

Water for the World



Designing Bucket Latrines Technical Note No. SAN. 1.D.5

A bucket latrine consists of a shelter and a platform which supports a slab and encloses a bucket. The bucket receives excreta, and it is emptied every one to three days by a laborer who carts the excreta to a disposal site. Designing a bucket latrine involves selecting locations for the latrines; determining latrine size; selecting materials, tools, and labor needed to build the latrines; determining the type and location of the disposal site; and determining personnel and equipment needed for the disposal operation. The products of the design process are: (1) a location map, (2) design drawings of the bucket latrine, (3) a construction materials list, and (4) an operation materials list.

This technical note describes how to design a bucket latrine and arrive at these three end-products. Read the entire technical note before beginning the design process.

Useful Definitions

CONTAMINATE - To make unclean by introducing an infectious (disease-causing) impurity such as bacteria from excreta.

EXCRETA - Human body wastes.

GROUNDWATER LEVEL- The level to which subsurface water rises during any given time of year.

Materials Needed

Measuring tape - To obtain field measurements.

Ruler - To draw a location map.

Location

Because of possible odors, a bucket latrine should be located at least 3m from the dwelling. Select a site that is accessible both for use of the toilet and removal of the bucket. When the sites for the bucket latrines have been selected, draw a location map similar to Figure 1, showing latrines, dwellings, roads, and disposal site (see later section on "Determining Type and Location of Disposal Site"). Give the map to the construction supervisor before construction begins.

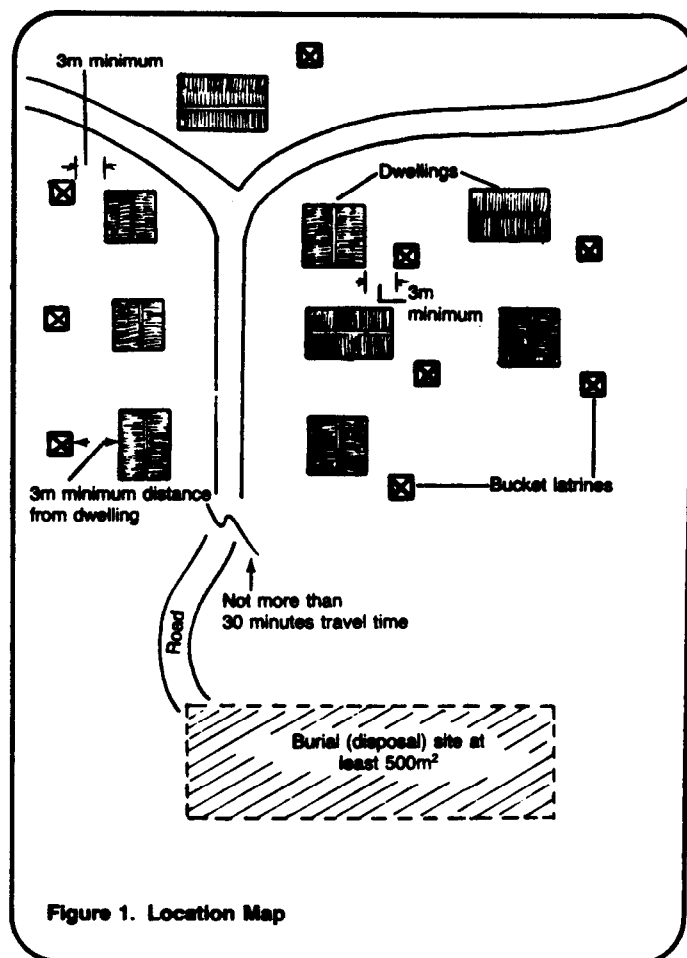


Figure 1. Location Map

General Design Information

The main features of a bucket latrine are the slab, platform, base, shelter, and bucket.

The slab is generally made from reinforced concrete. It may be a squatting slab or have a seat and pedestal (see "Designing Slabs for Privies," SAN.1.D.1).

The platform is made from concrete or brick and mortar. It supports the slab, encloses the bucket, and has a fly-proof door for removal of the bucket.

The base is usually made from reinforced concrete or brick and mortar with a cement mortar coating. The base supports the platform and the shelter.

The shelter may be made from a variety of locally available materials. It has an opening in the rear to allow access to the fly-proof door in the platform. See "Designing Privy Shelters," SAN.1.D.3.

Determining Size and Materials

Slab. Design the slab to be 1.0-1.2m wide, 1.0-1.2m long (front to rear), and 75mm thick. For complete details, see "Designing Slabs for Privies," SAN.1.D.1.

Platform. Design the platform so that the outside dimensions are the same as the dimensions of the slab. For example, if the slab is 1.0m wide and 1.1m long, the platform also should be 1.0m wide and 1.1m long. The height of the platform depends on the size of the bucket which will be used. The platform should be about 50mm higher than the bucket. For example, if the height of the bucket is 300mm, the platform height should be 300mm + 50mm = 350mm (Worksheet A, Lines 1-7). Table 1 summarizes the dimensions of the platform.

Include an opening for a fly-proof door in the rear wall of the platform. The opening must be large enough to remove and replace the bucket, and it should be flush with the bottom of the platform.

Table 1. Platform Dimensions for a Bucket Latrine

Feature	Measurement
Width	Width of the slab
Length (front to rear)	Length of the slab
Height	Bucket height plus 50mm

The door can be wood or metal. It must be hinged to open outward, and it must fit tightly around all edges.

The walls should be 50-100mm thick and strong enough to support the slab. If the walls are made of concrete, you need cement, sand, gravel, water, mixing containers, a shovel, a trowel, wood for forms, hammer, saw, nails, reinforcing material, and a laborer with some skills in working with concrete. If the walls are made of brick and mortar, you need bricks (or concrete blocks or select field stones), cement, sand, water, mixing container, shovel, trowel, and a laborer with some masonry skills. For complete details on working with cement or brick and mortar, including materials specifications and quantity calculations, see "Designing Septic Tanks," SAN.2.D.3.

To estimate the quantity of materials needed for the walls, use the following equation: $(2 \times \text{length} \times \text{height} \times \text{thickness}) + (2 \times \text{width} \times \text{height} \times \text{thickness})$. For example, if the walls are 0.075m thick, the platform height is 0.35m, the platform width is 1.0m, and the platform length is 1.1m, then the approximate quantity of wall materials needed is:

$$(2 \times 1.1\text{m} \times 0.35\text{m} \times 0.075\text{m}) + (2 \times 1.0\text{m} \times 0.35\text{m} \times 0.075\text{m}) = 0.06\text{m}^3 + 0.05\text{m}^3 = 0.11\text{m}^3 \text{ (Worksheet A, Lines 8-9).}$$

Worksheet A. Calculations for a Bucket Latrine

Slab

1. Width = 1.0 m
2. Length (front to rear) = 1.1 m
3. Thickness = 0.075m

Bucket

4. Height = 0.30 m

Platform

5. Width = Line 1 = 1.0 m
6. Length = Line 2 = 1.1 m
7. Height = Line 4 + 0.05m = 0.30m + 0.05m = 0.35 m
8. Wall thickness = 0.075m
9. Quantity of materials for platform walls = -
 $(2 \times \text{Line 5} \times \text{Line 7} \times \text{Line 8}) + (2 \times \text{Line 6} \times \text{Line 7} \times \text{Line 8}) =$
 $(2 \times \underline{1.0} \text{ m} \times \underline{0.35} \text{ m} \times \underline{0.075} \text{ m}) + (2 \times \underline{1.1} \text{ m} \times \underline{0.35} \text{ m} \times \underline{0.075} \text{ m}) =$
 $\underline{0.05} \text{ m}^3 + \underline{0.06} \text{ m}^3 = \underline{0.11} \text{ m}^3$

Base

10. Width = Line 5 + 0.15m = 1.0 m + 0.15m = 1.15 m
11. Length = Line 6 + 0.15m = 1.1 m + 0.15m = 1.25 m
12. Thickness = 0.10m
13. Quantity of materials for base = Line 10 x Line 11 x Line 12 =
 $\underline{1.15} \text{ m} \times \underline{1.25} \text{ m} \times \underline{0.1} \text{ m} = \underline{0.14} \text{ m}^3$

Base. Design the base so that its width equals the platform width plus 0.15m and its length equals the platform length plus 0.15m. For example, if the platform is 1.0m wide and 1.1m long, the base should be 1.15m wide and 1.25m long (Worksheet A, Lines 10-11). The base should be 0.1m thick. Table 2 summarizes the dimensions of the base.

If the base is made of concrete, you need the same materials as for a concrete platform. If the base is made of brick and mortar, you need the same materials as for a brick and mortar platform.

Table 2. Base Dimensions for a Bucket Latrine

Feature	Measurement
Width	Width of platform plus 0.15m
Length	Length of platform plus 0.15m
Thickness	0.1m

To estimate the quantity of materials needed for the base, multiply the length times the width times the thickness. For example, if the length is 1.25m, the width 1.15m, and the thickness 0.1m, then the approximate quantity of materials needed is $1.25m \times 1.15m \times 0.1m = 0.14m^3$ (Worksheet A, Lines 12-13).

Shelter. For details on materials, tools, and labor, see "Designing Privy Shelters," SAN.1.D.3. The shelter must have an opening in the rear wall to allow access to the opening in the platform.

Bucket. Buckets are usually made of galvanized metal, molded rubber or plastic, lacquered wood, or wood coated with creosote. The bucket should have a capacity of 20-30 liters and it should have a handle. It is necessary to have two buckets per latrine. When the dirty bucket is removed, it is replaced with the clean one.

When all dimensions, materials, tools, and labor have been determined, prepare design drawings similar to Figure 2 and a construction materials list similar to Table 3. Give them to the person in charge of construction before construction begins.

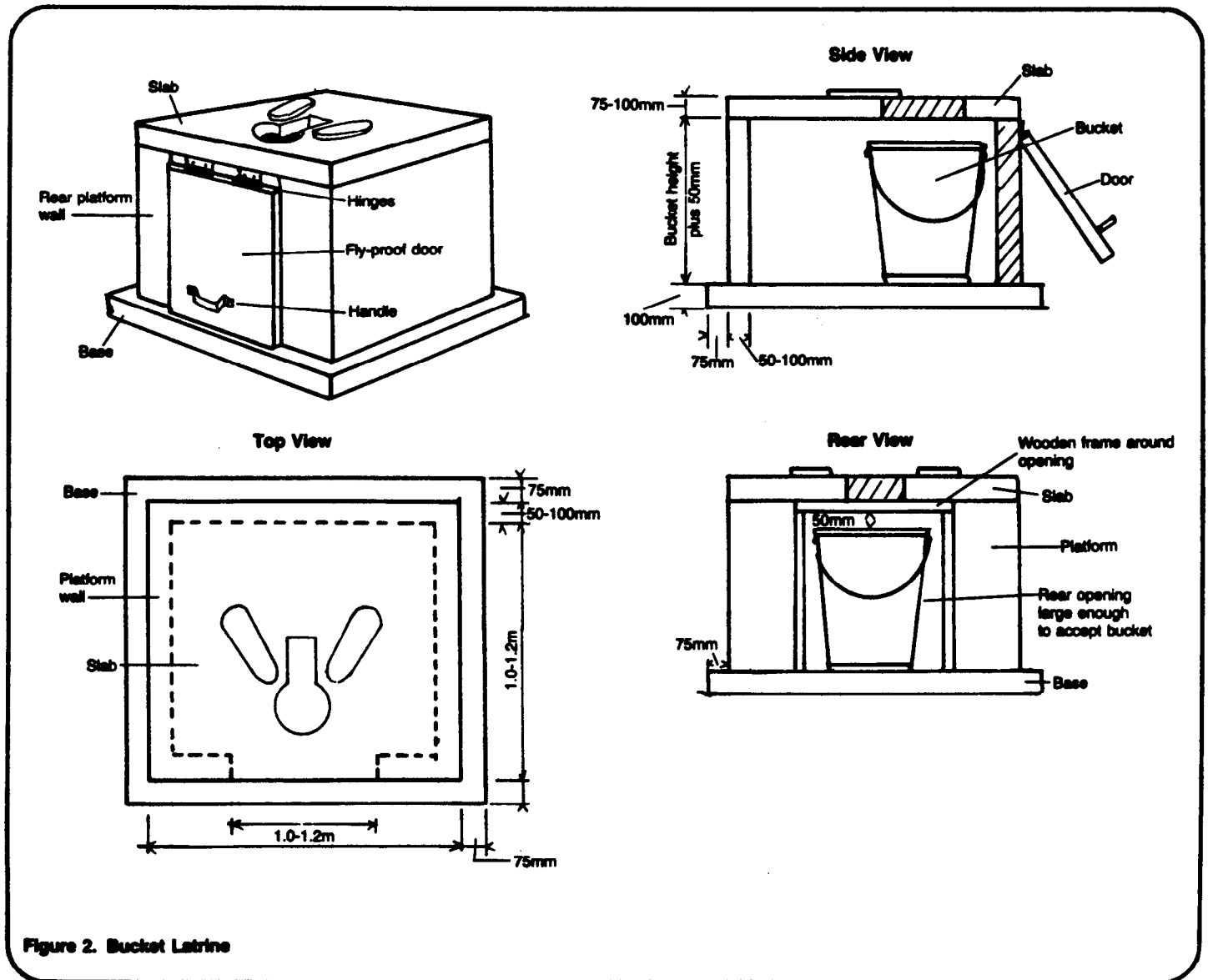


Table 3. Sample Construction Materials

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	_____
	Laborer (skilled with concrete)	1	_____
	Laborer (unskilled)	1	_____
Supplies	Wood (for forms and fly-proof door)	_____	_____
	Nails	_____	_____
	Cement (Portland)	_____	_____
	Sand (clean, sized fine to 6mm)	_____	_____
	Gravel (clean, sized 6-25mm)	_____	_____
	Water (clear)	_____	_____
	Reinforcing material	_____	_____
	Squatting slab	_____	_____
	Tin sheet (for fly-proof door)	_____	_____
	Hinges (for fly-proof door)	_____	_____
	Handle (for fly-proof door)	_____	_____
	Materials for shelter (see SAN.1.D.3)	_____	_____
	Buckets	_____	_____
Other	_____	_____	
Tools	Measuring tape	1	_____
	Hammer	1	_____
	Saw	1	_____
	Shovel	1	_____
	Trowel	1	_____
	Container for mixing concrete	1	_____
	Other	_____	_____

Total Estimated Cost = _____

Determining Type and Location of Disposal Site

There are four ways to dispose of excreta from a bucket latrine: biogas system, composting system, stabilization pond, and burial site.

Biogas and composting systems do not always satisfactorily destroy the disease-causing bacteria in excreta. They are excellent systems for conserving the energy and fertilizer value of the excreta. If either one of these systems is to be used, see "Designing a Composting System," SAN.3.D.2, or "Designing a Biogas System," SAN.3.D.4, for details.

A stabilization pond is a satisfactory disposal site, provided the excreta undergoes pre-treatment. For details, see "Designing Stabilization Ponds," SAN.2.D.5.

A burial site may be the simplest method of disposal, provided a suitable site can be located. The site should meet the following conditions:

1. The groundwater level should be at least 2m below ground to avoid contaminating water supplies. Test holes can be dug 2m deep and if no water is observed, the site is suitable.

2. The burial trench should have a maximum depth of 1m.

3. The soil should be suitable. That is, it must be neither predominantly clay nor sand.

4. The site should be no more than 30 minutes travel time from the latrines.

5. The area of the site should be at least 500m².

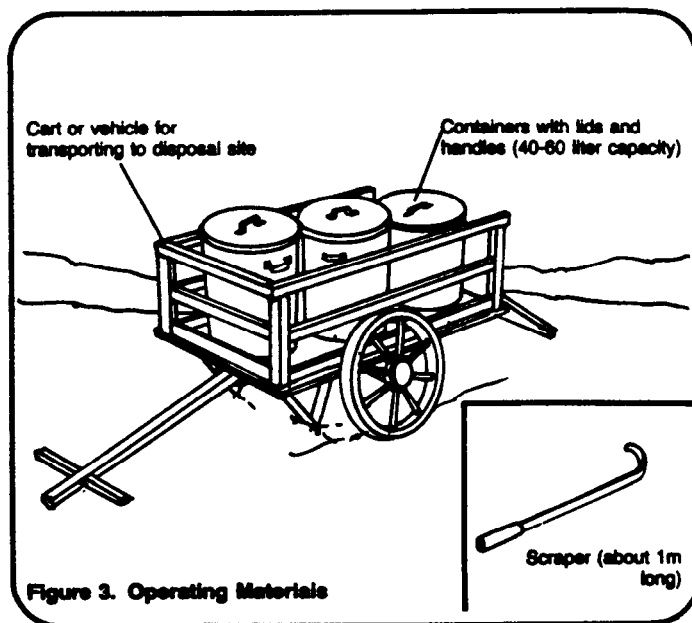
6. Water for washing hands and equipment should be available near the site.

When a suitable burial site has been found, prepare a location map similar to Figure 1, showing bucket latrines, dwellings, roads, and the disposal site. Give the map to the person in charge of construction.

Determining Personnel and Equipment for Operation

The number of workers needed depends on the type of disposal, the number of latrines to be serviced and on local work habits. Since the buckets should be emptied every day or every two days, there should be enough workers to empty at least half the buckets, dump excreta into larger containers and cart the containers to the disposal site. If the excreta is being buried, the workers must dig a short, shallow trench, bury the excreta, and wash their hands and equipment. All of this should occur within a reasonable length of time, for example, 6-10 hours.

To operate the latrines, materials needed include: large 40-60 liter containers equipped with lids, scrapers to empty buckets and containers, a vehicle to transport containers to the burial site (see Figure 3), shovels to bury the excreta, and brushes or other equipment to clean buckets and containers.



When all equipment and personnel needed to operate the system have been determined, prepare an operations materials list similar to Table 4 and give it to whoever will be in charge of operating and maintaining the latrine system.

In summary, give the person in charge of construction a location map similar to Figure 1, design drawings of the bucket latrine similar to Figure 2, and a construction materials list similar to Table 3. Give the person in charge of operations a materials list similar to Table 4.

Table 4. Sample Operations Materials List

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	_____
	Laborers	3	_____
Supplies, Tools, and Vehicles	Containers with lids (40-60 liters each)	_____	_____
	Scrapers with long handles	_____	_____
	Carts (hand-drawn)	_____	_____
	Shovels	_____	_____
	Gloves	_____	_____
	Boots	_____	_____
	Brushes for cleaning	_____	_____
	Containers for soap and water	_____	_____
Other	_____	_____	

Total Estimated Cost = _____