Sanitation Marketing Programme:

Catalogue of Affordable Latrine Options

March
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Acknowledgements

The products presented in this catalogue are the result of research, consultations and a development and testing exercise carried out by Robert Deal, an engineering consultant who is the primary author of this catalogue. The product ideas in the catalogue are not new, but are adaptations of designs used elsewhere where low-cost sanitation and hygiene options are needed, appearing in texts such as Caincross & Feachem (1983), *Environmental Health Engineering in the Tropics: An Introductory Text.*

Key technical support in the development of the catalogue was provided by Sam Watasa, the HIP Sanitation Marketing Consultant; Morris Israel, ARD; Teresa Nannozi, HIP Uganda Advisor; and Sam Mwebe of the Rural Association for Sanitation and Development, an NGO in Nkokonjeru, Uganda. Technical review and guidance was provided by Dr. Marion (Mimi) Jenkins, University of California-Davis and Scott Tobias, ARD.

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INTRODUCTION

This catalogue of affordable sanitation technologies was developed by the USAID-funded Hygiene Improvement Project's Sanitation Marketing (SanMark) Program in the Tororo District of Uganda. It is to be used by masons and sanitation promotional teams in their efforts to support heads of household to better understand the sanitation options available to them and to help these decision makers identify the option that best satisfies their needs and fits with their budget. The catalogue also may be of use to retailers and shopkeepers who are suppliers of the materials needed to build these latrines.

In the rural areas of Tororo, the traditional pit latrine, with mud or wooden floors, is prevalent, and there is very little information available on improved latrine options. Based on investigations by the SanMark project into the characteristics, motivations and constraints facing both consumers and suppliers of sanitation services in Tororo, it is most appropriate to focus attention on and promote a limited number of basic products that provide improvements over the traditional latrine. The latrine options presented incorporate design elements and materials that extend latrine life (over the traditional latrine), facilitate use and cleaning, and minimize costs through rational design and material utilization. The technology options presented rely on materials readily available at low cost in Tororo district. These options fit within the financial resources of most rural homeowners and with the availability, skills and expertise of local masons.

In this catalogue, we present several options for the various elements of a latrine: the superstructure, the slab and the pit. These can be mixed and matched and present the household head with a relatively wide array of alternatives to meet their sanitation needs. All latrines include hand-washing stations. As acceptance and demand for latrines grows, other options can be considered. Illustrations of these sanitation technologies are provided in the catalogue to help stimulate interest and future demand.

PITS AND FOUNDATIONS

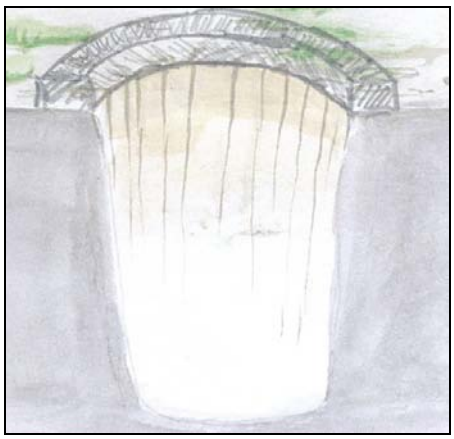
Brick Foundation for Slab

Materials
- Bricks – 200 for four courses but varies with site conditions and pit dimensions
- Pit (subcontracted)

Advantages
- Prevents collapsing of pit
- Uses cheap local brick
- Inexpensive

Disadvantages
- Suitable only in stable soils
- Unsuitable in sandy soils

Concrete Ring Foundation



Materials
- Cement
- Iron bars – 6 mm
- Pit (subcontracted)

Advantages
- Helps prevent collapsing of pit
- Inexpensive

Disadvantages
- Suitable only in stable soils

Corbelled Brick Foundation

Materials
- Bricks –varies with site conditions, pit dimensions and number of courses

Advantages
- Allows increase of pit volume with standard slab size
- Minimal extra materials cost

Disadvantages
- Additional pit excavation costs
- Requires skilled labour; added cost

(*photo shows corbelled foundation for double stance latrine*)

Open Brick Pit Lining

Materials
- Bricks
- Pit (subcontracted)

Advantages
- Prevents collapsing of pit in unstable soils
- Uses inexpensive local brick

Disadvantages
- Expensive
- Larger pit dimensions required to fit lining and maintain pit volume

SLABS

Reinforced Square Concrete Slab

Materials
- Cement - one (15 lt.) bucket
- Iron Bars - eight 99-cm pieces (8mm or 10mm)
- Aggregate - three (15 lt.) buckets
- Sand – three (15 lt.) buckets
- Water – one (15 lt.) bucket
- Epoxy paint (optional)

Advantages
- Easy to clean
- Long lasting
- Reusable

Disadvantages
- Cost of iron bar
- Heavy to transport; should be made on site
- Requires skilled labour

Dome Slab (non-reinforced)

Materials

- Cement – one (15 lt.) bucket
- Aggregate– three (15 lt.) buckets
- Sand – three (15 lt.) buckets
- Water – one (15 lt.) bucket
- Epoxy paint (optional)

Advantages

- Inexpensive
- Easy to clean
- Long lasting
- Reusable
- Easily rolled to new location

Disadvantages

- Requires skilled labour
- Fragile to transport; should be made on site

Square Slab with Raised Seat (for Handicapped or elderly)

Materials

- Cement (as above for slabs)
- Pre-cast raised seat

Advantages

- Easy to clean (seat interior will require cleaning also)
- Long lasting
- Reusable
- Comfort and accessibility for elderly and handicapped

Disadvantages

- Requires skilled labour
- Needs to be made near site
- Drop hole size may need to be adjusted to be flush with bottom of raised seat

SUPERSTRUCTURE

Wood Frame Structure with Papyrus Reed Walls (round or rectangular)

Materials
- Roof panel (metal sheet)
- Door (wood)
- Papyrus reeds
- Wood Framing

Advantages
- Inexpensive
- Cool
- Traditional construction methods

Disadvantages
- Walls not durable but cheap and easy to replace

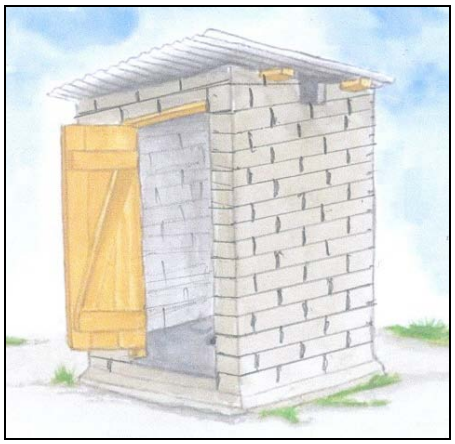
Packed Mud Walls Superstructure (round or rectangular)

Materials
- Wood
- Roof panel (metal sheet)
- Door (wood)
- Mud walls
- Vent pipe (optional)

Advantages
- Inexpensive
- Common in District
- Cool

Disadvantages
- Walls not as durable as bricks
- Requires maintenance

Brick Superstructure (Round or rectangular)



Materials
- Wood
- Roof panel (metal sheet)
- Door (wood)
- Bricks

Advantages
- Common practice in District
- Cool
- Very durable
- Minimal maintenance needed

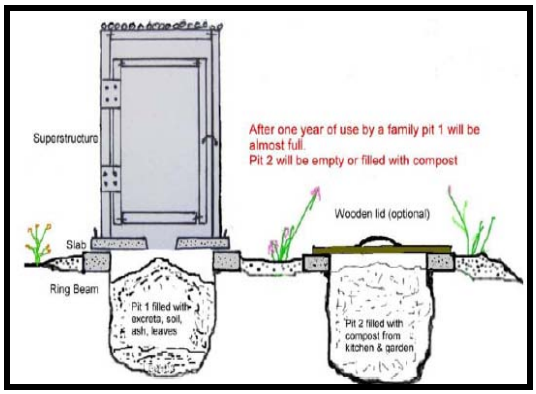
Disadvantages
- More expensive than other options

"NO-touch" hand washing facility (Tippy-Tap)

- Provided with all latrines

OTHER SANITATION PRODUCTS

Arbor-loo



Advantages

- Can use in conditions that prohibit deep pits, e.g., hard to excavate rock, collapsible sand or high water tables
- Small pits are inexpensive
- Slab to be movable
- Framed superstructure with reed walls can be moved
- Trees can be planted in pit after 1 year of pit closure

Alternating Pits

- After 1-2 years, old pit is emptied, waste used for gardens

Crestank Plastics – floor slab

- Can be used to improve existing mud floors
- Provides easy to clean surface
- Not significant load bearing capacity

Crestank Plastics – raised seat

- Modern toilet
- Easy to clean
- Can be used to collect urine for fertilizer
- Convenient for handicapped or elderly

TECHNICAL NOTES

Pits

Latrine pits can be circular, square, or rectangular. The circular pit is less likely to collapse, thus, the most durable. The following information should be considered when choosing pit shape and size:

- National guidelines for latrine pits require at least 15 foot depth (this can be very difficult in certain areas).
- Provide a pit with a reasonable volume at the time of construction.
- A family of six produces about 360 litres of solid waste per year. A depth of 15 feet (5 metres) with a circular pit with diameter of 3'-3" (1 metre) should last for about 10 years.
- **If a corbelled brick foundation** is used, increasing pit diameter by 16 inches (0.4 m) with the same slab dimensions, the pit volume will double, providing about 20 years of service.
- A circular lined pit using fired brick with open spaces at the joints will allow a deep pit in unstable soils.
- In conditions that prohibit deep pits, e.g., hard to excavate rock, collapsible sand or high water tables, the Arbor-loo could be used.

Foundations

- Foundations greatly reduce the possibility of pits collapsing and provide firm support for the concrete slabs.
- The concrete ring foundation assumes fairly stable soil conditions.

Slabs

The slabs most suitable for the project are:

- Square reinforced concrete slab (1m x 1m x 70mm)
- Circular non-reinforced concrete dome slab (1.2 m diameter).

The dome slab without reinforcing steel bars is very strong for vertical forces, supporting the weight of at least six adults. It is inexpensive, easy to roll around on site, and light enough for three adults to lift. Care is required for handling as the slab can easily crack if dropped.

Superstructure

The walls of a latrine can be built using any of the following materials:

- Packed mud (very common technique in Tororo District);
- Mud and wattle;
- Sun-baked brick with mud mortar and mud plastered walls (can be made by homeowner, possibly the cheapest option);
- Fired brick;
- Frame with wood poles or timbers, using natural local materials such as papyrus reeds or grass; and
- Door made from wood frame and available material for door face.

Roofing

Roof options include:

- Iron roofing sheets,
- Thatched grass roofing, and
- Plastic sheeting.

A metal roof lasts longest, and if the latrine sizes recommended in this catalogue are used, one sheet is all that is required. Thatched roofing is cheaper and cooler, but needs more maintenance/replacement. Plastic is considered a temporary measure.