

Section IV:

Maintenance and Planning

(For ministry of health managers, maintenance contractors, and personnel)

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4.1 Maintenance responsibility

A well-constructed WDU is designed to be durable and reliable. If the WDU has been built according to the specified standards, and maintained adhering to “Best Practices”, it will function efficiently for many years.

A qualified official other than the operator should inspect the WDU once every six months. An independent assessment will ensure greater freedom for the inspecting authority and provide an impartial view of the system’s operation. It is suggested that the services of a government environmental health officer, HCWM manager, or air pollution control specialist be enlisted for the inspection.

Normal wear and tear of the unit is to be expected. But if this is coupled with poor operation and maintenance practices, the WDU’s components will deteriorate rapidly. This will result in both a decrease in combustion quality and an increase in emissions, causing potential risks to the operator and to the public. Proper operation and maintenance extend the life, effectiveness, and reliability of the equipment, but require a coherent maintenance plan.

WDUs operated according to “Best Practices” require:

- 1) Maintenance planning; i.e.: that any services contracted for construction, training or any other activity should include maintenance as a component.
- 2) Preventive maintenance (i.e. inspections and scheduled maintenance visits); and
- 3) Unscheduled maintenance (i.e. response to maintenance requests for repairs of failed components).

Various persons, including ministry of health managers, maintenance contractors, HCWM supervisors and WDU operators have a role to play in the maintenance process.

4.2 Contract for maintenance services

Maintenance services are to be included as a component of services contracted right from the planning phase of a HCWM program. (Details of this process are defined in Section II, paragraph 2.6.4)

4.3 Planning

The importance of good maintenance planning should not be underestimated. Proper planning will enable coordination of necessary maintenance actions and schedules with budget, authorizations, human resources, procurement, transport, logistics, and reporting, etc., facilitating operations and eliminating extra costs. Maintenance planning is required for every HCWM program where WDUs are to be installed. Table 4.1 outlines the chronology, tasks and schedule of a typical maintenance program.

Preparation of a similar maintenance plan chart, adapted to local conditions, is required for any HCWM program. The HCWM program manager should review and approve the plan.

Table 4.1 Model Maintenance Plan

Assumptions			
1 Annual maintenance cycle		2 visits/yr	
2 Number of WDUs in program		50	
3 Average number of inspections/working day		2.5	
4 Average number of maintenance visits/working day		2	
5 Parts reordering cycle		Once/year	
	Responsibility	Activity schedule	
		Cycle 1	Cycle 2
Inspection		Week No.	Week No.
Proposal and inspection visit schedule	Inspector	1	27
Budget approval	HCW Prog. Mgr	2	28
Inspection (all sites)	Inspector	4-8	30-34
Inspection report	Inspector	10	36
Inspection report approval	HCW Prog. Mgr	12	38
Scheduled Maintenance			
Maintenance plan and schedule	Contractor	14	40
Budget approval	HCW Prog. Mgr	16	42
Inventory check for parts in stock	Contractor	16	42
Quotations and procurement order for parts not in stock	HCW Prog. Mgr	16	42
Withdrawal of available components from stock	Contractor	18	44
Scheduled maintenance visits (all sites)	Contractor	18-24	44-50
Maintenance report to HCWM	Contractor	26	52
Maintenance report approval (HCWM)	HCW Prog. Mgr	28	54
Financial settlement of contractor's services	HCW Prog. Mgr	Completion of contract/cycle	Completion of contract/cycle
Unscheduled Maintenance			
Request for maintenance from primary health facility (PHF)	HCWM at PHF	Date of Demand (DD)	
Budget approval for unscheduled maintenance visit	HCW Prog. Mgr.	DD+1 day	
Acquisition of parts required for maintenance	HCW Prog. Mgr.	DD+2 days	
Unscheduled maintenance visit	Contractor	DD+2 days	
Maintenance report to HCWM	Contractor	DD+3 days	
Maintenance report approval (HCWM)	HCW Prog. Mgr.	DD+4 days	
Financial settlement of contractor's services	HCW Prog. Mgr.	DD+6 days	

4.4 Stock of replacement parts

Budget, human resources, logistics, and parts inventory must support every maintenance plan, if it is to be effective.

Table 4.2, provides a list of the components and materials, and their required quantities, which need to be stocked at the location to ensure efficient operations. The quantities indicated are based on the assumption that 10 WDUs are included in a maintenance program. Quantities for larger or smaller programs should be adjusted on a pro-rata basis.

Table 4.2 Recommended stock of spare parts

Title of drawing or component	Drwg ref. No.	Quantity/10 WDU
Fabrication Drawing for Top Frame (PART A)	ML/FAB/001	2
Fabrication Drawing for Loading Door (PART B)	ML/FAB/002	5 Sets
Fabrication Drawing for Front Door Frame (PART C)	ML/FAB/003	5 Sets
Fabrication Drawing for Front Door (PART D)	ML/FAB/004	5 Sets
Fabrication Drawing for Spigot (PART E)	ML/FAB/005	5 Sets
Fabrication Drawing for Grate (PART F)	ML/FAB/006	10
Fabrication Drawing for Intermediate Bridge (PART G)	ML/FAB/007	5
Fabrication Drawing for Vertical Support (PART H)	ML/FAB/008	4
Fabrication Drawing for Vertical Frame (PART I)	ML/FAB/009	4
Fabrication Drawing for Horizontal Supports (PART J)	ML/FAB/010	2
Self-adjusting draft control and tee for chimney	ML/FAB/011	5 Sets
Fabrication drawing for stove pipe and chimney components OR Outsourced components	ML/FAB/012	10 Sets
Stovepipe Thermocouple	None	10
Refractory Brick	None	400 Nos.
Refractory Cement OR Refractory Mortar	None None	100 kg or 300 kg
High Temperature Paint	None	20 kg
Rust Proof Primer	None	10 kg
GI Corrugated Sheet (= or >1.5 mm gauge), 2m x 1m	None	5
Chain Link Fence (40 mm mesh, 3 mm dia wire)	None	20 m ²
Nuts, Bolts, Washers (M8 x 30 mm long)	None	100
Nuts, Bolts, Washers (M8 x 50mm long)	None	50
J Bolts, Washers, Tar Washers, Nuts (M8 x 125 long)	None	50
Strainer Cables,(4-6mm dia stranded corrosion resistant).	None	6
Strain adjusters, end lugs and clamping bolts for strainer cables	None	6

4.5 Preventive maintenance

Preventive maintenance ensures that the equipment functions efficiently and reduces the risk of equipment failure. Such maintenance ensures that:

- 1) Contaminated waste is reliably eliminated.
- 2) Equipment to destroy waste is available in good working condition.
- 3) The need for unscheduled maintenance visits is reduced.
- 4) Maintenance costs are under control—planned, scheduled maintenance is more cost-effective than unplanned, unscheduled maintenance.

A qualified official must inspect the installed WDU every six months. A complete inspection should cover the incinerator, the WDU structure, the tools and protective clothing, and the records. (These tasks are detailed in Table 4.3, Table 4.4, Table 4.6 and 4.7)

A qualified ministry of health official or program officer should conduct the inspections.

Once the WDU inspection is complete, an inspection report has to be submitted to the HCWM supervisor for review. The report should include:

- Requirements regarding repairs/replacement of parts,
- Schedule for completion of recommended actions, and
- Program budget for repairs.

Approval of the inspection report authorizes the following activities to proceed:

- 1) To draw from stock or procure the replacement parts required for the scheduled maintenance.
- 2) To embark upon a scheduled maintenance program based upon the budget and schedule provided in the inspector's report.
- 3) To contract or amend an existing contract for maintenance services.

4.6 Scheduled maintenance

Scheduled maintenance is the routine repair work carried out subsequent to the inspector's visit to each WDU in a HCWM program. Work is conducted as specified in the inspection report once approvals are given, replacement parts made available and budgets finalized.

A scheduled maintenance program reports on each maintenance task performed and documents the actions, replacement parts, and status of each WDU on completion of the scheduled maintenance visit. Scheduled maintenance is to be carried out as per an approved maintenance plan. (See, e.g., the maintenance plan provided in Table 4.1.)

4.7 Unscheduled maintenance

Unscheduled maintenance is defined by unforeseen defects that impair effective functioning of the WDU. Request for such maintenance has to be made by the person in charge of HCWM at the health facility.

Unscheduled maintenance is expensive since it requires deployment of maintenance personnel to a single location, and should only be undertaken if the requirement is urgent.

4.8 Summary

With adequate planning, resources and maintenance, operators should be able to successfully maintain a fully functional waste disposal unit.

Table 4.3 Inspection of Incinerator Parts

Responsible person:			Status of Incinerator Part					Date of inspection:			
Inspection item	Masonry & mortar	Loading door	Ash door	Top plate	Incin. frame	Stack spigot	Temp gauge	Flue valve	Inter bridge	Grate	Stack
Response option	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Incinerator (metallic parts)											
Hinge or hinge pin damaged											
Closing latch working, jammed or broken											
Detached from masonry											
Part warped or twisted											
Part badly corroded											
Requires repainting											
Partially or fully blocked											
Not operating correctly and affecting functioning of incinerator											
Incinerator (masonry parts)											
Major cracks											
Mortar repair required											
Bricks loose or missing											
Bricks cracked											

Note: Shaded cells do not need to be filled as other columns address these questions.

Table 4.4 Inspection schedule of tasks (WDU structure)

Responsible person:		Inspection of WDU structure						Date:	
WDU structure (metallic parts)									
Inspection item	Vertical angle iron members	Horizontal angle iron members	Stack guy lines	Chain link frames	Door	Waste hatch	Manhole covers	Tool/Clothing container	
Response option	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	
Parts badly corroded									
Part warped or twisted									
Part badly damaged									
Painting required									
Operating correctly									
WDU structure (concrete parts)									
Inspection item	Floor-level	Counter-level	Ash pit	Safety Box Store	Needle store	Enclosure			
Response option	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No			
Walls damaged									
Concrete slabs damaged									
Apertures in slabs badly damaged									
Operating correctly									

Note: Shaded cells do not need to be filled as these questions are addressed in other columns.

Table 4.5 Inspection schedule of tasks (tools and protective clothing)

Responsible person:			Inspection of tools and protective clothing					Date:		
Inspection item	Ash rake	Dustpan	Brush	Weighing scale	Sand Bucket	Fire-retardant gloves	Eye protection/ Face mask	Overall/ Protective clothing	Shovel	Lock for WDU door
Response option	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Item available										
In good condition										

Table 4.6 Inspection schedule of tasks (records)

Responsible person:		Inspection of records		Date:	
Inspection item	Operator waste disposal record	Inspection and maintenance visits	Repairs and maintenance		
Response option	Yes/No	Yes/No	Yes/No		
Records available					
Records complete					

Table 4.7 Inspection schedule of tasks (service need)

Responsible person:	Inspection of service needs (Yes/No, Comments)	Date:
Excessive ash in incinerator		
Excessive soot in stack		
Excessive ash/needles in pit		
Excessive safety boxes in store		
Excessive fuel stocks in store		