THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN

NATIONAL STANDARDS AND PROCEDURES FOR HEALTH CARE WASTE MANAGEMENT

DECEMBER, 2017

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ABBREVIATIONS

BAT	Best Available Technologies
BEP	Best Environmental Practice
CBOs	Community Based Organizations
CHMT	Council Health Management Team
CTF	Central Treatment Facility
DPD	Diethyl-p-phenylenediamine
FBOs	Faith Based Organizations
HBV	Hepatitis B virus
HCF	Healthcare Facility
HCRW	Healthcare Risk Waste
HCV	Hepatitis C virus
HCW	Healthcare Waste
HCWM	Healthcare Waste Management
HEV	Hepatitis E virus
HFC	Health Facility Committee
HIV/AIDS	Human Immunodeficiency Virus/Acquired-Immune Deficiency Syndrome
HSSP	Health Sector Strategic Plan
ICT	Information Communication Technology
IPPC	Integrated Pollution Prevention and Control
JHPIEGO	Johns Hopkins Program for International Education in Gynecology and Obstetrics
LGAs	Local Government Authorities
MOHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MSW	Municipal Solid Waste
MWI	Medical Waste Incinerator
NEAP	National Environmental Action Plan
NEMC	National Environment Management Council
NGOs	Non-Governmental Organizations
NSGRP	National Strategy for Growth and Reduction of Poverty
NHWMP	National Healthcare Waste Management Plan
OSHA	Occupational Safety and Health Authority
PCBs	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzo Dioxins
PCDF	Polychlorinated Dibenzo Furans

PE	Public Enterprise
PEP	Post-Exposure Prophylaxis
PORALG	President's Office - Regional Administration and Local Government
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PTS	Persistent Toxic Substances
QITs	Quality Improvement Teams
RHMT	Regional Health Management Team
TA	Technical Assistance
TAEC	Tanzania Atomic Energy Commission
TFDA	Tanzania Food and Drugs Authority
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UPOPs	Unintended Persistent Organic Pollutants
VPO – DoE	Vice President's Office – Department of Environment
WHO	World Health Organization

DEFINITION OF TERMS

Chemical waste: Waste containing chemical substances from laboratory; film developing process; used and expired disinfectants that are or no longer needed; solvents; waste with high content of heavy metals, e.g. batteries; broken thermometers and blood pressure gauges.
Cosmetics: Means any article intended to be used by means of rubbing, pouring, steaming, sprinkling, spraying on or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness or altering the appearance and includes any article intended for use as component of a cosmetic; such articles exclude articles intended besides the above purposes for use in the diagnosis, treatment or prevention of diseases and those intended to affect the structure or any function of the body;
Contamination: Means the **c**ontact with blood, body fluid, or other potentially infectious materials on an item or surface.
Disinfection: A process of reducing or killing micro-organisms by the use of chemicals, heat or UV light.
Environmental Health Practitioner: Means any officer duly qualified in environmental health sciences and registered under the Environmental Health Practitioners (Registration) Act, 2007
Genotoxic waste: Waste containing cytostatic drugs, vomit, urine or faeces from patients treated with cytostatic drugs, chemicals and radioactive material.
Healthcare worker: Any healthcare professional working in a healthcare facility including non-clinical staff.
Healthcare facility: Means a hospital, a health centers, a dispensary, a clinic, a nursing home,, a health post, and other health related facility.
Healthcare waste: Means waste generated from healthcare facilities, research centers, saloons and veterinary centers; including infectious waste, pathological waste, sharps, pharmaceutical waste, Genotoxic waste, radioactive waste, coagulated blood waste and expired medicines, drugs and cosmetics.
Human Remains: Means a body of a deceased person in whole or in parts regardless of its stage of composition.
Infectious waste: means any waste that contain pathogen in sufficient quantity to pose a serious threat to public health, such as cultures from laboratories, waste from surgeries and autopsies on patients with infectious diseases, waste from patients in isolation wards or undergoing hemodialysis and waste associated with infected animals.
Non-infectious waste: Waste of similar in nature to domestic and office waste like kitchen waste, food remains, office papers and packaging materials and any other items that can be scavenged.

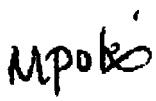
Pharmaceutical waste: These include expired, unused, spilt and contaminated pharmaceutical products, prescribed and proprietary drugs, vaccines and sera that are no longer required, and, due to their chemical or biological nature, need to be carefully disposed of.
Proximity Principle: Means the principle of treating and disposing of waste as close as possible to the point of generation.
Radioactive waste: These are materials contaminated with radionuclides substances produced as a result of procedures such as in vitro analysis of body tissue and fluid, in vivo organ imaging and tumor localization, and various investigative and therapeutic practices.
Saloon: includes a barber shop, hair dressing saloon, beauty saloon, pedicure, massage centre and any other premises used for the related purposes.
Sanitary Landfill: An engineered method of disposing of solid waste on land in a manner that protects the environment; by spreading the waste in thin layers, compacting it to the smallest practical volume, covering it with soil by the end of each working day, constructing barriers to infiltration, and evacuating the gases produced.
Sharps: Means objects or devices having sharp points or protuberances or cutting edges capable of piercing the skin or having potential to cause harm.
Sterilization: The process of total destruction of all micro-organisms achieved by physical or chemical means.
Waste disposal: Intentional burial, deposit, discharge, dumping, placing or release of any waste material into or on any air, land or water. In the context of radioactive waste management, disposal means the placement of waste in an approved, specified facility (e.g. near-surface or geological repository) or the approved direct discharge of effluents into the environment. Disposal is undertaken without the intention of retrieval.
Waste treatment: Any method, technique or process for altering the biological, chemical or physical characteristics of waste to reduce the hazards it presents and facilitate, or reduce the costs of, disposal. The basic treatment objectives include volume reduction, disinfection, neutralization or other change of composition to reduce hazards.
Waste management system: All administrative and operational activities involved in the generation, segregation, collection, storage, transport, treatment, and disposal of waste generated by healthcare facilities.

FOREWORD

Healthcare services provision is the genesis of health care waste generation. Health care waste carries a higher potential for causing infection and injury compared to other types of waste. Inadequate and inappropriate healthcare waste management (HCWM) may result into serious public health consequences including pollution of the environment. The effects to health associated with exposure to healthcare waste varies from minor injuries to getting serious infections such as HIV, Hepatitis B and other blood-borne infections. According to the World Health Organization (WHO), the risk of HIV and HBV due to exposure to sharps is estimated to be 0.3% and 30% respectively. The risk of acquiring diseases is even higher in scavengers who frequent dumps without wearing the necessary protective gears. Pollution of air, water and environment in general caused by inappropriate burning and indiscriminate disposal of health care waste has been known to be one of the major causes of chronic diseases such as cancer among exposed population.

This advancement of services in the health care delivery system in Tanzania, has led to an increased generation of HCW that was not addressed previously. It is in this regard that the MOHCDGEC has taken its position to review and develop new National Standards and procedures for health care waste that will be used by Local Government Authorities (LGAs), health care facilities, and implementers to promote proper management of health care waste. To achieve an effective health care waste management system requires a multi-sector approach, collaboration and involvement of stakeholders at all levels of the health care delivery system that is National, Zonal, Regional, Council and Community. These standards and procedures coupled with a legal framework, training of personnel, and raising public awareness are essential elements of a successful health care waste management system. To-date, health care waste management is growing in demand in the health facilities and it is in this vein that it should become an integral feature in planning of health care service delivery system in Tanzania.

It is expected that this document will create uniformity in approaches, and restore the state of the art for health care waste management across the country. I am certain that everyone involved in HCWM will benefit substantially from using this document



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Prof. Muhammad Bakari Kambi
CHIEF MEDICAL OFFICER

CHAPTER ONE: INTRODUCTION

1.0 Background

Tanzania is facing the challenge of adequately managing waste from healthcare services. The growing numbers of healthcare facilities and increased complexity of health services particularly in urban areas brings up new challenges despite notable progress made in standardization of Healthcare Waste Management (HCWM) policy and practice in the country. The National Health Policy requires the establishment of a network of healthcare facilities within a distance of four kilometers or provides a dispensary in every village. With 7,618 HCFs currently operational (MOHCDGEC - HFR , 2017), the government is struggling to achieve this goal. Improvement in approaches, materials, as well as technology is necessary to mitigate health and environmental risk posed by HCW from these facilities.

The use of healthcare waste incinerators is rapidly expanding and their uses have been vital managing infectious waste. However, incinerators are incriminated for discharges of harmful by-products into the atmosphere (Stewart-Pinkham, 1989). Many of these by-products are toxic and bio accumulative, presenting risk of chronic health effects (Takata, 2003). These concerns are emerging in Tanzania as much as in other developing countries where little has been done to determine airborne concentrations of the chemical pollutants emanated from combustion of HCW.

Of specific concern are the group of Unintended Persistent Organic Pollutants (UPOPs), the mitigation of which is now an agreed global action for all parties to the global health and environment conventions. Persistent organic pollutants, such as dioxins, furans and mercury, can be dispersed over large regions well beyond the local areas where the pollutants first emanated. Food contaminated near an incineration facility might be consumed by people close to the facility or far away from it. However, distant populations are likely to be more exposed through long-range transport of pollutants and low-level, widespread deposition on food crops at locations remote from an incinerator (Demirezen and Aksoy, 2006). A survey done in Tanzania showed that, most hospital incinerators had low incineration capacity with few of them made of fire bricks and other refractory materials (Manyele and Anicetus, 2006), hence a high risk for UPOPs emission. Composition of emissions from incinerators varies with the type of waste being burnt, the efficiency of the installation and the pollution control measures in place (Takata, 2003). Mitigation of health and environmental risks posed by UPOPs and other hazardous combustion products call for improvement for organizational approach, equipment, and technology for managing HCW. Some of the recommended approaches include minimizing the volume of incinerated plastic and other toxic materials, use of alternative technologies like waste treatment and recycling, centralization of waste treatment, safe management of toxic ash and their combinations.

Waste generated by healthcare activities include a broad range of materials from used needles and

syringes to soiled dressings, hypodermic needles, intravenous set needles; broken vials and ampoules, dressings, bandages, gauze, and cotton contaminated with blood and body fluids; and many other including diagnostic samples, chemicals, chemical reagents and pharmaceuticals (WHO, 2011 and HCWH, 2012). Management of this diverse risk requires a holistic review of current HCWM systems and development of appropriate stands addressing them through the waste management chain. This national standard document therefore addresses emerging concerns and application of new knowledge and technologies for safely managing all hazardous materials including infectious materials, sharps and injections, pharmaceutical wastes, toxic chemicals (like mercury spills), radioactive materials, and the need to increase process efficacy and cost effectiveness of HCWM operations at all levels.

Safe healthcare waste management is fundamental for the provision of quality health services, people- centered care, protecting patients, staff and community from infection and injuries and safeguarding the environment. Healthcare waste management is part of broader water, sanitation and hygiene (WASH) and infection prevention and control (IPC). Proper management of HCW thus contributes to increase in trust, uptake of services, efficiency and decrease in cost of service delivery. This is in line with the UN Sustainable Development Goals (SDG), particularly **Goal 3** on health, **Goal 6** on safely managed water and sanitation and **Goal 12** on sustainable consumption and production, and also the WHO/UNICEF "Global Action Plan on WASH in health care facilities" aims to ensure that all health care facilities provide basic WASH services by 2030 (WHO/UNICEF, 2016).

This document supplements to the overall objective of the Health Sector Strategic Plan IV, (2015-2020) which is "to reach all households with essential health and social welfare services , to meet, as much as possible, the expectations of the population, adhering to objective quality standards, and applying evidence-informed interventions through efficient channels of service delivery". Therefore, this document will provide key aspects of safe health care waste management in order to guide policy-makers, practitioners and facility managers to improve the quality of services in their health care facilities.

Furthermore, this document aligns with the WHO handbook on safe management of waste from health care activities (WHO, 2014), and takes into consideration relevant World Health Assembly (WHA) resolutions, other UN documents and emerging global and national developments on WASH and IPC. It is also in-line with the five guiding principles widely recognized as the basis for effective and controlled management of waste, which are the "polluter pays" principle, the "precautionary" principle, the "duty of care" principle, the "proximity" principle and the "prior informed consent" principle. Health care waste management practices seek to implement environmentally sound management of hazardous waste or other waste (ESM) 3, Best Environmental Practices (BEP)4 and Best Available Techniques (BAT) 5 in accordance with the Basel and Stockholm Conventions and relevant national regulations and requirements.

Healthcare Service Delivery

Tanzania has created an extensive network of Healthcare Facilities that provides 90% of the population with at least one HCF in a radius of 10 km. Moreover, Non-Governmental Organizations (NGOs) and private institutions play a major role in the sustainability of the Tanzania health sector.

a) District – level: Primary Health Services

At district level, basic clinical and public health services are provided through three layers of HCFs: The dispensaries, the health centres and the district hospitals:

The dispensary is the smallest curative unit located at the village level and it serves between 6,000 and 10,000 people. It has an Outpatient Department, a Reproductive, Maternal, New-born and Child health (RMNCH) unit and at least two observation beds, toilets and consultation rooms for the medical staff. It provides health education, treatment of diseases, delivery services, and immunization. It can be located in urban or rural areas.

The health centre is expected to cater for between 50000 and 80000 people, which is approximately the population of one administrative division. The services provided in health centres are similar to the ones provided in dispensaries but in addition provides in patients services and basic medical investigations can be carried out. Health centres have been upgraded to provide more healthcare services such as surgical services which have resulted into increased generation of healthcare waste.

The District hospital is the referral health unit at the District level. It normally has between 60 and 150 beds and provides OPD and RMNCH services, a store for drug and equipment, laboratory and blood banks, x-ray, operating theater, dispensing room, mortuary, kitchen, laundry, carpentry and tailoring workshop. The staff include Medical Officers, Assistant Medical Officers, Nurses of different qualifications, Pharmacists, Laboratory Technicians, Radiologists and a Health Officers. The government plans to establish one District Hospital per District. The hospital as a referent point for the district may also serve as a point for treatment of healthcare waste generated by neighboring lower level facilities. However, experience has shown that there is a burden created by this approach like increased running and maintenance cost for waste treatment facility of the district hospital.

b) Regional Level: Regional Referral Hospitals (Secondary Health Services)

The Regional Referral Hospital is the secondary referral healthcare facility receiving patients referred from the districts and serves a population of about 1 million people. Currently there are 24 Regional hospitals in the Tanzania mainland each one having between 200 and 400 beds. The services are similar to the ones provided in the District Hospitals but in addition, various specialized medical services are provided such as surgery gynecology/obstetrics and pediatrics. The pharmacy and laboratory services are more developed than in a District hospital.

c) National level: (National and Super Specialized/Consultant Hospitals) Tertiary Health Services

There is one national hospital, specialized hospitals, Zonal Referral hospitals, (the tertiary referral hospitals) and in the country. With more than 500 beds per hospitals, they provide highly specialized services. The four Hospitals are considered as Teaching Hospitals. With diverse healthcare services such hospitals have huge amount of generation of healthcare waste both Infectious waste and non-infectious waste.

d). *Private and Faith Based organization Health Services*

Private healthcare facilities are a major component of the healthcare delivery system which complement government health services in the country. Private health facilities have been growing rapidly, particularly in urban areas, since the re-legalization of private practices in 1991. Currently there a total of 1217 and 918 private and Faith based organizations healthcare facilities, respectively.

1.2 Rationale

The HCWM policy guidelines calls for every healthcare facility and other institutions to take the responsibility to label, separate, store, treat, transport, and dispose of all HCW in the manner prescribed in the policy, laws, and regulations for the purpose of safeguarding public health and the environment. Presence and use of standardized processes, equipment, and facilities is a prerequisite for unified guidance and enforcement of these policies. However, a number of challenges have emerged in the course of operationalization of these policies due to inadequate standards and guidelines that address the requirement of the stipulated policies. The existing standards and procedures for HCW in Tanzania developed in 2006 have addressed issues that have been rapidly changing due to development of science, technology and increase in population. This has resulted into new emerging challenges to HCWM system due to generation of toxic waste such as infectious waste and UPOPs caused by insufficient management and limitations in handling of specific wastes like pharmaceutical, cytotoxic, radioactive and heavy metals from healthcare operations. In addition, increased knowledge as a result of scientific findings has documented acceptable practices on HCWM but not addressed in the previous standards and procedures.

The development of this National Standards and Procedures for HCWM will be a tool for addressing the challenge and to meet the requirements of the relevant national policies and laws which include the Public Health Act 2009, Environmental Management Act 2004 and a revised National Environmental Policy, 2014. It will also implement the international regulations namely the Basel convention on the control of transboundary movement of hazardous waste of 1989 and their disposal, 1992 and Stockholm Convention on Persistent Organic Pollutants of 2001, which have been ratified by Tanzania as well as Minamata convention on Mercury, 2014 which is under way to be ratified. This document therefore, provides standardized procedures and specifications for acceptable HCWM practices that cater for all service levels and classes of HCFs in Tanzania.

1.3 Objectives

1.3.1 Broad Objective

To ensure compliance to standards, procedures and specifications for Healthcare Waste Management in Healthcare facilities at all levels and institutions in order to safeguard public health and the environment.

1.3.2 Specific Objectives

i. To provide uniformity in the healthcare waste management procedures, practices, equipment and technologies in healthcare facilities;
ii. To guide health care providers to adhere to the set standards and specifications;
iii. To provide guidance for monitoring of HCWM at all service delivery levels.

1.3.3 Scope and use

The standards and procedures apply to all health care facilities and other health related institutions including research institutions, health training institutions, laboratories, alternative health care providers such as traditional healers and traditional birth attendants; mortuaries, pharmacies and chemists be it public or private; saloons and other beauty centers that operate in the country at all levels.

The principles outlined are equally applicable to situations of home based care. The standards and procedures classifies HCW into hazardous and non- hazardous and details steps in its handling; from generation; minimization, re-use and recycling; segregation, storage, transportation and treatment to final disposal as well as equipment and tools required.

CHAPTER TWO: STANDARDS AND PROCEDURES

2.1. Standards and procedures

2.1.1 Standard for segregation of HCW

- Standard waste bins and liners should be used for waste segregation
- Waste should be segregated at source by the staff who generate it.
- Waste bins, needle cutters, sharps containers, or other waste storage container should be placed within reach of staff
- Standard safety boxes should be provided and used for storage of sharps waste
- Safety box should not be filled beyond 75% of its capacity
- HCW should not be segregated after it has been placed in the bin or container.
- Mixed waste should be treated according to the nature of hazardous waste (e.g. infectious waste) that it contains.

Procedure;

- Place standard waste bins and liners at every unit where HCW is generated
- Display instructions against each waste bins on proper waste storage in every functional unit
- Provide labels on each waste bin to direct users on proper waste storage.
- Separate HCW by putting each type in appropriate waste bins (Figure 1).
- Cover the waste bin with appropriate lid every time HCW is disposed in.
- Place waste properly into the waste bins to avoid littering around the containers.

Figure 1: Segregation of healthcare waste. (Source: WHO, 2001)

2.1.2. Standards for color coding of HCW receptacles and liners

- Colored waste bins should be used to differentiate the segregated HCW.
- Standard colors recommended are Red for highly infectious, Yellow for infectious, Black or Blue for noninfectious (Table 1).
- Mixed waste will be considered as hazardous waste.

Procedures

- Place the color coded waste bins with appropriate bin liners at every functional unit.
- Store each segregated waste in the receptacle corresponding to its coded color (Table 1).

Table 1 : Colour coding for different HCW categories

Waste category	Type of waste	Colour of receptacles and liner
Non-infectious Waste	Paper, packaging materials, plastic bottles, food remains, boxes, cartons	Black or Blue or
Infectious Waste	Used gloves, dressing materials, specimen containers, infusion packages, catheters, urinal bags	Yellow
Highly infectious waste	Anatomical waste, blood, body fluids, pathological waste, culture materials, stocks, petri dishes, waste from isolation ward or camp.	Red
Sharps waste	Used Syringes and needles, surgical blades, scalpels, , needles, scalpels, prickers, blades, broken glass (e.g., pipettes, ampoules, vials)	Yellow Safety Boxes

2.1.3. Standard for safe handling of healthcare waste

- Only trained personnel should handle HCW.
- HCW handlers must wear appropriate PPEs.
- Appropriate equipment for handling HCW must be provided.
- For easy handling of HCW, waste bins must be fixed with handles depending on the make and use of the container or equipment.
- Waste bins must have appropriate size for easy loading, lifting, and unloading.
- Health workers must be vaccinated for hepatitis B, Tetanus and must be given certificates.

Procedures

- Wear appropriate PPEs
- Ensure filled waste bin is properly covered.
- Ensure filled bin liner is properly sealed or tied.
- Handle waste separately according to color codes of the waste bins.
- When handling bags containing HCW;

- Ensure that the bag has been tightened and a stub is left for easy carrying
- Inspect the bag visually for leaks, breaks, tears, or penetrating sharps and if the bag is found leaking, broken or torn it should not be picked up and the incident should immediately be reported to management for mitigation.
- If safe, grab the bag, bend with knees and lift with legs while holding the bag by the stub and carry far away from the body
- Pick up waste bags by the neck and not by the main part of the bag

- Handle used sharps with the utmost care
- Collect all filled up waste bins from service delivery point
- Transport waste using standard trolleys to the point of storage
- Decontaminate used waste bins before returning them to respective position for next use.
- Remove PPEs after use, decontaminate or dispose of unwanted PPEs.
- Wash hands with soap or detergent in running water after handling HCW
- In case of injuries/accident
  - Immediately wash the injured area under running water with soap.
  - Report to the supervisor immediately after incidence.
  - Follow procedures as stipulated in PEP guidelines.
- Check all equipment daily according to standard operating procedure.
- Maintain a log book for all HCW related accidents.
- Keep a record of all HCW equipment and materials.
- Keep a daily record of the type and quality of HCW handled.

Note: Spills should be dealt with immediately to avoid spread of infections and other dangers associated with HCW.

Figure 2_: Recommended PPE for HCW handler

Note: *The apron should be wet-resistant, made up of plastic, washable, and covers the whole front body from the chest to the legs. This apron cannot, however, be used for incinerator operators or those exposed to high temperatures. The goggles must fit in such a way that they don't allow any liquids to drip down the eyes. Further specifications for PPE's are given under table… for specification*

2.1.4. Standard for proper storage bay of healthcare waste

- Storage bay should be located within the HCF at a distance accessible by all departments/ units.
- Storage bay should not cause or create nuisance in a work environment.
- Pathways to the bay should be paved to ease transportation
- The site of the storage bay should not be water logged
- Storage bay should be located close to the treatment or disposal site
- Appropriate containers should be used to store waste until it is transported for final treatment or disposal on or off-site

- Each category of waste should be stored separately.
- Bags and containers should be leak proof.
- Maintain frequency of removal depending on the volume and nature of the waste
- Cleaning equipment, PPEs, waste bags and containers should be located conveniently close to the storage area
- Provide for a separate storage room/compartment for different categories of waste
- Pathological waste should not be stored and must be disposed of immediately
- Radioactive waste should not be stored in a special constructed storage bay

Procedures

- Weigh and record HCW in a log book
- Place HCW in the appropriate compartment as per waste category
- Remove stored infectious and used sharps waste within 48 hours to the treatment point
- Remove and treat highly infectious wastes daily
- If any spillage occurs; cordon the area, collect the spilled waste, disinfect with 5% chlorine solution for 10 minutes and clean the area
- Clean and disinfect HCW storage bay every time the store is emptied
- For radioactive waste, report to the management who will contact the National Radiation Commission on proper procedure for handling and storage

2.1.5. Standard for safe transportation of healthcare waste

2.1.5.1 On-site transportation

Standards

- Transportation of HCW within a healthcare facility should be planned well ahead of time
- Different types of waste should be transported separately in designated trolleys or wheelbarrows
- Trolleys and wheeled bins should be cleaned and disinfected by the recommended disinfectants at the end of each working day
- Consignment forms for hazardous waste should be correctly and thoroughly filled in and safely kept
- The pathways for transportation should be paved to facilitate easy transportation

Procedures

- Prepare a facility's waste transportation plan with the following details:
    - A list of HCW generation point (e.g. unit, ward, department, etc.)
    - A list of categories of waste to be collected and transported from each point
    - A defined route to be followed by the responsible person(s) collecting the waste from source and transporting it to the facility's waste storage bay
    - A timed collection and transportation schedule in line with onsite transportation and storage times for the relevant waste
- Wear appropriate PPE when transporting waste
- Follow the waste transportation schedule

- Tie knot filled up bin liners
- Transport bags of waste in leak proof containers
- Collect filled up bin liners from the bins and use the trolley for transportation
- Replace the bin liners immediately
- Place the safety boxes away from wet surfaces during transportation
- Transport the waste through designated route, and carry the waste to the designated bay
- If any spillage occurs; cordon the area, collect the spilled waste, disinfect with 5% chlorine solution for 10 minutes and clean the area.

2.1.5.2 Off-site transportation

Standards

- Vehicle used to transport healthcare wastes should fulfill the following design criteria
    - The vehicle should have separate compartments for empty plastic bags, protective clothing, cleaning equipment, tools, and disinfectant, and should have special kits for spill management
    - The hazard sign should be displayed on the vehicle or container
    - The vehicle should be marked with the name and address of the waste carrier company and an emergency telephone number
    - Be fitted with loading and offloading equipment
- Use refrigerated containers/vehicles if the storage time exceeds the recommended limits or if transportation times are long

Procedures

- Wear appropriate PPEs when transporting and handling waste
- Weigh the amount of hazardous waste to be transported and record in the log book
- Fill dispatch documents before transportation of the waste
- Use the defined route, which has been planned before
- No further handling of waste shall be done after departure from the waste generation point
- Fill the consignment note and return it to the waste generator after completion of a journey
- Keep a copy of the tracking note for accountability

2.1.6. Standards for treatment of HCW

- Hazardous HCW should be treated before disposal
- Onsite treatment should be done within the HCF
- HCF management should evaluate safety, effectiveness and environmental soundness of the treatment methods

Procedures

- Prepare schedules for HCWM
- Wear appropriate PPEs
- Ensure the treatment facility is clean before new operation cycle.
- Follow SOPs for appropriate treatment method
- Conduct regular checks and maintenance

- Decontaminate and clean used HCW equipment for next use
- Maintain the surrounding environment
- Conduct regular medical surveillance for operators and waste handlers
- Observe IPC principles

2.1.6. Standard for HCW treatment methods

2.1.6.1 Non incineration technology (Autoclaving and shredding)

Standards for autoclaving

- Operating a gravity flow autoclave, medical waste shall be subjected to, a temperature of not less than: -
    - 121^0C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or
    - 135^0C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or
    - 149^0C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.
- Operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the Autoclave of all air. The waste shall be subjected to the temperature of not less than:
    - 121^0C and pressure of 15 psi for an autoclave residence time of not less than 45 minutes; or
    - 135^0C' and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;
- The entire load of medical waste must be autoclaved again if the standards are not met.
- Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor & record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle
- Validation test (Biological test) should be conducted after autoclaving

Procedure for autoclaving

- Wear appropriate PPE
- Check autoclave if clean, gasket intact and previous shift has not reported any problems
- Perform scheduled routine test (e.g. pressure test)
- Weigh and record waste for processing.
- Tag each waste bag with autoclave tape, with the date of processing written on it
- Place waste in autoclave, along with chemical integrator, self-contained biological indicator, if required
- Select appropriate program and run autoclave
- When waste is cool enough to handle, remove from autoclave and place in the appropriate storage area for disposal.
- Record treatment parameters, test results and any other relevant data

- Process the waste again if there are any problems with the cycle, e.g. power failure preventing cycle completion

2.1.6.2 Incineration

Standard

- **Primary and secondary chambers**
- **Capable of destructing waste into ashes (95%) reduced into ashes)**
- **Use fuel burners**
- **Emission conform to national and international standards**

Procedures for operating an incinerator

- Wear appropriate PPE
- Clean the area around the incinerator
- Weigh all types of HCW to be incinerated
- Record these quantities in the waste disposal record log book
- Ensure that all tools and equipment are available before operations
- Remove bottom ashes from previous day combustion process
- Make sure you have enough dry combustible materials and for the case of oil burner incinerator, make sure you have enough oil for the reserve tank
- Start with dry waste to warm up the incinerator for at least 20 – 30 mins; and for the case of oil burner incinerator start with the secondary burner first
- Load infectious waste after 20-30 minutes
- Monitor temperature between circles
- For De Monte Fort do not attempt to burn wet HCW waste in the incinerator at the beginning because the temperatures are still low

For the incinerator to work effectively the ash and loading doors must close correctly,

i.e. they must not be broken, strainer cables to the chimney should be tight, and there should be no risk that the chimney will fall down

Loading and destroying during incineration

- Load according to the instructions given in the manual to reduce smoke levels and emissions of harmful gases
- Do not open and/or sort waste packed in separate bags and safety boxes.
- Packaged waste for burning can be store temporarily in the designated waste store
- Load only waste that has been weighed and recorded in the operator's record.
- Load the safety boxes and the bin liners for burning through the loading door at the top of the incinerator.
- Open the loading door just before depositing HCW and close it immediately to avoid being exposed to toxic gases.
- Load safety boxes only when the temperature on the gauge is above 600°C but below 900°C.

- Load bin liners only when the temperature on the gauge is above 700°C.
- If the temperature drops below 600°C load fuel (wood, coconut husks, etc.) to raise the temperature and not healthcare waste.
- Load one full safety box approximately every 8–10 minutes
- Observe the temperature gauge to determine the best rate of loading.

NB. As a general rule burn safety boxes to increase temperatures in the incinerator, and bin liners to reduce temperatures in the incinerator.

Operating without a temperature gauge

- Some incinerators are not fitted with a temperature gauge so the operator has to judge the adequate operating temperatures, based on experience
- Inexperienced operators should not be assigned to operate incinerators that do not have a working temperature gauge fitted
- A good visual guide is to look through the secondary air inlet and check the colour of the smoke from the chimney.

Visual guide to judge temperature

- If a good strong flame is visible through the secondary air hole, the temperature should be more than 600°C at this point
- If the smoke is dense white, grey or black, poor combustion is occurring because the temperature is either above or below what is required
- If temperatures are too high, the chimney glows red

Cooling down

- When all the healthcare waste has been burned and the temperature indicated on the temperature gauge falls below 600°C, proceed to cool down
- After the waste has burned, leave enough time for the fire to die down and the ashes to cool
- This allows the "fixed carbon" in the waste bed to burn, reducing toxic emissions and ensuring that all the waste is totally destroyed.

Procedures for cooling the incinerator

- Allow the incinerator to cool down for at least five hours after use before removing the ash.

Removing ashes from the incinerator

Procedure

- Wear appropriate PPEs when removing the ash. Never handle the ash or other solids with bare hands.
- Use the rake to remove ash and other non-burnable waste to the ash pit

- If the incinerator is operated every day, remove the ashes and other non-burnable waste the following day, before operating the incinerator
- If the incinerator is not used every day, remove all the ash on the same day after five hours or remove it the following morning. Do not leave ash in the incinerator for long periods of time
- Carefully sweep the area around the incinerator to ensure that all the needles and non-combustible waste are placed in the ash pit
- Always close the trap door of the ash pit to avoid accidents

Maintaining an incinerator

Procedure

For an incineration process to work properly, it must be accompanied by the following:

- Clear operation procedures, which shall be posted near the incinerator
- Trained operators
- Reliable segregation system, so only infectious and non-polluting materials are incinerated
- Removal of ashes regularly
- Regular preventive maintenance
- Adequate supply of fuel
- A qualified personnel or Engineer must inspect the incinerator every 6 months and the following must be taken into account:
- Masonry inspection and repair
- Check for loose bricks and cracks in mortar, interior and exterior
- Repair damage or replace bricks
- Metal and chimney inspection and repair
- Check doors, hinges, grate, chimney cap. Replace if bent or damaged
- Clean soot from inside chimney
- Remove extraneous waste around the incinerator
- Clear bushes around incinerator

Safety precautions

- PPEs must be available and in good working condition
- Appropriate fire extinguisher must be available
- Appropriate tools e.g. rake, iron rod and a spade must be available to operate the incinerator

2.1.7 Standards for waste disposal

2.1.7.1 Standards for sanitary landfill

- The facility should undergo Environmental Impact Assessment
- There should be an office

- The facility must be registered and licensed
- The facility should be provided with adequate water supply
- Should be located at least 1km away from human settlements and agricultural activities
- Should be constructed in a way that it does not pollute ground and surface water
- HCW disposal facility must be large enough to serve population for at least 50 years
- The facility should be securely protected and fenced
- Operate the sanitary landfill as per waste management guidelines
- Should be provided with gas control devices
- Leachate control devices should be provided
- Every truck that discharges waste should be cleaned before leaving the land fill
- All staff should be registered and medical examined regularly
- Scavenging should be prohibited

Procedure

- Conduct environmental audit regularly
- Perform preventive maintenance of the facility
- Provide leachate collection pond to prevent pollution of land and water sources
- Compact waste and cover it with 3 inch of soil
- Provide washing bay for trucks

2.1.7.2 Standards for Placenta pit

- Should be located within the HCF compound
- Should not be located in water logged area
- Should be fenced
- Should be accessible
- Provide running water nearby the placenta pit and a soap for hand washing

Procedures for disposal of placenta

- Wear appropriate PPEs
- Open the pit hole cover and dispose placenta without spilling blood around the dome
- Replace the cover immediately and carefully
- Open the placenta pit cover
- Dispose placenta into the placenta pit without container or bin liner. In cases where incinerator is functional, placenta should be collected in bin liners and incinerated
- Disinfect and wash the container and incinerate the bin liner
- Close the placenta pit cover immediately after emptying the receptacle
- Decontaminate any spillage around the placenta openings with 0.5 % chlorine
- Wash hands with running water and soap after removal of PPE

2.1.7.3 Standards for Encapsulation

- Immobilizing materials should be used
- A hollow container should be used
- Containers should be made of permanent materials
- Container should be sealed
- The encapsulated waste should be placed at the base of a landfill and covered with fresh municipal solid waste or buried or stored as blocks

Procedure

- Place the wastes in the container
- Encapsulate small quantities of pharmaceuticals waste together with sharps
- Pack the hazardous wastes in the container up to 75%
- Seal the container with the mixture of lime, cement and water in the proportions 15:15:5 and the drum be sealed to capacity
- Place the drum on the pullet for easy transportation
- Dispose the encapsulated waste/drum in the landfill, bury or used as blocks
- Monitor the disposal point of drums

2.1.7.4 Standards for Ash Pit

- Select appropriate site for the pit, on site or offsite and the following should be considered;
    - The site should be as close to the incinerator as possible
    - In a secure, non-public area that cannot be accessed by animals.
    - The pit should be reinforced to prevent collapse and paved to prevent seepage

Procedures

- Wear PPE and follow procedures when using the ash pit.
- Check if the ash is cool enough to handle safely.
- Dispose ashes in a designed ash pit
- Cover the pit with soil when 50 cm from the top and seal it permanently
- Report any problems or requirements to the management

Table 2: Recommended Treatment and Disposal Options for HCW

Waste category	Rotary kiln	Incineration	High tech incineration with pollution control devices	Retention period (follow National Radiation Commission procedure)	Wet thermal treatment (autoclave)	Chemical disinfection	Microwave disinfection	Encapsulation/inertisation	Placenta pit	Anaerobic digestion/biodigestion[1]	Chemical degradation[2]	Sanitary landfill
Non-hazardous HCW[3]	No	No	No	No	No	No	No	No	No	Yes	No	Yes
Pathological waste	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	No
Sharps	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	No	No
Hazardous pharmaceutical waste	Yes	No	Yes	No	No	No	No	Yes	No	No	Yes	No
Non-hazardous pharmaceutical waste	Yes	Yes	Yes	No	No	No	No	Yes	No	No	Yes	No
Infectious waste	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Highly infectious waste	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Explosive waste	No	No	No	No	No	No	No	Yes	No	No	No	No
Chemical waste (heavy metals)	No	No	No	Yes[4]	No	No	No	Yes[5]	No	No	No	No
Radioactive waste	No	No	No	Yes	No	No	No	No	No	No	No	No

Key = Yes Can be use recommended method
No Cannot use the method

Table : Waste treatment and disposal options for HCW at different levels of HCF

Facility level	Autoclave	Incineration	Anaerobic digestion/ bio-digestion	Chemical degradation	Sanitary landfill
National Hospital	YES	YES	YES	YES	YES (General waste only and ashes)
Zonal Referral hospitals	YES	(Pyrolitic incinerators)	YES	YES	YES (General waste only and ashes)
Regional Referral hospital	YES	YES High Tech (Pyrolitic)	YES	YES	YES (General waste only and ashes)
Council and other hospitals	YES	YES High Tech-Pyrolitic	YES	YES	YES (General waste only and ashes)
Health Centre	YES	YES (High Tech /De Montfort)	NO	NO	YES (ashes)
Dispensary	YES	YES (De Montfort)	NO	NO	YES *(if applicable)

1 Only for biodegradable fractions of this waste stream
2 Different techniques and technologies may be appropriate for pharmaceuticals and organic materials
3 Non-hazardous waste should be recycled wherever possible
4 Waste may need storage until disposal facilities become available
5 Mercury may be inertised with sulphur; see procedure.

Home based healthcare	YES	YES (Send to nearest HCF incinerator)	NO	NO	NO
Standalone facilities, e.g., labs, diagnostic centers, pharmacies and training institutions.	YES		NO	YES	YES ashes and debris*(if applicable)

2.2 Standards for mercury management in HCF

- The use of mercury equipment should be minimized
- Standard precautions must be adhered when using, handling or storing mercury devices
- Appropriate instructions and facilities/equipment must be provided for handling mercury devices or leakage therefrom

Procedures for minimization of mercury devices

- Procure non mercury medical devices
- Promote use of non mercury medical devices
- Train on the use of non mercury medical devices

Procedure for preparation of mercury spill kit

- Procure or prepare materials for making spill kit (flashlight, plastic-coated playing cards or thin pieces of plastic, small plastic scoop or plastic dust pan, tweezers, eyedropper or syringe (without the needle), duct tape or sticky tape)
- Train staff on the following;
    - Make a spill kit
    - Manage mercury spill and include a step-by-step clean-up procedure
    - Assemble spill kits using necessary materials
    - Place spill kits in readily accessible locations
    - Replace spill kit contents that have been used after every spill
    - Provide safe mercury storage facilities
- Allocate compartment/shelf for storage of mercury waste and should be labeled
- Secure the compartment or shelf with lock
- Keep the storage area cool with natural or artificial ventilation

Procedures for management of mercury spillage

- The surface that has been contaminated with mercury spills should be cleaned using mercury spill kit
- Keep people away from the contaminated area
- Wear appropriate PPE
- Ventilate the area (e.g. open windows)
- Use mercury spill kit and sulfur powder to clean mercury spills

- Use cardboard or folded paper to make a small scoop to gather the mercury. Never use a broom or a vacuum cleaner
- Place all materials that have been contaminated in a plastic bag and seal the bag or in air-tight, rigid plastic container with some water or vapor suppression agent such as sulfur powder
- Place it inside an impact-resistant sealable container in a sturdy secondary container made of plastic or metal
- Keep all mercury containers tightly closed in a cool place
- Remove PPE and keep them in a room where mercury waste is stored
- Wash hands and all exposed skin with soap and water
- Write a report on the spill incident and recommend improvements to prevent future spills
- 2.3.0 Standards for management of pharmaceutical, cytotoxic and cosmetics waste in HCFs
- There should be a board mandated for management of pharmaceutical waste
- The Healthcare facility should have an inventory of unwanted and expired medicines
- Any medicine found to be unwanted shall be separated from the serviceable items, removed from normal stores ledger and recorded into the unwanted goods ledger
- All unwanted medicines and related medical supplies shall be stored in an identified separate marked area for easy access and verification.
- Authority should be informed on unwanted medicines and related medical supplies and given the report
- The management should seek for permit to dispose the medicine and medical supplies

Procedure for disposal of Pharmaceutical and cosmetics waste

- Healthcare facilities should conduct monthly inspection and physical inventory for the medical stores
- The condemnation committee shall verify the actual unwanted medicines and medical supplies
- Dispose unwanted/expired medicines and medical supplies to sanitary landfill after appropriate treatment
- Immobilize waste and encapsulate
- Use chemicals for degradation/denaturing of unwanted medicines.
    - Use simple reagents such as permanganate and sodium hypochlorite denature cytotoxic waste.
    - Alkaline hydrolysis used to denature unwanted or expired medicines at high temperature and pressure.
- Incinerate unwanted and expired medicines and medical supplies at temperature of 1200oC
- Use recommended method for disposal of each category of unwanted and expired medicines
- The management should inspect and identify unwanted medicine regularly

2.4 Standards for disposal of radioactive waste

- All radioactive sources in HCF should be identified
- Radioactive waste should be stored in lead shielded containers in a separate room/ compartment
- The containers for storage of radioactive waste should be labeled with appropriate symbol
- Management of radioactive should follow Tanzania Atomic Energy Commission (TAEC) Guidelines

Procedure

- Prepare an inventory of all radioactive equipment in the HCF
- Provide appropriate lead shielded containers for storage of radioactive waste
- Wear appropriate protective equipment before handling radioactive waste
- Report to TAEC any defective/obsolete radioactive equipment

2.5 Standards for treatment using anaerobic digestion (bio-digestion)

- The digester should be designed with a long treatment time (retention time) to make sure that any pathogens present are inactivated.
- Slurry from bio-digested healthcare waste cannot be used as a fertilizer because may contain pathogens and it must be diverted into the sewer or septic tank.

Procedure

For pathological/food waste:

- Open the hatch for waste
- Tip the waste in.
- Add an equal amount of water.
- Close the hatch

2.6 Standards for wastewater management in HCF

Standards

- There should be sound infrastructure for collection of wastewater from generation point
- The waste water storage facility should have adequate capacity
- There should be a proper drainage system including onsite disposal wastewater facilities
- There should be a decentralized wastewater treatment and disposal system
- Surface rain water should not be directed into waste water disposal system

Procedure

- Provide pre-treatment facility in sections which generate hazardous waste before release to a sewer or onsite storage facility as indicated in the Table 4
- Use registered and licensed vehicles for transfer of wastewater from onsite storage facility to disposal point

Table 4: Pre-treatment of wastewater from HCF

DEPARTMENT	PRE- TREATMENT METHOD (S)
Dental Department	Installing of amalgam separators/screen The separated mercury waste must be safely stored
Radiotherapy department	Separate collection of radioactive wastewater
Kitchen	Installation of grease trap to remove grease, oil, and other floating materials

2.7 Standard for management of faecal sludge

Standards

- Septic tanks and pit latrines should be easily accessible for desludging
- HCF should have proper system/method for control of faecal sludge
- Improved pit latrines should be closed when 100cm full below surface level
- Use proper vehicles for transportation of wastewater

Procedures

- Sludge should be disposed of in sanitary landfills
- Toilets should be cleaned at least twice a day.

2.8 Standard for management storm water

- There should be a catchment system for storm water
- Management should provide proper drainage system for storm water
- The storm water drains should be clean and maintained

Procedure

- Identify catchment and flow of storm water
- Collect storm water through drainage systems
- Conduct regular cleaning of storm water drains to avoid blockage

2.9 Standard for alternative chemical disinfectants

- The alternative chemical disinfectant should safe and friendly to the environment

Procedures

- Use alternative chemical disinfectants as indicated in Table 5

The following are recommended substitutes of chemicals

Table_5_ Alternative chemical disinfectants

Chemical	Uses/Application	Substitution/ Alternative
Disinfectant	Cleaning, washing	Hydrogen peroxide
Glutaraldehyde	Disinfection	peracetic Acid/hydrogen peroxide(H2O2), Sterris, Sterrad
Ethylene Oxide	Disinfection	peracetic Acid/hydrogen peroxide(H2O2),Sterris,Sterrad
Disinfectant	Cleaning, washing	Herbal- *Zingibercassumunar*, Cilantro
Choloroform	Reagent, detergent, DNA extraction	Acetonitrile, isopropyl acetate, dimethoxylethane, DNA extraction kits
Xylene	Decolorization, cleansing detergent	Limonene, citrus-based solvent
Ethidium bromide	DNA dye staining	SyBr green, Gel red, Gel green, Eva green
Sodium azide	Preservative reagent	Kathon CG/ICP, methyl paraben, propyl paraben
Diethyl ether	Lipid extraction	heptane, 2-propanol
Acetone	Fixing	Diacetone alcohol (DAA)
Benzene	Freezing point lowering	Cyclohexane;
Regular acids/bases	Acids and bases	Vinegar and sodium bicarbonate
Toluene	Solvent; cleaner	Alcohols

Currently used disinfectants
Chlorine, Precept, Cidex

Currently used antiseptics; Spirit, Hydrogen peroxide, Dettol, Iodine

2.10 Management of liquid waste and spills

- Stool, vomit and mucus from highly infectious patients (e.g. cholera patients) should be collected separately and thermally treated before disposal (e.g. by an autoclave reserved for waste treatment). Lime milk (calcium oxide) can be used during emergencies and if no appropriate autoclave or other disinfectant is available.

- Blood can be emptied into a septic or sewerage system if safety measures are followed (e.g. PPE and precautions against spatter). Other options for expired blood bags include disposal at a controlled land-disposal site, or treatment in a high-temperature incinerator (1100 °C) or in an autoclave that has a special liquid treatment programme cycle. If no other disposal option is available, expired blood bags may be isolated from patients and staff by placing unopened into a protected pit excavated within the grounds of the health-care facility or at another secure location.

Liquid laboratory hazardous waste (colorants, formalin) should be collected separately. Adsorbent (e.g. paper towel, sawdust) should be used for easier handling. The solid mass should be rendered immobile or encapsulated.

Chlorine-based disinfectant should be diluted to reach a concentration of <0.5% active chlorine, and should be disposed of directly in a soakaway pit. Chlorine-based disinfectant should not be disposed of in a septic tank, because it will harm the biodegradation process.

2.11. Blood and Fluid Spill Management Procedure

- After spill occurence cordon the area.
- Inform those close to the spill to leave the area
- Remove contaminated items or materials and dispose them in a biomedical waste container
- If you cant manage alone call cleaner for assistance and also Environmental health officer
- Assemble spill clean materials and put on PPEs (Shoe cover, hand gloves, approan, paper towel, tong, disinfectant
- Absorb the spill content by putting paper towel and pour disinfectant then leave for 15 minutes
- Soak paper towel with disinfectant and clean any vissiable spills
- Gather absorbed material and put in a biomedical waste container
- Spray the contaminated area with disinfectant and allow air to dry

After you have finished carefuly remove protective equipment (shoe cover, masks, gloves, approan) and wash your hand

CHAPTER THREE: SPECIFICATIONS FOR HEALTHCARE WASTE MANAGEMENT EQUIPMENT, TREATMENT AND DISPOSAL OPTIONS

Minimum Specifications for Waste Bins and Receptacles

Table 2 a: Recommended specifications of segregation equipment (waste bins and bin liners, internal transportation trolleys)

ITEM	DESCRIPTION AND SPECIFICATION	PICTURE
Medium sized waste bin	Capacity: 30 - 45 L • With handle, lid, foot-pedal operated. • Plastic receptacle features: Easy-clean plastic shell and lid. • Large step-on foot pedal operated lid. • Bio-hazard labels included • Weight 4kg . (single box), and Box dimensions 16" x 16" x 27"	
Large sized waste bin	Capacity: 50 -70 L With handle, lid, foot-pedal operated, and wheeled.	
Wheeled waste bin	Capacity: 70 -120 L • Designed for mechanical handling. • Rubber-tire wheels. • All bins manufactured to EN 840 European Standard. • Manufactured from high-density polyethylene with UV stabilizer. • Easy to push or pull • Appropriately color coded and properly marked/labeled the type of waste contained therein. • With smooth surfaces, leak proof, made of plastic. • Easy to load and unload	

ITEM	DESCRIPTION AND SPECIFICATION	PICTURE
Mobile bag stand	Triple-stand waste separator for the central separation of waste for recycling at wards, offices, kitchen, etc Allows workers easy access to bins for segregation at source For 80 litre bags Dimensions; 1180 x 460 x 920 Thickness: Metal frame (galvanic zincing) with plastic lid	
Bedside segregation trolley	• Designed to hold bins required by a particular ward or workstation • Allows waste segregation at the bedside or other patient treatment site • Made of Non-corrosive materials • Washable • Consist of rubber tyres with brakes	
Bin Trolley (infectious waste)	• Capacity to carry 50 - 100kg • Waste collecting trolley, infectious waste • With a ground clearance of not less than 200 mm • Manufactured in a robust and stable way	
Indoor wheeled trolley	• Waste collecting trolley for infectious waste • With a ground clearance of not less than 200 mm • Manufactured in a robust and stable way • Must be designed to hold at least 2-3 bins with capacity of 70 – 120L • Easy to clean	

Equipment for handling sharps

ITEM	DESCRIPTION AND SPECIFICATION	PICTURE
Needle cutter/smelter	**(i) Needle cutter** ❑ 5 years of life span – 200.000 needles **(ii) Needle Smelter Model:** HS-045 Specifications: ❑ Voltage 250V, 80 - 150W and 50Hz. ❑ Disposal time: 100 needles/ min ❑ Temperature over 1,600°C ❑ Process various needles such as 16~30 gauge and 1/2~1.8 inches ❑ It takes only 1 second for a needle to be processed Application: melt needles completely needles	 
Safety box	Strong cardboard/puncture proof box ❑ Single use ❑ WHO PQS listed: Must fulfil PQS code E10/ SB01.1 ❑ 2.5 - 5 litre sizes ❑ Yellow colored	
Sharps container (plastic/polypropylene)	❑ For the safe collection of sharp items, including needle strip-off devices to remove needles from syringes ❑ Single use only ❑ Must be marked with biohazard symbol ❑ 1 - 2.5 litre sizes	

ITEM	DESCRIPTION AND SPECIFICATION	PICTURE
Metal sterilization containers for sharps waste small , medium and large capacity/ autoclavable	❑ For the safe collection, transportation and autoclave disinfection of large quantities of sharps. ❑ Manufactured to fit healthcare facility autoclave ❑ Made from aluminium to resist corrosion ❑ Lockable for safety during transportation	

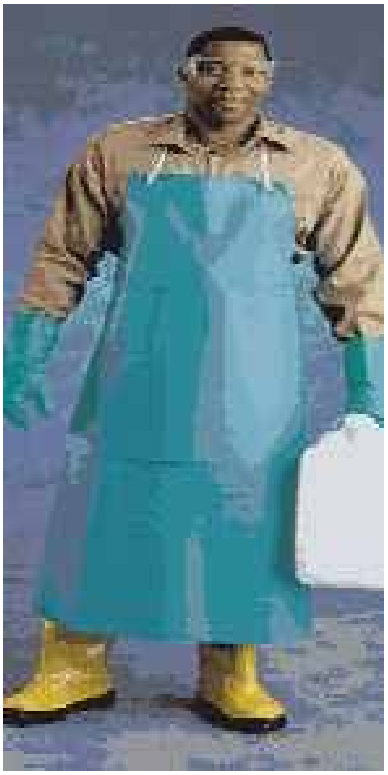
Bin liner specifications and color code

ITEM	DESCRIPTION AND SPECIFICATION	PICTURE
Bin liner (Waste bags)	❑ Recommended thickness >30 microns ❑ Non-PVC (should be double-bagged if off-site transport is to be performed). ❑ Material density: Low-density ❑ Polyethylene LDPE ❑ Bag size dimensions will depend on bin size. ❑ Must not exceed 10kg to ensure load endurance is not exceeded. ❑ Impact resistance 165 g. ❑ Load rating (min.) 35 kg ❑ Colour and markings: red or yellow with "Biohazard" or "Infectious waste" printed in black. ❑ Marking should include the universal biohazard symbol	  

3.2.4. Specification for PPEs

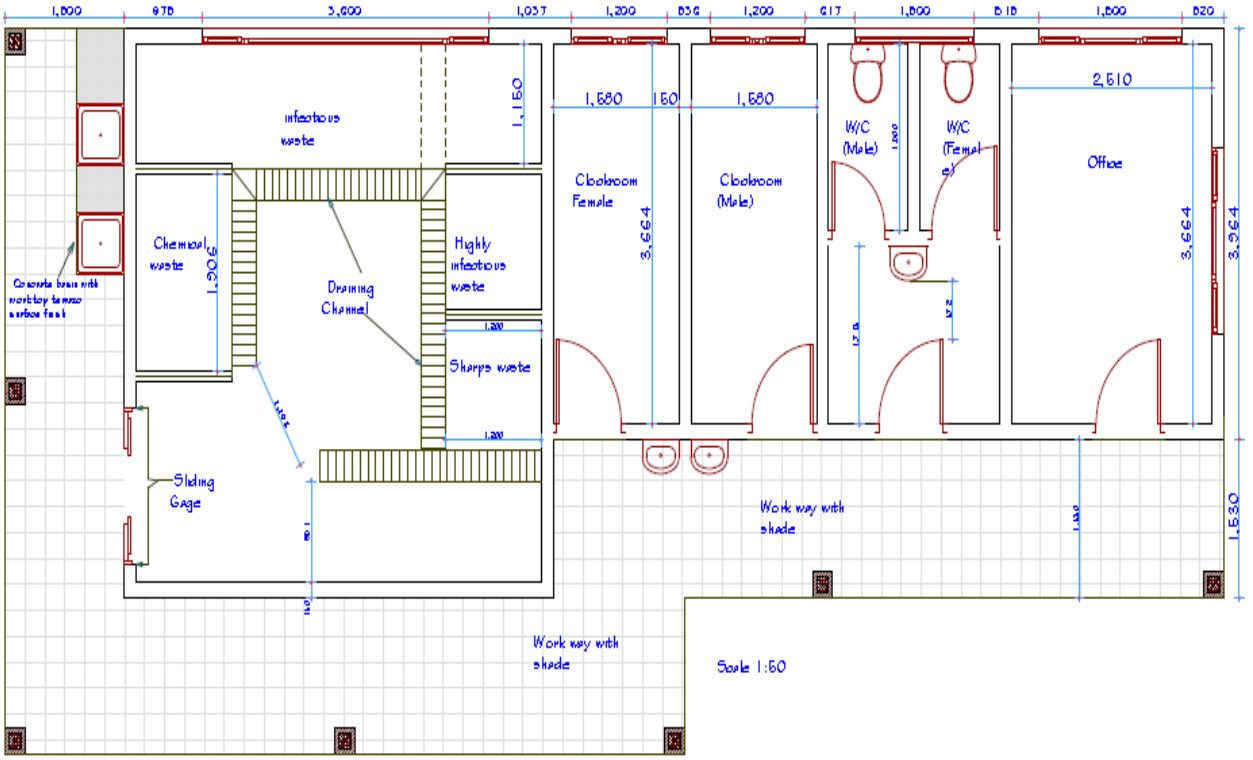
Table 1 b: Recommended Specification of PPEs

PPE	DESCRIPTION AND SPECIFICATION	PICTURE
Utility hand Gloves	**Glove design:** Hand-specific, designed for dexterity and comfort in addition to protection. Texture in palm area should provide grip and cleaning sensation to enable safety during janitorial activities. **Cuff design:** Straight cuff for maximum protection from contaminated liquids. Cuff should reach at least 75 mm from the upper arm surface when the elbow is flexed at 90°. **Palm thickness** Minimum of 0.5 mm/20 mil.\ Provide good resistance to snags , puncture , abrasion and cuts **Sizes** Up to 7.5"(19.00cm - x-small 7.5 – 8"(20.25cm) – small 8 – 8.5 (21.50cm) – medium 8.5 – 9" (23.00cm) – large Over 9.0" (23.00cm) – x-large	
Safety gloves (Puncture and cut protection gloves)	Protect against threats from nails, wire, glass fragments, metal shards, wood splinters, and all types of needles. Recommended for incinerator and waste bay operators	
Heavy duty_ Safety boot	Hide: Long-lasting, heat-resistant hard-wearing, lightweight, flexible, rust and corrosion resist Offers heel protection, comfort with odor- reducing, moisture-wicking properties. **Design specifications:** **Toe impact protection:** Toe impact energy up to 90 joules. **Siding:** Sole construction. **Sole puncture protection:** Minimum protection of 1,200 newton. **Slip-resistant sole:** Deep tread with coefficient of friction >0.	

PPE	DESCRIPTION AND SPECIFICATION	PICTURE
Gumboots	Molded polyvinyl or other plastic to ensure that it is waterproof Resistant to blood, fluids and easy to disinfect for maximum protection and hygiene. Anti-skid tread prevents slipping Supposed to be used during medical waste collection and transportation	
Apron	Made of 20 mil virgin vinyl with electronically heat sealed grommets. Extra-long nylon string ties included to secure apron in a variety of ways. Waterproof and chemical-proof standard	
Safety goggles	**Design:** Glasses with side protection or goggle **Lens:** Impact- and heat-resistant, molded, and 2.2 mm thick with ant-fog coating. **Heat resistant:** Self-extinguishing foam and heat-resistant materials. **Ventilation:** At minimum, four indirect ventilation slots. **Fit:** Wide contact between goggle and face**. Visibility:** Unobstructed peripheral vision. **Strap:** Adjustable support strap.	

PPE	DESCRIPTION AND SPECIFICATION	PICTURE
Mask	Should have exhalation valve that reduces heat and humidity, providing a cooler, more comfortable fit while minimizing fogging on eyewear. The RPFN952 has a low profile design with dual fixed straps, adjustable metal nose band, and smooth inner lining, ensuring a secure seal and comfortable fit. Folds flat for easy storage. **Sizes:** One size	
Head gear	Hard enough to protect the operators head from mechanical injuries and any possible splash from liquid waste and chemicals	

3.2.5 Specifications for Storage of healthcare waste



Structure

- Size depend on amount of waste generated in health care facility
- Floor impervious (easy for cleaning)
- Room with adequate ventilation
- Walls should be plastered and painted
- Lockable door
- The structure must be provided with different rooms for storage of highly infectious waste, Infectious waste, sharps, recyclable materials, and pathological waste
- Area should be fenced
- Durable Roofing material
- Proper drainage system
- Radioactive Waste storage should follow atomic energy regulations

3.2.6 Specifications for Transport equipment

Specifications for transport vehicles for infectious waste UN 3292

PICTURE	DESCRIPTION AND SPECIFICATIONS
	An example of a vehicle for transportation of sharps Body capacity: 2.0- 4.5ton Anti-rust paint Easy to clean Incorporate weighing device Anti-corrosion Steel
	An example of a vehicle for transportation of Bio-hazardous waste Capacity 1.5- 2tons To carry radioactive waste full packed on special containers /bins Anti-rust paint Easy to clean Incorporate weighing device Anti-corrosion Steel

PICTURE	DESCRIPTION AND SPECIFICATIONS
	An example of a vehicle for transportation of normal waste (Non -hazardous waste) Body capacity: 4.5-20(m^3) Anti-rust paint garbage compactor trucks with a range of loading capacities Anti-corrosion Steel or High-tensile Steel
	An example of a vehicle for transportation of liquid waste Suction pumps with capacity of 3-5hp Suction horse with non- collapsible mechanism Anti-corrosion Steel

3.2.7 Specifications for treatment methods

3.2.7.1 Non incineration technology (Autoclaving and shredding)

Small Autoclave, vertical loading pre-vacuum type.

ITEM:		PHOTO / DRAWING / GRAPHIC
Small Autoclave, vertical loading – pre-vacuum type - *Code: TRE-02-02*		
Technical Data:	**(Main)**	
Capacity: Size Material Voltage	Up to 15 kg/h 2000x1500x2000 Stainless steel 220V	
Application:		
For the treatment of infectious waste in small hospitals.		

Manual Fractionated Autoclave

ITEM:		PHOTO / DRAWING / GRAPHIC
Manual operated Autoclave for the treatment of infectious waste, horizontal loading, vacuum-steam-vacuum type *Code: TRE-02-03*		
Technical Data:	**(Main)**	
Capacity:	> 20 kg/h > 175 l/h	
Chamber size	> 250 l	
Material	Stainless steel	
Temperature	121°C, 134°C	
Application:		
For the treatment of infectious waste in rayon hospitals. Including: Waste loading trolleys and basket (2x) Water softener unit (1x) Air compressor (1x)		

Automatic Fractionated Autoclave

ITEM:		PHOTO / DRAWING / GRAPHIC
Automatic Autoclave for the treatment of infectious waste, horizontal loading, vacuum-steam-vacuum type *Code: TRE-02-04*		
Technical Data:	**(Main)**	
Capacity:	> 40 kg/h > 350 l/h	
Chamber size	> 450 l	
Material	Stainless steel	
Temperature	121°C, 134°C	
Application:		
For the treatment of infectious waste in large rayon hospitals Including: Waste loading trolleys and basket (2x) Water softener unit (1x) Air compressor (1x)		

Automatic Fractionated Autoclave,

ITEM:		PHOTO / DRAWING / GRAPHIC
Automatic Autoclave for the treatment of infectious waste, horizontal loading, vacuum-steam-vacuum type *Code: TRE-02-05*		
Technical Data:	**(Main)**	
Capacity:	> 50 kg/h > 500 l/h	
Chamber size	> 700 l	
Material	Stainless steel	
Temperature	121°C, 134°C	
Application:		
For the treatment of infectious waste Including: Waste loading trolleys and basket (2x) Water softener unit (1x) Air compressor (1x)		

Manual non-vacuum autoclave

ITEM	DESCRIPTION/SPECIFICATIONS
Electricity and final disposal: This autoclave should be used in district hospitals that have reliable electricity supply and proper final disposal arrangement for the sterilized and shredded waste materials. **Materials to be treated:** Syringes, needles, and other sharps and plastic materials. Not for organic materials. **Capacity:** Autoclave: inside chamber, 304 grade stainless steel, an inner volume of 167 L, radial locking arrangement, pressure and temperature gauges, water level indicator, safety valves, electrical control box. Supplied with spare heating element and gasket.	

ITEM	DESCRIPTION/SPECIFICATIONS
Small scale shredder/Plastic scrap granulator. Suitable for sharps. Blades can be removed for sharpening if necessary. Not suitable for waste containing liquid residues, bandages or other difficult to handle materials	 ***shredder and operator***

3.2.7.2 De Monte fort incinerators

<u>Demontfort Incinerators: Lower Level facilities</u>

Description

- Designed especially for low level healthcare facilities.
- Recommended for use:
    - Mark I incinerator is recommended for the dispensary
    - Mark III incinerator is recommended health centers'

  (Note: The selection of these incinerator depends on amount of waste generated at the facility)
- Capacity: Mark I 12 kg/h and Mark III 50 kg/h
- Lifespan: average: 3-5 years
- The unit must be constructed by a skilled technician who has been trained and certified by the Ministry
- Material for the construction should be of recommended quality

  It should be located at least 50 m away from the main buildings

Specifications;

1. Refractory (fire bricks) –
    - Made from refractory clay
    - Size; 230 x 115x 75mm
    - With stand temperature of at least 1300˚C.
2. Fire clay; shall be refractory clay which can with stand temperature of at least 1300˚C

3. Stainless steel sheets (4 mm)
4. Bolts, nuts and washers shall comply with B.S. 9 16mm
5. Concrete blocks for walking area and foundation shall comply with B.S. 2028 Type A.
6. Coarse aggregates for concrete shall be good, hard, clean aggregates from approved quarries. It shall be free from all decomposed materials.
7. Fine aggregate shall be good, clean and free from all decomposed materials.
8. Cement;
    - Fire cement which withstand temperature of 1,700 C
    - Ordinary Portland cement and shall comply with B.S. 12
9. Water used on the work shall be clean, free from earthly vegetable and organic matter and from acid and alkaline substances in suspension or solution.
10. Pressure impregnation; the softwood described as pressure impregnated shall be treated.
11. Joints; all nails, screws, bolts connectors etc. are to be as specified under "Metal Works".

Corrugated iron sheets shall be of G.28.

Material Requirement – BQ

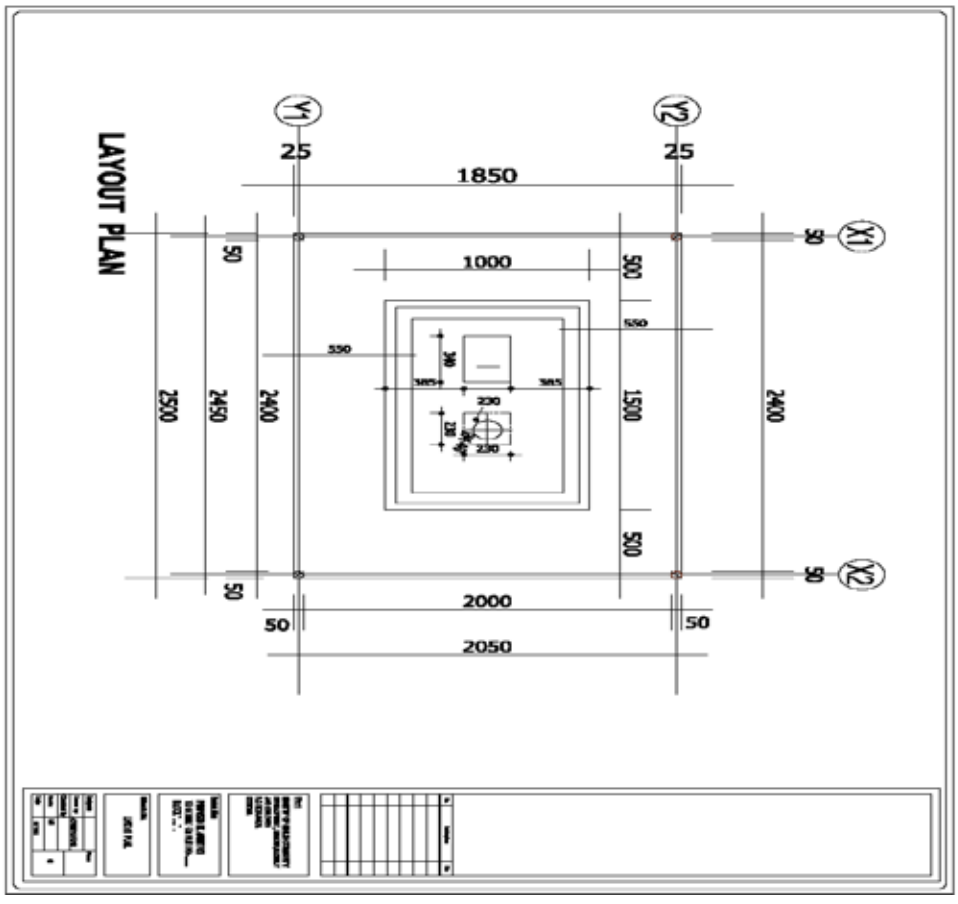
Category	*Item*	*Quantity*
A	**Preparation of Foundation**	
	Sand 1 lory	2 m^3
	Core stones	2 m^3
	Agregate 3/4	2 m^3
	Cement block	200
	Cement bag	12
	3 pc 2.5 inches black pipe	4
	1x8 timber 6pc	10
	Fire bricks (imported fire bricks)	300
	Black Pipe 2.5 "	3
	Fire cement	2
	Fire clay	1
	Subtotal	
B	**Roofing materials**	
	Coorugated iron sheet 28 gauge	15
	5 pc timber 4x2 (Treated)	10
	3 pc timber 2x2	10
	Roofing nails kg	2
	Mixed nails kg	3
	red oxide 1 litre	1
	Brush	1
	Flat bars	1
	Labor charge - Roofing artisans	1
	Sub Total	
C	**Metal work and firebricks**	
	steel sheet	1
	Chimney pipe	1
	2 pc angle line 3"x2" ffor frame and inner wall tighting	1

	Air vent pipe 1squire pipe pcs 3/4	1
	Flat bar pcs	4
	Chimney cover	1
	Squire pipe I pcs	1
	16mm iron bar	2
	Hinges	2
	Iron bar 16mm for grate	1
	U- channel (4m)	1
	Stainless steel rods kg	4
	Angle line for reinforcing cover sheet and outer wall	5
	3 pieces cutting disc	5
	2 piece round pipe for L/door	2
	12 pcs bush	1
	Bolts and nuts	20
	Flat bar pcs	5
	Labour charge	
D	**Supervission**	
E	**Fencing Wire**	

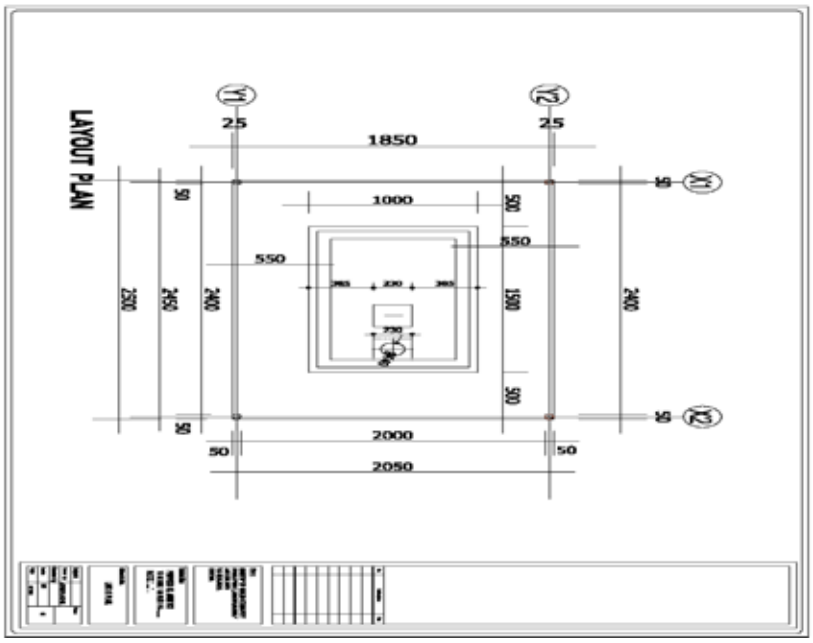
** ***For Mark 8 Units – Half units***

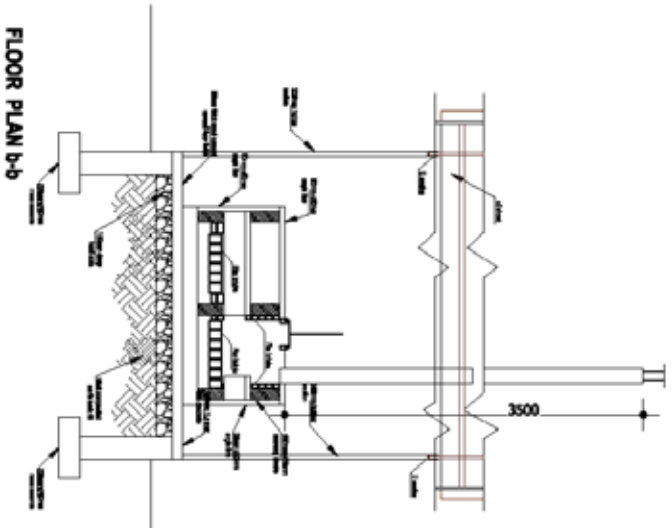
Incinerator Mark 8:

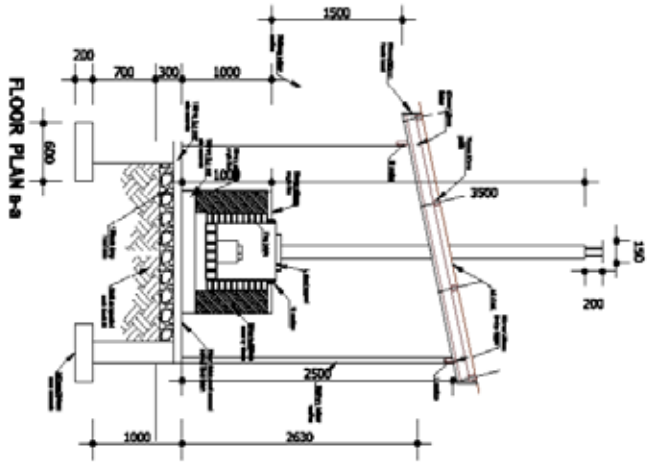
Option 1

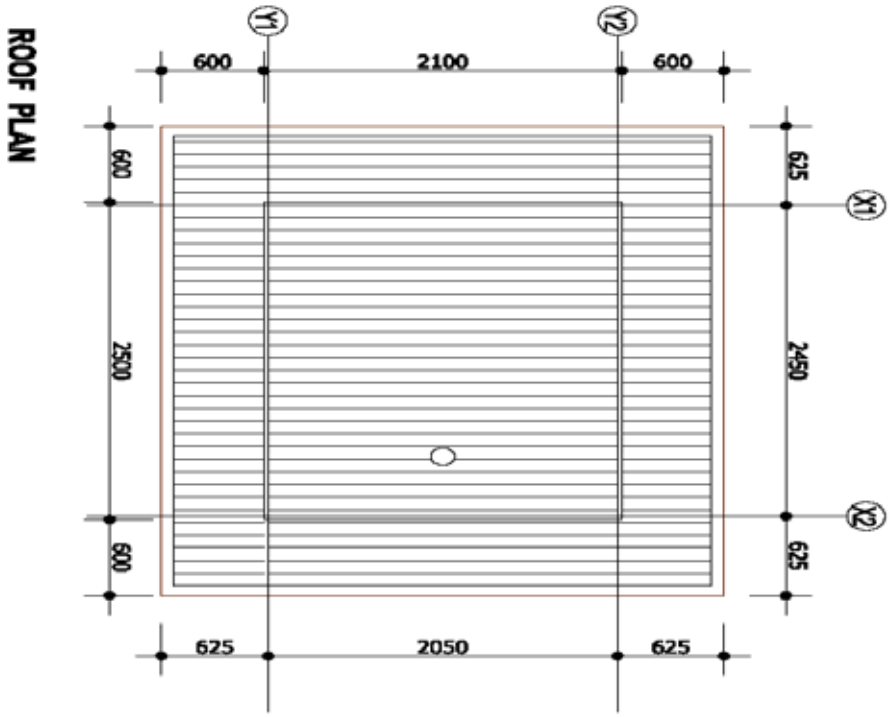


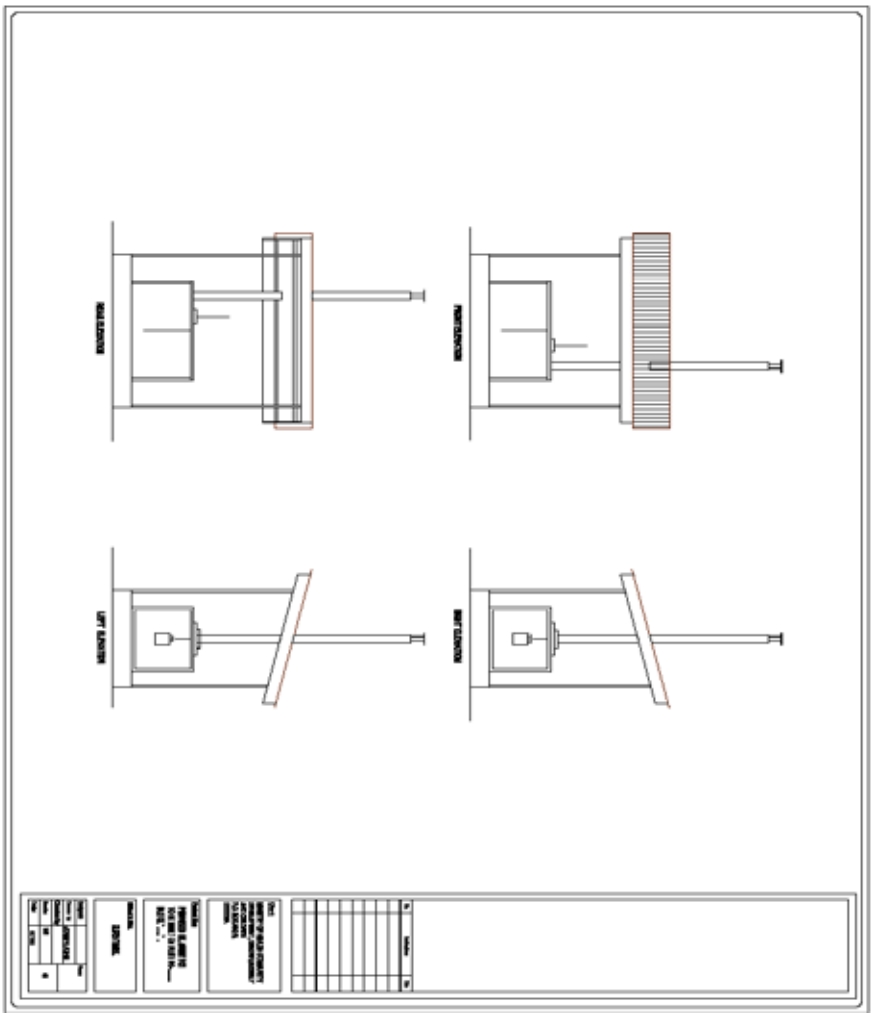
Option2


LAYOUT PLAN
Y1
Y2
25
25
1850
1000
550
550
2500
2450
2400
1500
2400
500
50
50
2000
50
50
2050

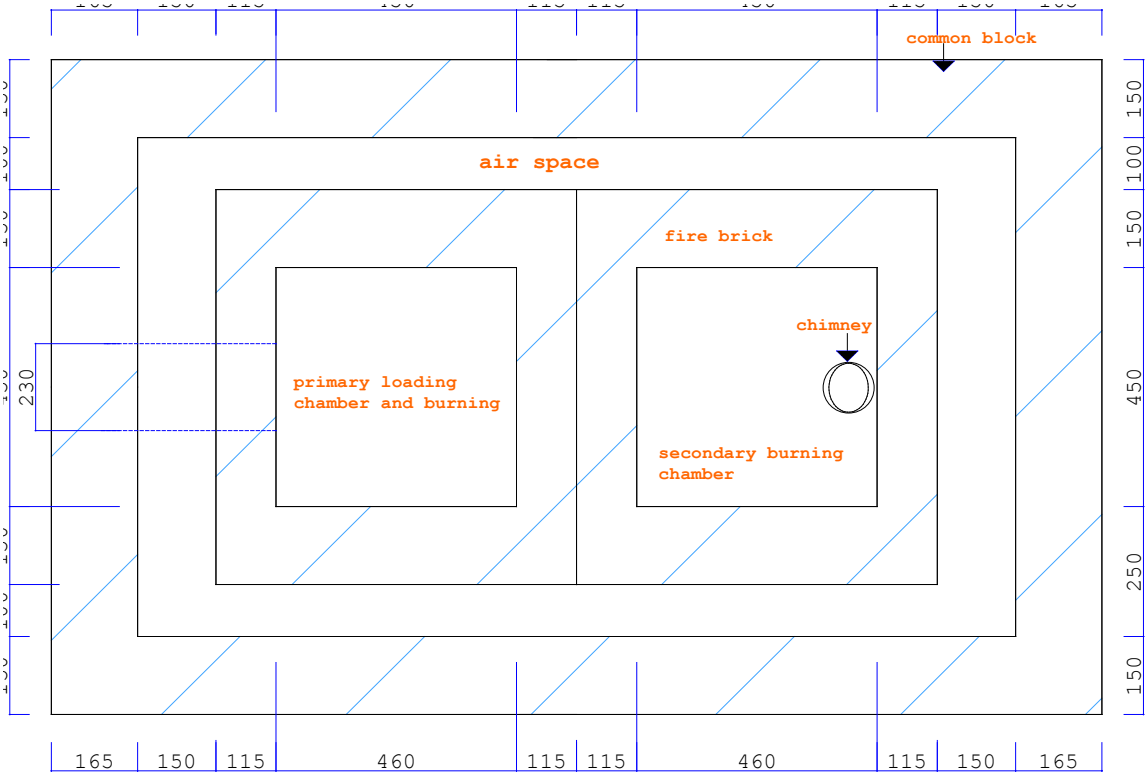

FLOOR PLAN b-b
3500


FLOOR PLAN a-a
1500
200
700
300
1000
600
3500
150
200
2500
1000
2630

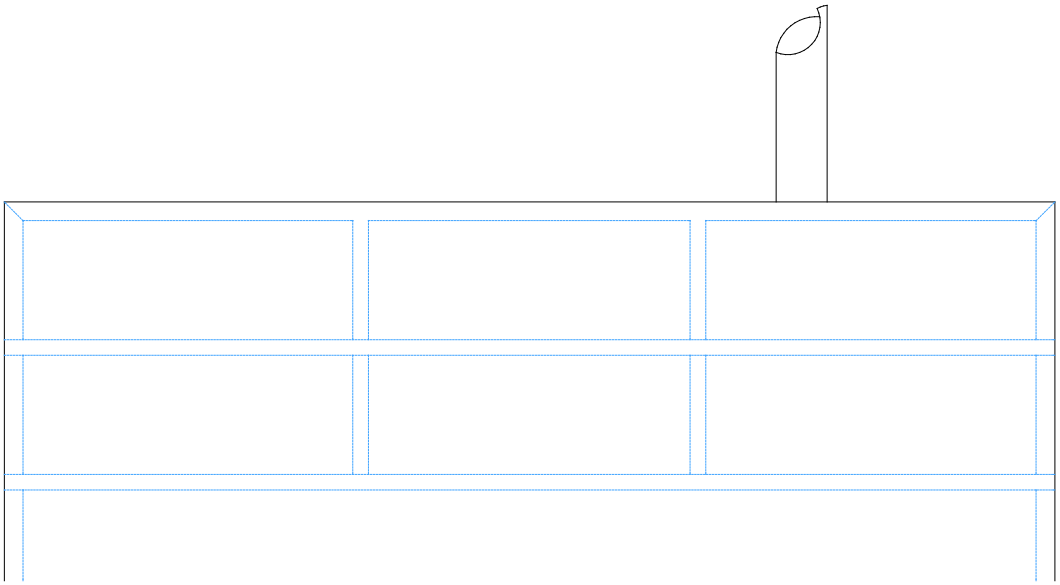

ROOF PLAN
Y1
Y2
600
2100
600
X1
X2
600
2500
600
625
2450
625
625
2050
625

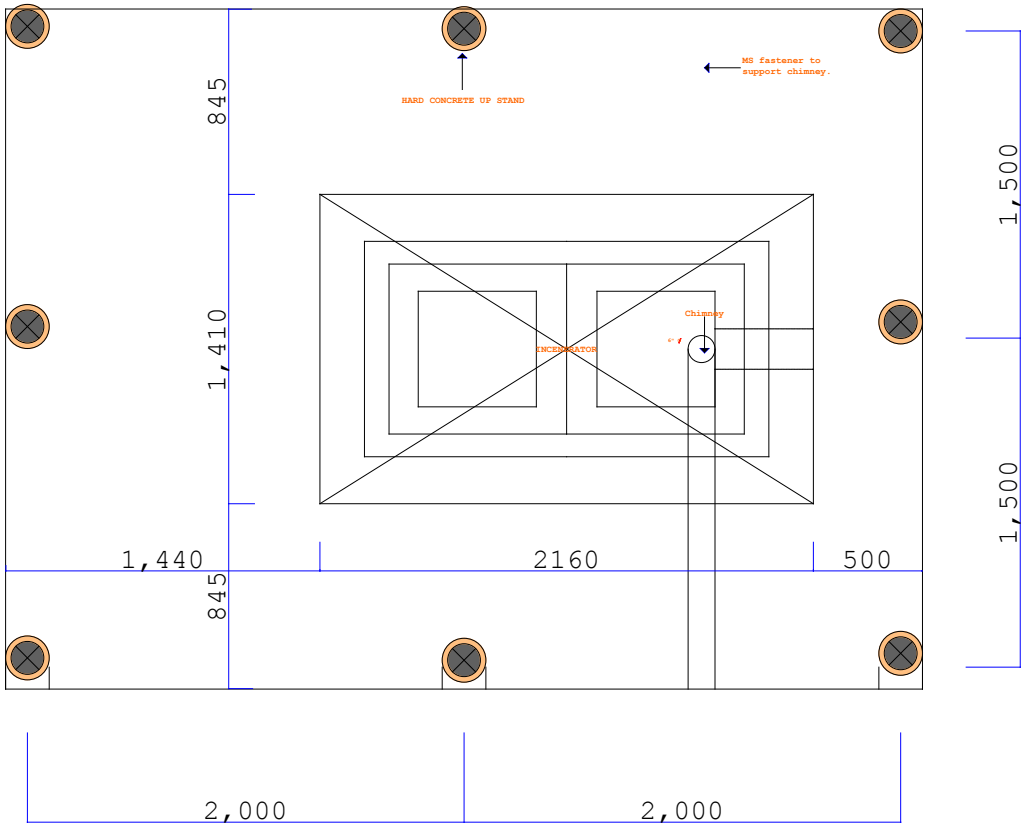


Demontfort Mark III

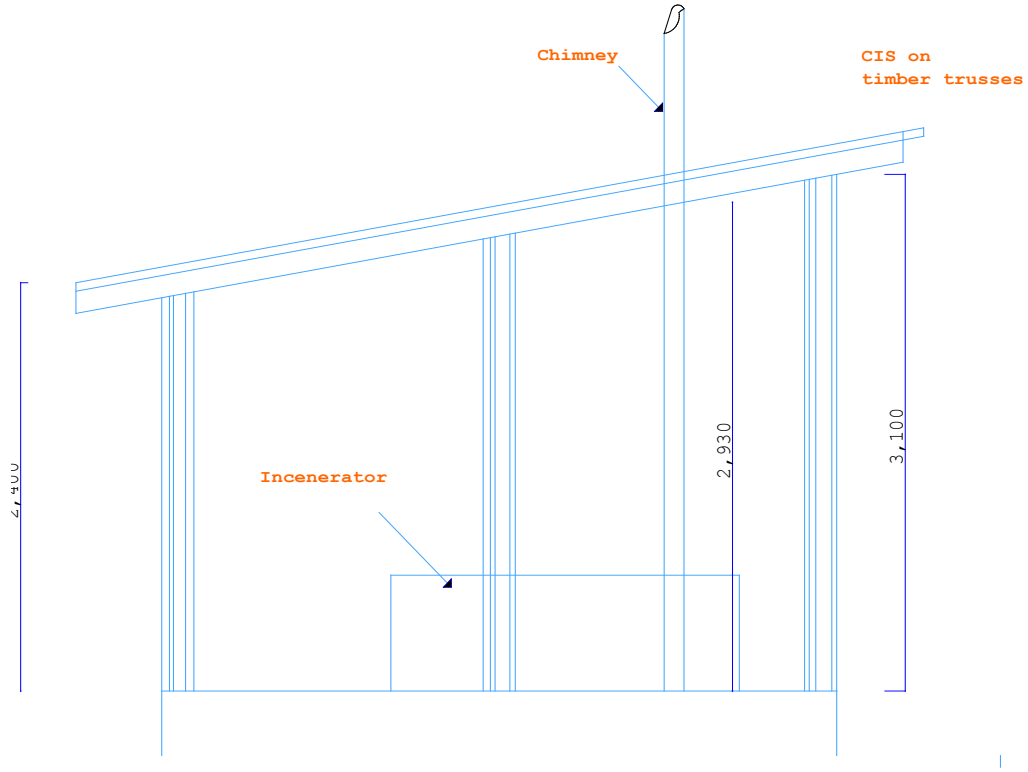


FLOOR PLAN

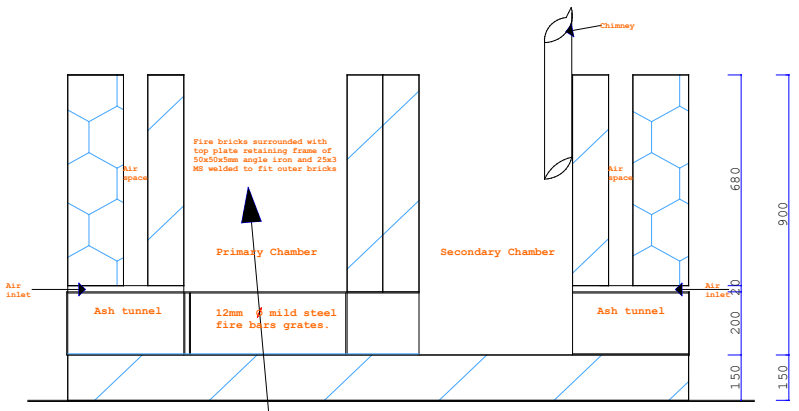




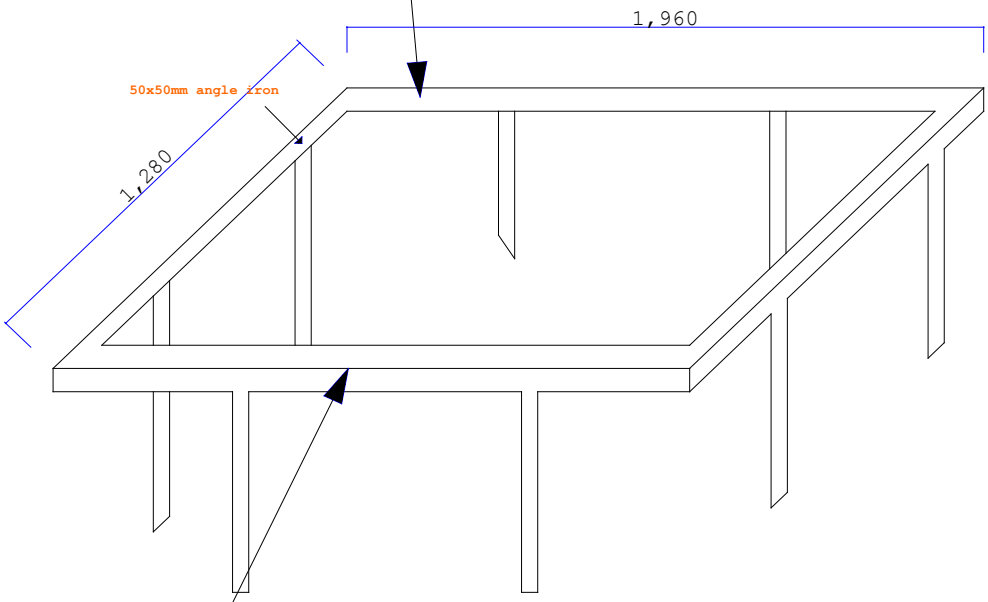
SITE PLAN 1:20

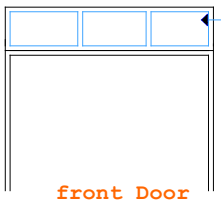


ELEVATION 1:20 SHADE FOR INCENERATION.

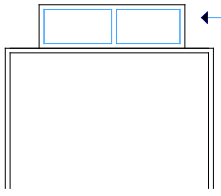


SECTION A-A 1:10

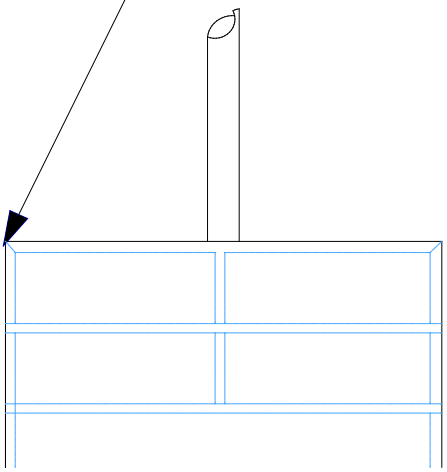




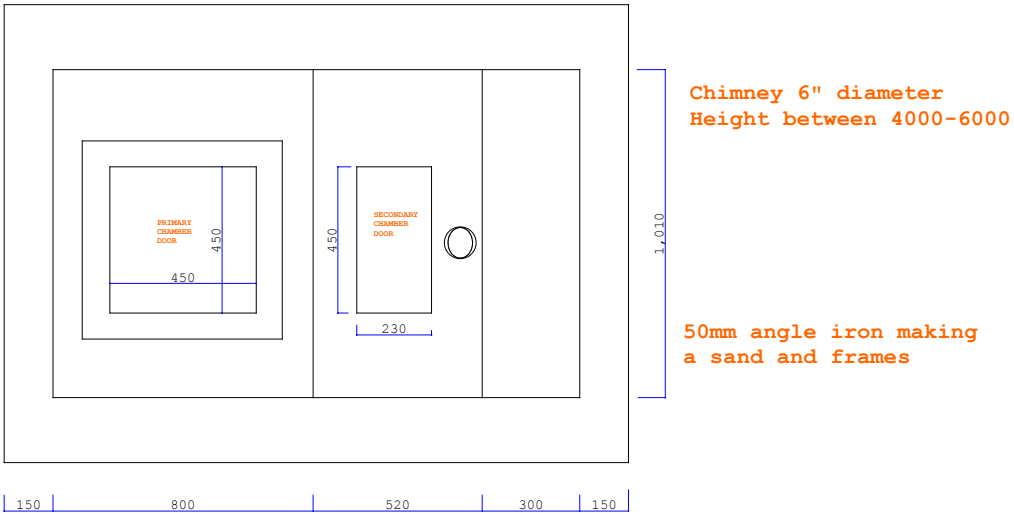
front Door



Rear Door



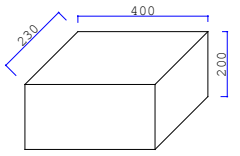
MS Door



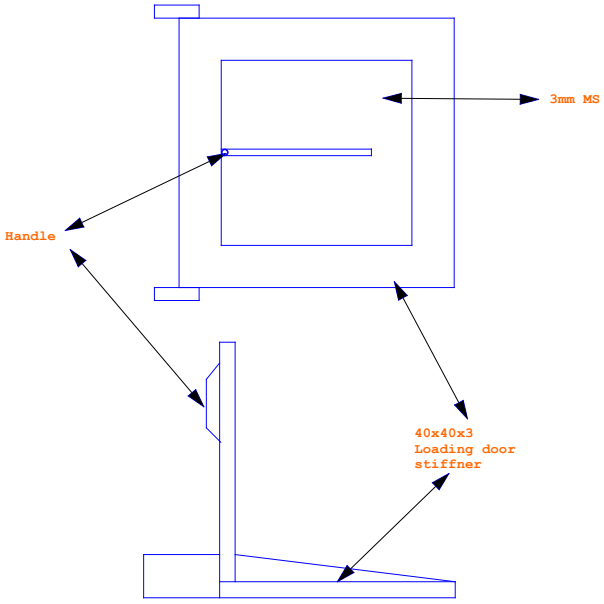
Chimney 6" diameter
Height between 4000-6000

50mm angle iron making
a sand and frames

REINFORCE WITH ANGLE IRON 1:10



Ashes unloading boxes
to have adoor on one side 1:10

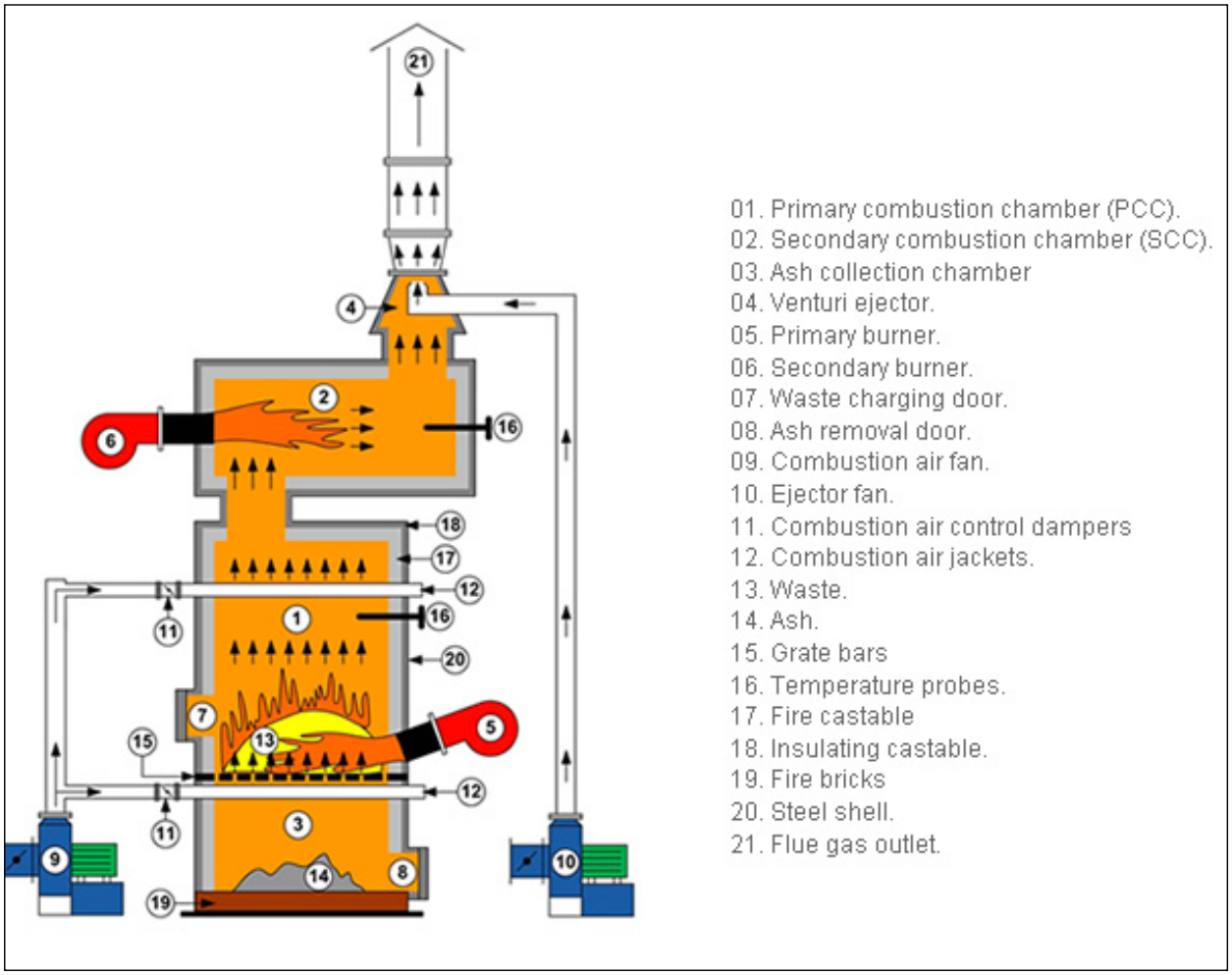


LOADING DOOR COVER 1:10

3.2.7.3. *High Technology Incinerator – oil burner fueled with pollution control devices*

It is oil burner fueled incinerator, made of double chamber with tertiary burning chamber or fitted with scrubbing system to serve as air pollution control devices. It is recommended for all hospitals at National, Zonal, Regional and Council levels.

3.2.7.3.1. Standard Model



Specifications

- Capacity of destruction in weight: (25 kg/h, 50kg/h, 100kg/h
- Incinerators are twin chamber, fixed hearth, pyrolytic and controlled air
- Capacity of 500 kgs/hr for solid and 1000 kgs/hr liquid wastes

Power Requirements: 380 V, three phase, 65AMPS, 50Hz

Chamber dimension : length 0,91m
Height 0,71m
Width 0.74m

The machine should have the following features

- Fully automatic control sequence ,
- Multi chambers air controlled ,

- Pollution monitoring and control system ,
- Refractory lined stack,
- Low noise
- It should be able to operate not less than 10 hours/day.
- Design Specification: Types A, B, C, D, and E of medical waste
- "PYROLYTIC" combustion, by controlling the gasification of waste.
- The incinerator must avoid the release of black smoke and fine dust, (Smokeless) during the loadings.
- It should be able to reduce the volume of wastes by 98%.
- It should be able to hold emission in the second burn with gas residence of not less than 2 seconds.
- The Temperatures of combustion: Minimum will be 850°C and max 1400°C and post combustion: >1100°C.
- The Internal diameter of the Chimney: Ø 400 and its height: 8 m
- Burner operation should be Automatic On/Off
- Fuel: could be gas or diesel
- Perfectly tight door for the manual loading of waste.
- The insulation of the combustion chamber should be composed of heat resistant materials to retain temperature within combustion chamber.
- Air blower: Electro-ventilator distributing the secondary air, the regulation of the air flow being carried out by valves and following the control of the automatic cycle.
- Contain control box which is watertight and dust proof
- The installed incinerator must bear a one year guarantee.
-

3.2.7.3.2: Typical Model

1. Wet scrubber incinerator with post treatment devices

- **Combustion chamber**
  Waste is thermally decomposed in the primary chamber at a temperature of 850–1,000˚ C. The resulting gaseous products are completely oxidized in the secondary chamber at 1,000˚ C with sufficient residence time.

- **Wet scrubber**
  Remove particulate matter as well as acid pollutant by capturing them in liquid droplets.

- **Cooling**
  Cooling is done through passage of particulate matter in carbonated water and pumped into venture scrubber to trap acid and other toxic gases.

Specifications for scrubber

- **Capacity:** 50–100 kg per batch incinerated in 40 min.
- **Burner capacity** of 7–14 kg diesel oil per hour.
- Chimney height not less than 4 m.

KRH 100 Model Incinerator with post treatment

Specifications;

- Batch feeding pyrolysis incinerator makes partial combustion layer by influx small amount of air than theoretical air.
- In primary chamber, waste is carbonized by heat from partial combustion layer to be fixed carbon, gases (CH4, CO, H2O) and liquid(Tar).
- Generated gas is used as fuel in combustion chamber (Secondary). No need other emission control device because flue gas is clean. If waste contains SOx or HCl, need to add additional gas treatment system.

Medical waste incinerator KRHT 100kg/hr-200B boiler included(200kg/hr

Specifications

Operating conditions;

- low degree caloric value: 4,000~5,000 kcal/kg: Burn rate: 100 kg/Hr: Operation condition: 8 ~24 Hr/Day

Utility;

- Fuel (diesel or gas)
- Electricity (Voltage 220V/380V; Frequency 50 Hz)

Features;

- Pyrolysis gasification combustion
- Smokeless & odorless perfect combustion
- Automatic control function
- Economically excellent equipment with minimum fuel consumption
- Batch Feeding method (One batch: 300 kg)
- Main combustion furnace (Primary combustion chamber)
- Ignition combustion device
- Re-combustion furnace (Secondary combustion chamber)
- Ignition burner
- Auxiliary Burner
- Oil tank and Oil piping system
- Dust collection device
- Forced Draft FAN
- Ejector fan
- Chimney
- Re-combustion temperature
- Automatic temperature control device
- Thermocouple

International Reference Standards of Emissions

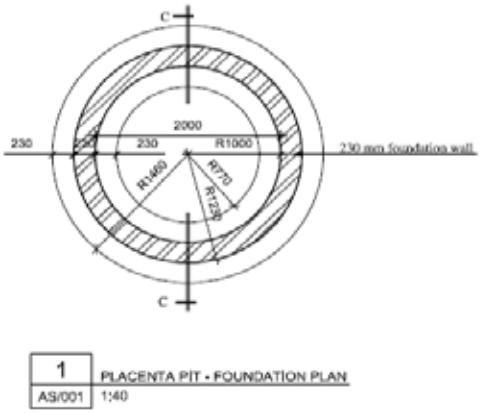
Pollutant Classification	U.S. EPA Standard
Dust(mg/m²)	230
Exhaust gas (Ringelmann smoke chart)	2 degree
Dioxin(ng/TEQm²)	57
CO (ppm)	20
HCL (ppm)	220
SO2 (ppm)	420
NO2 (ppm)	240
Smell	Odorless
Ignition loss	10%

3.2.8 Specifications for disposal methods

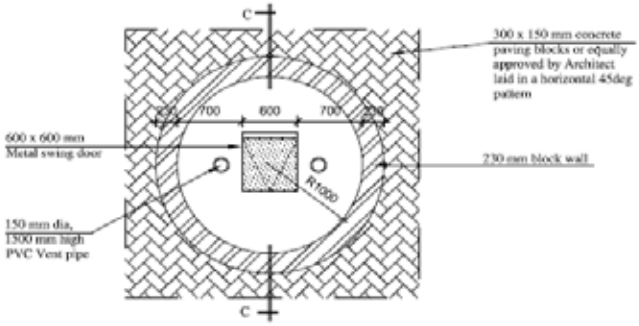
Specifications for disposal methods

Placenta pit

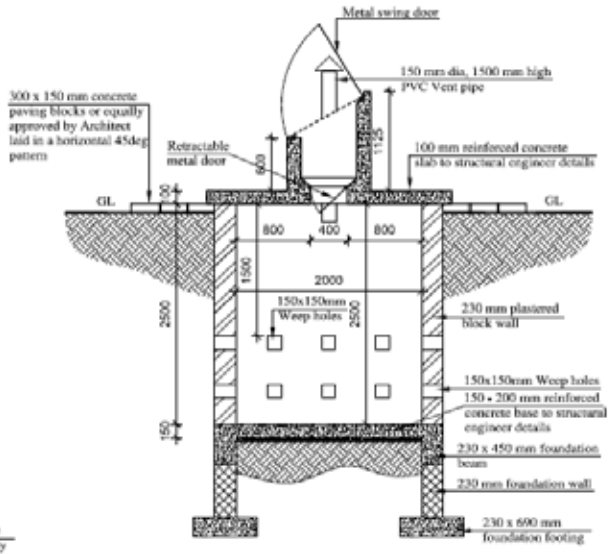
Layout for health center and dispensary



1 AS/001 PLACENTA PIT - FOUNDATION PLAN 1:40



2 AS/001 PLACENTA PIT - FLOOR PLAN 1:40

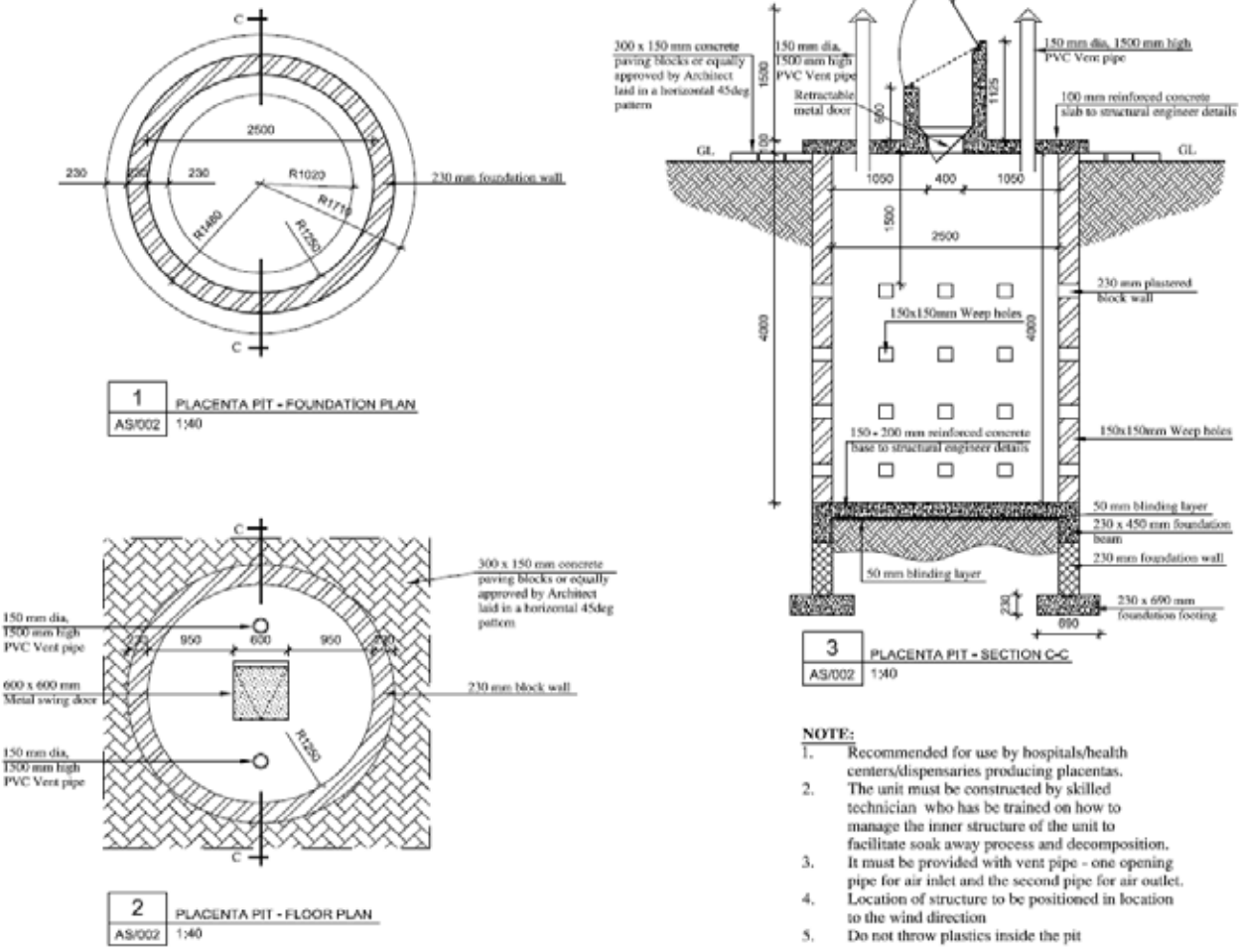


3 AS/001 PLACENTA PIT - SECTION A-A 1:40

NOTE:

1. Recommended for use by hospitals/health centers/dispensaries producing placentas.
2. The unit must be constructed by skilled technician who has be trained on how to manage the inner structure of the unit to facilitate soak away process and decomposition.
3. It must be provided with vent pipe - one opening pipe for air inlet and the second pipe for air outlet.
4. Location of structure to be positioned in location to the wind direction
5. Do not throw plastics inside the pit

Layout for Regional and District Healthcare Facilities



NOTE:

1. Recommended for use by hospitals/health centers/dispensaries producing placentas.
2. The unit must be constructed by skilled technician who has be trained on how to manage the inner structure of the unit to facilitate soak away process and decomposition.
3. It must be provided with vent pipe - one opening pipe for air inlet and the second pipe for air outlet.
4. Location of structure to be positioned in location to the wind direction
5. Do not throw plastics inside the pit

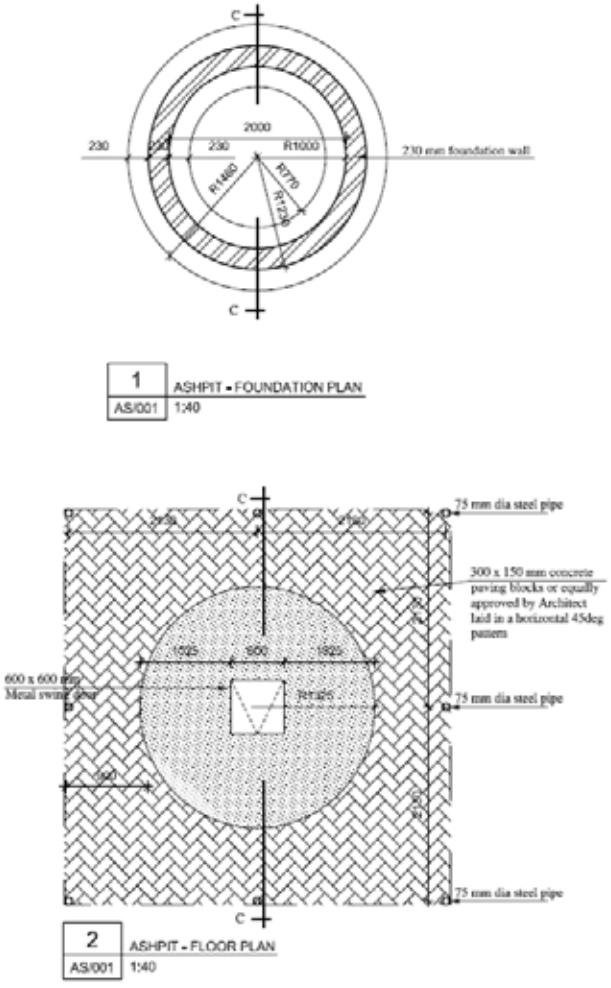
Bill of Quantities for Placenta Pit for Dispensary and Health Center

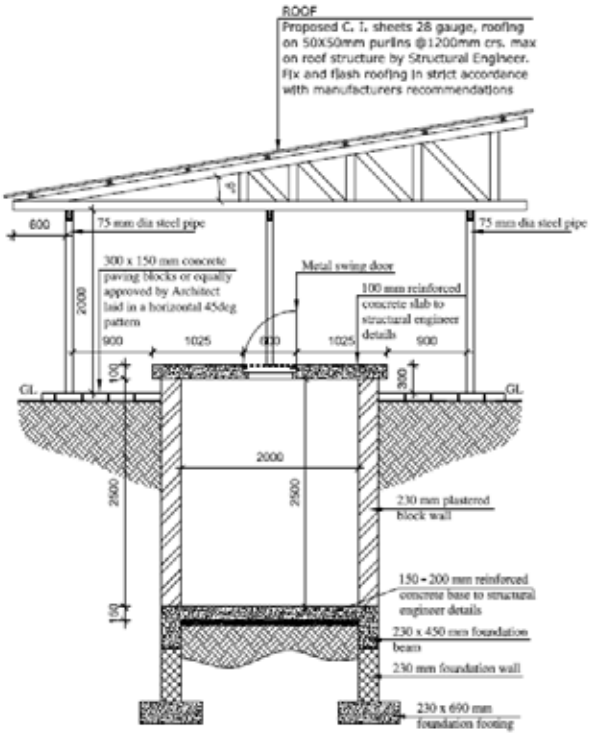
Item	Unit	Quantity
Excavation	m^3	12
Planking and strutting	Item	1.5
Removal of debris	Item	9
Back filling	m^3	5
R.C footing grade 25	m^3	1.5
formwork to edges	Item	10
wall 230 mm	m^2	20
DPC	m^2	12
DPM	m^2	15
Plaster	m^2	17
Painting bitiminous	m^2	6
100 mm R.C slab	m^3	15
vent pipe	m^2	8

Metal swing door P.C	Item	1.5
Paving blocks	m^2	25
labour cost	Item	
Additional PS sum		
Breaking rocks	m^3	1
Disposal of water	Item	1

Ash pit

Layout for ash pit





	Diameter (m)	Height (m)	Diameter (m)	Height (m)	Diameter (m)	Height (m)
Capacity	2.0	2.5	2.0	3.0	2.5	3.5
Volume	7,857.15 litres		9.428.50 litres		17.187.50 litres	
Designation	Dispensaries & heath centers		District hospitals		Regional hospitals	

NOTE:
Ashpit size will vary depending on the ash production per day, refers to the table above.

Bill of Quantities For Ash Pit

Item	**Unit**	**Quantity**
Excavation	m^3	12
Planking and strutting	item	1.5
Removal of debris	item	9
Back filling	m^3	5
R.C footing grade 25	m^3	1.5
formwork to edges	item	10
wall 230 mm	m^2	20
DPC	m^2	12
DPM	m^2	15
Plaster	m^2	10
Painting bitiminous	m^2	6
100 mm R.C slab	m^3	15
Metal swing door P.C	item	1.5
Paving blocks	m^2	25
labour cost	item	
Additional PS sum		
Breaking rocks	m^3	1
Disposal of water	item	1

CHAPTER FOUR: HEALTHCARE WASTE MANAGEMENT TRAINING COURSES

Introduction

The overall objectives of the training on HCWM are;

- To facilitate improvement of HCW management practices within the healthcare facilities,
- To prevent the exposure to employees, patients and the entire community to hazardous HCW in working environment
- To prevent pollution.

The training will be conducted in a tailored manner depending on the participants who are categorized as medical attendants and cleaners as one group and professional healthcare workers as the other group. The duration of training may vary from one to four weeks depending on the need. The developed training materials will be used throughout the sessions.

Learning Objectives

This course is intended to equip participants (workers) with skills and knowledge on proper management of HCW generated in health facilities. At the end of this course participants should be able to:

- Acquire knowledge and skills on proper handling of healthcare waste
- Apply safe management of HCW practices
- Protect themselves, patients and communities from risks due to infectious waste

Course Content

MODULE 1: INTRODUCTION TO HEALTHCARE WASTE MANAGEMENT

- **Module Overview**
  - Session One: Overview of HCWM
  - Session Two: Sources and types of HCW

MODULE 2: ENVIRONMENTAL MICROBIOLOGY

- **Module overview**
  - **Session 1:** Basics of Microbiology
  - **Session 2:** Immunology
  - **Session 3:** Microbial Ecology

MODULE 3: HEALTHCARE WASTE MANAGEMENT STREAMS

- **Module overview**
  - **Session 1**: Waste Minimization and Segregation of HCW
  - **Session 2:** Healthcare Waste Transportation
  - **Session 3**: Treatment Methods

- **Session 4:** Healthcare Waste Disposal Methods

MODULE 4: MANAGEMENT AND CONTROL OF CHEMICAL WASTE IN HEALTHCARE SETTINGS

- **Module overview**
  - **Session 1**: Sources and Types of Chemical in Healthcare Setting
  - **Session 2**: Reducing of UPOPs and Mercury Release
  - **Session 3:** Best Environmental Practices (BEP) and Best Available Techniques Concerning Health-Care Waste Management

MODULE 5: OCCUPATIONAL HEALTH AND SAFETY

- **Module overview**
  - **Session 1:** Workers Ethics and Right
  - **Session 2:** Occupational Health Hazard and Risks
  - **Session 3:** Health and Safety Practices of Health Workers
  - **Session 4:** Personal Protective Equipment

MODULE 6: INFECTION PREVENTION AND CONTROL IN THE CONTEXT OF HCWM

- **Module overview**
  - **Session 1**: Standard Precaution for Infection Prevention and Control
  - **Session 2**: Decontamination and Disinfection of Equipment and Linen
  - **Session 3**: Hospital Acquired Infections
  - **Session 4**: Housekeeping in Health Facilities
  - **Session 5:** Linen Management
  - **Session 6:** Injection Safety
  - **Session 7:** Post-exposure Prophylaxis

MODULE 7: DECEASED AND MORTUARY MANAGEMENT

- **Module overview**
  - **Session 1:** Providing Care of the Deceased at Mortuary
  - **Session 2:** Preparation of Deceased for Post-Mortem
  - **Session 3:** Preparation of Deceased for Burial at the Mortuary/Household
  - **Session 4:** Educating Relatives on Self-Protection when Contacting an Infectious Deceased

MODULE 8: WATER, SANITATION AND HYGIENE IN HEALTH CARE FACILITIES

- **Module Overview**
  - **Session One**: Water Supply
  - **Session two**: Improved Sanitation in HCF Facilities
  - **Session three**: Hand Hygiene and Hand washing
  - **Session four**: Waste Water Management in the Health Care Facility

- **Session five**: Vector and vermin control

MODULE 9: LANDSCAPING MANAGEMENT, GARDENING AND BEAUTIFICATIONS

- **Module overview**
  - **Session 1:** Landscaping Management
  - **Session 2:** Gardening and beautification of Healthcare Facility

MODULE 10: HEALTHCARE WASTE ORGANIZATIONAL ISSUES

- **Module overview**
  - **Session 1:** Organizational Structure of Healthcare Waste Management
  - **Session 2:** Role and Responsibilities in HCWM for Large and Small Health Facilities
  - **Session 3:** Policy and Legal Framework of Healthcare Waste Management

METHODS OF TEACHING

A range of teaching methods will apply and will include:

- Lecture and discussions
- Site visits
- Demonstrations (and practical)
- Group work
- Role play
- Buzzing
- Brainstorming