

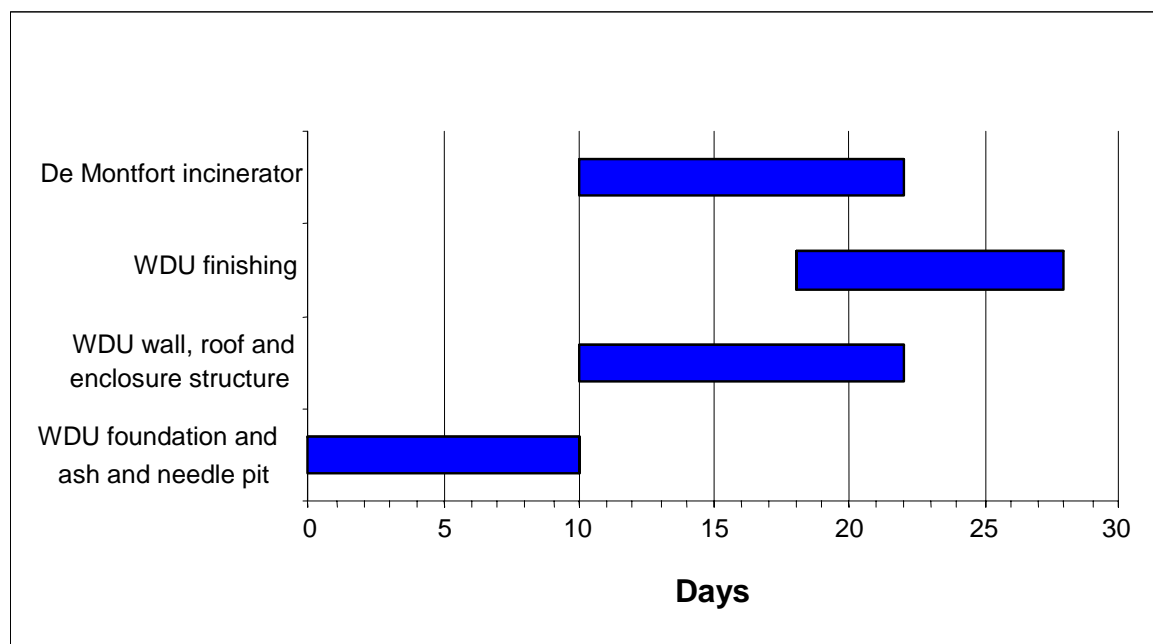
2.4.2 Construction timeline

The time required to build a WDU will depend upon workforce availability, skills and quality control. It should take approximately 1 to 4 weeks. Table 2.10 and 2.11 show the sequence and the linkages between the construction activities.

Table 2. 10 Steps in the construction process

Step in the Construction Process	Start Day	Duration (No. of Days)
WDU foundation and ash/needle pit	0	9
WDU wall, roof and enclosure structure	10	12
WDU finishing	18	10
De Montfort incinerator	10	12

Figure 2.4 DWDU Construction Schedule



2.4.3 Kit or local manufacturers' method

When planning HCWM programs, two options could be considered for procuring the components and labour of the Waste Disposal Unit. Table 2. 11 assists procurement agents to choose an appropriate option.

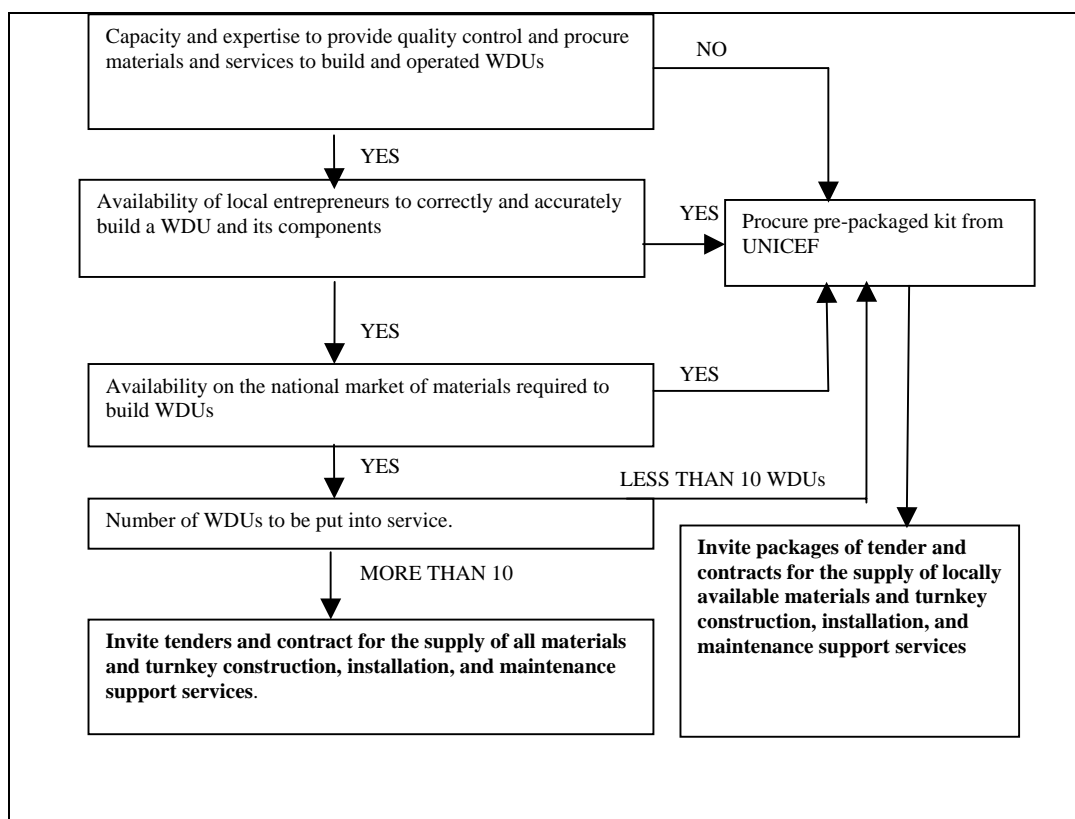
Table 2. 11 Options for procurement agents

<p style="text-align: center;">Option 1: Imported Kit Pre-packaged/Imported components</p>	<p style="text-align: center;">Option 2: Local Locally sourced components</p>
<p>The pre-packaged kit includes everything which is listed in Table 2.3. Procure a pre-packaged kit from UNICEF (listed in Product Information Sheets PIS/PQS), which includes all the fabricated metal components and the other materials (e.g. refractory bricks/cement) not readily available in the country where the HCWM program plans to use the WDUs.</p>	<p>Invite tenders and contract for the supply of all materials and turnkey construction, installation, training and maintenance support services.</p>
<p>The kit does not contain everything that is required and some things have to be procured locally. Invite tenders and contract locally for the supply of locally available materials not included in the UNICEF kit These materials are defined in Table 2.2. Also invite tender for turnkey construction, installation, training and maintenance support services.</p>	<p>Provide quality control, or contract experienced consultant services.</p>
<p>Provide quality control, or contract experienced consultant services.</p>	

2.4.4 Decision process for procurement approach

Figure 2.5 outlines the flow diagram for the Procurement Approach.

Figure 2.5 The decision to procure a flow diagram



2.5 Tender specification

Tender specification addresses the following main components: construction, training, and maintenance.

A limited number of entities should be invited to submit their tenders. Tendering procedures must be aligned with local practices, with clear recourse to the contractor in the event of sub-standard or non-performance. The selected contractor must deliver according to the tender specification.

The essential elements of each component are summarized below.

2.5.1 Construction

In addition to the standard provisions defined by international agencies and national governments, the tender specification should contain the following:

- Set of plans and assembly drawing as listed in Table 2.1.
- Set of drawings and quantities of locally supplied materials and components as listed in Table 2.2.
- Set of engineering drawings as listed in Table 2.3
- Specifications and estimated quantities of metallic materials as listed in Table 2.4.
- Specifications and estimated quantities of non-metallic components as listed in Table 2.5.
- Specifications and estimated quantities of paint and rust proofing, outsourced components and curing procedures as listed in Table 2.6, Table 2.7 and Table 2.8 respectively.
- A list of steps in the construction process defined in Table 2.9 according to the construction schedule in Table 2.11.
- Definition of the Quality Control process (specified by procurement agency).
- Component, provisional and final receiving report templates (specified by procurement agency).
- Terms and conditions of a performance bond or some similar arrangement to ensure that maintenance services are assured over 10 years.

2.5.2 Training

Rapid assessments of experiences operating the De Montfort incinerators highlight the importance of operator training and the impact of training on achieving “Best Practices”.

Tender specification should include provision for the following training:

- 1) Introductory training for all new WDU operators.
- 2) Retraining of WDU operators after approximately one year of operational experience.
- 3) Follow on training/retraining as deemed necessary to ensure operation of WDU as per “Best Practices”

The scope and content of each training component is provided in Section III: Training for operators of the De Montfort waste disposal unit.

An “Operator’s Manual” should be provided to each operator trained.

The training plan needs of supervisory staff assigned HCWM responsibilities at primary health facilities are not addressed in these guidelines. Supervisory staff should be familiar with these “Best Practices” for a WDU operation.

Operator training/re-training costs estimates are presented in Section I.

2.5.3 Maintenance

Feedback from evaluations of country programs clearly indicates that the invitation for tenders should not be restricted to a “construction contract”. Training and maintenance should necessarily be included to ensure quality and sustainability. Maintenance options must be carefully considered when inviting tenders. Also, success stories of local maintenance practices should be considered.

Well-known and proven maintenance practices include:

- Inclusion of an “Annual Maintenance Contract (AMC)” with a payment structure comprising an initial disbursement for installation services, subsequent annual disbursements for maintenance services, and a retainer (performance) bond payable upon successful completion of services. This approach is often difficult for funding agencies to administer since the payments extend over a long timeframe.
- Inclusion of a Maintenance Contract (MC), with a payment structure where the discounted value of maintenance over the maintenance period is paid upon fulfilling the installation and training requirements. A declining guarantee facility or performance bond deposited by the contractor is mandatory to ensure quality services are provided.⁹
- Inclusion of a Maintenance Contract, where the negotiated amount for installation and services, plus operating fee, are assigned to a bank or Non-Banking Financial Intermediary (NBFC) along with a “draw-down” agreement. The HCWM supervisor would have to certify, at each primary health facility, that the WDU has been adequately serviced and is functioning effectively. The contractor would then present signed certificates to the assigned bank or NBFC to release any payment due.

The scope and services of maintenance are outlined in Section IV. The estimated cost of maintenance is provided in Section I.

2.6 Contractor selection

The quality of services in many countries where the De Montfort incinerators have been installed has been unsatisfactory, resulting in sub-standard construction, sub-optimal performance, and dissatisfaction at the national government level.¹⁰

The poor quality is primarily an outcome of inadequate quality control and the lack of experience of entrepreneurs contracted for the services.

In programs where installation and maintenance services have to be contracted for more than 10 WDUs, the contracts should be awarded only to contractors who demonstrate technical and managerial capacity.

⁹ As the age of the equipment increases, the performance may decrease, hence the guarantee will be less as time progresses.

¹⁰ Small-Scale Incinerator Rapid Assessments in Kenya and Burkina Faso, PATH, June 2003. For more information, contact Terry Hart via email at tjh@itpi.co.in.

A potential contractor can demonstrate technical capacity by building a WDU. The WDU could either be the pre-packaged kit type or locally manufactured, depending upon the option adopted in a particular program. Agencies soliciting tenders should shortlist qualifying tenders and then invite the short-listed bidders to build a demonstration model. The bidder must supply the materials.¹¹

Contractors should satisfy the following criteria:

- Construction or supply of incinerator metallic components as defined in Table 2.3 to be 100 percent compliant with the engineering drawings provided in the Appendices. (Does not apply to kit-type WDUs.)
- Construction of WDU to be 100 percent compliant dimensionally with engineering drawings provided in the Appendices.
- All materials must meet specifications defined in Table 2.5 to Table 2.8.
- Cold crushing strength¹² of the refractory mortar used for the incinerator should not be less than 40 Mpa or Mega Pascal (N/m²).
- The installed WDU must satisfy the agency and/or representative of the national government upon visual inspection.

2.7 Quality Control

The failure of a number of HCWM programs has been attributed to poor quality control. Strict quality control is essential beginning with the program planning stage through to the construction and training stages, and throughout maintenance service.

The onus of quality control falls on the agency and/or national government responsible for the HCWM program planning and implementation. If professional resources are not available to ensure adequate quality control, then the services should be outsourced. (This is a common practice throughout construction industry.)

Quality control is required during all the phases with regard to the following:

- 1) **Planning and preparation:** Validate decisions on the mode of contracting for services and materials (kit or local procurement), specifically; inputs which determine whether to adopt the kit or local procurement approach, and choices related to tender document formulation, and bid evaluation.
- 2) **Materials reception:** Verify compliance of materials supplied with the technical and material specifications.
- 3) **Evaluation of demonstration models:** The demonstration models constructed by the short-listed tendering entrepreneurs need to be evaluated.
- 4) **Construction phase:** Verify each step as defined in the construction timeline (see Table 2.10)

¹¹ The costs of the demonstration model should be reimbursed to the bidder awarded the contract. The contract is awarded for a specific number of units. Hence, it is possible to either a) absorb the cost of the building WDU at a convenient site or b) build a demonstration unit on a site where it is required anyway. This approach helps to ensure that only serious bidders are involved, and that the quality of their work can be checked prior to giving the contract.

¹² Cold crushing strength refers to the capacity to withstand loading at ambient temperature and not the elevated (operating) temperature.

- 5) **Operator and supervisor training and certification:** Ensure training in “Best Practices” for all operators.
- 6) **Maintenance and service:** Make periodic visits to monitor post-installation maintenance and ensure service support for a 10-year period.

The quality control process should follow regular practices of reporting.