-effective for very large hospitals and major universities that have the space, labor, and budget to operate such equipment. Off-site treatment and disposal involve the hiring of a biohazardous waste disposal service whose employees are trained to collect and haul away medical waste in special containers for treatment at a facility designed to handle medical waste.

## 2. Scope

This SOP applies to all laboratory personnel who work within the clinical, public, and animal health laboratories in Libya.

## 3. Purpose

The purpose of this document is to establish the procedures for treatment, handling, and disposing of medical waste generated in laboratories and health facilities to ensure proper final disposal and the protection of personnel, environment, and community from potential contamination and/or exposure to hazardous biomaterials.

## 4. Responsibilities

It is the responsibility of a unit's manager and workers to develop suitable procedures for treating the biohazardous waste it produces, bearing in mind that each unit has unique requirements and problems. The method used in each lab should be proven effective in that lab.

### A. Facility management team responsibilities

1. Provide the waste treatment equipment, fuel, and operational budget.
2. Provide vaccinations for the incinerator operators.

- 
3. Ensure there is adequately trained manpower.

**B. Waste management officer responsibilities:**

1. Ensure that healthcare waste is segregated, stored, and transported to the treatment facility before disposal.
2. Secure site and final disposal of ash.
3. Monitor waste emissions and residue.

**C. Waste handler responsibilities**

1. Remove waste from generation points and transport it to the incinerator site.

**D. Operator responsibilities**

1. Operate the incinerator, autoclave, shredder and maintain records of waste treated and disposed.
2. Ensure proper maintenance of sanitation within the area.
3. Report any malfunctions of the incinerator or Autoclave to the maintenance officer.

## 5. Procedure

There are a number of different treatment options to deal with medical waste. These are listed below:

**1. Autoclave**

**A. Possible Risks**

1. Substantial heat and pressure generated by the autoclave.
2. Heat from steam, hot liquids, and other materials (including containers, the autoclave chamber and door).
3. Falling items e.g., heavy containers of waste being put into/removed from autoclave.
4. Failed treatment cycle and inclusion of untreated waste that may cause contamination to workers and environment.
5. Broken glassware that has been placed in bags rather than puncture-proof containers.
6. Possible explosion of the autoclave.

**B. Safety Instructions**

1. Never autoclave materials that contain toxic agents (e.g., disinfectants), corrosives (e.g., acids, bases, bleach, phenol), solvents or volatiles (e.g., ethanol, methanol, acetone, chloroform), or radioactive materials.
2. Train the operators on equipment safety measures e.g., potential burn hazard, emergency switch, safety valves, electrical isolators, and the use of fire extinguishers.



### C. Materials and Equipment

1. Autoclave containers/bins
2. Autoclave bags
3. Autoclave tape
4. Biological indicators
5. Personal protective equipment (PPE)
6. Rubber gloves for handling cool waste and other potentially infectious materials
7. Safety shoes/boots
8. Logs, Records and Forms

### D. Autoclave operation

1. Wear appropriate PPE (gum boots, overall, gloves, safety glass).
2. Perform routine equipment checks.
3. Prepare waste for autoclaving
  - a. Check state of waste bag: closed, not overfilled or damaged, labeled no sealed bottles.
  - b. Bag should be closed by autoclave tape (test strip) to confirm sterility after autoclaving
  - c. Record the weight / number of safety boxes and bags to be treated and log in the operation log
4. Prepare the autoclave
  - a. Turn on the power switch.
  - b. Add deionized water into the water container (Chamber)
  - c. Set sterilizing temperature and time
5. Load the waste
  - a. Put the waste bags into the loading bins.
  - b. Add Bio indicator in the load.
  - c. Put the baskets/loading bin into the autoclave chamber.
  - d. Close the autoclave.
  - e. Record the time when Sterilization begins.
  - f. Record the pressure readings in the operation log.
  - g. Record the time when sterilization stops.
  - h. Allow Aeration/cooling of the autoclave after sterilization is complete.
  - i. Wait until pressure gauge falls to zero.
6. Unload the waste
  - a. Wear heat-insulating gloves, eye protection, lab coat, and closed-toe shoes.
  - b. Ensure that the cycle has completed and both temperature and pressure have returned to a safe range.
  - c. Stand back from the door as a precaution and carefully open door no more



than 1 inch. This will release residual steam and allow pressure within liquids and containers to normalize.

- d. Allow the autoclaved load to stand for 10 minutes in the chamber to allow steam to clear and trapped air to escape from hot liquids.
- e. Remove items from the autoclave.

#### **E. Documentation**

1. Autoclave Operation Log – for recording operation procedures, each cycle must be recorded.
2. Autoclave Validation Log – for recording when each validation of the autoclave was conducted.

### **2. Incinerator**

#### **A. Possible risks**

1. Burns – The incinerator operator must follow operation guidelines and wear appropriate PPE (Leather Gloves).
2. Spillages – Spillage of health-care waste may occur when loading the waste in the incinerator. Spill kit and training on management on spillages must be provided at incineration area.
3. Explosions – Care must be taken to ensure explosive materials are not incinerated.
4. Smoke and fumes – Incineration produces smoke and fumes; therefore, the Incinerator operator must be provided with adequate and recommended PPEs at all-time i.e., fume masks.

#### **B. Materials and Equipment**

1. Personal Protective Equipment (PPE)
2. Incinerator Burn log
3. Maintenance Records and registers

#### **C. Pre-Operation**

1. Check the maintenance log in case a previous user has experienced a problem that will prevent the incinerator being used as usual.
2. Check that the Incinerator Logs (Daily and Monthly) are up to date and record any new data relevant to the upcoming run including the amount and type of waste to be incinerated.
3. Don PPE before handling any waste or performing maintenance. Avoid contamination during donning of PPE.
4. Check that enough fuel is available for operating the incinerator.
5. Perform any routine maintenance checks and record the results in the maintenance log.
6. Remove any ash from the incinerator combustion chamber.
7. Rake ash into a heat-proof, puncture-proof container.

8. Dispose the ash in the ash pit or package and label appropriately for of site disposal.

**D. Before burning of waste**

1. Preheat the incinerator for 20-30 minutes or as per the manufacturer's instructions.

**E. Loading the waste**

1. Load one-quarter of the incinerator's hourly capacity every 15 minutes. Poke the waste before additional loading.

**F. Monitoring the combustion process**

1. Do not leave the incinerator unattended during operation.
2. Monitor the following:
  - a. temperature
  - b. air inlet
  - c. fuel injection
  - d. clogging of the flume throughout the combustion process.
3. Monitor the color of the smoke emitted at the chimney.

**Note:** The following materials should NOT be incinerated: chemical residues, genotoxic and radioactive waste, inorganic compounds, pressurized containers, halogenated plastics, and waste with high content of heavy metals.

**G. Incineration**

1. Add the last load batch and burn for 30 minutes.
2. Turn off the burners and leave the blower fans running for at least one hour.
3. Shut off the fuel supply and allow the fire to die down.
4. Do not leave the incinerator until the fire has died down completely.
5. Ensure that the area is clean and that all materials, including PPE, are cleaned, and put away at the end of the day.
6. Take a bath before leaving work.

**F. Documentation**

1. Record all incineration activities in an Incinerator Burn Log, these should include:
  2. The type of waste treated
  3. quantities (in kg)
  4. operating temperatures
  5. incineration time

**3. Shredding**

1. Waste Shredder- This is a machine used to break large waste particles before disposal.

**A. Pre-operational safety checks**

- 
1. Check all bolts and screws for proper tightness to ensure the machine is in safe working condition.
  2. Ensure all guards are fitted, securely attached and functional.
  3. Never operate without the shredder hopper, chipper chute, or discharge chute properly attached to the machine.
  4. Be familiar with all controls and their proper operation.
  5. Faulty equipment must not be used, report suspected faulty machinery immediately.

## **B. Shredder Operation**

1. Wear PPE (Helmet, Goggle/face shields, respirators, Overall, Apron, Protective gumboots).
2. Perform daily clean up procedures in the Shredder room.
3. Perform daily maintenance checks.
4. Make sure there are no people in the shredder room.
5. Turn the main power switch "ON". Turn the control power switch on. The screen should turn RED.
6. The screen will read "MCR not Reset". Press the "MCR ON RESET" button in the control panel. This will turn on the Master control relay. If the relay button does not turn on, make sure the Emergency STOP button at the control panel is pulled out.
7. Press and Hold the Shredder Start/RUN button. A warning horn will sound for 5 seconds, at the end of the 5 seconds the shredder will start. (The knives will run anticlockwise for 5 seconds to clear any debris in the knives then it will run normally).
8. Load the Shredder:
  - a. To load the Shredder, use the tipper system. Do not load the shredder by hand.
  - b. Ensure the power supply to the tipper is on and the Emergency stop button is pulled out.
  - c. Turn "ON" the start button at the control panel.
  - d. Wheel the trolley/Aluminum bin to the loading cart.
  - e. Use the lever to dump the waste by "PULL UP" and "PULL DOWN"
  - f. To continue loading, feed the shredder steadily.

## **C. Stopping the shredder**

1. Stop feeding the shredder.
2. Keep running the shredder until the cutting chamber, discharge chutes and conveyer belts are empty.
3. Press the "STOP" button on the control panel.
4. Remove the shredded waste and pack to liners ready for final disposal.
5. Remove the PPE, clean and perform personal hygiene.

6. Secure the area and leave.

#### D. Documentation

1. Use the Shredder Operation Log

## 6. Healthcare waste disposal

### A. Open dumps

1. Health-care waste should not be deposited on or around open dumps. The risk of either people or animals coming into contact with infectious pathogens is obvious, with a further risk of subsequent disease transmission, either directly through wounds, inhalation, or ingestion, or indirectly through the food chain or a pathogenic host species.

### B. Sanitary landfills

It is the most preferred method of disposing treated medical wastes.

- Essential elements for designing and operation of sanitary landfills include:
  1. Access to site and working areas possible only for waste delivery and site vehicles.
  2. Presence of site personnel capable of effective control of daily operations.
  3. Organized deposit of wastes in a small area, allowing them to be spread, compacted, and covered daily.
  4. In the absence of sanitary landfills, any site from a controlled dump sites could accept health-care waste and avoid any measurable increase in infection risk.
- It is further recommended that health-care waste be deposited in one of the following ways:
  1. In a hollow excavated in the municipal waste area and immediately covered by a 2-metre layer of the municipal waste. (Scavenging in this part of the site must be prevented).
  2. In Libya, in compliance to Islamic religion, human organs and blood products are collected from different departments, transported to the graveyard, and buried.

**Note:** Before health-care wastes are sent for disposal, it is prudent to inspect landfill sites to ensure that there is sensible control of waste deposition.

## 7. Waste disposal recording

Appropriate records of waste disposal must be kept by the waste generator for a period of at least three years as follows:

- A. Name, address, and license number of the authorized contractor.
- B. Copy of agreement for waste disposal.
- C. Accurate identity of waste type and advice to authorized contractor of details for each load; date of collection; receipt of waste disposal or incineration from the authorized contractor for each load.



## 8. References

- World Health Organization; Treatment and disposal technologies for health-care waste
- PATH 2010: The incinerator guidebook: A practical guide for selecting purchasing, installing operating, and maintaining small scale incinerators in low resource settings
- World Health Organization; Small-scale incinerators for health-care waste. WHO/SDE/WSH/04.07. World Health Organization, Geneva, [http://www.who.int/water\\_sanitation\\_health/medicalwaste/smallincinerators/en/](http://www.who.int/water_sanitation_health/medicalwaste/smallincinerators/en/)

