WATER AND SANITATION FOR HEALTH PROJECT

WASH

COORDINATION AND INFORMATION CENTER

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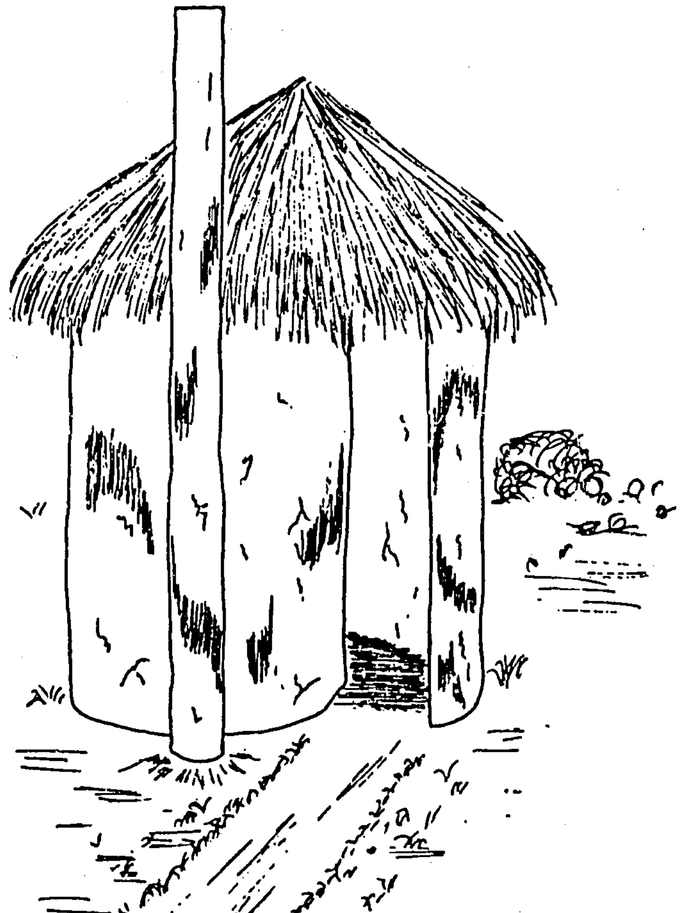
A WORKSHOP DESIGN FOR LATRINE CONSTRUCTION

A TRAINING GUIDE

WASH TECHNICAL REPORT NO. 25



Prepared for:
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A TRAINING GUIDE

Prepared for the Office of the Health, Bureau for Science and Technology
Agency for International Development
Under Order of Technical Direction No. 122

Prepared by

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HANDOUTS

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1. INTRODUCTION

1.1 Needs Addressed by the Training

The purpose of this training workshop is to provide participants with the needed skills and knowledge for assisting rural communities to organize and implement sanitary waste disposal projects and maintain sanitation facilities. Planning, constructing and maintaining appropriate and economical latrines with local community involvement is the central theme. This guide is intended to be used by trainers who will conduct the workshop. It is not a guide for participants although it contains materials which will be given to them.

This workshop is for participants who work with rural communities to improve their sanitation facilities. It is designed for participants without technical skills or knowledge to provide them with sufficient understanding and skills in the planning and construction of latrines to enable them to motivate and assist others at the local or village level in implementing latrine projects.

This training is appropriate for project promoters, fieldworkers, rural development or health specialists, and others working to promote improvements in rural health and sanitation. They may be ministry staff, extension workers, Peace Corps Volunteers, or any others responsible for and interested in improving methods of human waste disposal.

1.2 Overview and Goals of Workshop

During the workshop, a balance is struck between the technical skills needed to build a latrine and the communication and educational skills needed to transfer that knowledge. Participants will be divided into teams responsible for constructing single pit latrines in a local community during the course of this workshop. They will supervise or participate in all the major phases of building a latrine. They will evaluate a site, measure a pit and construct a base, slab, and a shelter for the latrine. At the same time participants are learning the technical details of latrine construction, they will also learn effective methods of mobilizing communities to plan and implement community-wide latrine projects. Learning to involve local communities during all phases of the project is emphasized as much as construction skills.

The overall workshop goals describe what participants will learn by the end of this 13-day program. The workshop schedule at the end of this section shows how the days are structured to achieve these learning goals.

At the end of this workshop, participants will be able to:

- o Define sanitation and understand the impact of latrines.
- o Understand the impact of sanitary waste disposal on the spread of disease.
- o Develop strategies and approaches for educating communities about latrines and related sanitation issues.

- o Understand and identify critical steps for mobilizing a community for any latrine project.
- o Identify community factors related to the construction, acceptance, and use of latrines.
- o Assess local physical conditions relating to improved sanitation.
- o Identify human and material resources needed to construct latrines and determine their availability.
- o Develop strategies to help the community to make an appropriate choice among alternative types of latrines.
- o Develop a plan for a latrine project.
- o Construct a latrine appropriate for a community.
- o Identify strategies for the continued operation, maintenance, repair and replacement of latrines.
- o Develop a plan to implement a latrine project "back home."

1.3 Training Approach

This training program and the methods and approach used are based on the following assumptions and beliefs:

- o A successful latrine project is one that is locally or community based, managed effectively over time by the community itself with a minimum dependence on outside expertise, and results in the use of sanitary latrines by a majority of the local population.
- o Knowledge and skills needed to implement project activities involve technical skills, skill in community work, and skill at project planning.
- o Necessary latrine construction skills can best be acquired through a balance of technical theory and practical "hands-on" application.
- o Adults learn best when they are actively involved in the learning process -- doing things, discussing, analyzing, and experimenting, rather than passively listening to lectures or observing other trainer-centered activities.
- o Workshop participants learn from each other as well as from the trainers, so learning should involve small groups who work together.
- o Workshop participants do not need to become technical experts. They need to learn enough technical skills to be able to supervise others and to help a community decide what kind of latrines to build and plan how to build them.

The training design in this guide is designed to provide workshop theory and discussion time for each step of a latrine project. It also gives participants hands-on field experience in actually constructing a latrine for domestic or community use. The workshop time is designed to cover the skills and knowledge needed to involve a local community in implementing a latrine project. Session 3 identifies a typical cycle for a latrine project. The workshop design follows this cycle closely. However, construction considerations dictate that some sessions be offered out of sequence. It is critical that all the concrete be poured no later than Day 5 to allow proper curing time. Two workshop sessions on community education and participation are therefore not offered until after the construction projects are started although, in actual practice, these steps would come first.

The purpose of the fieldwork is to provide hands-on learning opportunities for the participants. The primary purpose is not to build latrines (although obviously this is a significant secondary benefit) but for participants to achieve the learning goals of this workshop.

The use of an actual construction project for learning purposes during this workshop provides participants with the opportunity to:

- o Participate in all the phases of construction
- o Develop supervisory skills for managing a work crew
- o Interact with homeowners and users of the new latrines

1.4 Trainers' Skills and Numbers of Participants

These training materials have been designed to be used by trainers experienced in sanitation and waste disposal and in the training of adults. This guide is designed for use by a two-person training team which combines technical and training skills. One trainer must be skilled in the design and construction of latrines and have some experience in training.

At least one of the two must have prior training experience. He or she should have participated in training-of-trainers workshops and conducted previous workshops using active learning techniques. This trainer must be skilled in facilitating groups, have experience in village development work, and feel comfortable with technical material.* All trainers who use this guide must be oriented toward practical training and the use of their hands, since much of the training will involve actual construction work.

Since this course requires participants to become involved in and learn from actual work on a latrine construction project, the number of participants should be kept small. The suggested maximum number of participants is 20. More than 20 participants could limit the workshop's effectiveness and would require more construction sites and supervision.

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* One trainer could handle a participant group of ten or fewer. However, this trainer would need both the training and technical skills described above.

This guide assumes a ratio of no more than 10 participants to one trainer and is designed accordingly.

1.5 Project Staff

In addition to the two trainers required to conduct the workshop, the training staff should include a site coordinator and an appropriate size labor force to supplement participant labor. The coordinator arranges for procurement of materials, labor, transportation and housing for participants, and other logistical support. Working with the trainers, the coordinator is also responsible for overseeing the construction phases of the project and supervising the labor force. The coordinator should be familiar with local customs and language as well as purchasing and hiring practices.

1.6 Training Site

This training is designed to be conducted in a rural residential training location with ready access (preferably by foot) to a village. There needs to be adequate meeting room space available during the entire 13 days for daytime and evening sessions. Participants meet as a total group (approximately 20) as well as in smaller work groups. Ideally more than one meeting room should be available. The village needs to be prepared well ahead of time for the arrival of trainees. Villagers need to understand and be willing to cooperate with the training program. Details on the specific preparation needed for the construction projects can be found in the appropriate workshop session.

1.7 Organization of the Training Guide

Since this course is designed on principles of adult learning and experiential training methodologies, some of the common workshop components are:

Lecturettes (short trainer presentations)
Demonstrations
Large group discussions
Small group tasks
Role play
Simulations
Questionnaires and self assessment
Individual reading and reflecting

All methods are designed to put the learner in the active role of performing tasks, solving problems, working with others to plan activities, developing strategies, and trying things out. Participants are active both as individuals and as members of a working group.

This course is divided into 20 core training sessions. Each session covers a specific topic. A training session may be as short as two hours or as long as eight hours. They generally require a half or full day, depending on the nature of the topic. The session lengths given in the session guides do not include meal breaks but do include short breaks.

A synopsis of each session's steps, procedures, time, and handout and flipchart materials is contained in tabulated form at the beginning of each session. Trainer guidelines are written for each training session. These are intended to provide the training staff with detailed instructions on how to conduct the session. Specifically these guidelines include:

- o Session objectives
- o Overview of the session (what is contained in the session and why it is important)
- o Detailed instructions for conducting the training activities included in the session (i.e. lecturettes, notes for group discussions, role plays, field activities, etc.)
- o Time frames indicating how long each part of the session should take
- o Lists of materials needed for conducting the session
- o Prepared materials for distribution to participants

This guide is intended to help the training staff organize and conduct this training program. The guide assumes, however, the training staff has the technical expertise as well as the training skills necessary for conducting participatory, interactive workshops.

1.8 Materials for Participants

The materials to be distributed to participants follow the trainer guidelines for each training session in the training guide. For convenience these materials have also been regrouped at the end of the guide in the section titled "Participant Handouts." This will enable the trainers to remove all the handouts for duplicating purposes without disturbing the handouts inserted at the end of each session. The materials can be taken out of the training guide, copied for distribution, then put back in the guide for the next time the course is given.

The trainer can distribute materials in one of two ways. One is to distribute the handouts at the time they are covered in the training session. The other is to assemble all the handouts and put them into participant notebooks prior to the workshop. Thus, on the first day, the notebooks already containing handouts for the entire course are distributed to the participants. Both methods work effectively, and the training staff should choose the preferred method.

Handouts are numbered in the upper righthand corner of the page. They are identified by session number and their handout number. For example, the first handout for Session 3 is numbered Handout 3-1.

1.9 Construction Teams

For the construction, project teams are formed of four or at most five participants. Each team will construct an individual latrine. The most effective training will occur if the latrine can be built on an actual home site and the users are available to work with the training teams. However, if necessary latrines can be constructed at a public facility such as a school or clinic.

Each team will:

Evaluate the latrine site
Construct a slab base
Construct forms for a slab
Pour concrete slabs
Construct a latrine shelter with a vent pipe

For each of these major construction tasks, a different member of the team will be selected as team leader and will be responsible for supervising the fieldwork. Teams should be selected by the trainers based on a combination of skills and experience. As much as possible teams should be formed with a mix of construction and community development skills. It is recommended that teams be made up of people who do not work together all the time and/or who have different responsibilities and experiences.

Teams should not be selected until the workshop starts so trainers get to know the participants before making up the teams. In the first day, participants fill out an experience sheet to help trainers put together teams. Team assignments are given out on Day 3.

To ensure that latrines are completed, work crews and local site supervisors need to be arranged for in advance of the workshop. Local workers need to be available to complete tasks which teams do not have time to complete or tasks which no longer provide a learning opportunity for the participants.

The fieldwork is designed to provide hands-on experience in building latrines and also to build skills in managing and supervising others in the construction of latrines. The primary approach used to develop these supervisory skills is to give each participant an opportunity to be a team leader during a major phase of the construction. The team leader is responsible for:

- Preparing for the construction task

- Supervising other team members during the construction

- Arranging for and supervising the completion of the task by local workers

- Ensuring the site is cleared up and secured after the task

Team instructions and appropriate drawings have been developed for each of the major construction tasks. These can be found in the appropriate construction sessions. The only exception is latrine shelter construction (Session 14) for which there are no team instructions in the training guide. These need to be developed by the training team once a locally appropriate shelter has been chosen.

Team instructions for all the tasks can be given out during Session 6 after project teams have been identified and have chosen their team leaders. They can also be given out 24 hours before the appropriate session. This depends on trainer preference. However, instructions need to be provided in sufficient time to enable teams and team leaders to plan their construction activities. It is very important that the trainers stress the need for team planning before each construction task. Short periods of time for team planning are suggested in the sessions. If this time is not used for planning, teams will have a difficult and potentially frustrating time carrying out their field responsibilities.

For each of the construction tasks, trainers need to build in a brief time to meet with all of the team leaders and make sure they are clear about tasks and their responsibility. Because a specific time has not been designated for that during the session, trainers will need to build it in at the most appropriate points.

1.10 Community Involvement

The workshop requires that community members be actively involved in the construction of the latrine. This involvement must begin prior to the beginning of the workshop with the selection of sites for the pits and the initial agreement to accommodate the project. The trainers and workshop coordinator are responsible for developing the commitment of the community to assist in the implementation of the project. Participant teams should be able to start work with a community which has agreed to help with the work and be available during designated sessions for construction. During the workshop the trainers and/or coordinator need to monitor this agreement and maintain contact with community leaders to assure continued cooperation.

1.11 Local Labor

Each phase of the construction requires that a specified component of the latrine be completed within a limited time frame. Local labor, with appropriate skills, should be contacted to support the participants' work during each phase. Some phases require no assistance while others require one or two laborers to continue the work (Session 14:Shelter Construction). In addition, non-skilled labor will be needed to procure and transport materials (sand, gravel, poles, etc.) before and during the workshop. Depending on materials and designs it may be necessary to have an experienced carpenter (for rough cutting) and one or more masons available. Specific needs for laborers should be determined and arrangements made well in advance of the workshop. At least one laborer should be available to each team during the construction.

1.12 Alternative Latrine Designs

There are two options described in this training workshop. The basic workshop design is organized so that all participants build the same type of latrine in the field during the training program. An optional design is described in Appendix 1. In this alternative, half of the participants build one type of latrine while the other half builds a different type.

1.12.1 Ventilated Improved Pit (VIP) Latrines

The core workshop is designed so that all participants construct a ventilated improved single pit latrine with a concrete base and slab and a locally appropriate shelter. It gives all the participants the opportunity to perform the necessary tasks to build this latrine. Latrines are to be built in a local village for individual homeowners. They are permanent structures to be left in the community.

Other types of latrines are discussed and reviewed during the workshop. However, only concrete slab VIP latrines are actually constructed in the core workshop. Participants work in teams of four and each team is responsible for the construction of one latrine. The workshop is designed for 20 participants. Therefore five latrines are built. It is important that teams be kept to four participants so everyone has ample opportunity to do hands-on construction work.

Participants all learn thoroughly how to design and construct a VIP latrine. They are taught the fundamentals of:

- Locating a site
- Sizing and lining a single vault pit
- Forming and pouring a concrete base
- Pouring, forming, and installing concrete slabs
- Constructing a shelter
- Educating homeowners in the care and maintenance of the latrine

It is important that participants work on each phase of the project and preferably see a completed structure before the end of the workshop. If local work crews are used to complete tasks, they need to be available beginning the afternoon of Day 3.

1.12.2 Zimbabwe Latrine

Although the concrete slab VIP latrine is the basis for the workshop design, the training guide has been designed so that alternative latrine designs could be substituted. This would, of course, entail redoing some of the handouts for the technical sessions. However, the workshop is flexible in this regard and could be adapted to other latrine designs.

The optional design described in Appendix 1 has participants working on two types of the latrine projects, although the total number of latrines built remains the same. In the alternative design, half the participants build the same VIP latrine with a concrete slab as in the basic design. The other half build a VIP latrine with a wooden slab and mud and wattle shelter referred to as the Zimbabwe model. While there is not enough time during the two week workshop for an individual participant to actually construct more than one latrine, this does provide an opportunity to see and discuss the construction of these two basic models. This has clear advantages if participants are likely to be working with communities constructing more than one type of latrine.

There are drawbacks to building more than one type of latrine in a single workshop. First of all, the planning and logistics are more complicated if participants are building different latrines. Obviously, this requires careful organization before the workshop to ensure the availability of sufficient supplies and materials for each of the latrines to be built. Secondly, trainers will need to ensure that work crews are available as required for the two types of latrines. The timing is very tight in the workshop for the early phases of the construction. In particular, for the lumber slab latrine, it is critical that the pits be completed and lined before the slab work can begin. This means that a great deal of work is done on Days 3 and 4. The slabs need to be built right over the pit, which is different from the concrete slab. The latter is formed and poured first and only then put over the pit. An additional consideration is the skill and knowledge required of the trainers if they are to supervise the construction of two different types of latrines.

A final planning consideration for this alternative is how to work with the local village to select the model latrine for each family. This needs to be handled carefully to ensure that everyone feels fairly treated.

The above considerations are not meant to discourage the use of the alternative design, but simply to point out the complexities of doing so. Appendix 1 contains a schedule for optional design with an altered sequence of construction primarily in Days 4 and 5. Design changes which need to be made in Days 3, 4 and 5 are described in the appendix. There are also team instructions and construction drawings for the VIP latrine with timber slab (Zimbabwe model).

Either alternative to the construction work requires careful pre-workshop organization and planning, on-site technical assistance during construction, and structured workshop discussion after the fieldwork. The choice of which latrines to construct during the training should be based on the learning needs of the participants and the available resources and skills of the training staff and the local community.

The following section will describe specific steps in preparing for the workshop.

Note: For additional information on the planning, design, and implementation of low-cost sanitation technologies, particularly the VIP and pour flush latrines, a series of technical notes is available from the Technology Advisory Group (TAG) Water Supply and Urban Development Department, World Bank, 1818 H Street, N.W., Washington, D.C. 20433.

SCHEDULE FOR BASIC WORKSHOP*

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAYS SIX AND SEVEN
° Introduction to workshop	° Community mobilization and information gathering	° Types and selection of latrines ° Planning a latrine construction project	° Latrine slab construction Fieldwork	° Base construction Fieldwork	F R E E
		L U N C H			
° Sanitation, latrines and health	° Conducting a sanitary survey	° Site evaluation and construction project estimating		° Lining the pit	
DAY EIGHT	**DAY NINE**	**DAY TEN**	**DAY ELEVEN**	**DAY TWELVE**	**DAY THIRTEEN**
° Project information and development strategies	° Installation of latrine slabs Fieldwork	° Latrine shelter construction Fieldwork	° Latrine completion Fieldwork	° Improving existing latrines Fieldwork	° Planning your latrine project ° Workshop evaluation and closure
			L U N C H		
° Community decision-making	° Repair and maintenance of a latrine ° Latrine shelter construction		° Project review	° Community project planning	

*Based on participants constructing single VIP latrine with concrete slab.

SCHEDULE FOR OPTIONAL DESIGN

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAYS SIX AND SEVEN
° Introduction to workshop	° Community mobilization and information gathering	° Types and selection of latrines ° Planning a latrine construction project	° Base construction Fieldwork	° Field Work A- Pour concrete slabs B- Construct vent pipe	F R E E
LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	
° Sanitation, latrines and health	° Conducting a sanitary survey	° Site evaluation and construction project estimating	° Latrine slab construction Fieldwork A- Build forms for concrete B- Build timber slab	° Lining the pit	

DAY EIGHT	DAY NINE	DAY TEN	DAY ELEVEN	DAY TWELVE	DAY THIRTEEN
° Project information and development strategies	° Installation of latrine slabs Fieldwork	° Latrine shelter construction Fieldwork	° Latrine completion Fieldwork	° Improving existing latrines Fieldwork	° Planning your latrine project ° Workshop evaluation and closure
LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
° Community decision-making	° Repair and maintenance of a latrine ° Latrine shelter construction		° Project review	° Community project planning	

2. PREPARATION FOR THE WORKSHOP

This workshop requires careful planning and many arrangements which must be made prior to the start of the training. The following table indicates the key steps and time frames in its planning and implementation.

Activity	Time Completed Before Workshop
o Recruit and select participants	2 months
o Identify/hire training staff (trainers, workshop coordinators and site supervisor)	2 months
o Identify learning needs and roles and experience of participant group	4 months
o Select an appropriate village or community for the fieldwork	2 months
o Locate an adjacent training site	2 months
o Determine the basic workshop design and latrine model to be built	1 month
o Identify the quantity and type of field materials needed	1 month
o Work with village to obtain cooperation and appropriate participation	1 month
o Survey water and sanitation conditions and choose construction sites	1 month
o Arrange for participant and staff lodging and meals	1-2 months
o Arrange all necessary transportation	1 month
o Obtain all needed construction materials and tools	1 month
o Arrange for storage of supplies	1 month
o Decide how many laborers are needed and arrange to hire them	1 month
o Arrange for digging and lining (if necessary) of the appropriate number of pits prior to the arrival of participants	1 month
o Develop and adapt the suggested training sequence and materials to fit selected latrine type	1 month

- o Prepare needed workshop materials and handouts — 1 month
- o Contact and work with village leadership and groups affected by the construction project — 2 weeks
- o Schedule sequence of construction work with labor crew — 2 weeks
- o Staff preparation for training — 2 weeks
- o Dig and line pits for each latrine to be built — 1 week
- o Staff arrives at training site for final preparation and staff training — 1 week
- o Begin training

2.1 Preparation for Construction

The first and most important decision that must be made is exactly what type of latrine or latrines will be constructed by the participants. As described earlier, this guide provides designs for the construction of a single slab VIP latrine with a concrete slab and base or for a VIP latrine with a timber slab and mud and wattle shelter. It is fully expected that local options and considerations will dictate which, if either, choice is made. Quite possibly a somewhat different latrine may be selected. Local trainers will need to adapt, change, and modify the designs in this guide to suit local needs.

It is important to remember that the selection of type of latrine to be constructed should take into consideration:

- o Size and type of pit (dig prior to workshop)
- o Lining materials for the pit (install lining prior to workshop)
- o Size and type of slab (Session 8)
- o Size and type of slab base (Session 9)
- o Type of shelter (Session 14)

Trainers need to review each of the construction sessions to determine if all the information is correct and appropriate for the selected latrine project. In particular, attention needs to be paid to the team instructions, and construction drawings, and descriptions of needed materials. Even if the single slab VIP latrine is chosen for the construction, trainers will most likely need to modify and clarify team instructions to suit local conditions. If any of the construction steps are changed, it will require new drawings and new team instructions, and most importantly reviewing the workshop sequence and design. If the core design is chosen, trainers will still need to:

- o Arrange for digging pits in advance of the workshop

- Estimate and order materials and tools
- Estimate labor needs
- Modify team leader instructions for each construction task as needed
- Determine if each construction task is in the correct sequence and given adequate time in the workshop
- Develop detailed team instructions for the type of shelter chosen (there is no instruction in the core design)

2.2 Preparing the Staff to Conduct the Training Program

In order for a training program of this complexity to be conducted effectively and run smoothly, the training staff must work together as a team. A vital part of working together is spending time before the workshop begins to plan and coordinate how the training activities will be implemented. These planning activities take several days and need to include:

- Arriving at a mutual understanding and clarity on how the training will evolve
- Making decisions on which trainer will do what
- Preparing for conducting workshop sessions
- Advance site preparation for participant fieldwork
- Planning the exact mixture and timing for workshop and fieldwork
- Practicing delivery of training methods
- Discussion of the approach to adult learning in this workshop

2.3 Specific Session Preparation

The trainer guide describes in each session what is covered in the session and the necessary preparations. Several sessions require specific preparations which are best done prior to the start of the workshop or at least a few days before the actual session. These specific preparations are as follows:

General

Pits need to be dug and completed at least prior to Session 7 when participants evaluate the site, if not before the workshop begins. The recommended pit is 1 square and 2 deep.

Session 4 - Participants go to the field for the first time to conduct a partial sanitary survey. It is important that the community be notified and specific areas be surveyed and selected prior to the workshop. Local maps need to be obtained and logistical arrangements also need to be made.

Session 5 - In this session, several types of latrines are presented. It is important to pre-select the types suitable to the area. This will require developing detailed material for the lecturette and preparing appropriate drawings.

Session 6 - Drawings need to be selected or developed for use in the presentation describing the latrine type chosen for construction. Drawings (or sketches) should identify each component of the latrine to be constructed over the next week. Sketches can be taken from the ones already available in the guide or adapted and changed to better suit the requirements of the workshop.

Trainers need to make up construction teams based on the experience and skills of the participants. Decisions as to team membership should be made the evening before this session. (Team assignments are given out during this session.) Participants remain in the same teams for all the construction activities. Teams will conduct a site evaluation which includes contacting community members. The community should be notified and prepared in advance of this session.

Session 7 - Trainers need to develop a handout on for this session, based on Handout 7-5. This handout is necessary for participants to do the estimating exercise which is central to this session. In order to develop this handout, information needs to be gathered on local material and labor costs.

Session 8 - This session involves preparing and pouring concrete for the slab, and foot rests. All the forms are constructed during this session and need to be completed before preparing the concrete. All required construction materials and tools should be stockpiled and available at the construction site. Local labor may be needed to transport materials to the construction site and to assist in the construction.

Session 13 - This session requires that the slabs be transported to the sites and installed on the bases. Teams are responsible for recruiting community assistance in installing the slab. Local labor may also be used. Transportation of the slabs should be arranged by the coordinator.

Session 15 - This session requires the development of team instructions and appropriate drawings after selection of the type of shelter to be constructed. The timing and sequence of construction steps need to be revised to fit the shelter. Arrangements for local labor to complete the shelter must be made.

Session 17 - This session requires a field inspection of latrines which are in use in a local community. The area to be visited needs to be selected several days before the session and appropriate logistical and transportation arrangements made well in advance.

GUIDE TO SESSION 1: INTRODUCTION TO WORKSHOP

Total Time: 3 hours & 30 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Welcome and introductions	Trainer presentation	15 minutes		Purpose and theme of workshop
Participant introductions	Pair interview	10 minutes		Interview questions
	Introductions	25 minutes		
Workshop expectations	Small group work	30 minutes		Task instructions
	Small group report	30 minutes		
	BREAK	15 minutes		
Workshop goals	Presentations and discussion	15 minutes	Handout 1-1: Workshop Goals	Workshop goals
Schedule and methodology	Presentation and discussion	15 minutes	Handout 1-2: Schedule for Basic Workshop	Workshop schedule
Workshop procedures and norms	Discussion	15 minutes		Workshop norms
Self-assessment	Individual task Pair discussion	30 minutes	Handout 1-3: Self-Assessment Iventory	
Summary and closure	Total group	10 minutes		

Session 1: Introduction to the Workshop

Total Time: 3 hours & 30 minutes

OBJECTIVES

By the end of this session participants will be able to:

- o Describe the workshop goals and schedule
- o Identify their own expectations and how they will be met
- o Agree to norms for the workshop
- o Begin to get to know each other
- o Assess and describe individual strengths and learning needs

OVERVIEW

During this session, participants and trainers will begin to get to know each other and will identify the expectations and learning needs this workshop will address. This introductory session is critical for creating a productive learning climate, one where norms for working together as a learning community are clearly established. It is important that participants understand that the workshop is designed to enable them to take responsibility for their own learning.

The purpose and goals of the workshop along with the daily schedule are thoroughly reviewed in this session and are matched to participant expectations. Any adjustments or changes in the schedule based on participants' needs should be discussed here. The session concludes with a self-assessment instrument filled out by participants and discussed in pairs.

PROCEDURES

1. Welcome and Introductions — Time: 15 minutes

Introduce yourself and welcome participants. Describe briefly who is sponsoring this workshop and make the appropriate introductions if there are representatives of the sponsoring agencies present.

State that the overall purpose of this workshop is to develop the skills and knowledge needed to assist rural communities in organizing and implementing sanitary waste disposal projects and maintaining sanitary waste disposal facilities. Planning, constructing, and maintaining appropriate and economic latrines with active community involvement is the theme of this workshop. Note that the workshop will be described in more detail later but first the task is to find out more about one another. The purpose and theme of the workshop should be posted on a flipchart for easy reference.

2. Pair Interviews — Time: 10 minutes

Ask participants to form pairs and interview each other asking the following questions which you have listed on flipcharts:

- o Who are you?
- o Where do you live?
- o What do you do?
- o How did you get interested in sanitation and/or latrines?

Instruct the pairs to spend five minutes each per interview and to be prepared to introduce their partner to the rest of the group after both interviews are done.*

3. Introductions — Time: 25 minutes

Each person introduces his/her partner to the rest of the group. Introductions should be kept to no more than one minute. You might want a trainer to do the first introduction which should be brief, clear, and humorous, if appropriate.

Thank participants at the end. State that now that you know a little about each other, you want to know more about why each person is here.

4. Small Group Work - Workshop Expectations — Time: 30 minutes

Introduce this exercise by pointing out that every group is unique in the talents, interests, and expectations which it brings to training. State that it is important to know what those skills and expectations are so that the group as a whole can make the training responsive to those needs and, where necessary, can structure some additional ways (lunches, get-togethers, etc.), to meet those needs.

Divide the participants into four groups and assign the following tasks.

Take the next 30 minutes to identify and discuss in small groups:

- o The strengths or skills which you bring to this workshop.
- o The expectations you have of this workshop.

Trainers should give examples of their own expectations and skills.

Instruct groups to begin with five minutes of individual time where each person writes down his/her own strengths and expectations of the workshop.

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* It is advisable for the training staff to participate in this exercise.

After five minutes, tell each group to share and discuss their responses with each other. Tell groups to appoint someone to list the strengths and expectations on a flipchart and also to appoint a spokesperson to report back the information to the total group.

5. <u>Small Group Reports</u> Time: 30 minutes

Have each group post a flipchart with expectations on the wall. Each group reports to the total group. You should ask for clarification of any expectations that need explanations or details. You may want to respond to the expectations of each group or may want to hear from each group and then summarize the themes you have heard. Briefly indicate how the workshop will address these needs. Explain that knowing the expectations will enable the trainers and participants to look at the workshop goals and schedule from the standpoint of where and how they will be met.

<u>BREAK</u> Time: 15 minutes

6. <u>Goals</u> Time: 15 minutes

Refer back to the purpose and theme of the workshop. Then, share the following goals which should be on flipcharts for easy reference.

At the end of this training, participants will be able to:

- o Define sanitation and understand the impact of latrines.
- o Understand the impact of sanitary waste disposal on the spread of disease.
- o Develop strategies and approaches for educating communities about latrines and related sanitation issues.
- o Understand and identify critical steps necessary to mobilize a community for any latrine project.
- o Identify community factors related to the construction, acceptance, and use of latrines.
- o Assess local physical conditions relating to improved sanitation.
- o Identify human and material resources needed to construct latrines and determine their availability.
- o Develop strategies to help a community make an appropriate choice among alternative types of latrines.
- o Develop a plan for a latrine project.
- o Construct a latrine appropriate for a community.

- o Identify strategies for the continued operation, maintenance, repair and replacement of latrines.

- o Develop a plan to implement a latrine project "back home."

Clarify goals as needed and discuss how the participants' expectations fit into these goals. Pass out Handout 1-1:Latrine Construction Workshop Goals.

7. Schedule and Methodology Time: 15 minutes

Distribute Handout 1-2:Schedule for Basic Workshop. Have it posted on the wall for use throughout the course. Go over the schedule and explain in general how the training activities are arranged to meet the goals. Explain the kinds of activities which will be taking place each day. Make sure it is clear that the participants are in a workshop and not a traditional course. They are going to learn principally by doing. The workshop will include case studies, field experience, group and individual problem solving, discussions, role playing, demonstration, and skills practice. Describe clearly the combination of field and workshop activities.

Ask the participants to look over the expectations that they have just stated and to note where and when in the schedule they see these expectations being met. Note several of the key expectations and how they fit into the workshop schedule. Be clear whether or not the participants can expect these expectations to be met by the workshop. If any of those expectations will not be met by the workshop, it is important at this time to explain why and be perfectly clear that they will not be met. Most participants will understand and be cooperative if one of their goals or expectations is not met by the workshop, if this is made clear to them in the beginning. If appropriate, see if there are other ways to meet such expectations (e.g., Does another participant have a strength in this area? Can a lunch session be scheduled?).

8. Workshop Procedures and Norms Time: 15 minutes

Since the group will be working together for two weeks, it is important to make clear and discuss how everyone will work together, and what trainers and participants expect of each other. Have a list prepared of expectations that the training staff has of the group. These should include:

- o Everyone is expected to be responsible for his/her own learning.

- o Everyone is expected to participate fully in all sessions.

- o All sessions will start on time.

- o Clothes should be comfortable and appropriate especially for fieldwork.

- o Everyone is expected to work with his/her hands.

- o Any other norms training staff feels are appropriate.

Discuss norms briefly and ask for additions or comments from the participants.

9. Self Assessment   Time: 30 minutes

Distribute Handout 1-3:Self-Assessment Inventory and explain that it is based on a comprehensive analysis of all major tasks included in designing and implementing a latrine project. Share with participants that this task analysis was used to design this training course and develop the goals and schedule. In order for participants to further assess their own skills, they will have a chance to fill out the form at the beginning and towards the end of this workshop and discuss it with a partner.

The instrument is designed to help assist in continuing to analyze the skills and tasks involved in latrine construction projects and the areas individuals need to improve. The discussion provides another opportunity to learn more about at least one other person in the workshop.

Ask participants to take 15 minutes and fill out the self-assessment instrument. Answer any questions about the form. When the forms are completed, ask the participants to form into pairs and take another 15 minutes to discuss the following:

- o Their strengths and weaknesses
- o Areas in which they hope to improve during the workshop

10. Summary and Closure   Time: 10 minutes

Ask for comments on what they learned from this last exercise. See if there are common themes or new learning needs anyone wants to share.

Discuss how participants can use each other and trainers to monitor each other's progress during the workshop. Make it clear that you as a training staff are available for consultation and assistance at appropriate free times.

Ask for final comments on the workshop schedule and goals before breaking for lunch.

MATERIALS NEEDED

Flipchart for Workshop Goals
Flipchart for Workshop Schedule
Flipchart for Workshop Norms
Handout 1-1:Latrine Construction Workshop Goals
Handout 1-2:Schedule for Basic Workshop
Handout 1-3:Self-Assessment Inventory

LATRINE CONSTRUCTION WORKSHOP GOALS

PURPOSE:

To increase participant's ability to assist communities to organize, construct, and maintain sanitary waste disposal facilities.

THEME:

Planning, constructing, and maintaining appropriate and economic latrines with active community involvement.

GOALS:

At the end of the training participants will be able to:

- Define sanitation and understand the impact of latrines.
- Understand the impact of sanitary waste disposal on the spread of disease.
- Develop strategies and approaches for educating communities about latrines and related sanitation issues.
- Understand and identify critical steps for mobilizing a community for any latrine project.
- Identify community factors related to the construction, acceptance, and use of latrines.
- Assess local physical conditions relating to improved sanitation.
- Identify human and material resources needed to construct latrines and determine their availability.
- Develop strategies to help the community to make an appropriate choice among alternative types of latrines.
- Develop a plan for a latrine project.
- Construct a latrine appropriate for a community.
- Identify strategies for the continued operation, maintenance, repair and replacement of latrines.
- Develop a plan to implement a latrine project "back home."

SCHEDULE FOR BASIC WORKSHOP*

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAYS SIX AND SEVEN
° Introduction to workshop	° Community mobilization and information gathering	° Types and selection of latrines ° Planning a latrine construction project	° Latrine slab construction Fieldwork ↓	° Base construction Fieldwork ↓	F R E E
		L U N C H			
° Sanitation, latrines and health	° Conducting a sanitary survey	° Site evaluation and construction project estimating	↓	° Lining the pit	

DAY EIGHT	DAY NINE	DAY TEN	DAY ELEVEN	DAY TWELVE	DAY THIRTEEN
° Project information and development strategies	° Installation of latrine slabs Fieldwork ↓	° Latrine shelter construction Fieldwork ↓	° Latrine completion Fieldwork ↓	° Improving existing latrines Fieldwork ↓	° Planning your latrine project ° Workshop evaluation and closure
			L U N C H		
° Community decision-making	° Repair and maintenance of a latrine ° Latrine shelter construction	↓	° Project review	° Community project planning	

*Based on participants constructing single VIP latrine with concrete slab.

SELF-ASSESSMENT INVENTORY

Rank yourself in terms of how well you feel you do each of these tasks now. This is for your use to help you in your learning. Please be accurate and honest with your answers.

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
1. Community Mobilization				
1. Identify existing infrastructure in a community and its relationship to a sanitation project.	4	3	2	1
2. Work with appropriate community leaders and/or groups to initiate a sanitation project.	4	3	2	1
3. Identify and address social customs and practices relating to sanitation projects.	4	3	2	1
4. Gather information regarding current sanitation practices.	4	3	2	1
5. Investigate the history of past sanitation projects in the community. Evaluate the reason for their success or failure.	4	3	2	1
6. Plan culturally appropriate approaches for introducing the idea of latrine use to different groups in the village (leaders, men, women, etc.).	4	3	2	1
7. Identify and locate number of homes and other buildings in community.	4	3	2	1
8. Identify the resources accessable to the community necessary to initiate a successful project. These resources include materials, labor, tools, equipment, funds, transportation and leadership.	4	3	2	1
9. Present information concerning alternative methods and costs to provide sanitation facilities.	4	3	2	1

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
10. Assist the villagers to make decisions and develop a plan which defines the project scope and provides time frames.	4	3	2	1
11. Describe methods that will be used to assure that villages understand their reponsibilities before, during, and after construction of sanitation facilities.	4	3	2	1
12. Devise strategies for obtaining and allocating resources.	4	3	2	1
2. Project Development				
1. Identify local environmental diseases, their symptoms, means of transmission, and prevalence.	4	3	2	1
2. Use a sanitation project as a strategy for designing and implementing health education at the village level.	4	3	2	1
3. Develop strategies for educating and discussing with the community:				
a. the need for and use of a latrine	4	3	2	1
b. how disease is spread	4	3	2	1
c. dangers of animal waste	4	3	2	1
d. the importance to health of handwashing	4	3	2	1
e. discuss methods of solid waste disposal	4	3	2	1
3. Design				
1. Select from 5 types of latrines.	4	3	2	1
2. Size a communal latrine pit.	4	3	2	1
3. Size an individual latrine pit.	4	3	2	1
4. Select a latrine for use where there is water nearby.	4	3	2	1
5. Select a latrine site in relation to a potable water source.	4	3	2	1

		Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
6.	Discuss social restraints which may hinder a latrine project and possible solutions to those restraints.	4	3	2	1
7.	Determine equipment needs.	4	3	2	1
8.	Determine material quan :ies.	4	3	2	1
9.	Determine costs.	4	3	2	1
10.	Procure material.	4	3	2	1
11.	Determine human resource needs.	4	3	2	1

4. Construction

1.	Schedule construction in a proper sequence.	4	3	2	1
2.	Assess geological conditions.	4	3	2	1
3.	Construct a latrine pit.	4	3	2	1
4.	Be able to prepare and use a correct mix of sand, gravel, water, and cement for a concrete slab.	4	3	2	1
5.	Pour a concrete latrine slab with reinforcing.	4	3	2	1
6.	Build a wood/soil latrine slab.	4	3	2	1
7.	Build a latrine superstructure.	4	3	2	1

5. Monitor and Follow-up

1.	Develop a plan for continued operation and maintenance of latrine(s).	4	3	2	1
2.	Develop a strategy for relocating latrines as required.	4	3	2	1

		Do Well (4)	Do Okay (3)	Diffi-cult to do (2)	Can't do (1)
3.	Develop a strategy for the construction of additional latrines if needed.	4	3	2	1
4.	Identify follow-up health education activities necessary to encourage continued use of latrines.	4	3	2	1
5.	Establish a mechanism to monitor the use of latrines.	4	3	2	1
6.	Identify problems that affect the use of latrines and develop strategies to overcome them.	4	3	2	1
7.	Evaluate and analyze the project upon completion.	4	3	2	1

GUIDE TO SESSION 2: SANITATION, LATRINES AND HEALTH

Total Time: 3 hours & 15 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session	Presentation	5 minutes		Session objectives
Introduction of sanitation	Presentation	5 minutes		
	Small group work	15 minutes		
	Group reports and discussions	20 minutes		
Generalization and closure	Group discussion	5 minutes		
Sanitation and health	Lecturette	20 minutes	Handout 2-1: Water for the World: Means of Disease Transmission	
Disease cycle	Discussion	20 minutes	Handout 2-2: The Disease Cycle	Disease cycle
Defining the sanitation problem	Discussion	10 minutes		
Local beliefs and customs	Introduction	5 minutes		
	Group brainstorm	5 minutes		
	Group discussion	30 minutes		
Benefits and impacts of latrines	Small group task	20 minutes		
	Report and discuss	15 minutes		
	Discussion and summary	10 minutes	Handout 2-3: Participant Experience Survey	
Transition and closure	Group discussion	10 minutes		

Session 2: Sanitation, Latrines and Health

Total Time: 3 hours & 15 minutes

OBJECTIVES

By the end of this session, participants will be able to:

- Define sanitation and describe its impact on community well being
- Describe the disease cycle and ways to interrupt it
- Describe the impact of sanitary latrines on health
- Begin to identify examples of local beliefs and habits which may affect sanitary waste disposal

OVERVIEW

This session looks at sanitation and environmental health in broad terms. It then focuses on the disease cycle and how sanitation practices can be used to break that cycle and interrupt disease transmission. The session then moves to the central focus of this course, sanitary latrines and their impact. Participants are asked to identify how latrines affect health and the potential benefits of sanitary waste disposal practices. Handout 2-3: Participant Experience Survey is distributed to collect data for use in forming construction teams.

PROCEDURES

1. Introduction to Session — Time: 5 minutes

Introduce session objectives and provide overview.

2. Introduction of Sanitation — Time: 5 minutes

Introduce topic of sanitation. Explain that while this training is essentially how to initiate and implement a latrine project, latrines are just one aspect of controlling disease through an improved environment. Point out that other aspects are equally important to reduce the incidence of disease, and they will be discussed in depth this afternoon. Now we want to know what is meant by sanitation and clarify how each of us thinks of sanitation.

3. Small Group Work — Time: 15 minutes

Divide participants into four small groups and give the following directions: "Spend 10 minutes discussing what sanitation means to you. After 10 minutes, appoint a spokesperson and take 5 minutes to record on the flipchart what sanitation means to your group and what you included in the definition of sanitation."

4. Small Group Presentations and Discussion   Time: 20 minutes

Have each group report on work. Similarities and differences in the groups' definitions and their implications should be discussed.

Reinforce importance of understanding what others mean by sanitation so that misunderstandings do not occur. For example, in using the term "sanitation," if a village leader means "sanitary water supply" and you mean "latrines" there will clearly be problems. State that a common understanding of the term will help this group work together over the next two weeks.

5. Generalization and Closure   Time: 5 minutes

Now that the group has discussed sanitation, its purposes, components, and applications, ask the group to agree on a common definition of sanitation for the purpose of this workshop and their own future work.*

Ask for participant contributions in coming up with an agreed-upon definition of sanitation. It is not necessary to get consensus or to drag this out but simply to get a generally understood and agreed-upon definition. However, it is important to have participants actively involved in defining the term and not the trainers. As the trainer is writing the definition on the flipchart, he/she needs to get a general agreement on the words chosen or the words should not be used.

6. Lecturette on Sanitation and Health   Time: 20 minutes

The trainer should present and discuss the following information on sanitation. Add information relevant to local conditions and to the experience of participants. Use Handout 2-1:Water for the World:Means of Disease Transmission to prepare this lecturette.

Orientation to Latrines, Sanitation, and Health

The goal of improved sanitation is to prevent disease-causing organisms which are present in excreta from being transmitted to other individuals. In this way the health of the community is improved. In order to design an effective sanitation program it is important to understand how these diseases are transmitted.

Excreta-related viruses, bacteria, and parasites may spread through direct contact with an infected individual or indirectly by contamination of food and water or inhalation of dust. Disease organisms enter the body through any of the body orifices or, in the case of schistosomes and hookworm, the worm larvae penetrate the skin.

* An example may be "Sanitation is the control of disease through environmental safeguards including safe water and sanitary human waste disposal."

The transmission of some disease organisms such as tapeworms and shistosomes requires an intermediate host in which the organisms can develop. In other cases food may become contaminated by insects such as cockroaches and flies which live around fecal material and can carry pathogens in their gut and on their bodies and legs.

Wastewater in latrines also has been found to provide a breeding place for some species of culex mosquitoes which are the vectors of Bancroftian filariasis. In construction of latrines it is thus crucial to avoid creating a favorable environment for insect vectors, otherwise latrines may actually increase insect-borne diseases.

Indicate that there are many diseases such as malaria, cancer, venereal disease, sleeping sickness, and guinea worm which are not excreta-related. Improved excreta disposal will have little or no effect on the transmission of these diseases. There are other infections such as those caused by polio viruses which are excreta-related, but sanitation has been shown to have little effect in reducing their incidence. This is partly due to the existence of other routes of infection such as the oral route.

Types of Excreta-Related Diseases

Ask participants to list the excreta-related diseases which are found locally. The trainer should fill in any diseases which are not mentioned. The list might include:

Bacterial Diseases
- Typhoid
- Cholera
- Bacillary dysentary

Viral Diseases
- Infectious hepatitis
- Viral diarrheas

Protozoan Diseases
- Amoebic dysentry
- Girardia

Helminth (worm) infections
- Ascaris
- Hookworms
- Schistosomiasis
- Tapeworms

Health Effects of Excreta-Related Diseases

Ask participants to list the general effects of these diseases on the health of the community. Note the participants should not go into great clinical detail of the disease pathologies. They should mention a few of the following general effects of excreta-related diseases.

- High infant morbidity and mortality caused by diarrheal diseases

- Malnutrition

- Reduced resistance to other diseases

- Reduced worker productivity caused by illness

Health Indicators

Discuss what types of indicators could be used to determine if there is a health problem in the community which might be caused by poor sanitation.

Infant and child mortality
Number of cases of diseases
Observation of runny stools
General sanitary conditions of the community
Listless or dehydrated children
Presence of flies
Eye infections

7. Discussion of Disease Cycles Time: 20 minutes

Distribute Handout 2-2:The Disease Cycle and briefly review each step in the cycle. Ask the participants to give a description of the cycle for each of three local diseases. Diseases discussed should have different methods of transmission (for example, shistosomiasis, tapeworm, hookworm, malaria, or cholera).

Control of Excreta-Related Diseases

After each disease cycle is drawn ask participants what are the appropriate methods of blocking the disease cycle to prevent transmission. For example with schistosomiasis:

- Excreta can be isolated from surface waters by use of latrines

- Provide a clean source of water for drinking, bathing, and washing dishes and clothes

- Destroy snail vectors

- Treat infected individual with medicine which kills the schistosome worms

Ask how effective improved excreta disposal will be by itself in preventing each disease discussed.

Summarize that participants should now have a general understanding how excreta-related diseases are spread and controlled. Mention that sanitation is only one method of controlling disease and that there are often several routes of transmission of disease. Thus, improved sanitation is only effective in improving the community health when coupled with other programs designed to provide adequate housing, water supplies, health care, education, nutrition, and vaccinations.

After this discussion is completed, distribute Handout 2-1:Water for the World: Means of Disease Transmission noting that it provides additional information on the disease cycle and may be useful as material for community education.

8. Defining the Sanitation Problem Time: 10 minutes

The previous discussion should have pointed out that the prevention of disease cannot be handled solely through improved excreta disposal. It also indicates that the sanitation problem is broader than just safely disposing of human wastes. In the large group discuss the dimensions of the sanitation problem as they exist in the country.

Develop a list of other examples of sanitation problems. This list may include:

- There is a severe shortage of clean drinking water.
- Only a small percent of rural people have safe ways of disposing of human wastes.
- Traditional food handling and hygienic practices increase transmission of excreta-related diseases.
- In many communities improper disposal of wastewater and solid wastes provide breeding areas for rodent and insect disease vectors.

Constraints to Improving Sanitation

Summarize this list by stating that defining the existing conditions (as was just done) is only one way of describing the dimensions of the sanitation problem. We can also describe the problem in terms of the constraints that exist to improving the conditions. Lead a short discussion asking participants to describe reasons that the sanitation problems don't get effectively addressed. This list should include:

- There are severe economic constraints against people investing in sanitation facilities.
- Appropriate technology is often inadequate.
- Almost all sanitation systems require maintenance and an on-going commitment from the community.
- There are deeply seated cultural practices and beliefs which influence sanitary practices and these are difficult to modify.
- People often do not understand the relationship between sanitation and health and therefore have no strongly felt need to change.

This discussion should provide a natural transition into the topic of local habits and customs and how they may affect sanitation and particularly the use of latrires.

9. Local Beliefs and Customs Time: 5 minutes

Briefly introduce this topic by focusing on the importance of understanding local beliefs and practices before beginning a latrine construction project. These are practices and beliefs which will affect the use of latrines. Many of these customs will be obstacles to the implementation of a project while others may be supportive of the installation of latrines. For example, there are beliefs about spells being cast through contact with human excreta and practices such as locating latrines near food preparation areas which need to be overcome. On the other hand some religions place great importance on cleanliness and in some societies having a latrine is a status symbol. These factors may be helpful in supporting the involvement of the community in a latrine project. Be sure to stress the importance of determining local beliefs and practices before beginning to plan latrine projects. Cover the sensitive and personal nature of latrine construction particularly when working with individual families and their habits and customs. Give examples of how practices can prevent or support good health and sanitation. Use appropriate local examples.

10. Group Brainstorm Time: 5 minutes

Have full group brainstorm of all local beliefs and practices they can think of which will effect (either support or obstruct) the implementation of a latrine project. As ideas are offered ask if it is a "support" or an "obstacle." The trainer should record everyone's ideas without censuring or discussing them at this point. When there is enough information for a fruitful discussion and a majority of the group has participated, stop this process. It should not go longer than five minutes or so in any case.

11. Discussion of Beliefs Time: 30 minutes

Trainer leads a discussion around how these beliefs could affect a latrine project and potential problems that could occur if this information were not identified before a project starts. Do not go over every item on the group's list, but try to categorize them in such a manner that each item is discussed in a general sense.

Ask for ideas about how to collect information about beliefs and practices in a community. Ask for specific examples of approaches participants have used in approaching a new village or community to determine their sanitary practices and beliefs.*

* See Trainer Notes at the end of this session.

Summarize this discussion by discussing ways to overcome practices which hamper or block the use of latrines and using the supportive aspects to encourage use of latrines. State that "at this stage, we are more focused on how to find out the relevant information about sanitary practices than on how to solve problems." Make a transition into next activity which looks at how latrines may benefit the community. Clearly, identifying benefits of latrines is one way to overcome local resistance or suspicion.

12. Identify Benefits and Impacts of Latrines - Small Group Task — Time: 20 minutes

Introduce this task by asking participants to reflect on the discussion of sanitation and of the spread of disease. Ask them to think about the potential benefits of sanitary latrines on health and the spread of disease.

Divide participants into four groups. There should be no more than six persons in a group. Ask the groups to discuss:

- o Positive impacts or benefits of latrines
- o Ways sanitary latrines might interrupt the disease cycle
- o Any negative impacts latrines could have

Ask them to take 15 minutes for this task and to be prepared to report their conclusions. After 15 minutes, give them 5 minutes to organize a presentation (preferably on flip charts) for the rest of the group.

13. Report and Discuss Impact of Latrines — Time: 15 minutes

Ask the first group to spend five minutes reporting the results of their work. After they have concluded, ask the next group to report but focus primarily on any additional information or contradictory conclusions from the first group.

Ask the remaining groups to report briefly trying not to repeat what other groups have already stated.

14. Discussion of Latrines and Their Impact — Time: 10 minutes

After groups have all reported, discuss and summarize:

- o Benefits of latrines
- o Major categories of disease affected by latrines
- o Ways improper construction of latrines can have a negative impact on health (e.g. contribute to the spread of disease)

15. Transition and Closure Time: 10 minutes

Ask if participants learned anything that surprised them during this session or want to add any additional comments.

Review goals and ask for any general comments.

Conclude by thanking participants for their hard work.

Remind participants where and at what time they will meet tomorrow and give a brief overview of the activities for the day.

Distribute Handout 2-3:Participant Experience Survey (see Trainer Note No. 2 below). Explain that it will be used to determine the composition of the construction teams and that it should be completed by the lunch break tomorrow.

TRAINER NOTES

1. If time permits, some spontaneous role playing can be done here. Ask a participant to role play interviewing a villager about their human waste disposal practices. Process the role play focusing on understanding the villagers point of view and the sensitive nature of the information being sought.

2. Handout 2-3:The Participant Experience Survey will provide information on individual experience with six major activities of the workshop. The responses should be used to form construction teams with a combination of skills appropriate to the latrines to be built. The survey may be modified to include other variables arising from local conditions.

MATERIALS NEEDED

Handout 2-1:Water for the World:Means of Disease Transmission
Handout 2-2:The Disease Cycle
Handout 2-3:Participant Experience Survey
Flipchart for Session Objectives
Flipchart for Disease Cycle

Water for the World

Means of Disease Transmission
Technical Note No. DIS. 1.M.1

Water- and sanitation- related diseases are major causes of illness and death among people in both rural and urban areas in many developing countries. The health and well being of people cannot be improved without understanding these diseases and knowing how they are transmitted from one person to another.

This technical note describes what causes these diseases, how they are spread and the factors influencing their transmission. Methods for preventing the transmission of the water- and sanitation- related diseases can be found in the technical note, "Methods of Improving Environmental Health Conditions," DIS.1.M.2.

Useful Definitions

AQUIFER - A water-saturated geologic zone that will yield water to springs and wells.

BACTERIA - One-celled microorganisms which multiply by simple division and which can only be seen with a microscope.

FECES - The waste from the body moved out through the bowels.

LARVAE - Young forms that come from the eggs of insects and worm parasites.

PARASITES - Worms, insects or mites which live in or on animals or people.

There are about 30 diseases that are related to water and sanitation. Table 1 lists the 21 which are most important. Each of them affects from millions to hundreds of millions of people every year. All of these diseases are caused by living organisms that must spend much of their life in or on a human body. They include viruses so tiny that they can pass through the finest filter, bacteria and protozoa that can be seen only with the aid of a microscope, tiny mites that are barely visible to the eye and worms that may be a meter long.

The transmission of all of these diseases is related in some way to water supply and sanitation, usually to inadequate disposal of human wastes and to contaminated water supplies. The diseases are transmitted through contact with or consumption of water, contact with infected soil, the bites of insects that breed in or near water and poor personal and family hygiene. Man is usually the source of the organisms that cause these diseases and human activity is an important factor in the transmission of them.

Following the order shown in Table 1, the transmission of the diseases will be discussed for each of the five categories.

Waterborne Diseases (Water Quality Related)

In the waterborne diseases, the microorganisms which cause the disease are swallowed with contaminated water. All but one, Guinea worm, are caused by organisms found in human excreta, the source of the contamination. The infective stage of Guinea worm is not from fecal contamination, but is from a tiny larva that develops in a water-flea after the larva is discharged into the water. The larva comes from a blister on the skin of a person infected with the meter-long adult worm.

Cholera and typhoid fever are the waterborne diseases which are most feared because, when untreated, they have high death rates. However, the diarrheas and dysenteries are more important because of the infant deaths and huge numbers of illnesses they cause. In the developing countries,

Table 1. Water and Sanitation-Related Diseases

Category	Disease: Common name	Disease: Medical name	Type of Organism	Transmission
Waterborne (Water quality related)	Cholera Typhoid fever Paratyphoid fever Bacillary dysentery Amebic dysentery Diarrhea Diarrhea Jaundice Guinea worm	Cholera Typhoid Paratyphoid Shigellosis Amebiasis Salmonellosis Giardiasis Hepatitis Dracunculiasis	Vibrio Bacteria Bacteria Bacteria Protozoan Bacteria Protozoan Virus Worm	By consuming (drinking) fecally contaminated raw water containing an infective dose of the vibrio, bacterium, protozoan or virus; except Guinea worm where transmission is by swallowing water flea infected with worm larva that was shed from skin blister on infected human.
Water-washed (Water quantity; and accessibility related)	Bacillary dysentery Diarrhea Viral diarrhea Trachoma Pink eye Itch	Shigellosis Salmonellosis Enteroviruses Trachoma Conjunctivitis Scabies	Bacteria Bacteria Virus Intracelluar bacteria Bacteria Mite	Anal-oral or skin-to-skin direct contact transmission resulting from poor personal cleanliness and hygiene caused from lack of water for sufficient washing, bathing and cleaning.
Water-contact (Body-of-water related)	Blood fluke disease	Schistosomiasis	Worm	Eggs in feces or urine hatch larvae in water, penetrate suitable snail, multiply greatly in snail, free-swimming larvae leave snail, penetrate skin when person has contact with infected water.
Water-related insect vectors (carriers) (Water-site related)	Yellow fever Malaria Filarial fever Sleeping sickness River blindness	Yellow fever Malaria Filiariasis Trypanosomiasis Onchocerciasis	Virus Protozoa Worm Protozoa Worm	Mosquitoes, tsetse flies and blackflies, which breed in or near water, pick up disease organisms when they bite infected person; organisms grow in vectors and are inoculated into another person when insect bites.
Sanitation-related (Fecal polluted soil related)	Hookworm Roundworm	Ancylostomiasis Ascariasis	Worm Worm	Eggs or larvae become infective when feces are deposited on soil; eggs are eaten from contaminated hands or vegetables, or larvae penetrate skin that comes in contact with infected soil.

the diarrheas and dysenteries cause hundreds of millions of illnesses and millions of infant deaths each year.

The basic transmission of waterborne disease is person to person. The microorganisms for infected people contaminate water which is consumed by other people. Figure 1 shows a common way that water becomes contaminated. The contamination of water supplies occurs:

1. Where latrines and privies are located uphill from or very close to a water source such as a spring, stream, pond or well. Liquids carrying the organisms seep from the latrines into the water supply.

2. Where privy pits, soakage pits, or sewage absorption systems penetrate the water table of an aquifer located near the surface and shallow wells and springs whose water comes from the aquifer are contaminated.

3. Where wells and springs are unprotected so that surface run-off enters these water sources. The run-off after rainfall carries disease-causing organisms into the water source.

4. Where sanitation is poor. If people defecate on the ground or in bodies of water rather than in safe latrines or privies, disease-causing organisms can get into water supplies.

5. Where Guinea worm occurs, water is contaminated when the skin of an infected person with a blister caused by the worm is immersed in water and great numbers of larvae are released into the water. Some of the larvae are eaten by tiny water fleas (Cyclops). The larvae in the water fleas grow, shed their skins, and become infective. When a water flea containing an infective larva is drunk with water from the contaminated source, the little worm is transmitted to a new person where it grows to maturity under the skin.

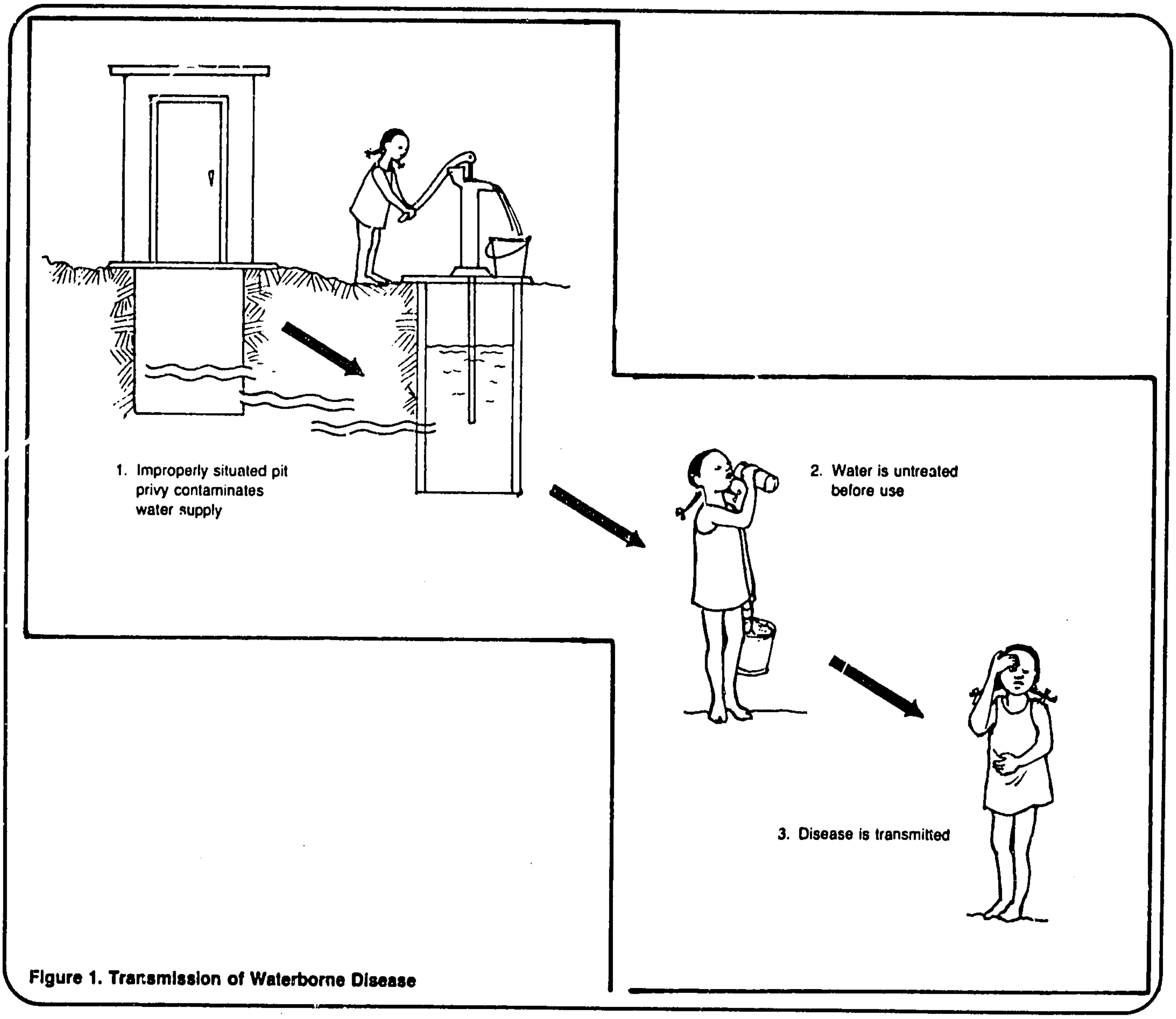


Figure 1. Transmission of Waterborne Disease

Water-Washed Diseases (Water Quantity and Accessibility Related)

Water-washed diseases are diseases whose transmission results from a lack of sufficient clean water for frequent bathing, hand washing before meals and after going to the toilet, and for washing clothes and household utensils. Several common diseases fall into this category. Shilgellosis (bacillary dysentery), salmonellosis (food poisoning), trachoma, and scabies are all diseases that can be passed by direct contact between people or by the direct contamination of food by dirty hands or flies. Figure 2 shows one way water-washed diseases are spread. The diseases in this group are transmitted:

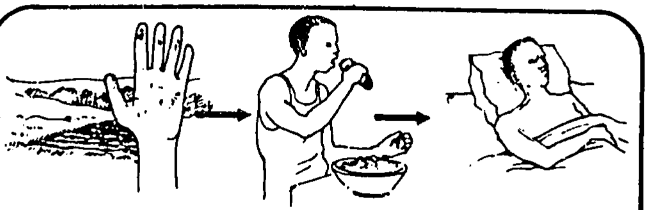


Figure 2. Transmission of Water-Washed Diseases

1. When a water supply produces insufficient quantities to meet peoples' needs or when the water supply is located at a distance from the users. The availability of only small amounts of water makes the practice of good personal and household hygiene difficult, or even impossible.

2. When feces are not disposed of in a sanitary way. Uncovered or unprotected latrines or stools passed on the ground are breeding places for flies and sources of bacteria. Bacteria and viruses are passed from feces to people by flies, contaminated fingers and food. Food contamination with salmonella quickly grows great numbers of the bacteria. When eaten, the food causes food-poisoning diarrhea with life-threatening consequences, especially for small children.

3. When people are ignorant of the need for personal hygiene and, for whatever set of reasons, either do not bathe frequently or use the same water and towels to wash more than one person, then trachoma and conjunctivitis are passed around within a family or other groups living together and scabies get passed from the skin of one person to the skin of another.

Water-Contact Diseases (Body-of-Water Related)

Water-contact diseases are diseases which are transmitted when people have contact with infected water. The single most important water-contact disease is Schistosomiasis (blood fluke disease). It is very widespread in Asia, Africa and South America with hundreds of millions of people at risk of getting the disease and millions suffering from it. Figure 3 shows how schistosomiasis is transmitted. Briefly, transmission is as follows: Schistosome eggs passed in urine or feces fall into water where a first stage larva hatches. The first stage larva, to survive, must find and penetrate a specific type of snail. In the snail, the first stage larva changes into a large number of sacs in which many thousands of forked-tailed second stage larva are produced over a period of months to years. Each day, several hundreds of these second stage larvae escape from the snail to swim about in the water seeking the warm skin of a human hand or food into which to penetrate. Once through the skin, the little worm enters the person's blood stream, grows to maturity (worms are about a centimeter long), works its way into the blood vessels of the intestine and urinary bladder, and lays its eggs in the wall of those organs. The eggs then cut their way through the tissues to the inside of the intestine or bladder and are passed with the feces or urine. So the transmission cycle continues.

Schistosomiasis is transmitted in areas:

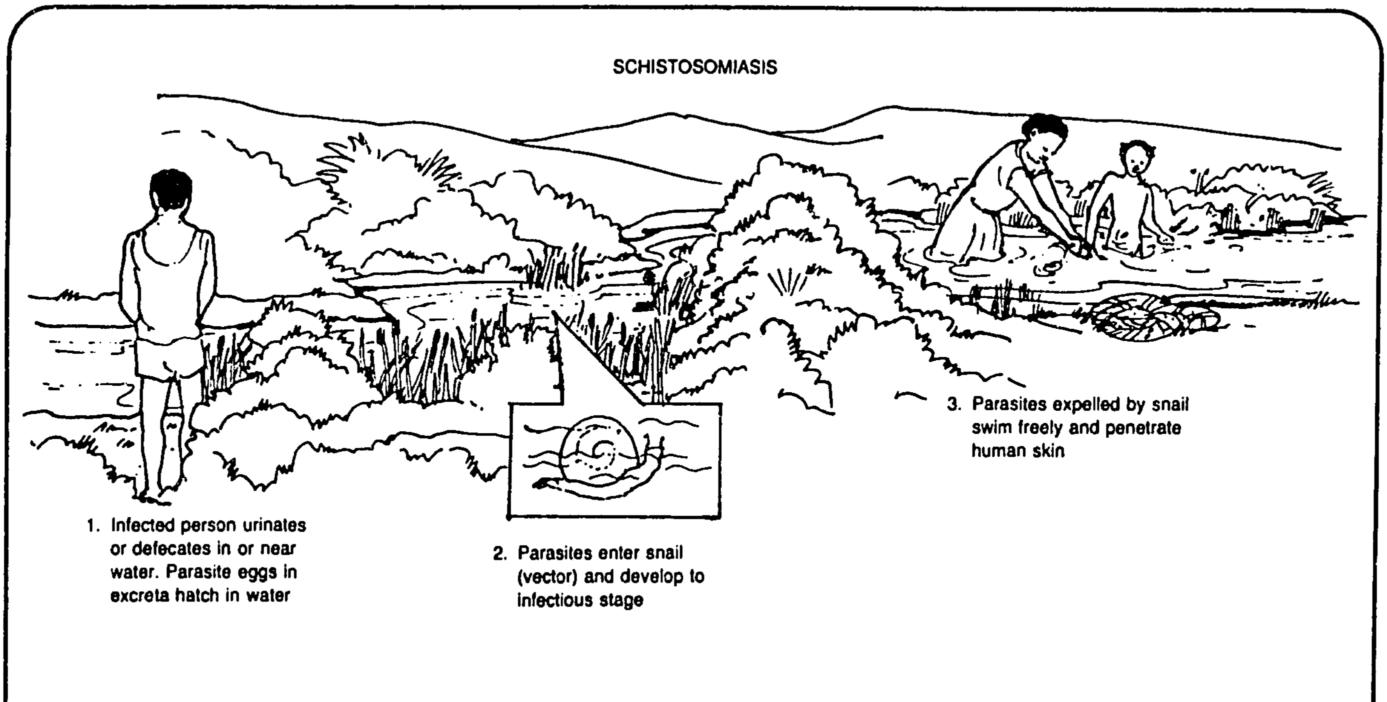


Figure 3. Transmission of Water-Bused/Water-Contact Diseases

1. Where poor sanitation is practiced so that feces or urine find their way into bodies of water that contain snails, or where rats or wild animals get the worms and keep the snails infected.

2. Where the appropriate type of snail is abundant and can become infected.

3. Where people enter infected water to bathe, wash clothes, dip up water, cultivate crops or swim.

4. Where irrigation projects or man-made lakes have extended the bodies of water in which snails can grow and have the chance to be infected from man or wild animals.

Water-Related/Insect Vector (Carrier) Diseases (Water Site Related)

Water-related insect vector diseases are those that are transmitted by insects which breed in or near water. Transmission occurs when the insect becomes infected with the disease organism from biting a person or animal, and then bites another person. The parasites are injected into the skin or bloodstream by the insect bite. The insects breed in water that is used as water supplies (streams and rivers) and, in the case of mosquitoes, in water storage jars, and water tanks, or in shaded high humidity areas near streams or lakes.

The most common diseases in this category are:

- African trypanosomiasis (sleeping sickness) which is transmitted by the tsetse fly which thrives on high humidity and breeds in river areas under lush vegetation growing at water sites.

- Onchocerciasis (river blindness) which is transmitted by blackflies which breed while attached to rocks and vegetation in fast-flowing rivers and streams. Figure 4 shows how onchocerciasis is transmitted.

- Malaria which is transmitted by female anopheline mosquitoes which breed in a wide variety of water collections.

- Arboviruses (yellow fever) which is also transmitted by mosquitoes. The type of mosquitoes that carries this disease is different from that which carries malaria. Mosquitoes that carry yellow fever breed in highly polluted stagnant water and usually rest in areas far from their breeding places.

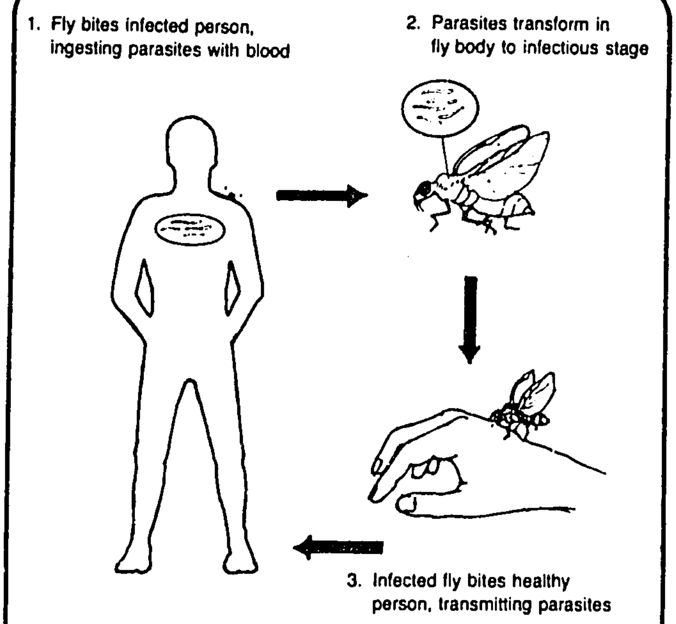


Figure 4. Transmission of Water-Related (Insect Carried) Diseases

- Filariasis which is a worm infection spread by mosquitoes. The mosquitoes that carry the parasite breed in any stagnant pond or pool or in water in cans, coconut husks, dishes, gutters or wherever water is standing.

The transmission of water-related insect vector diseases occurs in many types of situations in which the insect vectors are able to breed in large numbers, can bite persons infected with the protozoan or worm that causes the disease, and later, after the parasites have developed in them, have the opportunity to bite other people. In many situations, the water supply site where people come to get their water, is the place where the insects get their opportunity to bite both infected and other people. The household environment is also a place where some of these diseases are transmitted.

Sanitation-Related Diseases (Fecal Polluted Soil Related)

Sanitation-related diseases are specifically those that are transmitted by people lacking both sanitary facilities for waste disposal and knowledge of the need to dispose of wastes in a sanitary manner. The infective stage of the worm which causes those diseases develops in fecally contaminated soil. The most common diseases in this category are hookworm and roundworm.

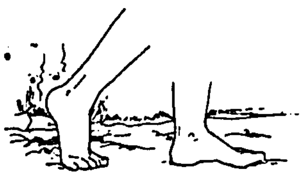
Hookworm larvae develop and live in damp soil that has been contaminated with feces containing hookworm eggs. They penetrate the bare feet of people walking or standing on the infected soil. See Figure 5. Entrance can also occur through the hands or other skin areas.

Roundworm or ascariasis is transmitted by swallowing eggs which have become infective by developing on polluted soil. The eggs are eaten by children who play on the infected soil, drop food on the soil and then eat it, or eat from dirty hands or eat contaminated raw vegetables.

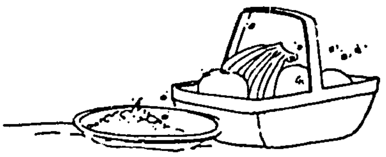
Both diseases occur:

1. Where there are not latrines and the soil is polluted, where latrines are not sanitary or where they are not used.

2. Where fresh untreated feces are used as fertilizer.



a. Hookworm is transmitted through the feet of people walking barefoot in contaminated soil



b. Roundworm is often transmitted by contaminated flies which land on food

Figure 5. Transmission of Sanitation-Related Diseases

3. Where people are not educated to wash their hands before eating.

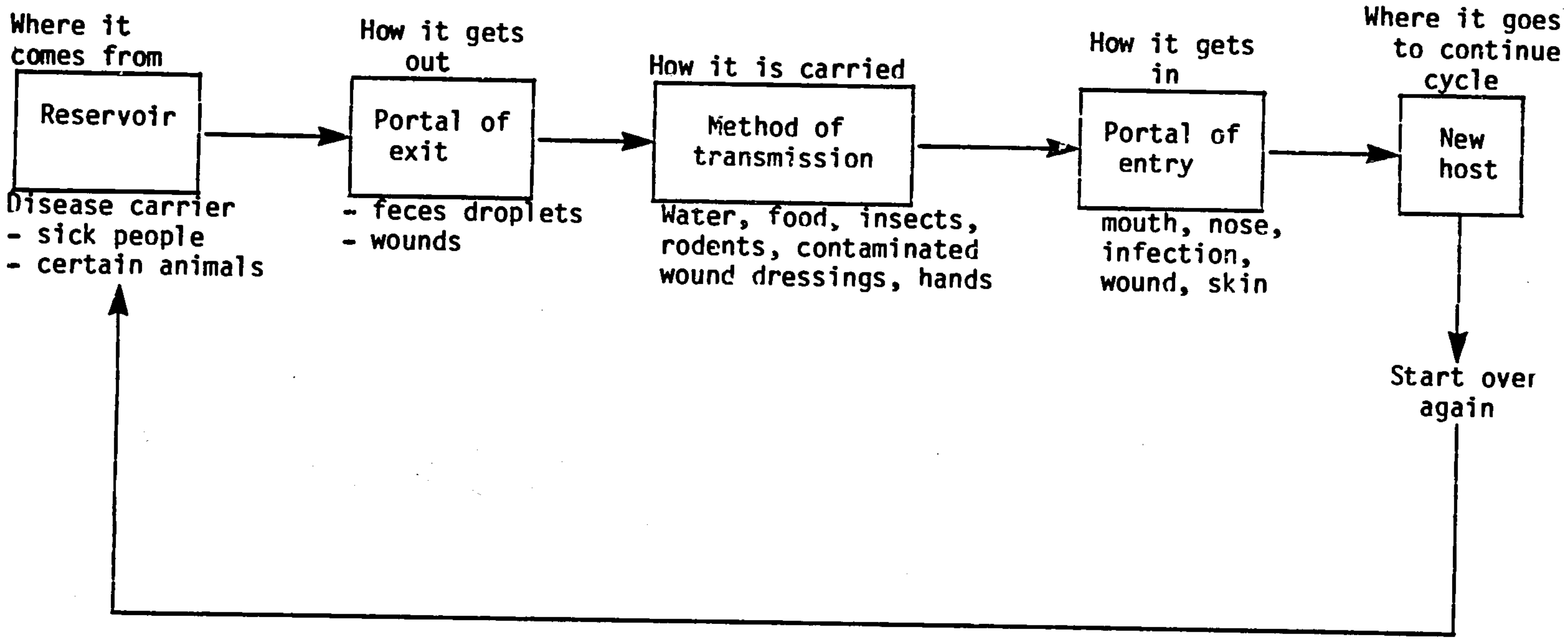
Summary

This technical note has discussed several diseases which are common in many countries. They are all directly related to local environmental conditions and are all passed from person to person. The cycle, or chain of transmission, involves both direct transmission of the disease or else depends on an agent, or vector, for the transmission.

Once the chain of transmission is understood, means to break the chain should be adopted. Generally, relatively simple environmental measures need to be developed to stop the spread. The methods of doing this are discussed in "Methods of Improving Environmental Health Conditions," DIS.1.M.2.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

THE DISEASE CYCLE



HANDOUT 2-2

PARTICIPANT EXPERIENCE SURVEY

Print your name in column one. In column two indicate your current title/position. In the remaining columns write "Yes" or "No" to indicate your experience for the stated activity.

Name	Job assignment	Have you ever laid blocks or bricks?	Have you ever built a structure with wattle and mud?	Have you ever mixed and poured concrete?	Have you ever implemented a community health program?	Have you ever led a community health workshop?	Have you ever constructed a pit latrine?

GUIDE TO SESSION 3: COMMUNITY MOBILIZATION AND INFORMATION GATHERING

Total Time: 3 hours 50 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Session introduction	Trainer presentation	5 minutes		Session objectives
Community involvement	Trainer presentation	10 minutes		
Project cycle	Presentation	10 minutes	Handout 3-1: Project Cycle Steps	Project cycle
	Discussion	20 minutes		
	Small group task	45 minutes		Task instruction
	Report and discuss	40 minutes		
Information gathering and sanitary survey	Trainer presentation and discussion	30 minutes	Handout 3-2: Sanitary Survey Form	
Sanitary survey	Task instructions	15 minutes		
Survey tools and techniques	Group discussion	20 minutes		
Sand and gravel test	Presentation and demonstration	30 minutes	Handout 3-3: Silt Test	
Transition and closure	Trainer review	5 minutes	Handout 3-4: Helping Health Workers Learn (abstract) Handout 3-5: Water for the World: Community Participation...	

Session 3:Community Mobilization and Information Gathering

Total Time: 3 hours & 50 minutes

OBJECTIVES

At the end of this session, participants will be able to:

- o Describe project cycle including key points for community involvement.
- o Analyze types of groups and individuals critical to the success of a sanitation project
- o Identify information needed for community to make a "go/no go" decision on a sanitation project

OVERVIEW

This session introduces the concept of community involvement and mobilization. A project cycle is introduced and critical steps discussed as issues of community responsibility are raised. An important theme of this session is that success is dependent on the involvement of the community, the local leaders, and key individuals at all important stages in the development of the projects. The session moves on to introduce information gathering techniques for use in collecting technical data needed to assist a community in making an informed decision. What to look for and ways to go about looking are reviewed. Demonstration and practice of survey techniques will conclude this session. Participants will then practice their skills by actually conducting a survey in the community in the afternoon.

PROCEDURES

1. Introduction Time: 5 minutes

Introduce the objectives of the session and briefly describe the flow of activities for the day. Objectives of Session 4:Conducting a Sanitary Survey may also be introduced here or held until the afternoon. The connection between the two sessions needs to be made at this point in any case. Be clear that participants will be conducting a survey in the community this afternoon.

2. Presentation of Community Involvement Time: 10 minutes

Introduce the concept of community involvement. State that involvement of the community in all phases of project initiation, planning, and implementation is the key to the success and long-range use of latrines in the village. The important issues are to determine how to involve appropriate individuals and who to involve in each phase.

Begin a brainstorming session by asking the following question: "Which groups and individuals in a community need to be involved in a community sanitation project?" List answers on a flip chart. After the list is sufficiently long for discussion, comment on the group's work and state that the group will discuss community involvement in more detail in a few minutes after discussing the project cycle.

3. Presentation of Project Cycle Time: 10 minutes

Introduce the need for a project cycle which identifies the key steps in organizing and implementing a sanitation project.

Tell participants a seven step project cycle for latrine projects has been identified. There are other similar models which work well. It is not important to have exactly the same model. What is important is to use a comprehensive model covering all the appropriate steps.

Introduce Handout 3-1:Project Cycle Steps and have it posted on a flipchart for use in discussion. Make sure all the terms are clear and there is a general understanding of the steps and their significance for a project. Explain how this workshop assumes that participants are working in communities which have already decided they want to implement a latrine project so that most of the workshop time will be spent on planning, implementation, and follow-up stages. However, this morning, the group will look briefly at how to help communities decide to go ahead with a project, and at the information needed before a community can decide what to do.

4. Discussion of Project Cycle Time: 20 minutes

Lead a large group discussion of the project cycle. Go over each step and ask participants to identify the tasks which need to be done for each step. Record tasks on flip chart and discuss briefly. This does not need to be a comprehensive list of tasks but should be sufficient to create a shared understanding of the type of tasks which come under each of the project cycle steps.

Make a transition to the next topic stating the following: A project can only succeed if the local community feels a sense of ownership and identifies the project as its own. Therefore, it is important to look specifically at who needs to be involved and at what point in order to build a feeling of ownership and responsibility for the success of the project.

5. Small Group - Involvement of Community Groups in Project Cycle Time: 45 minutes

Form four groups and give the following directions:

For the first two steps in the project cycle, answer the following questions:

- o Who needs to be involved in this step and why?
- o What are the consequences if they are not involved?

- What are some methods for involving them?

- What are the payoffs in the future for their involvement at this point?

Tell the groups to be prepared to report their responses to the total group. These reports should be presented on flipcharts.

6. Report and Discuss — Time: 40 minutes

Have each group report out. Try to keep presentations and discussion of each report to five minutes. After the groups report, go briefly over the following:

- Key community groups and individuals to involve

- Consequences of their involvement

- Methods to use to involve community groups

- Payoffs for involvement

Discuss similarities and differences in responses.

Summarize by pointing out that methods and approaches to use in involving the community will be discussed and worked on throughout the workshop as local participation is the key to any successful project. Make the transition to the next step, looking at what information needs to be gathered to help a community decide specifically what it wants to do.

7. Information Gathering and Introduction to Sanitary Survey — Time: 30 minutes

Review briefly the key types of information needed to initiate a latrine project (linking this to previous discussions as appropriate):

- The overall need and problem

- Community acceptance (beliefs, practices, and community experience in sanitation efforts)

- The overall technical feasibility (e.g., can it be done?)

- The types of latrines that could work given local conditions and resources

State that much of this information can be obtained by conducting a sanitary survey.

Sanitary surveys can be comprehensive and look at all environmentally-related deficiencies or can be more specifically related to human excreta practices. They can be community-based or specific to an individual home. A sanitary survey is a systematic way to collect information to determine project feasibility. For a community project, a sanitary survey is used to:

- o Document existing social structures and organization
- o Identify and list resources
- o Provide an indication of need (environmental illness)
- o Identify scope (number of homes)
- o Identify physical characteristics including groundwater depth, location of surface water, depth to rock, existing excreta disposal methods, and existing pollution and contamination (actual and potential).

In Session 5:Types and Selection of Latrines we will cover the information needed to determine appropriate types of latrines for this community. At this stage we will focus on the technical feasibility question.

Explain that the afternoon session will give participants practice in collecting this type of feasibility information. Ask participants to identify the technical information needed to determine project feasibility. List on the flipchart participant responses. Make sure the following points are covered. If any are not raised by the participants, the trainer should add them.

- o What materials are locally available?
- o What labor is/is not available and when?
- o Where are the water supplies and are they protected?
- o What is the soil type at the latrine sites?
- o How many families need latrines?
- o How much water is available for possible flushing or cleansing?

Summarize the information needs identified by the group and ask how they would collect this information and from what sources.

8. Sanitary Survey Task   Time: 15 minutes

Describe the sanitary survey to be used and make clear that it is a survey limited to technical feasibility questions. It is not a comprehensive survey or one that should be used without modifications when working in the field. This survey is designed as a training tool to fit the constraints of a workshop setting. It will provide participants the opportunity to gather information in a field setting. It will also enable them to analyze and discuss the implications of this information for a latrine project.

Distribute Handout 3-2:Sanitary Survey Form and go over each item to assure that everyone understands the questions and their usefulness in determining technical feasibility and identifying health problems.

9. Survey Tools and Techniques Time: 20 minutes

State that before conducting the survey, it is necessary to identify some of the tools which might be needed.

Ask group what type of "tools" they see as useful or necessary in conducting a sanitary survey. A list should include:

Pencil
Survey form
Community map or census if available
Measuring tape
Hand level
Flashlight

Discuss what substitutes could be used if needed. For example, pacing instead of a measuring tape if the length of pace is known, or substituting a mirror for a flashlight for using the sun as a light source.

Note that one of the tools listed was a map. Ask what kind of maps are available locally. These may include geological survey maps made from aerial photography, aerial photos from previous highway surveys, maps from previous projects, etc. Show how houses, public buildings, land contours and streams are shown, using an appropriate local map. Draw or use a typical site map and identify:

The water source and its relationship to the village
Location of stream(s)
Community buildings
Waste disposal site(s)
General slope of land
Grouping of homes

Summarize by pointing out that participants will need to make a simple sketch map during or after their survey work later in the day.

10. Sand and Gravel Tests Time: 30 minutes

Refer to the list of information needed to design a project. Locally available construction materials have been included.

If cement grout or concrete is to be used, a source of sand or sand and gravel is needed. Indigenous materials must be located and examined to determine their suitability as construction materials.

Explain that participants will need to conduct a sand and gravel test during the afternoon as part of the sanitary survey. A practice session follows this explanation.

Take a jar of local sand and demonstrate how to do a "jar test" for observing silt content. Have a jar, already prepared and settled, ready to show (use Handout 3-3:Silt Test as a guide). Explain that silty sand or dirty gravel might be made usable by washing. Explain that gravel needs to be hard and not dissolve in water. Types that dissolve or crumble include siltstone and sandstone. Explain that placing samples in water and breading them will give an indication of their suitability for use in grout or concrete. Tell participants they will be expected to do a silt test as part of the survey so they should keep Handout 3-3.

11. Transition to Next the Session Time: 5 minutes

Break for lunch after reminding participants that they will be conducting a partial sanitary survey after lunch. Give out Handout 3-4:Helping Health Workers Learn and Handout 3-5:Water for the World:Community Participation in Planning Water Supply and Sanitation Programs for background reading if you did not do this earlier in the session. Tell participants these readings present several perspectives on information gathering. In particular Helping Health Workers Learn outlines an approach to conducting surveys which involves the community. Note that the approach assumes the adequate preparation and get-acquainted time that was not available for the limited survey done today. Some of the suggested techniques also vary from those used today.

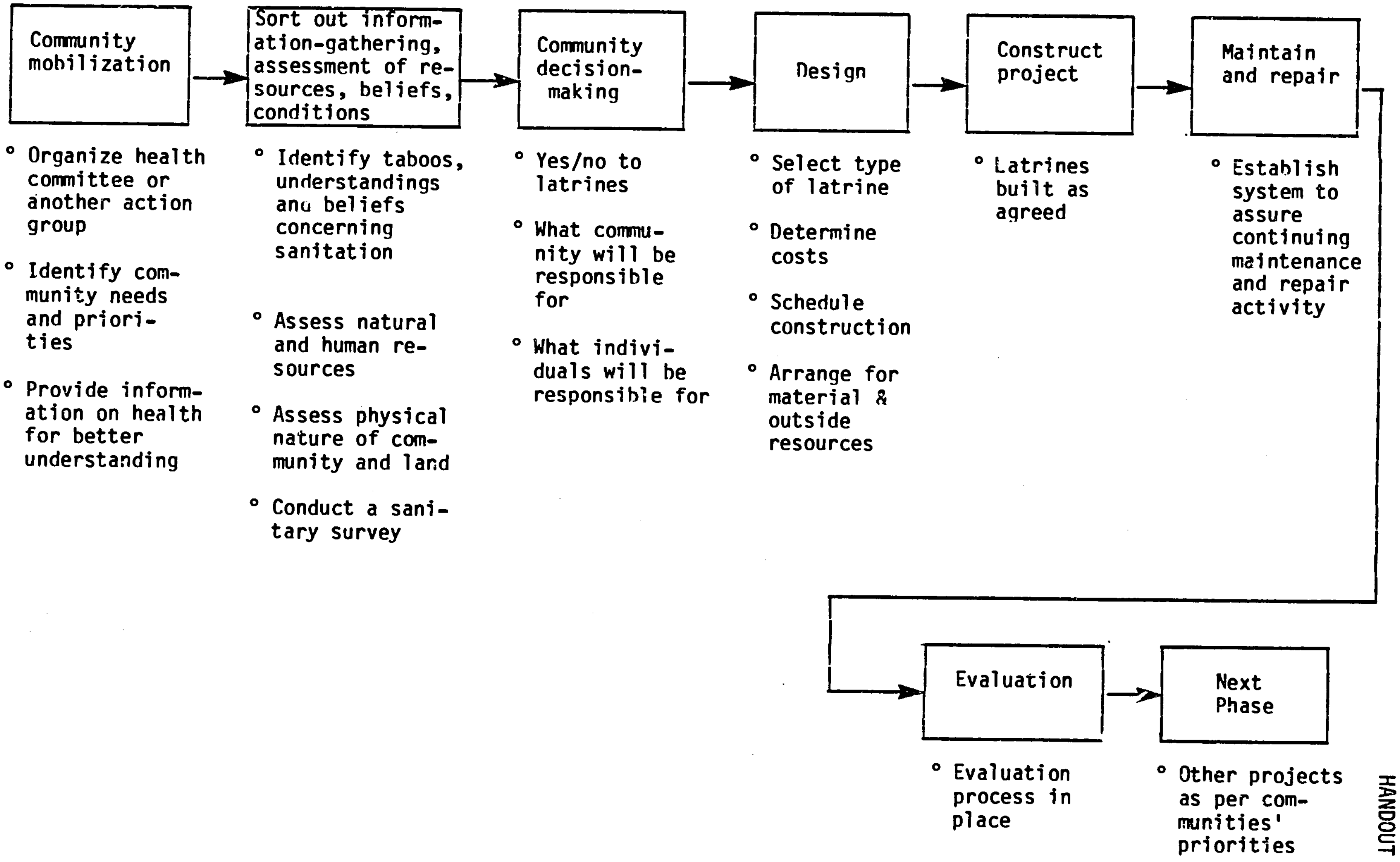
TRAINER NOTES

Keep the project cycle posted in the room. Use it frequently to help participants see where they are in the project cycle and the implication for their work back home.

MATERIALS NEEDED

Handout 3-1:Project Cycle Steps
Handout 3-2:Sanitary Survey Form
Handout 3-3:Silt Test
Handout 3-4:Helping Health Workers Learn
Handout 3-5:Water for the World: Community Participation....
Flipchart for Session Objectives
Flipchart for Project Cycle

PROJECT CYCLE STEPS



HANDOUT 3-1

SANITARY SURVEY FORM

Village	______	Number of Houses/Compounds	______
District	______	Estimated Population	______
Village Leader	______	Is there a Health Committee?	______
Village Health Representative	______	Who is its leader?	______

Is there a health education program for the village? ______

If yes, describe

Waste Disposal:

Number of houses/compounds with no excreta disposal facilities ______

Number of houses/compounds with excreta disposal facilities ______

Describe types of excreta disposal facilities ______

Are existing excreta disposal facilities a health hazard? If so why?

Are latrines individual or communal?

Are houses spread out sufficiently to site latrines?

What is the water level during the dry and wet season?

What type of soil is there in the village (i.e. sandy, clay, rocky)?

Where and in what manner are garbage and trash disposed?

Are garbage and trash a problem? Why?

NOTE: Use the back of this page to sketch a map of the community's important features.

Continued on next page

SANITARY SURVEY FORM (Cont'd.)

Indicators:

Are rats and other rodents a problem in the area?

Are flies, cockroaches, and other insects a problem?

Other observations:

Resource availability and unit costs:

	Availability Yes/No	Unit Cost		Availability Yes/No	Unit Cost
Contractors			Cement		/sack
Skilled labor		/hr	Lumber		/meter sq.
Unskilled labor		/hr	Native materials		
Sand		/	Bamboo, trees		
Gravel		/	Brick		/each
			Re-bar		/each

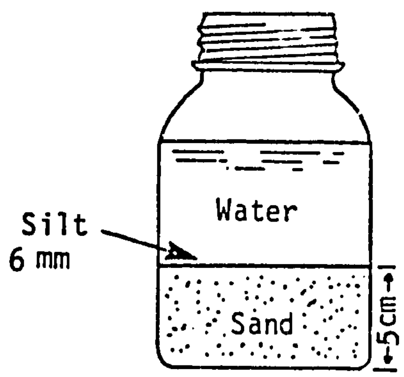
Additional Comments/Observations

Continued on next page

Sanitary Survey Form (Cont'd.)

Water sources locate on map	Protected from contamination yes/no	Water quality taste, odor, color, turbidity	How is water obtained? Bucket, pump etc.	Communal or private source	What season is this source used? Dry/wet	Distance of source from user's homes	COMMENTS
Wells							
Springs							
Streams							
Ponds							
Other							

SILT TEST



In making the silt test, an ordinary liter bottle or jar is used. Fill the container to a depth of 5 cm with a representative sample of dry sand to be tested. Add water until the bottle or jar is about three-fourths full. Shake vigorously for 1 minute --the last few shakes being in a sidewise direction to level off the sand. Allow the jar to stand for an hour, during which time any silt present will be deposited in a layer above the sand. If this layer is more than 6 mm thick, the sand from which the sample is taken is not satisfactory for concrete work unless the excess silt is removed. This may be done by washing.

A book of methods, aids, and ideas for instructors at the village level

Helping Health Workers Learn

David Werner and Bill Bower

LEARNING FROM, WITH, AND ABOUT THE COMMUNITY

The main job of a health worker in a community-based program is not to deliver services. And it is not simply to act as a link between the community and the outside health system. It is to **help people learn how to meet their own and each other's health needs more effectively.**

In order to do this, the health worker needs a deep understanding of the community's strengths, problems, and special characteristics. Together with the people, the health worker will want to consider . . .

NEEDS

- local health problems and their causes
- other problems that affect people's well-being
- what people feel to be their biggest problems and needs

SOCIAL FACTORS

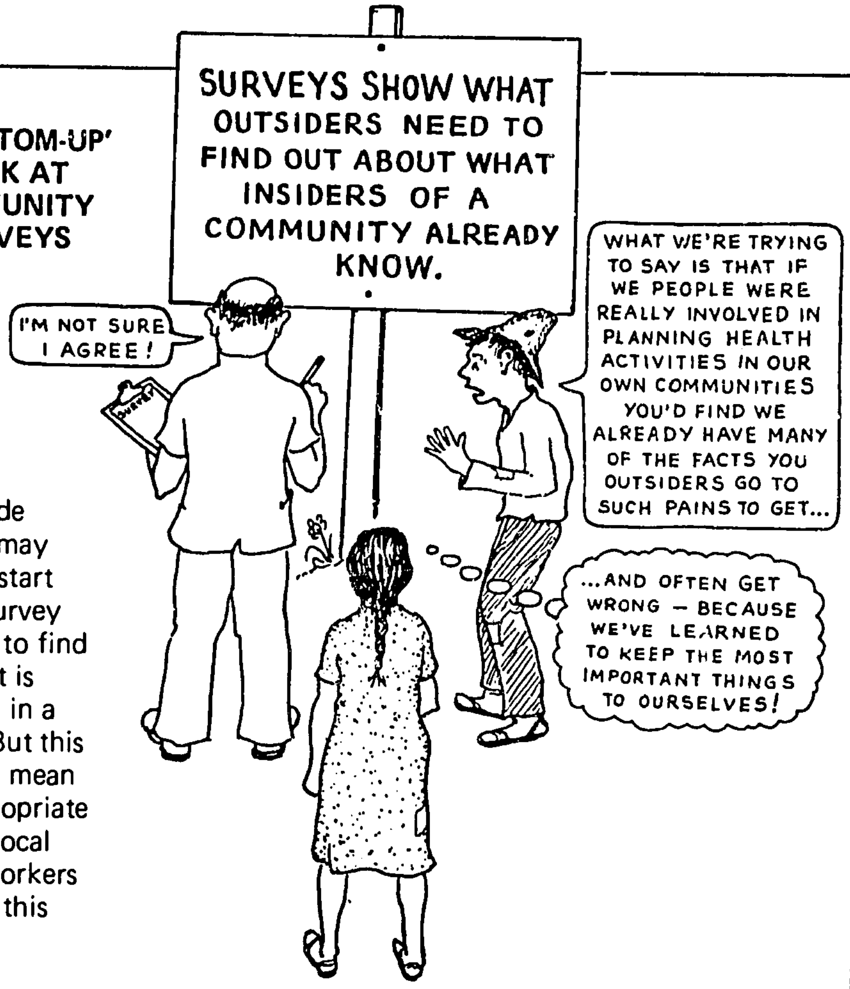
- beliefs, customs, and habits that affect health
- family and social structures
- traditional forms of healing and of problem solving
- ways people in the community relate to each other
- ways people learn (traditionally and in schools)
- who controls whom and what (distribution of land, power, and resources)

RESOURCES

- people with special skills: leaders, healers, story tellers, artists, craftsmen, teachers
- land, crops, food sources, fuel sources (firewood, etc.), water
- building and clothing supplies
- markets, transportation, communication, tools
- availability of work; earnings in relation to cost of living

This looks like a lot of information. And it is! But fortunately, **a health worker who is from the community already knows most of the important facts.** He does not need to run around collecting a lot of data. All he needs to do is sit down with a group of people and look carefully at what they already know.

A 'BOTTOM-UP' LOOK AT COMMUNITY SURVEYS



Outside experts may need to start with a survey in order to find out what is going on in a village. But this does not mean it is appropriate to have local health workers start off this way.

When does information gathering make sense?

Although starting off with a detailed community survey is often a mistake, there are times when a health worker and the people in his community may want to gather specific information. For example:

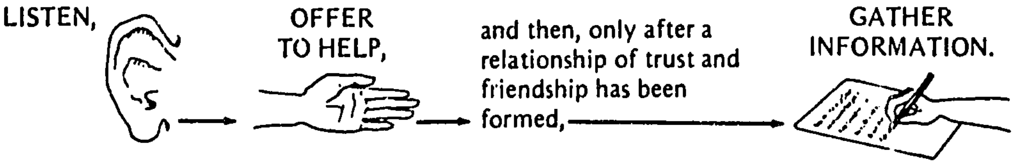
- People may want to see whether many children are underweight (poorly nourished) and therefore more likely to get sick. (See p. **25**-7.)
- They may want to find out if bottle-fed babies in their village get diarrhea more often than breast-fed babies. (See p. **24**-17.)
- They may want to see whether a particular health activity produces results. For example, a village may plan a campaign to control malaria. The people can take a survey before they begin, to find out how many persons have had fevers and chills. Then—after everyone has taken part by draining ditches, sleeping under mosquito nets, and getting early treatment—the villagers can take another survey and compare the results.

Because surveys often show results that would not otherwise be noticed, they can help to renew people's enthusiasm for continuing an activity (or to stop or change an activity that is not working). See Evaluation, Chapter 9, and On-the-spot Surveys, p. **7**-13.

Suggestions for gathering community information

There are no set rules or one 'right' approach for gathering needed information in a community. However, several people-centered programs have come up with the following ideas:

1. Go to people's homes and get to know them. But **do not start by taking a survey.** Information learned through friendly, casual visits is often truer and more useful. Put the needs and feelings of the people first.



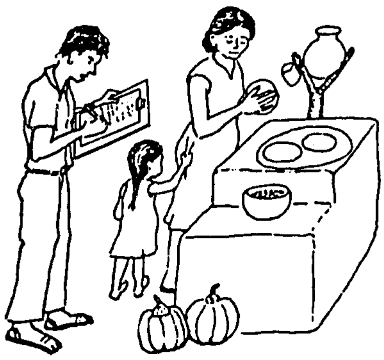
2. When gathering information, try to **find out what problems people feel are most important** or want to solve first. **Learn what ideas they have** for solving them.
3. **Ask only for information that makes sense** (and not simply because you were told to collect it). Be sure you and the people understand **why** the information is needed. For example, be sure parents understand why you weigh children **before** you do it.
4. **Involve local people in gathering the information.** Be sure studies are not *of* the people, but *by* the people. (For simple surveys in which children and non-literate people can take part, see p. 7-13 and Chapters 24 and 25.)
5. When conducting a survey or community diagnosis, **try to avoid taking along written questionnaires.** Avoid writing notes while a person is talking to you. Listen carefully, remember what you can, and **write your notes later.** Always be honest and open about the purpose of your visit.
6. Look for ways of making the survey a learning, exploring experience for those being questioned. Try to ask questions that not only seek information, but that also get people thinking and looking at things in new ways.

   For example, instead of simply asking, "How many people in your family can read?" follow up by asking, "What good is it to know how to read and write?" "Does the school here teach your children what they most need to know?" "If not, who does?" (For more ideas about this type of question, see *Where There Is No Doctor,* p. w10 and w11.)
7. Observe people carefully. You can find out as much by watching the way people act and do things as you can by asking questions. Learn to look and listen.
8. **Go slowly when giving people advice,** especially when it concerns their attitudes and habits. It is often better to tell a story about how others solved a similar problem by trying a new way. And **set a good example yourself.**

Note: Where official records of births and deaths are fairly accurate, these can also provide important health information without bothering people in their homes. It is a good idea to compare the ***deaths in children under five*** with ***total deaths.*** For example, in one area of the Philippines, a rise in children's deaths from 35% to 70% of total deaths between 1975 and 1980 shows that conditions affecting health are getting worse!

For local health workers and their communities,

the need is not to gather information . . .



but to gather everyone together and look at what they already know.

People in a village or community already know most of the essential facts from their own experience. (Not exact numbers, perhaps, but these are usually not needed.) What they need to do is ask themselves:

- How do the combined facts of our situation—needs, social factors, and resources—affect our health and well-being?

- How can we work with these facts—using some, changing or reorganizing others—to improve our health and well-being?

The process of looking at these questions in a community group is sometimes called ***community analysis*** or ***community diagnosis.*** At best, this means not only a diagnosis ***of*** the community, but a self-analysis ***by*** the community.

Community diagnosis—whom does it serve?

Ideally, a community diagnosis is a self-analysis by a community of the problems that concern people most. But watch out! The term ***community diagnosis*** is used quite differently by many of the larger health programs. To them it has come to mean a detailed survey, which health workers are required to conduct in their communities after training. Often the information collected through these surveys serves the needs of the health authorities, but means little to the people themselves.

To require a new health worker to conduct a long, complicated community survey can turn people against him from the first. Many people dislike or distrust surveys. This is especially true for the poorest of the poor, who are repeatedly studied but seldom see any real benefits.

DIAGRAM 2

Ten reasons advanced for Community Participation

1. With participation, more will be accomplished.
2. With participation, services can be provided more cheaply.
3. Participation has an instrinsic value for participants.
4. Participation is a catalyst for further development.
5. Participation encourages a sense of responsibility.
6. Participation guarantees that a felt need is involved.
7. Participation ensures things are done the right way.
8. Participation uses valuable indigenous knowledge.
9. Participation frees people from dependence on others' skills.
10. Participation makes people more conscious of the causes of their poverty and what they can do about it.

Water for the World

Community Participation in Planning Water Supply and Sanitation Programs

Technical Note No. HR. 2.P

Community participation in planning a water and sanitation system is one of the most important contributions to a project's success. For local participation to be productive, both the community and the action agency must be committed to it from the start. See "Overview of Water and Sanitation System Development," HR.1. Educational campaigns on the options for improvements in water and sanitation on the local level are essential to develop the community awareness that leads to responsible participation in developing a system. The community and the action agency must jointly develop a water and sanitation system that can be locally operated and maintained with a minimum of advice and assistance from outsiders. Community involvement in project planning is essential to the later phases of design, construction, and operation and maintenance. Community involvement is especially important in the areas of financial arrangements, in-kind contributions, labor schedules, legal clearances, selection of acceptable technology, and training in operation and maintenance.

Community Education

Local awareness and understanding of the advantages of water supply and sanitation improvements increase the probability of community participation in developing appropriate water and sanitation facilities. The success of a water and sanitation project depends on users wanting, understanding, and accepting the system.

Community education serves several purposes. One is to explain to villagers the economic advantages of improved water and sanitation systems. Another purpose is to familiarize the community with the technologies available so that they will select one they can operate and maintain with a minimum of outside involvement. A third purpose is to teach villagers which personal and communal water and sanitation practices are harmful to good health so behavioral changes can take place.

Education programs should be arranged through the action agency. The action agency and the village water and sanitation committee should organize the community education campaign using all appropriate cultural channels and reaching all social levels. The educational effort can be coordinated with other development projects, such as hospital construction or primary health care, as well as with local institutions such as schools, and organizations such as mothers' clubs.

Both hygiene and technical education should be integrated into all stages of the planning phase. This is best accomplished if local water and sanitation practices are throughly understood. Local water and sanitation beliefs, legends and patterns of water use and excreta disposal should be identified and understood by the health or technical educator.

Some suggested components to use in health and hygiene education are:

- rules of personal hygiene,

- rules of communal hygiene and environmental sanitation,

- methods of water source protection,

- rules of water supply protection in the household,

- health reasons for a safe water supply,

• health reasons for sanitary excreta and refuse disposal.

Convenience and privacy are the most likely reasons people will accept and use new facilities. Even so, local disease statistics and projected economic consequences are good tools for explaining the need for good health. Examples set by role models such as teachers, engineers, community leaders and even school children can change behavioral patterns in a community. Visual aids and the mass media are effective supplements to an educational campaign.

Local programs might be organized as:

• hygiene explanations of water and sanitation systems integrated into construction schedules for laborers,

• family, mother and child education programs in personal and communal hygiene,

• school programs on health and hygiene, including demonstrations and supervised good use of new facilities at school,

• manuals for facilities use for operation and maintenance personnel,

• environmental sanitation and village clean-up campaigns.

It is difficult to persuade people to change old habits but the difficulty can be lessened by the manner in which change is introduced. Community leaders should understand problems and solutions early so they can help explain the coming changes. Leaders can motivate villagers through their own actions and through community approved sanctions for misuse of facilities. When community leaders, the village committee, the action agency and the villagers all have similar understandings, they can work toward a common goal.

The action agency must explain and evaluate technical options with the community to determine their social acceptability. Throughout the project, the action agency and the village water and sanitation committee should explain each project activity and the reason for its sequence to the rest of the village. This can be accomplished at public meetings or in informal discussions. Refer to "Methods of Operation and Maintenance Training," HR.3.M for more information on technical education.

Community education, or even data collection done with local participation, begun in the early planning stages of a project will stimulate interest and can help start active community involvement in the project. Public awareness of technical alternatives and personal and public practices related to hygiene and sanitation can provide health benefits that the provision of a water or sanitation system alone cannot affect.

Formulate Alternatives

The collection and evaluation of field data will often continue throughout the entire project as new options and information are presented. The action agency will be responsible for appraising the technical field data and identifying the technical options it believes are practically and economically feasible. The community will be responsible for evaluating its social, cultural and economic situation and identifying options which it perfers.

Before final steps are taken in formulating water supply and sanitation alternatives, the community, with technical assistance from the agency, should clarify its priorities and needs. It must identify its expectations and capabilities for technical involvement in system operation and maintenance, its own reliable resources (cash, labor, materials, equipment, services), and the support services it will need for education and training in health, construction, operation, maintenance and facility use.

The action agency should identify the technically feasible alternatives which meet local needs. Each option the agency presents to the community should include:

• a technical description and explanation,

- estimated installation costs,
- installation needs such as construction time, labor, material and equipment,
- operation and maintenance costs,
- community's operation and maintenance responsibilities,
- estimated total costs,
- funding requirements, sources and availability.

The agency must fully explain the community responsibilities for each option and the support services the agency can provide. The action agency must keep in mind that the village will be managing its own system in the operation and maintenance stages. Efficient operation and maintenance of water and sanitation systems in isolated and rural areas requires simple equipment and procedures and as little water treatment as possible.

Both the agency and the village must weigh the following factors for each alternative considered:

1. Technical feasibility, based on data collected in preliminary studies (refer to "Methods of Initiating Community Participation in Water and Sanitation Programs," HR.2.M).

2. Construction needs:

   a. Is site (land) available?
   b. Can water and sanitation facilities be made available at convenient places for everyone in the village? Can facilities be extended to new residences?
   c. What materials, tools, and equipment are necessary?
   d. Which are available locally?
   e. How can non-local materials and supplies be obtained?
   f. What kind of and how much labor is necessary?
   g. Is it available?
   h. How much will materials, equipment, and labor cost?
   i. When are laborers free for construction?
   j. When and how will funding be available?
   k. What season is best for construction?

3. Operation and maintenance needs:

   a. Will an operating budget be required?
   b. Is local personnel available for operation of systems?
   c. Are trained personnel for operation and maintenance necessary? How many?
   d. Can water agency provide training for operation and maintenance?
   e. How much will operation and maintenance cost daily, weekly, and monthly?
   f. What minimum costs will be necessary to keep the system going? How will funds be provided?

4. Community needs and preferences.

5. Social, cultural, religious acceptability.

Select a Method

After evaluating all alternatives presented, the most appropriate system for the village must be chosen. There is often wide variation between the most desirable alternatives and the most workable solutions. The water committee and the action agency must be careful not to choose either a sophisticated but unrealistic system or a system that is realistic but inadequate for meeting the community's needs. Often, established standards of quantity and quality will have to be balanced off against community preferences.

No system should be selected that involves complicated or expensive designs or equipment. Systems must be technically sound, economically feasible and acceptable to all segments of the community. Systems should be chosen for suitability and not prestige, but convenience and aesthetics should not be overlooked. Any features that exhaust the technical, economic or social resources of the community invite system failure and should not be selected. Systems using local resources are more likely to succeed than those dependent on outside resources.

It is not always necessary to develop an entirely new system. Small projects and improvements on existing systems may meet current urgent needs and promote village participation. The project planner should provide information for the village on the costs and efforts involved in minimal level service improvements which can be expanded over time.

The best water supply alternatives are those that provide the community with safe and abundant water from a reliable, accessible and socially acceptable source at the lowest cost. The best sanitation system alternatives are those which provide the most socially and environmentally acceptable level of effective service at the lowest cost.

Financial Arrangements

Special meetings should be held between the community and the agency to analyze finances and sources of support. The community should be instrumental in establishing financial arrangements for the project. Fund-raising instituted by the villagers to help pay part of the capital costs of the water and sanitation system may help pay for recurrent expenses or raise money for other village projects. Care must be taken to ensure there is equity in contributions and payments. The financial value of local labor, materials and services can constitute a considerable proportion of total costs. When the community has contributed to the cost of the system, and has also participated in planning and constructing it, local residents may develop a stronger sense of responsibility for the system. If the community cannot pay for the project itself, it should arrange for in-kind support. For example, the community can identify sources for items on the materials list and arrange donations, trades or other in-kind commitments.

The community should also be instrumental in developing a financing schedule. If at all possible, the action agency should teach elementary accounting to villagers. The community can:

- price materials and identify the best price alternatives,
- calculate project costs per family, cost per capita, and total cost,
- decide how the community will pay for construction,
- determine any repayment schedules for loans,
- decide how the community will pay for operation and maintenance,
- decide how and when any fees will be collected,
- determine wages for construction workers and operation and maintenance personnel.

Set Specific Goals and Write a Project Plan

After the appropriate technology is selected, goals for developing and completing the system should be set. Set specific goals that can be measured so people can tell when they have reached them. Be sure any necessary legal arrangements are made.

Project goals must clearly state:

- What the project is.
- What the project will accomplish in terms of effort and benefits.
- What methods will be used to complete the project.
- When work will be done.

Write a project plan that incorporates these goals into a specific time frame.

The village committee should help choose personnel for construction, operation and maintenance. Specify:

- How a construction supervisor will be chosen.
- Who will be supervisor.
- Who will be construction workers.
- How the operation and maintenance managers will be selected.
- Who the operation and maintenance managers will be.
- Who will keep books and file monthly maintenance and accounting reports.

The construction supervisor, the village committee, and the action agency should:

• Make a list of

-- the materials which must be procurred outside of the community and their costs, and

-- the materials which can be gathered locally.

• Make an equipment list, including tools and vehicles, and all costs.

• Make a list of where to procure all materials and equipment and set up a schedule for delivery.

The village committee should be instrumental in scheduling labor with the constuction supervisor. Identify and specify in the project schedule:

• Tasks for completeing construction.

• Which parts of the system can be locally constructed.

• Which parts of the system will have to be constructed outside community.

• Which jobs the community will perform.

• Which jobs the agency will perform.

• Which jobs will require both community and agency work.

• Sequence of tasks.

• When work must be done (according to migration patterns, planting, harvesting, climatic cycles and holidays).

• Schedule of completion dates for construction activities.

The action agency usually arranges for equipment and materials to be delivered to the village. Delivery needs to be budgeted into project costs. Tools and equipment are generally furnished for project use by the agency. The community usually pays for construction materials, so it is best to use local materials such as sand, gravel and stones whenever possible.

The community should provide facilities for storing materials, tools and equipment at the project site. This will include an area for storing large equipment and a building for storing smaller items. Transportation within the village should also be provided by the villagers.

The community must help decide where the water and sanitation facilities will be located. Possibilities for extending the system to individual households or new residents should be explained. The community must be responsible for establishing an authority to enforce rules about late fee payments and negligent use of the system.

Adequate provision must be made for proper operation and maintenance of a system, at both the local level and through a backup resource arranged through the action agency and located convenient to the village. The community and the agency should work together to designate a health education staff and plan a health education program schedule. The two groups should set up an evaluation schedule for the system. Specify evaluation criteria, when the system will be evaluated and by whom.

Community Approval

A written or otherwise acceptable project plan may have to be approved by local, regional or national leaders, by water agency officials, or by funding agencies' officials. It must also be officially approved by the community. A project plan should include:

1. A description of the water and sanitation problem in the community.

2. An explanation of the proposed technical system and its expected benefits including the number of facilities.

3. An explanation of the method of construction to be used.

4. Design drawings (these can be simple at first, but dates for final

design drawings must be included in the project timetable).

5. Community and topographic map showing placement of facilities and location of construction. Show placement of facilities within houseplots and relationships of water supply facilities to sanitation facilities.

6. Costs of constructing system including labor (wages, number of workers, time), tools, equipment, materials, services and land that must be purchased.

7. Costs of operating and maintaining project for a specified period of time (per year or per month).

8. Schedule for implementation, including seasonal considerations, timetables for each phase of the project, and total time necessary.

If the community accepts the proposal and the responsibilities involved, a formal agreement should be made. Designing and building the system should begin according to the work schedule proposed.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using Water for the World Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

GUIDE TO SESSION 4: CONDUCTING A SANITARY SURVEY

Total Time: 3 hours & 45 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Session introduction	Trainer presentation	5 minutes	Handout 3-2: Sanitary Survey FORM (from previous session)	Session objectives
Sanitary survey	Discussion	10-15 min.	Handout 4-1: Example of a Simplied Map	
Conducting a sanitary survey	Field task	2 hours	Community maps and information developed by participants Glass jar with lid from last session and measuring tape (each team)	
Finalize and sketch maps	Individual task	15 minutes		Team discussion questions
Analysis of surveys	Team discussion	20 minutes		
	Team reports	40 minutes		
Application and closure	Trainer led discussion	10 minutes		

Session 4: Conducting A Sanitary Survey

Total Time: 3 hours & 45 minutes

OBJECTIVES

At the end of this session, participants will be able to:

- Collect data using a sanitary survey form
- Determine suitability of indigenous material for construction
- Prepare an overall site plan

OVERVIEW

Session 3 identified information needed to present a latrine project to a community and discussed some tools for obtaining this information. This session provides an opportunity to gather some of the needed information. Participants will conduct a village survey utilizing survey methods such as interviewing, measuring, estimating, and mapping. They will observe and document many of the sanitary conditions previously discussed. The local community needs to be aware of and agree to the survey well ahead of time. You need to plan this session carefully. Be sure to include travel time. If you need more time, you can do steps 1 and 2 before the lunch break and therefore have participant teams ready to go to the field immediately after lunch.

The survey should be conducted with representatives from the community. Representatives should be contacted before the workshop begins. These representatives should know what information and resources are locally available and where they are found. If all the necessary information cannot be obtained, the trainers will have to provide the missing information. This may include information regarding materials and the availability of sand, gravel, and timber, etc.

The survey is to be conducted in two-to-four person teams. The size of the teams will be determined by the size of the village. The smaller the teams the more meaningful the experience. If the village is large enough, different teams can be assigned specific sections of the village.

PROCEDURES

1. Session Introduction

Time: 5 minutes

Review objectives and relate to morning session. Describe overview and how this session will be conducted.

2. Sanitary Survey Time: 10-15 minutes

Make sure each participant has a copy of Handout 3-2:Sanitary Survey Form. Break into teams. Give out and review Handout 4-1:Example of a Simplified Map. Talk about what needs to be included on a map. Tell participants they will need to draw one in the field. Point out that the map should be as complete as possible in the limited amount of time. Also emphazise the importance of putting items on the map which will assist them in planning the project and working with community leaders and members.

3. Conducting a Sanitary Survey Time: 2 hours

Assign the teams specific sections of the village to survey. Introduce them to the community representatives if appropriate. Identify the general area they are to survey and provide them with information not readily obtainable such as cost and availability of building materials and labor.

Each person should have his/her own survey form and each team a glass container for a silt test. Each participant will complete the survey and sketch a map of the village on the back during the field visit. Participants should locate appropriate sand and gravel deposits and perform a silt test as a team. Give participants two hours for the field task.

4. Finalize Sketches Time: 15 minutes

After returning to the workshop, individuals finalize their sketch maps of the village and organize the information they obtained and draw conclusions based on their data.

5. Analysis of Surveys - Team Discussion Time: 20 minutes

Have survey teams discuss the implications of their findings and answer the following questions. Put the questions on the flipchart:

- What did the silt test indicate and what are implications for construction?
- Do you have sufficient information to make a "go/no go" decision on a latrine project? If not, what else do you need?
- What preliminary recommendations could your team make to the village?
- What were the most significant things you learned from this activity?
- How could you use your map to plan the project? Inform the community?

6. Team Reports Time: 40 minutes

Have each team present its findings and discuss responses to the above questions. Keep teams on track and keep time to 5-10 minutes per team. Discuss learnings, similarities and differences in information gathered, and recommendations. Be sure to discuss any significant discrepancies in information and/or conclusions. Cover the villagers ability to pay and cost data that would be necessary to make a decision.

7. Application and Closure Time: 10 minutes

Discuss how community members can be involved in a survey and what benefits this involvement could have on the project. Ask participants how learnings from this discussion could apply to their back home situation. Specifically ask:

- o How would you use this survey at your home site?
- o What would you change?
- o In what situation would you not do a survey?

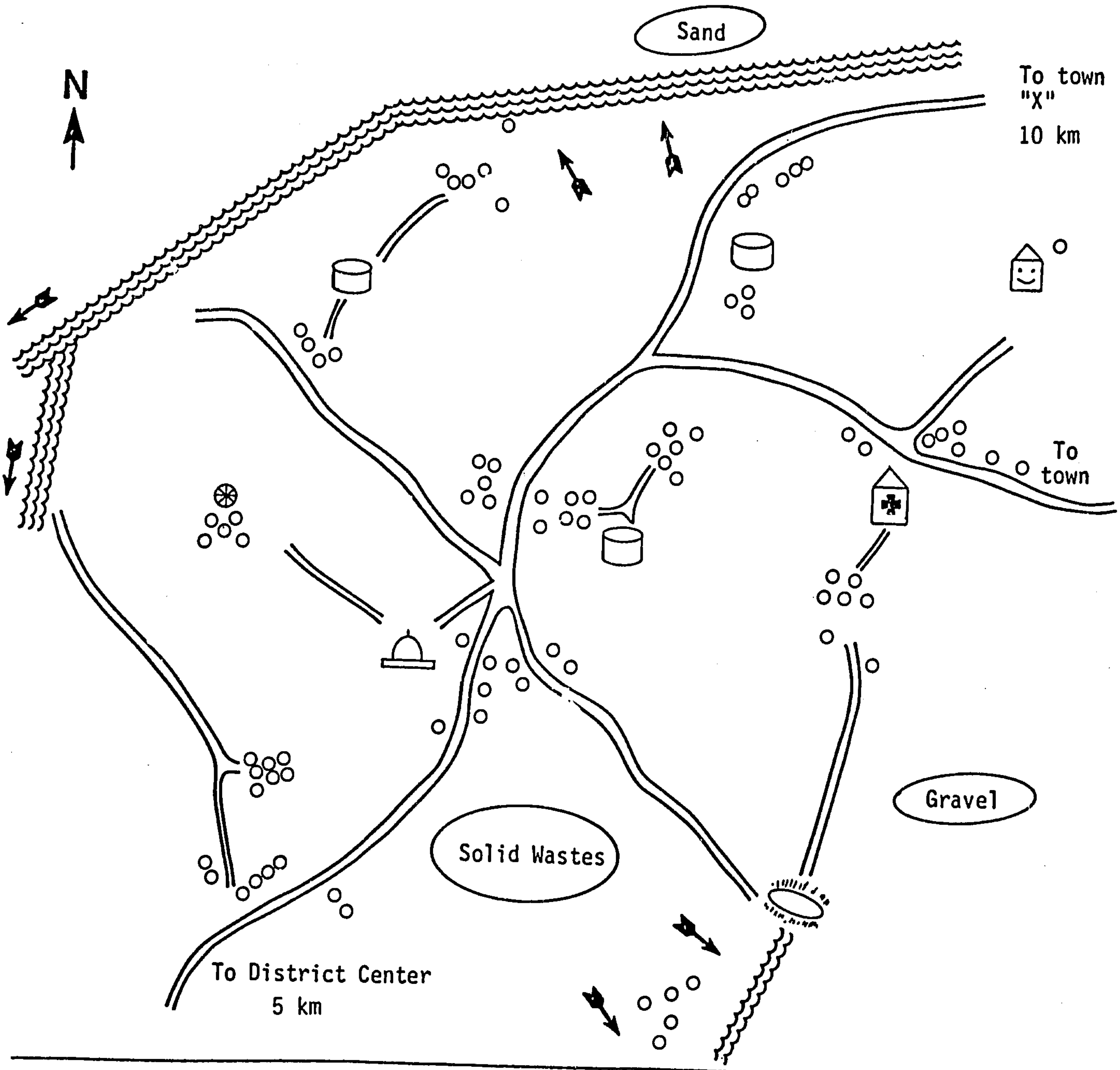
Review the goals of the day and see if they were met. Remind participants of the time and place of the evening session.

MATERIALS NEEDED

Flipchart for Session Objectives:
Flipchart for Team Discussion Questions
Handout 4-1:Example of a Simplified Map
Handout 3-2:Sanitary Survey Form
Community information as needed
Maps of whole community
Glass jar for each team
Measuring tape

HANDOUT 4-1

EXAMPLE OF A SIMPLIFIED MAP



SYMBOLS WHICH CAN BE USED ON MAP:

Cluster of Houses

Headman's House

Mosque or Church

Clinic

Solid Waste Disposal Sites

Sand and Gravel Deposits

Slope of Land

School

Well

Spring

Road or Path

Stream Showing Direction of Flow

GUIDE TO SESSION 5: TYPES AND SELECTION OF LATRINES

Total Time: 2 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Trainer presentation	10 minutes		
Latrine components	Lecturette	15 minutes	Handout 5-1: User Preference in Latrine Design	
Types of latrines	Present and discuss	25 minutes		Drawing for each latrine type
	Small group task	20 minutes		Task instructions
	Group reports	20 minutes		
Generalize	Discussion	5 minutes		
Closure and summary	Trainer presentation and discussion	10 minutes		
	BREAK	15 minutes		

Session 5: Types and Selection of Latrines

Total Time: 2 hours

OBJECTIVES

By the end of this session participants will be able to:

- o Select an appropriate latrine from five different types or variations

OVERVIEW

The session describes the methods of human waste disposal and focuses on the most common acceptable types of latrines used in rural communities. The advantages and disadvantages of each type are discussed.

Criteria for selecting a type of latrine taking into account local conditions, beliefs, and resources are reviewed. The types of latrines and specific details to be presented should be selected by trainers well before the session to ensure presentation of viable options given local conditions. Drawings on flipcharts should be prepared to clarify the presentation of each type.

PROCEDURES

1. Introduction — Time: 10 minutes

Introduce session objectives and present overview.

Discuss that there are many modes of human excreta disposal, ranging from using the bush or fields to a flush toilet with water-carried wastes. At one extreme the method can contribute to disease and at the other the method is very costly and goes beyond disease prevention. The focus of this session is to identify and select latrines which are acceptable to the community, provide a safe method of excreta disposal, and are inexpensive to operate and maintain.

2. Lecturette on Latrine Components* — Time: 15 minutes

Make a presentation covering the following information.

A. Latrines are made of four components:

A shelter
A slab
A pit
A vent (for dry pit latrines)

*See Trainer Note No. 1 at the end of this session.

B. The shelter gives the user privacy and, depending on the design, may protect the user and the privy from the weather. It should be made from local materials such as palm thatch, bamboo, or mud and wattle, depending on local preference.

C. The slab covers the pit and has a hole near the center through which to defecate. It can have either a squatting hole or a seat and pedestal, depending on local preference. The slab can be made from bamboo, wood, concrete, or brick.

If made of wood, the wood should be treated or be resistant to wood rot and insect attack. Concrete slabs are usually reinforced. The reinforcement is normally re-bar but bamboo or fiberous material can be substituted. In all cases the top surface should be finished to prevent dampness and to make cleaning easy. Consideration should also be given to hole adaptation for the safety of children.

D. The pit is dug in permeable soil and holds the excreta. The bottom of the pit should generally be at least one meter above groundwater levels. The size of the pit will vary, depending on the number of users, the type of anal cleaning material used, and the desired lifetime of the pit. For example, a pit that is 1 m square and 1.5 m deep can be used by a family of five for about six years.

The upper edge of the pit has a base for the slab and sometimes a lining as well depending on the type of soil in which it is dug. The lining shores up the sides of the pit. It is made from bamboo, boards, brick, or field stone. The base encircles the top of the pit and supports the slab. It is made of logs, bricks, or concrete.

The pit will eventually fill with excreta. When it is filled to within 0.5 m below the slab, the slab and shelter may be moved to a new pit and the old pit filled with dirt.

One option for lengthening the life of a pit is to build it with a smaller surface area but very deep.

E. A vent pipe is recommended for pit latrines. It allows odors to escape from the latrine. A secondary purpose is to trap flies which are escaping from the latrine and drawn to the light at the top of the pipe. Because the top is screened, the flies are trapped and eventually die.

The pipe can be made of metal, plastic, brick, or other material and located either inside or outside the latrine. It is sometimes located outside facing the sun and painted black to help create an updraft. At least one study has shown, however, that wind plays a more important role in creating this updraft.

The pipe should be at least 15 cm in diameter; however, the larger the pipe, the more effective it will be (see Trainer Notes on Vent Pipes, which is included among the handouts at the end of this section, for more information).

F. Ask for questions before moving on to the specific latrine types.

G. Discuss latrine user preference and the importance of determining user preference when choosing a latrine model. Ask for examples of user concerns such as the following aspects of latrines. Be sure to cover:

Size
Appearance
Adaptability to use by small children
Privacy
Ease of access

Discuss and distribute Handout 5-1:User Preference in Latrine Design.

3. Types of Latrines Time: 25 minutes

Introduce the following five types of latrines.* Using attached References on Latrine Types, present sketches of types of latrines on flipcharts. Discuss:

- o Pit latrine
- o Ventilated improved pit (VIP) latrine with single, double, and offset pits
- o Pour flush latrine with pit and vault with soakaway
- o Composting latrine
- o Bucket latrine

Recommend that for most conditions a variation of the VIP or the pour flush latrine should be selected. The others are less desirable for the following reasons. Simple pit latrines give an offensive odor and attract flies if the hole is not covered. Composting latrines are generally not recommended as they require fairly strict maintenance. Bucket latrines require removal of excreta every one to three days and a safe method of disposal is needed such as composting.

The advantages of four latrine types will be discussed in small groups.

4. Types of Latrines - Small Group Work Time: 20 minutes

Break into four groups. Assign each group one of the following latrine types:

- o A ventilated improved pit latrine made entirely from indigenous material to the extent it is available.

---

* Use latrines types appropriate and relevant to local conditions. This does not need to be limited to the types already in use in the community, but to ones which might be appropriate to local conditions, beliefs, and customs. Use the types suggested or others more appropriate to help participants understand the options.

- o A ventilated improved pit latrine with a concrete slab and a brick or wood shelter and a plastic vent pipe.
- o A pour flush latrine using a locally made flush device and indigenous material for the shelter.
- o A latrine using an offset pit and a shelter made of indigenous material.

Instruct the groups to take 15-20 minutes and do the following which you put on a flipchart.

- o Identify the advantages and disadvantages of their assigned latrine given local conditions.
- o Estimate the cost of constructing one latrine of this type based on their knowledge of local costs. This does not have to be an exact estimate but a "guesstimate" based on their knowledge to date (see Trainer Note No. 2 at the end of this section).

Appoint a spokesperson to report for your group.

5. Group Reports Time: 20 minutes

Each group presents costs and pros and cons for the latrine type. Ask for additions, deletions, or comments on each presentation. If important points are left out, the trainer should fill them in based on reference material. It is important to discuss each of these types and look at the trade-offs between costs and sanitary advantages that sometimes need to be made.

6. Generalize Time: 5 minutes

When all reports are completed, ask:

- o Does any type clearly fit local conditions?
- o Are there any types which clearly should not be used locally?
- o Can local materials be used for each type?
- o Are there other types which could be used?

7. Closure and Summary Time: 10 minutes

In summary, repeat that latrine selection should be based on the following considerations (not in any order of priority):

Available resources
Social acceptability

Affordability
Availability of land and space
Sanitary features
Safety
User preference
Difficulty of maintenance and repair

Ask participants to identify which type of latrine(s) is (are) most likely to be suitable in their area.

Tell participants that after the break the group will come back and look at the type of latrine they will be constructing, the planning steps needed to construct the latrine and the make-up of each of the construction teams

BREAK Time: 15 mintues

TRAINER NOTES

1. See drawings and description of latrine components in References on Latrine Types at the end of this session. Use this material to organize the lecturette. Be sure to choose examples appropriate to local conditions.

2. If you feel the participants do not have the skills or experience to do even a rough cost estimate you can drop this second task and have them do only the first identification task. If you do eliminate the cost task, lead a brief discussion after the exercise of relative costs and provide the appropriate information.

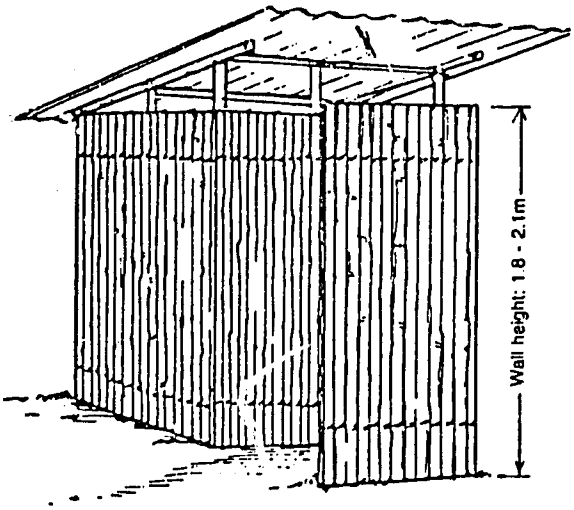
MATERIALS NEEDED

Handout 5-1:User Preference in Latrine Design
Flipchart for Latrine Types
Flipchart for Task Instructions

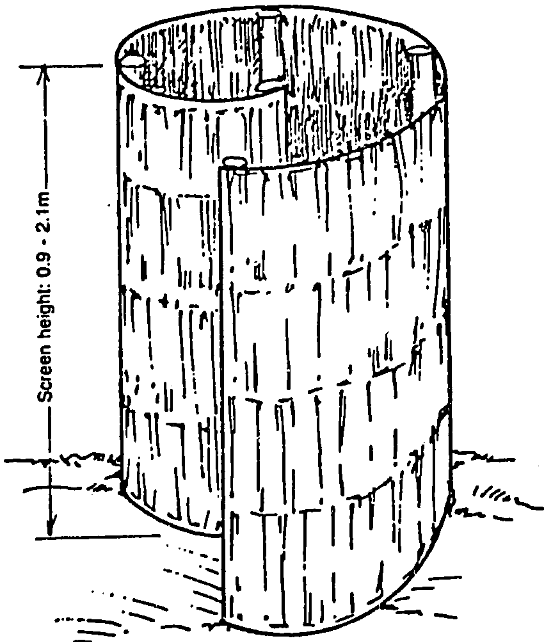
USER PREFERENCE IN LATRINE DESIGN

Item	Preference Variable
1. Positioning/access	Distance from household Privacy of access Ease of access
2. Comfort	Posture Anal cleansing material Odor Presence of flies, mosquitoes Size of superstructure Ensures privacy
3. Safety	Stability Suitability for children
4. Status	Appearance in comparison with local alternatives Choice of building materials Size
5. Aesthetics	Building style Finishing materials
6. Management and costs	Ease of maintenance Length of latrine life Ease of latrine replacement/renewal Labor needs Financial costs Systems of payment
7. Social organization	Inter-familial sharing preferences Intra-familial sharing preferences

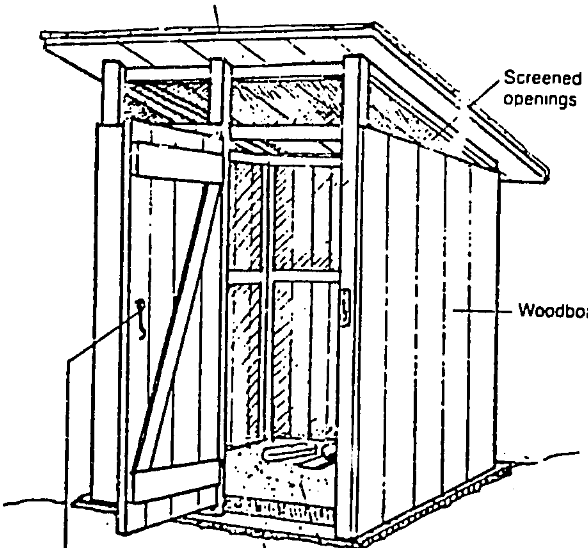
REFERENCES ON LATRINE TYPES



BAMBOO SHELTER WITH CORRUGATED METAL ROOF



SPIRAL (Palm Thatch)



Fly-Proof Shelter with Screening and Door

TRAINER NOTES ON LATRINE TYPES

A privy shelter is a partition or structure that gives the person using the privy privacy. Depending on the design, a shelter can protect the privy and the user from the weather and keep out flies, rats, scavenging dogs, and other pests. Designing a shelter involves selecting the type of shelter; features; and selecting materials, tools, and labor. The products of the design process are (1) a plan view of shelter; (2) a detailed view of any special features; and (3) a detailed materials list.

The three basic types of privy shelters are a simple partition shelter with a roof, and a shelter with a roof and door. Figures 1, 2 and 3 show the types of privy shelters.

The most important factors in selecting a type of shelter are cost, local customs and personal preferences of users. Determine how much privacy people want and whether or not a roof and door are acceptable or desired. Other factors that influence selection are available money, materials, and skilled labor, and the extent to which control of pests is important.

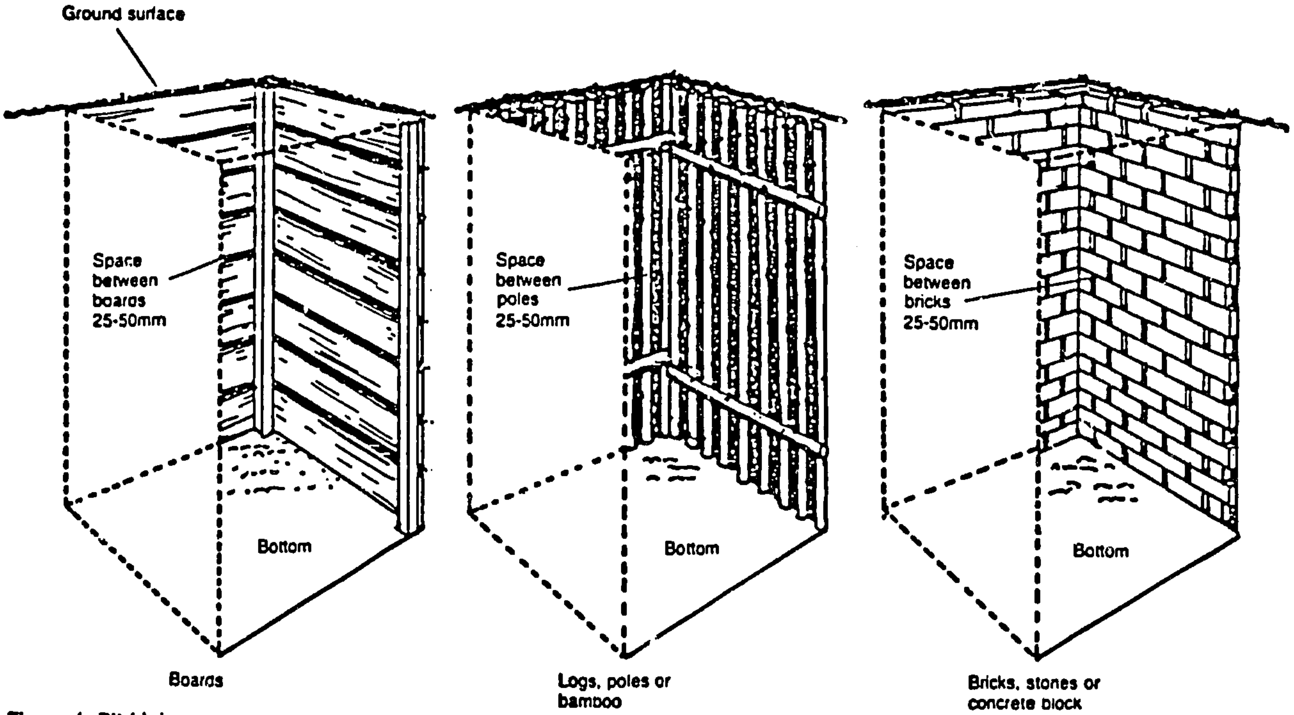


Figure 4. Pit Linings

If the soil is such that the walls of the pit will not stand on their own in both the wet and dry seasons, the pit must have a lining.

Lining. The material used for the lining, if needed, can be bamboo, logs, poles, boards, bricks, concrete blocks, or select field stones. Use a material that is readily available and that laborers are familiar with. The quantity depends on the type of material and the size of the pit. One way to estimate the quantity is to calculate the area of the pit walls, since the lining must cover nearly the entire wall area except for the spaces between the boards, poles, or bricks.

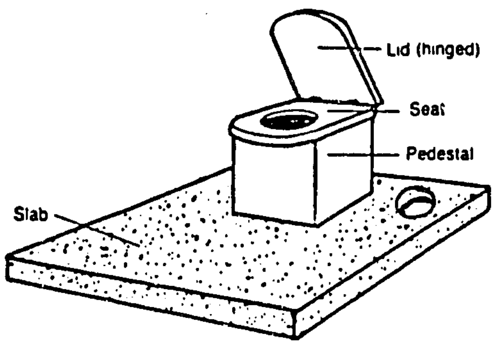
Calculations for Lining

The area of the pit walls equals two times the width plus two times the length multiplied by the depth.

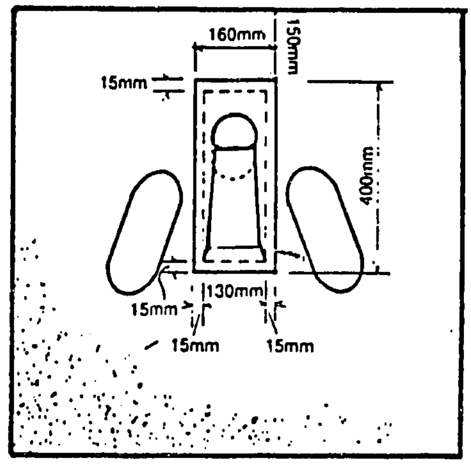
For example, suppose a pit is 1.1 meters wide, 1.2 meters long, and 2.1 meters deep. Then the area equals:

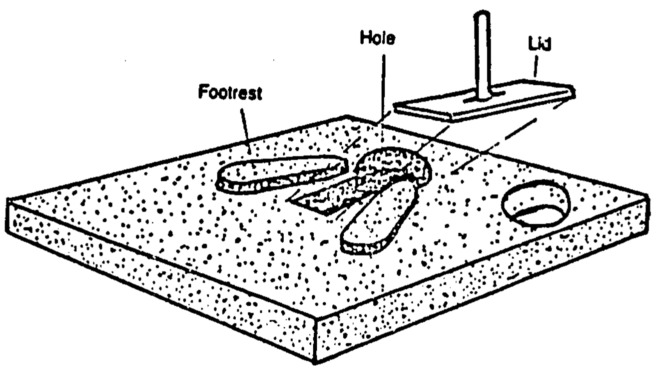
$$(2 \times 1.1) + (2 \times 1.2) \times 2.1$$
$$= (2.2 + 2.4) \times 2.1$$
$$= 4.6 \times 2.1$$
$$= 9.7\text{m}^2$$

The lining material must cover an area equal to about 9.7 square meters.

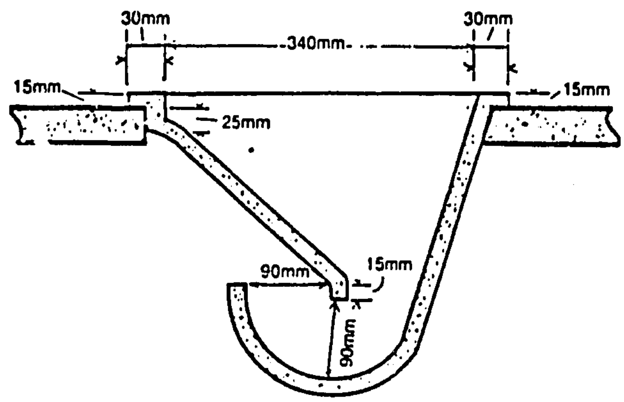


Sitting Slab with Pedestal, Seat and Lid





Squatting Slab



PRE-CAST CONCRETE

Pour-flush Bowl for Squatting Slab

Slabs can be made from a variety of materials, including reinforced concrete, wood or bamboo. Generally, they are made from concrete, because concrete is strong, long-lasting, and easy to clean.

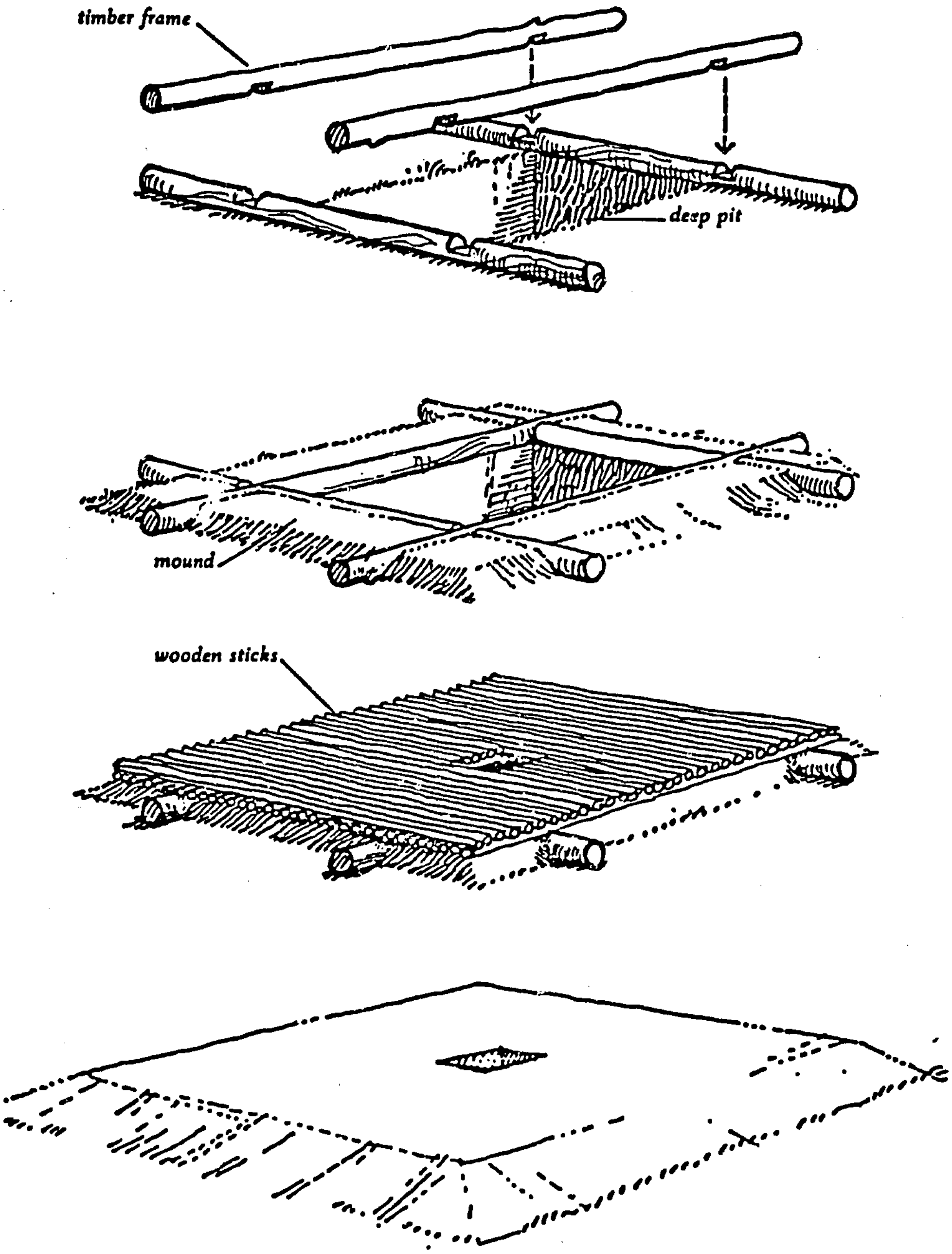
A concrete slab must have reinforcing material, such as steel bars 10mm in diameter, wire mesh, or split bamboo. To calculate the quantity of steel bars needed, draw a sketch showing bars in place, and count the number and lengths of the bars. If wire mesh is used, the quantity is approximately equal to the area of the slab (length times width).

If the slab has a seat and pedestal, the pedestal can be made from brick, concrete blocks, or wood, and the seat can be made from wood. One-piece, ceramic seat-and-pedestal units may be available.

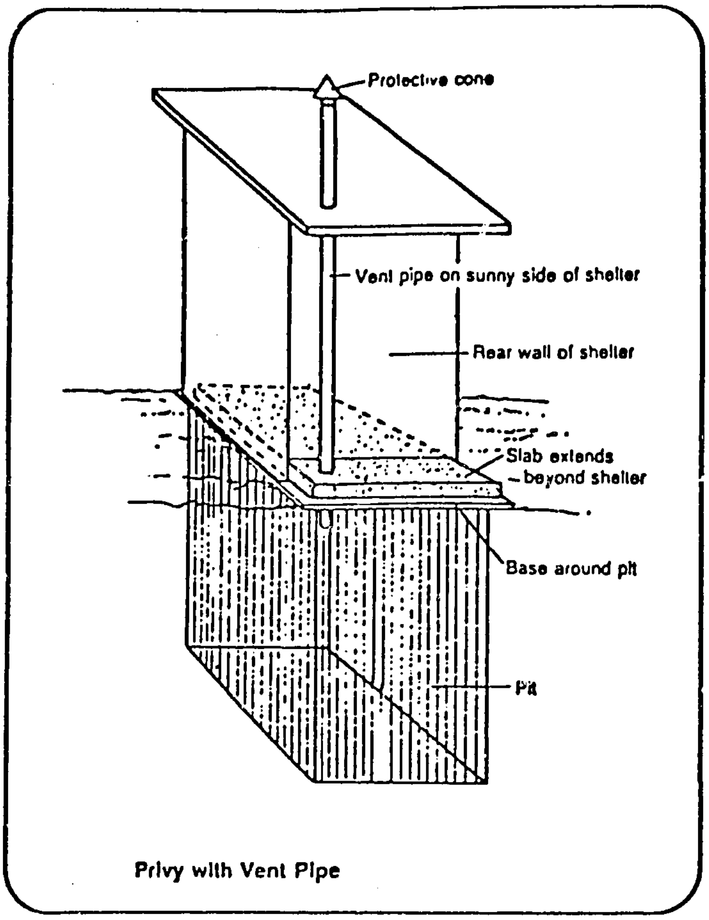
A cover made from wood should be provided for both sitting-type and squatting-type slabs. The cover for the seat and pedestal may be attached to the back of the seat with hinges.

A pour-flush bowl may be made from galvanized metal, concrete, molded rubber, or ceramic material. These units may be prefabricated and ready to install. A skilled craftsman could produce a galvanized metal or concrete pour-flush bowl

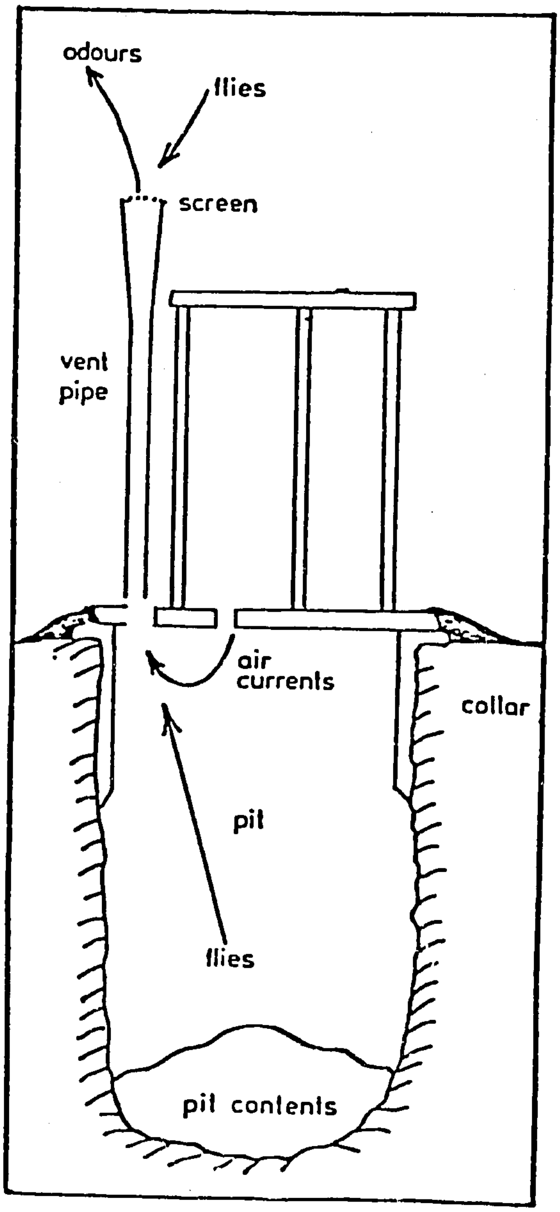
Tanzanian Pit Latrine with Stick Slab*



* From: Winblad, U. & Kilama, W., "Sanitation without Water," SIDA, S-105 25 Stockholm, Sweden, 1980.



Privy with Vent Pipe



Operation:

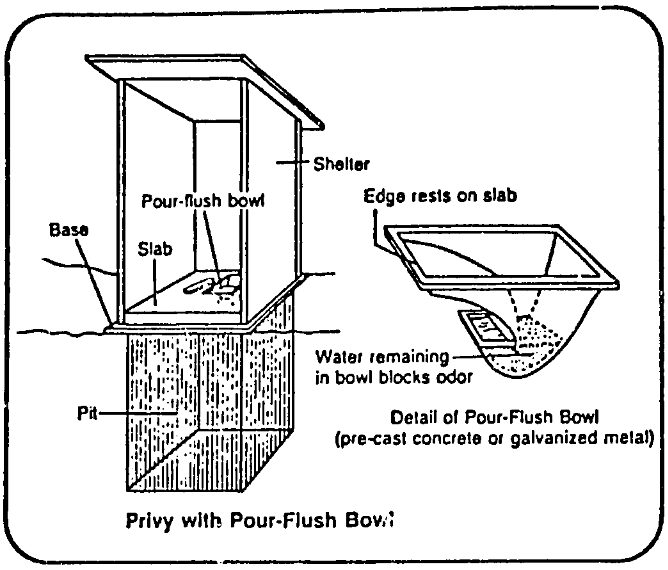
Same as pit latrine. One variation is a latrine shelter which is relatively dark inside. In this case the hole is not covered to allow a continuous flow of air as shown. Flies are attracted to the odor but cannot enter because of the screen. Those flies which may be in the pit fly up the pipe which is the only source of light in the pit. They cannot escape because of the screen and so die.

Pros.

Can be built of indigenous material; little or no odor; good fly protection; economical to build.

Cons.

Need sufficient land to relocate every 3 to 10 years.



Privy with Pour-Flush Bowl

Operation:

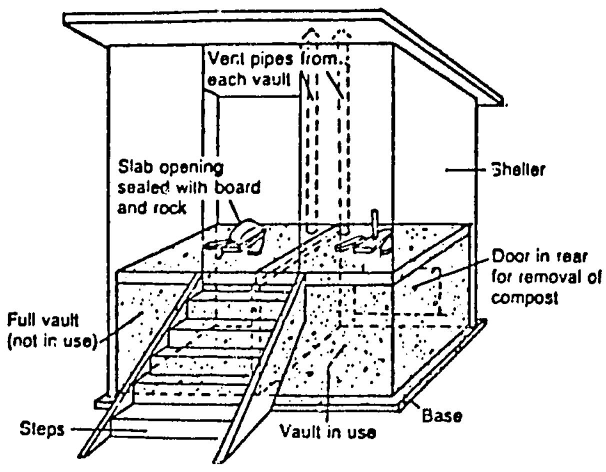
A bowl is used which has a water seal between the shelter and the pit thus excluding odors and insects. Water is used to flush the contents after use.

Pros - Relatively simple to build

- Excludes odors
- Prevents insect problems if water is kept in bowl
- Relatively economical
- Pit lasts longer than dry pits

Cons - Water must be readily available

- Anal cleansing material is limited or is set aside creating a disposal problem
- Soil must allow perculation of the water.



Compost Toilet

Operation:

Only one vault is used at a time. It holds the excreta to which is added ashes, sawdust, woodchips, or vegetable wastes. When the vault becomes two-thirds full, which takes six to 12 months, it is filled with dirt and sealed. The second vault is then used until it becomes two-thirds full. At that time, it is filled with dirt and sealed, and the first vault will have changed into compost material. The compost is removed from the first vault through the door at the back and used to fertilize crops. The first vault is now ready to use again.

Pros

- Can be used when water or rock is a problem
- Wastes can be used as fertilizer
- Is a permanent structure

Cons

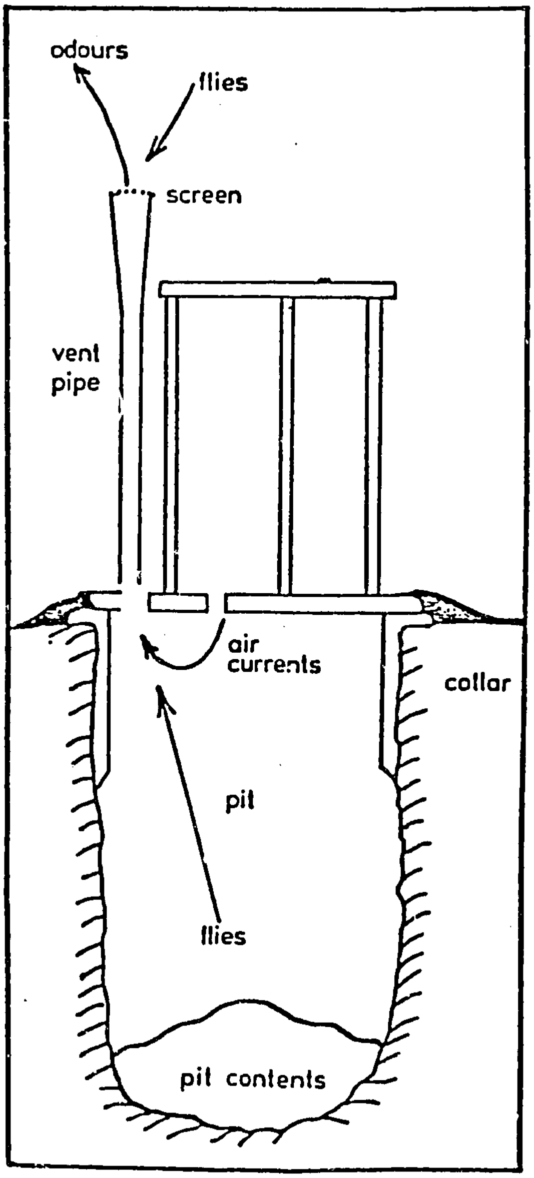
- Other materials must be added for it to work
- Temperatures may not be high enough to kill disease and cysts
- High cost to construct
- Vaults need to be watertight
- Fairly exact operating procedures need to be followed.

VIP latrines in Zimbabwe

The two problems with pit latrines are flies, which carry disease, and odour. The ventilated pit latrine, better known as the VIP latrine, is an improved version which overcomes the chief disadvantages of the conventional design.

The VIP latrine was developed and field tested between 1973 and 1976 by the Blair Research Laboratories at Harare to provide a safe and acceptable sanitation system which does not require water. By 1981 30,000 latrines had been built.

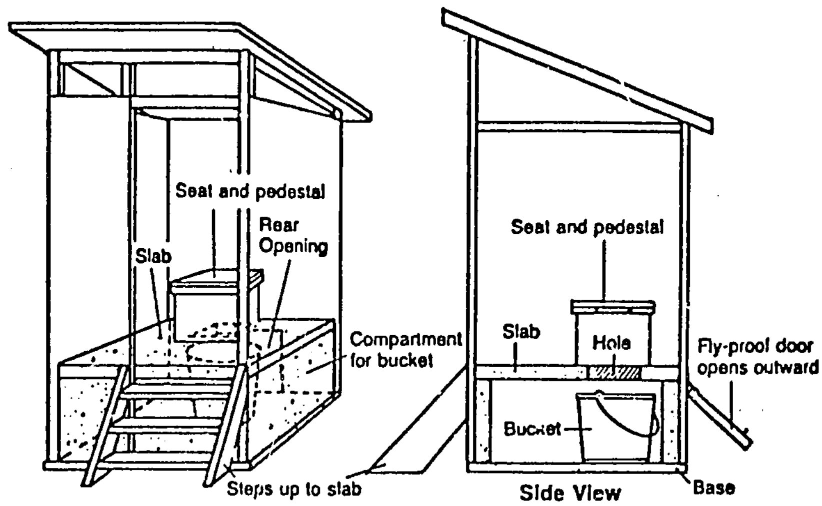
A slab with two openings covers a sealed pit. A ventilation pipe is fitted on one of the openings. The other opening is the squatting hole. Fresh air is drawn through the hole and up the pipe. The latrine itself remains odourless.



The top of the pipe is fitted with a corrosion-resistant flyscreen. Flies from the surroundings are attracted to the screen by the escaping odours but cannot reach the pit. If flies do enter the pit, they are attracted by the light from the top of the pipe and are trapped within it.

The latrine is kept partially dark inside by building the wall in the shape of a spiral with a recessed entrance (see References,p.1,Session 5). The darkness helps to keep flies away. The spiral shape is one of the few modifications which have been made to the original design.

Because it is simple and reliable, the VIP latrine has been widely accepted in rural Zimbabwe, the researchers say. Blair staff visit villages to demonstrate how the latrine is built and train local craftsmen and health assistants to maintain it. Latrines are then built by the villagers themselves.



Bucket Latrine

Operation:

Latrine is used as with the other latrines. Buckets are removed on a 1 to 3 day basis. The contents are disposed of by burying, composting or use as fertilizer.

Pros

- Can be constructed of indigenous material
- Can be used where ground water or rock is a problem
- Requires less labor to construct than other types
- Does not have to be moved

Cons

- Requires continuous removal of waste
- Limits and cleansing material
- Many opportunities for disease spread
- Water is required to wash the containers

TRAINER NOTES ON VENT PIPES

Vent pipes work on the principle of the stack effect. Air movement across the top of the vent (i.e. wind) pulls air out of the vent which causes suction in the pipe which pulls air up the vent. Air moving up pulls air out of the pipe and air leaving the pit pulls air down the squat hole into the pit. It is important that the vent pipe or chimney be sealed around its entire surface and sealed completely at its base where it joins the slab. If the vent pipe leaks air this reduces the suction from the vent to the pit and air will be pulled into the vent through the leak rather than pulled out of the pit. It is also important that the latrine slab be well sealed to the pit so that air entering the pit comes only through the squat hole.

The size of the vent depends on its shape and material of construction. A smooth round shaped cross section is best (i.e. a smooth wall pipe - AC or plastic) and can be as small as 6". If the inside surface of the vent is rough textured and irregular, then air flow is more difficult and the vent must be larger to gain the same effective air flow (10" minimum). A square vent shape, like a buck chimney, may have smooth walls like a pipe, but the square shape causes turbulence and counters the beneficial effect of the smooth walls. Minimum inside dimensions should be 9" x 9".

Since the most important factor affecting ventilation is the passage of air (wind) over the top of the stack, it is important that the vent be unobstructed by the roof of the latrine shelter. A minimum height for the vent above the highest part of the roof is 18", and 24" is preferable. This also affects the siting of latrines. Ideally they should not be under trees or next to taller buildings which block the wind. If there is a prevailing wind, then the opening of the latrine shelter should face into the wind so that air rushes into the shelter, down the latrine hole, and up the vent. A door on the downwind side will have an opposite effect. Wind rushing past a building will pull air out of a leeward door and compete with the suction up the vent stack.

The squat hole needs to be uncovered for ventilation. Therefore the latrine shelter neeos to be dark so insects will not be attracted up to light coming through the squat hole but will be attracted only up the vent.

Painting the vent black to act as a solar heat collector to improve ventilation (hot air rises faster than cooler air) has not proved to be significant.

An important note about soil cement blocks or concrete blocks or bricks for a vent is that masonry is very heavy and a stack can weigh 450-600 lbs.

GUIDE TO SESSION 6: PLANNING A LATRINE CONSTRUCTION PROJECT: TEAM ASSIGNMENTS

Total Time: 2 hours & 30 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session	Trainer presentation	5 minutes		Session objectives
Project construction steps	Present and discuss	20 minutes	Handout 6-1: Construction Flowchart	Construction flowchart
Introduction of latrine type and design	Lecturette and discussion	15 minutes	Diagrams of latrine components to be developed by the trainer(s)	Latrine components
Inventory of skills	Time assignment	10 minutes		Team assignments
	Team discussion	25 minutes		Team questions
Description of fieldwork activities	Presentation	10 minutes		Schedule of fieldwork activities
Introduction to team leaders	Presentation	5 minutes	Handout 6-2: Team Leader Notes	
Team and leadership effectiveness	Team discussion Large group report	30 minutes		
Team preparation	Team task	30 minutes		

Session 6: Planning a Latrine Construction Project: Team Assignments

Total Time: 2 hours & 30 minutes

OBJECTIVES

At the end of the session, participants will be able to:

- o Identify, in sequence, the construction steps for a latrine project
- o Identify and utilize criteria for effective teamwork and team leadership
- o Describe the type of latrine to be constructed

OVERVIEW

This session begins with a discussion of specific project construction planning. Participants identify the sequence of steps in the construction of a specific type of latrine. These steps will be used in scheduling construction activities and organizing work done by construction teams.

Next the type of latrine to be constructed during the fieldwork is introduced. Trainers need to select drawings to be used for this presentation based on the specific components of the latrine selected for construction. These may already exist in the training materials or some drawings may need to be redrawn to be more suitable. Construction teams are then announced. Participants work in their project teams and develop criteria for effective teamwork and leadership. The teams spend time identifying their own skills, resources, and learning objectives. Teams also begin planning their work, including determining the rotation and the role of team leader for each construction task. The session concludes with teams going to lunch together.

PROCEDURES

1. Introduction to Session — Time: 5 minutes

Share objectives and give the overview in your own words.

2. Project Construction Steps — Time: 20 minutes

Ask participants to identify the steps necessary to construct a latrine. List the responses on a flipchart. Add to the group list any of the following items not included:

Select a latrine type
Determine location of the latrine
Develop list of materials
Estimate labor needs and time

Estimate costs
Determine responsibilities
Digging of a hole
Construction of a slab
Construction of a shelter
Final clean up
Maintenance and repair

Discuss the appropriate sequence of the steps. Using this information, present a flowchart which shows the sequence of events. A flowchart example is shown as Handout 6-1:Construction Flowchart. (Be sure to prepare a flowchart on a flipchart prior to this session.) At the end of this activity distribute Handout 6-1.

3. Introduction of the Latrine Type and Design Time: 15 minutes

In this lecturette review the design of the latrine to be built during the workshop. Refer to information from prior sessions as appropriate. Provide participants with diagrams of all the components of the latrine and put on flipcharts as appropriate. These include:

Pit
Slab base
Latrine slab
Shelter
Vent pipe

Also provide diagrams of all forms to be constructed.

The trainer should indicate why the latrine design was chosen and briefly describe each component. Do not go into detail on each component. Explain that this will be done before each construction step of their field project. Right now the latrine type is being introduced for use in today's planning and field activities.

The following factors affect the design selection. Discuss how each influenced the selection of this particular latrine design.

Local behavior
Cultural beliefs
Availability of material and skilled labor
Local methods of construction
Geological conditions
Health considerations
Government requirements

4. Team Assignment/Inventory of Skills Time: 10 minutes

Introduce this section by stating that now that the work to be done has been described, it is necessary to look at how the construction and project development tasks will be accomplished. Describe how all construction work will be done in teams. Each team will be responsible for constructing a single pit VIP latrine. Explain that each team will be assigned to one site and will be working together with community members. Teams will also be responsible for supervising work crews, mobilizing the community, and educating latrine users on the use and maintenance of a latrine.

Assign individuals to their project teams and ask them to rearrange their seating so that teams are together. Put team assignments on a flipchart. Briefly explain how team members were assigned and the general mix of experience and skills in each team.

5. Inventory of Team Skills — Time: 25 minutes

Give the following instructions: "In your teams, spend 20 minutes sharing with each other your strengths, experiences and areas of knowledge which will help the team in planning and implementing a latrine project. You may want to compare among yourselves your self assessments done on the first day. The purpose here is for you, as team members, to begin to sort out what resources and skills you bring to this project, and to help you allocate responsibilities and tasks during your fieldwork."

After 20 minutes, stop the team discussions briefly and ask teams to conclude by sharing with each other the answer to the following:

> What are you most interested in learning/practicing during the completion of this project? (e.g., - How to develop an education program? How to pound a nail? Or better ways to mix concrete?)

This discussion will give teams an idea of how they can learn from each other during the workshop.

6. Description of Fieldwork Activities — Time: 10 minutes

Now that teams have had some time to get acquainted and survey their resources, review the schedule of field tasks and when they will occur. Using a flipchart with the schedule of tasks, describe the following:

(Day 3) Wednesday - Evaluation of the site and pit for the latrine

(Day 4) Thursday - Form and pour concrete slabs which will then be left to cure until Tuesday (4 days)

(Day 5) Friday - Build forms and pour the concrete base

(Day 9) Tuesday - Install the slab

(Day 10) Wednesday - Build a shelter for each latrine

(Day 11) Thursday - Complete the latrine construction and clean up

Discuss how the teams will be working with homeowners during fieldwork and how they will have back-up labor to complete construction tasks as needed. Explain that teams will be provided specific instructions for each construction phase.

Emphasize that during the construction the team will be responsible for planning and delivering necessary educational sessions to the community on the maintenance of sanitary latrines.

7. Introduction to Team Leaders   Time: 5 minutes

Describe the plan for rotating team leaders by stating that each team member will be leader for one of the major construction tasks. This will give everyone an opportunity to practice supervising others. Team leaders will be responsible for:

- Planning with team for their construction task
- Liaison with training staff
- Supervising the construction
- Assuring that tools and materials are available and returned to storage

Discuss how important it is to learn about being a leader (or supervisor) and being supervised. Ask how many participants will actually be doing construction work in the field versus those who will provide supervision and/or assistance to others. As many participants will be supervising others in the construction work, it is important to learn effective techniques for supervision.

Distribute Handout 6-2:Team Leader Notes, and go over them briefly. Note that these will be used later by each person preparing for his/her team leader role.

8. Team and Leadership Effectiveness   Time: 30 minutes

Introduce this section by reviewing the importance of effective teamwork and leadership to the success of any project. While the actual effectiveness of the teams will depend on how well they manage their relationships, it is important to start the work with a common understanding of the factors which create effective teamwork and leadership.

Have teams quickly list the guidelines they would like to follow for effective teamwork. Give only five minutes. After five minutes stop the team discussions and record their responses on a flipchart. Take one or two responses from each team until all teams have exhausted their list. Ask for any additions and summarize the key points and themes.

The trainer should be sure the following points are covered:

Team Effectiveness

Seek and respect opinions of others
Contribute skills and knowledge

Willingness to learn and be taught
Agree upon goals for a task
Clear understanding of individual responsibilities
A clear work plan
Listening
Sharing work load, even the "dirty jobs"

Have teams list and discuss the criteria for an effective leader. In the total group develop a list of responses and discuss. Agree to the key points.

Be sure the following points are included in the list.

Effective Leadership

Organizes work
Contributes
Gives clear instructions
Knows when to delegate
Listens
Accepts suggestions from team members
Shares information openly and willingly
Gives feedback
Understands all aspects of work

If the training group is mixed culturally, ask how the cultural differences might affect the expectations individuals will have for teamwork and leadership. After a few examples are given, ask how these differences might be overcome. Do not go into great detail but get at least one or two responses. In the next activity teams will make their own decisions about these factors.

Save the flipcharts for reference in a later session. Summarize by stating these lists will be used as a checklist during the construction time to see how well the teams are working together.

9. Team Preparation Time: 30 minutes

Give teams 30 minutes to discuss and complete the following:

- Review the team effectiveness and leadership guidelines to assure agreement and commitment to following them.

- Discuss potential cultural differences and ways to manage them.

- Select team leaders for each phase of construction.

The major construction phases which require a leader are:

Making forms for the concrete slab
Pouring the concrete slab
Forming and pouring the concrete base
Installing the slab

Building the shelter
Latrine completion

10. Closure

Tell participants to go to lunch with their team members when they are done with the task.

TRAINER NOTES

1. Teams should not have more than four or five members to enable each participant to be involved in actual construction. Each person should have the opportunity to be a team leader.

2. Decide, based on group size, how many team leaders you want each team to select. Not all tasks necessarily require a team leader. The group size, the complexity of the tasks and the importance of practicing leadership skills should be the determining factors.

   Instructions are included in the training guide for the following:

   Building a form for the latrine slab
   Pouring the concrete slab
   Construction of a concrete base
   Installing the slab
   Latrine completion

   Instructions need to be developed for:

   Building a shelter

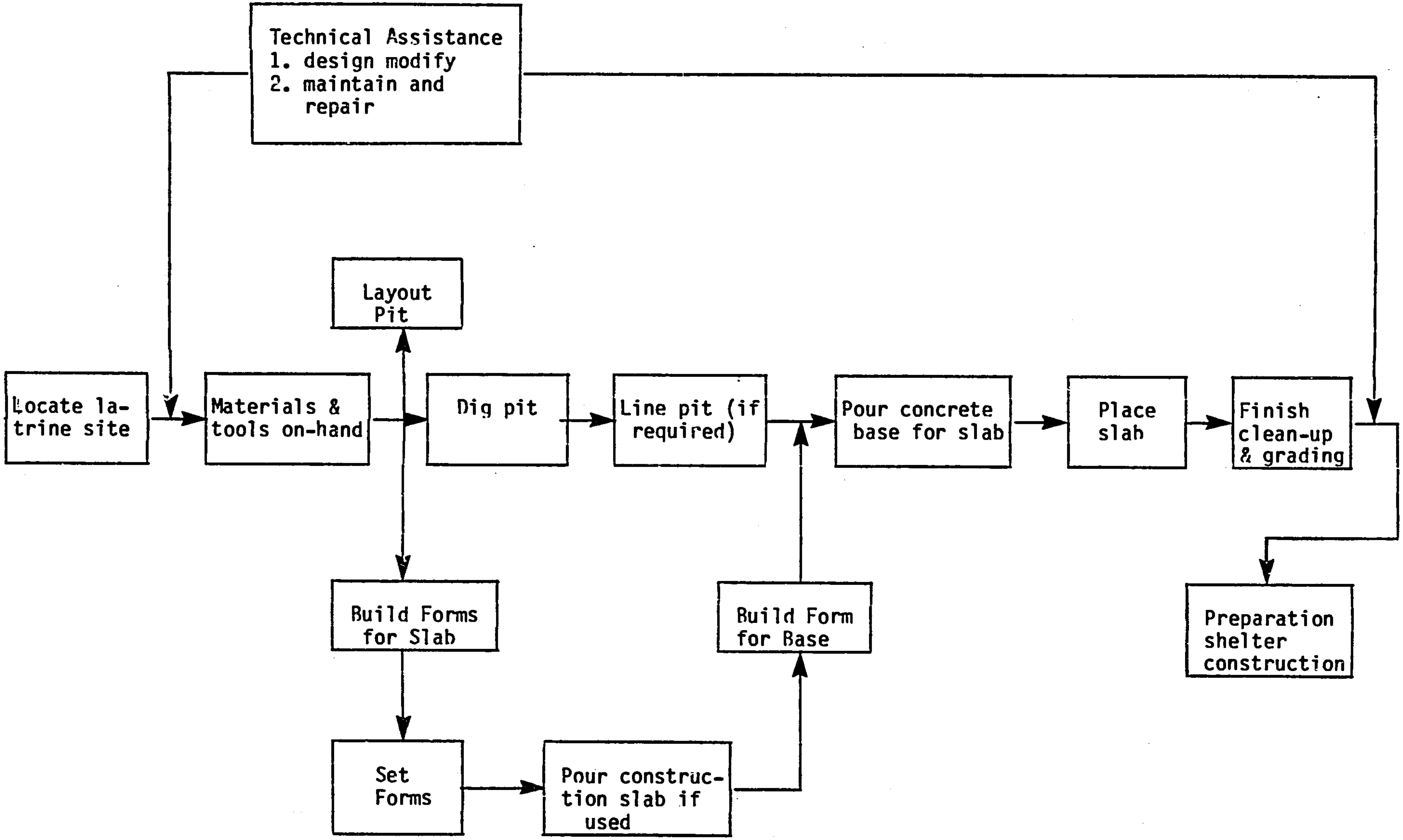
3. Be sure to allow time to meet with team leaders before each of the construction activities actually begins to discuss their task.

4. Hand out Construction Flowchart and Team Leader Notes (Handout 6-1 and 6-2) during or at the end of this session.

MATERIALS NEEDED

Handout 6-1:Construction Flowchart
Handout 6-2:Team Leader Notes
Flipchart for Latrine Diagrams

CONSTRUCTION FLOWCHART



TEAM LEADER NOTES

What will you need to organize your task and your team?

1. List of materials needed
2. List of activities/tasks
3. Sequence of tasks
4. Time required for each task
5. Tools/materials/supplies
6. Information about the community/homeowner/workers
7. Understanding the skills and knowledge of your team members

You are responsible for making sure that you have everything you need and that you and your team understand the instructions clearly. You are also responsible for returning tools and materials to their appropriate places. Be sure the site is cleaned up after work is completed. You will also act as liaison with training staff during the construction phase.

You will need to:

- Work with your team to develop a work plan and determine specific assignments
- Prepare ahead for fieldwork
- Supervise the work of your team in the field

GUIDE TO SESSION 7: SITE EVALUATION AND CONSTRUCTION PROJECT ESTIMATING

Total Time: 4 hours & 10 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session	Trainer presentation	5 minutes		Session objectives
Site selection	Present and discuss	15 minutes	Handout 7-1: Site Location Diagram	On-site sketch
Pit design and excavation	Present and discuss	15 minutes	Handout 7-2: Water for the World: Designing Pits for Privies	
			Handout 7-3: Instructions for Soil Indentification	
Evaluation of site and pit	Fieldwork	60 minutes	Handout 7-4: Evaluation of Site and Pit	
	Reports on fieldwork	20 minutes		
	BREAK	15 minutes		
Estimating material, equipment, and labor needs	Lecturette and discussion	20 minutes	Diagrams of latrines	
	Practice exercise	40 minutes	Handout 7-5: Estimating Exercise (to be prepared by trainer)	
			Handout 7-6: Resources Checklist	
	Report and discuss	20 minutes		
	Review and generalize	10 minutes		
Construction	Discussion	25 minutes		
Closure		5 minutes		

Session 7: Site Evaluation and Construction Project Estimating

Total Time: 4 hours & 10 minutes

OBJECTIVES

At the end of this session participants will be able to:

- o Evaluate and sketch the appropriate placement of the latrine pit
- o Estimate material, labor, and equipment needs for a latrine project

OVERVIEW

This session is divided into two parts. The first part begins with a review of factors to be considered in locating latrines and in the excavation and design of pits. Teams spend an hour in the field evaluating the sites that have been chosen for the construction. They also measure the pits and identify user preferences for latrine location. This part of the session concludes with a workshop discussion of the fieldwork.

The second part of the session focuses on developing team skills and knowledge needed for estimating material, equipment, and labor needs. Trainers critique and discuss their work with the total group. A summary discussion of the day's activities concludes this session.

PROCEDURES

1. Introduction to Session — Time: 5 minutes

Share the objectives and overview in your own words.

2. Site Selection — Time: 15 minutes

Introduce this discussion by explaining that in site selection, user education is very important. Explain that the user needs to know what might happen if the latrine is improperly located. Discuss why.

On a flipchart show an example of an on-site sketch of a house and latrine showing recommended minimum distances from the latrine to the house, well, and stream. Give the recommended minimum distance between the bottom of the hole and the water table. Note that this level may vary so the depth to water should be measured during the wet season. Also point out that the latrine should be located downhill from a water supply (this can usually be determined by assuming that water flows towards a surface stream). See Handout 7-1: Site Location Diagram. Distribute this handout as you explain the distances.

Introduce and define site surveys and how to use them in locating latrines. Discuss what specific information is needed from a site survey. With the help of the group, prepare a short list and write it on a flipchart. This should include:

- o Where do the users get their water?
- o Will rock be a problem?
- o How many people will use the latrine on a continuing basis?
- o How will the latrine be built (contract or householder)?
- o Who will furnish the material?
- o How much land is available to put a latrine on?
- o How far down is the water table?
- o Are there any restrictions, e.g., current practices?
- o In which direction does the land slope?

Participants should make note of these items as they will be used later in evaluating the site.

3. Pit Design and Excavation - Presentation and Discussion   Time: 15 minutes

Like the site selection, the excavation of the pits has been completed prior to the workshop in order to save time. However, it is important to review the factors for the design and digging of the pit.

Use Handout 7-2:Water for the World:Designing Pits for Privies, to organize a brief presentation on factors to consider in the design of a pit for a latrine.

A. List and discuss the following factors:

- o Soil suitability and stability
- o Number of persons using pit
- o Type of anal cleansing material used:

  Decomposing - paper
  Non-decomposing - rocks, sticks

- o Depth of pit:

  The bottom of the pit should be at least 1 m above impervious material such as bedrock and the groundwater table during the wet season.

  For safety reasons it should not be hand dug more than 3 m deep.

B. When it has been determined that the soil is suitable for a latrine, a pit can be sized. The first step is to determine the required capacity by estimating how much it will have to hold. Once the number of people using the latrine and the type of anal cleansing material is determined, the volume can be calculated. This, however, is often not necessary since standard size pits are usually feasible.

C. Distribute and review Handout 7-2:Water for the World:Designing Pits for Privies and Handout 7-3:Instructions for Soil Identification.

D. Discuss the advantages of standard sizes. Explain if a standard diameter (length and width) is feasible then the only variable in designing a pit and slab is the pit depth. If a pit of 2 m to 2.5 m in depth was selected, the majority of families would have a latrine which would last five years or longer using non-decomposable anal cleansing material. There are several advantages of using standard sized pits and slabs. They simplify designs and permit reuse of drawings and forms.

The following are some reasons to use standard sizes:

Pit: simplifies design
usually allows adequate storage
easier to explain

Slab: can pre-cast slab
can re-use forms

Summarize major points in selecting the site and constructing the pit.

4. Fieldwork:Evaluation of the Site and Pit Time: 60 minutes

Teams have approximately one hour to visit their assigned construction sites to evaluate the site and the pit. If necessary, provide teams with maps directing them to their sites. Be sure each team has a measuring tape. Distribute Handout 7-4:Evaluation of Site and Pit and review it with the full group.

Ask the teams to spend a few minutes planning how to do this task. They should decide who will do what and make sure they have organized their work so it will be done in the allotted time.

Tell the teams to take no more than 10 minutes to assign tasks and plan and to move to their fieldwork as soon as they are done. Remind them to be ready to give a brief report on their fieldwork after returning to the workshop.

5. Report on Fieldwork Time: 30 minutes

Ask each team to give a two or three minute summary of their fieldwork by responding to the following questions (put questions on a flipchart).

o How well did the sites meet the criteria for a well situated latrine?

- What user preferences did you identify?

- What problems, if any, does the site location or pit excavation present?

Give each team 10 minutes to organize its presentation.

After each team has responded to the questions, summarize themes and important points. Note that the dimensions of the pit will be used for base and slab construction in the next part of this session. Address any problems which need to be resolved at this time.

Make a transition to the next subject of estimating materials and labor for construction.

BREAK — Time: 15 minutes

6. Estimating Material, Equipment, and Labor Needs Presentation and Discussion — Time: 20 minutes

Briefly remind participants that they now have information on the type of latrine to be built, the location of the latrine, the dimensions of the pit, and the resources available at the site. Make sure that the teams have all this information available.

Explain that they are going to use this information to help estimate the requirements for material, equipment, and labor for their latrine project.

Based on Trainer Note 1:Estimating for Construction - Lecture Notes (found following the handouts for this section), give a brief presentation on estimating covering what the teams need to know for the case study which follows. The lecture should give guidelines for estimating all appropriate items on Handout 7-6:Resources Checklist. Give examples to reinforce the major points. The lecture should not cover estimating materials not relevant to this task.

7. Estimating Exercise — Time: 40 minutes

Prepare for this activity by obtaining information on costs and quantities which are pertinent to the latrines to be constructed in the fieldwork. Costs should be given in local currency. The estimating exercise provides a model for the information to be provided. Prepare Handout 7-5:Estimating Exercise, with details completed, as a worksheet for this exercise model

Make sure participants have their latrine diagrams and site information available. Ask each team to complete the estimating exercise using Handout 7-6:Resources Checklist to record its responses. This exercise should be based on estimating the cost of one latrine. Economy of scale will be looked at later. In order for the participants to get the most from this practice the estimates should first be completed individually and then estimates should be compared and discussed within each construction team. Allow individuals 15 minutes and construction teams 20 minutes. Teams should agree on the final estimates.

8. Present and Discuss Results in Total Group Time: 20 minutes

Have each team report its estimates for materials as required in the estimating exercises. After the first team reports, other teams should add new or different information. Ask for comments on the difficulty of this task.

For example, ask:

- o Was it difficult to estimate labor resources?
- o What type of information might improve the estimates?
- o Were there any surprises or was anything learned which was unanticipated?

Ask participants to estimate the cost for ten latrines and look at the economy of scale. Participants should note that tools, equipment and slab forms can be shared and reused and materials can be bought in bulk.

9. Review and Generalize Time: 10 minutes

Summarize the discussion on the importance of accurate and proper calculations. Lead a brief discussion on the difficulty of estimating correctly the time needed for each task. Stress the importance of planning and having contingency plans.

Give examples of unanticipated problems. For example, market day comes and your work force leaves for the day. Ask for appropriate local examples.

10. Discussion of Construction Time: 25 minutes

In the large group ask participants to give examples of what they learned about estimating and about evaluating a latrine site. Record these on a flipchart.

Ask for any questions regarding the day's activities and discuss as time and energy allow.

11. Closure Time: 5 minutes

Thank teams for a good day of work. Review sessions for the next day.

MATERIALS NEEDED

Handout 7-1:Site Location Diagram
Handout 7-2:Water for the World:Designing Pits for Privies
Handout 7-3:Instructions for Soil Identification
Handout 7-4:Evaluation of Site and Pit
Handout 7-5:Estimating Exercise (to be prepared by trainer)
Handout 7-6:Resources Checklist
Flipchart for Session Objectives
Flipchart for Diagrams for Latrine Design

Site Location Diagram

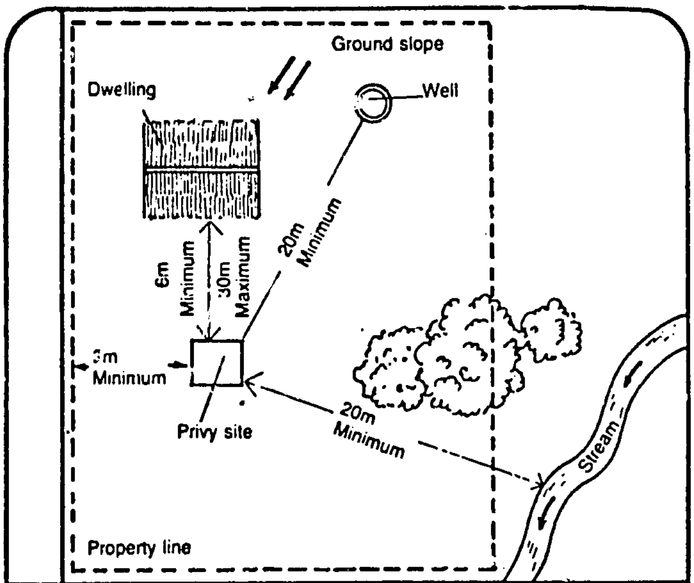


Figure 1. Location Map

1. Name: ______________
2. Village: ____________
3. Number of Users: _________
4. Depth of Water: __________
5. Recommended Pit Depth: _______

Water for the World

Designing Pits for Privies

Technical Note No. SAN. 1.D.2.

Designing a pit for a privy involves selecting its location, calculating its size, and determining the labor, materials, and tools needed for construction. The products of the design process are: (1) a location map, (2) technical drawings of the pit, (3) sketches of the pit lining, if needed, and base for the slab, and (4) a materials list. These products should be given to the construction supervisor before construction begins.

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

Useful Definitions

DECOMPOSE - To decay and become reduced in volume due to bacterial action; this happens to excreta in a pit.

IMPERVIOUS - Not allowing liquid to pass through.

PERMEABLE - Allowing liquid to soak in.

Materials Needed

Measuring tape - To obtain accurate field information for a location map.

Ruler - To draw a location map.

Location

The major factors in selecting a location for a privy are: (1) location of water supplies, dwellings, and property lines, (2) soil type, (3) groundwater levels, and (4) impervious layers.

Location of Water Supplies, Dwellings, and Property Lines. A pit privy should be downhill from water wells. It should be at least:

20m from the nearest well or stream,
6m from the nearest dwelling,
3m from the nearest property line.

For the sake of convenience, the privy should be no farther than 30m from the building to be served. It should be on fairly level ground. When a proposed site has been selected, determine the soil type.

Soil Type. A pit should be dug in permeable soil so the liquid part of the excreta can soak into the ground. The rate at which liquid soaks in depends on the type of soil. If the rate is too fast or too slow, the soil is not suitable for a pit. The main types of soil are sand, sandy loam, loam, silt loam, clay loam, and clay. For a detailed description of soil types see "Determining Soil Suitability," SAN.2.P.4.

When the soil at the pit site has been identified, use the following chart to determine its suitability.

Table 1. Soil Suitability

Soil Type	Suitability
Sand	No
Sandy Loam	Yes
Loam	Yes
Silt Loam	Yes
Clay Loam	No
Clay	No

If the soil is not suitable, select another location for the pit. If no good location can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1). If the soil is suitable, proceed to the next step.

Groundwater Levels. The bottom of the pit must be at least 1m above the groundwater level during the wettest season of the year. This information may be available from local residents, water well owners, or water well drillers. If the information is not available or reliable, field tests must be made. These tests are described in detail in "Determining Soil Suitability," SAN.2.P.4. In brief, a hole must be dug 1m deeper than the proposed pit. Dig the test hole during the wettest season. If no groundwater is observed, groundwater levels are suitable.

If groundwater levels are not suitable, select another location for the pit. If no acceptable location can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1).

Impervious Layers. The bottom of a pit must be at least 1m above impervious layers such as creviced rock, hardpan, shale, or clay. The same test hole dug for determining groundwater levels can be used to check for impervious layers. If there are impervious layers in the test hole, the site is unacceptable for a pit and a new site must be found. If no suitable site can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1).

When a suitable site has been found, draw a location map similar to Figure 1, showing the pit site and distances to water supplies, streams, dwellings, property lines, and any other nearby structures or prominent geographical features.

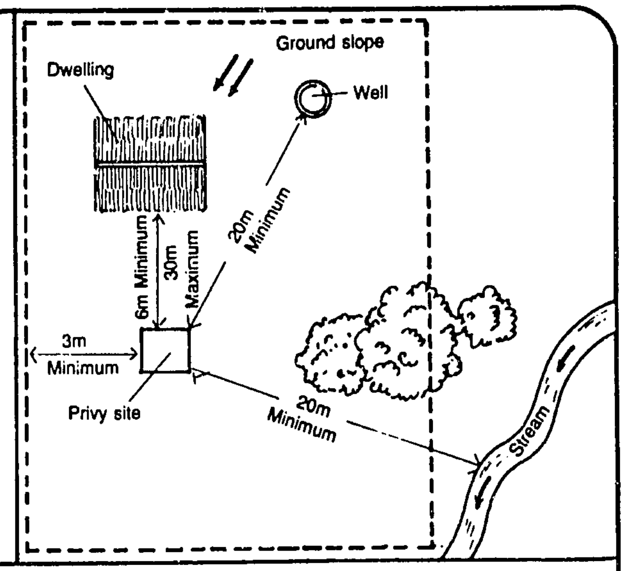


Figure 1. Location Map

Determining Pit Size

To determine the length, width and depth of a pit, first calculate the capacity. The capacity, or volume, of a pit is determined by the number of users of the privy, the number of years the pit is expected to last, whether the privy will have a pour-flush bowl, and the type of anal cleansing material used. Worksheet A shows a sample calculation of the size of a pit.

The number of users equals the number of persons living in or using the building to be served (Worksheet A, Line 1).

The pit should be designed to last 5 to 10 years, preferably 10 (Worksheet A, Line 2).

If the privy will have a pour-flush bowl, the pit can be smaller because the water used to flush the bowl will cause the excreta in the pit to decompose more rapidly (Worksheet A, Line 4).

The capacity of the pit is calculated as follows:

For a pit without a pour-flush: number of persons times number of years times 0.06 equals volume in cubic meters (Worksheet A, Line 5).

For a pit with a pour-flush: number of persons times number of years times 0.04 equals volume in cubic meters (Worksheet A, Line 6).

Worksheet A. Calculations for Privy Pit, Lining, and Base

Capacity of Pit

1. Number of users = 6
2. Designed life of pit in years = 8
3. Line 1 x Line 2 = 48
4. Is there a pour-flush bowl? ☒ no ☐ yes
5. If "no," then Line 3 x 0.06 = 2.8 m^3
6. If "yes," then Line 3 x 0.04 = ______ m^3
7. Do anal cleansing materials readily decompose? ☒ yes ☐ no
8. If "yes," then capacity = Line 5 (or Line 6) = 2.8 m^3
9. If "no," then capacity = 1.5 x (Line 5 or Line 6) = ______ m^3

Dimensions of Pit

10. Capacity (from Line 8 or Line 9) = 2.8 m^3
11. Pit is for (check one): ☐ pit privy ☒ ventilated pit privy ☐ offset pit privy
12. Width (from Table 2) = 1.1 m
13. Length (from Table 2) = 1.2 m
14. Line 12 x Line 13 = 1.32 m^2
15. Depth = $\frac{\text{Line 10}}{\text{Line 14}}$ = 2.1 m

Quantity of Lining Material (area of pit walls)

16. 2 x Line 12 = 2.2 m
17. 2 x Line 13 = 2.4 m
18. Line 16 + Line 17 = 4.6 m
19. Area of walls = Line 15 x Line 18 = 9.7 m_2

Distance Around Pit (periphery)

20. Periphery = Line 16 + Line 17 = 4.6 m

Volume of Poured Concrete Base

21. Width of base = 0.15 m
22. Thickness of base = 0.05 m
23. Volume = Line 20 x Line 21 x Line 22 = 0.03 m^3

Lengths for Wood or Log Base

24. Line 12 + 1.0m = 2.1 m
25. Line 13 + 1.0m = 2.1 m
26. Lengths of the four logs or wood beams:

(1) Line 24 = 2.1 m
(2) Line 24 = 2.1 m
(3) Line 25 = 2.2 m
(4) Line 25 = 2.2 m

Example 1. Suppose a pit privy without a pour-flush is being designed for a family of six and is to last eight years. Then the capacity of the pit equals:

$6 \times 8 \times 0.06 = 2.8$ cubic meters (Worksheet A, Lines 1-5).

Example 2. Suppose a pit privy with a pour-flush is being designed for a family of six for eight years. Then the capacity of the pit equals:

$6 \times 8 \times 0.04 = 1.9$ cubic meters (Worksheet A, Lines 1-6).

If anal cleansing materials that do not readily decompose such as grass, leaves, corncobs or mudballs are used, the capacity of the pit should be multiplied by 1.5 (Worksheet A, Line 7). For example, if the capacity of the pit was calculated to be 3.0 cubic meters and corncobs are the usual anal cleansing material, the required capacity of the pit is:

$3.0m^3 \times 1.5 = 4.5$ cubic meters (Worksheet A, Line 9).

When the capacity has been calculated, determine the dimensions of the pit. First, find the length and width. They depend on the type of slab and shelter being used (see "Designing Slabs for Privies," SAN.1.D.1 and "Designing Privy Shelters," SAN.1.D.3).

In general, a pit for a privy is square and is directly beneath the slab and shelter. A pit for a ventilated pit privy is either slightly offset or slightly longer than it is wide to accommodate the vent pipe. A pit for an offset pit privy is longer than it is wide and larger than a pit that is not offset.

(NOTE: A pour-flush bowl is generally used with a ventilated pit privy or an offset pit privy.)

Table 2 shows the general width and length and the minimum depth of the pit for each type of privy.

Determine the correct depth by dividing the design capacity by the width times the length (Worksheet A, Lines 10-15).

Table 2. Privy Type and Pit Dimensions

Privy Type	Pit Dimensions		
	Width	Length	Depth
Pit Privy	1.0-1.2m	1.0-1.2m	at least 1.5m
Ventilated Pit	1.0-1.2m	1.1-1.5m	at least 1.5m
Offset Pit	1.0-1.2m	1.5-2.0m	at least 3.0m

For example, calculate the correct depth of a ventilated privy with a capacity of 2.8 cubic meters, a width of 1.1 meters, and a length of 1.2 meters.

$$\text{depth} = \frac{2.8m^3}{1.1m \times 1.2m}$$

$$= \frac{2.8m^3}{1.32m}$$

$$= 2.1m$$

For pits 2.5-3.5m deep, add 0.15m to the length and 0.15m to the width to accommodate a step or ledge left in the walls during construction. For safety reasons, do not design a pit to be dug by hand deeper than 3.5m.

When the dimensions of the pit have been determined, make a technical drawing similar to Figure 2 showing length, width, and depth. For an offset pit privy, which requires a chute from the squatting slab to the pit, make a drawing similar to Figure 3 showing length, width, and depth of pit, and excavation for the chute. Give these drawings to the construction supervisor.

If the soil is such that the walls of the pit will not stand on their own in both the wet and dry seasons, the pit must have a lining. All pits need a base to support the slab (see "Designing Slabs for Privies," SAN.1.D.1).

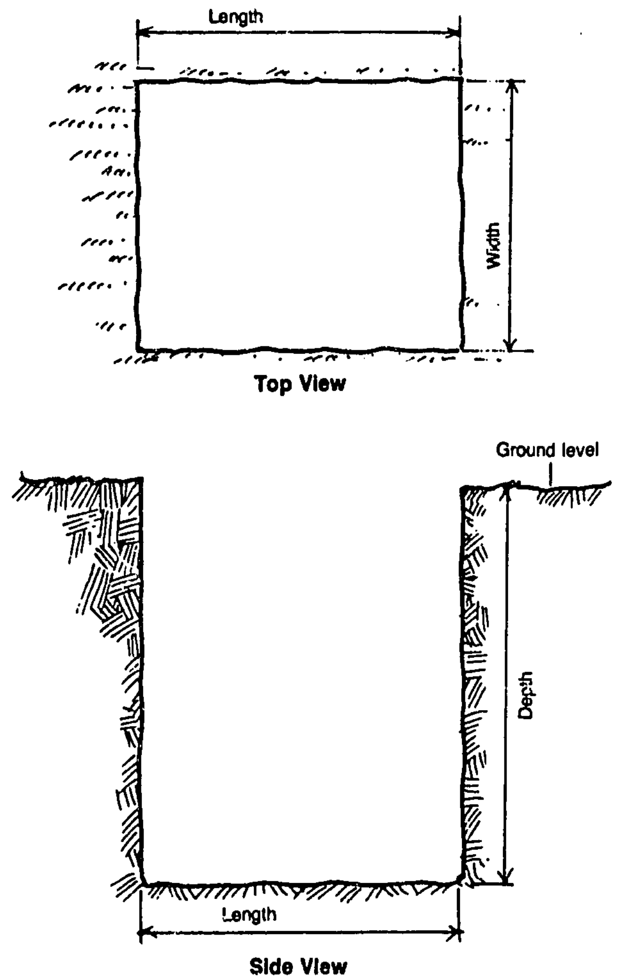


Figure 2. Dimensions for Pit Privy or Ventilated Privy

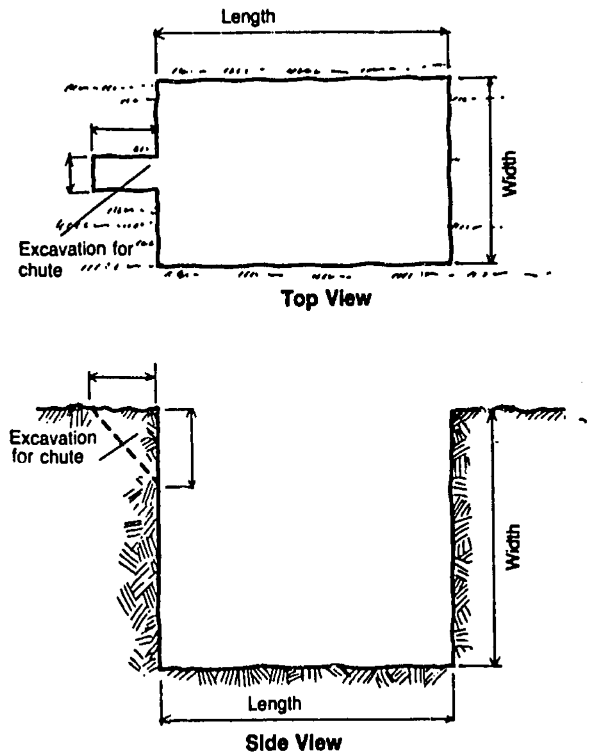


Figure 3. Dimensions for Offset Pit Privy

Caution!

Before the pit is excavated, design and construct the slab or, if it is an offset pit, the cover (see "Designing Slabs for Privies," SAN.1.D.1 and "Constructing Slabs for Privies," SAN.1.C.1). This is necessary so that when the pit is constructed, it can be covered immediately. A pit left open and unattended is a serious hazard. Whenever workers leave the site, they should cover the pit with the slab.

The lining can be made of bamboo, logs, poles, boards, bricks, concrete blocks, or select field stones. Whatever material is used, it must have slits or open spaces to allow the liquid part of excreta to pass through to the soil. For an offset pit privy, a space must be left in the lining to allow for the chute.

Prepare a sketch similar to one of those in Figure 4 showing the lining material and a sketch similar to one of those in Figure 5 showing the materials to be used for the base, and give both of them to the construction supervisor.

Materials List

Prepare a materials list similar to Table 3, showing labor requirements, types and quantities of materials and tools, and the estimated funds needed to construct the pit, including lining and base. This technical note provides the means of determining some quantities. The remaining quantities will have to be determined by you as the project designer or by the construction supervisor.

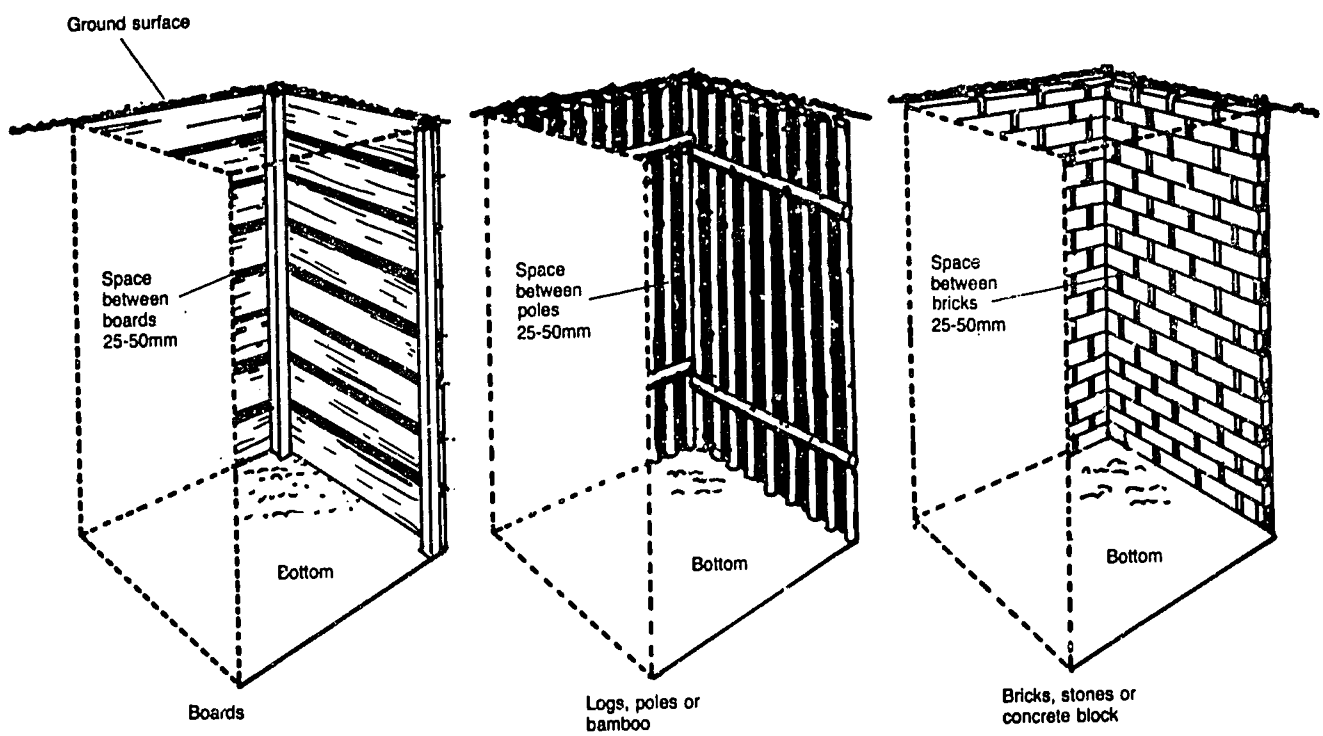


Figure 4. Pit Linings

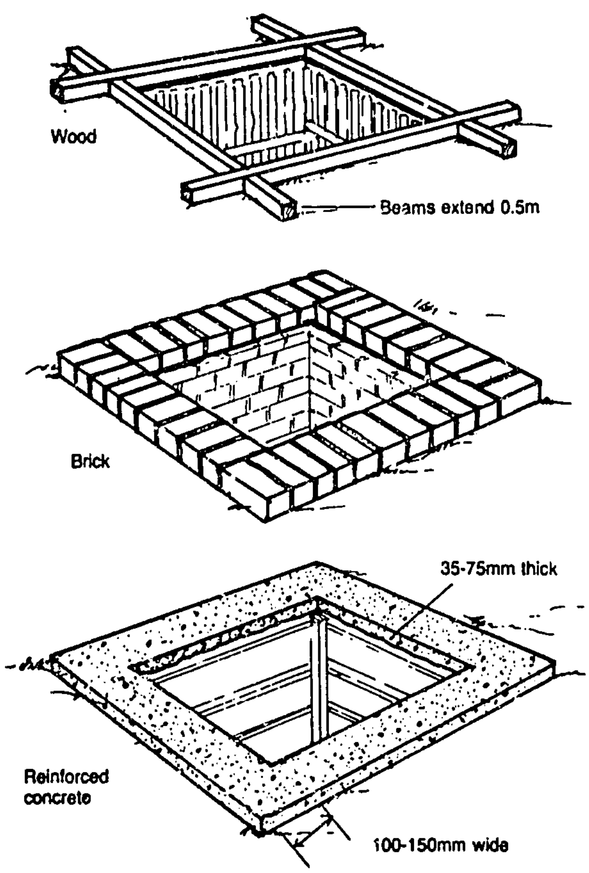


Figure 5. Bases

Labor. Ideally, there should be at least two laborers to dig the pit. If the pit lining or base is wood, one worker should have some carpentry skills; if the lining or base is brick or concrete block, one worker should have some masonry skills; if the base is poured concrete, one worker should have some concrete skills. If this number of laborers is not available, you can certainly make do with fewer. The person in charge of construction should be present during all stages of construction.

Lining. The material used for the lining, if needed, can be bamboo, logs, poles, boards, bricks, concrete blocks, or select field stones. Use a material that is readily available and that laborers are familiar with. The quantity depends on the type of material and the size of the pit. One way to estimate the quantity is to calculate the area of the pit walls, since the lining must cover nearly the entire wall area except for the spaces between the boards, poles, or bricks.

Table 3. Sample Materials List

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	______
	Laborers (one experienced with carpentry, stone masonry, or poured concrete, whichever applies)	2 (at least)	______
Supplies	For laying out the system: wooden stakes or sticks	____	______
	For the lining: bamboo, poles logs, boards, bricks, concrete blocks, select field stones	____	______
	For the base: wood, bricks, concrete blocks	____	______
	For poured concrete or mortar:		
	Cement	____	______
	Sand	____	______
	Gravel	____	______
	Water	____	______
	Other	____	______
Tools and Equipment	Box or bucket	1	______
	Sturdy rope or ladder	1	______
	Measuring tape	1	______
	Shovels	2 (at least)	______
	Wheelbarrow	1	______
	Hammer	1	______
	Saw	1	______
	Nails	--	______
	Trowel	1	______
	Plumb line (string and rock)	1	______
	Hatchet or machete	1	______
	Container (for mixing mortar)	1	______
	Concrete slab	1	______
	Other	--	______
		Total Estimated Cost =	______

The area of the pit walls equals two times the width plus two times the length multiplied by the depth (Worksheet A, Lines 16-19).

For example, suppose a pit is 1.1 meters wide, 1.2 meters long, and 2.1 meters deep. Then the area equals:

$$(2 \times 1.1) + (2 \times 1.2) \times 2.1$$
$$= (2.2 + 2.4) \times 2.1$$
$$= 4.6 \times 2.1$$
$$= 9.7\text{m}^2$$

The lining material must cover an area equal to about 9.7 square meters.

<u>Base</u>. The material used for the base can be wood, bricks, concrete blocks, or poured concrete. Use a material that is readily available and that the laborers are familiar with. Figure 5 shows three different types of bases.

(NOTE: A wood base may not last as long as a brick, concrete block, or poured concrete base.)

The quantity depends on the type of material and the size of the pit. One way to estimate the quantity for a brick, concrete block, or poured concrete base is to calculate the distance around the top of the pit. This distance is called the periphery; it is equal to twice the length plus twice the width (Worksheet A, Line 20).

For a base made of bricks or concrete blocks, there must be a sufficient quantity to place the bricks or blocks side by side for a distance equal to the periphery of the pit.

For example, suppose a brick base is needed for a pit 1.1 meters wide and 1.3 meters long. Then the periphery equals:

$$(2 \times 1.1) + (2 \times 1.3)$$
$$= 2.2 + 2.4$$
$$= 4.6\text{m}$$

There must be enough bricks to be placed side by side around a periphery of 4.6 meters.

For a poured concrete base, the quantity of poured concrete is equal to the periphery of the pit times the width of the base times the thickness of the base (Worksheet A, Lines 21-23).

For example, suppose a concrete base 0.15 meters wide and 0.05 meters thick is needed for a pit with a periphery of 4.6 meters. Then the quantity of concrete equals:

$4.6m \times 0.15m \times 0.05m$

$= 0.03m^3$

For a wood base, four logs or sturdy wooden beams are needed, one for each side of the pit. Each log should be 1 meter longer than the side of the pit on which it will be laid, as shown in Figure 5 (Worksheet A, Lines 24-26). For example, suppose a wood base is needed for a pit that is 1.2 meters wide and 1.3 meters long. Then the lengths of the four logs would be:

(1.2+1.0),(1.2+1.0),(1.3+1.0),(1.3+1.0)

= 2.2m, 2.2m, 2.3m, 2.3m.

Tools. The tools required will vary according to the type of pit lining and base. All types of pits require at least two shovels (one per laborer) or other digging implements. A wheelbarrow is useful for carting away excavated dirt and for bringing other material to the pit site. A saw and nails are needed if the lining or base is made of wood, logs or boards. If the lining or base is made of bricks or concrete blocks, or the base is made of poured concrete, a container for mixing the concrete or mortar and a trowel for applying and smoothing concrete or mortar are needed.

Also needed are a measuring tape to help determine the exact location of the pit, and wooden stakes or sticks to lay it out on the ground. A plumb line (long string with a rock tied to the end) will be useful to ensure that the pit walls are dug vertically. A sturdy rope or ladder should be available for the laborers to get into and out of the pit.

Cost. The cost of the pit depends on a number of variables: which materials are available and which must be purchased; how much labor will be volunteered and how much must be paid for; prices and wage rates; and so on. Make your best estimate based on local conditions.

When all calculations, determinations, and estimates have been made, prepare a materials list similar to Table 3, and give it to the construction supervisor. In summary, give the construction supervisor: (1) a location map similar to Figure 1, showing the location of the pit in relation to all nearby structures and geographical features; (2) a technical drawing similar to either Figure 2 or Figure 3, depending on the type of pit privy, showing correct dimensions of the pit; (3) sketches similar to those in Figure 4 and Figure 5, showing the general configuration of the pit lining and base; and (4) a materials list similar to Table 3 showing the labor, materials, tools, and money needed to construct the pit, lining, and base.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

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INSTRUCTIONS FOR SOIL IDENTIFICATION

Identifying Soil Types. The six basic types of soil are: (1) sand, (2) sandy loam, (3) loam, (4) silt loam, (5) clay loam, and (6) clay. They can be identified by sight and touch. When testing soil by touch, test it when both dry and moist.

(1) Sand: Individual grains are easily seen and felt. A handful of sand squeezed when dry will not hold its shape; squeezed when moist, it will barely hold its shape, crumbling when touched.

(2) Sandy Loam: Contains a large percentage of sand so that sand grains can be seen and felt. Squeezed when dry, a handful of sandy loam will not hold its shape; squeezed when moist, it holds its shape and forms a cast that will not break when handled carefully.

(3) Loam: Has a fairly smooth, yet slightly gritty feel; clods crumble easily. Squeezed when dry, loam forms a cast that can be handled carefully without breaking; squeezed when moist the cast can be handled freely without breaking.

(4) Silt Loam: Feels soft and floury; clods are easily crumbled. Squeezed when dry or wet, silt loam forms a cast that can be handled freely without breaking. A small ball of moist soil pressed between thumb and finger will not form a ribbon.

(5) Clay Loam: Fine textured; clods are hard. Moist clay loam is plastic and, when squeezed, forms a cast that can withstand considerable handling without breaking. A small ball of moist clay loam pressed between thumb and finger forms a thin ribbon that barely sustains its own weight.

(6) Clay: Fine textured; clods are very hard. Wet clay is plastic and usually sticky. A small ball of moist clay pressed betwen thumb and finger forms a long ribbon.

EVALUATION OF SITE AND PIT

During this activity you will conduct a survey of your team's project site and collect information for use in later phases of the project. In preparing for this activity be sure you have developed a list of factors to evaluate. Use the list developed earlier in this session as a guide. Before you begin, spend a few minutes planning your work so that all tasks are completed in the time available. During your fieldwork you should complete the following tasks:

1) Locate the site.

2) Locate and talk to local residents (users) about the VIP latrine. Determine user preference about the orientation of the entrance. Discuss collaboration for construction and identify available labor resources from the community.

3) Evaluate the site for:

    a. Distances from buildings, wells, rivers, etc.
    b. Drainage
    c. Soil type
    d. Other factors such as wind potential for venting, solar exposure of the vent, shading of the entrance, etc.

4) Measure the pit and record its dimensions for use in base and slab construction.

5) Check for the availability of sand, aggregate, water etc., for construction. If these have been ordered and stockpiled quantities should be determined.

6) Draw a sketch map of the site incorporating the information collected in the site survey

Select one person to report findings to the total group.

<u>MATERIALS NEEDED</u>

Pencil and Paper
Measuring Tape
Handout 7-1:Site Location Diagram

(Sample)

ESTIMATING EXERCISE

Assume that the residents at your latrine site have asked for an estimate of materials, labor, and the cost of constructing a latrine. You do not need to calculate the resources necessary for the shelter since they have not asked for an estimate of the cost of a shelter.

Use information from your site survey (available labor, sand, etc.) and the latrine plans which you were given to estimate the materials, equipment, and labor needed to:

Excavate and line the pit
Build a base for the slab
Construct the latrine slab forms
Pour the latrine slab

You know the ingredients needed for the concrete slab will include the following:

1 sack of cement
56 liters of sand
112 liters of gravel

From a previous survey you have the following information to help you estimate the cost of materials and labor.

Cement	- US $12 for a one kilogram sack
Lumber	- US $8 for a plank 4 cm x 24 cm x 400 cm
Sand and gravel	- can be obtained at a site 3 kilometers away. However, a method to bring it to the site is necessary.
Tree/Pole	- Trees up to 25 cm in diameter are located nearby and belong to the homeowner.
Re-bar	- US$1 a meter
Nails	- US$3 a kilogram
Skilled labor (mason, carpenter)	- US$4 per person per day
Unskilled labor	- US$2 per person per day

Trainer Note: Rewrite the estimating exercise by providing actual quantities and cost figures for the project being completed in the workshop. Add/delete materials as appropriate to the latrine design. Be sure that the materials added are also noted on Handout 7-6:Resources Checklist.

RESOURCES CHECKLIST

Materials	Quantity	Cost
<u>Latrine Pit</u>		
Wood for lining		
______________		
______________		
______________		
<u>Slab Base</u>		
______________		
______________		
______________		
______________		
<u>Latrine Slab</u>		
Cement		
Re-bar		
______________		
______________		
<u>Slab Forms</u>		
Lumber		
Nails		
______________		
______________		
Total Materials Cost		

Tools	Quantity	Cost
Shovels		
Saw		
____________		
____________		
____________		
____________		
____________		
____________		
____________		
Total Tool Cost		

Equipment	Quantity	Cost
Truck		
Push-cart		
____________		
____________		

Total Project Cost

Material

Labor

Tools

Equipment

Total	

Activity/Labor	*Skills & number of persons	Time	Cost
Excavation of pit			
Lining pit			
Construction of slab base			
Construction of slab forms			
Latrine slab			
Pouring the slab			
Installing the slab			
Transportation of materials			
	Total Labor Cost		

* Mason
Laborer
Carpenter
etc.

ESTIMATING FOR CONSTRUCTION - LECTURE NOTES

Several types of estimates are required in order to determine quantities of materials, days of labor, and costs of materials, tools, and manpower. Board feet of lumber must be determined for forms, pit lining and the shelter. Amounts of concrete must be figured to estimate the desired number of bags of cement, head pans of sand, and buckets of gravel needed for the project. The number of tools (saws, machetes, shovels, etc.) must be determined to estimate the budget. Labor and transportation cost are also necessary for the preparation of the budget as well as work plans.

The preparation of estimates requires a set of accurate plans with correct measurements and recommended materials and mixtures. Centrally developed plans usually give exact quantities required for materials and tools. However, these plans frequently require modification due to local conditions or user preference so it is best to have some knowledge of the techniques for estimating the 'inputs' to the project.

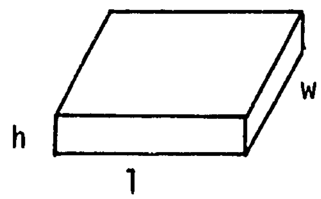
FREQUENT CALCULATIONS

Many estimates require the builder to determine the area and volume of components or materials. Whether these calculations are used for estimating volume of concrete, the amount of sand in a given pile, or the number of bricks needed for a wall or vent pipe, basic formulas apply.

Volumetric Formulas

Key: V=Volume h=height w=width l=length b=base r=radius π=pi=3.12

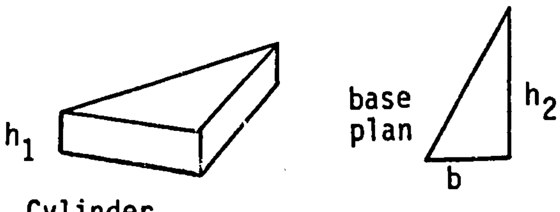
1. Rectangular solid (box)



$V = h \times w \times l$

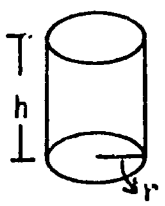
2. Extended Triangle

$V = h_1 \times$ area of base



Plan
Area = $1/2b \times h_2$

3. Cylinder

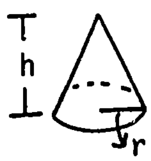


$V = h \times$ area of base

Area of base $= \pi r^2$

$V = h \times (\pi r^2)$

4. Cone



$V = 1/3h \times (\pi r^2)$

These formulas are used for many of the estimates in the construction of latrines. When using these formulas it is important to remember that all measurements must be in the same units (inches, feet, centimeters, meters). Therefore if some dimensions are expressed in inches and some in feet they should all be converted to the same unit.

Example: A privy Slab 4 ft. x 3 ft. x 4 in.
All measurements must use the same or related units
4 inches is converted to 1/3 foot.
V= h x w x l
V=1/3 x 3 x 4 = 4 cubic feet

Volumes in construction are frequently expressed in cubic yards or cubic meters. There are 27 cubic feet in one cubic yard. For the above example, the volume would equal 4/27 cubic yard.

ESTIMATING CONCRETE

If the volume of a component (i.e. the slab) is known, the amount of sand, gravel and cement required can be determined. These materials are always in a volume proportionate to each other. This proportion is commonly 3 parts gravel to 2 parts sand to 1 part cement (3:2:1). The following approximate volumes of ingredients will be required for one cubic meter ($1m^3$) of concrete.

Gravel 0.75 m^3

Sand 0.50 m^3

Cement 0.25 m^3

Note that this same ratio will hold true for any volume of concrete.

The individual volumes of ingredients add up to more than one cubic meter (1.5 cubic meters). This excess allows for the voids that occur between the pieces of gravel and particles of sand. A pile of gravel can be 10 percent open space (voids). When sand and cement are added, the sand fills in the spaces in the gravel and the cement fills in the voids between sand particles. In the example above a factor of 1.5 was used to increase the volumes of each ingredients.

Accounting for the spaces in gravel and sand gives a fairly accurate estimate for the ideal world. Unfortunately, however, there is always some waste and loss of materials in the real world. Sand and gravel get scattered from the pile. It is difficult to get the last 10 percent of a sand pile up off the ground. Some concrete will spill out of the form, etc. So for estimating, especially for a multi-unit project add a 15 percent margin for each ingredient.

The final volume figures need to be converted to local standard measurements (bags, buckets, headpans, etc). The quantity held by local containers will need to be determined by filling them with a measured quantity. The volume of a locally provided bag of cement must also be determined.

Refer to Handout 8-3:Making Good Concrete for additional information on estimating concrete.

Provide easy to follow examples of calculations.

ESTIMATING LUMBER

Lumber, timber, or poles should be estimated by figuring the number of boards or poles required in specific lengths and widths. The time spent estimating lumber (finished/cut boards) should depend on its costs and availability. If all wood is to be purchased, then the estimate should be as exact as possible. A margin of 5 percent should be added to allow for waste and errors. If bush poles are used from a local supply, the estimates can be approximate with an added 15-20 percent for error.

In determining the amount of lumber/poles required an accurate plan is essential.

ESTIMATING MASONRY

Estimates for block or brick walls are determined by dividing the surface area of the wall by the surface area of one brick/block and its mortar joints on two sides.

Example

$1\ m^3 = 1{,}000{,}000\ cm^3$

If a block measures 18 cm high x 38 cm long and 2 cm of mortar are used around the block, the total height is 20 cm (18+2) and the total length is 40 cm (38+2).

The total area of the blocks is determined by: A = height (h) x length (l)

If the wall is 2 m high x 3 m long its surface area = $6m^2$.
$A = 20\ cm \times 40\ cm = 800\ cm^2 = .8\ m^2$

The number of blocks needed is $= \frac{\text{area of wall}}{\text{area of block}} = \frac{6\ m^3}{.8\ m} = 75$ blocks

To estimate the mortar required, calculate the volume needed for one block and multiply it by the total number of blocks. For an 18 cm x 18 cm x 38 cm block with mortar joints 2 cm thick, the total volume for one block would equal

$$\begin{array}{ccccc} (2\ cm \times 18\ cm \times 18\ cm) & + & (2\ cm \times 18\ cm \times 38\ cm) & & \\ 648\ cm^3 & + & 1368\ cm^3 & = & 2016\ cm^3 \end{array}$$

Total for the wall = 75 blocks x 2016 cm^3 = 151,200 cm^3 = .15 m^3 (approx.)

Therefore if the mortar is a mixture of 1 cement to 3 sand, then approximately .04 m^3 of cement and .11 m^3 of sand are needed for each wall.

Multiply this volume by the number of walls of equal size to determine the total cement and sand required. Add 20 percent to mortar volumes for waste and loss. This margin should also be added to the total of bricks/blocks.

Discuss the need for estimating labor and time and other factors such as transportation and weather to ensure comprehensive project planning. There are too many caveats, local variables, and experience-based judgements related to such factors to enable / fixed formulas to apply such as the ones just discussed for materials.

Summarize by stressing the importance of estimating labor and other needs.

GUIDE TO SESSION 8: LATRINE SLAB CONSTRUCTION

Total Time: 8 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session	Presentation	5 minutes		Session objectives
Constructing forms for slab	Presentation and discussion	15 minutes	Handout 8-1: Team Instructions for Construction of Slab Forms	Diagrams of forms
Team planning	Team activity	15 minutes		
Making slab forms	Fieldwork	90 minutes	Construction materials	
	BREAK	15 minutes		
Designing concrete mixes	Lecturette	30 minutes		
Mixing and pouring concrete/placing re-bar	Demonstration	45 minutes		
	LUNCH	60 minutes		
Pouring slab - introduction	Presentation	5 minutes		
Team planning	Team activity	15 minutes	Handout 8-2: Team Instructions for Mixing and Pouring Concrete	
Mixing, pouring, placing re-bar	Fieldwork	2 hours	Handout 8-3: Making Good Concrete	
Discuss teamwork	Group discussion	30 minutes	Construction materials	
Learnings about forming and pouring concrete	Group discussion	30 minutes		
Closure		5 minutes		

Session 8:Latrine Slab Construction

Total Time: 8 hours

OBJECTIVES

At the end of this session, participants will.be able to:

- o Construct forms for a concrete slab
- o Place reinforcement rods
- o Mix and pour concrete
- o Cure a concrete slab

OVERVIEW

During the first half of this session, participants learn how to construct forms for a two piece concrete slab with a vent pipe form and foot rests. During the morning, participants in the construction teams build all the necessary forms for use in the afternoon when they will be pouring concrete slabs.

The second half of this session is focused on learning the essentials of preparing, mixing and pouring good concrete. A lecturette is followed by a field demonstration of preparing and mixing concrete. Participants then return to their teams to prepare and pour concrete for the slab and foot rests. The day ends with a group discussion of teamwork and what was learned about concrete.

There are two sets of team instructions for this session. One covers constructing the forms and the other pouring concrete slabs. It is recommended that teams choose different team leaders for each of these activities, as they are separate and fairly complex construction tasks.

Mixing and pouring the concrete slab can be done either at a central location or at the latrine site, depending on material availability and the slab chosen. A decision needs to be made prior to the session as to where it will take place. A central location will allow the trainers to monitor the work and be available for questions. A disadvantage is that the slab needs to be moved some distance before installation.

PROCEDURES

1. Introduction Time: 5 minutes

Give the session goals and the overview of the day. Describe the combination of fieldwork and workshop time. Be sure to prepare participants for the fact that this will be a long and difficult day of construction.

2. Constructing Forms for Slab — Time: 15 minutes

Introduce the morning's task by discussing the importance of precision in building the forms. Identify all the forms needed for the VIP latrine and describe how participants will build the forms required for the slab and foot-rests, but not for constructing the base. The base will be made in Session 9.

Go over Handout 8-1: Team Instructions for Construction of Slab Forms for forming a two-piece latrine slab. Explain that the teams will be constructing front and rear slab forms as well as the drop-hole, vent-pipe and foot-rest forms. Go over with the total group or with the team leaders Figures 1 and 2 in Handout 8-1, as they show the dimensions and layout of the forms. Discuss the materials needed. All the materials, with the exception of part of the foot-rest forms, should be soft wood, preferably mill cut and planed to relatively square straight dimensions. Discuss the fact that the only complex problem in making the forms is shaping the drop-hole form. There are two approaches described in Figure 2 for drop-hole form construction. Trainers need to identify the appropriate approach for participants to use.

3. Team Planning — Time: 15 minutes

Give the teams 15 minutes to plan their work with their team leaders. Encourage the teams to divide up their tasks as all the forms need to be completed in order to pour concrete later in the day.

4. Field Activity - Making Forms — Time: 90 minutes

Teams construct forms as instructed.

BREAK — Time: 15 minutes

5. Lecturette on Designing Concrete Mixes — Time: 30 minutes

In your own words state that concrete is one of the principal construction materials. It is widely used for footings, foundation walls, basement walls, walls above ground, and floors for all kinds of buildings. It is also used in making improvements on the farm and around the home, such as building cisterns, well platforms, retaining walls, and many other useful structures.

To give maximum service and satisfaction, the concrete must be of good quality. Then it will be strong, durable, and watertight and possess the other desirable characteristics of well-made concrete. It is just as easy to make good quality concrete as to make poor quality concrete.

This session describes the few simple rules to follow in making good concrete. This information is needed whether the participants do their own concrete work or have it done by a local builder.

Explain and write on a flipchart that:

The making of good concrete involves:

1) Selecting ingredients
2) Proportioning
3) Mixing
4) Making, shaping, and bracing forms
5) Placing concrete in forms
6) Finishing
7) Curing
8) Reinforcing

Use Handout 8-3:Making Good Concrete to prepare a lecturette. Be sure to elaborate on the following key points:

A. Selecting ingredients

- o Cement - Portland Cement, free flowing powder
- o Water - Clean, if drinkable then probably o.k. for concrete
- o Sand - Uniform from fine to 6 mm size, clean and hard
- o Gravel/Crushed Stone - 6 mm to 1/5th thickness of slab, clean and hard

B. Cleaning Sand and Gravel

Explain that if the sand and gravel are not clean, the concrete will not be as strong as it would be with clean components. Large stones, sticks, grass and clumps of earth and other debris should be removed from the sand and gravel. If the sand and gravel are still not adequately clean, they can be washed with water.

C. Proportioning

Explain that there are four major ingredients in concrete. These are cement, sand, gravel and water. A common proportion of these materials is 1 part cement and 2 parts sand to 3 parts aggregate.

Note that the strength, durability, and watertightness of concrete are controlled by the amount of water used per sack of cement. In general, the less water used the better the quality of the concrete, so long as the mixture is plastic and workable. Some concrete must be stronger and more watertight than others; less water is used for such concrete.

For normal concrete use a quantity of water equal to 38 l per 50 kg sack of cement or 6 gals per 94 lb bag.

Note that this is for very dry sand in the mix.

<u>For damp sand</u> - which feels slightly damp to the touch, use 25.6 l per sack

<u>For wet sand</u> - which feels wet and leaves a little moisture on the hands, use 23 l per sack

<u>For very wet sand</u> - which is sand that leaves the hand wet and glistens or sparkles when picked up, use 20 l per sack of cement

D. <u>Mixing</u>

- <u>Mixing by Machine</u>

Concrete must be thoroughly mixed to yield the strongest product. For a machine mix, allow five or six minutes after all the materials are in the drum. First, put about 10 percent of the water in the drum. Then add water uniformly with the dry materials, leaving another 10 percent to be added after the dry materials are in the drum.

- <u>Mixing by Hand</u>

On most self-help projects, the amount of concrete needed may be small because it is impossible to get a mechanical mixer. If a few precautions are taken, hand-mixed concrete can be as strong as concrete mixed in a machine.

The first requirement for mixing by hand is a mixing area which is both clean and watertight. This can be a wood and metal mixing trough or a simple concrete floor.

Use the following procedures, being careful to measure all materials:

1) Spread the sand evenly over the mixing area.

2) Spread the cement evenly over the sand and mix these materials by turning them with a shovel until the color is uniform.

3) Spread this mixture out evenly, spread the gravel on it, and mix thoroughly before water is added.

A workable mixture should be smooth and plastic, neither so wet that it will run nor so stiff that it will crumble. If it is too wet, add small amounts of sand and gravel, in the proper proportion until it is workable. If a concrete mixture is too stiff, it will be difficult to place in the forms. If it is not stiff enough, it probably does not have enough aggregate, thus making it an uneconomical use of cement.

When work is finished for the day, be sure to rinse concrete from the mixing area and the tools to keep them from rusting and to prevent concrete from caking on them. Smooth, shiny tools and mixing surfaces make mixing much easier. The tools will also last much longer.

E. Forming

Forms are molds into which the concrete is placed. The surfaces of the forms which come into contact with the concrete should be sealed to prevent sticking. This can be done by coating the inside surface with used motor oil. This also adds to the life of the form. The forms should also have a smooth surface for easier removal.

Finally the forms should be secured by staking around the sides to prevent bulging or movement which could ruin the slab.

F. Placing Concrete in Forms

State that to make strong concrete structures it is important to place fresh concrete in the forms correctly.

The wet concrete mix should not be handled roughly when it is being carried and put in the forms. It is very easy, through jogging or throwing, to separate the fine aggregate from the coarse aggregate. Do not let the concrete drop freely for a distance greater than 90 to 120 cm (3 to 4 feet). Concrete is strongest when the various sizes of aggregates and cement paste are well mixed.

Properly proportioned concrete will have to be worked into place in the form. Concrete that flows out to completely fill in a form is too wet and therefore weak.

As the concrete is being placed, it should be compacted so there are no air holes which would leave weak spots in the concrete. This can be done by tamping the concrete with some long thin tools or vibrating the concrete. Tamping can be done with a thin (2 cm) iron rod, a wooden pole, or a shovel.

Special attention must be paid to the edges of the form to make sure that they are completely filled with concrete. If the forms are strong enough, they can be struck with a hammer on the outside to vibrate the concrete just enough to allow it to settle completely in the forms. Too much vibration, however, can force most of the large aggregate toward the bottom thus reducing the overall strength of the concrete.

G. Reinforcement

Concrete is made stronger by using a reinforcing material. This is usually a steel rod called a re-rod or re-bar. Steel re-rod should be tied together with wire where it crosses. Also common is steel wire mesh. Less commonly used and less effective is bamboo. If bamboo is used it should be completely dry (cured). The ends should be sealed to reduce the water uptake from the slab. The bamboo should be split and the skin side should face the bottom of the slab.

H. Finishing

Once the concrete is poured into the forms, its surface should be worked to an even finish. The smoothness of the finish will depend on what the surface will be used for. Where more concrete or mortar will later be placed on top, the area should be left relatively rough to aid in bonding. Where the surface will later be walked on, as for example the cover of a well on which a pump will be mounted, it should be somewhat rough to prevent people from slipping on the concrete when its surface is wet.

This somewhat rough texture can be achieved by finishing with a wooden float or by lightly brushing the surface to give it a texture. A very smooth finish can be made with a metal trowel. Over-finishing (repeated finishing) can lead to powdering and erosion of the surface.

I. Curing Concrete

After the forms are filled, the concrete must be cured until it reaches the required strength. Curing involves keeping the concrete damp so that the chemical reaction that causes the concrete to harden will continue for as long as is necessary to achieve the desired strength. Once the concrete is allowed to dry, the chemical hardening action will gradually taper off and cease.

The early stage of curing is extremely critical. Special steps should be taken to keep the concrete wet. Once the concrete dries, it will stop hardening; after this happens it cannot be re-wetted in the field to re-start the hardening process.

Covering the exposed concrete surfaces is usually easier than continuously sprinkling or frequently dousing the concrete with water which would otherwise be necessary to prevent the concrete surface from becoming dry. Protective covers often used include canvas, empty cement bags, burlap, plastic, palm leaves, straw and wet sand. The covering should also be kept wet so that it will not absorb water from the concrete.

6. Mixing and Pouring Concrete/Placing Re-bar - Demonstration

Time: 45 minutes

Demonstrate to the total group the proportioning and mixing of concrete ingredients as well as the pouring of concrete into forms. The demonstration should cover the following points:

Proportioning
Mixing
Preparing forms for concrete
Cutting and placing reinforcement rods
Pouring concrete
Finishing surface

Also demonstrate the procedure for curing cement by covering it with plastic, burlap, straw or similar material. You will need to have a form prepared prior to the demonstration as well as all materials in hand.

LUNCH — Time: 60 minutes

7. Pouring Cement for Slab — Time: 5 minutes

In the total group review the steps for pouring concrete for the slab. Distribute Handout 8-2:Team Instructions for Mixing and Pouring Concrete. Points covered should include:

Concrete mix ratio
Measurements and placement of reinforcement rods
Preparation of forms and oiling inside surfaces
Finishing surface

See if there are any questions about the handout. Check with team leaders to see if they need any assistance.

8. Team Planning — Time: 15 minutes

Give teams 15 minutes to plan their work. Refer them to the instructions. Answer questions before the teams begin to mix and pour concrete.

9. Mixing and Pouring Slab — Time: 2 hours

Teams proportion, mix, and pour concrete according to the team instructions.

10. Discussion of Teamwork — Time: 30 minutes

Even though it has been a long day, this session is important because it gives participants an opportunity to reflect on the day's activities in an organized way. The tone and pace should be upbeat with as much participant interaction as possible. Introduce the session by stressing the importance, especially on busy days like this, of taking a step back to review what has been learned and to deal with remaining questions. Note that at the end of each construction phase there will be an opportunity to discuss teamwork/leadership and the construction aspects of that phase.

In the total group, take about 15 minutes and ask each team leader:

- How did it go today? What were the highlights?
- What was it like to be the team leader and manage others?
- What did you learn about supervising others?
- Is there anything you would do differently next time?

Be sure to manage the time carefully. Do not let this drag or allow one team leader to dominate the time. Keep the focus on supervising others and help draw out what was learned.

For the next 15 minutes discuss with the other team members:

- o What did you learn about teamwork?
- o What kind of leadership style did your team leaders use? What was helpful/ not helpful for you?
- o What did you find difficult in doing this task?
- o What would you do differently next time?

Be sure people handle any negative comments about leadership style carefully. The point is to learn effective ways to supervise others and begin to understand different approaches that can be used in various situations.

11. Learning About Concrete Time: 30 minutes

Ask what were the two most significant things learned about:

forming a slab
pouring concrete

Brainstorm a list of things to remember about concrete and forms. Ask what was difficult about these tasks? Discuss any questions and clarify points, as needed. What would be different at your sites? What would you have to adopt? Distribute Handout 8-3:Making Good Concrete as background information.

12. Closure Time: 5 minutes

Thank team leaders again and also commend everyone for their hard work. Review session goals and see if they were met.

MATERIALS NEEDED

Handout 8-1:Team Instructions for Construction of Slab Forms
Handout 8-2:Team Instructions for Mixing and Pouring Concrete
Handout 8-3:Making Good Concrete

TEAM INSTRUCTIONS FOR CONSTRUCTION OF SLAB FORMS

Your team will be cutting and assembling front and rear slab forms and forms for a drop-hole, vent pipe, and foot rests. These forms will be used to pour concrete later in the day.

The task of constructing the forms can be subdivided into one of cutting and fastening the frames; secondly, making the drop-hole, vent-pipe, and foot-rest forms; and thirdly, placing the drop-hole and vent-pipe forms in the frame.

1. Cut lumber to desired dimensions as shown in Figures 1, 2 and 3. Use measuring tape and pencil to mark lumber to be cut.

2. Once the lumber has been cut, the pieces should be fit together to determine if they fit correctly and are of the correct dimension. Ask the trainer to check the form before they are nailed together.

3. Nail together the frame boards, which connect with each other along the length as shown in Figure 1.

4. Make two foot-rest forms as shown in Figure 3.

5. A flat area on the ground is covered with a plastic sheet, and the slab forms are staked into place as shown in Figures 1 and 2. Special care should be taken to make sure the corners of the forms are right angles and that the forms are right side up as shown in Figures 1 and 2. Do not nail the frame boards to the stakes.

6. Sand the edges of all pieces, particularly the drop-hole and vent-pipe forms.

7. Coat each piece of the form with used motor oil or grease and wipe off the excess.

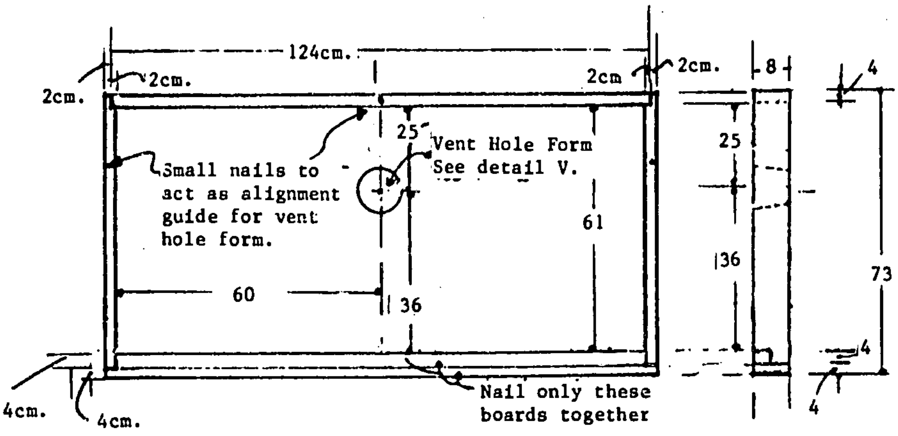
8. Cut the screed board. The dimensions are shown in Figure 5.

9. Place the vent hole form as in Figure 1.

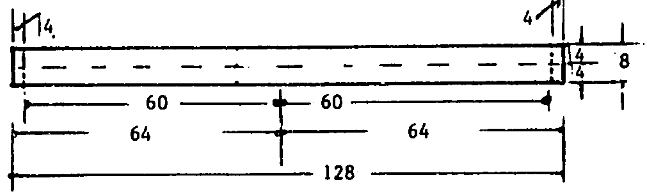
10. Place the drop-hole form as in Figure 2.

Note: Ninety minutes have been alloted for actually making the forms. This will vary if lumber has to be cut lengthwise.

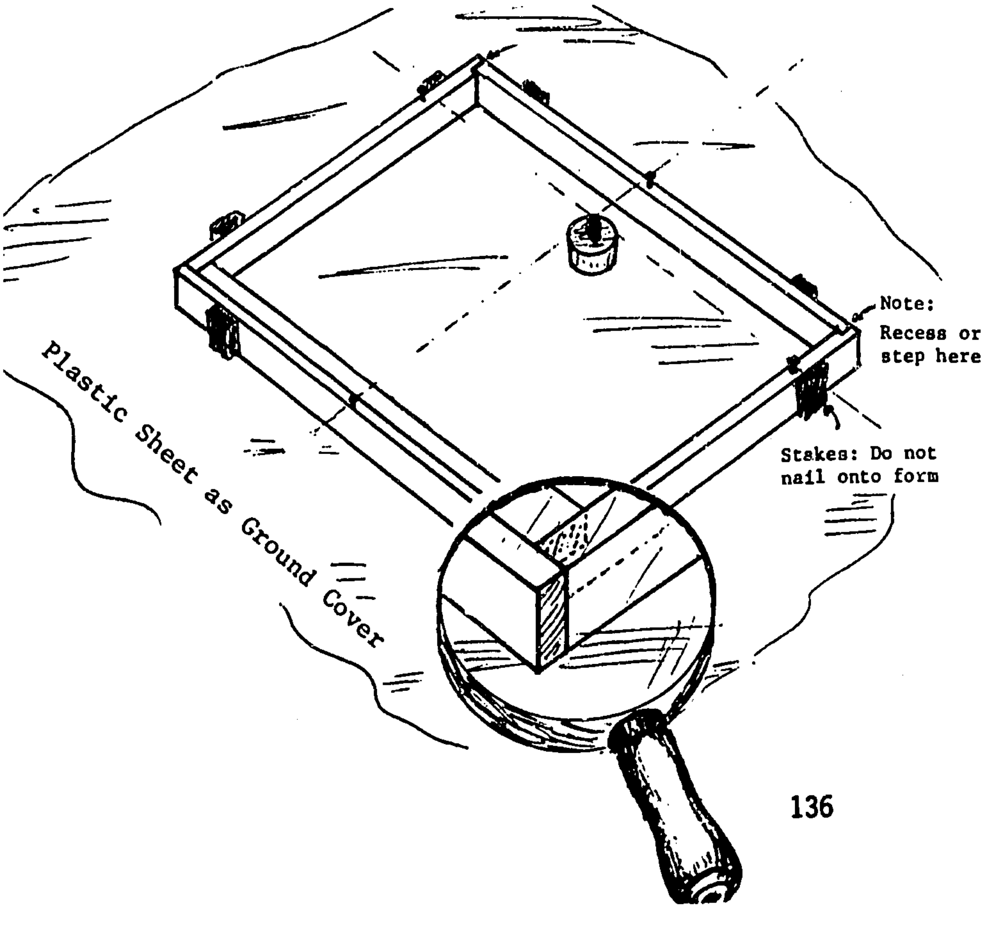
Figure 1. REAR LATRINE SLAB FORM
(Top, End & Side Views)

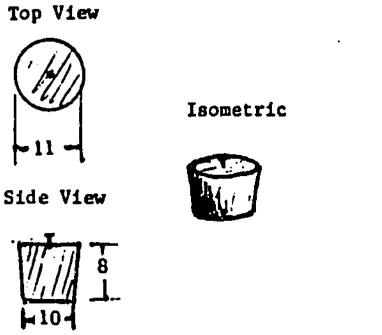


End View



Isometric View: The Form Assembled and Ready for Casting

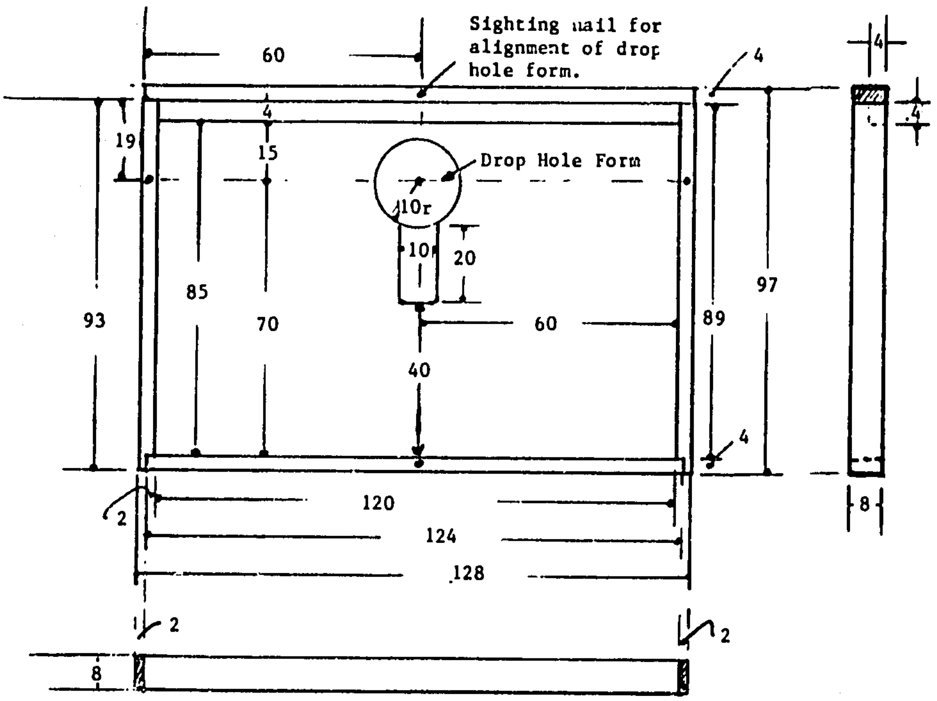




Note: The Cylinder is tapered for easy removal from concrete. A small nail is set in the center top to help locate/align the cylinder in the form as it is free standing.

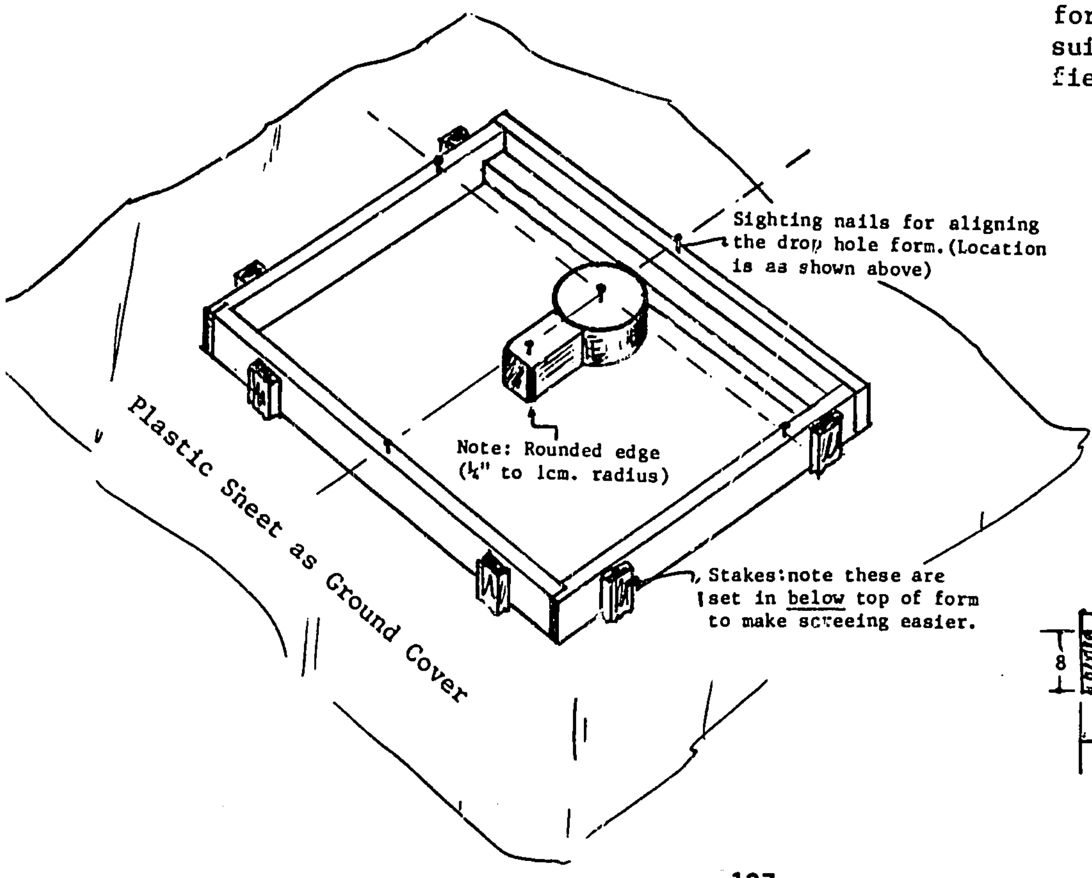
Detail V: Vent Hole Form

Figure 2. FRONT LATRINE SLAB FORM
(Top, End & Side Views)



DROP HOLE FORM DETAIL:

The drop hole form is a free standing wood block. It is made either from one piece of carved wood or two smaller pieces joined together. The latter alternative is ideal if a wood lathe is handy. The former alternative best suits labor intensive rural field situations.



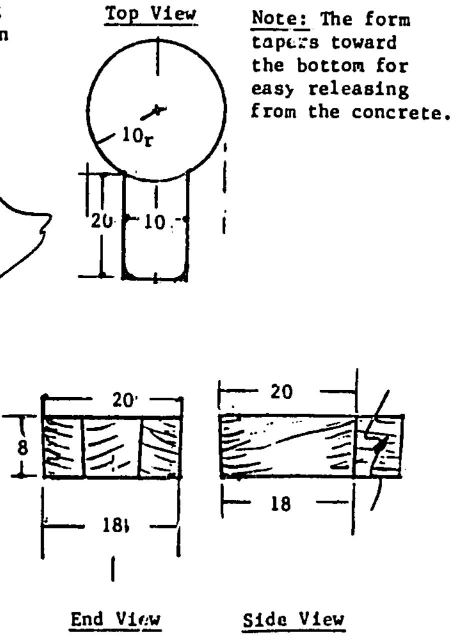
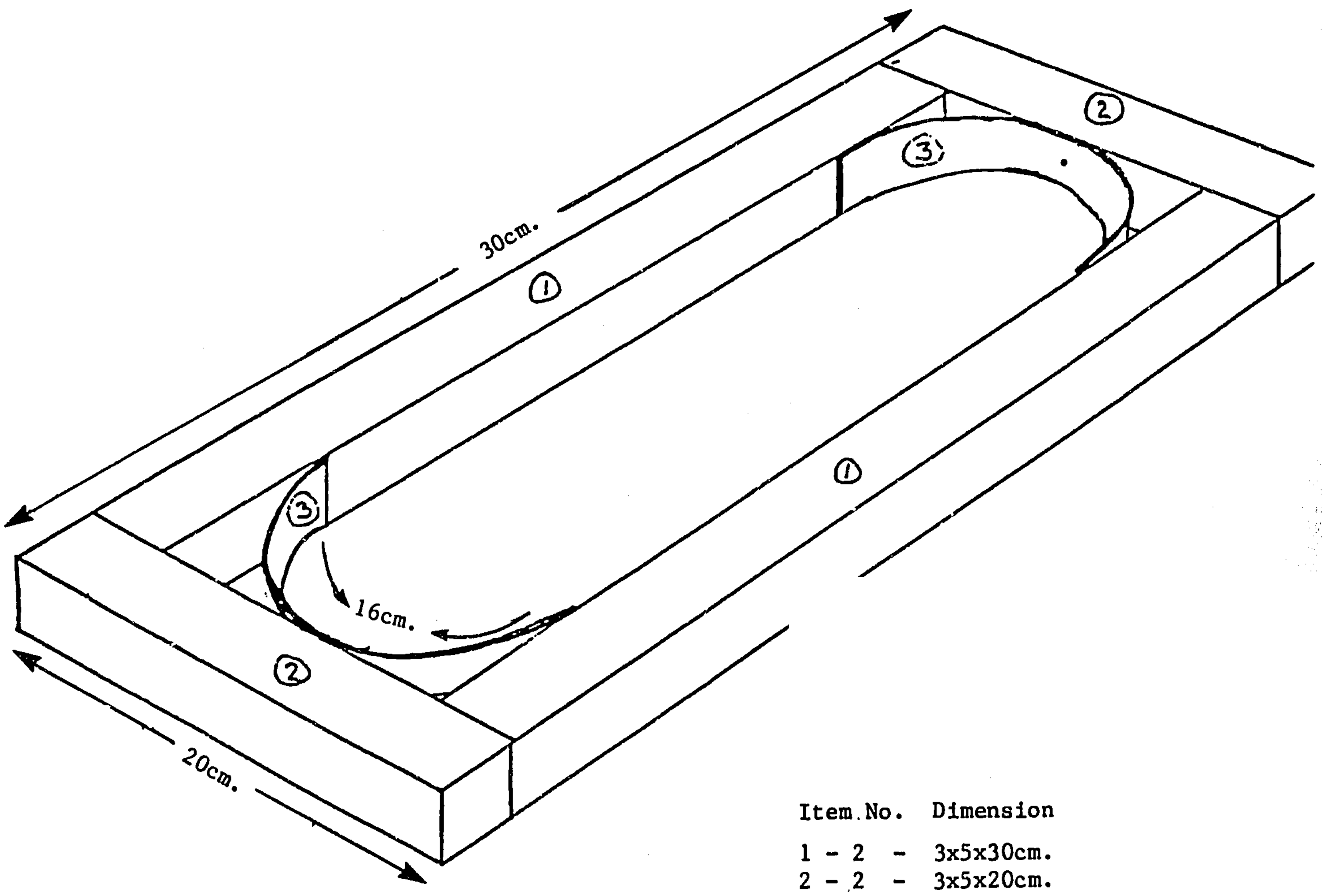


Figure 3. FOOT REST FORM



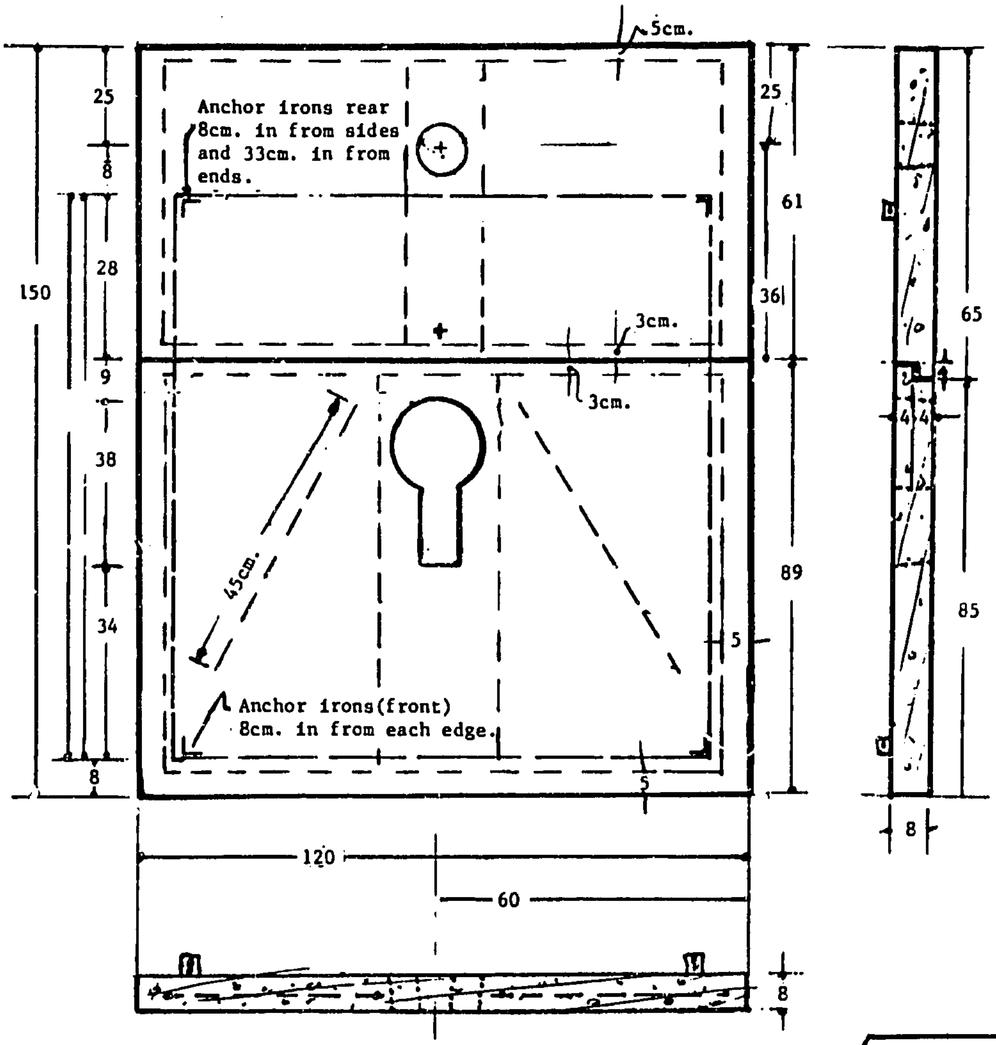
Item.No. Dimension

1 - 2 - 3x5x30cm.
2 - 2 - 3x5x20cm.

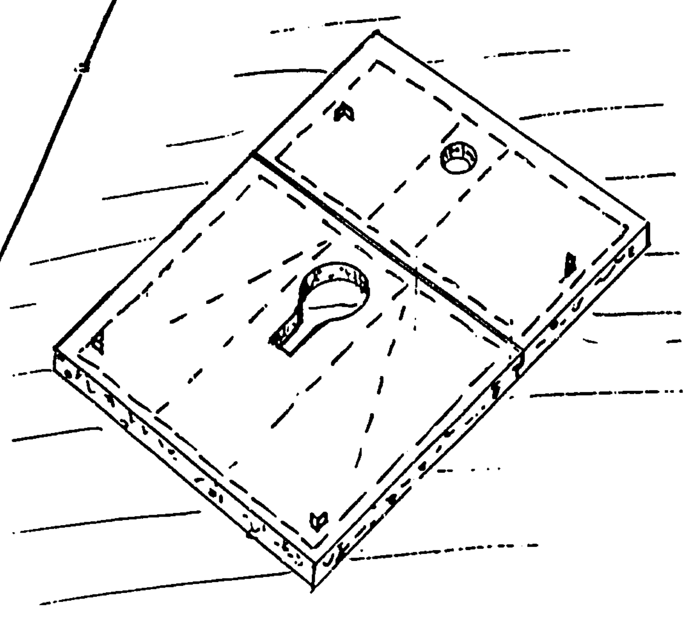
3 - 2 -- metal 3x16cm.

Note: Need 2 foot rest.

Figure 4. THE CAST CONCRETE PIT LATRINE SLAB WITH LATERAL SEPARATION INTO TWO SECTIONS (Front, Side & End Views)



THE SLAB IN ISOMETRIC VIEW



Materials

Cement: 3/5 bag or 32 kg. or 21.6 liters
Sand: 95 kg. or 43.2 liters
Gravel: 143 kg. or 64.8 liters
Reinforcing Rod (Re Bar): All 6mm. Ø
- 4 PCS: 110cm. length laterals
- 4 PCS: 81cm. length front longitudinals
- 4 PCS: 53cm. length rear
- 2 PCS: 45cm. length diagonals

Anchor (angle) iron 4 PCS 4x4x10cm.

Key to location lines in slab:

——— ——— ——— = Superstructure
— — — — — = Reinforcing Rod

TOOLS & MATERIALS FOR SLAB FORM CONSTRUCTION ONLY

QTY.	TOOLS
1	Wood Rasp (1/2 round - 12" - 14")
1	Wood Crosscut Saw
1	Wood Chisel (3/4" to 1-1/2")
1	Hammer (Claw)
1	Tin Snips (Large)
1	Builders Square (or T Square)
1	Measuring Tape 2 m
1	Sandpaper - 50-100 Grit $2H^2$ (30 x 60 cm) area
1	Rag/Brush for Used Motor Oil, Grease or Animal Fat

QTY.	MATERIALS	DISTRIBUTION OF ITEMS				
		Front Form		Rear Form		Foot Rest
		Frame	Drop Hole	Frame	Vent Pipe	
	Wood: (in centimeters unless otherwise noted)					
2	3 x 5 x 20	(As stakes)		(As stakes)		2
18	3 x 5 x 30	8		8		2
2	4 x 8 x 73			2		
2	4 x 8 x 93	2				
2	4 x 8 x 120	1		1		
2	4 x 8 x 124	1		1		
2	4 x 8 x 128	1		1		
1	11 x 11 x 8				1	
*1	*8 x 20 x 40 (for 1 carved form)		1			
	Nails or wood screws					
	10 5 cm Flat Head/Round Head					10
21	11 " " " (as locator or alignment pins)	4	2	4	1	
1	Sheet Metal (16 to 24 ga) 3 x 16 cm strip					1
100cc	Used oil, grease, or animal fat	<smooth coat over all parts of form>				

* If drop hole is to be made with a wood lathe the material would be: 1 pc 20 x 20 x 8 plus 1 pc 24 x 8 x 10. Latter is tongue and grooved into former which is turned to a 20 cm diameter cylinder.

TEAM INSTRUCTIONS FOR MIXING AND POURING CONCRETE

1. Choose a site for mixing concrete. The area should be smooth and watertight such as a concrete, metal, or wooden surface.

2. Clean the surface of the mixing area thoroughly.

3. Check to see if the sand needs to be washed. This should have been determined earlier by a silt test.

4. If sand is not clean enough wash with water.

5. Inspect gravel and remove any debris such as sticks, grass, clumps of soil, and large stones. The gravel should be 6 to 25 mm in diameter.

6. Measure out 2 parts sand and spread evenly over the mixing area. Mix only enough concrete to fill one form at a time. The quantities of materials to be mixed should be calculated by the team leader prior to this session.

7. Measure out 1 part cement and spread evenly over the sand.

8. Mix materials until color is uniform.

9. Spread this mixture out evenly; spread 3 parts gravel on it and mix thoroughly before water is added.

10. Form a hollow in the material and add water slowly while one or two of the participants mix the concrete with shovels.

11. Continue mixing until the mix is smooth and plastic, neither so wet that it will run nor so stiff that it will crumble.

12. Be careful not to add too much water. If, however, the mix is too wet add a small amount of sand and gravel in the proper 2:3 proportion until the mix is correct.

13. The wet concrete mix is carried to the slab form. Instruct the team to be careful not to handle the mixture too roughly or the fine aggregate will separate from the coarse aggregate.

14. Fill the slab mold one half of its depth (about 25 cm) with concrete. Be careful not to move vent-hole and drop-hole forms while pouring.

15. Place the reinforcement bar (re-bar) and anchor irons as shown in Figure 1.

16. Continue to fill the form with concrete. The concrete should be compacted so there are no air holes. This can be done using a piece of reinforcement bar, wooden pole or a shovel. Make sure the concrete has completely filled the edges of the form.

17. When the form is filled, screed the surface (Figure 5) to provide a rough finish. The screeding is done by pulling the screed back and forth and at the same time moving it across the form.

18. Once the concrete begins to stiffen slightly, use a finishing trowel to slope the slab towards the drop-hole as shown in Figure 4 (Handout 8-1). Smooth the concrete with the trowel to make it easy for cleaning. To get a smoother finish, mortar can be applied (1 part cement, 3 parts sand) to the surface.

19. The area where the foot rests are placed should be roughened up with a trowel to aid in bonding between the slab and foot rests. The foot rests should be placed as is appropriate locally. The foot rests will be made when the slab is installed.

20. Fill the second slab form repeating steps 3 to 20.

21. When the concrete stiffens in the first slab form, place the foot-rest forms as shown in Figure 4 (Handout 8-1). Fill the forms with concrete. Then repeat this step for the second foot-rest form.

22. Cover slabs with plastic sheeting to allow slow curing. If plastic sheeting is not available, cover with burlap, straw, etc. and keep moist over the next 4 days during the curing process.

23. Clean up work area and return all tools and materials to their proper place.

24. Make sure slabs are checked daily and add water to keep slabs moist during curing. This is critical during the first eight hours.

One may wish to finish off the slab with a smooth coat of plaster (1 part cement to 3 parts sand and gravel). This coating can be built up along the edges to provide a sloping surface toward the center drop-hole to aid in cleaning the latrine in actual use. Grades of 10 percent are suitable. This implies a coating which is about six centimeters in thickness at the most distant corners of the slab, sloping to about a half a centimeter in the vicinity of the drop-hole.

If a cement coat is to be applied, it is advisable to make the application within the first four hours of casting the slab to insure a reasonably good bond.

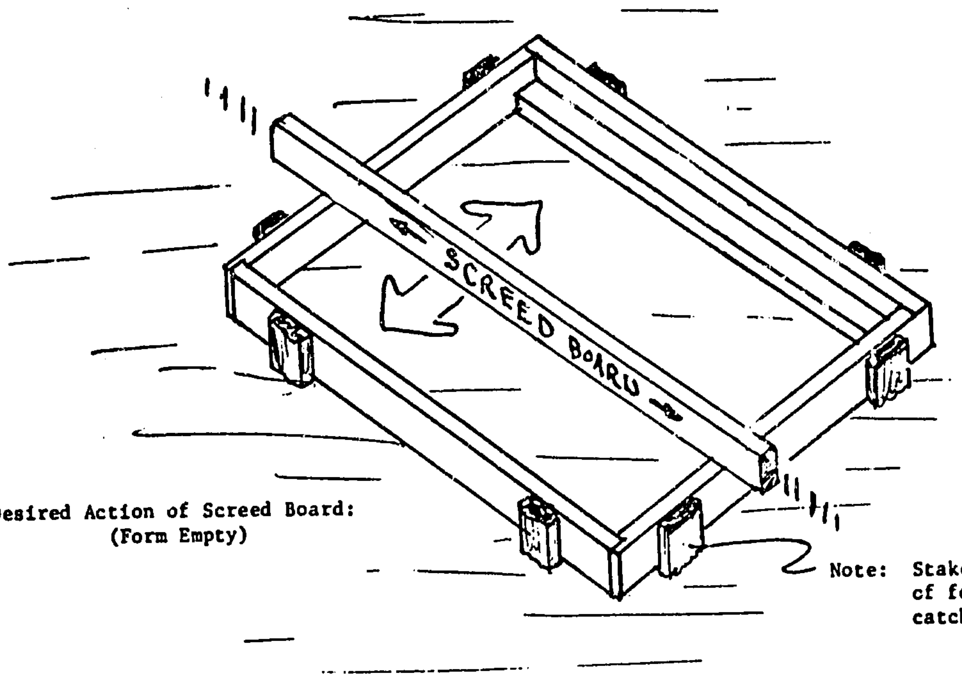
Materials Needed

Cement
Gravel
Sand
Lumber
Sheet metal
Nails
Used motor oil
Three screws to bolt vent-pipe form together

Tools Needed

Hammers
Saws
Measuring tape
Pencil
Square
Tin snips or a wood rasp
Shovel
Trowel
Buckets
Wheel barrow (optional)

Figure 5. SCREED BOARD USE IN LEVELLING CONCRETE IN FORMS.



Desired Action of Screed Board:
(Form Empty)

Note: Stakes set below level of form board to prevent catching of screed board.

The concrete is screed in the plain form shown with the drop hole/vent pipe forms in position. These must be held down as they will tend to float while the concrete is being screed. (Drop hole and vent pipe forms are not shown here)

MAKING GOOD CONCRETE

A. Introduction to Cement

Cement is one of the most useful materials in construction. It can easily be mixed with sand and water to make mortar or with gravel, sand and water to make concrete. Both mortar and concrete are among the strongest and most durable materials used for all types of construction around the world. Mortar is normally used as the bonding agent between bricks or rocks while concrete is normally reinforced with steel bars and molded to the desired size and shape.

Cement is available in almost every country in the world. Sand and gravel are usually available locally. Occasionally it will be difficult to get cement for latrine construction either because there are other higher priority demands for the cement or because it is too expensive. It is impossible here to say how or even whether cement can be obtained in such a circumstance.

Of the two cement compounds, mortar and concrete, concrete is the stronger. This is because the rock that makes up the gravel itself is stronger than the concrete and so contributes to its strength. Sometimes the two can be used interchangeably where lack of materials or working conditions demand it. Remember that concrete is the stronger product and should be used where possible.

NOTE: The rest of the discussion in this appendix will deal specifically with concrete. The same procedures can and should be followed if mortar is used instead.

B. Ingredients of Concrete

Concrete is made from cement, sand, gravel and water. These ingredients are combined in certain proportions to achieve the desired strength. The amount of water used to mix these ingredients is by far the most important factor in determining the final strength of the concrete. Use the least amount of water that will still give you a workable mix. Sand and gravel, which are sometimes referred to as fine and coarse aggregate respectively, should be clean and properly graded. Cement and water form a paste which, when mixed, acts as a glue to bind the aggregates together in a strong hard mass.

1. Proportions:

- There are four major ingredients in concrete: cement, sand, gravel, and water.
- Dry ingredients are normally mixed in certain proportions and then water is added. Proportions are expressed as follows: 1:2:4, which means that

to one part cement you add two parts sand and four parts gravel. A "part" usually refers to a unit of volume. Example: A 1:2:4 concrete mix could be obtained by mixing 1 bucket full of cement with 2 buckets of sand and 4 buckets of gravel.

- Proportions are almost always expressed as cement: sand: gravel, and they are usually labelled that way.

- There are many minor variations in the proportions used for mixing concrete. The most commonly used are 1:2:4, 1:2:3, 1:2.5:5. For purposes of well construction, all work equally well.

  NOTE: A 1:2:4 mix will go a little farther than the 1:2:3 mix and allows a little more room for using less than the best grade of sand or gravel than a 1:2.5:5 mix.

- Normal range for amount of water used to mix each 50 kg bag of cement is between 20 liters and 30 liters (94 lb. bag of cement is between 4.5 gal. and 7 gal.)

- The water-tightness of concrete depends primarily on the water/cement ratio and the length of moist curing. This is similar to concrete strength in that less water and longer moist-curing promote water-tightness.

Choice of Ingredients

- Cement: The descriptions and properties given in this appendix are specifically of Portland cement. This is the type most commonly used and hereafter will be referred to only as cement.

  When used, it should be dry, powdery and free of lumps. When storing cement, try to avoid all possible contact with moisture. Store it away from exterior walls, off damp floors, and stacked close together to reduce air circulation. If it could be kept completely dry it could be stored indefinitely. Even exposed to air it will gradually draw moisture, thus limiting even the covered storage time to between 6 months and 1 year depending on conditions.

- Water: In general, water fit for drinking is suitable for mixing concrete. Impurities in the water may affect concrete setting time, strength, shrinkage or promote corrosion of reinforcement.

- Aggregates: Fine and coarse aggregates together occupy 60% to 80% of concrete volume.

  - Fine aggregate: Sand should range in size from less than .25 mm to 6.3 mm. Sand from sea shores, dunes or river banks is usually too fine for normal mixes. (You can sometimes scrape about 30 cm of fine surface sand off and find coarser, more suitable sand beneath it.)

  - Large Aggregate: Within the recommended size limits mentioned later, the larger the gravel you use the stronger and more economical the concrete will be.

- The larger the size of the gravel the less water and cement will be required to get the same strength concrete.

- The maximum gravel size should not exceed:

  - one-fifth the minimum dimension of the member;
  - three-fourths the clear space between reinforcing bars or between reinforcement and forms. (Optimum aggregate size in many situations is about 2.0 cm.)

The shape and surface texture of aggregates affect properties of freshly mixed concrete more than they affect hardened concrete. Rough textured or flat and elongated particles require more water to produce workable concrete than do rounded or cubical aggregates and more water reduces the final strength of the concrete.

It is extremely important to have the gravel and sand clean. Silt, clay, or bits of organic matter, even in low concentrations, will ruin concrete. A very simple test for cleanliness makes use of a clear widemouth jar. Fill the jar about half full of the sand and small aggregate to be tested, and cover with water. Shake the mixture vigorously, and then allow it to stand for three hours. In almost every case there will be a distinct line dividing the fine sand suitable for concrete and that which is too fine. If the very fine material amounts to more than 10% of the suitable material, then the concrete made from it will be weak.

This means that other fine material should be sought, or the available material should be washed to remove the material that is too fine. This can be done by putting the sand (and gravel if necessary) in some container such as a drum. Cover the aggregate with water, stir thoroughly, let stand for a minute, and pour off the liquid. One or two such treatments will remove most of the very fine material and organic matter.

Another point to consider in the selection of aggregate is its strength. About the only simple test is to break some of the stones with a hammer. If the effort required to break the majority of aggregate stones is greater than the effort required to break a similar sized piece of concrete, then the aggregate will make strong concrete. If the stones break easily, then you can expect that the concrete made of these stones will only be as strong as the stones themselves.

In very dry climates several precautions must be taken. If the sand is perfectly dry, it packs into a smaller space. If 20 buckets of dry sand are put in a pile and two buckets of water stirred in, you could carry away about 27 buckets of damp sand. If your sand is completely dry, add some water to it or else measure by weight instead of volume. The surface of the curing concrete should be kept damp. This is because water evaporating from the surface will remove some of the water needed to make concrete properly. Cover the concrete with building paper, burlap, straw, or anything that will hold moisture and keep the direct sun and wind from the concrete surface. Keep the concrete moist by sprinkling as often as necessary; this may be as often as three times per day. After the first week of curing, it is not necessary to keep the surface damp continuously (see "Curing Concrete" below).

3. Estimating Quantities of Materials Needed

1. Calculate the volume of concrete needed.

2. Multiply the volume of concrete needed by 3/2 (1.5) to get the total volume of dry loose material needed. The cement and sand do little to add to the volume of the concrete because they fill in the air spaces between the gravel.

3. Add 10% (1/10) for losses due to handling.

4. Add the numbers in the volumetric proportion that you will use to get a relative total. This will allow you later to compute fractions of the total needed for each ingredient (1:2:3 = 6).

5. Determine the amount of cement needed by multiplying the volume of dry material needed (from step 2) by the proportional amount of the total mix (e.g., amount cement needed = 1/6 x volume dry materials).

6. Divide by the unit volume per bag, 33.2 liters per 50 kg bag cement or 1 cubic foot per 94 lb. bag cement. When figuring the number of cement bags round up to nearest whole number.

NOTE: This calculation, even with the 10% addition for handling losses, rarely leaves any extra concrete, particularly for small jobs requiring less than 5 hand-mixed bags of cement.

C. Construction with Concrete

1. Outline of Concrete Work:

- Build form (8C.5.2)
- Place rebar (8C.5.3)
- Mix concrete (8C.5.4)
- Pour concrete (8C.5.4)
- Remove forms (8C.5.4)
- Finish surface (8C.5.4)
- Cure concrete (8C.5.4)

2. Materials for Forms

The following materials are used to construct interior forms:

- Steel: forms made of steel are durable and strong but are heavy, awkward, and expensive.

- Sheet metal: with a simple triangular interior support, forms made of sheet metal have proved to be successful. They are lighter and more maneuverable than steel forms but are not as strong and durable.

- Wood: this material is commonly used because it is lightweight and strong. It must be carefully bent, waterproofed, and reinforced.

By using boards as wide as possible, form construction is easier and quicker. It also reduces the number of lines on the concrete surface that form at the junction of two boards. Plywood is excellent, especially if it has a special high density overlay surface. This allows for a smoother concrete finish, easier form removal and less wear on the forms.

If unsurfaced wood is used for forms, oil or grease the inside surface to make removal of the forms easier and to prevent the wood from drawing too much water from the concrete. Do not oil or grease the wood if the concrete surface will be painted or stuccoed.

- Earth: Any earth that can be dug into and still hold its shape can also be used as a form. Carefully dig out the desired shape and fill it with concrete. Once the concrete has set and cured it can be dug up and used where needed. A new form will have to be dug out for each piece of concrete poured.

- Other materials: Plastics and fiberglass are also occasionally used and continue to be experimented with as form materials. Fiberglass is much lighter than steel and, if handled carefully, lasts for a long time. Its cost and availability in developing nations seem to be the only factors limiting more widespread trials.

3. Concrete Reinforcement

Reinforcing concrete will allow much greater loads to be carried. Design of reinforced concrete structures that are large or must carry high loads can become too complicated for a person without special training.

Concrete alone has great compression strength but little tensile strength. Concrete is very difficult to squeeze (compression), but breaks relatively easily when stretched (put in tension). Reinforcing steel has exactly the opposite properties; it is strong in tension and weak in compression. Combining the two results in a material (reinforced concrete) which is strong in both compression and tension and therefore useful in a large number of situations.

Concrete is best reinforced with specially made steel rods which can be imbedded in the concrete. Bamboo has also been used to reinforce concrete with some success although it is liable to deteriorate with time.

- Reinforced concrete sections should be at least 7.5 cm thick although 10 cm is preferable.

- The reinforcing bar (rebar) usually comes in long sections of a given diameter.

- Exactly how much rebar is needed in a particular pour will depend on the load it will have to support. For most concrete work, including everything discussed in this manual, rebar should take up 0.5% to 1% of the cross-sectional area.

- Reinforcing bars should also have clean surfaces free of loose scale and rust. Bars in poor condition should be brushed thoroughly with a stiff wire brush.

- When placing rebar in a form before the concrete is poured it should be located:

  - at least 2.5 cm from the form everywhere.
  - in a plane approximately one-third of the way into the thickness of the pour from the bottom of the structure or slab.
  - in a grid so that there is never more than three times the final concrete thickness between adjacent bars.
  - no closer than 3 cm to a parallel bar.

- Rebar strength is approximately additive according to cross-sectional area. Four 4 mm rebars will be about as strong as one 8 mm rebar. The cross-sectional area of four 4 mm rebars equals the cross-sectional area of one 8 mm rebar.

- The rebars should be arranged in an evenly spaced grid-type pattern with more and/or thicker rebar along the longest dimension of the pour.

- All intersections where rebars cross should be tied with thin wire.

- When one rebar is tied onto another to increase the length of the rebars, the overlap should be 20 times the diameter of the rebar and be tied twice with wire.

Rebar Size	Overlap
6 mm	12 cm
8 mm	16 cm
10 mm	20 cm
12 mm	24 cm

- Larger sizes of rebar often have raised patterns on them which are designed to allow them to be held firmly in place by the concrete. Smaller sizes of rebar are generally smooth. When using smooth rebar always make a small hook at the end of each piece that will be in the concrete. Without the hook, temperature changes may eventually loosen the concrete from the rebar thereby destroying much of its reinforcing effect.

- Rebar should be carefully prepared so that the rebar is straight and square. Sloppy rebar work will result in weaker concrete and waste rebar.

- For particularly strong pieces or where small irregular shapes are being formed, the rebar can be put together in a cage-like arrangement. Use small rebar for the cross-sections and larger rebar for the length. This system is used to reinforce pieces like a cutting ring, with its irregular shape, or perhaps a well cover, which may have many people standing on it at one time.

- Where possible, it is usually best to assemble rebar inside the form so that it will fit exactly.

- The proper distance from the bottom of the pour in a slab can be achieved by setting the rebar on a few small stones before the concrete is poured or simply pulling the rebar grid a couple of centimeters up into the concrete after some concrete has been spread over the whole pour.

4. Mixing Concrete by Machine or by Hand

a. Mixing by Machine

Concrete must be thoroughly mixed to yield the strongest product. For machine mix, allow 5 or 6 minutes after all the materials are in the drum. First, put about 10% of the mixing water in the drum. Then add water uniformly with the dry materials, leaving another 10% to be added after the dry materials are in the drum.

b. Mixing by Hand

On many self-help projects, the amount of concrete needed may be small or it may be difficult to get a mechanical mixer. If a few precautions are taken, hand-mixed concrete can be as strong as concrete mixed in a machine.

The first requirement for mixing by hand is a mixing area which is both clean and watertight. This can be a wood and metal mixing trough (Fig. 8C-45) or simple round concrete floor (Fig. 8C-46).

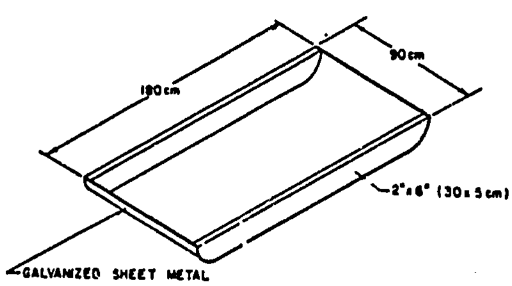


Figure 8C-47. Mixing Trough

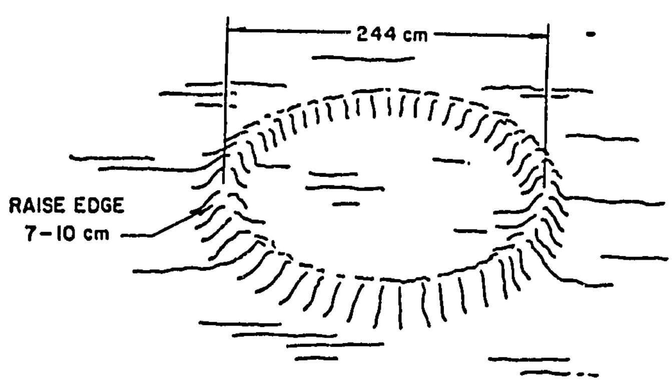


Figure 8C-48. Mixing Floor

Use the following procedure:

1. Spread the fine aggregate evenly over the mixing area.

2. Spread the cement evenly over the fine aggregate and mix these materials by turning them with a shovel until the color is uniform.

3. Spread this mixture out evenly, spread the coarse aggregate on it and mix thoroughly again. All dry materials should be thoroughly mixed before water is added.

A workable mix should be smooth and plastic -- neither so wet that it will run nor so stiff that it will crumble. If the mix is too wet, add small amounts of sand and gravel, in the proper proportion, until the mix is workable. If a concrete mix is too stiff, it will be difficult to place in the forms. If it is not stiff enough, the mix probably does not have enough aggregate, thus making it an uneconomical use of cement.

When work is finished for the day, be sure to rinse concrete from the mixing area and the tools to keep them from rusting and to prevent cement from caking on them. Smooth shiny tools and mixing boat surfaces make mixing surprisingly easier. The tools will also last much longer.

5. Pouring Concrete Into Forms

To make strong concrete structures, it is important to place fresh concrete in the forms correctly.

The wet concrete mix should not be handled roughly when it is being carried and put in the forms. It is very easy, through joggling or throwing, to separate the fine aggregate from the coarse aggregate. Do not let the concrete drop freely for a distance greater than 90 to 120 cm (3 to 4 feet). Concrete is strongest when the various sizes of aggregates and cement paste are well mixed.

Properly proportioned concrete will have to be worked into place in the form. Concrete that would on its own flow out to completely fill in a form would be too wet and therefore weak.

When pouring concrete structures that are over 120 cm high, leave holes in the forms at intervals of less than 120 cm through which concrete can be poured and which can later be covered to permit pouring above that level. Alternatively, a slide could be used through which concrete could flow down to the bottom of the form without separating. Any "U"-shaped trough wide enough to facilitate pouring concrete into it, narrow enough to fit inside the form, and long enough so that the concrete can slide down the chute without separating will work.

As the concrete is being placed it should be compacted so that no air holes, which would leave weak spots in the concrete, are left. This can be done by tamping the concrete with some long thin tools or vibrating the concrete. Tamping can be accomplished with a thin (2 cm) iron rod, a wooden pole or a shovel.

The concrete will be compacted to some extent as it is moved into its final position in the form. However, special attention must be paid to the edges of the pour to make sure that the concrete has completely filled in against the form. If the forms are strong enough they can be struck with a hammer on the outside to vibrate the concrete just enough to allow it to settle completely in against the forms. Too much vibration can force most of the large aggregate toward the bottom of the pour, thus reducing the overall strength of the concrete.

6. Finishing

Once the concrete is poured into the forms, its surface should be worked to an even finish. The smoothness of the finish will depend on what the surface will be used for. Where more concrete or mortar will later be placed on this pour, the area should be left relatively rough to facilitate bonding. Where the surface will later be walked on, as for example the cover of a well on which a pump will be mounted, it should be somewhat rough to prevent people from slipping on the concrete when its surface is wet. This somewhat rough texture can be achieved by finishing with a wooden float or by lightly brushing the surface to give it a texture. A very smooth finish can be made with a metal trowel. Over-finishing (repeated finishing) can lead to powdering and erosion of the surface.

7. Curing Concrete

After the forms are filled, the concrete must be cured until it reaches the required strength. Curing involves keeping the concrete damp so that the chemical reaction that causes the concrete to harden will continue for as long as is necessary to achieve the desired strength. Once the concrete is allowed to dry the chemical hardening action will gradually taper off and cease.

The early stage of curing is extremely critical. Special steps should be taken to keep the concrete wet. Once the concrete dries, it will stop hardening; after this happens it cannot be re-wetted in the field to re-start the hardening process.

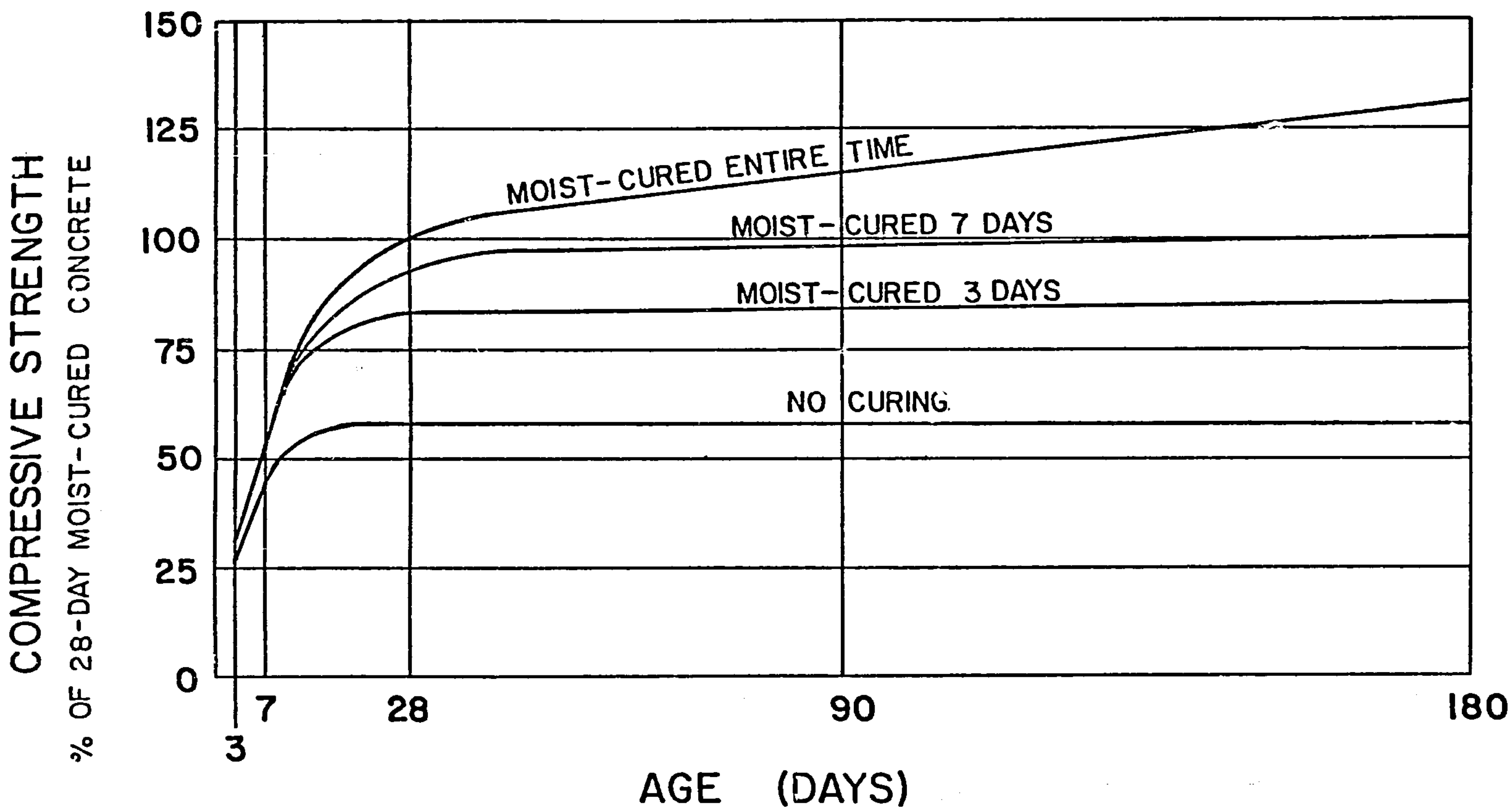
Covering the exposed concrete surfaces is usually easier than continuously sprinkling or frequently dousing the concrete with water which would otherwise be necessary to prevent the concrete surface from becoming dry. Protective covers often used include canvas, empty cement bags, burlap, plastic, palm leaves, straw and wet sand. The covering should also be kept wet so that it will not absorb water from the concrete.

Concrete is strong enough for light loads after 7 days. In most cases, forms can be removed from standing structures like bridges and walls after 4 or 5 days, but if they are left in place they will help to keep the concrete from drying out. Where concrete structures are being cast on the ground, the forms can be removed as soon as the concrete sets enough to hold its own shape (3 to 6 hours) if there is no load on the structure and measures are taken to ensure proper curing.

The concrete's final strength will result in part from how long it is moist cured. As can be seen from the Graph 8C-1, concrete will eventually reach about 60% of its design strength if not moist cured at all, 80% if moist cured for 3 days, and almost 100% if moist cured for 7 days. If concrete is kept moist, it will continue to harden indefinitely.

GRAPH 8C-1

Compressive Strength of Concrete



GUIDE TO SESSION 9: CONSTRUCTING A BASE

Total Time: 4 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to the session	Presentation	5 minutes		Session objectives
Constructing a base	Presentation and discussion	15 minutes	Handout 9-1: Examples of Latrine Bases	
Field task assignment	Presentation and discussion	10 minutes	Handout 9-2: Team Instructions for Construction of a Concrete Base	
Field task	Fieldwork	2 hours & 50 minutes	Construction materials	
Review of fieldwork	Discussion	35 minutes		
Closure	Group discussion	5 minutes		

Session 9:Base Construction

Total Time: 4 hours

OBJECTIVES

At the end of this session participants will be able to:

- o Construct a form for a concrete base
- o Dig a shelf for the base around the pit
- o Pour and place concrete into the form

OVERVIEW

This session consists primarily of construction. Each construction team makes a simple wooden form for the base, digs a shelf around the pit, and pours the concrete base. The mixing and pouring of concrete will be a review for the participants because they mixed concrete for the slab the previous day.

The session has been designed for making a base around a square unlined pit. Some modification will be necessary if the pit is circular and/or lined. Although some latrine designs call for the base to be constructed before the pit is dug, this workshop does not since the pits are dug prior to the workshop in order to save time.

The participants have the entire morning for this activity.

PROCEDURES

1. Introduction Time: 5 minutes

Share the session's objectives and give an overview.

2. Constructing a Base: Lecturette Time: 15 minutes

The trainer should present and discuss the following information on constructing a base (also commonly referred to as a ring beam, collar, or concrete frame):

- o There are two main reasons for building a base for a latrine slab.
  - The base prevents erosion around the slab, particularly from rainwater.
  - The base adds support for the concrete slab and the surface structure.

A base can be constructed with wood, bricks, concrete block, or poured concrete. However, a wood base will not last as long as the other types because of termite damage and rotting. Look at Handout 9-1:Examples of Latrine Bases.

The quantity of materials needed to construct a base depends on the type of material and the size of the pit. One way to estimate the quantity for a brick, concrete, or concrete block base is to calculate the distance around the top of the pit. This distance is called the periphery; it is equal to twice the length plus twice the width. For a base made of bricks or concrete blocks, there must be enough bricks or blocks to place side by side. For example, if a pit is 1.2 m long and 1 m wide, the periphery equals

$$\begin{aligned} & (2 \times 1.2) + (2 \times 1) \\ = \; & 2.4 + 2 \\ = \; & 4.4 \text{ m} \end{aligned}$$

For a poured concrete base, the quantity of poured concrete is equal to the area of the larger trench minus the area of the pit times the thickness of the base. In this workshop, a poured concrete base will be used for a pit that is 1 m square. The base will be 150 mm wide and 75 mm thick.

Ask the participants to calculate the amount of concrete needed. The answer is

$$\begin{array}{ll} & 1.3 \text{ m } (1 \text{ m} + 150 \text{ mm} + 150 \text{ mm}) \\ \times & 1.3 \text{ m } \quad '' \quad '' \quad '' \\ \hline & 1.69 \text{ m}^3 \\ - & 1 \text{ m}^3 \text{ (area of pit)} \\ \hline & .69 \text{ m}^3 \\ \times & .075 \text{ m (thickness of base)} \\ \hline & .052 \text{ m}^3 \text{ (amount of concrete needed)} \end{array}$$

3. Field Task Assignment — Time: 10 minutes

Explain to the participants that they will be constructing a poured concrete base. Distribute Handout 9-2:Team Instructions for Construction of a Concrete Base. Go over the instructions with the total group and explain that there are three main parts to this task.

- o Building a wooden form for the inner wall.
- o Cutting a shelf for the base around the pit.
- o Pouring and placing concrete into the form.

Ask the group to break into their construction teams. Remind the team leaders of their roles. Tell the group they have 3 hours to complete the task and should be back in the workshop 40 minutes before the end of the session to review the morning's fieldwork.

4. Fieldwork Time: 2 hours & 50 minutes

Teams go to their sites and construct poured concrete bases. No work crews are needed for this session.

5. Review Fieldwork Time: 35 minutes

In the total group take about 10 minutes and ask each team leader:

- o How did it go today? What were the highlights?
- o What was it like to be team leader and to manager others?
- o What did you learn about supervising others?
- o What would you do differently next time?

Manage the time carefully and keep the focus on what was learned in supervising others.

For the next 10 mintues discuss with the team members the following:

- o What did you learn about being a worker?
- o What kind of leadership style did your team leader use?

Be sure to handle any negative comments about leadership style carefully. The points is to learn effective ways to supervise others.

Review the actual fieldwork by asking the following questions. Take about 15 minutes.

- o What aspects of the construction did you find difficult?
- o What problems did you encounter and how were they resolved?
- o What would you do differently next time?
- o What were the most important things you learned about building a base?

Ask for any further questions or comments.

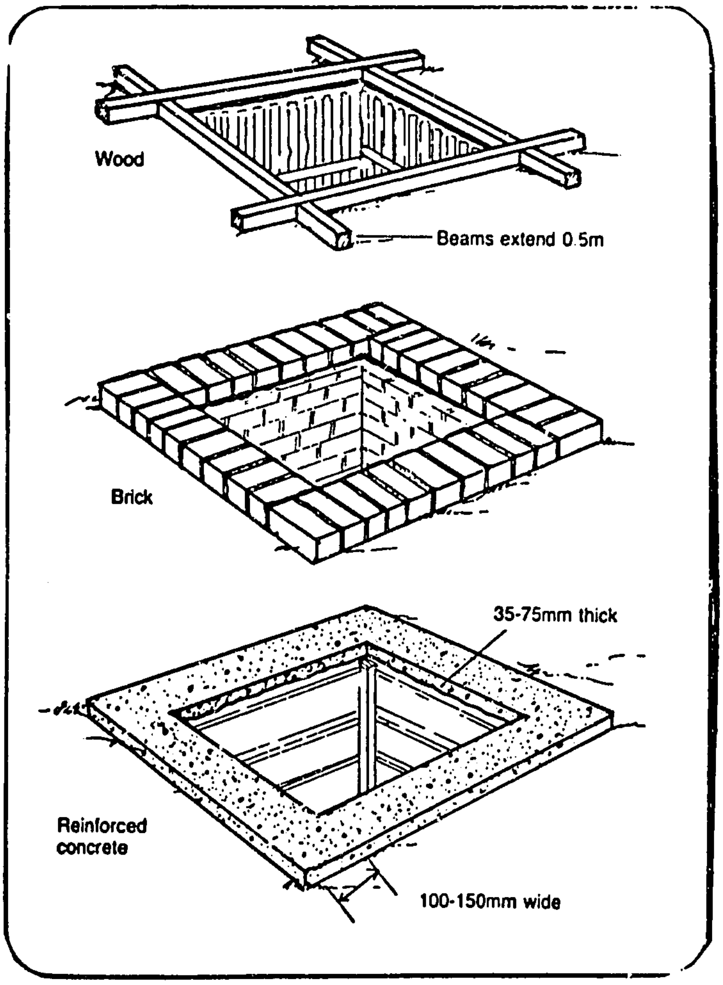
6. Closure Time: 5 minutes

Thank team leaders and commend every one for their hard work. Point out that the afternoon session will focus on pit lining and, as the last session of the first week, on making sure that all construction is completed and ready for next week.

MATERIALS NEEDED

Handout 9-1:Examples of Latrine Bases
Handout 9-2:Team Instructions for Construction of a Concrete Base
Construction Materials

Examples of Latrine Bases



TEAM INSTRUCTIONS FOR CONSTRUCTION OF A CONCRETE BASE

Your team will be:

1) Constructing a wood form for a concrete base.

2) Cutting a shelf.

3) Pouring and placing concrete into the form.

Prepare for this activity by determining in what order you will do specific tasks and who will do what. Be aware of each other's skills and of individual needs to learn specific construction tasks.

The pit is 1 meter square.

1) Measure and draw a line at least 150 mm away from the pit hole parallel to each side of the pit (see Handout 9-3).

2) Dig a shallow shelf around the edge of the pit 75 mm deep out to the line measured above. Make the outer edge as vertical as possible since this will serve as the outer form when pouring the base.

3) Bend a length of reinforcement bar (re-bar) (8 mm) into a square with sides measuring 1.15 m.

4) Cut 2 pieces of 50 x 150 mm or 50 x 200 mm lumber into 1 m lengths. Cut 2 pieces of 50 x 150 mm or 50 x 200 mm lumber into 1.05 m lengths. Nail four pieces together in the shape of a square. Cut 2 poles 2 m long and nail them across the top of the square as seen in Figure 2 below.

5) Place square form over the top of the pit. After the shelf has been dug, the inner form constructed and placed, and the re-bar bent into squares, you are ready to mix the concrete.

6) Mix concrete using the same preparation figures as described for the slab preparation in Session 8.

7) Wet the ground and pour the first layer of concrete on the shelf with a thickness of 20 to 30 mm.

8) Place 8 mm re-bar square in the trench on top of the first concrete layer.

9) Pour the remaining concrete over the re-bar until it is level with the ground surface. To ensure concrete settling properly, periodically vibrate the poured concrete with a stick.

10) Finish and smooth off the top of the base.

11) Cover the poured concrete and let set for 1-1/2 days.

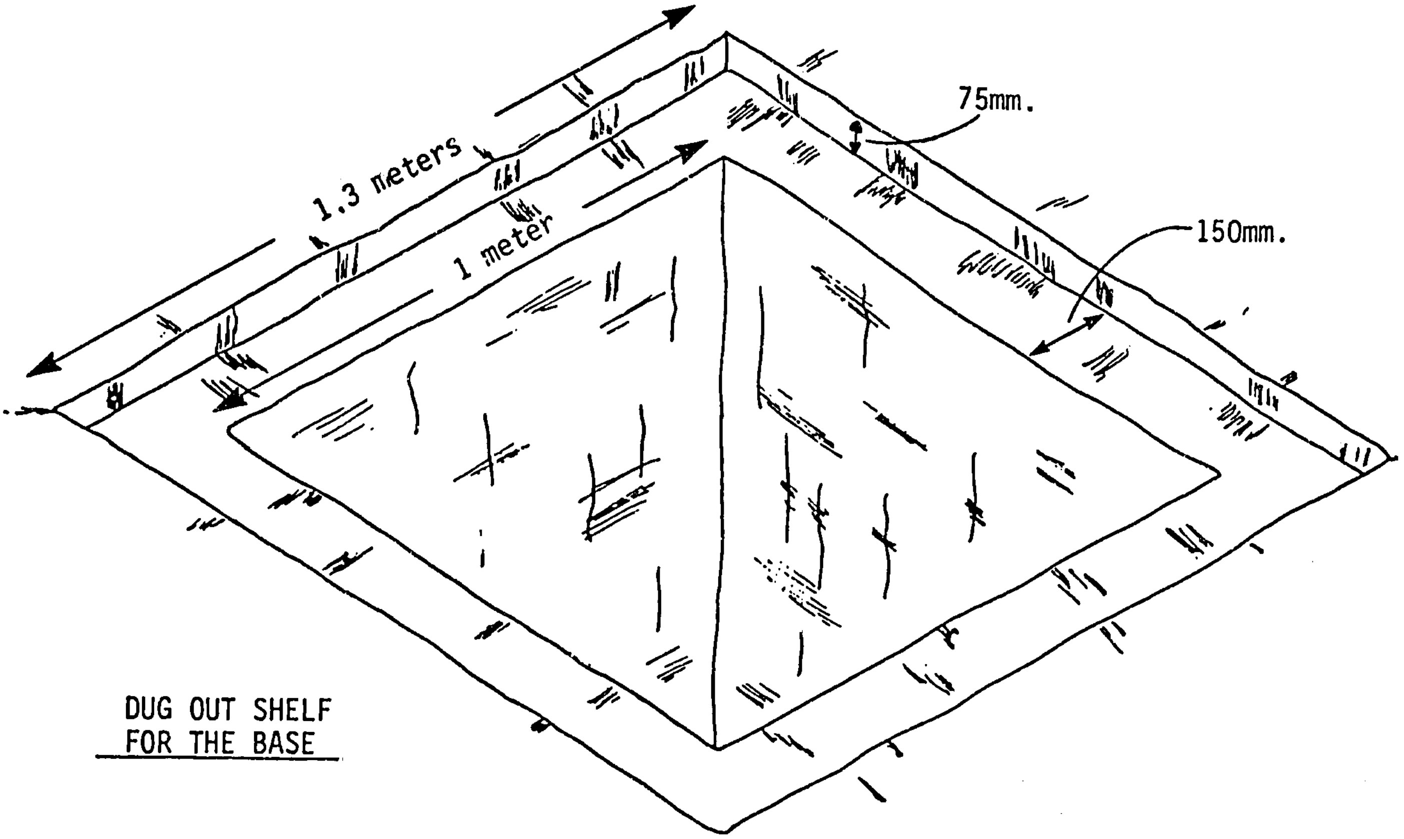
12) Remove inner forms.

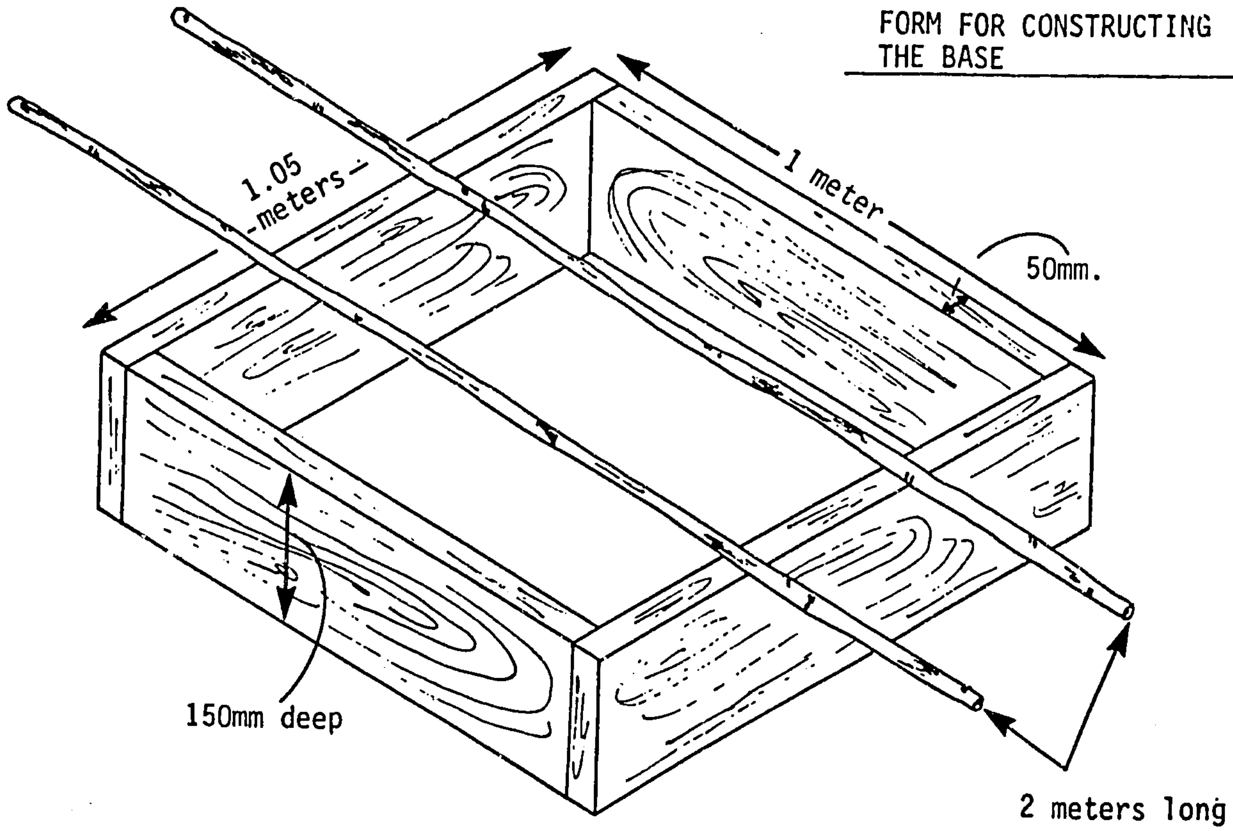
MATERIALS NEEDED (Per construction team)

Cement (.013 m^3)
Sand (.026 m^3)
Gravel (.052 m^3)
Wood 50 mm x 150 mm x 45 mm
Nails
Used motor oil
Wire
2 poles 2 meters long

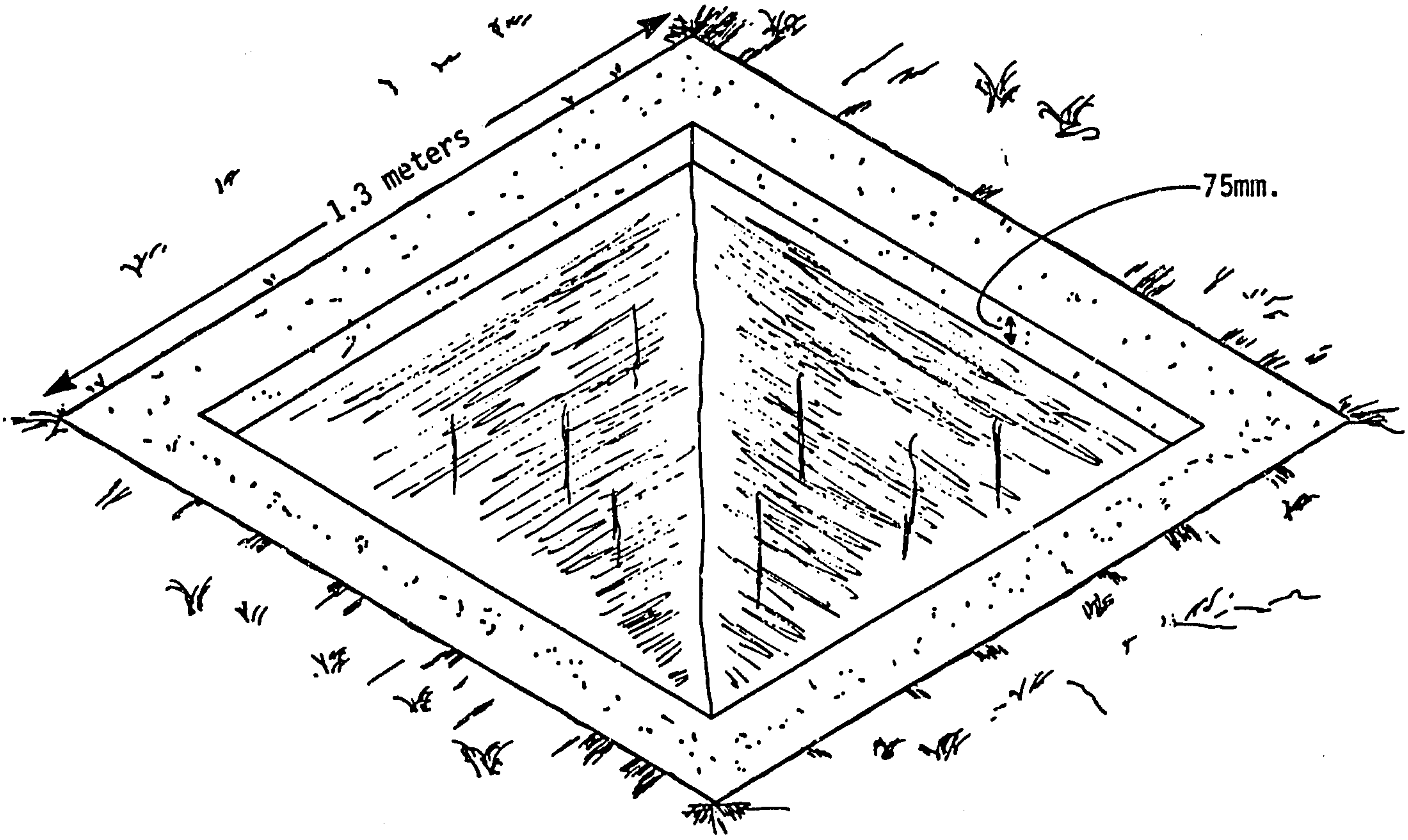
TOOLS NEEDED

Axe or Shovel
Tape measure
Saw
Hammer
Trowel





Latrine Base Construction



COMPLETED CONCRETE BASE

GUIDE TO SESSION 10: LINING THE PIT

Total Time: 3 hours & 30 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session	Presentation	5 minutes		Session objectives
Lining a pit	Presentation and discussion	30 minutes	Handout 10-1, 10-2, 10-3, 10-4 and 10-5: Instructions and Drawings for Lining Pits	
Estimating lining requirements	Discussion and examples of calculations	15 minutes		
Field task assignment	Present and discuss	10 minutes		Task instructions
Field tasks	Fieldwork	90 minutes		
Review of field tasks	Discussion	20 minutes		
Process teamwork	Teams discussion	20 minutes		
Closure	Group discussion	20 minutes		

Session 10: Lining the Pit

Total Time: 3 hours & 30 minutes

OBJECTIVES

At the end of this session participants will be able to:

- State reasons for lining a pit
- Estimate materials needed for lining a pit
- Explain how to line a pit using locally appropriate materials

OVERVIEW

This session explains how pits should be lined. The session begins with a brief introduction and a discussion of why pits need to be lined and what materials are appropriate for lining. Teams also estimate materials needed for lining.

Because of time constraints, the participants do not actually line pits during the workshop. If the pits require lining, this is done prior to the fourth day of the workshop by the work crews. If the pits have been lined, the teams will inspect the linings to see how it was done and make observations.

Since this is the final field task of the first week of training, participants also make sure that all the fieldwork has been properly completed for Tuesday, when the slabs will be installed. The teams also inspect each other's work. Upon completion of the field tasks, the session is reviewed in the workshop.

PROCEDURES

1. Introduction to Session — Time: 5 minutes

Share objectives and provide an overview of the day.

2. Lining a Pit - Lecturette — Time: 30 minutes

Introduce the topic. Describe how lining a pit is extremely important. In many instances, it is recommended that the pit be lined. The two principal reasons for this are to:

hold back the soil around it
indirectly support the slab

Many pits need to be lined even though the soil is sometimes dense like clay and appears stable. This is the case when the soil gets wet and becomes greasy and slides. Ask for examples of what can happen if a pit is not properly lined. Mention that the decision to line a pit should be based on the past experience of local people and on the judgement of someone with experience in soil conditions.

Discuss the types of material that can be used for lining. These should include:

brick
concrete blocks
logs
bamboo
timber poles

Explain that the two criteria to use in selecting materials for lining are strength and cost. The best source of information on cost, availability, and durability of materials is usually local people. Ask for materials that participants know are used in their area to line pits.

Describe Handouts 10-1, 10-2, and 10-3 (all on lining square or rectangular pits) and discuss pit lining procedures with the total group. Point out the differences in lining with poles and bricks. Then distribute Handout 10-4 and 10-5 (on lining circular pits) and discuss lining circular pits and how it differs from lining square pits.

3. Estimate Lining Requirements   Time: 15 minutes

To determine the quantity of material needed for lining, the overall area of each side of the pit needs to be determined. This is done by multiplying the pit depth times the width of each wall and adding them together.

If a pit is 2.7 m deep by 1 m square the quantity of material would be:

2.7 x 4 = 10.8 m square

The quantity of material can now be determined, i.e., if there are 100 bricks per square meter then 10.8 m square x 100 bricks = 1,080 bricks needed.

Work through an example or two of how to calculate the quantity of materials needed to line a pit. Use different types of materials in the examples.

4. Field Task Assignment   Time: 10 minutes

Explain to teams that they will have three field tasks. Write the following on a flipchart.

1) Inspect the pit linings done by the work crew. Each team should use the appropriate instructions (Handout 10-1 or 10-2 if a square pit or 10-4 if a circular pit) as a basis for inspecting the pit linings. Inspect your own pits plus one other. This task will not be necessary if the pits are not lined (30 minutes).

2) Look at each other's construction work (i.e. the concrete collar and the slab) and note any differences or problems and their solutions (30 minutes).

3) Check the work site to make sure everything is secure for the weekend and prepared for Tuesday when the slabs will be installed. Pay special attention to safety (30 minutes).

5. <u>Field Tasks</u> Time: 90 minutes

The teams carry out the above three tasks. Circulate and make sure the teams are completing the task appropriately. Assist teams in inspecting each other's work as the last task. Be sure there are no differences or problems which have not been solved.

6. <u>Review of Field Tasks</u> Time: 20 minutes

In the total group discuss the first two tasks. Ask the following questions:

<u>Pit Linings</u>

- Describe how the pits were lined.
- Did you notice any problems?
- What solutions would you propose?

Summarize the major points in lining pits.

<u>Inspection of Other's Work</u>

- Are there any questions for the other teams?
- Did you notice any difference in what the other teams did?
- As a result of seeing the other teams' work would you do anything differently the next time?

7. <u>Analysis of Teamwork</u> Time: 20 minutes

Have participants go back into their construction teams and discuss teamwork and leadership issues. Ask them to reflect on all the work they have done so far and discuss (post these questions on flipcharts):

- What are the highlights and/or strong points of this team for me?
- What things would I do differently next time either as a team member or leader?
- What are additional ways I'd like this team to support me or help me learn next week?

Tell the teams to review the list of guidelines for effective teamwork developed in Session 6 and review how well they are doing.

8. <u>Closure and Transition</u> Time: 20 minutes

Summarize the session. Ask for any final comments.

Review the training goals for the first week. Ask if there are any comments. Make a transition to next week by briefly summarizing the overall focus of the second week of training.

<u>MATERIALS NEEDED</u>

Flipchart for Session Objectives
Flipchart for Task Instructions
Handout 10-1: Instructions for Lining a Square or Rectangular Pit with Logs, Poles or Bamboo
Handout 10-2: Instructions for Lining a Square Pit with Cement or Brick
Handout 10-3: Pit Lining
Handout 10-4: Instructions for Lining a Circular Pit with Logs, Poles or Bamboo
Handout 10-5: Circular Pit Designs for the VIP Latrine

INSTRUCTIONS FOR LINING A SQUARE OR RECTANGULAR PIT WITH LOGS, POLES OR BAMBOO

Logs, Poles or Bamboo Lining

1. Check materials and make sure you have sufficient lining materials on site.

2. Cut logs or poles to a length equal to the depth of the pit. Poles should reach from the bottom of the pit to the base. The poles should be treated to protect them against rot and insects.

3. Cut 2 cross poles for each side. They should be equal in length to the width of each side.

4. Place the poles vertically along the side of the pit. They should be spaced 25 to 75 mm apart.

5. Nail or tie the cross poles in place about 0.5 meter from the top and bottom of the pit (Handout 10-3).

6. Nail or fit the lining of each side together at the corner of the pit.

7. Clean up the work site and return the tools.

Materials

Measuring tape
Logs, poles, or bamboo
Hammer and nails or rope and knife
Pencil
Saw, machete or axe
Bailing wire or nylon cord

INSTRUCTIONS FOR LINING A SQUARE PIT WITH CEMENT OR BRICK

Brick or Concrete Block Base

1. Check materials to ensure you have all the necessary materials on site.
2. Discuss the danger of stacking bricks too closely to the latrine (i.e. they might fall on the person working in the pit).
3. Bricks or blocks can be lowered in a bucket attached to a rope. Make sure the rope and bucket can handle the weight of the load.
4. Stack the cement blocks or bricks up the side of the pit to the slab base. Mortar the vertical space between the bricks (Handout 10-3).
5. For additional strength the last two layers of bricks are mortared together.
6. Check the progress of the work daily.

Materials for Cement or Brick Lining

Concrete blocks or brick
Sand
Cement
Trowel
Measuring tape
Shovel
Bucket and rope

PIT LINING

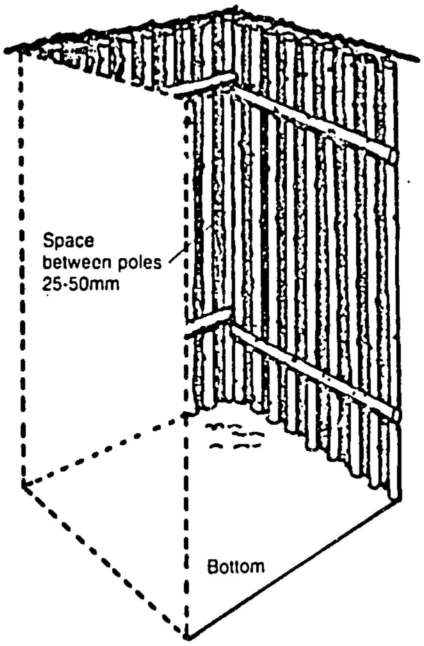


Fig. 1 Log, pole or bamboo pit lining.

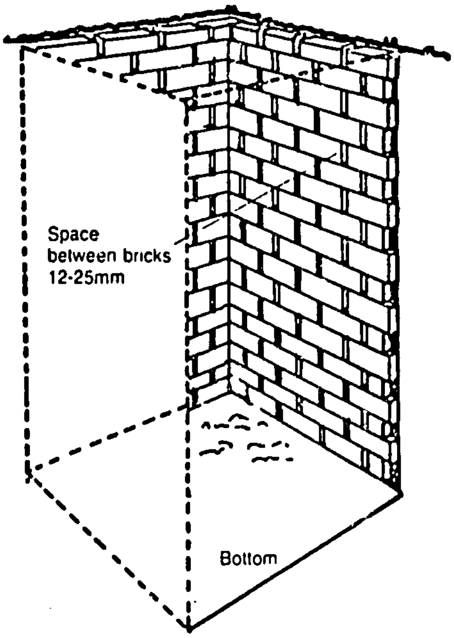


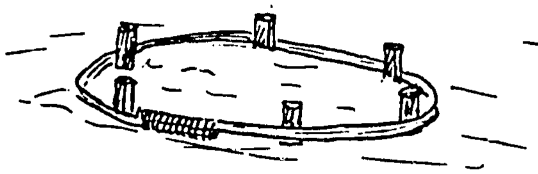
Fig. 2 Brick, stone or concrete block lining.

INSTRUCTIONS FOR LINING A CIRCULAR PIT WITH LOGS, POLES OR BAMBOO

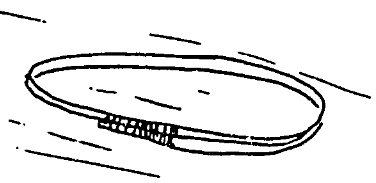
1. Check materials and make sure you have sufficient lining materials at the sites.

2. Cut logs or poles to a length equal to the depth of the pit. Poles should reach from the bottom of the pit to the base. The poles should be treated to protect them against rot and insects.

3. For the circular pit, make three 80 cm diameter reinforcing rings out of green wood or young bamboo trees. Do this by scribing an 80 cm circle on the ground, and driving six wood stakes along the circle to make a form. Wrap the green wood or bamboo around the stakes until they overlap about 30 cm. Tie these together with wire or nylon rope. The green wood or bamboo strips used should be 12-15 mm diameter and 3.5 m long.



Wall Reinforcing Ring Construction



Completed Ring

4. Place the poles vertically along the side of the pit. They should be spaced 25 to 75 mm apart.

5. Slip the rings into position as shown in Handout 10-5, Figure 1. That is 15 cm from the bottom, halfway up the wall (1 m) and 15 cm from the top of the wall.

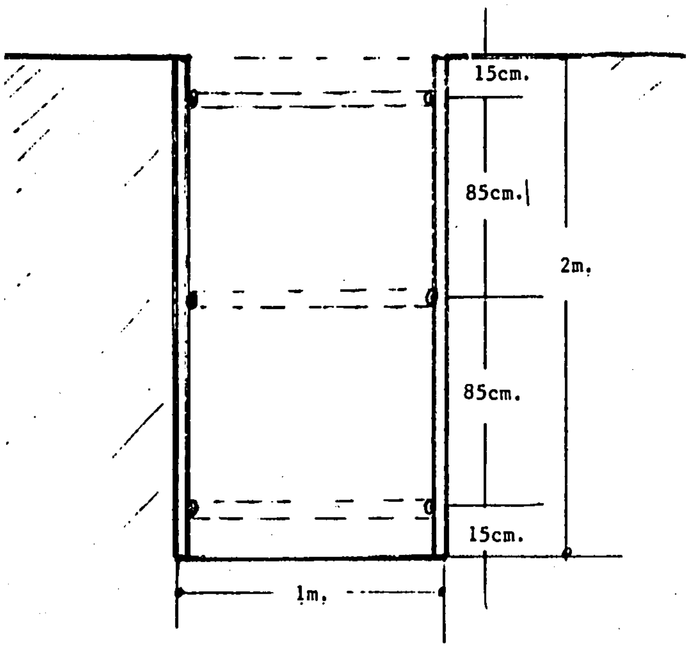
6. Nail or bind the rings to several poles around the pit to prevent slipping. (Later normal earth movement and pit filling material will press the lining against the rings and hold them securely in position.)

Materials

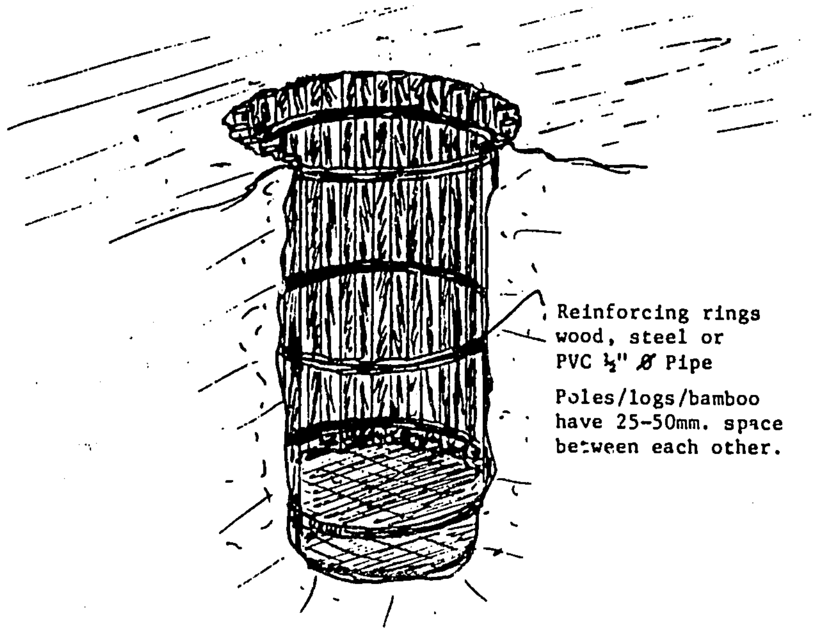
Measuring tape
Logs, poles or bamboo
Hammer and nails or rope and knife
Pencil
Saw, machete, or axe
Bailing wire or nylon cord

Note: Please refer to Figure 2 of Handout 10-5 as well as Handout 10-2 for developing instructions for lining a circular pit with brick.

CIRCULAR PIT DESIGNS FOR THE VIP LATRINE

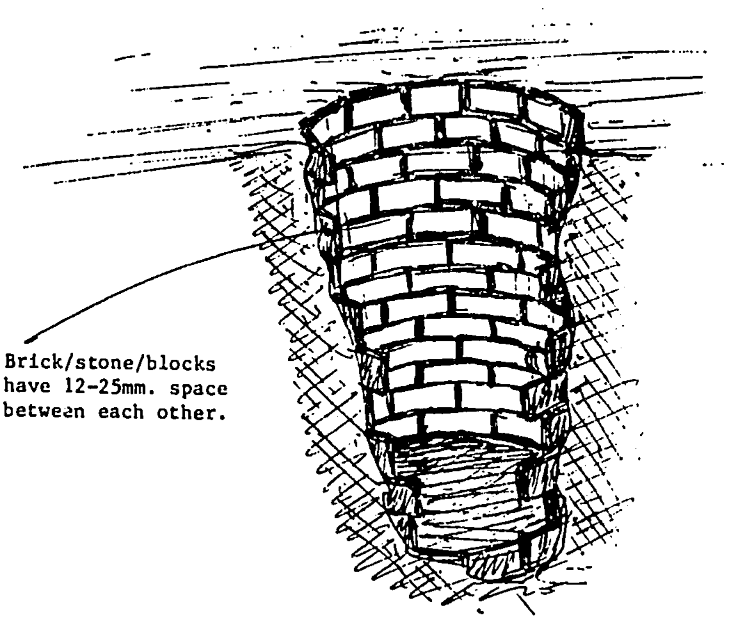


Side View with pole and reinforcing rings in position

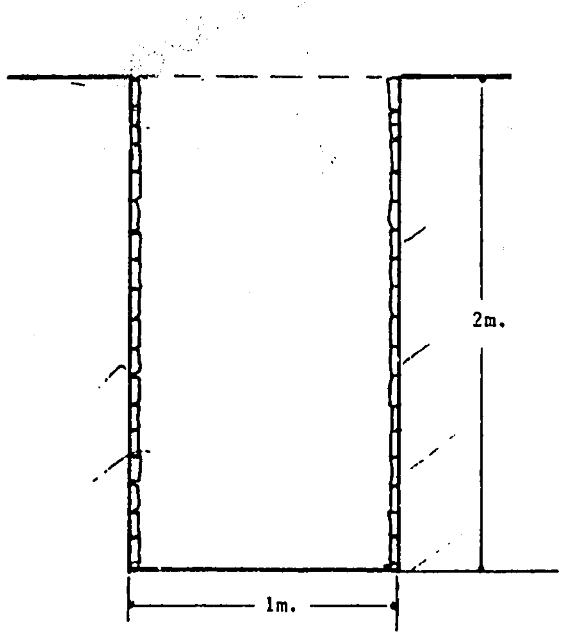


Cutaway View of Completed Pit

Figure 1. LOG, POLE OR BAMBOO PIT LINING



Cutaway View of Completed Pit



Side View with bricks in position

Figure 2. BRICK, STONE OR CONCRETE BLOCK LINING

GUIDE TO SESSION 11: PROJECT INFORMATION AND DEVELOPMENT STRATEGIES

Total Time: 3 hours & 30 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Opening and climate setting for week two	Trainer led discussion	20 minutes		Course goals participant expectations (from Session 1)
Introduction	Presentation	5 minutes		
		10 minutes		Project cycle (from Session 3)
Major health Indicators	Lecturette and discussion	10 minutes		
Community involvement	Discussion	30 minutes		Questions for groups
Helping others learn about sanitation	Introduction Task instructions	10 minutes		Topic list Task instructions
	Small group work	45 minutes		
	Group presentations	60 minutes		
	Discussion	15 minutes		
Closure		15 minutes		

Session 11:Project Information and Development Strategies

Total Time: 3 hours & 30 minutes

OBJECTIVES

At the end of this session, participants will be able to:

- o Identify ways for using a latrine project to involve and educate a community about other sanitation needs

- o Design an educational approach for presenting information about:

  how disease is spread
  the importance of a sanitary water supply
  the need for and use of latrines
  animal and solid waste disposal

OVERVIEW

This session is designed to explore educational strategies for promoting improved sanitation practices. It begins by looking at how health indicators can be used to identify sanitation problems. It then introduces the idea that an individual latrine construction project, such as the one being done by each team, may be used to broaden the community's awareness of other sanitation issues. It looks at strategies for involving a community in sanitation improvement activities. Participants then are given the opportunity to design an educational activity and try it out in this session.

PROCEDURES

1. Opening and Climate Setting for Week Two Time: 20 minutes

Go back to overall workshop purpose and goals (Handout 1-1). Discuss goals already covered and identify central goals for this week. Refer back to project cycle flipchart from Session 3 and discuss what steps have been covered and what steps will still be covered in this week. Discuss preparations for returning home and applying learnings. Review schedule and mix of field and workshop time for the second week.

Refer back to expectations identified in Day 1 and give participants an opportunity to talk about how well these expectations are being met. Be sure to keep these expectations posted in the group meeting room. This is a good time to have individuals reflect on their learnings so far and review what they still want to accomplish by the end of the workshop.

Ask if there are any questions, ideas, or feedback, from last week not yet discussed. Allow time for any unresolved issues or problems to be discussed.

2. Introduction Time: 5 minutes

Introduce the goals of the session and give session overview. Explain that this session includes health education strategies but it is not designed to produce "health educators." It looks at practical ways of applying what has been learned in the workshop and focuses on how to use a specific latrine project to generate more community awareness and efforts related to broader sanitation issues.

3. Discussion and Review of Major Health Indicators Time: 10 minutes

Outline how major health indicators can be used to identify the need for environmental improvements. See the Trainer Lecture Notes at the end of this section for suggested content. Supplement this with your own knowledge and local information. The amount of detail here depends on the skills and experience of your participants and how much information was covered in prior sessions.

Discuss local conditions and indicators. Make clear how this ties into sanitation and latrines and how a latrine project will often be just an entry point into a village to begin a broader improvement effort. Give some examples such as the use of survey data on solid waste disposal to begin a dialogue with a health committee about improving disposal practices. Ask for other examples of ways to use latrines to build community awareness of sanitation practices.

4. Developing Strategies for Community Involvement Time: 30 minutes

Lead a group discussion on community involvement and opportunites for educating others about sanitation issues. The central part of this discussion is to look at how to use latrine construction projects as a springboard to broader sanitation improvement projects. Ask and discuss the following:

- How could your latrine project be used to involve this community in broader-based environmental improvement projects?
- What strategies could you use to involve the community in identifying and implementing additional health and sanitation projects?

Discuss the impact of different strategies and approaches. Introduce the notion that education is part of any of these strategies. State that, many times, we are faced with the need for educating and/or training local groups in effective sanitation practices. In this session, we want to focus on this aspect and practice and develop some materials to use in educating others about improving sanitation conditions.

5. Helping Others Learn Time: 10 minutes

Introduce concept of helping/educating others. Discuss methods used in this training to help people learn (e.g., demonstration, group discussion, fieldwork, role playing, etc.) Brainstorm a list of points to keep in mind when preparing an educational package.

Ask what traditional learning methods are used in the villages for teaching (e.g., stories, songs, talks, etc.).

Discuss briefly how these and others might apply to your work as "health educators."

State that for the next hour participants will practice ways to help others learn about important sanitation issues. Groups will design training packages and then practice using them. These should turn out to be useful to them in working with their own communities, back home.

Tell participants to form into five small groups and select one of the following topics:

- How disease is spread
- The importance of a sanitary water supply
- Animal and solid waste disposal
- The need for and use of latrines
- Other environmental sanitation issues of your choice

Post on flipcharts and tell participants their task is to:

- Determine who their "audience" is and what they want that audience to learn about the topic.
- Select an educational methodology to use (skit, role play, dialogue, etc.).
- Prepare a 20-minute program for presentation to the rest of this group.
- Prepare any handouts or visual aids as appropriate.

6. Groups Prepare — Time: 45 minutes

Give groups 45 minutes for this task. After 45 minutes check progress. If needed, give an additional 10 to 15 minutes to complete preparation.

7. Group Presentations — Time: 60 minutes

Ask each group to implement their approach. Groups should be responsible for setting the stage the way they want to and for providing the rest of the participants with the context within which they are doing so. Keep each group's time to 15-20 minutes with a brief discussion after each. Praise each group on points well made, and ask how they feel about their approach. This session is designed to provide some fun and provoke new ideas about ways to approach/educate others. Groups may run long if they get creative about their topic. If needed and useful, allow some extra time for this section. Be sure however, to leave time for processing what they have learned.

8. Process Presentations — Time: 15 minutes

Lead a discussion on what worked well in the presentations and what type of improvements could be made before taking this material back to their communties.

9. Application and Closure — Time: 15 minutes

Ask individuals to take out some paper and answer the following questions:

- o What have I learned today about ways to educate community groups about sanitation issues?
- o How might I approach my own community differently based on what I have learned?
- o What are ways I can begin to educate and involve others in planning sanitation projects?

MATERIALS NEEDED

Flipchart for Session Objectives
Flipchart for Task Instruction
Flipchart for Course Goals (from Session 1)
Flipchart for Project Cycle (from Session 3)
Flipchart for Participant Expectations (from Session 1)

TRAINER LECTURE NOTES ON HEALTH INDICATORS

State that:

The decision to proceed with a sanitation program should be based on whether or not one is needed. This need may be expressed by the village population itself or identified because of health problems.

Often a village will not ask for sanitation improvements because they don't realize the relationship between health and sanitation. If the village population is healthy, then there may not be a need for sanitation improvements. However, where there are health problems, these often indicate a need for improving sanitation practices.

For these reasons it is useful to have a way of identifying the health conditions in a community as they relate to diseases associated with poor sanitation. You will often need to educate members of the community on how health conditions can be changed by improving sanitation.

Health indicators can also be useful to help apportion your resources and time among villages.

Commonly used health indicators include:

- o Infant mortality
- o Death rates in children
- o Numbers of cases of diseases

While these are good indicators they are often not available for a specific village or area (even when such data are available, interviews and observations should be used to verify or supplement it).

Other Indicators:

Carefully conducted interviews can provide information concerning deaths and diseases. You can learn for example if infants and children have died recently of illness, if there is diarrhea in the families, and what other illness have occurred.

Observations can also be useful. They include:

- o the general sanitary conditions of the community
- o whether children seem listless or dehydrated

- o the general health of babies (Do they cry a lot? Seem listless?)
- o the presence of flies
- o eye infections
- o ear infections (noted by constant picking at the ear)
- o observation of runny stools

Have the group volunteer other observations that might reflect poor sanitation.

GUIDE TO SESSION 12: COMMUNITY DECISION-MAKING

Total Time: 2 hours & 35 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation and discussion	10 minutes		Session objectives
Community decision-making	Introduction to task	5 minutes		Task instructions
Design of strategy	Small group work	40 minutes		
	BREAK	15 minutes		
Community meeting	Simulation	25 minutes		
	Group discussion	40 minutes		
Generalizing	Group discussion	10 minutes		
Closure	Group discussion	10 minutes		

Session 12:Community Decision-Making

Total Time: 2 hours & 35 minutes

OBJECTIVES

By the end of this session, participants will be able to:

- o Identify and practice approaches to sharing information with community groups and leaders regarding benefits of a sanitation project.
- o Work with community leaders and groups to determine whether a sanitation project will be implemented and, if so, what type.
- o Help communities identify how and by whom monitoring and evaluation of the project will occur.

OVERVIEW

This session deals with a critical aspect of the planning phase of a project, the one that involves the community in determining what type, if any, latrine project is needed. It is an information sharing and planning phase and as such requires skills in planning, negotiating, educating, and generating the support of appropriate decision-makers in the community. It follows community mobilization discussed in Session 4. Therefore this session is out of sequence because it is presented after construction begins. Normally no construction would begin before clear decisions are made. A training workshop requires some adaptations of the sequence of activities which would occur under actual field conditions.

PROCEDURES

1. Introduction to Session — Time: 10 minutes

Share goals and overview of the session.

Be sure to emphasize and discuss the fact that community decisions occur towards the beginning of the project cycle. Tell participants that they were unable to practice this step with the local community because in actuality this community had to decide and come to agreement about the latrine project well before the training workshop began. Since the participants needed to have experience in constructing an individual latrine, the community had to be prepared beforehand. Also, due to the need for curing time for cement, it was necessary to begin construction early instead of going through all the project steps in logical sequence.

2. Introduce Community Decision Making* Time: 5 minutes

State the following in your own words: "Once you have determined that a community appears to have the minimum resources and community structure to participate in a project, the community needs to decide if they want to commit themselves to a project. In order to do this, the project developer needs to determine what the community needs to know and how to communicate it. Ultimately the community and individual homeowners need to decide with the project developer whether or not to proceed with a project. The following is an exercise in how to accomplish these tasks using a simulation of a community meeting."

3. Group Tasks: Designing a Meeting Strategy Time: 40 minutes

Divide the group into two sub-groups. One group will be the project developers, and the other group will be the community. Each group will do the tasks outlined below. Give instructions to each group before groups are split up. Put instructions on the flipchart and check if they are clear to each group. Make sure it is clear they will actually conduct a community meeting after this preparation.

Project Developers' Task

Instruct the "Project Developers" as follows:

"Prepare a strategy for meeting with community leaders. You are trying to help the community improve sanitation and decide what to do. Include any information they need to make a decision about initiating a latrine project. Consider community responsibilities, resource contributions, and any other relevant information based on your experience in the community and the social and technical information gathered. Anticipate issues that the leaders may raise and be prepared to respond. Prepare a strategy for the presentation of this information in a community meeting. Use visual aids where appropriate. Use any techniques you want for educational purposes."

Depending upon the size of the group, all the project developers may play the role together as if there is a small team working with the community, or they may select two or three of their group to play the role and the rest can be observers (the latter option is recommended).

Community Task

Instruct the "Community" as follows:

"As a community group interested in a latrine project, what information would you want to know from a project developer? Determine all needed information. Prepare for a community meeting with the project developers. Identify issues/concerns you have about the project. Decide who among you will ask what questions, who will role play which person from the village, and what strategy you will use for this meeting. Be sure to include in your meeting one or two homeowners who may get latrines."

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* See Trainer Notes at the end of this session.

BREAK   Time: 15 minutes

4. Community Meeting Simulation   Time: 25 minutes

Let groups arrange the setting in the form of a community meeting appropriate to local meeting conditions. Conduct role play. Let the role play go long enough for the strategies on both sides to be worked out. This should take about 20 minutes or so.

5. Discussing the Meeting Simulation   Time: 40 minutes

In order to learn the most from this simulation, it is suggested that both sides of the role play be debriefed in a question-discussion process. The following questions should be asked:

Community (First):

- How did the meeting go? What went well?
- Were you able to get the information you needed to assist you to make a decision?
- What did the project developer do to prepare you for the meeting? What else would have been useful?
- If you were the promoter what would you have done differently?

Promoters:

- What was your goal for the meeting?
- What did you do that helped you achieve that goal?
- What hindered its achievement?
- How accurately did you anticipate the needs of the community regarding required information? Regarding issues/concerns?

Overall Discussion:

Community

- What decision would you be able to make based on the information you got in the meeting?

Developers

- If community made a "go" decision what would you do next?
- If the community made a "no" decision what would you do next?

6. <u>Generalizing for the Simulation</u> Time: 10 minutes

Draw out what everyone has learned from this exercise by asking:

- o What have you learned about the community decision-making process in a project like this?
- o What are the things the project developer should keep in mind when giving information to the community, both from the point of view of the community and the project promoter?
- o What guidelines would you suggest for planning and conducting community decision-making meetings?

7. <u>Closure</u> Time: 10 minutes

Ask what was learned. Did anyone hear of an idea that was new to them? Summarize the difficulties and importance of having the community take ownership and responsibility for the project.

TRAINER NOTES

If group is larger than 20 you might want to split into two sessions for the afternoon, if there are two trainers and each is comfortable with conducting this session. Another option is to split the group for the simulation and bring them back together for the discussion (procedures 5 and 6).

<u>MATERIALS NEEDED</u>

Flipchart for Session Objectives
Flipchart for Task Instructions

GUIDE TO SESSION 13: INSTALLATION OF LATRINE SLABS

Total Time: 3 hours & 40 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction to session and slab installation.	Present and discuss	15 minutes		
Instructions for slab installation	Present and discuss	10 minutes	Handout 13-1: Team Instructions for Installing a Slab	Task instructions
Team planning	Teamwork	15 minutes		
Slab installation	Fieldwork	2 hours		
Discussion of fieldwork	Group discussion	30 minutes		
	Small group task	30 minutes	Handout 13-2: Water for the World: Operating and Maintaining Privies	

Session 13: Installation of Latrine Slabs

Total Time: 3 hours & 40 minutes

OBJECTIVES

By the end of the session, participants will be able to:

- o Describe the steps and tools necessary for proper installation of a slab
- o Identify problems which can occur if a slab is improperly installed

OVERVIEW

This morning opens briefly with a discussion of achievements of week one and plans for week two. It is important here to review where participants are in terms of the project cycle and goals of the workshop.

This session focusses on the information needed to properly install a slab over a pit. It begins with a brief workshop discussion and is followed by teams installing slabs in the field. An hour-long debriefing and discussion concludes this session.

PROCEDURES

1. Introduction to Session and Slab Installation — Time: 15 minutes

Introduce session objectives and overview. Discuss slab installation and factors to consider when transporting and installing slabs.

Discuss:

- o Most appropriate ways to transport slabs over short, medium, or long distances.
- o Advantages and disadvantages of pouring slabs in one central location or individually at each house.
- o What to do if slabs are chipped or damaged while being transported or installed.

2. Instructions on Slab Installation — Time: 10 minutes

Explain to the groups that they will have approximately two hours to accomplish the following tasks:

- o Remove slabs from the forms.
- o Transport the slabs to the latrine site.
- o Install the slabs.

Caution the participants to try not to damage the forms when they remove the slabs from them, and to avoid damaging the slabs during transportation and installation.

Instruct participants that the slabs should be installed so they are level. If water is poured on the slab the water should flow towards the drop hole. The slabs should be firmly planted on the base. Small stones can be used to fill in spaces between the base and the slab.

3. Team Planning — Time: 15 minutes

Ask if there are any further questions.

Go over team instructions and then proceed to the field. Give teams 10-15 minutes to plan before fieldwork starts.

Talk about the fact that teams need to plan how they will set down the slab. An example might be to put sticks diagonally across so that they can get their fingers out after setting the slab down.

4. Slab Installation — Time: 2 hours

The trainer should make sure a vehicle is present if slabs have to be transported long distances. Check that the pit linings have been completed before the groups install slabs. Once the slabs are installed the trainer should check all slabs to see if they are well supported by the base and that they are level.

5. Discussions of Fieldwork — Time: 30 minutes

In a total group ask participants:

- o What difficulties were encountered?
- o How were they resolved?
- o What would your group do differently the next time?
- o What is most important to remember about installing a slabs?

6. Small Group Discussion of Fieldwork — Time: 30 minutes

Ask team leaders and members to form small groups with members of other teams. In these groups, discuss what is working well in teams and what they learned that would apply back home.

After about 20 minutes ask for examples of good teamwork that have occurred thus far. Take three or four examples. Then look for examples of one or two problems and how they are being overcome.

7. Closure

Review the days objectives and activities and preview the next session.

8. Reading

Distribute Handout 13-2:Water for the World:Operating and Maintaining Privies. Tell participants to read it prior to the next session.

MATERIALS NEEDED

Handout 13-1:Team Instructions for Installing a Slab
Handout 13-2:Water for the World: Operating and Maintaining Privies
Flipchart for Task Instructions

TEAM INSTRUCTIONS FOR INSTALLING A SLAB

Your team will remove the slabs from the forms, transport the slabs to the latrine site and mount them on the base. Make sure all materials and tools are at the site. If a vehicle is needed to transport the slab, consult with the trainers.

1. Remove the slabs from the forms. Try not to damage the forms so they can be used another time. Use a hammer to gently tap the form away from the concrete.

2. The slab must then be transported to the construction site. If the distance is short the slab can be transported on two sturdy poles. If a longer distance is involved a push-cart or truck should be used.

3. Remember each slab will weigh more than 150 kilograms. Do not drop the slabs and be sure to tie them down or cushion them if they are transported by truck. You will need to determine the most appropriate way to transport the slab.

4. Before placing the slab on the base, cover the top of the base with 1-2 inches of mud or clay soil to provide a seal between the two parts. The mud should be damp and plastic, but not wet. Place the mud in the base so that it is level.

5. If the pit lining has not yet been completed it must first be completed before mounting the slab.

6. Gently place the slab on the base.

7. If the slab is not level the base must be readjusted. Small rocks can be used to support the slab at a level position and to fill in any empty spaces between the base and the slab.

8. Walk on the edges of the slab to set it down in the mud. Use extra mud to seal the edges all around.

9. Mix a small amount of concrete and pour for the foot-rests. Make sure to cure for three days.

Materials and Tools

Sand
Cement
Small stones
Clay soil or mud
Transport vehicle if needed
Trowel
Bucket
Hammer
Foot-rest forms
Used motor oil

Water for the World

Operating and Maintaining Privies

Technical Note No. SAN. 1.0.1

A privy consists of a pit to hold excreta, a slab with a squatting hole or a seat and pedestal, and a shelter to give the user privacy. There is little operation of a privy except for using it. Maintaining a privy involves cleaning the slab weekly, repairing the privy as needed, and eventually filling the pit with soil and moving the slab and shelter to a new pit.

Routine maintenance of a privy is important, because a poorly maintained privy can become unsightly, smelly, unsanitary, and a breeding place for flies. This technical note describes how to operate and maintain a privy.

Useful Definition

EXCRETA - Human body wastes.

Materials Needed

For operating a privy: lid; anal cleansing materials; and bucket of water for a pour-flush privy.

For cleaning a privy: brush; mop or palm fronds, bucket, and soapy water; or ashes and whisk broom.

For repairing a privy: shovel; the same tools and materials needed to construct the privy shelter and slab, that is, hammer, saw, nails, boards, fly-proof screen, bamboo, wire, bricks, and mortar.

For moving a privy: shovels; cart and draft animals for moving the slab; tools for disassembling the shelter.

Operating a Privy

Be certain the privy has a lid over the squatting hole or the seat and pedestal, anal cleansing materials, and a box or jar of ashes or dry soil. After each use of the privy, use a small can or coconut shell to sprinkle ashes or soil through the hole. This will help eliminate odors and prevent fly-breeding. See Figure 1. If it is a pour-flush toilet, water must be readily available. The easiest way to take care of this is to keep a bucket in the shelter. Users should be taught to pour enough water into the pour-flush bowl after each use to flush the contents of the bowl into the pit and to replace the water seal. The lid should be put back on after every use to keep flies and odors out of the shelter and the shelter door, if there is one, should be kept closed at all times. Re-supply the privy with anal cleansing materials and water as needed.

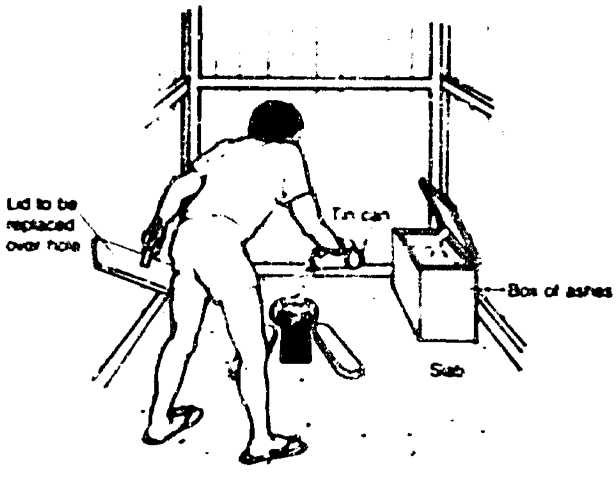


Figure 1. Sprinkling Ashes After Using Privy

Figure 2. Cleaning Privy Slab

Cleaning a Privy

Clean the privy slab at least once a week. Keep a brush in the shelter to clean the squatting hole or seat. Wash the slab with a mop or palm fronds and soapy water, if it is available, as shown in Figure 2. If water and a mop are unavailable or unacceptable, sprinkle ashes on the slab to absorb moisture and excreta. Then brush or sweep the dirty ashes into the hole.

Repairing a Privy

Inspect the privy slab, the shelter, and the grounds around the privy at least once a month. Examine the slab for cracks, excessive wear, or other damage. Repair minor damage at once with the same materials used to construct the slab. If there appears to be major damage, consult the project designer or the person who supervised construction before attempting repairs.

Examine the lid. If it no longer completely covers the hole due to damage or excessive wear, repair it or replace it with a new one.

Examine the inside and outside of the shelter, including the walls, roof, door and hinges, vent pipe, fly-proof screens, and so on. Check for damage or excessive wear. Repair minor damage at once with the same materials used for construction as shown in Figure 3.

Look for signs of termites getting into the shelter where it touches the ground. If termites are found, they must be killed or they will eat any parts of the wooden shelter they can reach. If there are not many termites, large amounts of boiling water may be effective in killing them. Scrape away the tops of the tunnels they have made

Figure 3. Privy Maintenance

in the wood and pour the water along the tunnels. If the termite infestation is large and they have burrowed deep into the wood, a chemical will be needed to kill them. Termites are very sensitive to drying, so if their tunnels are exposed to the air during a dry period, they may be killed. This method is of no use in hot, rainy weather.

Examine the ground around the privy for erosion caused by surface water or holes caused by animals digging. Fill in holes with soil. If necessary, dig shallow trenches or build small dams to divert surface water away from the privy site.

Moving a Privy

When the contents of the pit reach 0.5-1.0m below the privy slab, begin preparations for a new pit or another excreta disposal method. The site, size, and dimensions of the new pit should be determined by the project designer (see "Designing Pits for Privies," SAN.1.D.2).

When the contents of the pit are within 0.5m of the privy slab, the pit must be abandoned. Remove the slab and the shelter. Fill in the pit with soil and mound about 0.6m to allow for settling as shown in Figure 4. After a few weeks plant vegetation over the pit site.

Depending on the condition they are in, the slab and shelter may be used for the new privy. Four to six people can load the slab on a cart and haul it to the new pit. Or, place round poles under the slab to act as rollers and drag it to the new site if it is nearby. Take the shelter down and reassemble it over the new pit and slab. If this is not possible, use salvageable parts of the old shelter to construct or repair the new shelter.

The cleaning and maintenance of a privy may be done by the privy users or by a designated worker who may care for several privies. Keep a maintenance record similar to Table 1 showing dates, locations of privies, and tasks.

Figure 4. Moving Privy to New Location

Table 1. Sample Maintenance Record for Privies

Date	Location	Task
4 May '82	School	Cleaned three privies. Inspected. Okay.
5 May '82	Mendoza house	Cleaned privy. Inspected privy and grounds. Repaired screens.
5 May '82	N'Kruma house	Privy cleaned by family. Inspected privy. Okay.
7 May '82	Nexon house	Cleaned privy. Inspected privy and grounds. Filled in hole near privy. Repaired lid and door.
9 May '82	Al Hafar house	Cleaned privy. Inspected privy. Okay. Contents of pit about 1.0m from slab. Notified project designer.
11 May '82	School	Cleaned three privies.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using Water for the World Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C. 20523, U.S.A.

GUIDE TO SESSION 14: REPAIR AND MAINTENANCE OF A LATRINE

Total Time: 2 hours & 15 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Session introduction	Presentation	10 minutes	Handout 13-2: Water for the World: Operating and Maintaining Privies	Session objectives
Repair and maintenance of latrine	Task instructions	5 minutes		Task instructions
	Small group task	20 minutes		
	Reports and discussion	20 minutes		
	Discussion of application	20 minutes		
Maintenance of communal latrines	Group discussion	15 minutes		
Latrine users	Group discussion	10 minutes		
Plan education strategies	Team task	20 minutes		Team instructions
	Teams share plans	10 minutes		
Closure		5 minutes		

Session 14: Repair and Maintenance of a Latrine

Total Time: 2 hours & 15 minutes

OBJECTIVES

By the end of this session participants will be able to:

- o Describe the steps necessary to maintain a latrine in a sanitary condition
- o Describe how and when to relocate a latrine
- o Develop strategies for implementing on-going maintenance and repair of a latrine

OVERVIEW

This session provides participants with ideas on how to initiate a repair and maintenance program to be implemented by the latrine users. It is important that this information be provided to and understood by all of the users while the latrine is being built. It is at this time that the users will be most receptive and available to receive this information. A discussion of the information needed is followed by planning time in teams to practice educating others in proper maintenance and repair procedures. They will be practicing these skills over the next two days as they work in the field. There will be time during Session 15 to review their progress and discuss what they learned.

PROCEDURES

1. Introduction to Repair and Maintenance of a Latrine — Time: 10 minutes

Share the overview and session objectives. Stress the importance of this stage to the success of the entire project. Give participants a few minutes to review the reading they were given to do over lunch, Handout 13-2: Water for the World: Operating and Maintaining Privies.

2. Small Group Task Instructions — Time: 5 minutes

Break into three groups mixing up teams as much as possible. Assign each group one of the following topics:

Operating and maintaining a latrine
Repairing a latrine
Replacing a latrine

Instruct the groups to discuss their topics and prepare to report back to the rest of the group:

Key points about the topic
Potential problems
Solutions
Who needs to know what

Groups have 20 minutes to prepare their reports. Instruct groups to put their reports on flipcharts and to limit reports to five minutes.

3. Small Group Work Time: 20 minutes

4. Group Reports and Discussion Time: 20 minutes

5. Discussion of Applications Time: 20 minutes

For each of the topics discuss applications:

- o Are suggested procedures in the handout or group reports appropriate for local conditions?

- o If not, what are appropriate substitutes?

6. Maintenance of Communal Latrines Time: 15 minutes

Lead a group discussion on the special issues involved in maintaining sanitary communal latrines. Use examples of school or hospital latrines and identify what needs to be done to clean, maintain, and replace communal latrines.

7. Discussion on Education of Latrine Users Time: 10 minutes

Review the need for educating individual users before a latrine project is complete. Describe the importance of educating users on the proper use, maintenance, and repair of latrines. Ask the group to identify ways to approach and educate users on on-going maintenance and repair. List the ways on a flipchart. This list and discussion need not be exhaustive. It is simply to elicit ideas. Explain that participants will have an opportunity to practice these ideas shortly.

8. Team Task: Plan Education Strategy Time: 20 minutes

Give the following instructions and put them on a flipchart:

"In your construction team, spend the next 20 minutes developing an approach and strategies to use to educate the users of the new latrine on effective operation and on-going maintenance. Plan specifically what you can do over the next two days as your team completes the fieldwork."

Be prepared to implement these strategies and report back the results during Session 16:Latrine Completion and Project Review.

9. Teams Share Plans Time: 10 minutes

Briefly have teams share plans with each other to help them benefit from each other's thinking. This can be done in the total group or by having small groups with representatives from each team.

10. Closure Time: 5 minutes

State that after a break the session will be focused on learning about constructing a latrine shelter. This will prepare teams for going out and doing the construction work the next day.

MATERIALS NEEDED

Flipchart for Session Objectives
Flipchart for Task Instructions
Flipchart for Team Instructions

GUIDE TO SESSION 15: LATRINE SHELTER CONSTRUCTION

Total Time: 9 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	10 minutes		Session objectives
Latrine shelters	Present and discuss	30 minutes		
Demonstration of shelter construction	Field demonstration	30 minutes		
Planning for fieldwork	Teamwork	15 minutes		
	DAY 10			
Shelter construction	Fieldwork	4-6 hours		
Fieldwork and team leadership	Team leader discussion	40 minutes		
Process teamwork	Discussion in teams	15 minutes		
Generalization about shelter construction	Group discussion	20 minutes	Handout 15-1: Water for the World: Constructing Privy Shelters	
Analysis of project status	Team task	20 minutes		

Session 15: Latrine Shelter Construction

Total Time: 9 hours

OBJECTIVES

At the end of this session, participants will be able to:

- o Construct a latrine shelter
- o Identify appropriate local materials for shelters

OVERVIEW

This session covers the final phase of latrine construction. The session begins in the late afternoon with a workshop discussion and introduction to the type of shelters and available and appropriate materials. Participants go to a pre-selected existing shelter in the community that trainers can use to demonstrate the construction steps. It is best if the demonstration shelter is the same or almost the same as the one to be built by participants.

Tomorrow, this session continues with teams constructing shelters in the field which will take almost the entire day. It concludes with a workshop discussion of the fieldwork and a review of things learned. The final activity is for teams to analyze what remaining steps are needed to complete their latrine construction projects.

Given the wide variety of potential shelters to be built and local preference for shelters, the trainers need to decide on an appropriate shelter to be constructed. There are no team instructions for building a shelter included here. Trainers need to develop team instructions and drawings prior to this session. Depending on the type of shelter selected, the timing of this session may need to be changed. Trainers should make the appropriate changes.

PROCEDURES

1. Introduction to Session — Time: 10 minutes

Share the session objectives and give an overview. Describe clearly the procedures for this session and the mix of field and workshop activities for the rest of today and tomorrow. Briefly describe the shelter (or shelters if different types are being built) to be built by the teams.

2. Discussion of Latrine Shelters — Time: 30 minutes

Design a presentation and discussion of shelter types using Handout 15-1: Water for the World: Constructing Privy Shelters as a guide.

Supplement the article with discussion of the most commonly used local shelters and their advantages and disadvantages. Ask participants to identify the various types of local materials available for building a shelter.

3. Demonstration of Construction Time: 30 minutes

Use a local shelter as a demonstration to review specific construction steps in shelter construction. Review vent-pipe construction and other essential components. If appropriate, draw a construction plan for the shelter beforehand and review this with participants at the shelter site.

4. Fieldwork Planning Time: 15 minutes

Remind participants that they will convene in the field in the morning to begin construction of shelters. Check with team leaders to make sure they are clear on what they need to do the next day. Make sure all materials are available as well as back-up labor if needed.

Give teams the task of planning and organizing their shelter contruction activities before reconvening in the morning.

Session 15 continues on Day 10

5. Fieldwork:Shelter Construction Time: 4 to 6 hours

Teams construct latrine shelters as described by team leaders. Trainers provide technical assistance as needed. Teams should review plans and ask for any needed information before they go to the field.

6. Fieldwork and Team Leadership Time: 40 minutes

In the total group, take about 20 minutes and ask each team:

- How did it go today? What were the highlights?
- What problems were encountered and how were they overcome?
- What did you find difficult in doing this task?
- What would you do differently next time?

7. Discuss Teamwork Time: 15 minutes

In teams, discuss what you have learned about supervising teams made up of individuals from different cultures? What difficulties exist? How are they overcome?

8. Generalizations about Shelter Construction Time: 20 minutes

Bring teams back together to discuss latrine shelters. Ask what were the two most important things they learned about latrine shelters from this session.

Ask if anyone had any surprises or unanticipated learning during this session. Discuss how these learnings may be applied in their own communities.

Discuss any questions and clarify points as needed. Summarize learnings about latrine shelter construction. Distribute Handout 15-1:Constructing Privy Shelters.

9. Analysis of Project Status Time: 20 minutes

Discuss briefly the fact that the teams are about to complete their construction activities. The next day will be their last opportunity to be involved in the construction, and also to "let go" and transfer ownership of the latrines to local residents.

State that the teams need to determine specifically how much more it will take to complete their project. Have them break into teams and identify:

- o What is left to accomplish.
- o How it will be done.
- o How much time it will take.
- o What additional resources are required.
- o Any follow-up activities that need to be done by the homeowners.

Tell teams they should be prepared in the morning to report on where they are and how they will complete their work by noon.

MATERIALS NEEDED

A Handout on Team Instructions for Shelter Construction (to be developed by trainers)
Flipchart for Session Objectives
Flipchart for Team planning and Task Instructions
Handout 15-1:Water for the World:Constructing Privy Shelters
Construction Materials

Water for the World

Constructing Privy Shelters
Technical Note No. SAN. 1.C.3

A privy shelter is a screen or structure that gives the person using the privy privacy. Depending on the design, a shelter can protect the user from the weather and keep out flies, rats, scavenging dogs, and other pests. Constructing a privy shelter involves assembling necessary labor, materials, and tools; building the shelter to the dimensions specified by the project designer; and building any special features.

A properly constructed shelter can last 5-10 years or more. This technical note describes each step in building a shelter. Read the entire technical note before beginning construction.

Materials Needed

The project designer must provide three papers before construction can begin:

1. A plan view of the shelter similar to one or more of Figures 1-4, and 8a and 8b, showing the correct dimensions of the shelter.

2. A detailed view of any special features similar to one or more of Figures 5-7.

3. A detailed materials list similar to Table 1, showing all necessary labor, supplies and tools.

After the project designer has given you these documents and you have read this technical note carefully, begin assembling the necessary laborers, supplies and tools.

Construction Steps

Depending on local conditions, availability of materials, and skills of workers, some construction steps will require only a few hours, while others may take a day or more. Table 2 shows a sample work plan for building a privy shelter including time estimates for each step. Draw up a similar work plan with rough time estimates based on local conditions. You will then have an idea of when specific workmen, supplies, and tools must be available during the construction process.

For a simple screen shelter:

1. Assemble all laborers, supplies, tools, and drawings needed to begin construction. Study all drawings carefully.

2. Cut corner posts or uprights to the correct lengths.

3. Set corner posts or uprights firmly in the ground in a vertical position around the privy slab to a depth of 0.3-0.6m as shown in Figure 9a. Thoroughly tamp the ground after the posts are in place.

4. Build or weave together the screening material and secure it to the corner posts with vine, wire, or equivalent. Begin at the end corner post and work your way around the screen. The screen should touch the ground and be as high as the tops of the corner posts as shown in Figure 9b.

For a bamboo shelter with roof or roof and door:

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Build a foundation around the privy slab from bamboo poles 50-100mm in diameter. Notch the ends of the poles, fit them together, and tie them with wire or vine, as shown in Figure 10a.

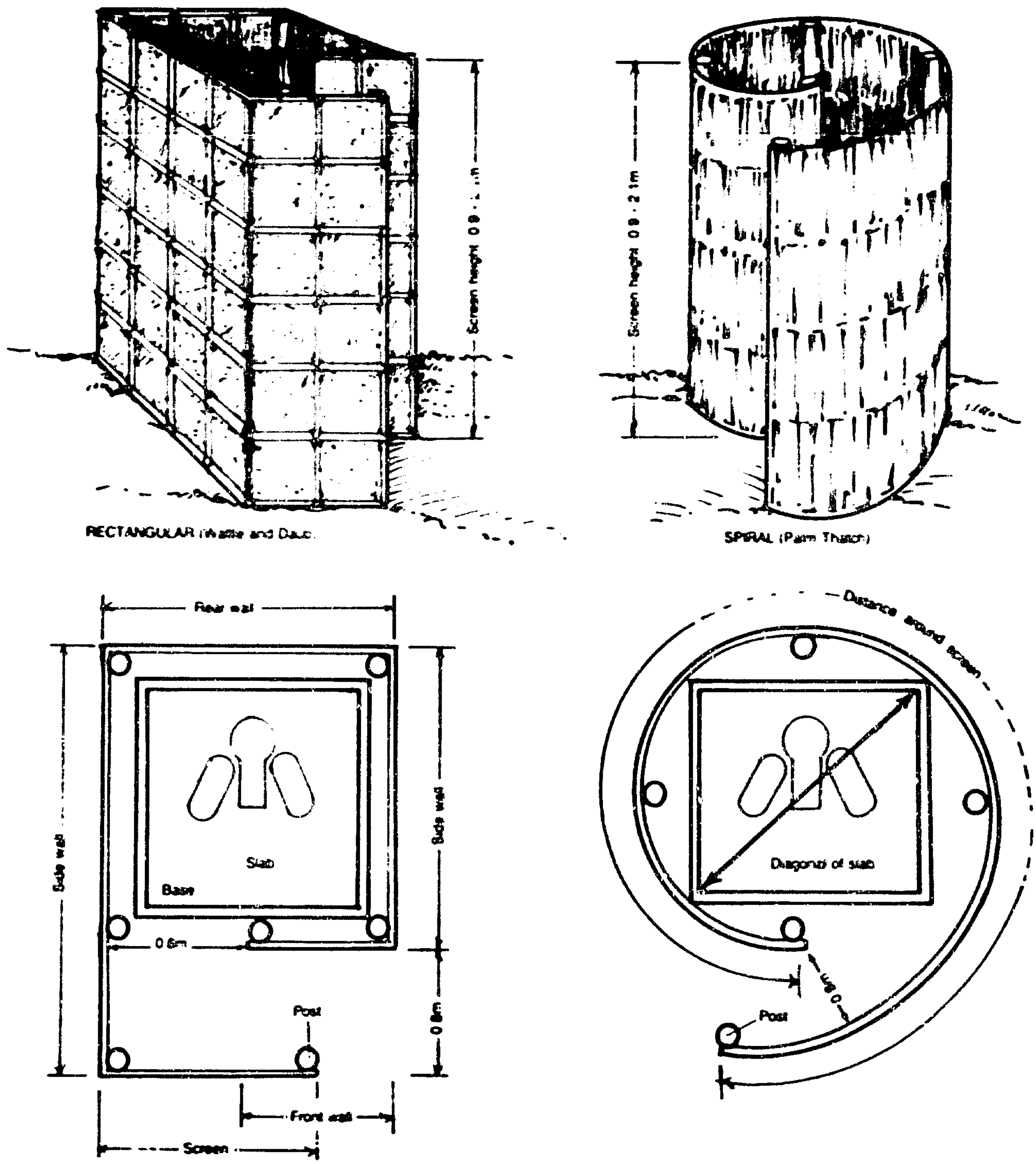


Figure 1. Simple Screen Shelters

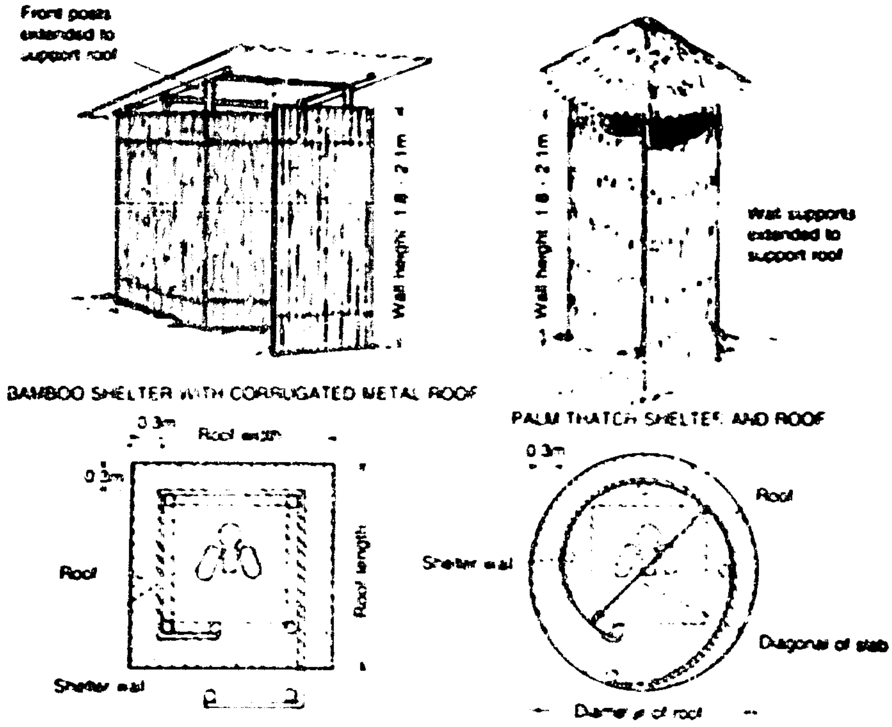


Figure 2. Privy Shelters with Roof

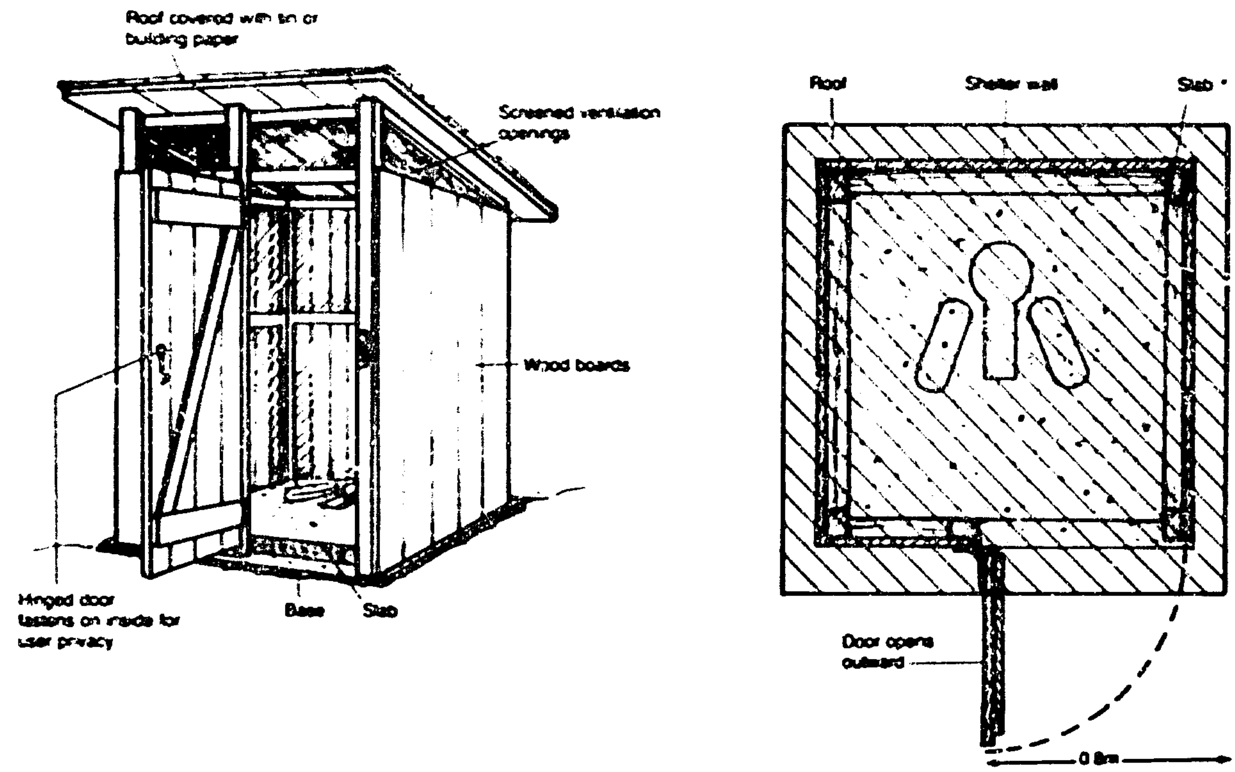


Figure 3. Fly-Proof with Screening and Door

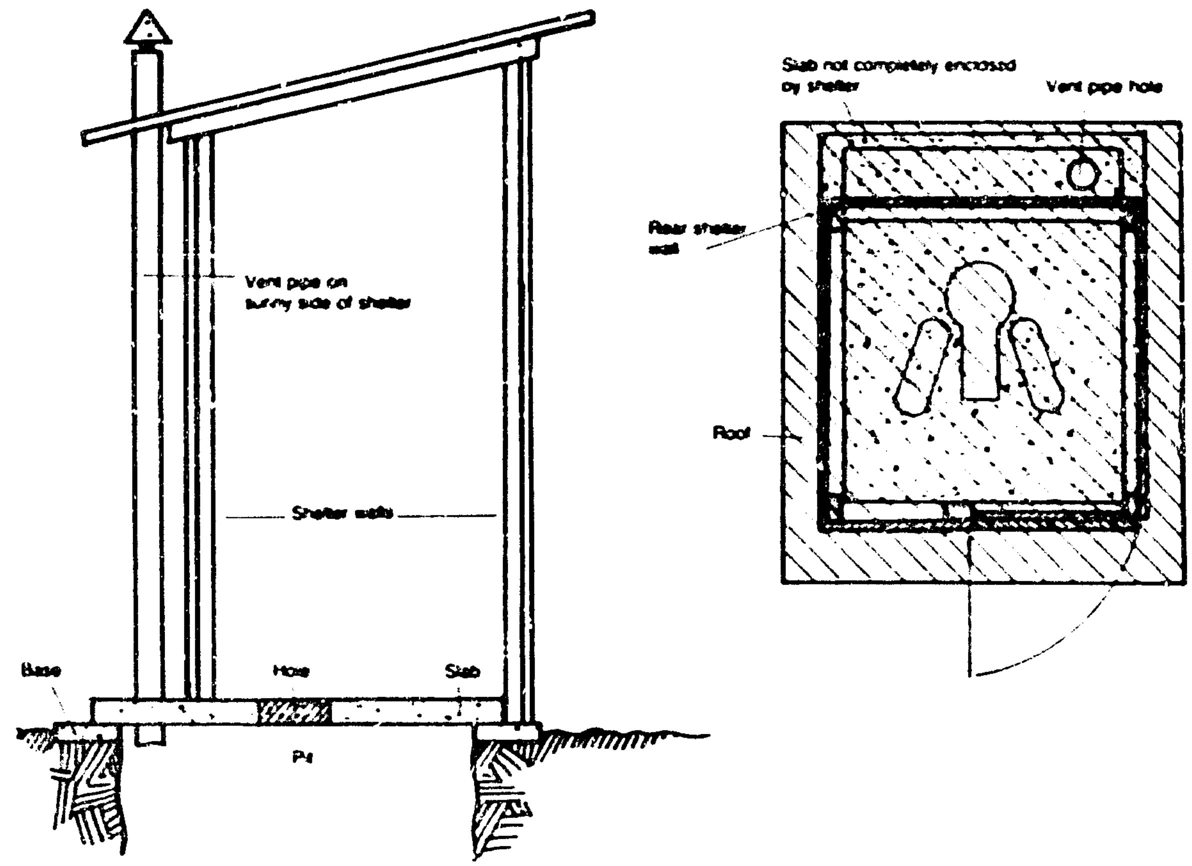


Figure 4. Shelter for Ventilated Privy

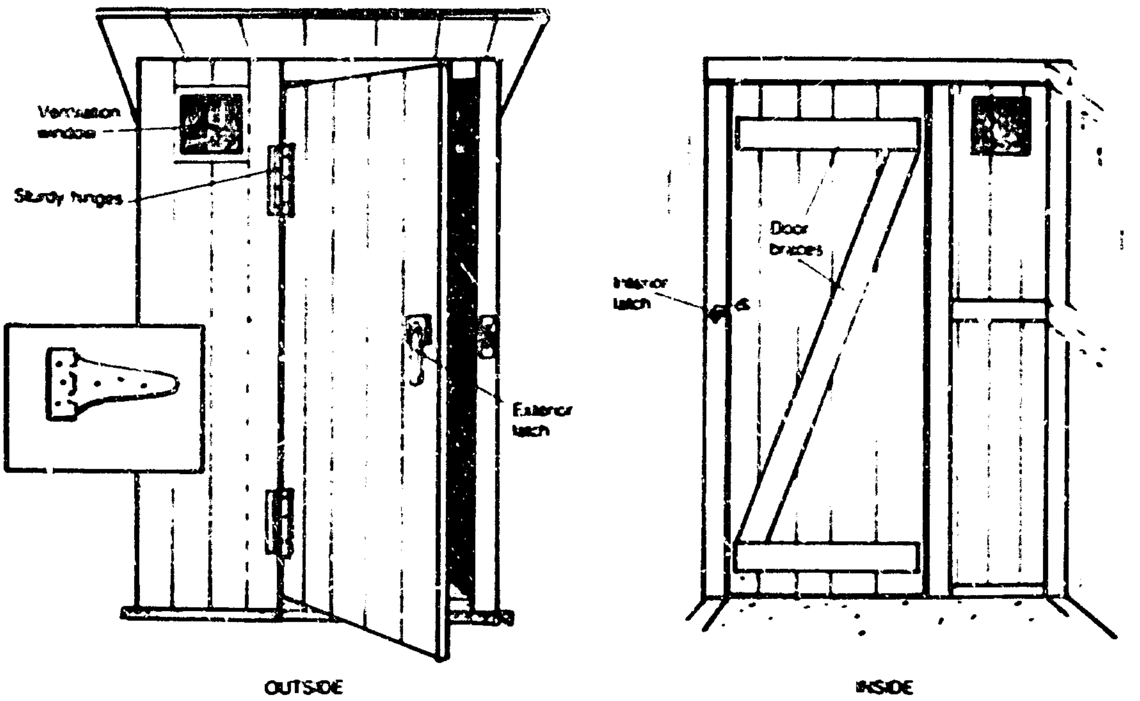


Figure 5. Detail of Door for Fly-Proof Shelter

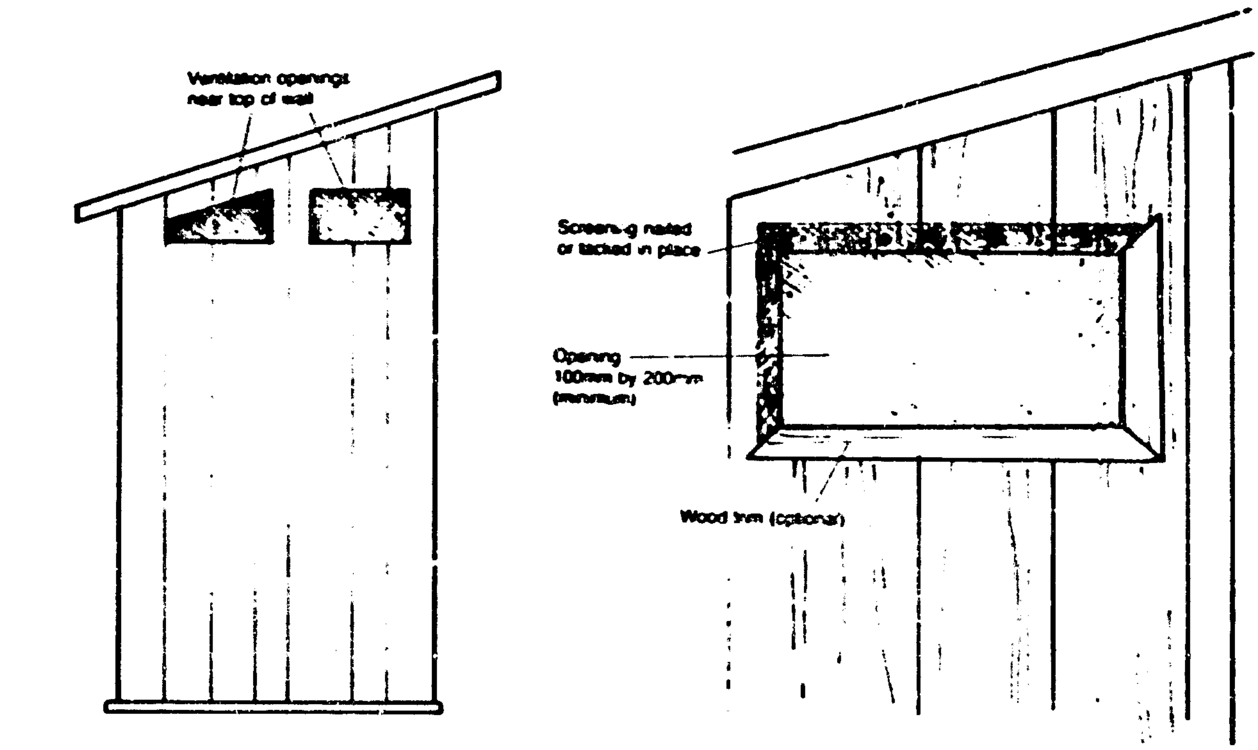


Figure 6. Fly-Proof Screening Covering Ventilation Openings

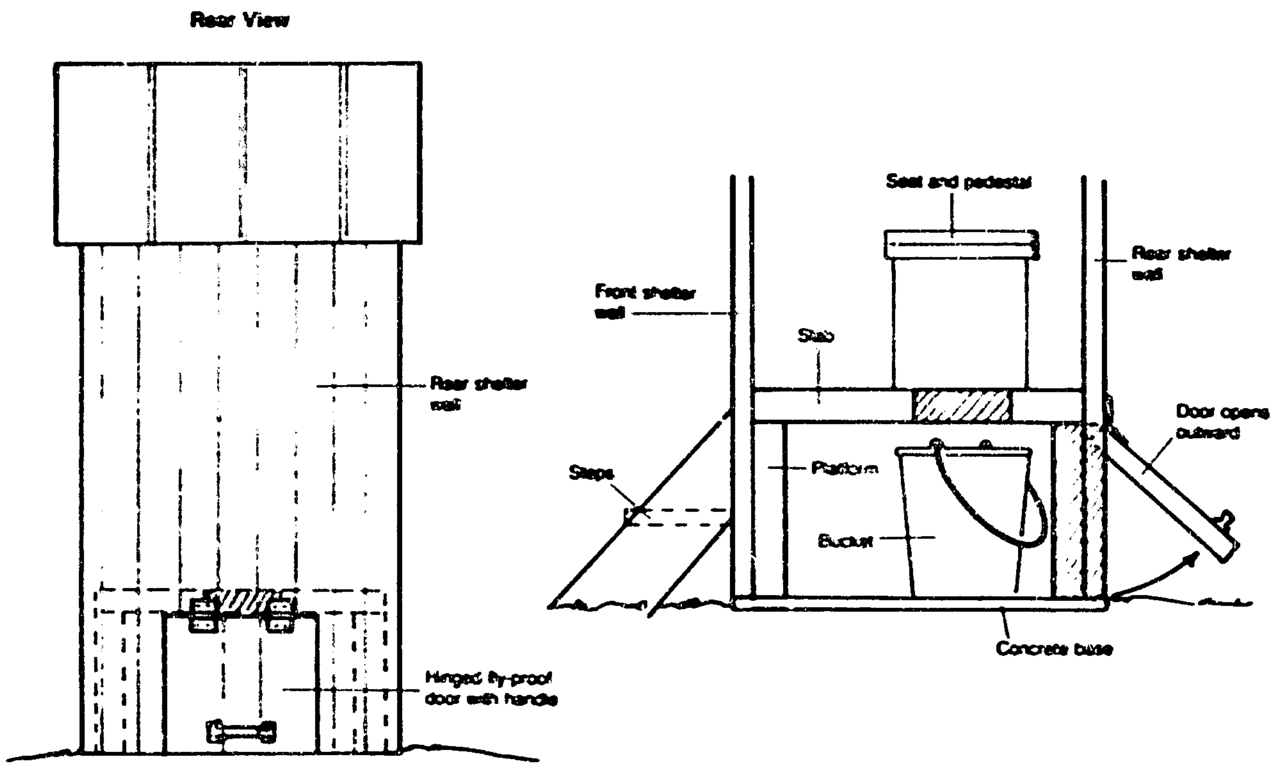


Figure 7. Detail of Shelter for Bucket Latrine

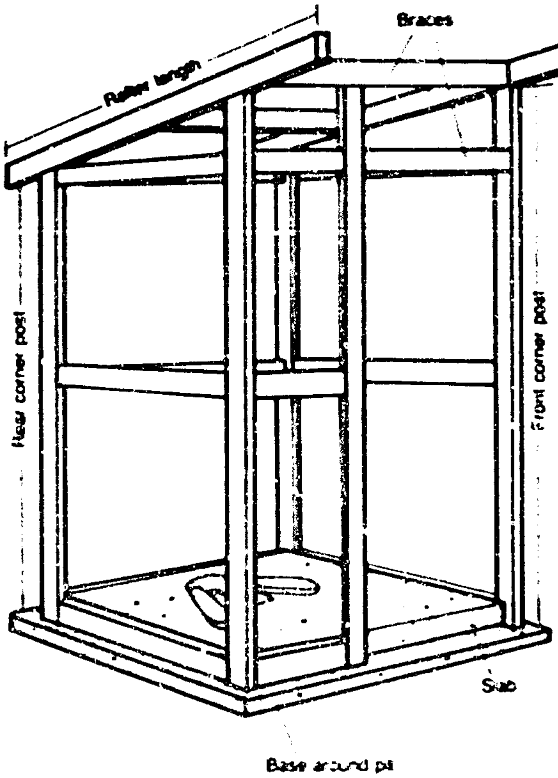


Figure 8a. Typical Shelter Framework Using Lumber

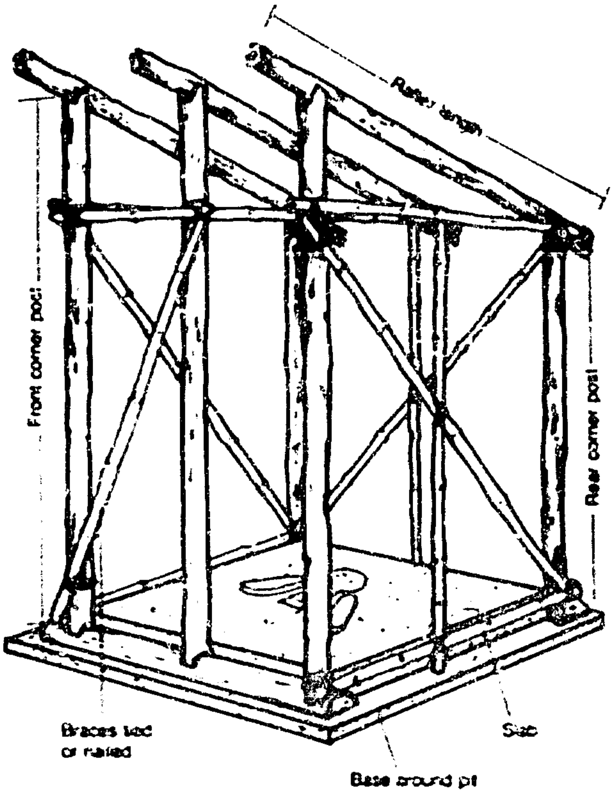


Figure 8b. Typical Shelter Framework Using Logs, Poles or Bamboo

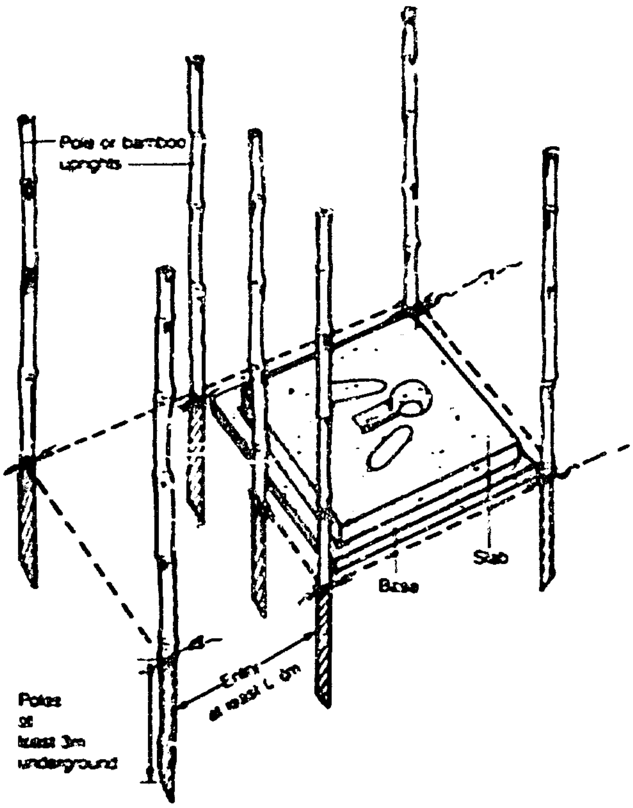


Figure 9a. Cornerposts for Screen Shelter

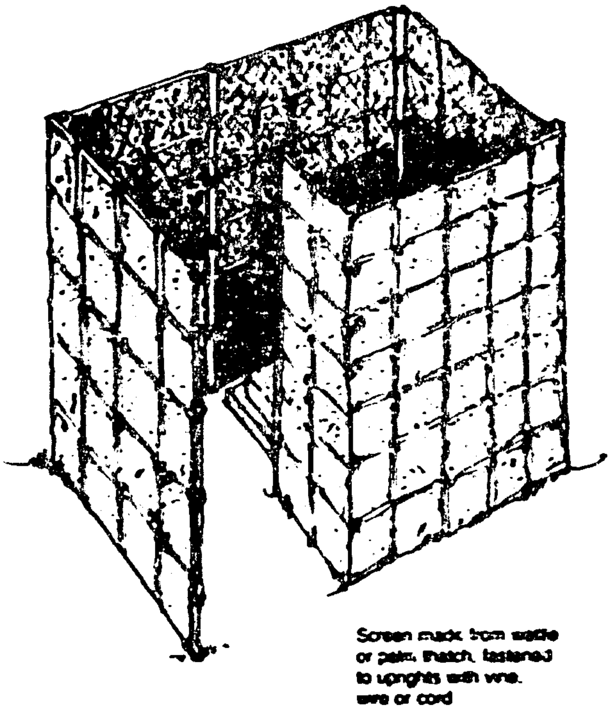
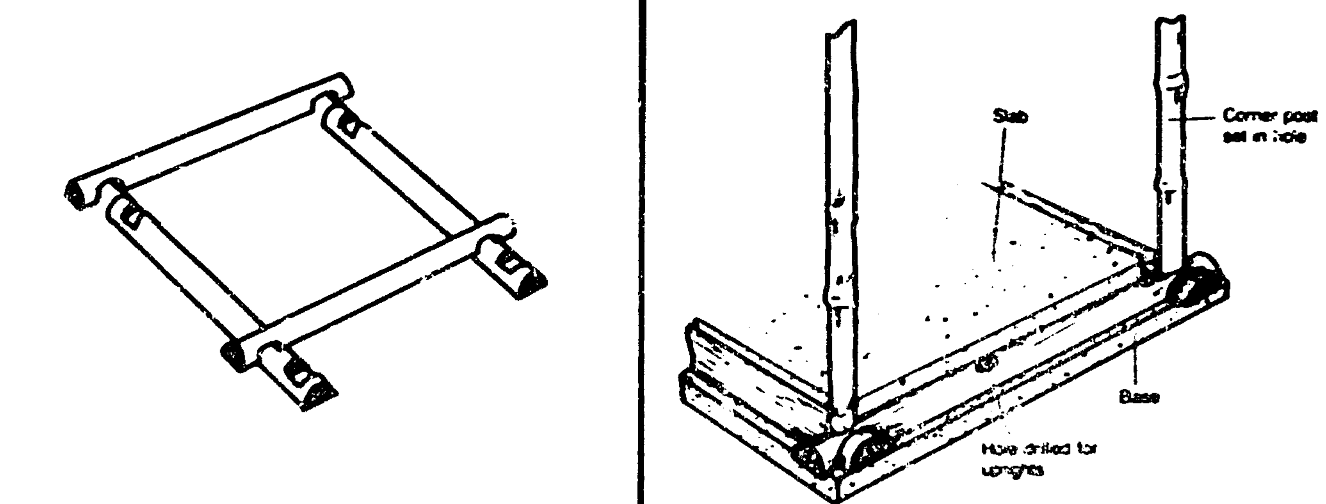


Figure 9b. Completed Screen Shelter



a. Poles notched to fit together

b. Poles on concrete base

Figure 10. Foundation for Bamboo Shelter

Table 1. Sample Materials List for Privy Shelter

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	______
	Laborer (carpentry skills)	1	______
Supplies	Foundation: logs, 1.5m long, 100mm diam.	4	______
	Corner posts: wood beams, 1.8m long, 50mm diam.	4	______
	Walls: wood boards, various lengths, 25mm thick	13.2m^2	______
	Roof: Corrugated metal	4.2m^2	______
	Screens flyproof for ventilation openings, 150 x 250mm	12	______
	Metal hinges	2	______
	Latch	1	______
	Nails	______	______
	Other	______	______
Tools	Measuring tape	1	______
	Hammer	1	______
	Saw	1	______
	Carpenter's level or equivalent (not essential but very useful)	1	______
	Carpenter's square or equivalent (not essential but very useful)	1	______
	Other	______	______

Total Cost = ______

Do Not Use The Quantities in the Sample - Calculate your Own

Table 2. Sample Work Plan for Building a Wood Privy with a Door

Time Estimate	Day	Task	Personnel	Tools and Materials
1 hour	1	Build foundation	Foreman; laborer with some carpentry skills	2 hammers; saw; nails; measuring tape (these will be needed throughout construction); 4 wood beams, 100mm by 100mm
1½ hours	1	Erect corner posts, uprights, and crossbraces	"	8 boards, 50mm by 100mm; 10 boards, 50mm by 50mm
½ hour	1	Build rafters	"	2 boards, 50mm by 100mm
3 hours	1	Build walls	"	14 square meters of boards, 25mm by 150mm
2 hours	2	Build roof	"	4 boards, 50mm by 50mm; 5 square meters of tin sheets; tin snips
1 hour	2	Build door and attach hinges and latch	"	1.7 square meters of boards, 25mm by 150mm; 3 boards, 25mm by 100mm; 2 metal hinges; screws and screwdriver; eyelet-and-hook latch
½ hour	2	Pick up scrap lumber, nails, and other leftover material	"	

3. Drill or cut holes in the foundation for the corner posts and uprights. Erect the posts, making sure they are vertical, and secure them to the foundation with wire or vine. Leave at least 0.8m space for the entryway or doorway. See Figure 10b. For a shelter with a door, the corner post and upright on each side of the doorway serve as the door frame.

4. Secure the crosspoles to the corner posts with wire or vine. The top crosspoles should be placed at the designed height of the walls. If the roof is raised for ventilation, the top crosspoles will be 100-150mm below the tops of the corner posts. For a shelter with a door, one crosspole will define the top of the doorway, which should be at least 2.0m high.

5. Secure the rafters to the corner posts with wire or vine. Rafters should extend about 0.3m beyond the front and rear walls.

6. Begin the screening wall, if there is one, by erecting two uprights as shown in Figure 11a. Bury the ends at least 0.3m in the ground and thoroughly tamp. Secure the crosspoles to the uprights.

7. Build the shelter walls and screening wall with bamboo, as shown in Figure 11b. Secure the bamboo to the crosspoles and uprights with wire or vine.

8. Build the roof with bamboo strips and palm thatch, as shown in Figure 11b. Start at the lower edge of the roof and work toward the higher edge, overlapping the thatch or palm leaves. The roof should extend about 0.3m beyond all walls.

9. Build a door, if there is one, with bamboo as shown in Figure 12. Attach the hinges, fasten the door to the door frame, and attach a latch, as described in the section on building special features.

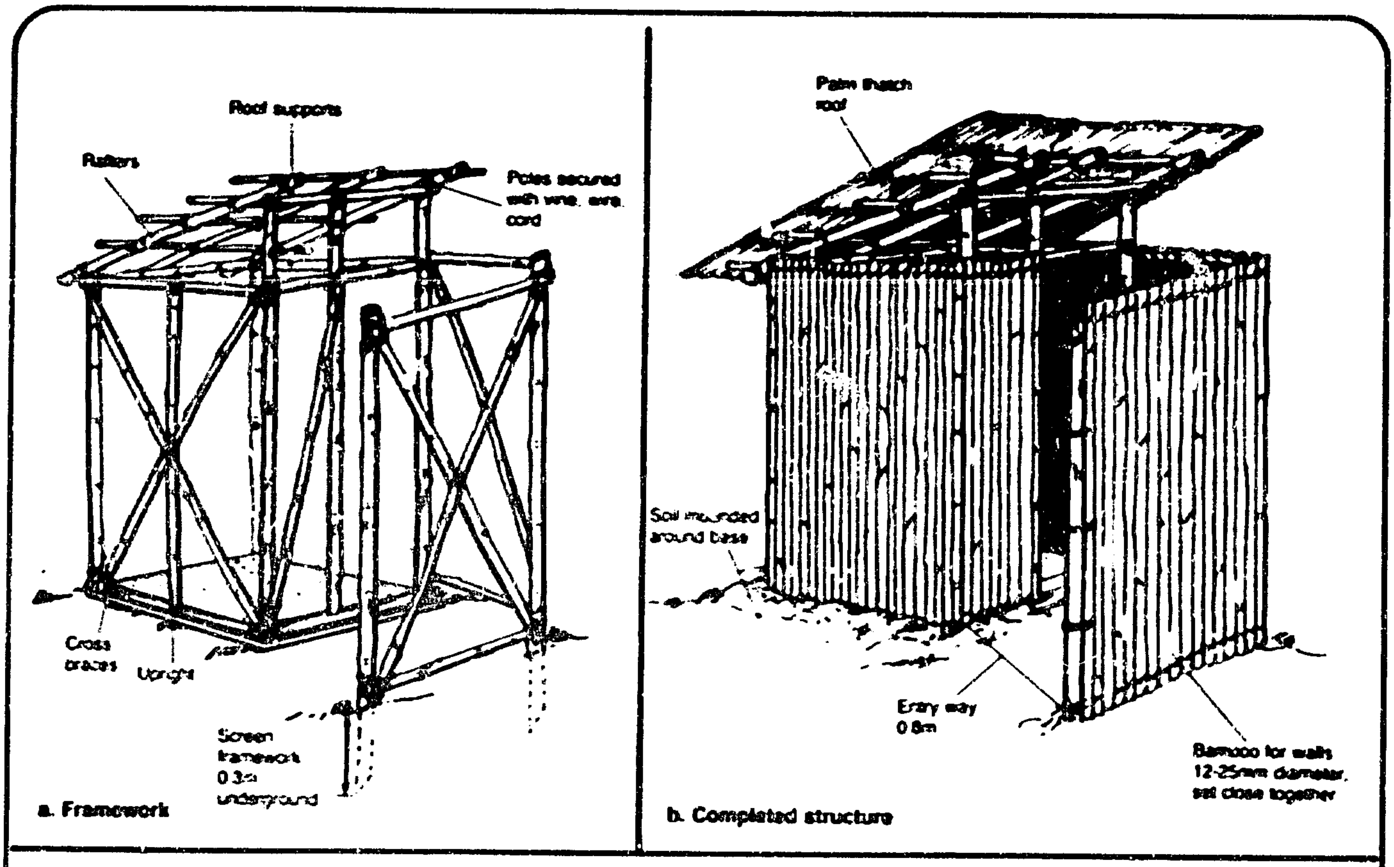


Figure 11. Construction of Bamboo Shelter with Screen and Roof

10. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screens, as described in the section on building special features.

11. Mound soil around the bottom of the walls to help keep out pests.

For a wood shelter with a roof or roof and door:

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Build a foundation around the privy slab from wood beams 50-100mm in diameter as shown in Figures 13a and 13b.

3. Erect the corner posts and uprights, making sure they are vertical, and nail them securely to the

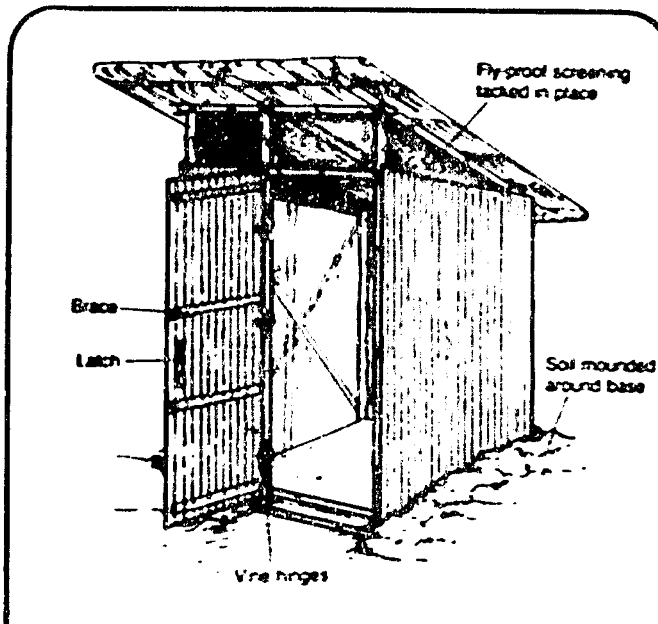


Figure 12. Bamboo Shelter with Door

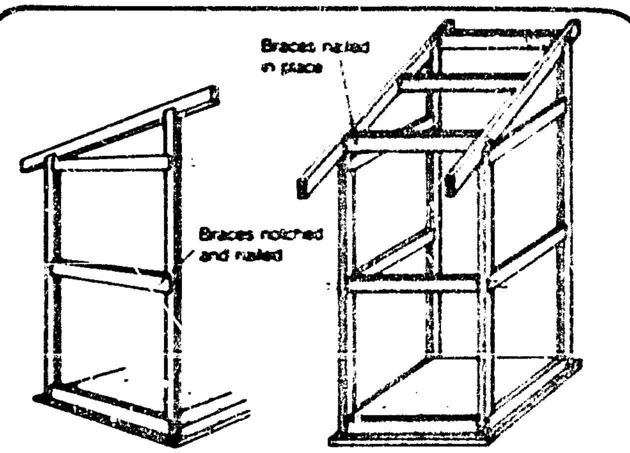
foundation. Leave at least 0.8m space for the entryway or doorway, as shown in Figure 14. For a shelter with a door, the corner post and upright on each side of the doorway serve as the door frame.

4. Nail crossbraces to the inside edges of the corner posts and uprights. The top crossbrace should be at the designed height of the walls. If the roof is to be raised for ventilation, the top crossbraces will be 100-150mm below the tops of the corner posts. For a shelter with a door, one crossbrace will define the top of the doorway, which should be at least 2.0m high.

5. Nail the rafters on top of the cornerposts. The rafters should extend about 0.3m beyond the shelter walls.

6. Begin the screening wall, if there is one, by erecting two uprights as shown in Figure 14. Bury the ends 0.3-0.6m in the ground and thoroughly tamp. Nail crossbraces to the inside edges of the uprights.

7. Build the walls and screening wall by nailing boards to the outside edges of the corner posts and uprights, as shown in Figure 15.



a. Side wall and rafter showing position of base b. Joining two side walls with braces (rear view)

Figure 13. Framework for Wooden Shelter

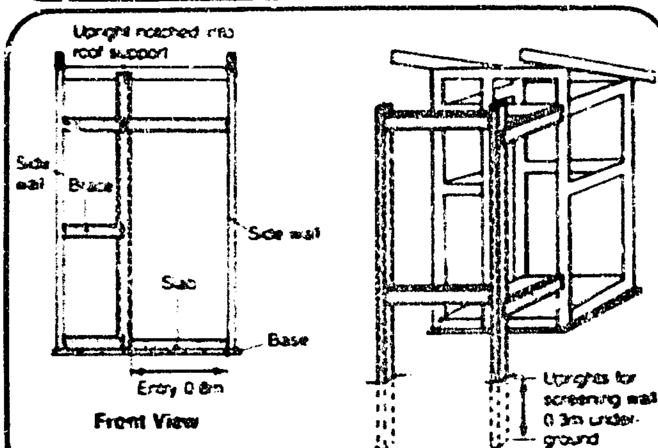
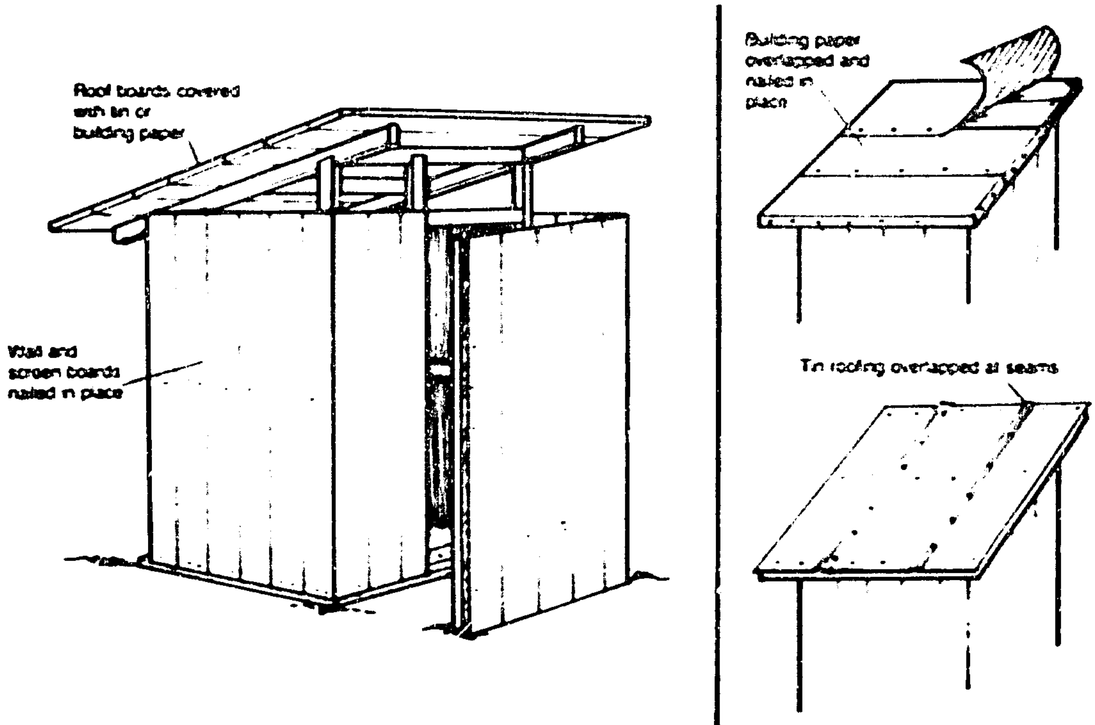


Figure 14. Framework for Wooden Shelter with Screen



Roof detail

Figure 15. Completed Shelter

8. Build the roof by nailing crosspieces to the rafters, then nailing tin sheets to the crosspieces. Start from the lower edge of the roof and work toward the higher edge, overlapping the tin sheets as shown in Figure 15. The roof should extend about 0.3m beyond all walls.

9. Build a door, if there is one, with wood boards as shown in Figures 3 and 5. Attach the hinges, fasten the door to the door frame, and put on a latch as described in the section on building special features.

10. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screens as described in the section on building special features.

For a brick and mortar shelter with a roof or roof and door:

Since brick and mortar shelters should stand for more than 10 years, they are recommended for use with offset pit privies or compost toilets, which generally last that long. Because of the weight of brick and mortar shelters, they are not recommended for use with ventilated pit privies in which the back wall of the privy rests on the privy slab.

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Mortar a row of bricks to the base of the pit, mortaring the inside edge of the bricks to the privy slab.

3. Mortar a second row of bricks overlapping the first row as shown in Figure 16. Leave at least 0.8m space for the entry.

4. For a shelter with a door, build the door frame with wood beams 50mm thick by 100mm wide, and set it in place with a temporary brace as shown in Figure 17. Fasten L-shaped metal strips to each side of the door frame with nails or screws. The horizontal part of the strip will be mortared between the rows of bricks to hold the frame in place. Attach a second pair of L-shaped strips when the walls reach about half their height, and a third pair when the walls reach nearly the total height.

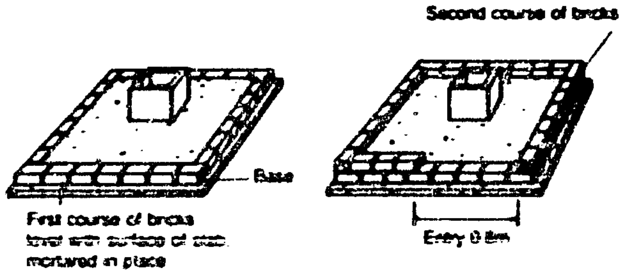


Figure 16. Foundation for Brick Shelter

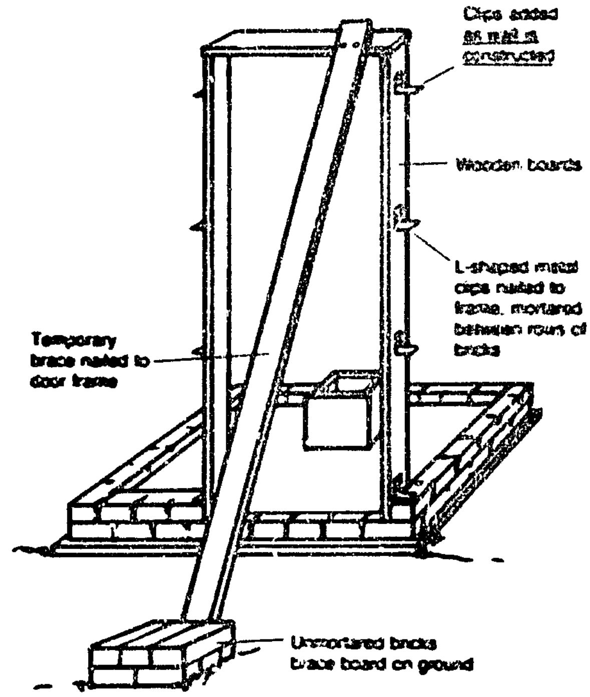


Figure 17. Framework for Entry or Door

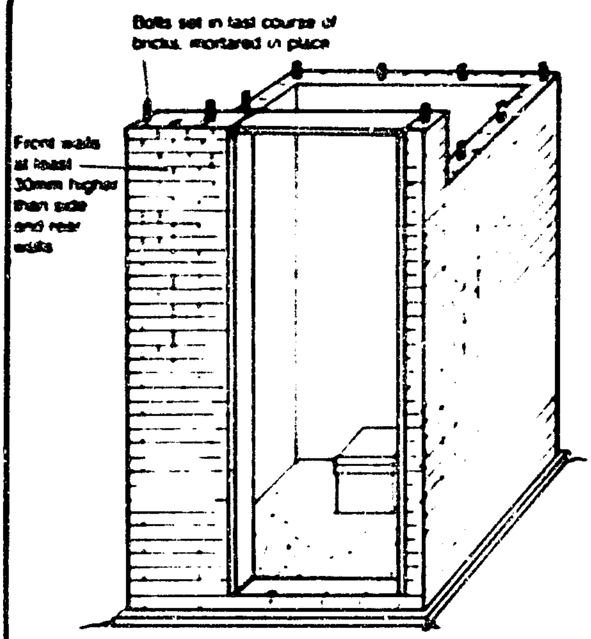


Figure 18. Constructing Brick Shelter

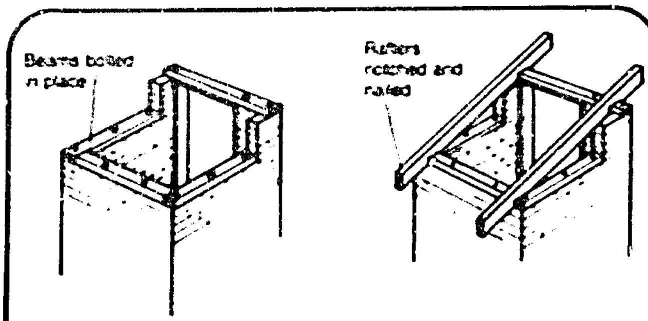


Figure 19. Roof for Brick Shelter

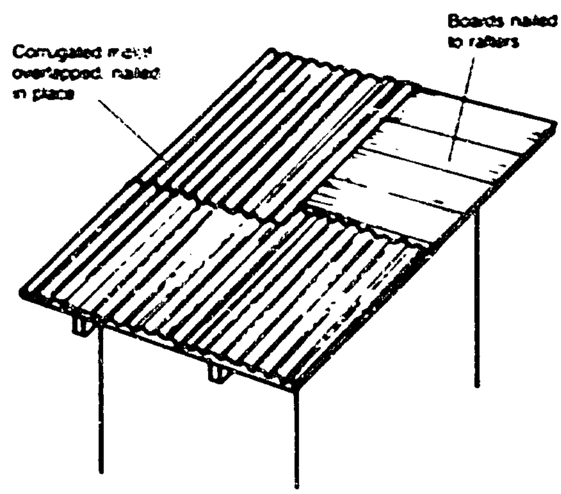


Figure 20. Corrugated Roofing

5. Continue laying rows of bricks up to the design height of the walls, being careful to keep the walls vertical.

6. Place bolts about 12mm diameter by at least 100mm long in the top bricks near the corners of each wall as shown in Figure 18. Mortar the bolts in place with the threaded ends up.

7. Allow a day or two for the mortar to set. Remove the temporary brace.

8. Drill or burn holes in wood beams 50mm thick by 100mm wide, matching the size and location of the holes to the bolts sticking up from the bricks. Set these top beams in place and fasten them to the bolts securely using nuts as shown in Figure 19.

9. Nail the rafters to the top beams. The rafters should extend about 0.3m beyond the walls as shown in Figure 19.

10. Build the roof by nailing cross-pieces to the rafters and nailing corrugated metal sheets to the cross-pieces. The furrows in the metal should be lined up in the direction of the roof slope. Start from the lower edge of the roof and work toward the higher edge, overlapping the corrugated sheets as shown in Figure 20. The roof should extend about 0.3m beyond all walls.

11. Build a screening wall, if there is one, by nailing uprights to the wood beam foundation. Nail the crossbraces to the uprights and to the top beam of the shelter. Nail the boards to the uprights as shown in Figure 21a.

12. Build a door, if there is one, with wood boards as shown in Figure 21b. Attach the hinges, fasten the door to the door frame, and put on a latch, as described in the section on building special features.

13. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screen as described in the section on building special features.

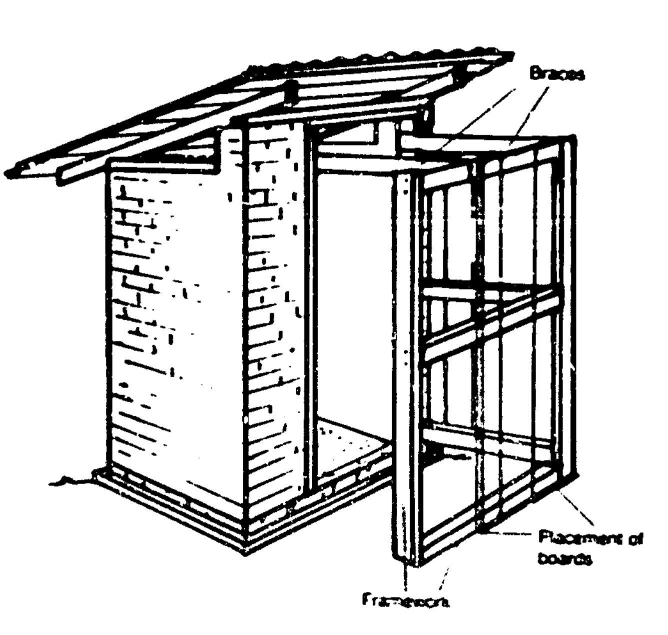


Figure 21a. Brick Shelter with Screening Wall

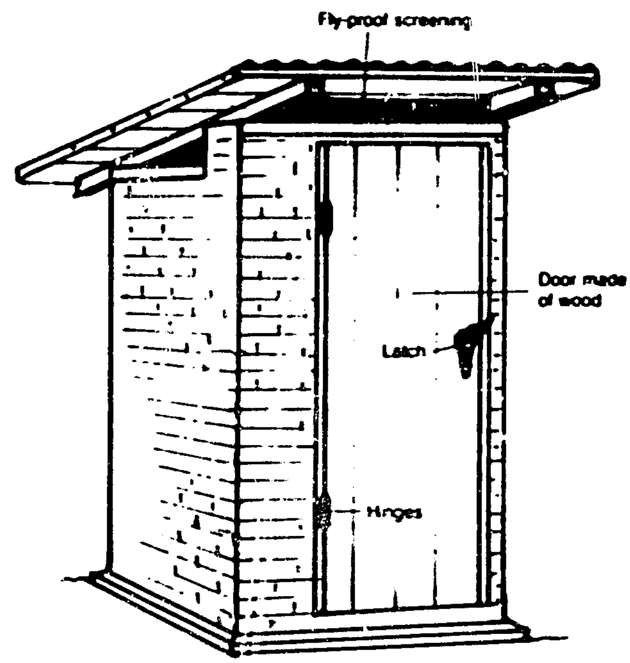


Figure 21b. Brick Shelter with Door

Building Special Features

Ventilation Openings. If the roof is not raised above the walls for ventilation, and ventilation openings are desired, cut openings near the tops of the walls. The openings should be about 200mm wide by 100mm high and spaced around the walls about 150mm apart as shown in Figure 6.

Screens. Screens covering ventilation openings must have mesh no larger than 2mm in order to keep out flies. Screens should be made of rust-proof material such as bronze, copper, plastic, or aluminum. If the screens are not rust-proof, paint them to prevent rust.

To cover a ventilation opening, cut a section of screen large enough to overlap the opening by 25mm on all sides and nail it in place as shown in Figure 6.

Door Hinges. Before attaching the hinges, hold the door in place and mark the door and the door frame where the hinges should be placed. Hinges should be about 150mm from the top of the door and 250mm from the bottom. They should be placed so that the door opens outward, if this is culturally acceptable.

If you are using prefabricated metal hinges with removeable pins, remove the pin from each hinge and separate the two halves. Attach one half with screws or nails to the door frame and the other half to the door. Raise the door in place, fit the halves of the hinges together, and reinsert the pin in each hinge.

If you are using a strap hinge, install it on the door. Lift the door into place and use a temporary support to hold it off the floor in its correct position. Accurately mark the proper location of the hinge on the door frame. Take the hinge apart and install the frame half. Then, hang the door.

For hinges of stiff leather such as soles of discarded boots or sandals, nail the hinges to the door, raise the door in place, and nail the hinges to the door frame.

For hinges made of vine, raise the door in place and tie the vine around the bamboo poles of the door and door frame. Leave enough slack so the door can be easily opened and closed.

Door Latch. For an eyelet-and-hook latch, secure the eyelet to the inside

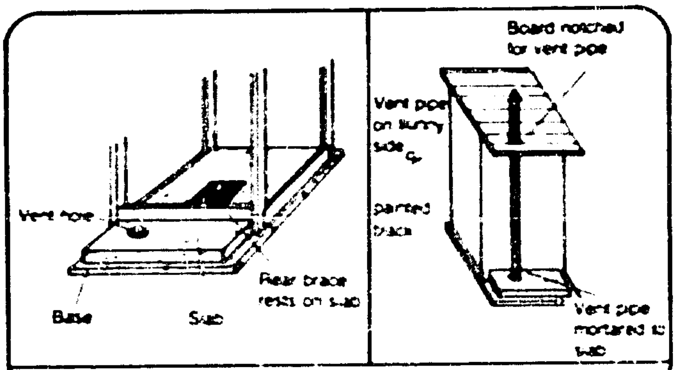


Figure 22. Constructing a Ventilated Shelter

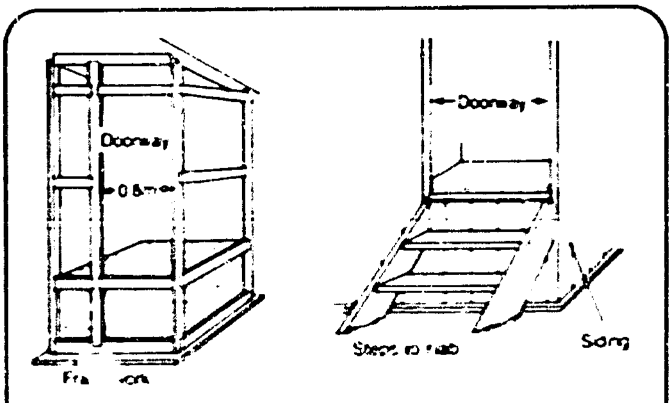


Figure 23. Construction of Shelter for Bucket Latrine

of the door frame, and attach the hook to the inside of the door. The latch should be just above the middle of the door. For a bar latch, nail a piece of wood to the inside of the door. For a peg-and-loop latch, fasten the bamboo peg to the inside of the door frame and tie the vine loop to the inside of the door.

Vent Pipe. The vent pipe is mortared to the vent hole in the privy slab and attached to the shelter roof or the wall, if extra support is needed. The pipe should be vertical. If the roof overhangs the vent hole, cut a hole or notch in the roof to accommodate the vent pipe as shown in Figure 22. Attach the vent pipe to the roof and wall with either a metal band and screws, wood and nails, wire, or vine.

Shelter for Off-set Pit Privy. The foundation for the shelter must rest on the ground and abut the platform which supports the privy slab. Level the ground and thoroughly tamp it before building the foundation. The bottom of the privy walls begin at the foundation and completely enclose the platform. The bottom of the doorway or entryway begins at the privy slab and is higher than the foundation. For additional details see "Constructing Slabs for Privies," SAN.1.C.1.

Shelter for Bucket Latrine. The foundation for the shelter rests on the platform base and abuts the platform. Build the shelter walls to completely enclose the platform. The bottom of the entryway is level with the privy slab as shown in Figure 23. A fly-proof door for removal of the bucket

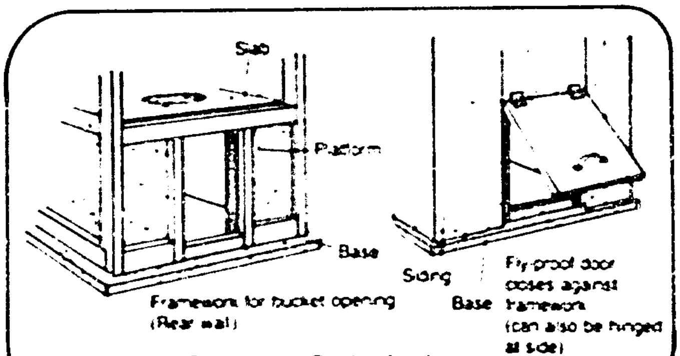


Figure 24. Rear Opening for Bucket Latrine

must be built into either the rear of the platform or the rear wall of the shelter. The door should have hinges and a latch to keep it tightly closed. If the door is built into the platform, leave an opening in the rear shelter wall as shown in Figure 24. For additional details, see "Constructing Bucket Latrines," SAN.1.C.5.

Shelter for a Compost Toilet. The foundation for the shelter rests on the base of the double vault and abuts the vault. Build the shelter walls to completely enclose the platform. The bottom of the entryway is level with the privy slab as shown in Figure 25. Airtight doors will be built into the rear of the vault. Leave openings in the rear shelter wall to allow access to these doors as shown in Figure 25. For additional details, see "Constructing Compost Toilets," SAN.1.C.6.

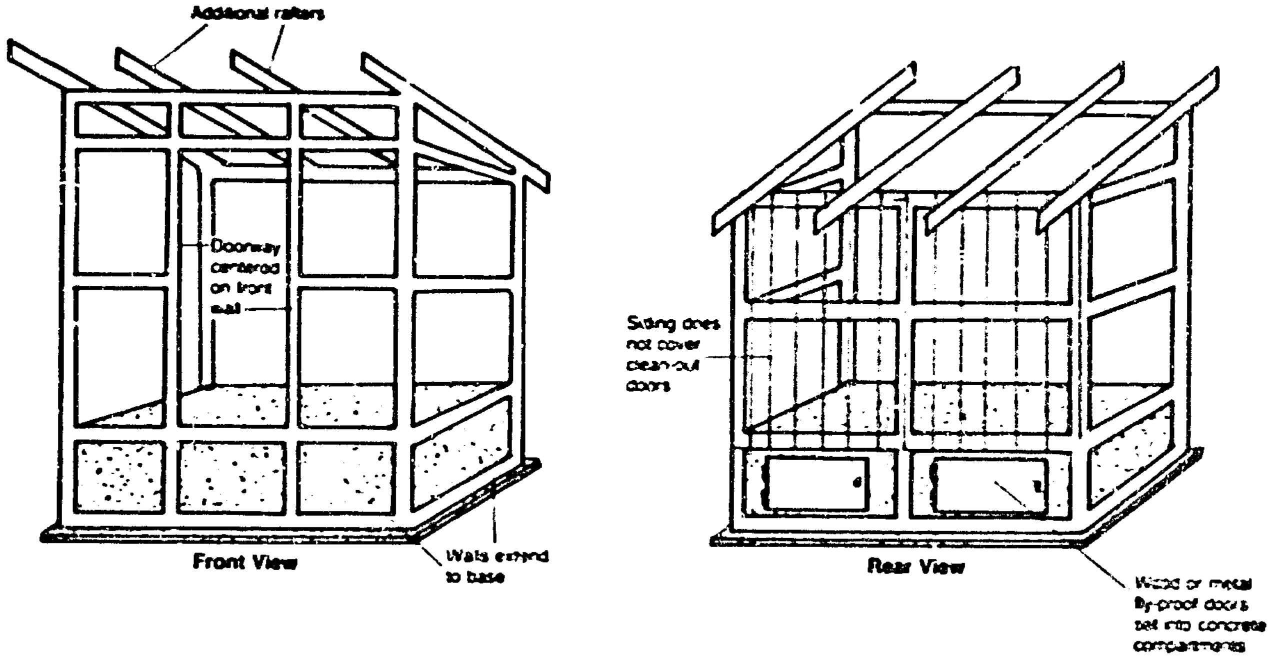


Figure 25. Framework Pattern for Composting Toilet

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using Water for the World Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, USA.

GUIDE TO SESSION 16: LATRINE COMPLETION AND PROJECT REVIEW

Total Time: 9 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	5 minutes		Session objectives
Plans for completion	Team reports	30 minutes		
Project completion	Fieldwork in teams	3 to 3 1/2 hours	Handout 16-1: Team Instructions for Completing the Latrine Construction	
	LUNCH	60 minutes		
Discuss fieldwork	Group discussion	30 minutes		
	Team task	5 minutes		
User education	Team reports	25 minutes		
	Summary discussion	25 minutes		
	BREAK	15 minutes		
Planning skills	Team task	20 minutes		
Review of planning	Group sharing	20 minutes		
Construction projects	Analyze learning	90 minutes	Handout 16-2: Project Learning Worksheet	Task instructions
	Individual task Team task Group discussion Self-assessment		Handout 16-3: Self-Assessment Inventory	
Closure	Total group discussion	10 minutes		

Session 16:Latrine Completion and Project Review

Total Time: 9 hours

OBJECTIVES

At the end of this session participants will be able to:

- o Complete and/or plan the completion of a latrine project
- o Describe when a project is complete
- o Assess their own skills and their ability to plan and supervise a latrine project

OVERVIEW

This session is designed to provide the participants with an understanding of what is needed to complete an individual latrine. It shows that completion means more than building a structure. Excess construction material and waste should be removed, erosion control considered and implemented if needed, and, most important, the users trained to maintain and repair their latrine. In the final portion the individual will assess his or her skills in planning and supervising the construction of a latrine.

This session takes the entire day. The day is divided into two parts. The morning begins with a short session in the workshop and then is followed by three hours of fieldwork to complete the latrine projects. Final plans for setting up on-going maintenance activities need to be concluded also.

During the afternoon, there is an in-depth review and analysis of what was learned from the field project. This is a key aspect of the training. It helps participants generalize and assess what they have learned from their construction work and begin to look at how they can apply it more broadly. This begins the process of community and back-home planning.

PROCEDURES

1. Session Introduction Time: 5 minutes

Put agenda for the day on a flipchart and discuss it. Share the objectives and overview.

2. Team Reports on Plans for Completion Time: 30 minutes

Ask the teams to report on where they are and what needs to be done to finish their projects. Have each team describe briefly its strategy for completion. Provide feedback as needed on team plans. It is important that each team succeed in reaching some level of completion of its project. Team instructions are included as Handout 16-1.

Stress that in addition to project completion tasks, this is the final opportunity for handing over the project to the community. Stress again the importance of having the community and/or householder feel they own the latrine project in order for the latrines to be used and maintained properly.

Briefly review the tasks necessary for project completion.

- o Shelter completed or arrangements made to complete it
- o Area graded and cleaned of construction debris
- o Community education on latrine maintenance completed

3. Fieldwork Time: 3 to 3 1/2 hours

Have the teams report to their projects and come back to the workshop after lunch. The team task is to complete construction or arrange for completion by the work force. Trainer(s) go from project to project to provide opportunity for questions and to observe progress. Tell teams to report back to the workshop after lunch. An opportunity for teams to see each other's completed projects should be provided during the morning.

LUNCH Time: 60 minutes

4. Discuss Fieldwork Time: 30 minutes

Review the morning activities using an abbreviated version of the processing questions from other sessions. Since there will be more discussion in the afternoon, you may want to limit questions to asking team leaders and workers:

- o What were the significant things you learned today?
- o Is there anything you would do differently the next time?

5. User Education on Repair and Maintenance Time: 5 minutes

Remind participants of discussion in session on educating users about repair and maintenance. Give participants a few minutes in teams to discuss strategies they used to educate the latrine users and how effective these were.

6. Report and Discuss Time: 25 minutes

Ask each team to report and discuss briefly strategies used for educating latrine users in proper operation and maintenance of latrine.

In summary ask:

- o What strategies seemed most effective?

- o Was timing important?
- o What might they do differently the next time?
- o How can this experience be useful to you in your work?

7. Summarize Other Strategies and Approaches to User Education   Time: 25 minutes

Introduce the idea of broader community education strategies. Ask the group to identify other strategies which might be used to provide user education in a community-wide effort. List responses. Ask for or provide an example of effective community education. Ideas you might add if appropriate are as follows:

- o Training programs in the schools
- o Home visits by a community health worker
- o The use of posters and counseling at health clinics
- o Group meetings
- o A discussion guide for use in places like well-baby clinics
- o Flyers or hand-out materials.

Since this topic was discussed in Session 11, this discussion should be brief. It should be used to help participants focus on how some of the strategies and skills used in educating individual users may also apply to larger education efforts.

BREAK   Time: 15 minutes

8. Planning Skills - Team Task   Time: 20 minutes

Tell participants that now we will look back over the entire construction process and review the methods and approaches used to plan each of the activities. Focus participants on the construction process which began on Day 3. Have them go back to the plans they made at the beginning for how they would approach the team tasks.

Ask teams to review their own planning process and evaluate its effectiveness. Have participants work for 15 minutes in their teams. The task for each team is to review their plans and the planning procedures used and compare to the reality of the construction activities. Have each team identify the most effective and least effective aspects of their planning process. Teams should be prepared to report back briefly on the effectiveness of the planning process used and the implications for future project planning. They should organize their information so it can be shared in one or two minutes with the others.

9. Group Review of Planning Time: 20 minutes

Ask each group to share briefly what they learned about planning. Discuss effective planning techniques and ways to assist communities to plan realistically. Stress the importance of comprehensive planning but also the need for flexibility in the planning to allow for unanticipated problems which occur in the actual fieldwork.

10. Analyze Learning:Construction Projects Time: 90 minutes

Tell participants "we now want to step back and review what was learned during the construction projects and how each individual might apply it in their work." Emphasize that it is important before moving on to the next session to review and summarize the important learnings from the construction pr-jects and give each person a chance to put these into perspective for themselves. Tell participants the next hour and a half will be spent on the tasks listed below. Make sure instructions are posted and that the trainer keeps track of time and moves the groups from one task to the next as appropriate.

Step One

Ask each individual to take 20 minutes and fill in Handout 16-2:Project Learning Worksheet. Tell participants this is for their own individual use and they do not have to share any of it unless they want to. (20 minutes)

Step Two

In construction teams, have a discussion about what each person learned. Discuss its potential application back home. (30 minutes)

Step Three

In the total group, ask for volunteers to share what significant things they learned or highlights of the construction project. (10 minutes)

Step Four

This is a good place to ask individuals to do another Self-Assessment Inventory (Handout 16-3) of their skills and compare their answers with the first time they did the assessment earlier in the workshop. If appropriate they can discuss their responses in pairs. (30 minutes)

11. Closure Time: 10 minutes

Review session goals and goals of the construction project.

Explain how tomorrow in the workshop we will be moving from individual construction projects into larger community projects.

MATERIALS NEEDED

Handout 16-1: Team Instructions for Completing the Latrine Construction
Handout 16-2: Project Learning Worksheet
Handout 16-3: Self-Assessment Inventory

TEAM INSTRUCTIONS FOR COMPLETING THE LATRINE CONSTRUCTION

Review with the team the activities needed for completion of the shelter. They are listed on the handout from the previous session, Team Instruction for Shelter Construction. Besides completing the shelter the following activities should be carried out:

1. Build a mound around the latrine base to prevent rainwater from entering the pit.

2. Pack the mound in order to prevent erosion. Explain to the homeowners that planting vegetation and placing rocks around the latrine will also aid in erosion control.

3. Instruct the user on the maintenance and use of the latrine as planned by your team. The user needs to know what to do when the latrine fills up and how the slab can be moved to another location.

4. If the shelter has not yet been completed by the end of the morning give detailed instructions to the homeowner/labor crew on the necessary steps needed to finish the job.

5. The team should pick up all building debris and trash and return all tools.

6. If the homeowner/labor crew continue the construction over the next few days you should return to the site to inspect the work and provide further direction if needed.

PROJECT LEARNING WORKSHEET

The three most important things I learned during this project were:

Three things I would do differently next time are:

As a team leader I learned:

As a team member I learned:

SELF-ASSESSMENT INVENTORY

Rank yourself in terms of how well you feel you do each of these tasks now. This is for your use to help you in your learning. Please be accurate and honest with your answers.

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
1. Community Mobilization				
1. Identify existing infrastructure in a community and its relationship to a sanitation project.	4	3	2	1
2. Work with appropriate community leaders and/or groups to initiate a sanitation project.	4	3	2	1
3. Identify and address social customs and practices relating to sanitation projects.	4	3	2	1
4. Gather information regarding current sanitation practices.	4	3	2	1
5. Investigate the history of past sanitation projects in the community. Evaluate the reason for their success or failure.	4	3	2	1
6. Plan culturally appropriate approaches for introducing the idea of latrine use to different groups in the village (leaders, men, women, etc.).	4	3	2	1
7. Identify and locate number of homes and other buildings in community.	4	3	2	1
8. Identify the resources accessable to the community necessary to initiate a successful project. These resources include materials, labor, tools, equipment, funds, transportation and leadership.	4	3	2	1
9. Present information concerning alternative methods and costs to provide sanitation facilities.	4	3	2	1

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
10. Assist the villagers to make decisions and develop a plan which defines the project scope and provides time frames.	4	3	2	1
11. Describe methods that will be used to assure that villages understand their reponsibilities before, during, and after construction of sanitation facilities.	4	3	2	1
12. Devise strategies for obtaining and allocating resources.	4	3	2	1
2. Project Development				
1. Identify local environmental diseases, their symptoms, means of transmission, and prevalence.	4	3	2	1
2. Use a sanitation project as a strategy for designing and implementing health education at the village level.	4	3	2	1
3. Develop strategies for educating and discussing with the community:				
a. the need for and use of a latrine	4	3	2	1
b. how disease is spread	4	3	2	1
c. dangers of animal waste	4	3	2	1
d. the importance to health of handwashing	4	3	2	1
e. discuss methods of solid waste disposal	4	3	2	1
3. Design				
1. Select from 5 types of latrines.	4	3	2	1
2. Size a communal latrine pit.	4	3	2	1
3. Size an individual latrine pit.	4	3	2	1
4. Select a latrine for use where there is water nearby.	4	3	2	1
5. Select a latrine site in relation to a potable water source.	4	3	2	1

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
6. Discuss social restraints which may hinder a latrine project and possible solutions to those restraints.	4	3	2	1
7. Determine equipment needs.	4	3	2	1
8. Determine material quantities.	4	3	2	1
9. Determine costs.	4	3	2	1
10. Procure material.	4	3	2	1
11. Determine human resource needs.	4	3	2	1

4. Construction

1. Schedule construction in a proper sequence	4	3	2	1
2. Assess geological conditions.	4	3	2	1
3. Construct a latrine pit.	4	3	2	1
4. Be able to prepare and use a correct mix of sand, gravel, water and cement for a concrete slab.	4	3	2	1
5. Pour a concrete latrine slab with reinforcing.	4	3	2	1
6. Build a wood/soil latrine slab.	4	3	2	1
7. Build a latrine superstructure.	4	3	2	1

5. Monitor and Follow-up

1. Develop a plan for continued operation and maintenance of latrine(s).	4	3	2	1
2. Develop a strategy for relocating latrines as required.	4	3	2	1

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
3. Develop a strategy for the construction of additional latrines if needed.	4	3	2	1
4. Identify follow-up health education activities necessary to encourage continued use of latrines.	4	3	2	1
5. Establish a mechanism to monitor the use of latrines.	4	3	2	1
6. Identify problems that affect the use of latrines and develop strategies to overcome them.	4	3	2	1
7. Evaluate and analyze the project upon completion.	4	3	2	1

GUIDE TO SESSION 17: IMPROVING EXISTING LATRINES

Total Time: 4 hours

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	10 minutes		Session objectives
Traditional latrines	Discussion and brain-storming	15 minutes		
Intructions for field inspection	Present and discuss	20 minutes	Handout 17-1: Instructions for Inspecting Latrines	Task instructions
Field inspections	Fieldwork	90 minutes		
Preparation of improvement plans	Individual work	30 minutes		
Suggested improvements	Individual reports (break into two groups)	40 minutes		
	Discussion	25 minutes		
Closure		10 minutes		

Session 17: Improving Existing Latrines

Total Time: 4 hours

OBJECTIVES

At the end of this session, participants will be able to:

- o Describe how traditional latrines are built
- o Identify whether health risks exist in traditional construction
- o Design an improvement plan for one existing latrine which minimizes health risks and improves construction

OVERVIEW

This session focuses on the types of latrines which already exist in the villages and on ways to improve the construction and the effectiveness of these latrines. This session is scheduled after completion of the construction projects so that participants can apply the planning and construction skills they have learned to designing methods for improving existing latrines.

This session begins with a brief introduction and task description. Participants are then sent to a nearby village to inspect latrines. Trainers need to identify a site for this trip which is accessible and also provides a variety of latrines for participants to view. Participants will inspect several latrines and identify one latrine which needs to be improved, diagram the necessary improvements, and identify needed resources.

Reports will be prepared and presented back in the workshop.

PROCEDURES

1. Introduction — Time: 10 minutes

Share overview and session objectives. Answer any questions as needed.

2. Discussion of Traditional Latrines — Time: 15 minutes

Have a brief discussion of the types of latrines already being used in the local communities. Describe how in some situations, it will be more appropriate to improve traditional latrines than to construct new ones. Discuss advantages and disadvantages of using existing latrines.

Brainstorm a list of possible improvements of local latrines that could make them more sanitary and durable.

3. Instructions for Field Inspection   Time: 20 minutes

Give participants the following task instructions. These are also provided as Handout 17-1:Instructions for Inspection Latrines.

Inform participants they will have an hour and a half in the field to conduct the inspection and begin to plan the improvements. They will then return to the workshop and have 30 minutes to complete the plan and prepare to report. Before leaving for the field, answer any questions and make sure everyone understands clearly the task and any logistical arrangments.

4. Field Inspections   Time: 90 minutes

Inspection of latrines as described.

5. Preparation of Improvement Plans   Time: 30 minutes

Individuals complete plans according to instructions, and prepare for reports.

6. Reports on Suggested Improvements   Time: 40 minutes

Divide the group into two for the reports in order to cut down on their potential repetitiveness. Individuals present reports and clarify needed points as needed. A general discussion should be deferred until after all reports are completed.

7. Discussion of Improvement Plans   Time: 25 minutes

Discuss similarities, differences, and any unique or unusual ideas from the reports.

8. Closure   Time: 10 minutes

Ask for suggestions and ideas participants have about applying these ideas back home.

TRAINER NOTES

Participants can work individually or in groups of two or three on the latrine inspection task. This depends on the size of the group and the schedule for the day. If time permits, it is preferable to have participants working individually on the improvement plans and diagrams. This gives each person practice in diagramming and estimating. It also means each person has to give a report which takes more workshop time.

MATERIALS NEEDED

Handout 17-1:Instructions for Inspecting Latrines
Directions to field sites if appropriate
Flipchart for Session Objectives

INSTRUCTIONS FOR INSPECTING LATRINES

a) Pick three latrines and inspect their construction.

b) Write down the dimensions and materials used for the base, slab, lining, and shelter. Note any other special features.

c) Identify the location of the latrine (in relation to water, kitchen, house, etc.).

d) Determine what if any health risks are posed by these latrines.

e) Choose one latrine that needs to and can be realistically improved.

f) If appropriate try to determine the homeowner's willingness to improve the latrine. Plan how to provide the homeowner with suggestions for improvement.

g) Develop an improvement plan which includes:

- a diagram of the proposed improvements
- specific estimates of tools, materials, labor needed
- a cost estimate (if possible)

h) Report briefly your suggested improvements to the rest of the group.

GUIDE TO SESSION 18: COMMUNITY PROJECT PLANNING

Total Time: 4 hours & 25 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	10 minutes		Session objectives
Major project steps	Review and discuss	10 minutes		Project steps
	Individual task (optional)	15 minutes		
Community planning	Group discussion	15 minutes		
	Case study (small groups)	60 minutes	Handout 18-1: Case Study - Zye Village	Task instructions
	Group reports	20 minutes	Handout 18-2: Resources Checklist	
Planning and sequencing project steps	Small group task	30-40 min.		
Determine responsibility	Small group task	20 minutes		Task instructions
	Group reports	30-40 min.		
Resources for community projects	Trainer led discussion	30 minutes		
Closure		5 minutes		

Session 18: Community Project Planning

Total Time: 4 hours & 25 minutes

OBJECTIVES

At the end of this session participants will be able to:

- o Plan for a community-wide latrine project
- o Estimate materials, resources, and costs for a community project
- o Develop overall time frames and put project steps in sequence
- o Identify resources for implementation of projects

OVERVIEW

This session moves from conceptualizing an individual latrine project to the development of a larger community-type project where there is the potential for a large number of households to get latrines. The session begins by looking at the major projects just completed and the skills and knowledge which can be applied to developing a community-wide project. Participants analyze a case study which gives an opportunity to plan a community project and estimate the materials and resources needed. A key part of the case study is to look at roles and responsibilities in a larger scale community effort.

PROCEDURES

1. Introduction to Session — Time: 10 minutes

Introduce session objectives and overview. Introduce the concept of a community-wide project. Discuss similarities and differences with individual latrine projects. Remind participants of Session 11 where they looked at strategies for community involvement and education. This session looks at all the steps involved in developing a project with a community.

2. Discussion of Major Project Steps and How to Apply New Planning Skills — Time: 10 minutes

Review with participants the major steps that have been covered in the workshop up until now.

Review following steps briefly:

Assessment of conditions and needs
Analysis of findings
Sharing findings with community

Community decision-making
Project planning and design
Construction
Maintenance and repair

Ask for any new thoughts or learnings in any or all of these steps.

3. Individual Task (Optional) Time: 15 minutes

If trainers believe more time is appropriate, use this task. If not, skip it. Ask participants to take each of the previous headings and write down the most important things they learned. Encourage participants to take this task seriously. They have not had time to reflect and write much so far. It is important to reinforce what they have learned by actually writing it out. The day before they identified their most important learnings from the construction process. In this session they are being asked to get even more specific about what they have learned overall.

4. Application of What was Learned to Community Projects Time: 15 minutes

Introduce idea of community-wide project. Ask participants to discuss what they learned in the field that may apply to a more comprehensive community effort. For example:

- If you learned how to assess one individual site what more might you need to know for a community project?
- How would you know who to involve in decision-making?
- How much more complex would material delivery become during construction?

5. Community Project Planning: Case Study Time: 60 minutes

Form into four groups. Distribute Handout 18-1:Case Study - Zye Village and ask participants to do the following:

- Individually, read the case study. It describes a community and specifies the type of latrine project to be implemented.
- Analyze the case study and agree in your group to the exact scope of the project.
- Estimate material needs and costs (use Handout 18-2:Resources Checklist).
- Identify needed resources (determine if sufficient).
- Prepare to report findings to the rest of the group.

6. Share and Report Time: 20 minutes

Ask each group to report for no longer than five minutes. Each reports briefly on the estimates and compares them with other groups. Problem solve with any group that is not sure how to obtain the needed resources (material or labor).

7. Planning and Sequencing Project Steps - Small Groups* Time: 30-40 minutes

Instruct participants to return to small groups and to:

- o Identify and put in sequence the tasks needed to complete this project
- o Estimate the time needed to complete each step (see chart for step 8).

8. Determine Responsibility Time: 20 minutes

After approximately 30 minutes ask the groups to finish up the planning steps in the next few minutes and go to the next stage. Instruct them to identify who should have major responsibility for each of the steps. Tell groups to first identify all potential actors in or outside the community and to allocate responsibility. Have groups put the following format on a flipchart to use in reports.

Tasks	Time needed	(Responsible person/group)
1.		
2.		
3.		

9. Share and Report Time: 30-40 minutes

Ask each group to share its plan and the sequence and who was assigned responsibility. Give each group five minutes to report. Encourage groups to be brief with reports if plans are similar.

Note similarities and differences and discuss implications after groups have finished reporting.

Focus on the question of responsibility. Discuss how and why groups made decisions. If groups assigned responsibility to different persons in the community, find out why. It is possible to have several different but still appropriate ways

* See Trainer Notes at the end of this session.

of assigning responsibility. It is important to be clear why it is being done. Point out importance and potential difficulties of clearly identifying roles and responsibilities in a project. Reinforce again how critical it is to have community members assuming responsibility rather than project developers.

10. Discussion of Resources Time: 30 minutes

Lead a group discussion of what resources may be needed to implement a community project. Ask participants to brainstorm what type of resources may be available for community wide projects. Give examples such as government agencies or religious groups.

11. Closure Time: 5 minutes

Acknowledge difficult and sometimes tedious nature of thorough planning like this. Ask if people found it difficult to apply concepts learned earlier in the workshop to community planning. Do they think they can do it back in their own communities? Ask for examples.

Refer to the session goals and ask if they were met.

Remind participants that tomorrow they will be planning for projects back home so they should be thinking about what they want to do.

Trainer Notes

Steps 7 and 8 can be introduced at one time before breaking into small groups or can be presented as two different sets of instructions.

MATERIAL NEEDED

Handout 18-1:Case Study - Zye Village
Handout 18-2:Resources Checklist

CASE STUDY - ZYE VILLAGE

The local health official of Zye has told you that there are numerous recent cases of diarrhea in the village and asks that you meet with village representatives to see about improving sanitation for the village.

The meeting with the village chief, school master, one of the local merchants, and a spokeswoman, Ms Zy, ended with the following information.

1. The community wanted sanitation improvements and had raised the equivalent of US $321 to support a project.

2. There are 41 occupied households without latrines.

3. Five houses are occupied by elderly persons and six by widows with young children. Two additional families are from another area, and the chief and Ms Zy specifically requested that they not be included, at least as far as the community funds were involved.

4. There are no communal latrines in public places such as the primary school and the dispensary. Following the meeting, you, the local health official, and the chief conduct a sanitary survey which validates the information concerning the number of households. The two households the chief does not want served both have many small children. You also learn the following:

   - there is a sand and gravel deposit nearby;
   - the soil is generally adequate for waste disposal;
   - there is a government controlled forest adjacent to the village;
   - the stream flows year around;
   - locally made brick is available at 5 cents a brick.

5. The community obtains water from protected wells within the town.

You know from previous projects that cement will cost about $8 a bag, re-bar about $2 for each slab and that it takes 1,600 bricks to build a shelter. Past experience indicates that a half bag of cement is needed per slab.

The government has a rural sanitation program that will give a cement latrine slab free to a family if the shelter is made of brick, lumber, or concrete block and built to specifications.

During your visit to the area you are impressed with the overall closeness and interest of the community in improvement projects.

RESOURCES CHECKLIST

Materials	Quantity	Cost
Latrine Pit		
Wood for lining		
-		
-		
-		
Slab Base		
-		
-		
-		
-		
Latrine Slab		
Cement		
Re-bar		
-		
-		
Slab Forms		
Lumber		
Nails		
-		
-		
	Total Materials Cost	

Activity/Labor	*Skills & number of persons	Time	Cost
Excavation of pit			
Lining pit			
Construction of slab base			
Construction of slab forms			
Latrine slab			
Pouring the slab			
Installing the slab			
Transportation of materials			
		Total Labor Cost	

* Mason
Carpenter
etc.

Tools	Quantity	Cost
Shovels		
Saw		
-		
-		
-		
-		
-		
-		
-		
Total Tool Cost		

Equipment	Quantity	Cost
Truck		
Push-cart		
-		
-		

Total Project Cost

Material

Labor

Tools

Equipment

Total

GUIDE TO SESSION 19: PLANNING YOUR LATRINE PROJECT

Total Time: 2 hours & 30 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	5 minutes		Session objectives
Reviewing and summarizing learning	Individual task	20 minutes		
	Group discussion	25 minutes		
Introduction to personal work plans	Presentation	10 minutes		
Work planning	Individual task	40 minutes		Task instructions
	Pair discussion	20 minutes		Discussion and questions
	Group discussion	20 minutes		
Closure	Discussion	10 minutes		

Session 19: Planning Your Latrine Project

Total Time: 2 hours & 30 minutes

OBJECTIVES

By the end of this session, participants will:

- o Develop a plan for implementing a latrine project.
- o Identify in detail the activities for the first month of this plan.

OVERVIEW

This session is intended to help the participants plan for their first latrine project. Throughout the course participants reflected on how they could apply the skills and knowledge from that session to their first project. The next three hours will be spent beginning to work out the details for a plan covering an entire latrine project. So far a good deal of time has been spent working on the technical skill and knowledge of building a latrine. Equally important is the skill and knowledge required to effectively plan and carry out a latrine project with full community involvement. The full involvement of the community is especially important with latrine projects because the benefits of sanitary waste disposal are not always obvious and this involvement provides a means for making people aware of the benefits. This awareness will be the key to continued use of sanitary latrines.

PROCEDURES

1. Introduction   Time: 5 minutes

Give the group the information in the overview, and state the objectives.

2. Individual Reviewing/Summarizing Activity   Time: 20 minutes

Give the participants 20 to 30 minutes to work on their own to review their notes and check back through their handouts. They should write down any concerns they have or any unresolved questions. Reintroduce the project cycle from Session 3 and point out that they now need to plan and to implement these activities back home.

3. Group Discussion   Time: 25 minutes

At the end of the time spent on individual reflection and review, ask what they identified as concerns and unresolved questions. Lead a discussion for the next 20 minutes based on answers and strategies for resolving these issues.

4. Introduction to Preparing Work Plan For Constructing Latrines — Time: 10 minutes

Introduce the topic of planning back home. Share how difficult it can be after a workshop to go back home and want to change something or improve a project without a clear plan of what needs to be changed and how to go about doing it.

Introduce the idea of using a personal work plan as the mechanism to organize, schedule, and coordinate resources and activities necessary for timely and successful development of a project. Of the villages they work with, have participants determine where each village is in terms of being ready to support a latrine project.

5. Work Planning: Individual Task — Time: 40 minutes

Assign the following task to the participants to complete on their own for one of the villages they listed. Give them 40 minutes to work on the task. Trainers should give clear specific examples of goal statements to get participants started.

- o Set clear and specific goals.
- o Identify the activities you would undertake during the next two months to achieve these goals.
- o How long would you estimate each activity will take?
- o In what order would you schedule these activities so that events are coordinated effectively?

6. Pair Discussion — Time: 20 minutes

At the end of the 40 minutes, have each participant pick a partner and discuss each other's goals and plans. Urge them to offer comments and suggestions to help make the plans as realistic as possible. Give them 20 to 25 minutes for this joint discussion.

Put on a flipchart and discuss examples of questions for partners.

- o How clear are the goals?
- o How will you know when you accomplish them?
- o How much time can you devote to this project?
- o How many trips can you make to the designated village?
- o What resources are there in the village, both skills and materials?
- o Who should know about this project, and who should be involved?

7. Group Discussion   Time: 20 minutes

After the two-member teams have spent 20 minutes working together, lead a discussion with the total group around the following questions:

- What are some examples of activities you feel should occur in week one?
- Which activities did you feel would take the most time?
- What problems might you anticipate in scheduling these activities?

8. Summary and Closure   Time: 10 minutes

Refer back to the goals for this session. Engage the participants in a brief discussion over whether they feel the goals have been reached. Summarize and emphasize the importance of planning, and encourage them to continue working on this type of planning as a tool for managing their latrine activities.

Tell participants that after a brief break, we will ask them to look at the workshop as a whole and evaluate its effectiveness.

MATERIALS NEEDED

Flipchart for Session Objectives
Flipchart for Task Instructions
Flipchart for Discussion Questions

GUIDE TO SESSION 20: WORKSHOP EVALUATION

Total Time: 1 hour & 15 minutes

SUBJECT	PROCEDURE	TIME	HANDOUTS/MATERIALS	FLIPCHART REQUIRED
Introduction	Presentation	5 minutes		
Written evaluation	Individual task	30 minutes	Handout 20-1: Evaluation Form	
Oral feedback	Group discussion	20-30 min.		Workshop strengths and suggested improvements
Closure	Group discussion	10 minutes		

Session 20: Workshop Evaluation

Total Time: 1 hour & 15 minutes

OBJECTIVES

- To fill out the workshop evaluation form
- To provide oral feedback to the trainers on the workshop

OVERVIEW

It is assumed that the trainer will be able to evaluate the workshop in a variety of ways, formally and informally. Each session contains objectives which are generally verifiable by observation: skills can be either demonstrated or not. It is also assumed that the recipients of this training are well-motivated adults who will seek help if they don't understand something. The ultimate evaluation measure, however, will be demonstrated long after the workshop when the participant is implementing latrine projects. If the training has been successful, the participant will be able to use the learning from the workshop to promote a project which is technically and socially sound.

This evaluation session provides one additional source of data. It is based upon the participants' feelings and observations about the workshop. The information gained from this session can be used both to improve future workshops and to help the trainer do a better job next time in conducting this workshop. This session uses two tools, a written "opinionnaire" and an informal oral feedback session. The written portion should be given to provide a record for the trainer. It is intended to be done anonymously to ensure more open feedback. The oral portion is designed to gather information about the workshop which will help explain and interpret the written data and provide an opportunity for give and take between the trainers and the participants.

PROCEDURES

1. Introduction — Time: 5 minutes

Introduce the evaluation session by explaining that the evaluation is important to the trainers as a way of learning how the training has been received and for future learning purposes. Describe the two parts of the evaluation (written and oral) and the time constraints.

2. Written Evaluation — Time: 30 minutes

Distribute Handout 20-1: Evaluation Form and answer any questions about the instructions on the form. Then give the group time to fill it out.

3. Oral Feedback Time: 20 to 30 minutes

Write on the top of the flipchart the headings as follows:

Workshop Strengths	Constructive Suggestions for Improvement

Ask the group to volunteer comments on both subjects. Record the comments as they are given. At each comment, it is good to verify the comment with others in the group to see if the comment is shared by others or is only one person's opinion. It is particularly important that the trainer not act defensively and spend a lot of time explaining weaknesses. This will only serve to discourage constructive feedback.

4. Closure Time: 10 minutes

When the group has discussed the comments and suggestions sufficiently, close the session by acknowledging all of the good ideas and feedback.

MATERIALS

Handout 20-1:Evaluation Form
Flipchart for Workshop Strengths and Suggested Improvements

EVALUATION FORM

A. Goal Attainment: Please circle the appropriate number to indicate the degree to which the workshop goals have been achieved.

I can now:

o Define sanitation and understand the impact of latrines.	1 Low	2	3	4	5 High
o Understand the impact of sanitary waste disposal on the spread of disease.	1 Low	2	3	4	5 High
o Develop strategies and approaches for educating communities about latrines and related sanitation issues.	1 Low	2	3	4	5 High
o Understand and identify critical steps for mobilizing a community for any latrine project.	1 Low	2	3	4	5 High
o Identify community factors related to the construction, acceptance, and use of latrines	1 Low	2	3	4	5 High
o Assess local physical conditions relating to improved sanitation.	1 Low	2	3	4	5 High
o Identify human and material resources needed to construct latrines and determine their availability.	1 Low	2	3	4	5 High
o Develop strategies to help the community to make an appropriate choice among alternative types of latrines.	1 Low	2	3	4	5 High
o Develop a plan for a latrine project.	1 Low	2	3	4	5 High
o Construct a latrine appropriate for a community.	1 Low	2	3	4	5 High
o Identify strategies for the continued operation, maintenance, repair, and replacement of latrines.	1 Low	2	3	4	5 High
o Develop a plan to implement a latrine project "back home."	1 Low	2	3	4	5 High

B. Workshop Feedback and Learning: Please answer the following questions as fully as possible so that the trainers can learn how effective the workshop methodology was.

1. What have been the most positive things about this workshop? Comments:

2. What have been the most negative things about this workshop? Comments:

3. What one thing stands out as important to you in this workshop? Comments:

4. What things have you learned that you did not know before? Comments:

C. Workshop Organization and Training

1. What comments do you have about the way the workshop was planned and organized?

2. What can be done in the future to improve a workshop like this?

3. What specific steps in developing a latrine project do you feel you will need to learn more about in order to successfully promote and develop a project in the future?

4. What comments do you have about the trainers?

5. Is there anything else you would like to say?

Appendix 1

ALTERNATIVE LATRINE DESIGN

This section offers suggestions for an alternative design for the construction phases of this workshop, which would allow a second type of latrine to be built by some of the participants.

The basic learning goals and the major activities remain the same in this alternative. The critical difference is that half of the participants build a VIP latrine with a timber slab and mud and wattle shelter while the other half construct a VIP latrine with a concrete slab as described in the core workshop.

In order to accommodate this change in the task of the construction teams, there needs to be some reordering of activities on Days 3, 4 and 5. All the same sessions get covered. However, they need to be reordered to allow for a different sequence of construction activites. A thirteen day calendar with the suggested sequence of activities follows this section.

In addition to a resequencing of sessions, this design requires new materials and team instructions be given to the teams constructing the latrine with the timber slab (referred to as the timber teams). New team instructions for the appropriate key tasks can be found at the end of this section. These will need to be checked and reviewed to make sure they accurately reflect local conditions and tasks.

The major resequencing of the workshop sessions comes on Day 4 and 5. This change is required since the timber model requires that the slab be built directly over the pit, which requires the pit be completed and the base constructed before beginning the slab.

Essentially the changes required for using this option are:

Day 3: Session 6 - <u>Planning a Latrine Construction Project</u>

The only change required in this session is for the trainers to allow more time during the introduction of the construction projects to explain the two types of latrines that will be built, and describe the sequence of field activities

Day 3: Session 7 - <u>Site Evaluation and Construction Project Estimating</u>

All teams will use the same instructions for evaluation of sites and pits, as this task is the same for the two types of latrines.

The trainers will need to decide whether to have the particpants use two different types of latrines in the estimating exercise or continue with only one model. It is preferable to have the participants use the type of latrine they will be building if possible. If using two types of latrines, trainers need to prepare the relevant information on material costs and adapt the estimating exercise sheet (Handout 7-5) for use by both groups.

Day 4: Session 9 - Base Construction

Since the timber latrine needs to have the base constructed prior to building the slab, this session has to be changed to Day 4 and completed before the session on slab construction. Trainers will need therefore to alter the design to cover the information on the proper mixing and pouring of concrete at this point instead of in Session 8 as the core design. In this design, Session 8 follows Session 9 on the afternoon of Day 4. A careful review of this day and restructuring of activities needs to be done by the trainers well in advance of this session.

The team instructions for constructing a base assume a concrete base and concrete collar. If all teams are to construct the same base, no new team instructions are needed. If a different base is used by the timber teams, trainers need to develop appropriate instructions, in advance of this session. A simple wood base may be preferable for the timber teams. It is a simpler and cheaper construction task. It is advisable to have a work crew available to assist with this work, in order to complete it in a timely fashion.

Day 4: Session 8 - Latrine Slab Construction

This session begins in the afternoon and is completed the following morning. In the prior session, all teams should have learned the fundamentals of pouring concrete, even if they will not be using it in their slab construction. Therefore, all participants heard the lecture and participated in the field demonstration activities.

The teams begin to do different activities at the point where they begin the actual work on construction of their slabs (procedures 3 and 7). Timber teams begin to build the log platform slabs as per new team instructions while the concrete teams work on building forms for their concrete. New team instructions for the timber teams are attached.

Trainers need to review the procedures in this session carefully to make sure all the tasks can be completed on time and are in the right sequence. Adjustments are likely to be needed in this design to accommodate the different construction activites.

Day 5: Session 8 - Latrine Slab Construction - Continued

Continue this session according to design. The teams using concrete slabs should pour the concrete during this morning. The teams using timber should construct vent-pipes according to team instructions attached. Make sure questions are added to the processing activities at the end of the fieldwork to enable teams to discuss and compare the different construction tasks.

Beginning with Session 10, Lining the Pit, on the afternoon of Day 5, the remainder of the sessions stay in the same order as the core design. Adaptations need to be made within the construction sessions to insert the appropriate team instructions for the timber teams and to add time for questions in any of the processing sessions for a comparison of the type of latrines being built. Be sure to check these sessions for appropriateness and adequacy of timing and sequencing of the construction steps.

On the following pages you will find:

A Workshop Schedule for Optional Design

Handout A-1:Team Instructions for Timber Slab Construction

Handout A-2:Team Instructions for Vent-Pipe Installation

Handout A-3:Team Instructions for Mud and Wattle Latrine Shelter

SCHEDULE FOR OPTIONAL DESIGN

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAYS SIX AND SEVEN
° Introduction to workshop	° Community mobilization and information gathering	° Types and selection of latrines ° Planning a latrine construction project	° Base construction Fieldwork	° Field Work A- Pour concrete slabs B- Construct vent pipe	F R E E
		L U N C H			
° Sanitation, latrines and health	° Conducting a sanitary survey	° Site evaluation and construction project estimating	° Latrine slab construction Fieldwork A- Build forms for concrete B- Build timber slab	° Lining the pit	

DAY EIGHT	DAY NINE	DAY TEN	DAY ELEVEN	DAY TWELVE	DAY THIRTEEN
° Project information and development strategies	° Installation of latrine slabs Fieldwork	° Latrine shelter construction Fieldwork	° Latrine completion Fieldwork	° Improving existing latrines Fieldwork	° Planning your latrine project ° Workshop evaluation and closure
			L U N C H		
° Community decision-making	° Repair and maintenance of a latrine ° Latrine shelter construction		° Project review	° Community project planning	

TEAM INSTRUCTIONS FOR TIMBER SLAB CONSTRUCTION

Time: Approx. 2 hours

Your task begins after the pit is constructed and fully lined. Your team will be building a timber slab directly over the pit.

1) Check to be sure the appropriate quantity and quality of logs are available for a log platform (Drawing 1). Check that all other supplies are available and ready.

2) Go over the attached drawings with your team members.

3) Determine location of the shelter opening so that the squatting hole can be appropriately placed. The shelter opening must be facing north or south. The choice between north or south direction should be based on privacy needs. See Drawing 3 for location of squat hole in north or south opening of shelters (superstructure).

4) Be sure platform is built across the pit in a manner that allows a vent pipe to be closest to the equator to receive maximum sunlight. The shelter is on the side of the vent pipe away from the equator. The squatting hole is placed in the middle of the platform if the shelter and vent pipe are on the same side. If they are on opposite sides, the squat hole needs to be at the extreme opposite end of the slab.

5) Begin to form the slab by placing two logs each 2.3 m long and 10 cm in diameter along the pit 30 cm apart (see Drawing 1). Place these logs so that their upper surface is flush with the ground level. This will require removing soil at both ends of the pit.

6) Place the 1.2 meter long logs across the longitudinal logs so there are no gaps (see Drawings 1 and 2). Nail these logs to the longitudinal logs using 15 cm-long nails.

7) Form openings for the vent pipe and squat hole in the selected places (see drawings). Make these openings by using pairs of shorter logs (10 cm) and placing them so they come to the inner edge of the two longitudinal logs. This will leave two 20-cm by 30-cm holes in the platform.

8) Surfacing or finishing material will be put on the slab after the shelter is completed.

MATERIAL LIST

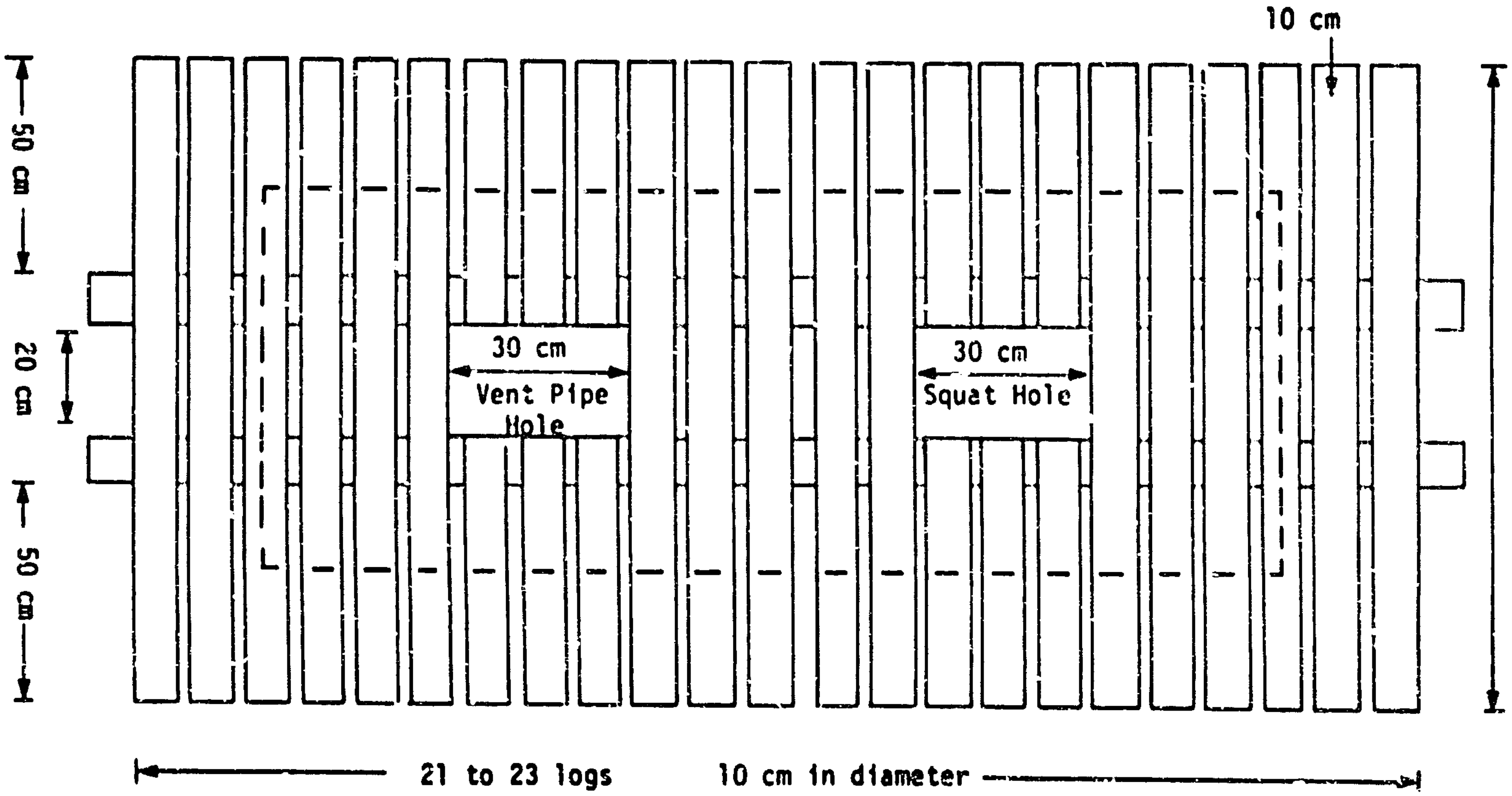
Logs/Timber - 12 logs 50 cm long
17 logs 1.2 m long
2 logs 2.3 m long
Logs must be 10 cm in diameter. Logs must be resistant to termites and insect-proof

Nails/Spikes - 46 - 15 cm long
or wire to tie

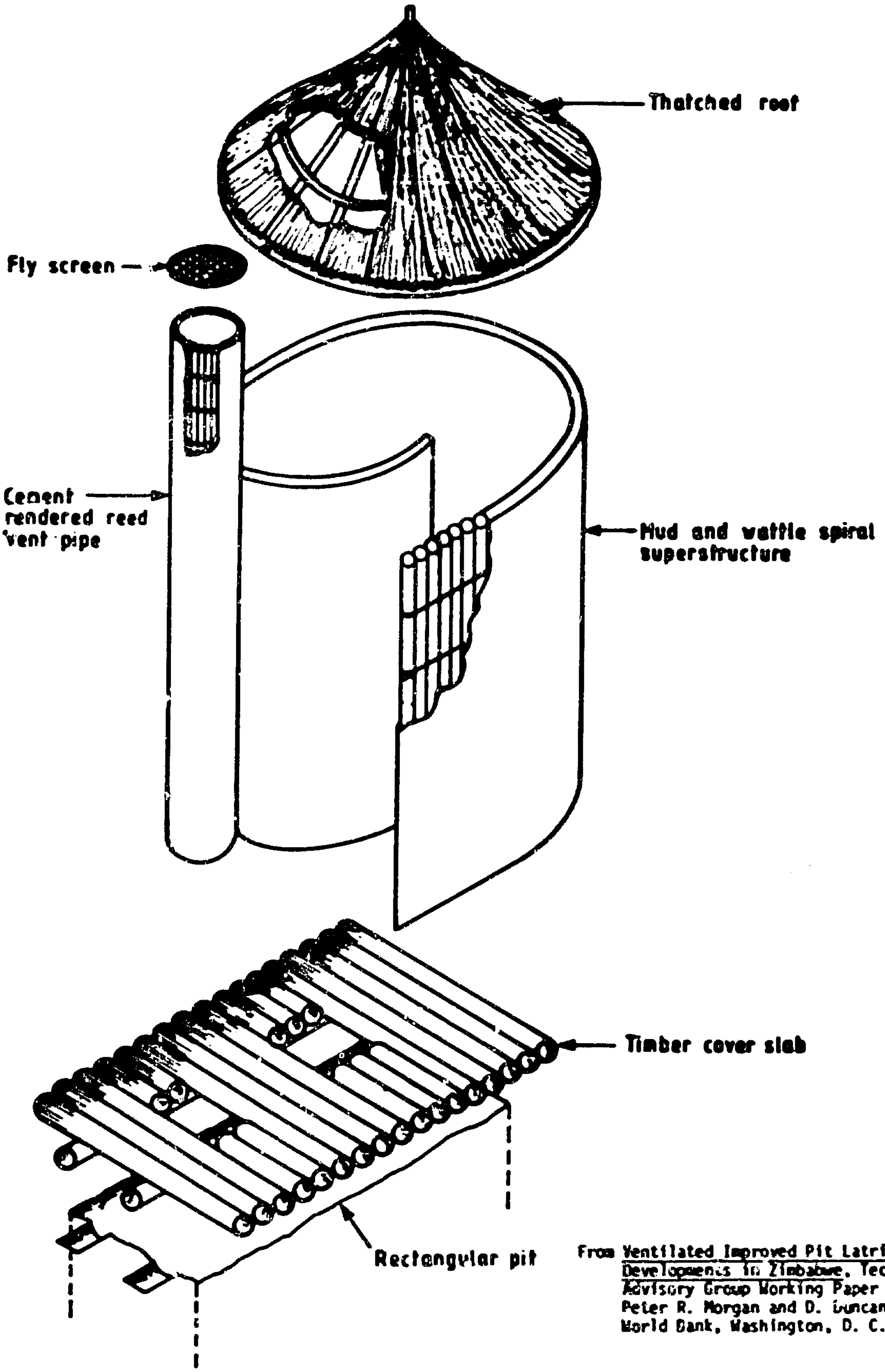
TOOLS

2 shovels
2 hammers
2 saws
1 axe
1 measuring tape (2 meters)

DRAWING 1



PLAN VIEW
TIMBER PLATFORM
ZIMBABWE - TYPE LATRINE

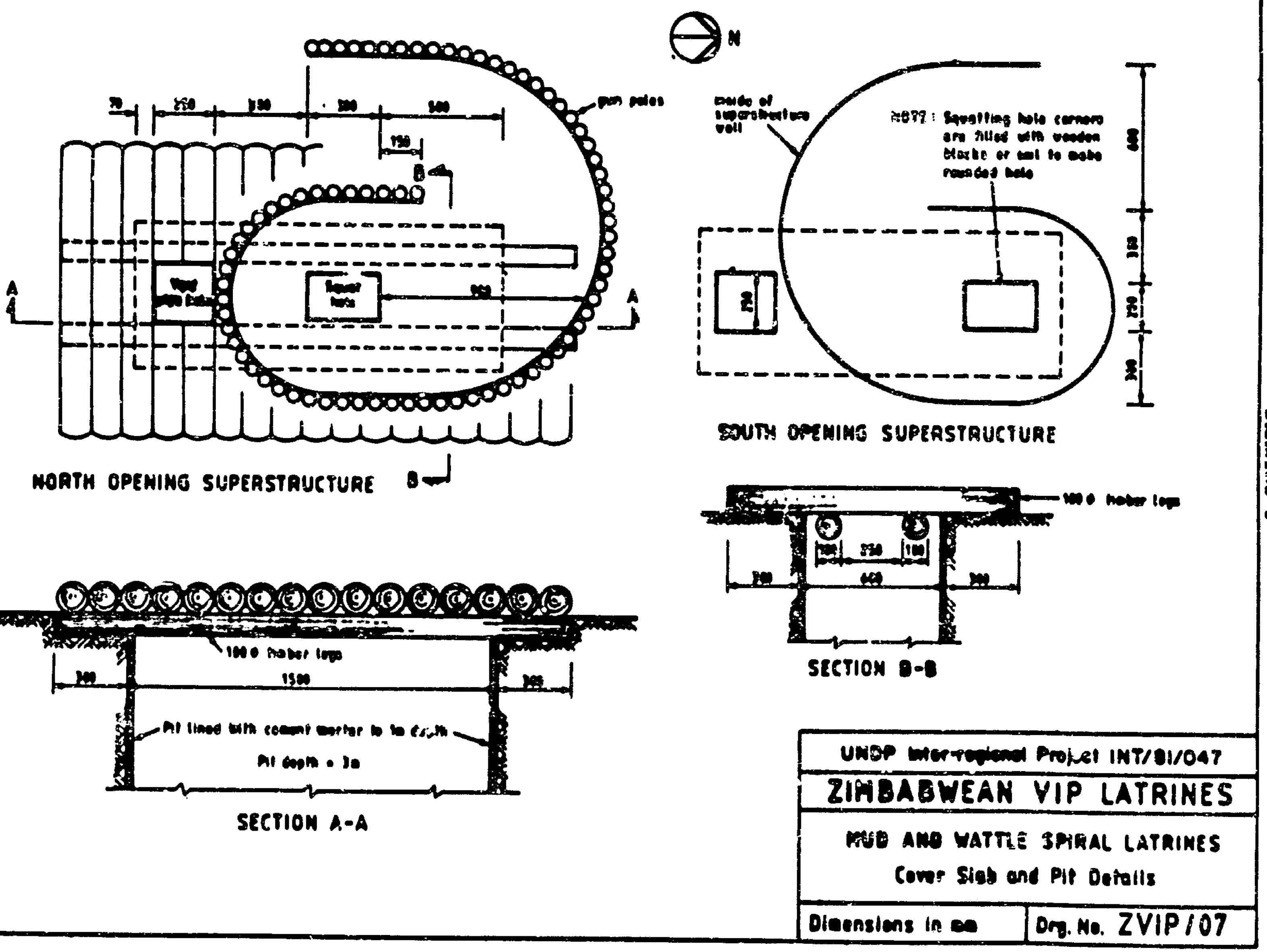


From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982

Drawing 2: Exploded schematic diagram of mud and wattle spiral VIP latrine.

DRAWING 3

From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982



TEAM INSTRUCTIONS FOR VENT-PIPE INSTALLATION

These instructions describe how to build the vent pipe and plaster the first half of the circumference. The second half will not be plastered until the shelter is built and the vent pipe can be tied to it. Review drawings carefully before beginning construction.

1) Make a mat 2.4 m by 0.9 m from local reeds, which should be 2.4 m long and 2 to 3 cm in diameter. Tie the reeds together by weaving under and over the reeds with string or wire.

2) Make four or five rings 28 cm in diameter from green sapling.

3) Roll the mat around the rings, spaced evenly along the mat, to form a vent pipe of 28 cm internal diameter. Tie the ends together with wire.

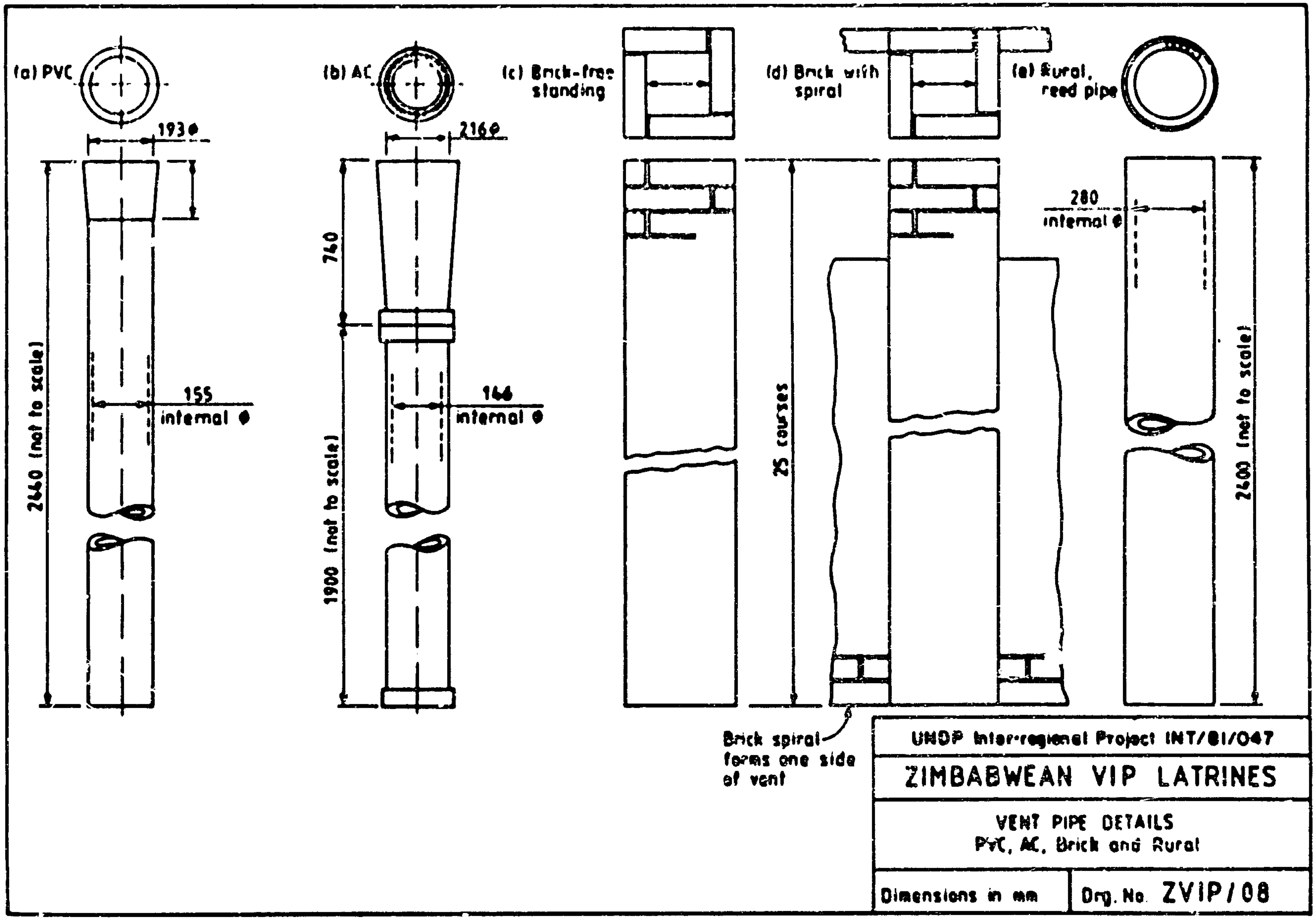
4) Wire fly screen to one end of vent pipe.

5) Use cement mortar, (1 part cement, 6 parts sand) to plaster half the circumference of the pipe.

6) Put the pipe in a safe place to dry. Pick a drying location where it will be safe from damage until the shelter is built. The shelter should be completed in the next few days.

MATERIALS NEEDED

local reeds 2.4 m long
string or wire
green sapling
cement mortar
wire cutters
cement trowel



From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe. Technology Advisory Group Working Paper Number Two. Peter R. Morgan and D. Duncan Mara. World Bank, Washington, D. C. 1982

TEAM INSTRUCTIONS FOR MUD AND WATTLE LATRINE SHELTER

Your team will be constructing a shelter from logs and poles and covering it with mud and wattle. You will also construct a thatch roof to close in the shelter.

To complete the shelter, the slab and vent pipe will also be plastered and the vent pipe attached to the shelter.

Review drawings with your team. Then do the following:

1) Use 30-40 timber poles (1.8 m long - 5 to 8 cm diameter) and form a spiral shape (see Drawings). Five or six of the poles need to be pointed at one end so they can be firmly wedged between and nailed to slab logs.

2) Tie logs together using number 18-gage (1.219 mm) wire. Keep the upper sections of the logs in place by fastening green sapling rings around them.

3) Nail lower sections of logs into cover slab in spiral shape as shown in drawings.

4) Review drawings of roof. It needs to be made from sapling poles 3 cm in diameter which are pliable and can be shaped appropriately.

5) The roof is shaped like a cone. For the bottom ring (roof base) shape poles into circular form. The diameter of the roof base is 2 m. The top point of the cone is 0.5 m above the plane of the base.

6) Weave and tie 1.2 m long gum poles, extending from the base to the top point between five rings spaced 22.5 cm apart.

7) Use straw or grass to make a dense, thick thatch. Tie it to the roof. Make sure thatch is thick enough to keep the inside of the shelter dark in order to lessen its attraction for flies.

8) Tie vent pipe to superstructure.

9) Tie roof to superstructure.

10) Begin application of mud to superstructure.* Plaster everything with mud both inside and out. Have your team leader check with trainers for appropriate soil to use.

11) Cover slab with plaster so that the floor slopes in all directions toward squat hole.

12) Allow mud to dry. Replaster and fill any cracks which appear.

13) Plaster all surfaces with thin coat of cement mortar.

14) Paint slab and vent pipe with black bitumastic paint.

15) Cover exposed parts of slabs with soil which should be placed to slope gradually away from latrine.

16) Plan or instruct homeowner to plant grass to protect area from erosion.

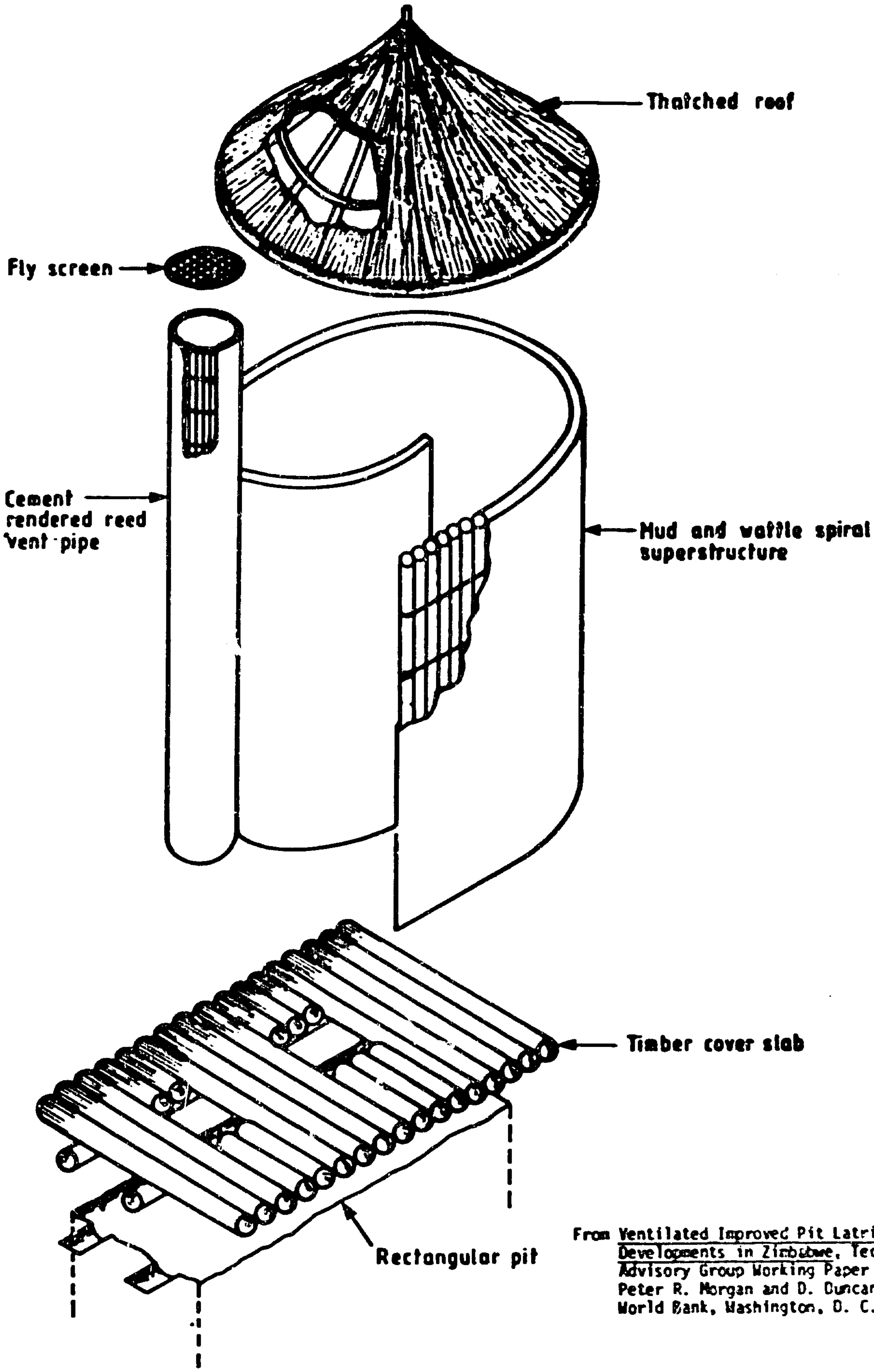
MATERIALS NEEDED FOR TASK

timber poles - 30 to 40, 1.8 m long, 5 to 8 cm in diameter
18 swg wire
nails 8 cm long
green sapling rings, 5 needed
gum poles - 3 cm diameter x 1.2 m long-26 are needed
thatch material (straw or grass)

Tools Needed

2 hammers
2 saws
1 measuring tape (2 meter)
2 pairs of pliers
3 cement trowels
2 paint brushes
2 shovels
1 bucket marked in liters

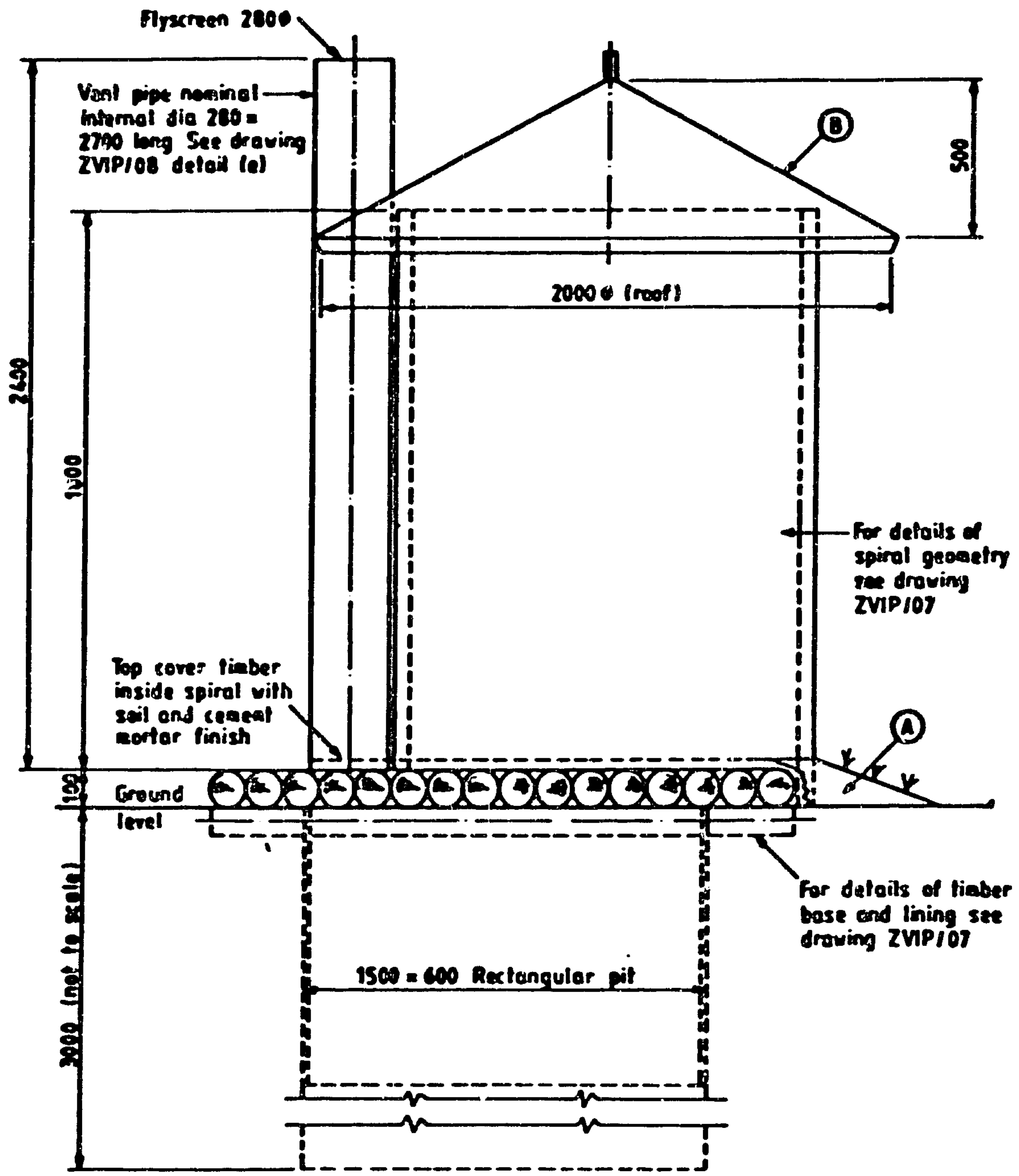
* In some areas traditional plastering material is not soil from the ground. Instead they use soil from termite hills which has good adhesive properties and durability. Check with trainers beforehand to determine best soil to use here.



From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982

Exploded schematic diagram of mud and wattle spiral VIP latrine.

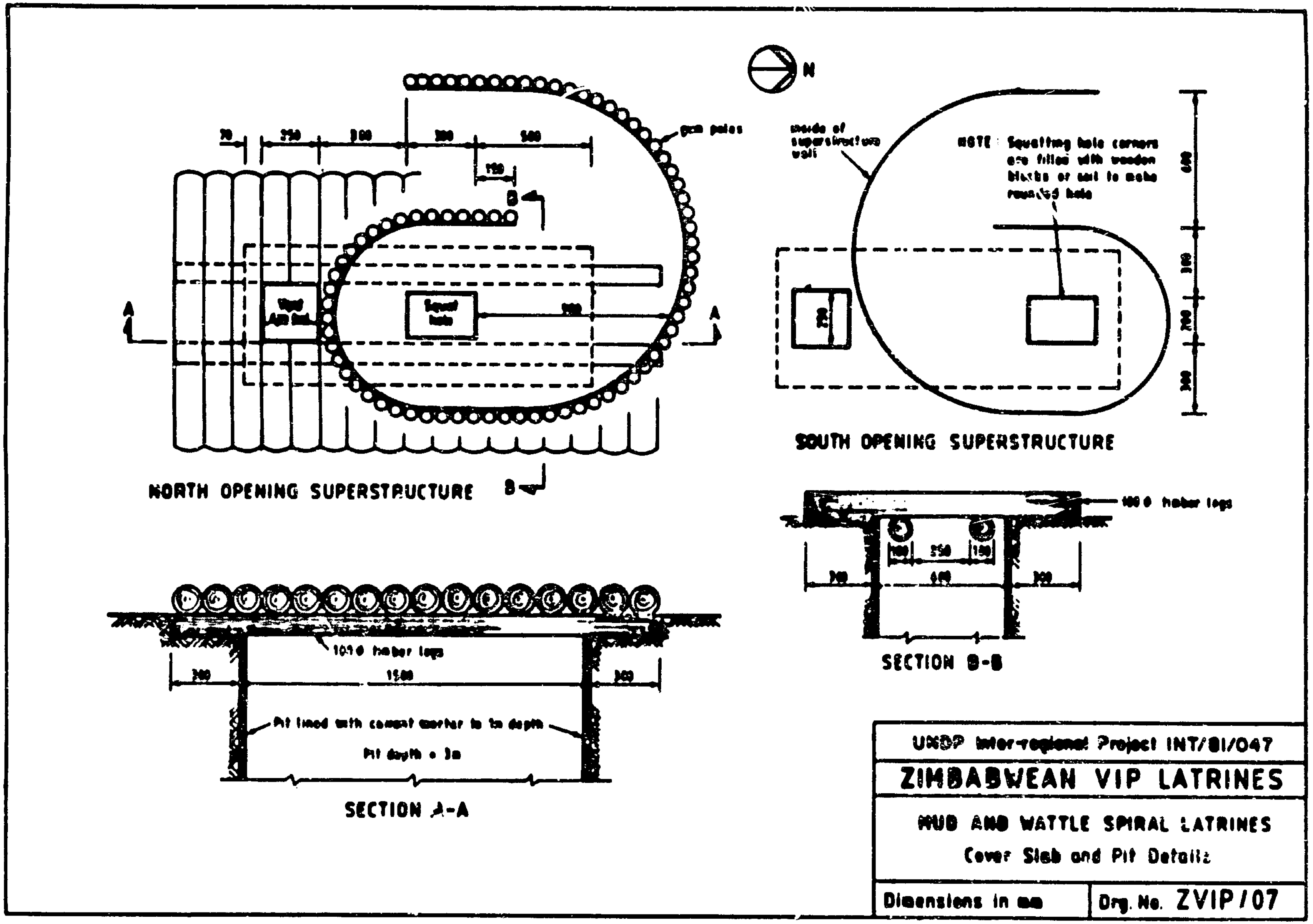
From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982



(A) For drainage cover exposed timber with soil and plant grass.

(B) Roof details - Straw or grass thatch on 30 dia. gum pole structure with five circular ties. Gum poles cut to 1200 length.

UNDP Inter-regional Project INT/81/047	
ZIMBABWEAN VIP LATRINES	
MUD AND WATTLE SPIRAL LATRINE General Arrangement	
Dimensions in mm	Drg. No. ZVIP/06



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APPENDIX 2

PARTICIPANT REFERENCE PACKET

(HANDOUTS)

LATRINE CONSTRUCTION WORKSHOP GOALS

PURPOSE:

To increase participant's ability to assist communities to organize, construct, and maintain sanitary waste disposal facilities.

THEME:

Planning, constructing, and maintaining appropriate and economic latrines with active community involvement.

GOALS:

At the end of the training participants will be able to:

- Define sanitation and understand the impact of latrines.
- Understand the impact of sanitary waste disposal on the spread of disease.
- Develop strategies and approaches for educating communities about latrines and related sanitation issues.
- Understand and identify critical steps for mobilizing a community for any latrine project.
- Identify community factors related to the construction, acceptance, and use of latrines.
- Assess local physical conditions relating to improved sanitation.
- Identify human and material resources needed to construct latrines and determine their availability.
- Develop strategies to help the community to make an appropriate choice among alternative types of latrines.
- Develop a plan for a latrine project.
- Construct a latrine appropriate for a community.
- Identify strategies for the continued operation, maintenance, repair and replacement of latrines.
- Develop a plan to implement a latrine project "back home."

SCHEDULE FOR BASIC WORKSHOP*

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAYS SIX AND SEVEN
° Introduction to workshop	° Community mobilization and information gathering	° Types and selection of latrines ° Planning a latrine construction project	° Latrine slab construction Fieldwork	° Base construction Fieldwork	F R E E
		L U N C H			
° Sanitation, latrines and health	° Conducting a sanitary survey	° Site evaluation and construction project estimating		° Lining the pit	

DAY EIGHT	DAY NINE	DAY TEN	DAY ELEVEN	DAY TWELVE	DAY THIRTEEN
° Project information and development strategies	° Installation of latrine slabs Fieldwork	° Latrine shelter construction Fieldwork	° Latrine completion Fieldwork	° Improving existing latrines Fieldwork	° Planning your latrine project ° Workshop evaluation and closure
			L U N C H		
° Community decision-making	° Repair and maintenance of a latrine ° Latrine shelter construction		° Project review	° Community project planning	

*Based on participants constructing single VIP latrine with concrete slab.

SELF-ASSESSMENT INVENTORY

Rank yourself in terms of how well you feel you do each of these tasks now. This is for your use to help you in your learning. Please be accurate and honest with your answers.

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
1. Community Mobilization				
1. Identify existing infrastructure in a community and its relationship to a sanitation project.	4	3	2	1
2. Work with appropriate community leaders and/or groups to initiate a sanitation project.	4	3	2	1
3. Identify and address social customs and practices relating to sanitation projects.	4	3	2	1
4. Gather information regarding current sanitation practices.	4	3	2	1
5. Investigate the history of past sanitation projects in the community. Evaluate the reason for their success or failure.	4	3	2	1
6. Plan culturally appropriate approaches for introducing the idea of latrine use to different groups in the village (leaders, men, women, etc.).	4	3	2	1
7. Identify and locate number of homes and other buildings in community.	4	3	2	1
8. Identify the resources accessable to the community necessary to initiate a successful project. These resources include materials, labor, tools, equipment, funds, transportation and leadership.	4	3	2	1
9. Present information concerning alternative methods and costs to provide sanitation facilities.	4	3	2	1

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
10. Assist the villagers to make decisions and develop a plan which defines the project scope and provides time frames.	4	3	2	1
11. Describe methods that will be used to assure that villages understand their reponsibilities before, during, and after construction of sanitation facilities.	4	3	2	1
12. Devise strategies for obtaining and allocating resources.	4	3	2	1
2. Project Development				
1. Identify local environmental diseases, their symptoms, means of transmission, and prevalence.	4	3	2	1
2. Use a sanitation project as a strategy for designing and implementing health education at the village level.	4	3	2	1
3. Develop strategies for educating and discussing with the community:				
a. the need for and use of a latrine	4	3	2	1
b. how disease is spread	4	3	2	1
c. dangers of animal waste	4	3	2	1
d. the importance to health of handwashing	4	3	2	1
e. discuss methods of solid waste disposal	4	3	2	1
3. Design				
1. Select from 5 types of latrines.	4	3	2	1
2. Size a communal latrine pit.	4	3	2	1
3. Size an individual latrine pit.	4	3	2	1
4. Select a latrine for use where there is water nearby.	4	3	2	1
5. Select a latrine site in relation to a potable water source.	4	3	2	1

		Do Well (4)	Do Okay (3)	Diffi-cult to do (2)	Can't do (1)
6.	Discuss social restraints which may hinder a latrine project and possible solutions to those restraints.	4	3	2	1
7.	Determine equipment needs.	4	3	2	1
8.	Determine material quantities.	4	3	2	1
9.	Determine costs.	4	3	2	1
10.	Procure material.	4	3	2	1
11.	Determine human resource needs.	4	3	2	1
4.	**Construction**				
1.	Schedule construction in a proper sequence.	4	3	2	1
2.	Assess geological conditions.	4	3	2	1
3.	Construct a latrine pit.	4	3	2	1
4.	Be able to prepare and use a correct mix of sand, gravel, water, and cement for a concrete slab.	4	3	2	1
5.	Pour a concrete latrine slab with reinforcing.	4	3	2	1
6.	Build a wood/soil latrine slab.	4	3	2	1
7.	Build a latrine superstructure.	4	3	2	1
5.	**Monitor and Follow-up**				
1.	Develop a plan for continued operation and maintenance of latrine(s).	4	3	2	1
2.	Develop a strategy for relocating latrines as required.	4	3	2	1

	Do Well (4)	Do Okay (3)	Diffi-cult to do (2)	Can't do (1)
3. Develop a strategy for the construction of additional latrines if needed.	4	3	2	1
4. Identify follow-up health education activities necessary to encourage continued use of latrines.	4	3	2	1
5. Establish a mechanism to monitor the use of latrines.	4	3	2	1
6. Identify problems that affect the use of latrines and develop strategies to overcome them.	4	3	2	1
7. Evaluate and analyze the project upon completion.	4	3	2	1

Water for the World

Means of Disease Transmission
Technical Note No. DIS. 1.M.1

Water- and sanitation- related diseases are major causes of illness and death among people in both rural and urban areas in many developing countries. The health and well being of people cannot be improved without understanding these diseases and knowing how they are transmitted from one person to another.

This technical note describes what causes these diseases, how they are spread and the factors influencing their transmission. Methods for preventing the transmission of the water- and sanitation- related diseases can be found in the technical note, "Methods of Improving Environmental Health Conditions," DIS.1.M.2.

Useful Definitions

AQUIFER - A water-saturated geologic zone that will yield water to springs and wells.

BACTERIA - One-celled microorganisms which multiply by simple division and which can only be seen with a microscope.

FECES - The waste from the body moved out through the bowels.

LARVAE - Young forms that come from the eggs of insects and worm parasites.

PARASITES - Worms, insects or mites which live in or on animals or people.

There are about 30 diseases that are related to water and sanitation. Table 1 lists the 21 which are most important. Each of them affects from millions to hundreds of millions of people every year. All of these diseases are caused by living organisms that must spend much of their life in or on a human body. They include viruses so tiny that they can pass through the finest filter, bacteria and protozoa that can be seen only with the aid of a microscope, tiny mites that are barely visible to the eye and worms that may be a meter long.

The transmission of all of these diseases is related in some way to water supply and sanitation, usually to inadequate disposal of human wastes and to contaminated water supplies. The diseases are transmitted through contact with or consumption of water, contact with infected soil, the bites of insects that breed in or near water and poor personal and family hygiene. Man is usually the source of the organisms that cause these diseases and human activity is an important factor in the transmission of them.

Following the order shown in Table 1, the transmission of the diseases will be discussed for each of the five categories.

Waterborne Diseases (Water Quality Related)

In the waterborne diseases, the microorganisms which cause the disease are swallowed with contaminated water. All but one, Guinea worm, are caused by organisms found in human excreta, the source of the contamination. The infective stage of Guinea worm is not from fecal contamination, but is from a tiny larva that develops in a water-flea after the larva is discharged into the water. The larva comes from a blister on the skin of a person infected with the meter-long adult worm.

Cholera and typhoid fever are the waterborne diseases which are most feared because, when untreated, they have high death rates. However, the diarrheas and dysenteries are more important because of the infant deaths and huge numbers of illnesses they cause. In the developing countries,

Table 1. Water and Sanitation-Related Diseases

Category	Disease: Common name	Disease: Medical name	Type of Organism	Transmission
Waterborne (Water quality related)	Cholera Typhoid fever Paratyphoid fever Bacillary dysentery Amebic dysentery Diarrhea Diarrhea Jaundice Guinea worm	Cholera Typhoid Paratyphoid Shigellosis Amebiasis Salmonellosis Giardiasis Hepatitis Dracunculiasis	Vibrio Bacteria Bacteria Bacteria Protozoan Bacteria Protozoan Virus Worm	By consuming (drinking) fecally contaminated raw water containing an infective dose of the vibrio, bacterium, protozoan or virus; except Guinea worm where transmission is by swallowing water flea infected with worm larva that was shed from skin blister on infected human.
Water-washed (Water quantity; and accessibility related)	Bacillary dysentery Diarrhea Viral diarrhea Trachoma Pink eye Itch	Shigellosis Salmonellosis Enteroviruses Trachoma Conjunctivitis Scabies	Bacteria Bacteria Virus Intracellular bacteria Bacteria Mite	Anal-oral or skin-to-skin direct contact transmission resulting from poor personal cleanliness and hygiene caused from lack of water for sufficient washing, bathing and cleaning.
Water-contact (Body-of-water related)	Blood fluke disease	Schistosomiasis	Worm	Eggs in feces or urine hatch larvae in water, penetrate suitable snail, multiply greatly in snail, free-swimming larvae leave snail, penetrate skin when person has contact with infected water.
Water-related insect vectors (carriers) (Water-site related)	Yellow fever Malaria Filarial fever Sleeping sickness River blindness	Yellow fever Malaria Filiariasis Trypanosomiasis Onchocerciasis	Virus Protozoa Worm Protozoa Worm	Mosquitoes, tsetse flies and blackflies, which breed in or near water, pick up disease organisms when they bite infected person; organisms grow in vectors and are inoculated into another person when insect bites.
Sanitation-related (Fecal polluted soil related)	Hookworm Roundworm	Ancylostomiasis Ascariasis	Worm Worm	Eggs or larvae become infective when feces are deposited on soil; eggs are eaten from contaminated hands or vegetables, or larvae penetrate skin that comes in contact with infected soil.

the diarrheas and dysenteries cause hundreds of millions of illnesses and millions of infant deaths each year.

The basic transmission of waterborne disease is person to person. The microorganisms for infected people contaminate water which is consumed by other people. Figure 1 shows a common way that water becomes contaminated. The contamination of water supplies occurs:

1. Where latrines and privies are located uphill from or very close to a water source such as a spring, stream, pond or well. Liquids carrying the organisms seep from the latrines into the water supply.

2. Where privy pits, soakage pits, or sewage absorption systems penetrate the water table of an aquifer located near the surface and shallow wells and springs whose water comes from the aquifer are contaminated.

3. Where wells and springs are unprotected so that surface run-off enters these water sources. The run-off after rainfall carries disease-causing organisms into the water source.

4. Where sanitation is poor. If people defecate on the ground or in bodies of water rather than in safe latrines or privies, disease-causing organisms can get into water supplies.

5. Where Guinea worm occurs, water is contaminated when the skin of an infected person with a blister caused by the worm is immersed in water and great numbers of larvae are released into the water. Some of the larvae are eaten by tiny water fleas (Cyclops). The larvae in the water fleas grow, shed their skins, and become infective. When a water flea containing an infective larva is drunk with water from the contaminated source, the little worm is transmitted to a new person where it grows to maturity under the skin.

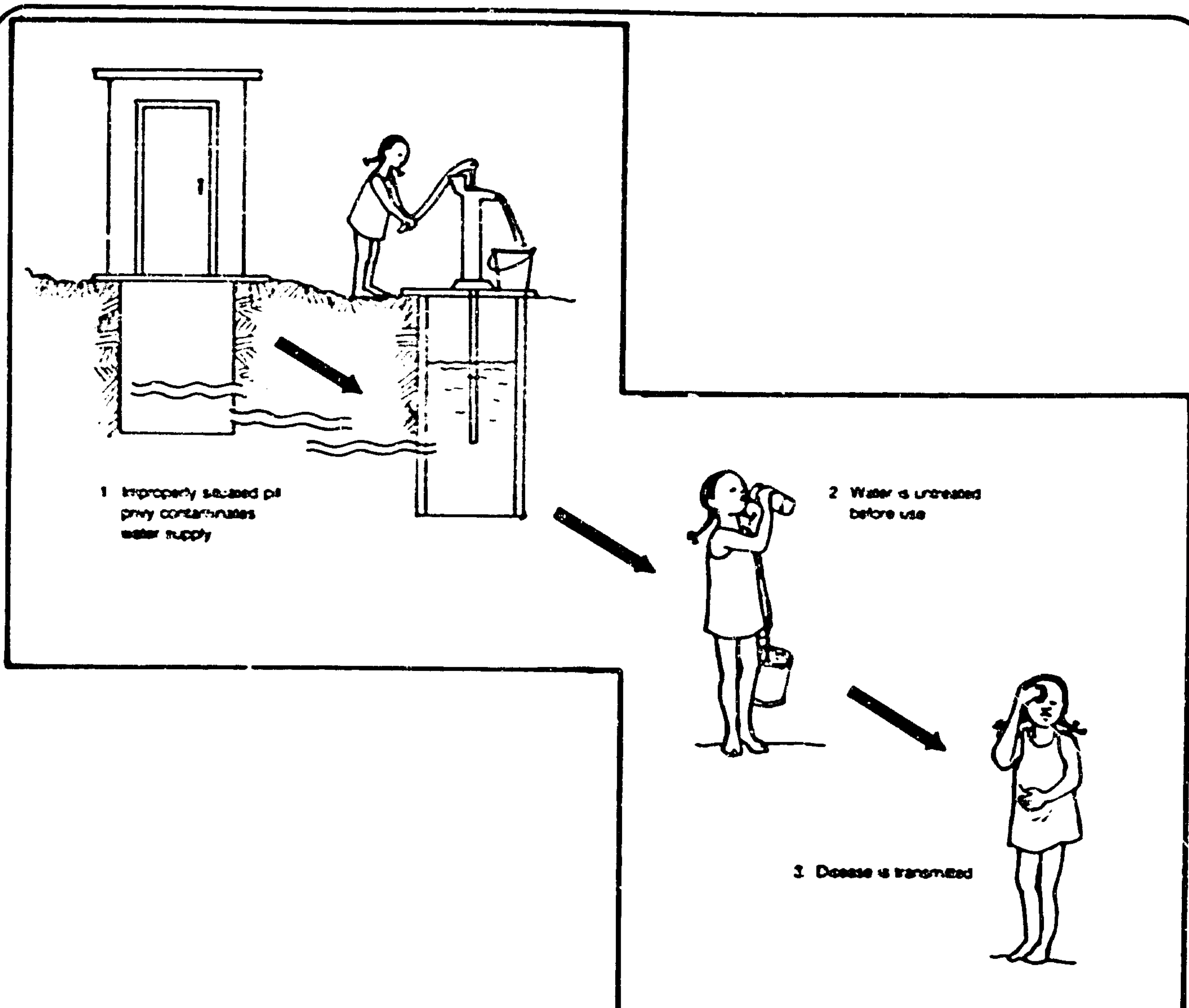


Figure 1. Transmission of Waterborne Disease

Water-Washed Diseases (Water Quantity and Accessibility Related)

Water-washed diseases are diseases whose transmission results from a lack of sufficient clean water for frequent bathing, hand washing before meals and after going to the toilet, and for washing clothes and household utensils. Several common diseases fall into this category. Shilgellosis (bacillary dysentery), salmonellosis (food poisoning), trachoma, and scabies are all diseases that can be passed by direct contact between people or by the direct contamination of food by dirty hands or flies. Figure 2 shows one way water-washed diseases are spread. The diseases in this group are transmitted:

Figure 2. Transmission of Water-Washed Diseases

1. When a water supply produces insufficient quantities to meet peoples' needs or when the water supply is located at a distance from the users. The availability of only small amounts of water makes the practice of good personal and household hygiene difficult, or even impossible.

2. When feces are not disposed of in a sanitary way. Uncovered or unprotected latrines or stools passed on the ground are breeding places for flies and sources of bacteria. Bacteria and viruses are passed from feces to people by flies, contaminated fingers and food. Food contamination with salmonella quickly grows great numbers of the bacteria. When eaten, the food causes food-poisoning diarrhea with life-threatening consequences, especially for small children.

3. When people are ignorant of the need for personal hygiene and, for whatever set of reasons, either do not bathe frequently or use the same water and towels to wash more than one person, then trachoma and conjunctivitis are passed around within a family or other groups living together and scabies get passed from the skin of one person to the skin of another.

Water-Contact Diseases (Body-of-Water Related)

Water-contact diseases are diseases which are transmitted when people have contact with infected water. The single most important water-contact disease is Schistosomiasis (blood fluke disease). It is very widespread in Asia, Africa and South America with hundreds of millions of people at risk of getting the disease and millions suffering from it. Figure 3 shows how schistosomiasis is transmitted. Briefly, transmission is as follows: Schistosome eggs passed in urine or feces fall into water where a first stage larva hatches. The first stage larva, to survive, must find and penetrate a specific type of snail. In the snail, the first stage larva changes into a large number of sacs in which many thousands of forked-tailed second stage larva are produced over a period of months to years. Each day, several hundreds of these second stage larvae escape from the snail to swim about in the water seeking the warm skin of a human hand or food into which to penetrate. Once through the skin, the little worm enters the person's blood stream, grows to maturity (worms are about a centimeter long), works its way into the blood vessels of the intestine and urinary bladder, and lays its eggs in the wall of those organs. The eggs then cut their way through the tissues to the inside of the intestine or bladder and are passed with the feces or urine. So the transmission cycle continues.

Schistosomiasis is transmitted in areas:

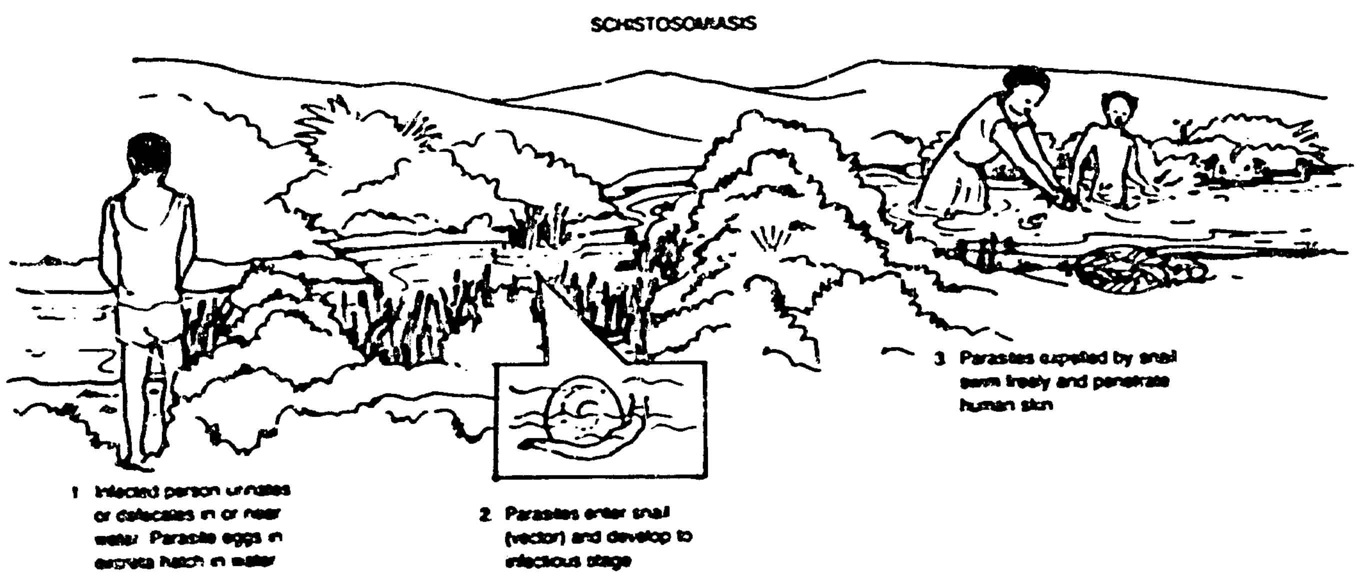


Figure 3. Transmission of Water-Based Water-Contact Diseases

1. Where poor sanitation is practiced so that feces or urine find their way into bodies of water that contain snails, or where rats or wild animals get the worms and keep the snails infected.

2. Where the appropriate type of snail is abundant and can become infected.

3. Where people enter infected water to bathe, wash clothes, dip up water, cultivate crops or swim.

4. Where irrigation projects or man-made lakes have extended the bodies of water in which snails can grow and have the chance to be infected from man or wild animals.

Water-Related/Insect Vector (Carrier) Diseases (Water Site Related)

Water-related insect vector diseases are those that are transmitted by insects which breed in or near water. Transmission occurs when the insect becomes infected with the disease organism from biting a person or animal, and then bites another person. The parasites are injected into the skin or bloodstream by the insect bite. The insects breed in water that is used as water supplies (streams and rivers) and, in the case of mosquitoes, in water storage jars, and water tanks, or in shaded high humidity areas near streams or lakes.

The most common diseases in this category are:

- African trypanosomiasis (sleeping sickness) which is transmitted by the tsetse fly which thrives on high humidity and breeds in river areas under lush vegetation growing at water sites.

- Onchocerciasis (river blindness) which is transmitted by blackflies which breed while attached to rocks and vegetation in fast-flowing rivers and streams. Figure 4 shows how onchocerciasis is transmitted.

- Malaria which is transmitted by female anopheline mosquitoes which breed in a wide variety of water collections.

- Arboviruses (yellow fever) which is also transmitted by mosquitoes. The

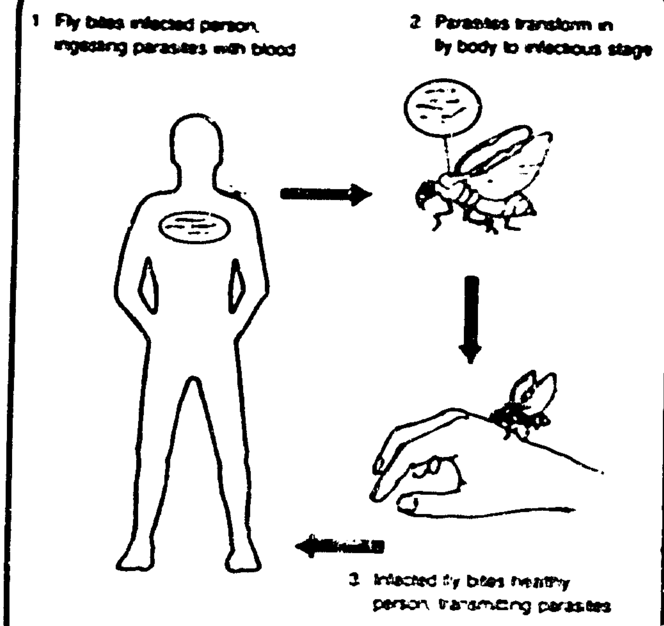


Figure 4. Transmission of Water-Related (Insect Carrier) Diseases

type of mosquitoes that carries this disease is different from that which carries malaria. Mosquitoes that carry yellow fever breed in highly polluted stagnant water and usually rest in areas far from their breeding places.

- Filariasis which is a worm infection spread by mosquitoes. The mosquitoes that carry the parasite breed in any stagnant pond or pool or in water in cans, coconut husks, dishes, gutters or wherever water is standing.

The transmission of water-related insect vector diseases occurs in many types of situations in which the insect vectors are able to breed in large numbers, can bite persons infected with the protozoan or worm that causes the disease, and later, after the parasites have developed in them, have the opportunity to bite other people. In many situations, the water supply site where people come to get their water, is the place where the insects get their opportunity to bite both infected and other people. The household environment is also a place where some of these diseases are transmitted.

Sanitation-Related Diseases (Fecal Polluted Soil Related)

Sanitation-related diseases are specifically those that are transmitted by people lacking both sanitary facilities for waste disposal and knowledge of the need to dispose of wastes in a sanitary manner. The infective stage of the worm which causes those diseases develops in fecally contaminated soil. The most common diseases in this category are hookworm and roundworm.

Hookworm larvae develop and live in damp soil that has been contaminated with feces containing hookworm eggs. They penetrate the bare feet of people walking or standing on the infected soil. See Figure 5. Entrance can also occur through the hands or other skin areas.

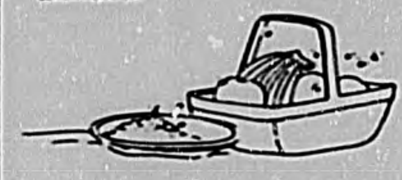
Roundworm or ascariasis is transmitted by swallowing eggs which have become infective by developing on polluted soil. The eggs are eaten by children who play on the infected soil, drop food on the soil and then eat it, or eat from dirty hands or eat contaminated raw vegetables.

Both diseases occur:

1. Where there are not latrines and the soil is polluted, where latrines are not sanitary or where they are not used.

2. Where fresh untreated feces are used as fertilizer.

a. Hookworm is transmitted through the feet of people walking barefoot in contaminated soil



b. Roundworm is often transmitted by contaminated flies which land on food

Figure 5. Transmission of Sanitation-Related Diseases

3. Where people are not educated to wash their hands before eating.

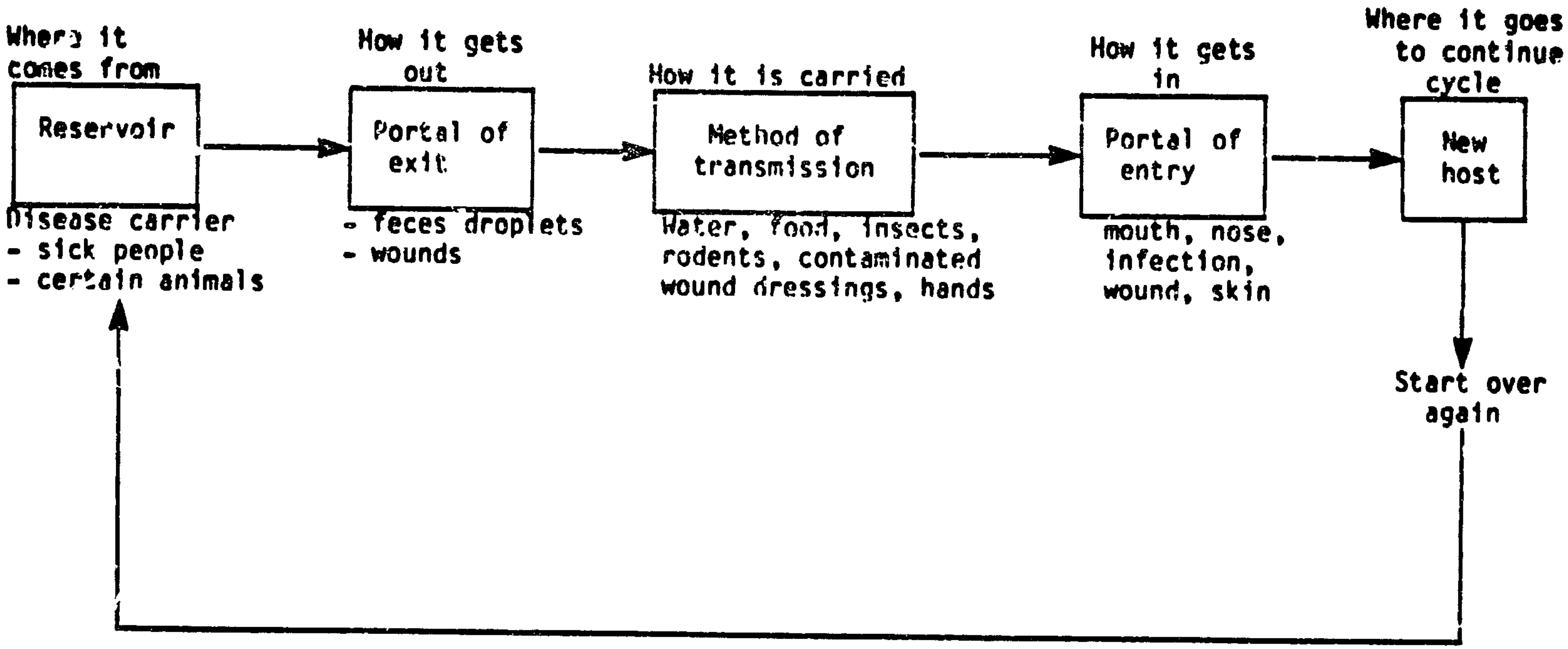
Summary

This technical note has discussed several diseases which are common in many countries. They are all directly related to local environmental conditions and are all passed from person to person. The cycle, or chain of transmission, involves both direct transmission of the disease or else depends on an agent, or vector, for the transmission.

Once the chain of transmission is understood, means to break the chain should be adopted. Generally, relatively simple environmental measures need to be developed to stop the spread. The methods of doing this are discussed in "Methods of Improving Environmental Health Conditions," DIS.1.M.2.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using Water for the World Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

THE DISEASE CYCLE

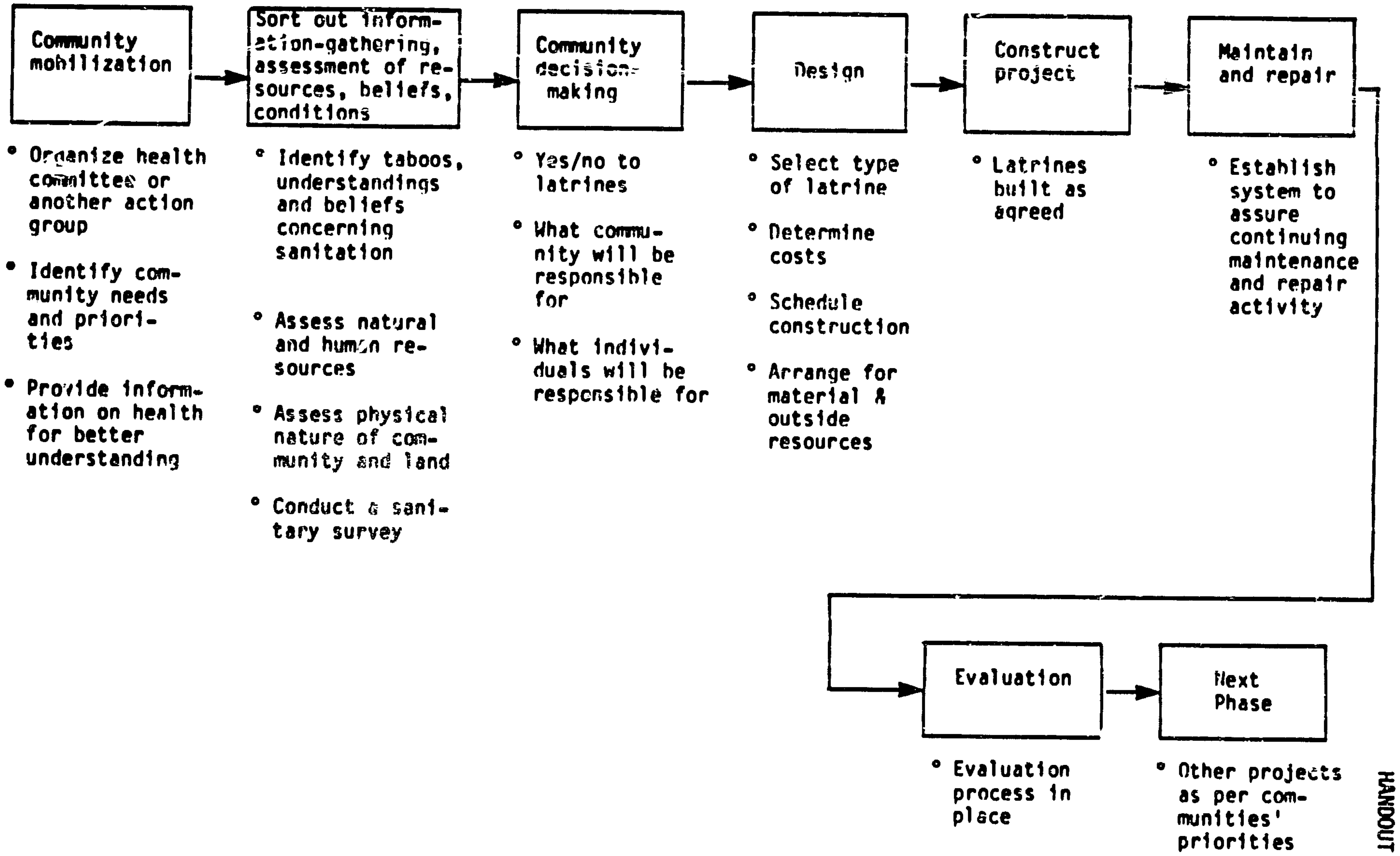


PARTICIPANT EXPERIENCE SURVEY

Print your name in column one. In column two indicate your current title/position. In the remaining columns write "Yes" or "No" to indicate your experience for the stated activity.

Name	Job assignment	Have you ever laid blocks or bricks?	Have you ever built a structure with wattle and mud?	Have you ever mixed and poured concrete?	Have you ever implemented a community health program?	Have you ever led a community health workshop?	Have you ever constructed a pit latrine?

PROJECT CYCLE STEPS



HANDOUT 3-1

SANITARY SURVEY FORM

Village ____________________ Number of Houses/Compounds ____________

District ____________________ Estimated Population ____________

Village Leader ____________________ Is there a Health Committee? ____________

Village Health Representative ____________________ Who is its leader? ____________

Is there a health education program for the village? ____________________

If yes, describe

Waste Disposal:

Number of houses/compounds with no excreta disposal facilities ____________

Number of houses/compounds with excreta disposal facilities ____________

Describe types of excreta disposal facilities ____________

Are existing excreta disposal facilities a health hazard? If so why?

Are latrines individual or communal?

Are houses spread out sufficiently to site latrines?

What is the water level during the dry and wet season?

What type of soil is there in the village (i.e. sandy, clay, rocky)?

Where and in what manner are garbage and trash disposed?

Are garbage and trash a problem? Why?

NOTE: Use the back of this page to sketch a map of the community's important features.

Continued on next page

SANITARY SURVEY FORM (Cont'd.)

Indicators:

Are rats and other rodents a problem in the area?

Are flies, cockroaches, and other insects a problem?

Other observations:

Resource availability and unit costs:

	Availability Yes/No	Unit Cost		Availability Yes/No	Unit Cost
Contractors			Cement		/sack
Skilled labor		/hr	Lumber		/meter sq.
Unskilled labor		/hr	Native materials		
Sand		/	Bamboo, trees		
Gravel		/	Brick		/each
			Re-bar		/each

Additional Comments/Observations

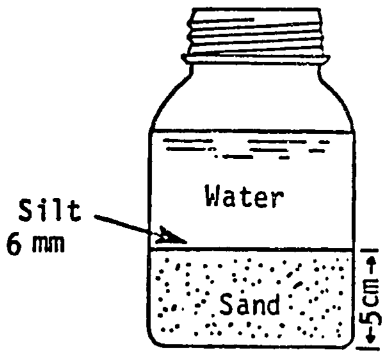
Continued on next page

Sanitary Survey Form (Cont'd.)

Water sources locate on map	Protected from contamination yes/no	Water quality taste, odor, color, turbidity	How is water obtained? Bucket, pump etc.	Communal or private source	What season is this source used? Dry/wet	Distance of source from user's homes	COMMENTS
Wells							
Springs							
Streams							
Ponds							
Other							

SILT TEST

In making the silt test, an ordinary liter bottle or jar is used. Fill the container to a depth of 5 cm with a representative sample of dry sand to be tested. Add water until the bottle or jar is about three-fourths full. Shake vigorously for 1 minute --the last few shakes being in a sidewise direction to level off the sand. Allow the jar to stand for an hour, during which time any silt present will be deposited in a layer above the sand. If this layer is more than 6 mm thick, the sand from which the sample is taken is not satisfactory for concrete work unless the excess silt is removed. This may be done by washing.



A book of methods, aids, and ideas for instructors at the village level

Helping Health Workers Learn

David Werner and Bill Bower

LEARNING FROM, WITH, AND ABOUT THE COMMUNITY

The main job of a health worker in a community-based program is not to deliver services. And it is not simply to act as a link between the community and the outside health system. It is to **help people learn how to meet their own and each other's health needs more effectively.**

In order to do this, the health worker needs a deep understanding of the community's strengths, problems, and special characteristics. Together with the people, the health worker will want to consider . . .

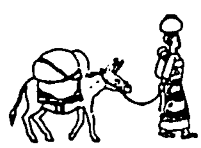
NEEDS

- local health problems and their causes
- other problems that affect people's well-being
- what people feel to be their biggest problems and needs

SOCIAL FACTORS

- beliefs, customs, and habits that affect health
- family and social structures
- traditional forms of healing and of problem solving
- ways people in the community relate to each other
- ways people learn (traditionally and in schools)
- who controls whom and what (distribution of land, power, and resources)

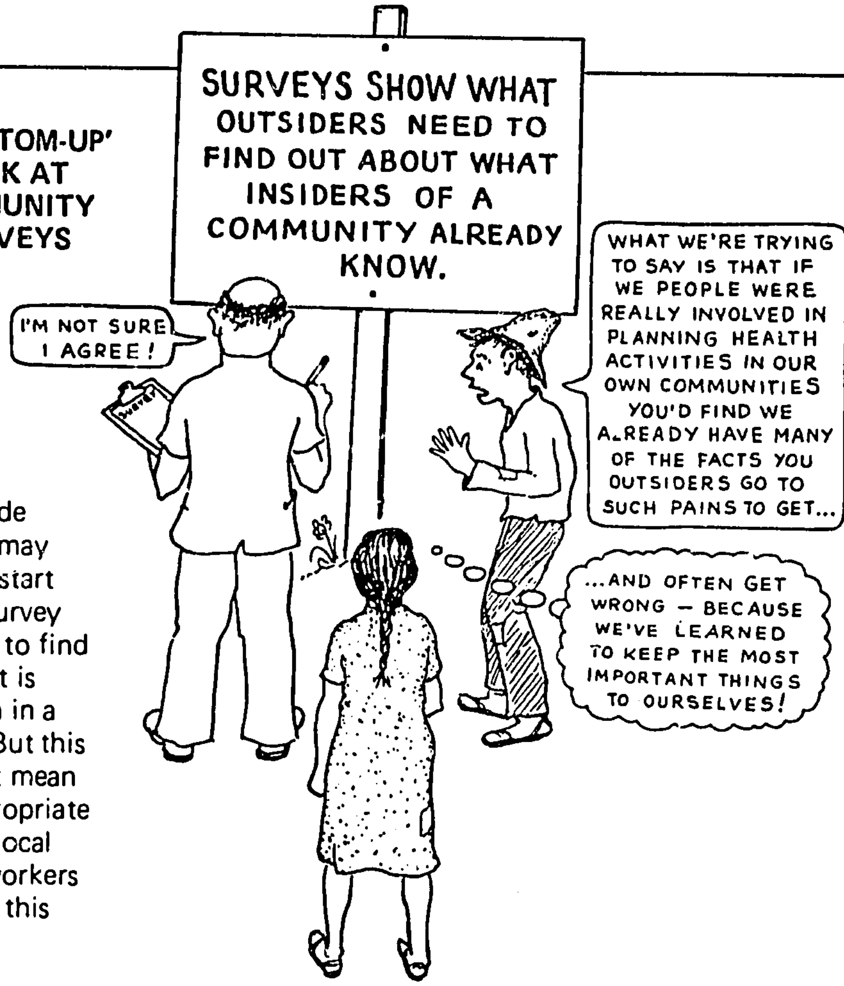
RESOURCES



- people with special skills: leaders, healers, story tellers, artists, craftsmen, teachers
- land, crops, food sources, fuel sources (firewood, etc.), water
- building and clothing supplies
- markets, transportation, communication, tools
- availability of work; earnings in relation to cost of living

This looks like a lot of information. And it is! But fortunately, **a health worker who is from the community already knows most of the important facts.** He does not need to run around collecting a lot of data. All he needs to do is sit down with a group of people and look carefully at what they already know.

A 'BOTTOM-UP' LOOK AT COMMUNITY SURVEYS



Outside experts may need to start with a survey in order to find out what is going on in a village. But this does not mean it is appropriate to have local health workers start off this way.

When does information gathering make sense?

Although starting off with a detailed community survey is often a mistake, there are times when a health worker and the people in his community may want to gather specific information. For example:

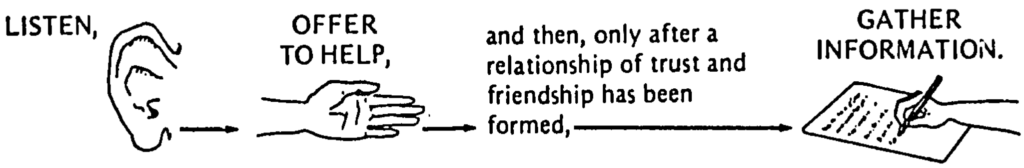
- People may want to see whether many children are underweight (poorly nourished) and therefore more likely to get sick. (See p. 25-7.)
- They may want to find out if bottle-fed babies in their village get diarrhea more often than breast-fed babies. (See p. 24-17.)
- They may want to see whether a particular health activity produces results. For example, a village may plan a campaign to control malaria. The people can take a survey before they begin, to find out how many persons have had fevers and chills. Then—after everyone has taken part by draining ditches, sleeping under mosquito nets, and getting early treatment—the villagers can take another survey and compare the results.

Because surveys often show results that would not otherwise be noticed, they can help to renew people's enthusiasm for continuing an activity (or to stop or change an activity that is not working). See Evaluation, Chapter 9, and On-the-spot Surveys, p. 7-13.

Suggestions for gathering community information

There are no set rules or one 'right' approach for gathering needed information in a community. However, several people-centered programs have come up with the following ideas:

1. Go to people's homes and get to know them. But **do not start by taking a survey.** Information learned through friendly, casual visits is often truer and more useful. Put the needs and feelings of the people first.



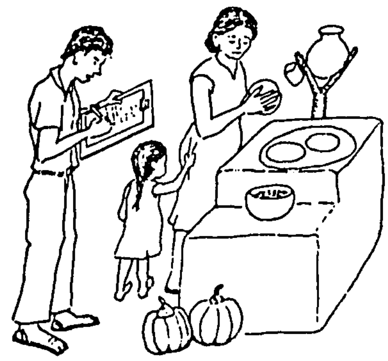
2. When gathering information, try to **find out what problems people feel are most important** or want to solve first. **Learn what ideas they have** for solving them.
3. **Ask only for information that makes sense** (and not simply because you were told to collect it). Be sure you and the people understand **why** the information is needed. For example, be sure parents understand why you weigh children **before** you do it.
4. **Involve local people in gathering the information.** Be sure studies are not *of* the people, but *by* the people. (For simple surveys in which children and non-literate people can take part, see p. 7-13 and Chapters 24 and 25.)
5. When conducting a survey or community diagnosis, **try to avoid taking along written questionnaires.** Avoid writing notes while a person is talking to you. Listen carefully, remember what you can, and **write your notes later.** Always be honest and open about the purpose of your visit.
6. Look for ways of making the survey a learning, exploring experience for those being questioned. Try to ask questions that not only seek information, but that also get people thinking and looking at things in new ways.

   For example, instead of simply asking, "How many people in your family can read?" follow up by asking, "What good is it to know how to read and write?" "Does the school here teach your children what they most need to know?" "If not, who does?" (For more ideas about this type of question, see *Where There Is No Doctor,* p. w10 and w11.)
7. Observe people carefully. You can find out as much by watching the way people act and do things as you can by asking questions. Learn to look and listen.
8. **Go slowly when giving people advice,** especially when it concerns their attitudes and habits. It is often better to tell a story about how others solved a similar problem by trying a new way. And **set a good example yourself.**

Note: Where official records of births and deaths are fairly accurate, these can also provide important health information without bothering people in their homes. It is a good idea to compare the ***deaths in children under five*** with ***total deaths.*** For example, in one area of the Philippines, a rise in children's deaths from 35% to 70% of total deaths between 1975 and 1980 shows that conditions affecting health are getting worse!

For local health workers and their communities,

the need is not to gather information . . .	**but to gather everyone together and look at what they already know.**



People in a village or community already know most of the essential facts from their own experience. (Not exact numbers, perhaps, but these are usually not needed.) What they need to do is ask themselves:

- How do the combined facts of our situation—needs, social factors, and resources—affect our health and well-being?
- How can we work with these facts—using some, changing or reorganizing others—to improve our health and well-being?

The process of looking at these questions in a community group is sometimes called *community analysis* or *community diagnosis.* At best, this means not only a diagnosis *of* the community, but a self-analysis *by* the community.

Community diagnosis—whom does it serve?

Ideally, a community diagnosis is a self-analysis by a community of the problems that concern people most. But watch out! The term *community diagnosis* is used quite differently by many of the larger health programs. To them it has come to mean a detailed survey, which health workers are required to conduct in their communities after training. Often the information collected through these surveys serves the needs of the health authorities, but means little to the people themselves.

To require a new health worker to conduct a long, complicated community survey can turn people against him from the first. Many people dislike or distrust surveys. This is especially true for the poorest of the poor, who are repeatedly studied but seldom see any real benefits.

DIAGRAM 2

Ten reasons advanced for Community Participation

1. With participation, more will be accomplished.
2. With participation, services can be provided more cheaply.
3. Participation has an instrinsic value for participants.
4. Participation is a catalyst for further development.
5. Participation encourages a sense of responsibility.
6. Participation guarantees that a felt need is involved.
7. Participation ensures things are done the right way.
8. Participation uses valuable indigenous knowledge.
9. Participation frees people from dependence on others' skills.
10. Participation makes people more conscious of the causes of their poverty and what they can do about it.

Water for the World

Community Participation in Planning Water Supply and Sanitation Programs

Technical Note No. HR. 2.P

Community participation in planning a water and sanitation system is one of the most important contributions to a project's success. For local participation to be productive, both the community and the action agency must be committed to it from the start. See "Overview of Water and Sanitation System Development," HR.1. Educational campaigns on the options for improvements in water and sanitation on the local level are essential to develop the community awareness that leads to responsible participation in developing a system. The community and the action agency must jointly develop a water and sanitation system that can be locally operated and maintained with a minimum of advice and assistance from outsiders. Community involvement in project planning is essential to the later phases of design, construction, and operation and maintenance. Community involvement is especially important in the areas of financial arrangements, in-kind contributions, labor schedules, legal clearances, selection of acceptable technology, and training in operation and maintenance.

Community Education

Local awareness and understanding of the advantages of water supply and sanitation improvements increase the probability of community participation in developing appropriate water and sanitation facilities. The success of a water and sanitation project depends on users wanting, understanding, and accepting the system.

Community education serves several purposes. One is to explain to villagers the economic advantages of improved water and sanitation systems. Another purpose is to familiarize the community with the technologies available so that they will select one they can operate and maintain with a minimum of outside involvement. A third purpose is to teach villagers which personal and communal water and sanitation practices are harmful to good health so behavioral changes can take place.

Education programs should be arranged through the action agency. The action agency and the village water and sanitation committee should organize the community education campaign using all appropriate cultural channels and reaching all social levels. The educational effort can be coordinated with other development projects, such as hospital construction or primary health care, as well as with local institutions such as schools, and organizations such as mothers' clubs.

Both hygiene and technical education should be integrated into all stages of the planning phase. This is best accomplished if local water and sanitation practices are throughly understood. Local water and sanitation beliefs, legends and patterns of water use and excreta disposal should be identified and understood by the health or technical educator.

Some suggested components to use in health and hygiene education are:

- rules of personal hygiene,

- rules of communal hygiene and environmental sanitation,

- methods of water source protection,

- rules of water supply protection in the household,

- health reasons for a safe water supply,

• health reasons for sanitary excreta and refuse disposal.

Convenience and privacy are the most likely reasons people will accept and use new facilities. Even so, local disease statistics and projected economic consequences are good tools for explaining the need for good health. Examples set by role models such as teachers, engineers, community leaders and even school children can change behavioral patterns in a community. Visual aids and the mass media are effective supplements to an educational campaign.

Local programs might be organized as:

• hygiene explanations of water and sanitation systems integrated into construction schedules for laborers,

• family, mother and child education programs in personal and communal hygiene,

• school programs on health and hygiene, including demonstrations and supervised good use of new facilities at school,

• manuals for facilities use for operation and maintenance personnel,

• environmental sanitation and village clean-up campaigns.

It is difficult to persuade people to change old habits but the difficulty can be lessened by the manner in which change is introduced. Community leaders should understand problems and solutions early so they can help explain the coming changes. Leaders can motivate villagers through their own actions and through community approved sanctions for misuse of facilities. When community leaders, the village committee, the action agency and the villagers all have similar understandings, they can work toward a common goal.

The action agency must explain and evaluate technical options with the community to determine their social acceptability. Throughout the project, the action agency and the village water and sanitation committee should explain each project activity and the reason for its sequence to the rest of the village. This can be accomplished at public meetings or in informal discussions. Refer to "Methods of Operation and Maintenance Training," HR.3.M for more information on technical education.

Community education, or even data collection done with local participation, begun in the early planning stages of a project will stimulate interest and can help start active community involvement in the project. Public awareness of technical alternatives and personal and public practices related to hygiene and sanitation can provide health benefits that the provision of a water or sanitation system alone cannot affect.

Formulate Alternatives

The collection and evaluation of field data will often continue throughout the entire project as new options and information are presented. The action agency will be responsible for appraising the technical field data and identifying the technical options it believes are practically and economically feasible. The community will be responsible for evaluating its social, cultural and economic situation and identifying options which it perfers.

Before final steps are taken in formulating water supply and sanitation alternatives, the community, with technical assistance from the agency, should clarify its priorities and needs. It must identify its expectations and capabilities for technical involvement in system operation and maintenance, its own reliable resources (cash, labor, materials, equipment, services), and the support services it will need for education and training in health, construction, operation, maintenance and facility use.

The action agency should identify the technically feasible alternatives which meet local needs. Each option the agency presents to the community should include:

• a technical description and explanation,

- estimated installation costs,
- installation needs such as construction time, labor, material and equipment,
- operation and maintenance costs,
- community's operation and maintenance responsibilities,
- estimated total costs,
- funding requirements, sources and availability.

The agency must fully explain the community responsibilities for each option and the support services the agency can provide. The action agency must keep in mind that the village will be managing its own system in the operation and maintenance stages. Efficient operation and maintenance of water and sanitation systems in isolated and rural areas requires simple equipment and procedures and as little water treatment as possible.

Both the agency and the village must weigh the following factors for each alternative considered:

1. Technical feasibility, based on data collected in preliminary studies (refer to "Methods of Initiating Community Participation in Water and Sanitation Programs," HR.2.M).

2. Construction needs:

a. Is site (land) available?
b. Can water and sanitation facilities be made available at convenient places for everyone in the village? Can facilities be extended to new residences?
c. What materials, tools, and equipment are necessary?
d. Which are available locally?
e. How can non-local materials and supplies be obtained?
f. What kind of and how much labor is necessary?
g. Is it available?
h. How much will materials, equipment, and labor cost?
i. When are laborers free for construction?
j. When and how will funding be available?
k. What season is best for construction?

3. Operation and maintenance needs:

a. Will an operating budget be required?
b. Is local personnel available for operation of systems?
c. Are trained personnel for operation and maintenance necessary? How many?
d. Can water agency provide training for operation and maintenance?
e. How much will operation and maintenance cost daily, weekly, and monthly?
f. What minimum costs will be necessary to keep the system going? How will funds be provided?

4. Community needs and preferences.

5. Social, cultural, religious acceptability.

Select a Method

After evaluating all alternatives presented, the most appropriate system for the village must be chosen. There is often wide variation between the most desirable alternatives and the most workable solutions. The water committee and the action agency must be careful not to choose either a sophisticated but unrealistic system or a system that is realistic but inadequate for meeting the community's needs. Often, established standards of quantity and quality will have to be balanced off against community preferences.

No system should be selected that involves complicated or expensive designs or equipment. Systems must be technically sound, economically feasible and acceptable to all segments of the community. Systems should be chosen for suitability and not prestige, but convenience and aesthetics should not be overlooked. Any features that exhaust the technical, economic or social resources of the community invite system failure and should not be selected. Systems using local resources are more likely to succeed than those dependent on outside resources.

It is not always necessary to develop an entirely new system. Small projects and improvements on existing systems may meet current urgent needs and promote village participation. The project planner should provide information for the village on the costs and efforts involved in minimal level service improvements which can be expanded over time.

The best water supply alternatives are those that provide the community with safe and abundant water from a reliable, accessible and socially acceptable source at the lowest cost. The best sanitation system alternatives are those which provide the most socially and environmentally acceptable level of effective service at the lowest cost.

Financial Arrangements

Special meetings should be held between the community and the agency to analyze finances and sources of support. The community should be instrumental in establishing financial arrangements for the project. Fundraising instituted by the villagers to help pay part of the capital costs of the water and sanitation system may help pay for recurrent expenses or raise money for other village projects. Care must be taken to ensure there is equity in contributions and payments. The financial value of local labor, materials and services can constitute a considerable proportion of total costs. When the community has contributed to the cost of the system, and has also participated in planning and constructing it, local residents may develop a stronger sense of responsibility for the system. If the community cannot pay for the project itself, it should arrange for in-kind support. For example, the community can identify sources for items on the materials list and arrange donations, trades or other in-kind commitments.

The community should also be instrumental in developing a financing schedule. If at all possible, the action agency should teach elementary accounting to villagers. The community can:

- price materials and identify the best price alternatives,
- calculate project costs per family, cost per capita, and total cost,
- decide how the community will pay for construction,
- determine any repayment schedules for loans,
- decide how the community will pay for operation and maintenance,
- decide how and when any fees will be collected,
- determine wages for construction workers and operation and maintenance personnel.

Set Specific Goals and Write a Project Plan

After the appropriate technology is selected, goals for developing and completing the system should be set. Set specific goals that can be measured so people can tell when they have reached them. Be sure any necessary legal arrangements are made.

Project goals must clearly state:

- What the project is.
- What the project will accomplish in terms of effort and benefits.
- What methods will be used to complete the project.
- When work will be done.

Write a project plan that incorporates these goals into a specific time frame.

The village committee should help choose personnel for construction, operation and maintenance. Specify:

- How a construction supervisor will be chosen.
- Who will be supervisor.
- Who will be construction workers.
- How the operation and maintenance managers will be selected.
- Who the operation and maintenance managers will be.
- Who will keep books and file monthly maintenance and accounting reports.

The construction supervisor, the village committee, and the action agency should:

• Make a list of

-- the materials which must be procurred outside of the community and their costs, and

-- the materials which can be gathered locally.

• Make an equipment list, including tools and vehicles, and all costs.

• Make a list of where to procure all materials and equipment and set up a schedule for delivery.

The village committee should be instrumental in scheduling labor with the constuction supervisor. Identify and specify in the project schedule:

• Tasks for completeing construction.

• Which parts of the system can be locally constructed.

• Which parts of the system will have to be constructed outside community.

• Which jobs the community will perform.

• Which jobs the agency will perform.

• Which jobs will require both community and agency work.

• Sequence of tasks.

• When work must be done (according to migration patterns, planting, harvesting, climatic cycles and holidays).

• Schedule of completion dates for construction activities.

The action agency usually arranges for equipment and materials to be delivered to the village. Delivery needs to be budgeted into project costs. Tools and equipment are generally furnished for project use by the agency. The community usually pays for construction materials, so it is best to use local materials such as sand, gravel and stones whenever possible.

The community should provide facilities for storing materials, tools and equipment at the project site. This will include an area for storing large equipment and a building for storing smaller items. Transportation within the village should also be provided by the villagers.

The community must help decide where the water and sanitation facilities will be located. Possibilities for extending the system to individual households or new residents should be explained. The community must be responsible for establishing an authority to enforce rules about late fee payments and negligent use of the system.

Adequate provision must be made for proper operation and maintenance of a system, at both the local level and through a backup resource arranged through the action agency and located convenient to the village. The community and the agency should work together to designate a health education staff and plan a health education program schedule. The two groups should set up an evaluation schedule for the system. Specify evaluation criteria, when the system will be evaluated and by whom.

Community Approval

A written or otherwise acceptable project plan may have to be approved by local, regional or national leaders, by water agency officials, or by funding agencies' officials. It must also be officially approved by the community. A project plan should include:

1. A description of the water and sanitation problem in the community.

2. An explanation of the proposed technical system and its expected benefits including the number of facilities.

3. An explanation of the method of construction to be used.

4. Design drawings (these can be simple at first, but dates for final

design drawings must be included in the project timetable).

5. Community and topographic map showing placement of facilities and location of construction. Show placement of facilities within houseplots and relationships of water supply facilities to sanitation facilities.

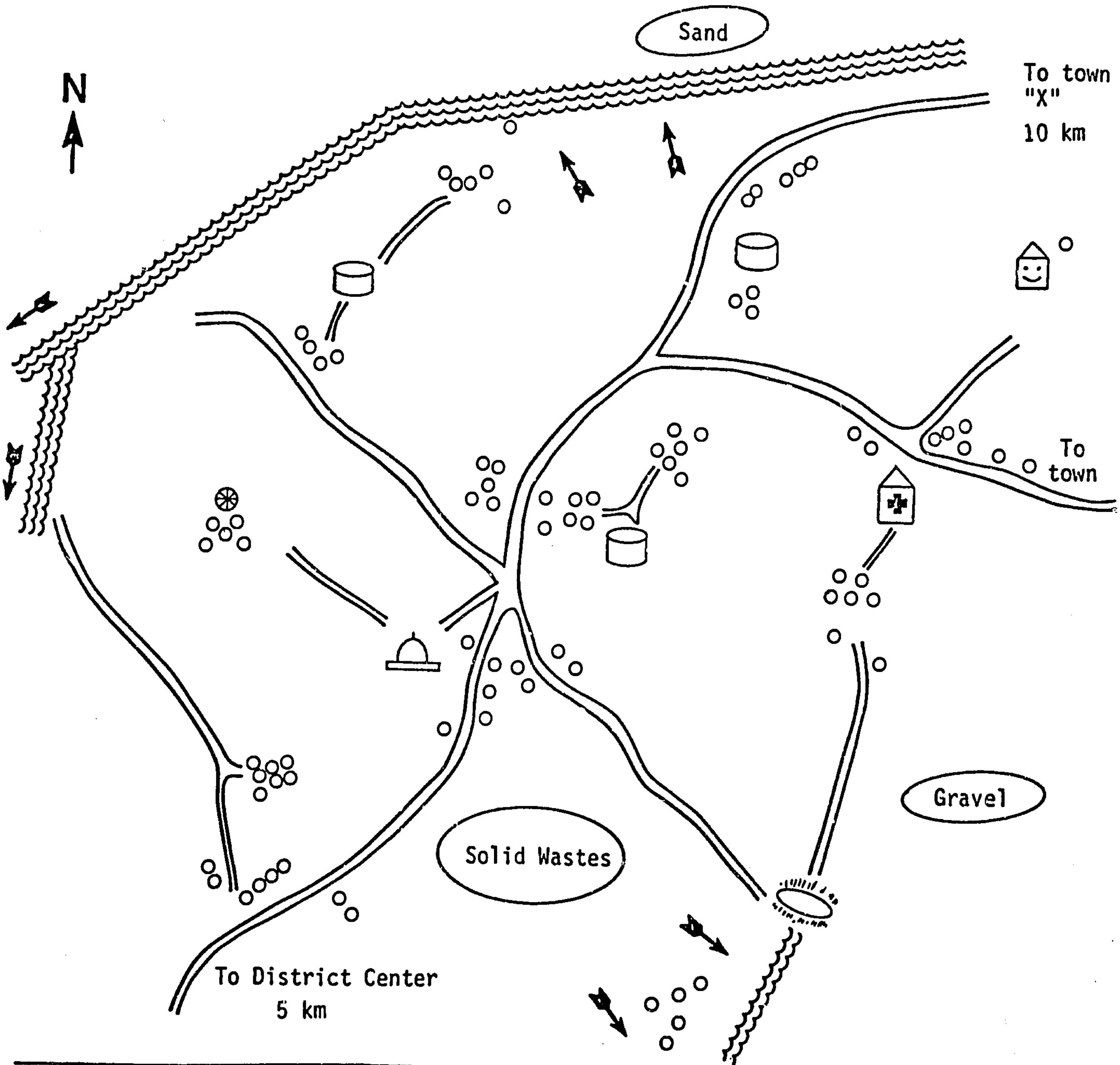
6. Costs of constructing system including labor (wages, number of workers, time), tools, equipment, materials, services and land that must be purchased.

7. Costs of operating and maintaining project for a specified period of time (per year or per month).

8. Schedule for implementation, including seasonal considerations, timetables for each phase of the project, and total time necessary.

If the community accepts the proposal and the responsibilities involved, a formal agreement should be made. Designing and building the system should begin according to the work schedule proposed.

EXAMPLE OF A SIMPLIFIED MAP



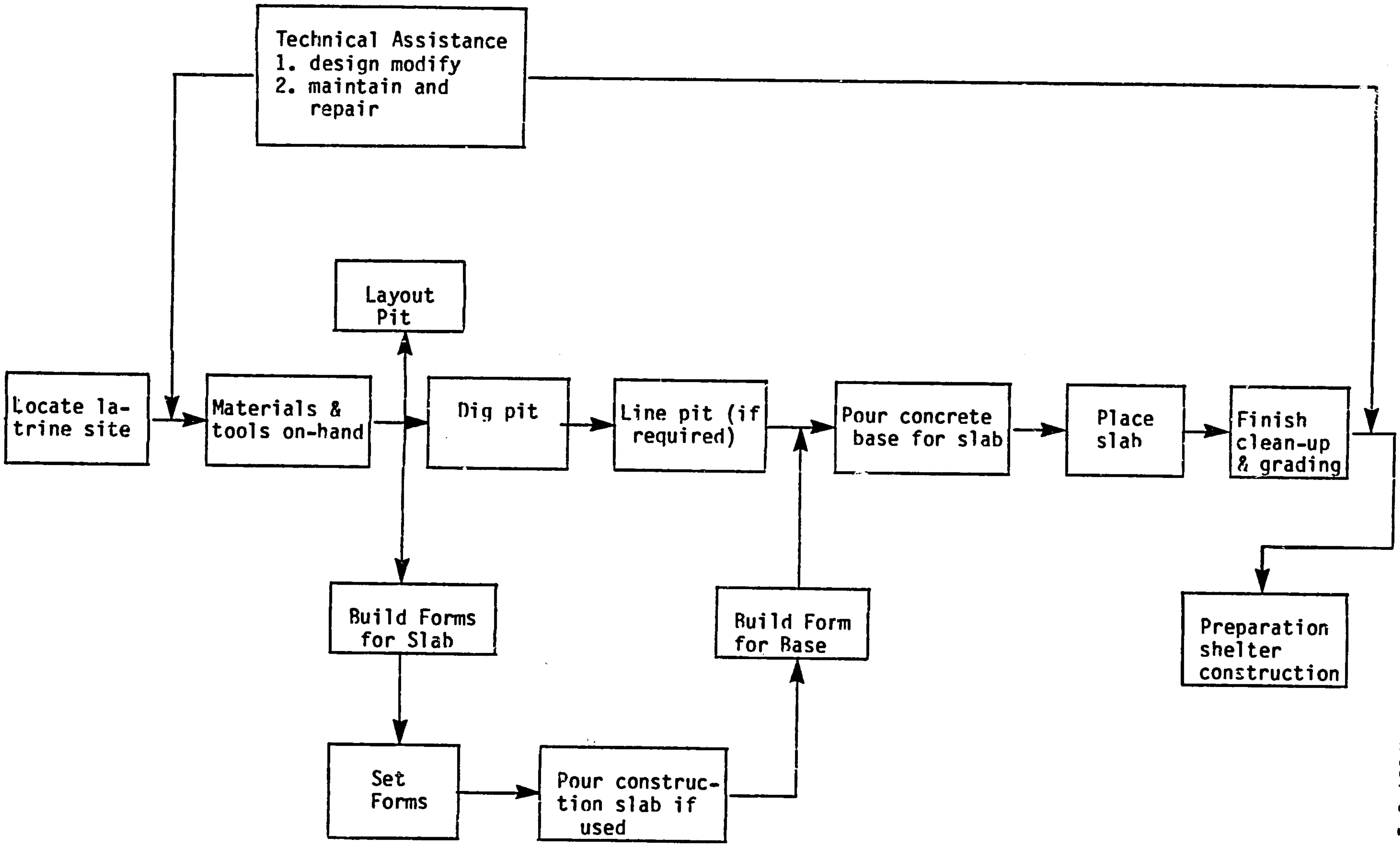
SYMBOLS WHICH CAN BE USED ON MAP:

- Cluster of Houses
- Headman's House
- Mosque or Church
- Clinic
- Solid Waste Disposal Sites
- Sand and Gravel Deposits
- Slope of Land
- School
- Well
- Spring
- Road or Path
- Stream Showing Direction of Flow

USER PREFERENCE IN LATRINE DESIGN

Item	Preference Variable
1. Positioning/access	Distance from household Privacy of access Ease of access
2. Comfort	Posture Anal cleansing material Odor Presence of flies, mosquitoes Size of superstructure Ensures privacy
3. Safety	Stability Suitability for children
4. Status	Appearance in comparison with local alternatives Choice of building materials Size
5. Aesthetics	Building style Finishing materials
6. Management and costs	Ease of maintenance Length of latrine life Ease of latrine replacement/renewal Labor needs Financial costs Systems of payment
7. Social organization	Inter-familial sharing preferences Intra-familial sharing preferences

CONSTRUCTION FLOWCHART



HANDOUT 6-1

TEAM LEADER NOTES

What will you need to organize your task and your team?

1. List of materials needed
2. List of activities/tasks
3. Sequence of tasks
4. Time required for each task
5. Tools/materials/supplies
6. Information about the community/homeowner/workers
7. Understanding the skills and knowledge of your team members

You are responsible for making sure that you have everything you need and that you and your team understand the instructions clearly. You are also responsible for returning tools and materials to their appropriate places. Be sure the site is cleaned up after work is completed. You will also act as liaison with training staff during the construction phase.

You will need to:

- o Work with your team to develop a work plan and determine specific assignments
- o Prepare ahead for fieldwork
- o Supervise the work of your team in the field

Site Location Diagram

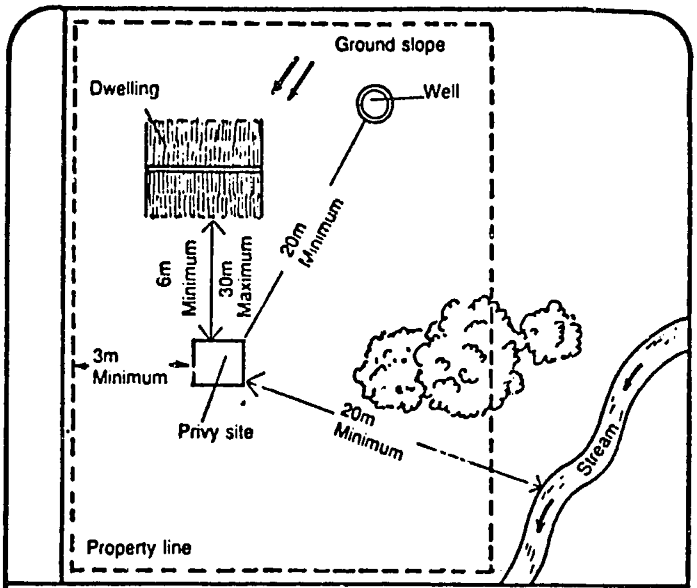


Figure 1. Location Map

1. Name: ________________
2. Village: ______________
3. Number of Users: __________
4. Depth of Water: ____________
5. Recommended Pit Depth: _________

Water for the World

Designing Pits for Privies

Technical Note No. SAN. 1.D.2.

Designing a pit for a privy involves selecting its location, calculating its size, and determining the labor, materials, and tools needed for construction. The products of the design process are: (1) a location map, (2) technical drawings of the pit, (3) sketches of the pit lining, if needed, and base for the slab, and (4) a materials list. These products should be given to the construction supervisor before construction begins.

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

Useful Definitions

DECOMPOSE - To decay and become reduced in volume due to bacterial action; this happens to excreta in a pit.

IMPERVIOUS - Not allowing liquid to pass through.

PERMEABLE - Allowing liquid to soak in.

Materials Needed

Measuring tape - To obtain accurate field information for a location map.

Ruler - To draw a location map.

Location

The major factors in selecting a location for a privy are: (1) location of water supplies, dwellings, and property lines, (2) soil type, (3) groundwater levels, and (4) impervious layers.

Location of Water Supplies, Dwellings, and Property Lines. A pit privy should be downhill from water wells. It should be at least:

20m from the nearest well or stream,
6m from the nearest dwelling,
3m from the nearest property line.

For the sake of convenience, the privy should be no farther than 30m from the building to be served. It should be on fairly level ground. When a proposed site has been selected, determine the soil type.

Soil Type. A pit should be dug in permeable soil so the liquid part of the excreta can soak into the ground. The rate at which liquid soaks in depends on the type of soil. If the rate is too fast or too slow, the soil is not suitable for a pit. The main types of soil are sand, sandy loam, loam, silt loam, clay loam, and clay. For a detailed description of soil types see "Determining Soil Suitability," SAN.2.P.4.

When the soil at the pit site has been identified, use the following chart to determine its suitability.

Table 1. Soil Suitability

Soil Type	Suitability
Sand	No
Sandy Loam	Yes
Loam	Yes
Silt Loam	Yes
Clay Loam	No
Clay	No

If the soil is not suitable, select another location for the pit. If no good location can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1). If the soil is suitable, proceed to the next step.

Groundwater Levels. The bottom of the pit must be at least 1m above the groundwater level during the wettest season of the year. This information may be available from local residents, water well owners, or water well drillers. If the information is not available or reliable, field tests must be made. These tests are described in detail in "Determining Soil Suitability," SAN.2.P.4. In brief, a hole must be dug 1m deeper than the proposed pit. Dig the test hole during the wettest season. If no groundwater is observed, groundwater levels are suitable.

If groundwater levels are not suitable, select another location for the pit. If no acceptable location can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1).

Impervious Layers. The bottom of a pit must be at least 1m above impervious layers such as creviced rock, hardpan, shale, or clay. The same test hole dug for determining groundwater levels can be used to check for impervious layers. If there are impervious layers in the test hole, the site is unacceptable for a pit and a new site must be found. If no suitable site can be found, design an alternative excreta disposal system (see "Simple Methods of Excreta Disposal," SAN.1.M.1).

When a suitable site has been found, draw a location map similar to Figure 1, showing the pit site and distances to water supplies, streams, dwellings, property lines, and any other nearby structures or prominent geographical features.

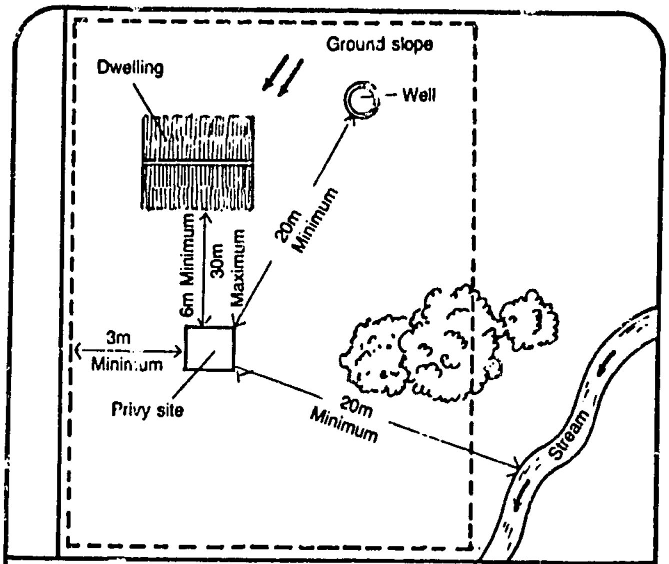


Figure 1. Location Map

Determining Pit Size

To determine the length, width and depth of a pit, first calculate the capacity. The capacity, or volume, of a pit is determined by the number of users of the privy, the number of years the pit is expected to last, whether the privy will have a pour-flush bowl, and the type of anal cleansing material used. Worksheet A shows a sample calculation of the size of a pit.

The number of users equals the number of persons living in or using the building to be served (Worksheet A, Line 1).

The pit should be designed to last 5 to 10 years, preferably 10 (Worksheet A, Line 2).

If the privy will have a pour-flush bowl, the pit can be smaller because the water used to flush the bowl will cause the excreta in the pit to decompose more rapidly (Worksheet A, Line 4).

The capacity of the pit is calculated as follows:

For a pit without a pour-flush: number of persons times number of years times 0.06 equals volume in cubic meters (Worksheet A, Line 5).

For a pit with a pour-flush: number of persons times number of years times 0.04 equals volume in cubic meters (Worksheet A, Line 6).

Worksheet A. Calculations for Privy Pit, Lining, and Base

Capacity of Pit

1. Number of users = 6
2. Designed life of pit in years = 8
3. Line 1 x Line 2 = 48
4. Is there a pour-flush bowl? [x] no [ ] yes
5. If "no," then Line 3 x 0.06 = 2.8 m^3
6. If "yes," then Line 3 x 0.04 = ______ m^3
7. Do anal cleansing materials readily decompose? [x] yes [ ] no
8. If "yes," then capacity = Line 5 (or Line 6) = 2.8 m^3
9. If "no," then capacity = 1.5 x (Line 5 or Line 6) = ______ m^3

Dimensions of Pit

10. Capacity (from Line 8 or Line 9) = 2.8 m^3
11. Pit is for (check one): [ ] pit privy [x] ventilated pit privy [ ] offset pit privy
12. Width (from Table 2) = 1.1 m
13. Length (from Table 2) = 1.2 m
14. Line 12 x Line 13 = 1.32 m^2
15. Depth = $\frac{\text{Line 10}}{\text{Line 14}}$ = 2.1 m

Quantity of Lining Material (area of pit walls)

16. 2 x Line 12 = 2.2 m
17. 2 x Line 13 = 2.4 m
18. Line 16 + Line 17 = 4.6 m
19. Area of walls = Line 15 x Line 18 = 9.7 m_2

Distance Around Pit (periphery)

20. Periphery = Line 16 + Line 17 = 4.6 m

Volume of Poured Concrete Base

21. Width of base = 0.15 m
22. Thickness of base = 0.05 m
23. Volume = Line 20 x Line 21 x Line 22 = 0.03 m^3

Lengths for Wood or Log Base

24. Line 12 + 1.0m = 2.1 m
25. Line 13 + 1.0m = 2.1 m
26. Lengths of the four logs or wood beams:

   (1) Line 24 = 2.1 m
   (2) Line 24 = 2.1 m
   (3) Line 25 = 2.2 m
   (4) Line 25 = 2.2 m

Example 1. Suppose a pit privy without a pour-flush is being designed for a family of six and is to last eight years. Then the capacity of the pit equals:

6 x 8 x 0.06 = 2.8 cubic meters (Worksheet A, Lines 1-5).

Example 2. Suppose a pit privy with a pour-flush is being designed for a family of six for eight years. Then the capacity of the pit equals:

6 x 8 x 0.04 = 1.9 cubic meters (Worksheet A, Lines 1-6).

If anal cleansing materials that do not readily decompose such as grass, leaves, corncobs or mudballs are used, the capacity of the pit should be multiplied by 1.5 (Worksheet A, Line 7). For example, if the capacity of the pit was calculated to be 3.0 cubic meters and corncobs are the usual anal cleansing material, the required capacity of the pit is:

$3.0m^3$ x 1.5 = 4.5 cubic meters (Worksheet A, Line 9).

When the capacity has been calculated, determine the dimensions of the pit. First, find the length and width. They depend on the type of slab and shelter being used (see "Designing Slabs for Privies," SAN.1.D.1 and "Designing Privy Shelters," SAN.1.D.3).

In general, a pit for a privy is square and is directly beneath the slab and shelter. A pit for a ventilated pit privy is either slightly offset or slightly longer than it is wide to accommodate the vent pipe. A pit for an offset pit privy is longer than it is wide and larger than a pit that is not offset.

(NOTE: A pour-flush bowl is generally used with a ventilated pit privy or an offset pit privy.)

Table 2 shows the general width and length and the minimum depth of the pit for each type of privy.

Determine the correct depth by dividing the design capacity by the width times the length (Worksheet A, Lines 10-15).

Table 2. Privy Type and Pit Dimensions

Privy Type	Pit Dimensions		
	Width	Length	Depth
Pit Privy	1.0-1.2m	1.0-1.2m	at least 1.5m
Ventilated Pit	1.0-1.2m	1.1-1.5m	at least 1.5m
Offset Pit	1.0-1.2m	1.5-2.0m	at least 3.0m

For example, calculate the correct depth of a ventilated privy with a capacity of 2.8 cubic meters, a width of 1.1 meters, and a length of 1.2 meters.

$$\text{depth} = \frac{2.8m^3}{1.1m \times 1.2m}$$

$$= \frac{2.8m^3}{1.32m}$$

$$= 2.1m$$

For pits 2.5-3.5m deep, add 0.15m to the length and 0.15m to the width to accommodate a step or ledge left in the walls during construction. For safety reasons, do not design a pit to be dug by hand deeper than 3.5m.

When the dimensions of the pit have been determined, make a technical drawing similar to Figure 2 showing length, width, and depth. For an offset pit privy, which requires a chute from the squatting slab to the pit, make a drawing similar to Figure 3 showing length, width, and depth of pit, and excavation for the chute. Give these drawings to the construction supervisor.

If the soil is such that the walls of the pit will not stand on their own in both the wet and dry seasons, the pit must have a lining. All pits need a base to support the slab (see "Designing Slabs for Privies," SAN.1.D.1).

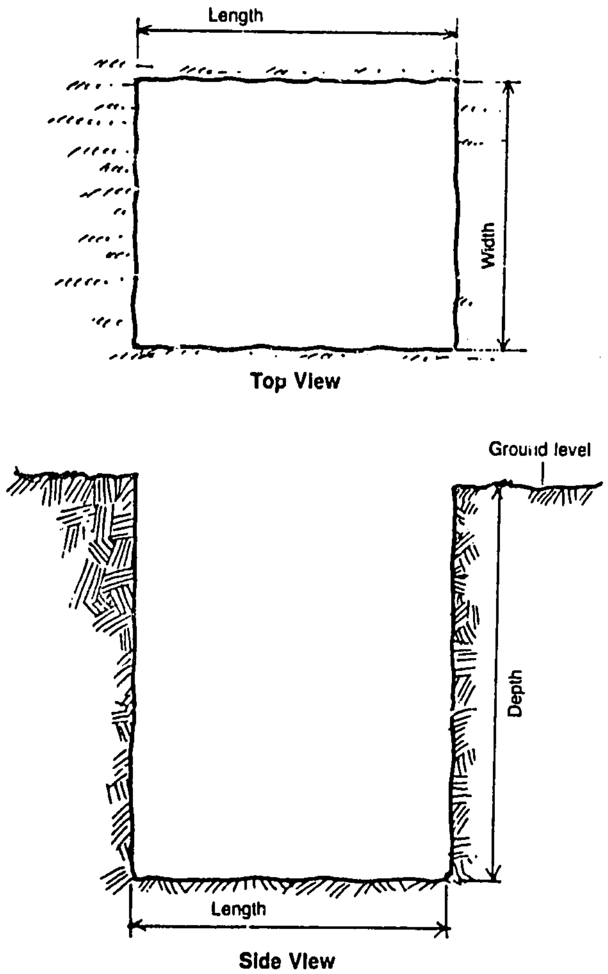


Figure 2. Dimensions for Pit Privy or Ventilated Privy

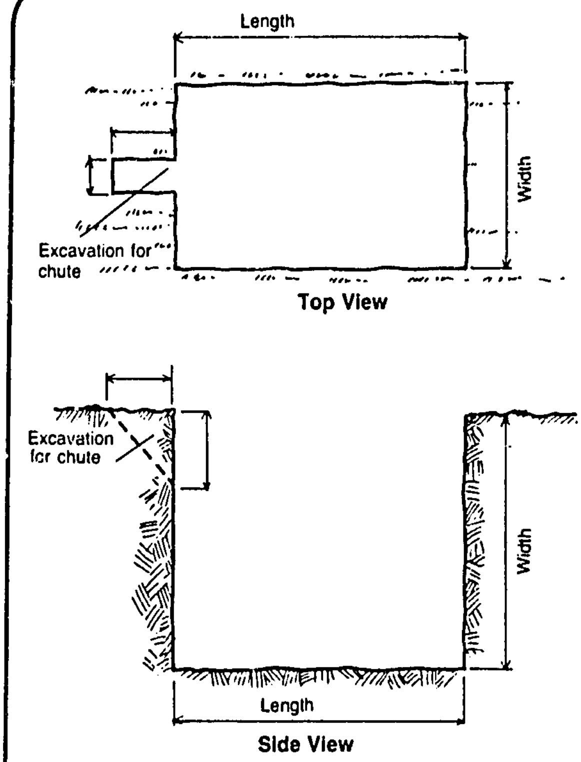


Figure 3. Dimensions for Offset Pit Privy

Caution!

Before the pit is excavated, design and construct the slab or, if it is an offset pit, the cover (see "Designing Slabs for Privies," SAN.1.D.1 and "Constructing Slabs for Privies," SAN.1.C.1). This is necessary so that when the pit is constructed, it can be covered immediately. A pit left open and unattended is a serious hazard. Whenever workers leave the site, they should cover the pit with the slab.

The lining can be made of bamboo, logs, poles, boards, bricks, concrete blocks, or select field stones. Whatever material is used, it must have slits or open spaces to allow the liquid part of excreta to pass through to the soil. For an offset pit privy, a space must be left in the lining to allow for the chute.

Prepare a sketch similar to one of those in Figure 4 showing the lining material and a sketch similar to one of those in Figure 5 showing the materials to be used for the base, and give both of them to the construction supervisor.

Materials List

Prepare a materials list similar to Table 3, showing labor requirements, types and quantities of materials and tools, and the estimated funds needed to construct the pit, including lining and base. This technical note provides the means of determining some quantities. The remaining quantities will have to be determined by you as the project designer or by the construction supervisor.

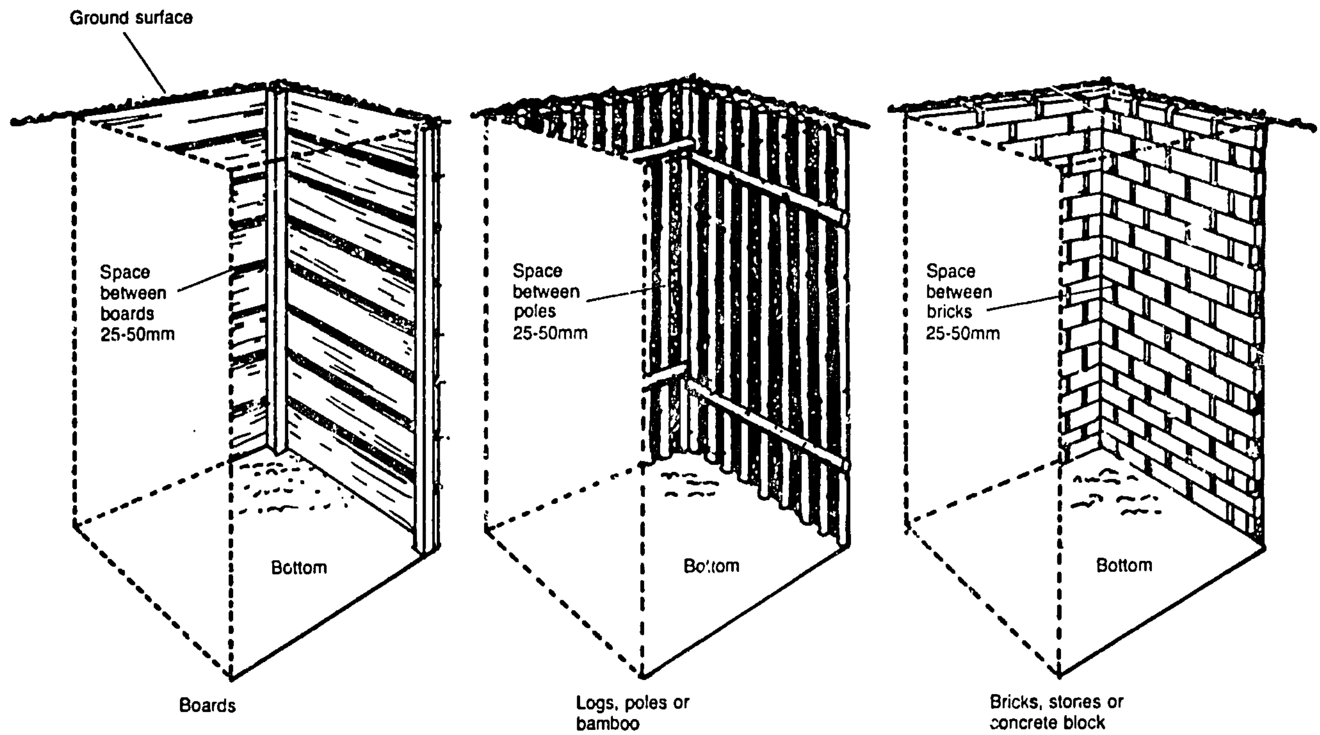


Figure 4. Pit Linings

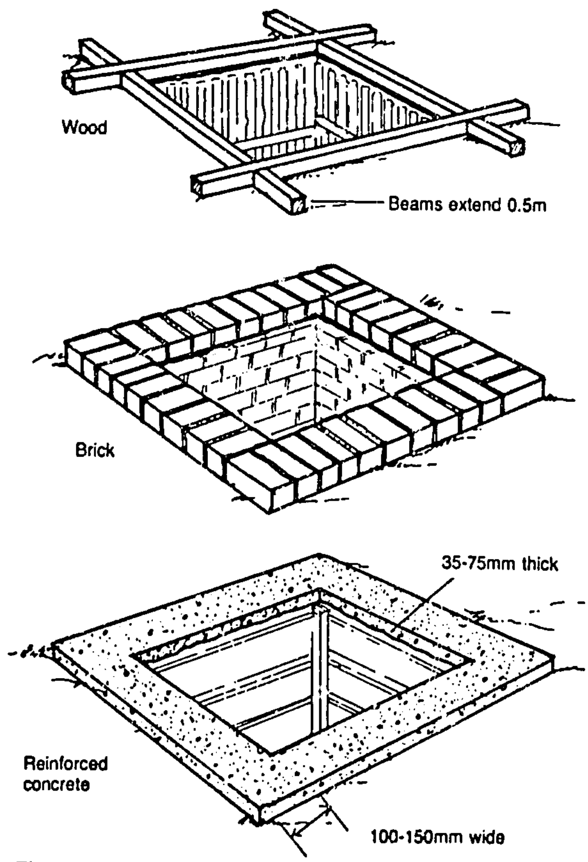


Figure 5. Bases

Labor. Ideally, there should be at least two laborers to dig the pit. If the pit lining or base is wood, one worker should have some carpentry skills; if the lining or base is brick or concrete block, one worker should have some masonry skills; if the base is poured concrete, one worker should have some concrete skills. If this number of laborers is not available, you can certainly make do with fewer. The person in charge of construction should be present during all stages of construction.

Lining. The material used for the lining, if needed, can be bamboo, logs, poles, boards, bricks, concrete blocks, or select field stones. Use a material that is readily available and that laborers are familiar with. The quantity depends on the type of material and the size of the pit. One way to estimate the quantity is to calculate the area of the pit walls, since the lining must cover nearly the entire wall area except for the spaces between the boards, poles, or bricks.

Table 3. Sample Materials List

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	____
	Laborers (one experienced with carpentry, stone masonry, or poured concrete, whichever applies)	2 (at least)	____
Supplies	For laying out the system: wooden stakes or sticks	____	____
	For the lining: bamboo, poles logs, boards, bricks, concrete blocks, select field stones	____	____
	For the base: wood, bricks, concrete blocks	____	____
	For poured concrete or mortar:		
	Cement	____	____
	Sand	____	____
	Gravel	____	____
	Water	____	____
	Other	____	____
Tools and Equipment	Box or bucket	1	____
	Sturdy rope or ladder	1	____
	Measuring tape	1	____
	Shovels	2 (at least)	____
	Wheelbarrow	1	____
	Hammer	1	____
	Saw	1	____
	Nails	--	____
	Trowel	1	____
	Plumb line (string and rock)	1	____
	Hatchet or machete	1	____
	Container (for mixing mortar)	1	____
	Concrete slab	1	____
	Other	--	____

Total Estimated Cost = ____

The area of the pit walls equals two times the width plus two times the length multiplied by the depth (Worksheet A, Lines 16-19).

For example, suppose a pit is 1.1 meters wide, 1.2 meters long, and 2.1 meters deep. Then the area equals:

$$(2 \times 1.1) + (2 \times 1.2) \times 2.1$$
$$= (2.2 + 2.4) \times 2.1$$
$$= 4.6 \times 2.1$$
$$= 9.7\text{m}^2$$

The lining material must cover an area equal to about 9.7 square meters.

Base. The material used for the base can be wood, bricks, concrete blocks, or poured concrete. Use a material that is readily available and that the laborers are familiar with. Figure 5 shows three different types of bases.

(NOTE: A wood base may not last as long as a brick, concrete block, or poured concrete base.)

The quantity depends on the type of material and the size of the pit. One way to estimate the quantity for a brick, concrete block, or poured concrete base is to calculate the distance around the top of the pit. This distance is called the periphery; it is equal to twice the length plus twice the width (Worksheet A, Line 20).

For a base made of bricks or concrete blocks, there must be a sufficient quantity to place the bricks or blocks side by side for a distance equal to the periphery of the pit.

For example, suppose a brick base is needed for a pit 1.1 meters wide and 1.3 meters long. Then the periphery equals:

$$(2 \times 1.1) + (2 \times 1.3)$$
$$= 2.2 + 2.4$$
$$= 4.6\text{m}$$

There must be enough bricks to be placed side by side around a periphery of 4.6 meters.

For a poured concrete base, the quantity of poured concrete is equal to the periphery of the pit times the width of the base times the thickness of the base (Worksheet A, Lines 21-23).

For example, suppose a concrete base 0.15 meters wide and 0.05 meters thick is needed for a pit with a periphery of 4.6 meters. Then the quantity of concrete equals:

$4.6m \times 0.15m \times 0.05m$

$= 0.03m^3$

For a wood base, four logs or sturdy wooden beams are needed, one for each side of the pit. Each log should be 1 meter longer than the side of the pit on which it will be laid, as shown in Figure 5 (Worksheet A, Lines 24-26). For example, suppose a wood base is needed for a pit that is 1.2 meters wide and 1.3 meters long. Then the lengths of the four logs would be:

$(1.2+1.0), (1.2+1.0), (1.3+1.0), (1.3+1.0)$

$= 2.2m, 2.2m, 2.3m, 2.3m.$

Tools. The tools required will vary according to the type of pit lining and base. All types of pits require at least two shovels (one per laborer) or other digging implements. A wheelbarrow is useful for carting away excavated dirt and for bringing other material to the pit site. A saw and nails are needed if the lining or base is made of wood, logs or boards. If the lining or base is made of bricks or concrete blocks, or the base is made of poured concrete, a container for mixing the concrete or mortar and a trowel for applying and smoothing concrete or mortar are needed.

Also needed are a measuring tape to help determine the exact location of the pit, and wooden stakes or sticks to lay it out on the ground. A plumb line (long string with a rock tied to the end) will be useful to ensure that the pit walls are dug vertically. A sturdy rope or ladder should be available for the laborers to get into and out of the pit.

Cost. The cost of the pit depends on a number of variables: which materials are available and which must be purchased; how much labor will be volunteered and how much must be paid for; prices and wage rates; and so on. Make your best estimate based on local conditions.

When all calculations, determinations, and estimates have been made, prepare a materials list similar to Table 3, and give it to the construction supervisor. In summary, give the construction supervisor: (1) a location map similar to Figure 1, showing the location of the pit in relation to all nearby structures and geographical features; (2) a technical drawing similar to either Figure 2 or Figure 3, depending on the type of pit privy, showing correct dimensions of the pit; (3) sketches similar to those in Figure 4 and Figure 5, showing the general configuration of the pit lining and base; and (4) a materials list similar to Table 3 showing the labor, materials, tools, and money needed to construct the pit, lining, and base.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

1982

INSTRUCTIONS FOR SOIL IDENTIFICATION

Identifying Soil Types. The six basic types of soil are: (1) sand, (2) sandy loam, (3) loam, (4) silt loam, (5) clay loam, and (6) clay. They can be identified by sight and touch. When testing soil by touch, test it when both dry and moist.

(1) Sand: Individual grains are easily seen and felt. A handful of sand squeezed when dry will not hold its shape; squeezed when moist, it will barely hold its shape, crumbling when touched.

(2) Sandy Loam: Contains a large percentage of sand so that sand grains can be seen and felt. Squeezed when dry, a handful of sandy loam will not hold its shape; squeezed when moist, it holds its shape and forms a cast that will not break when handled carefully.

(3) Loam: Has a fairly smooth, yet slightly gritty feel; clods crumble easily. Squeezed when dry, loam forms a cast that can be handled carefully without breaking; squeezed when moist the cast can be handled freely without breaking.

(4) Silt Loam: Feels soft and floury; clods are easily crumbled. Squeezed when dry or wet, silt loam forms a cast that can be handled freely without breaking. A small ball of moist soil pressed between thumb and finger will not form a ribbon.

(5) Clay Loam: Fine textured; clods are hard. Moist clay loam is plastic and, when squeezed, forms a cast that can withstand considerable handling without breaking. A small ball of moist clay loam pressed between thumb and finger forms a thin ribbon that barely sustains its own weight.

(6) Clay: Fine textured; clods are very hard. Wet clay is plastic and usually sticky. A small ball of moist clay pressed betwen thumb and finger forms a long ribbon.

EVALUATION OF SITE AND PIT

During this activity you will conduct a survey of your team's project site and collect information for use in later phases of the project. In preparing for this activity be sure you have developed a list of factors to evaluate. Use the list developed earlier in this session as a guide. Before you begin, spend a few minutes planning your work so that all tasks are completed in the time available. During your fieldwork you should complete the following tasks:

1) Locate the site.

2) Locate and talk to local residents (users) about the VIP latrine. Determine user preference about the orientation of the entrance. Discuss collaboration for construction and identify available labor resources from the community.

3) Evaluate the site for:

    a. Distances from buildings, wells, rivers, etc.
    b. Drainage
    c. Soil type
    d. Other factors such as wind potential for venting, solar exposure of the vent, shading of the entrance, etc.

4) Measure the pit and record its dimensions for use in base and slab construction.

5) Check for the availability of sand, aggregate, water etc., for construction. If these have been ordered and stockpiled quantities should be determined.

6) Draw a sketch map of the site incorporating the information collected in the site survey

Select one person to report findings to the total group.

MATERIALS NEEDED

Pencil and Paper
Measuring Tape
Handout 7-1:Site Location Diagram

(Sample)

HANDOUT 7-5

ESTIMATING EXERCISE

Assume that the residents at your latrine site have asked for an estimate of materials, labor, and the cost of constructing a latrine. You do not need to calculate the resources necessary for the shelter since they have not asked for an estimate of the cost of a shelter.

Use information from your site survey (available labor, sand, etc.) and the latrine plans which you were given to estimate the materials, equipment, and labor needed to:

Excavate and line the pit
Build a base for the slab
Construct the latrine slab forms
Pour the latrine slab

You know the ingredients needed for the concrete slab will include the following:

1 sack of cement
56 liters of sand
112 liters of gravel

From a previous survey you have the following information to help you estimate the cost of materials and labor.

Cement	- US $12 for a one kilogram sack
Lumber	- US $8 for a plank 4 cm x 24 cm x 400 cm
Sand and gravel	- can be obtained at a site 3 kilometers away. However, a method to bring it to the site is necessary.
Tree/Pole	- Trees up to 25 cm in diameter are located nearby and belong to the homeowner.
Re-bar	- US$1 a meter
Nails	- US$3 a kilogram
Skilled labor (mason, carpenter)	- US$4 per person per day
Unskilled labor	- US$2 per person per day

<u>Trainer Note</u>: Rewrite the estimating exercise by providing actual quantities and cost figures for the project being completed in the workshop. Add/delete materials as appropriate to the latrine design. Be sure that the materials added are also noted on <u>Handout 7-6:Resources Checklist</u>.

RESOURCES CHECKLIST

Materials	Quantity	Cost
Latrine Pit		
Wood for lining		
__________		
__________		
__________		
Slab Base		
__________		
__________		
__________		
__________		
Latrine Slab		
Cement		
Re-bar		
__________		
__________		
Slab Forms		
Lumber		
Nails		
__________		
__________		
	Total Materials Cost	

Tools	Quantity	Cost
Shovels		
Saw		
____________		
____________		
____________		
____________		
____________		
____________		
____________		
Total Tool Cost		

Equipment	Quantity	Cost
Truck		
Push-cart		
____________		
____________		

Total Project Cost

Material

Labor

Tools

Equipment

Total	

Activity/Labor	*Skills & number of persons	Time	Cost
Excavation of pit			
Lining pit			
Construction of slab base			
Construction of slab forms			
Latrine slab			
Pouring the slab			
Installing the slab			
Transportation of materials			
		Total Labor Cost	

* Mason
Laborer
Carpenter
etc.

TEAM INSTRUCTIONS FOR CONSTRUCTION OF SLAB FORMS

Your team will be cutting and assembling front and rear slab forms and forms for a drop-hole, vent pipe, and foot rests. These forms will be used to pour concrete later in the day.

The task of constructing the forms can be subdivided into one of cutting and fastening the frames; secondly, making the drop-hole, vent-pipe, and foot-rest forms; and thirdly, placing the drop-hole and vent-pipe forms in the frame.

1. Cut lumber to desired dimensions as shown in Figures 1, 2 and 3. Use measuring tape and pencil to mark lumber to be cut.

2. Once the lumber has been cut, the pieces should be fit together to determine if they fit correctly and are of the correct dimension. Ask the trainer to check the form before they are nailed together.

3. Nail together the frame boards, which connect with each other along the length as shown in Figure 1.

4. Make two foot-rest forms as shown in Figure 3.

5. A flat area on the ground is covered with a plastic sheet, and the slab forms are staked into place as shown in Figures 1 and 2. Special care should be taken to make sure the corners of the forms are right angles and that the forms are right side up as shown in Figures 1 and 2. Do not nail the frame boards to the stakes.

6. Sand the edges of all pieces, particularly the drop-hole and vent-pipe forms.

7. Coat each piece of the form with used motor oil or grease and wipe off the excess.

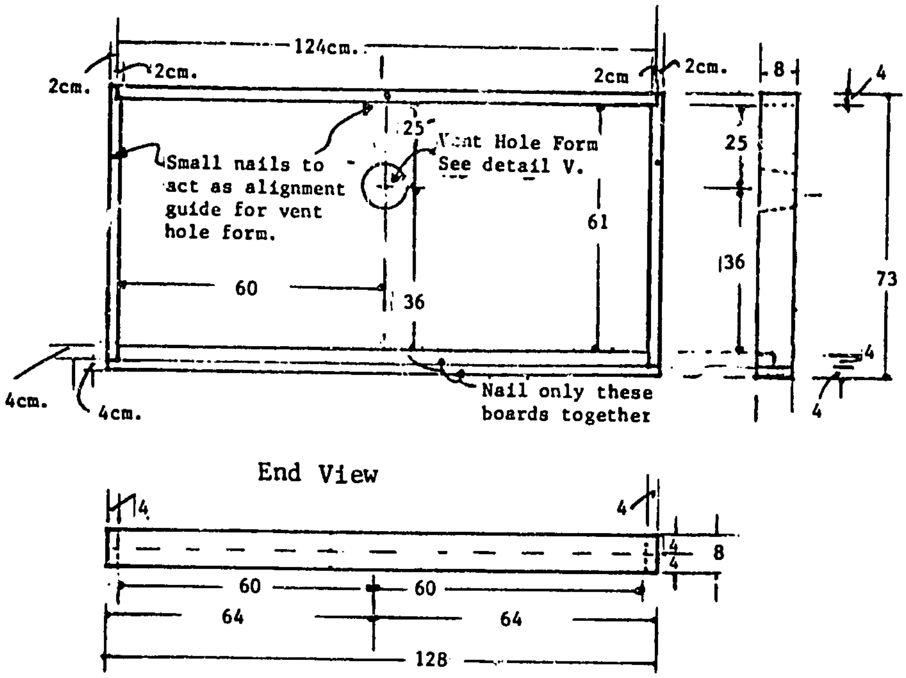
8. Cut the screed board. The dimensions are shown in Figure 5.

9. Place the vent hole form as in Figure 1.

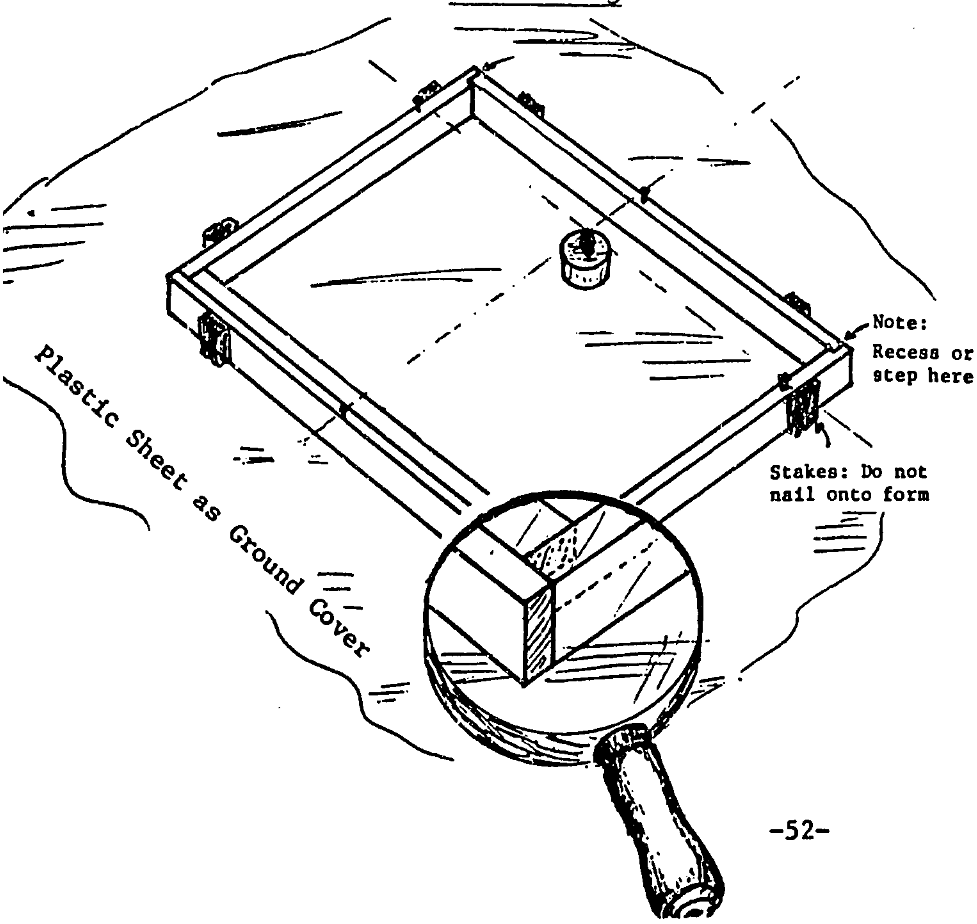
10. Place the drop-hole form as in Figure 2.

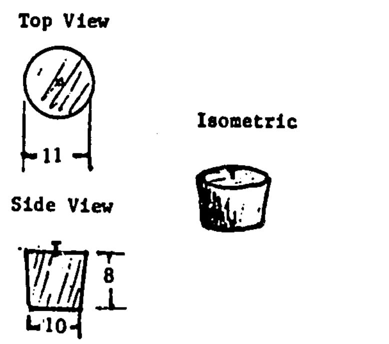
Note: Ninety minutes have been alloted for actually making the forms. This will vary if lumber has to be cut lengthwise.

Figure 1. REAR LATRINE SLAB FORM (Top, End & Side Views)



Isometric View: The Form Assembled and Ready for Casting

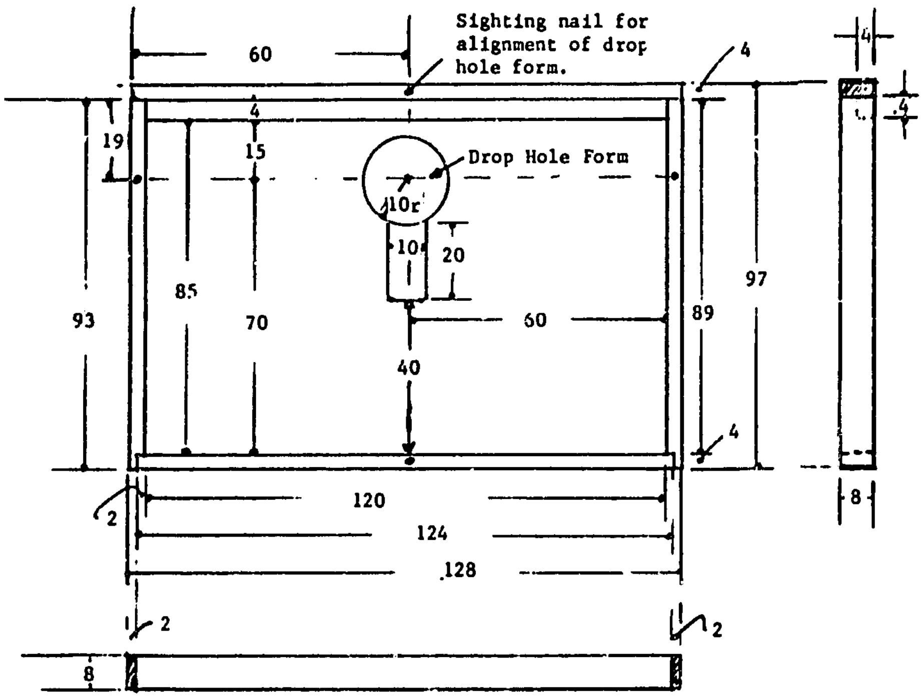




Note: The Cylinder is tapered for easy removal from concrete. A small nail is set in the center top to help locate/align the cylinder in the form as it is free standing.

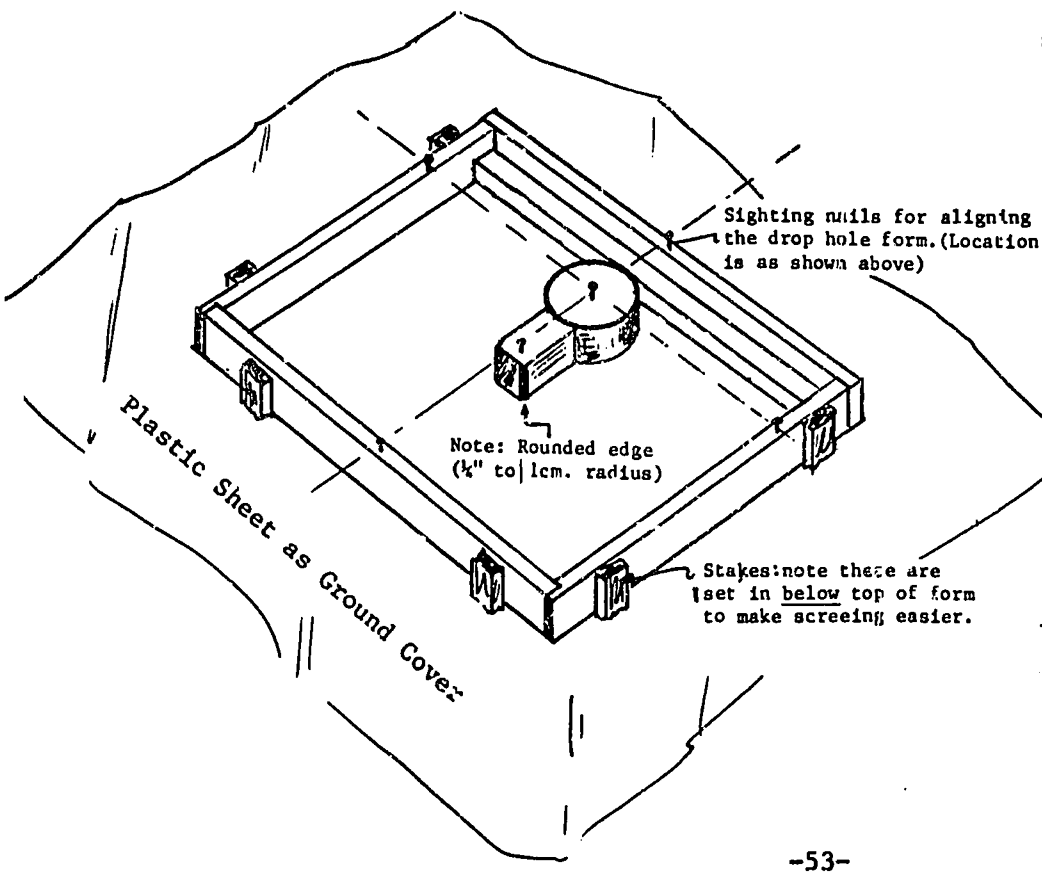
Detail V: Vent Hole Form

Figure 2. FRONT LATRINE SLAB FORM
(Top, End & Side Views)



DROP HOLE FORM DETAIL:

The drop hole form is a free standing wood block. It is made either from one piece of carved wood or two smaller pieces joined together. The latter alternative is ideal if a wood lathe is handy. The former alternative best suits labor intensive rural field situations.



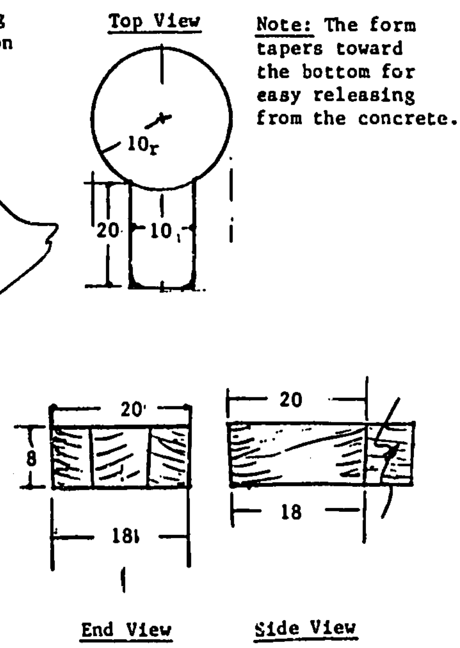
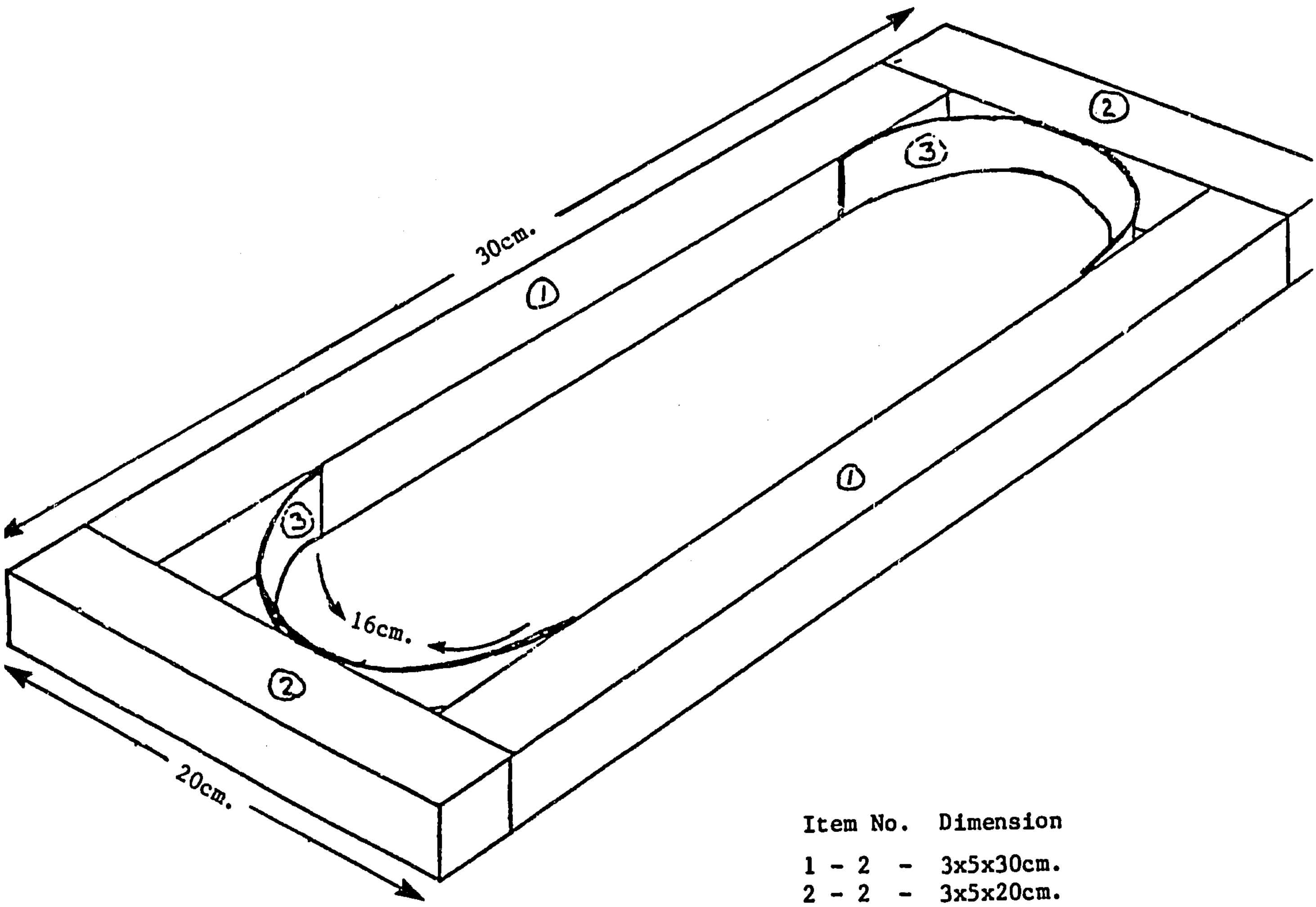


Figure 3. FOOT REST FORM



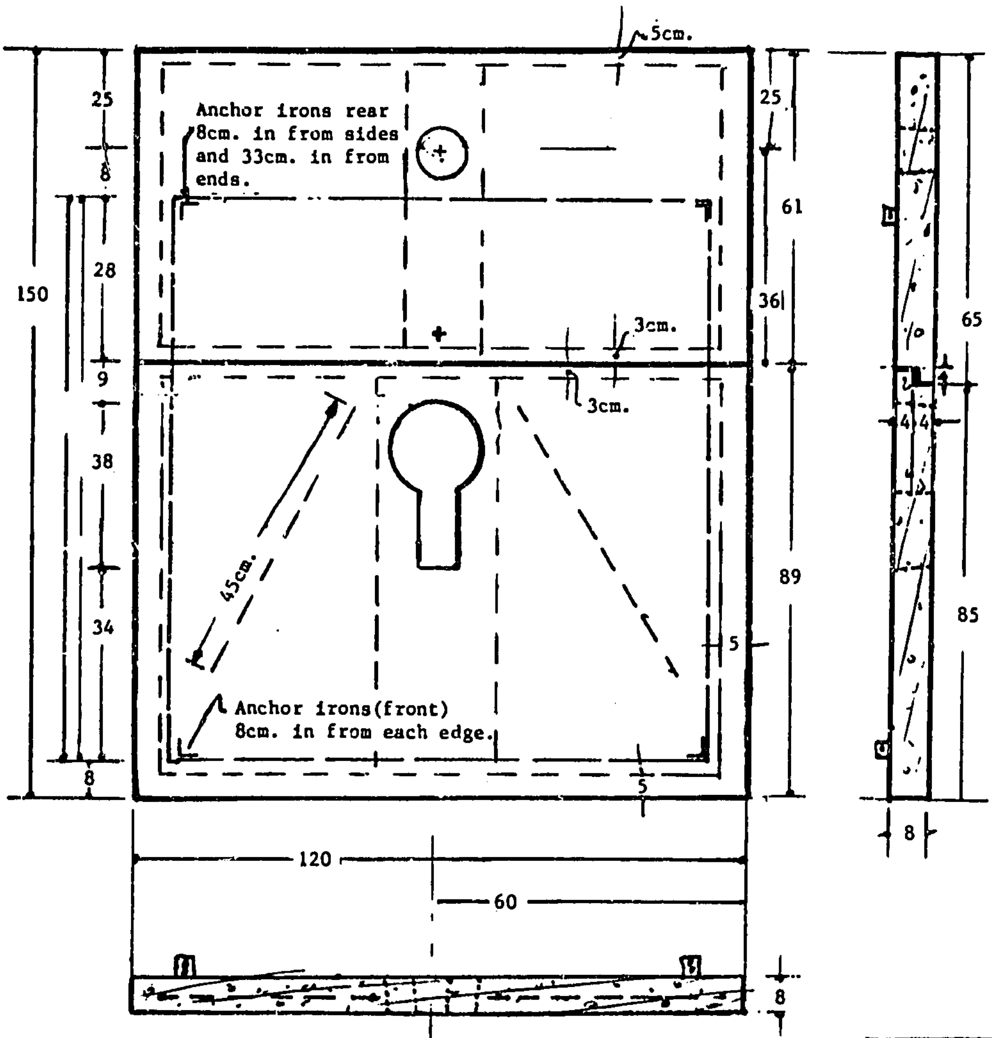
Item No. Dimension

1 - 2 - 3x5x30cm.
2 - 2 - 3x5x20cm.

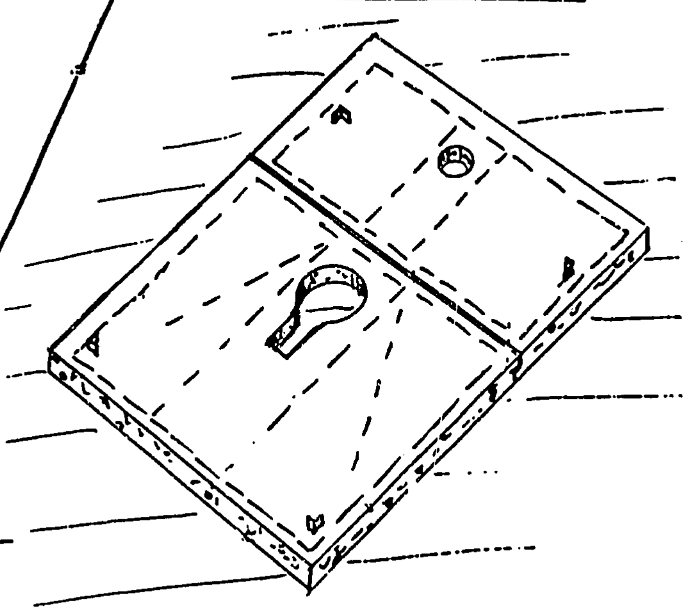
3 - 2 - metal 3x16cm.

Note: Need 2 foot rest.

Figure 4. THE CAST CONCRETE PIT LATRINE SLAB WITH LATERAL SEPARATION INTO TWO SECTIONS (Front, Side & End Views)



THE SLAB IN ISOMETRIC VIEW



Materials

Cement: 3/5 bag or 32 kg. or 21.6 liters
Sand: 95 kg. or 43.2 liters
Gravel: 143 kg. or 64.8 liters
Reinforcing Rod (Re Bar): All 6mm. Ø
4 PCS: 110cm. length laterals
4 PCS: 81cm. length front longitudinals
4 PCS: 53cm. length rear
2 PCS: 45cm. length diagonals
Anchor (angle) iron 4 PCS 4x4x10cm.

Key to location lines in slab:

——— = Superstructure
— — — = Reinforcing Rod

TOOLS & MATERIALS FOR SLAB FORM CONSTRUCTION ONLY

QTY.	TOOLS
1	Wood Rasp (1/2 round - 12" - 14")
1	Wood Crosscut Saw
1	Wood Chisel (3/4" to 1-1/2")
1	Hammer (Claw)
1	Tin Snips (Large)
1	Builders Square (or T Square)
1	Measuring Tape 2 m
1	Sandpaper - 50-100 Grit $2H^2$ (30 x 60 cm) area
1	Rag/Brush for Used Motor Oil, Grease or Animal Fat

QTY.	MATERIALS	DISTRIBUTION OF ITEMS				
		Front Form		Rear Form		Foot Rest
		Frame	Drop Hole	Frame	Vent Pipe	
	Wood: (in centimeters unless otherwise noted)					
2	3 x 5 x 20	(As stakes)		(As stakes)		2
18	3 x 5 x 30	8		8		2
2	4 x 8 x 73			2		
2	4 x 8 x 93	2				
2	4 x 8 x 120	1		1		
2	4 x 8 x 124	1		1		
2	4 x 8 x 128	1		1		
1	11 x 11 x 8				1	
*1	*8 x 20 x 40 (for 1 carved form)		1			
	Nails or wood screws 10 5 cm Flat Head/Round Head					10
21	11 " " " (as locator or alignment pins)	4	2	4	1	
1	Sheet Metal (16 to 24 ga) 3 x 16 cm strip					1
100cc	Used oil, grease, or animal fat	<smooth coat over all parts of form>				

* If drop hole is to be made with a wood lathe the material would be: 1 pc 20 x 20 x 8 plus 1 pc 24 x 8 x 10. Latter is tongue and grooved into former which is turned to a 20 cm diameter cylinder.

TEAM INSTRUCTIONS FOR MIXING AND POURING CONCRETE

1. Choose a site for mixing concrete. The area should be smooth and water-tight such as a concrete, metal, or wooden surface.
2. Clean the surface of the mixing area thoroughly.
3. Check to see if the sand needs to be washed. This should have been determined earlier by a silt test.
4. If sand is not clean enough wash with water.
5. Inspect gravel and remove any debris such as sticks, grass, clumps of soil, and large stones. The gravel should be 6 to 25 mm in diameter.
6. Measure out 2 parts sand and spread evenly over the mixing area. Mix only enough concrete to fill one form at a time. The quantities of materials to be mixed should be calculated by the team leader prior to this session.
7. Measure out 1 part cement and spread evenly over the sand.
8. Mix materials until color is uniform.
9. Spread this mixture out evenly; spread 3 parts gravel on it and mix thoroughly before water is added.
10. Form a hollow in the material and add water slowly while one or two of the participants mix the concrete with shovels.
11. Continue mixing until the mix is smooth and plastic, neither so wet that it will run nor so stiff that it will crumble.
12. Be careful not to add too much water. If, however, the mix is too wet add a small amount of sand and gravel in the proper 2:3 proportion until the mix is correct.
13. The wet concrete mix is carried to the slab form. Instruct the team to be careful not to handle the mixture too roughly or the fine aggregate will separate from the coarse aggregate.
14. Fill the slab mold one half of its depth (about 25 cm) with concrete. Be careful not to move vent-hole and drop-hole forms while pouring.
15. Place the reinforcement bar (re-bar) and anchor irons as shown in Figure 1.
16. Continue to fill the form with concrete. The concrete should be compacted so there are no air holes. This can be done using a piece of reinforcement bar, wooden pole or a shovel. Make sure the concrete has completely filled the edges of the form.

17. When the form is filled, screed the surface (Figure 5) to provide a rough finish. The screeding is done by pulling the screed back and forth and at the same time moving it across the form.

18. Once the concrete begins to stiffen slightly, use a finishing trowel to slope the slab towards the drop-hole as shown in Figure 4 (Handout 8-1). Smooth the concrete with the trowel to make it easy for cleaning. To get a smoother finish, mortar can be applied (1 part cement, 3 parts sand) to the surface.

19. The area where the foot rests are placed should be roughened up with a trowel to aid in bonding between the slab and foot rests. The foot rests should be placed as is appropriate locally. The foot rests will be made when the slab is installed.

20. Fill the second slab form repeating steps 3 to 20.

21. When the concrete stiffens in the first slab form, place the foot-rest forms as shown in Figure 4 (Handout 8-1). Fill the forms with concrete. Then repeat this step for the second foot-rest form.

22. Cover slabs with plastic sheeting to allow slow curing. If plastic sheeting is not available, cover with burlap, straw, etc. and keep moist over the next 4 days during the curing process.

23. Clean up work area and return all tools and materials to their proper place.

24. Make sure slabs are checked daily and add water to keep slabs moist during curing. This is critical during the first eight hours.

One may wish to finish off the slab with a smooth coat of plaster (1 part cement to 3 parts sand and gravel). This coating can be built up along the edges to provide a sloping surface toward the center drop-hole to aid in cleaning the latrine in actual use. Grades of 10 percent are suitable. This implies a coating which is about six centimeters in thickness at the most distant corners of the slab, sloping to about a half a centimeter in the vicinity of the drop-hole.

If a cement coat is to be applied, it is advisable to make the application within the first four hours of casting the slab to insure a reasonably good bond.

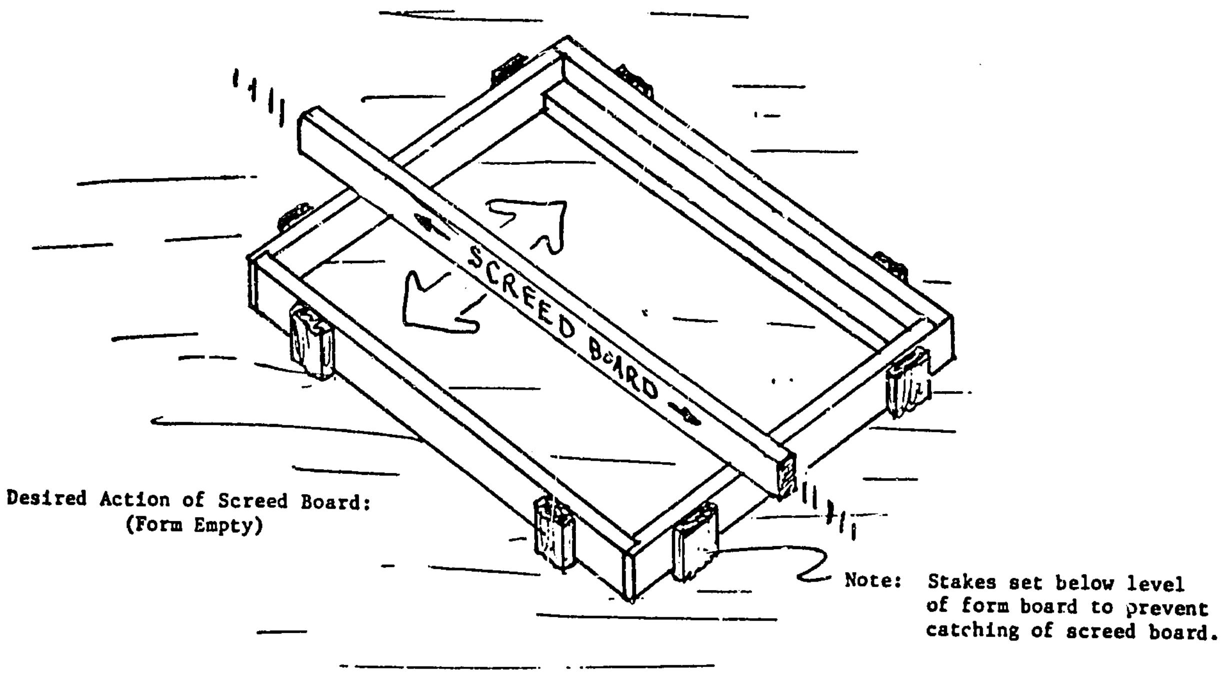
<u>Materials Needed</u>

Cement
Gravel
Sand
Lumber
Sheet metal
Nails
Used motor oil
Three screws to bolt vent-pipe form together

Tools Needed

Hammers
Saws
Measuring tape
Pencil
Square
Tin snips or a wood rasp
Shovel
Trowel
Buckets
Wheel barrow (optional)

Figure 5. SCREED BOARD USE IN LEVELLING CONCRETE IN FORMS.



The concrete is screed in the plain form shown with the drop hole/vent pipe forms in position. These must be held down as they will tend to float while the concrete is being screed. (Drop hole and vent pipe forms are not shown here)

MAKING GOOD CONCRETE

A. Introduction to Cement

Cement is one of the most useful materials in construction. It can easily be mixed with sand and water to make mortar or with gravel, sand and water to make concrete. Both mortar and concrete are among the strongest and most durable materials used for all types of construction around the world. Mortar is normally used as the bonding agent between bricks or rocks while concrete is normally reinforced with steel bars and molded to the desired size and shape.

Cement is available in almost every country in the world. Sand and gravel are usually available locally. Occasionally it will be difficult to get cement for latrine construction either because there are other higher priority demands for the cement or because it is too expensive. It is impossible here to say how or even whether cement can be obtained in such a circumstance.

Of the two cement compounds, mortar and concrete, concrete is the stronger. This is because the rock that makes up the gravel itself is stronger than the concrete and so contributes to its strength. Sometimes the two can be used interchangeably where lack of materials or working conditions demand it. Remember that concrete is the stronger product and should be used where possible.

<u>NOTE</u>: The rest of the discussion in this appendix will deal specifically with concrete. The same procedures can and should be followed if mortar is used instead.

B. Ingredients of Concrete

Concrete is made from cement, sand, gravel and water. These ingredients are combined in certain proportions to achieve the desired strength. The amount of water used to mix these ingredients is by far the most important factor in determining the final strength of the concrete. Use the least amount of water that will still give you a workable mix. Sand and gravel, which are sometimes referred to as fine and coarse aggregate respectively, should be clean and properly graded. Cement and water form a paste which, when mixed, acts as a glue to bind the aggregates together in a strong hard mass.

1. Proportions:

- There are four major ingredients in concrete: cement, sand, gravel, and water.

- Dry ingredients are normally mixed in certain proportions and then water is added. Proportions are expressed as follows: 1:2:4, which means that to one part cement you add two parts sand and four parts gravel. A "part" usually refers to a unit of volume. Example: A 1:2:4 concrete mix could be obtained by mixing 1 bucket full of cement with 2 buckets of sand and 4 buckets of gravel.

- Proportions are almost always expressed as cement: sand: gravel, and they are usually labelled that way.

- There are many minor variations in the proportions used for mixing concrete. The most commonly used are 1:2:4, 1:2:3, 1:2.5:5. For purposes of well construction, all work equally well.

  NOTE: A 1:2:4 mix will go a little farther than the 1:2:3 mix and allows a little more room for using less than the best grade of sand or gravel than a 1:2.5:5 mix.

- Normal range for amount of water used to mix each 50 kg bag of cement is between 20 liters and 30 liters (94 lb. bag of cement is between 4.5 gal. and 7 gal.)

- The water-tightness of concrete depends primarily on the water/cement ratio and the length of moist curing. This is similar to concrete strength in that less water and longer moist-curing promote water-tightness.

2. Choice of Ingredients

- Cement: The descriptions and properties given in this appendix are specifically of Portland cement. This is the type most commonly used and hereafter will be referred to only as cement.

  When used, it should be dry, powdery and free of lumps. When storing cement, try to avoid all possible contact with moisture. Store it away from exterior walls, off damp floors, and stacked close together to reduce air circulation. If it could be kept completely dry it could be stored indefinitely. Even exposed to air it will gradually draw moisture, thus limiting even the covered storage time to between 6 months and 1 year depending on conditions.

- Water: In general, water fit for drinking is suitable for mixing concrete. Impurities in the water may affect concrete setting time, strength, shrinkage or promote corrosion of reinforcement.

- Aggregates: Fine and coarse aggregates together occupy 60% to 80% of concrete volume.

  Fine aggregate: Sand should range in size from less than .25 mm to 6.3 mm. Sand from sea shores, dunes or river banks is usually too fine for normal mixes. (You can sometimes scrape about 30 cm of fine surface sand off and find coarser, more suitable sand beneath it.)

  Large Aggregate: Within the recommended size limits mentioned later, the larger the gravel you use the stronger and more economical the concrete will be.

- The larger the size of the gravel the less water and cement will be required to get the same strength concrete.
- The maximum gravel size should not exceed:
  - one-fifth the minimum dimension of the member;
  - three-fourths the clear space between reinforcing bars or between reinforcement and forms. (Optimum aggregate size in many situations is about 2.0 cm.)

The shape and surface texture of aggregates affect properties of freshly mixed concrete more than they affect hardened concrete. Rough textured or flat and elongated particles require more water to produce workable concrete than do rounded or cubical aggregates and more water reduces the final strength of the concrete.

It is extremely important to have the gravel and sand clean. Silt, clay, or bits of organic matter, even in low concentrations, will ruin concrete. A very simple test for cleanliness makes use of a clear widemouth jar. Fill the jar about half full of the sand and small aggregate to be tested, and cover with water. Shake the mixture vigorously, and then allow it to stand for three hours. In almost every case there will be a distinct line dividing the fine sand suitable for concrete and that which is too fine. If the very fine material amounts to more than 10% of the suitable material, then the concrete made from it will be weak.

This means that other fine material should be sought, or the available material should be washed to remove the material that is too fine. This can be done by putting the sand (and gravel if necessary) in some container such as a drum. Cover the aggregate with water, stir thoroughly, let stand for a minute, and pour off the liquid. One or two such treatments will remove most of the very fine material and organic matter.

Another point to consider in the selection of aggregate is its strength. About the only simple test is to break some of the stones with a hammer. If the effort required to break the majority of aggregate stones is greater than the effort required to break a similar sized piece of concrete, then the aggregate will make strong concrete. If the stones break easily, then you can expect that the concrete made of these stones will only be as strong as the stones themselves.

In very dry climates several precautions must be taken. If the sand is perfectly dry, it packs into a smaller space. If 20 buckets of dry sand are put in a pile and two buckets of water stirred in, you could carry away about 27 buckets of damp sand. If your sand is completely dry, add some water to it or else measure by weight instead of volume. The surface of the curing concrete should be kept damp. This is because water evaporating from the surface will remove some of the water needed to make concrete properly. Cover the concrete with building paper, burlap, straw, or anything that will hold moisture and keep the direct sun and wind from the concrete surface. Keep the concrete moist by sprinkling as often as necessary; this may be as often as three times per day. After the first week of curing, it is not necessary to keep the surface damp continuously (see "Curing Concrete" below).

3. Estimating Quantities of Materials Needed

   1. Calculate the volume of concrete needed.

   2. Multiply the volume of concrete needed by 3/2 (1.5) to get the total volume of dry loose material needed. The cement and sand do little to add to the volume of the concrete because they fill in the air spaces between the gravel.

   3. Add 10% (1/10) for losses due to handling.

   4. Add the numbers in the volumetric proportion that you will use to get a relative total. This will allow you later to compute fractions of the total needed for each ingredient (1:2:3 = 6).

   5. Determine the amount of cement needed by multiplying the volume of dry material needed (from step 2) by the proportional amount of the total mix (e.g., amount cement needed = 1/6 x volume dry materials).

   6. Divide by the unit volume per bag, 33.2 liters per 50 kg bag cement or 1 cubic foot per 94 lb. bag cement. When figuring the number of cement bags round up to nearest whole number.

   NOTE: This calculation, even with the 10% addition for handling losses, rarely leaves any extra concrete, particularly for small jobs requiring less than 5 hand-mixed bags of cement.

C. Construction with Concrete

1. Outline of Concrete Work:

   - Build form (8C.5.2)
   - Place rebar (8C.5.3)
   - Mix concrete (8C.5.4)
   - Pour concrete (8C.5.4)
   - Remove forms (8C.5.4)
   - Finish surface (8C.5.4)
   - Cure concrete (8C.5.4)

2. Materials for Forms

   The following materials are used to construct interior forms:

   - Steel: forms made of steel are durable and strong but are heavy, awkward, and expensive.

   - Sheet metal: with a simple triangular interior support, forms made of sheet metal have proved to be successful. They are lighter and more maneuverable than steel forms but are not as strong and durable.

   - Wood: this material is commonly used because it is lightweight and strong. It must be carefully bent, waterproofed, and reinforced.

By using boards as wide as possible, form construction is easier and quicker. It also reduces the number of lines on the concrete surface that form at the junction of two boards. Plywood is excellent, especially if it has a special high density overlay surface. This allows for a smoother concrete finish, easier form removal and less wear on the forms.

If unsurfaced wood is used for forms, oil or grease the inside surface to make removal of the forms easier and to prevent the wood from drawing too much water from the concrete. Do not oil or grease the wood if the concrete surface will be painted or stuccoed.

- Earth: Any earth that can be dug into and still hold its shape can also be used as a form. Carefully dig out the desired shape and fill it with concrete. Once the concrete has set and cured it can be dug up and used where needed. A new form will have to be dug out for each piece of concrete poured.

- Other materials: Plastics and fiberglass are also occasionally used and continue to be experimented with as form materials. Fiberglass is much lighter than steel and, if handled carefully, lasts for a long time. Its cost and availability in developing nations seem to be the only factors limiting more widespread trials.

3. Concrete Reinforcement

Reinforcing concrete will allow much greater loads to be carried. Design of reinforced concrete structures that are large or must carry high loads can become too complicated for a person without special training.

Concrete alone has great compression strength but little tensile strength. Concrete is very difficult to squeeze (compression), but breaks relatively easily when stretched (put in tension). Reinforcing steel has exactly the opposite properties; it is strong in tension and weak in compression. Combining the two results in a material (reinforced concrete) which is strong in both compression and tension and therefore useful in a large number of situations.

Concrete is best reinforced with specially made steel rods which can be imbedded in the concrete. Bamboo has also been used to reinforce concrete with some success although it is liable to deteriorate with time.

- Reinforced concrete sections should be at least 7.5 cm thick although 10 cm is preferable.

- The reinforcing bar (rebar) usually comes in long sections of a given diameter.

- Exactly how much rebar is needed in a particular pour will depend on the load it will have to support. For most concrete work, including everything discussed in this manual, rebar should take up 0.5% to 1% of the cross-sectional area.

- Reinforcing bars should also have clean surfaces free of loose scale and rust. Bars in poor condition should be brushed thoroughly with a stiff wire brush.

- When placing rebar in a form before the concrete is poured it should be located:

  - at least 2.5 cm from the form everywhere.
  - in a plane approximately one-third of the way into the thickness of the pour from the bottom of the structure or slab.
  - in a grid so that there is never more than three times the final concrete thickness between adjacent bars.
  - no closer than 3 cm to a parallel bar.

- Rebar strength is approximately additive according to cross-sectional area. Four 4 mm rebars will be about as strong as one 8 mm rebar. The cross-sectional area of four 4 mm rebars equals the cross-sectional area of one 8 mm rebar.

- The rebars should be arranged in an evenly spaced grid-type pattern with more and/or thicker rebar along the longest dimension of the pour.

- All intersections where rebars cross should be tied with thin wire.

- When one rebar is tied onto another to increase the length of the rebars, the overlap should be 20 times the diameter of the rebar and be tied twice with wire.

Rebar Size	Overlap
6 mm	12 cm
8 mm	16 cm
10 mm	20 cm
12 mm	24 cm

- Larger sizes of rebar often have raised patterns on them which are designed to allow them to be held firmly in place by the concrete. Smaller sizes of rebar are generally smooth. When using smooth rebar always make a small hook at the end of each piece that will be in the concrete. Without the hook, temperature changes may eventually loosen the concrete from the rebar thereby destroying much of its reinforcing effect.

- Rebar should be carefully prepared so that the rebar is straight and square. Sloppy rebar work will result in weaker concrete and waste rebar.

- For particularly strong pieces or where small irregular shapes are being formed, the rebar can be put together in a cage-like arrangement. Use small rebar for the cross-sections and larger rebar for the length. This system is used to reinforce pieces like a cutting ring, with its irregular shape, or perhaps a well cover, which may have many people standing on it at one time.

- Where possible, it is usually best to assemble rebar inside the form so that it will fit exactly.

- The proper distance from the bottom of the pour in a slab can be achieved by setting the rebar on a few small stones before the concrete is poured or simply pulling the rebar grid a couple of centimeters up into the concrete after some concrete has been spread over the whole pour.

4. Mixing Concrete by Machine or by Hand

a. Mixing by Machine

Concrete must be thoroughly mixed to yield the strongest product. For machine mix, allow 5 or 6 minutes after all the materials are in the drum. First, put about 10% of the mixing water in the drum. Then add water uniformly with the dry materials, leaving another 10% to be added after the dry materials are in the drum.

b. Mixing by Hand

On many self-help projects, the amount of concrete needed may be small or it may be difficult to get a mechanical mixer. If a few precautions are taken, hand-mixed concrete can be as strong as concrete mixed in a machine.

The first requirement for mixing by hand is a mixing area which is both clean and watertight. This can be a wood and metal mixing trough (Fig. 8C-45) or simple round concrete floor (Fig. 8C-46).

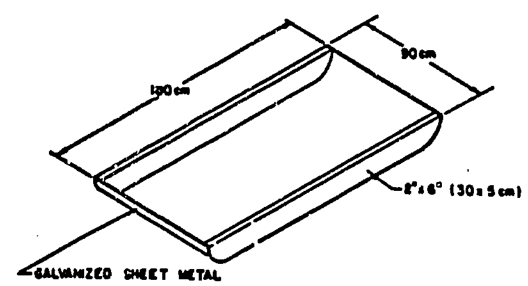


Figure 8C-47. Mixing Trough

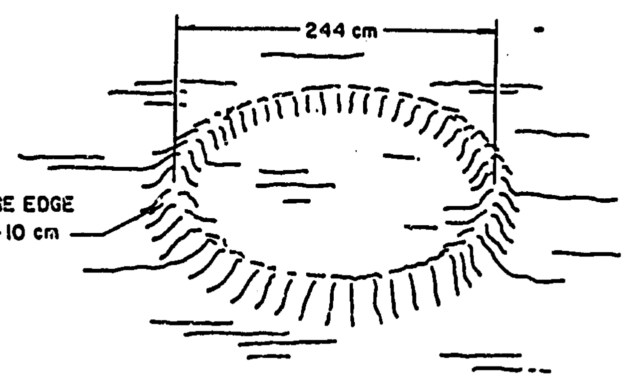


Figure 8C-48. Mixing Floor

Use the following procedure:

1. Spread the fine aggregate evenly over the mixing area.

2. Spread the cement evenly over the fine aggregate and mix these materials by turning them with a shovel until the color is uniform.

3. Spread this mixture out evenly, spread the coarse aggregate on it and mix thoroughly again. All dry materials should be thoroughly mixed before water is added.

A workable mix should be smooth and plastic -- neither so wet that it will run nor so stiff that it will crumble. If the mix is too wet, add small amounts of sand and gravel, in the proper proportion, until the mix is workable. If a concrete mix is too stiff, it will be difficult to place in the forms. If it is not stiff enough, the mix probably does not have enough aggregate, thus making it an uneconomical use of cement.

When work is finished for the day, be sure to rinse concrete from the mixing area and the tools to keep them from rusting and to prevent cement from caking on them. Smooth shiny tools and mixing boat surfaces make mixing surprisingly easier. The tools will also last much longer.

5. Pouring Concrete Into Forms

To make strong concrete structures, it is important to place fresh concrete in the forms correctly.

The wet concrete mix should not be handled roughly when it is being carried and put in the forms. It is very easy, through joggling or throwing, to separate the fine aggregate from the coarse aggregate. Do not let the concrete drop freely for a distance greater than 90 to 120 cm (3 to 4 feet). Concrete is strongest when the various sizes of aggregates and cement paste are well mixed.

Properly proportioned concrete will have to be worked into place in the form. Concrete that would on its own flow out to completely fill in a form would be too wet and therefore weak.

When pouring concrete structures that are over 120 cm high, leave holes in the forms at intervals of less than 120 cm through which concrete can be poured and which can later be covered to permit pouring above that level. Alternatively, a slide could be used through which concrete could flow down to the bottom of the form without separating. Any "U"-shaped trough wide enough to facilitate pouring concrete into it, narrow enough to fit inside the form, and long enough so that the concrete can slide down the chute without separating will work.

As the concrete is being placed it should be compacted so that no air holes, which would leave weak spots in the concrete, are left. This can be done by tamping the concrete with some long thin tools or vibrating the concrete. Tamping can be accomplished with a thin (2 cm) iron rod, a wooden pole or a shovel.

The concrete will be compacted to some extent as it is moved into its final position in the form. However, special attention must be paid to the edges of the pour to make sure that the concrete has completely filled in against the form. If the forms are strong enough they can be struck with a hammer on the outside to vibrate the concrete just enough to allow it to settle completely in against the forms. Too much vibration can force most of the large aggregate toward the bottom of the pour, thus reducing the overall strength of the concrete.

6. Finishing

Once the concrete is poured into the forms, its surface should be worked to an even finish. The smoothness of the finish will depend on what the surface will be used for. Where more concrete or mortar will later be placed on this pour, the area should be left relatively rough to facilitate bonding. Where the surface will later be walked on, as for example the cover of a well on which a pump will be mounted, it should be somewhat rough to prevent people from slipping on the concrete when its surface is wet. This somewhat rough texture can be achieved by finishing with a wooden float or by lightly brushing the surface to give it a texture. A very smooth finish can be made with a metal trowel. Over-finishing (repeated finishing) can lead to powdering and erosion of the surface.

7. Curing Concrete

After the forms are filled, the concrete must be cured until it reaches the required strength. Curing involves keeping the concrete damp so that the chemical reaction that causes the concrete to harden will continue for as long as is necessary to achieve the desired strength. Once the concrete is allowed to dry the chemical hardening action will gradually taper off and cease.

The early stage of curing is extremely critical. Special steps should be taken to keep the concrete wet. Once the concrete dries, it will stop hardening; after this happens it cannot be re-wetted in the field to re-start the hardening process.

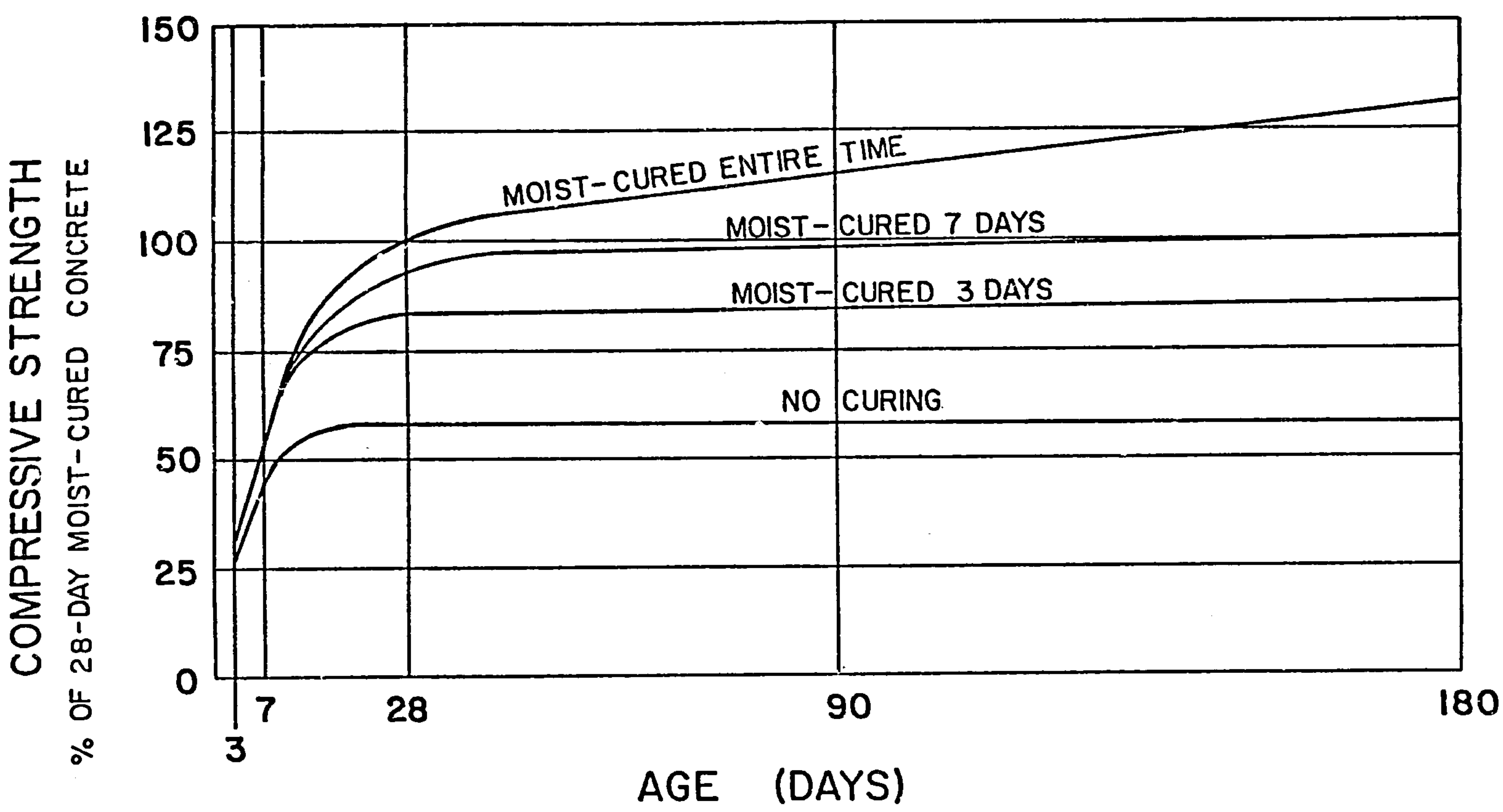
Covering the exposed concrete surfaces is usually easier than continuously sprinkling or frequently dousing the concrete with water which would otherwise be necessary to prevent the concrete surface from becoming dry. Protective covers often used include canvas, empty cement bags, burlap, plastic, palm leaves, straw and wet sand. The covering should also be kept wet so that it will not absorb water from the concrete.

Concrete is strong enough for light loads after 7 days. In most cases, forms can be removed from standing structures like bridges and walls after 4 or 5 days, but if they are left in place they will help to keep the concrete from drying out. Where concrete structures are being cast on the ground, the forms can be removed as soon as the concrete sets enough to hold its own shape (3 to 6 hours) if there is no load on the structure and measures are taken to ensure proper curing.

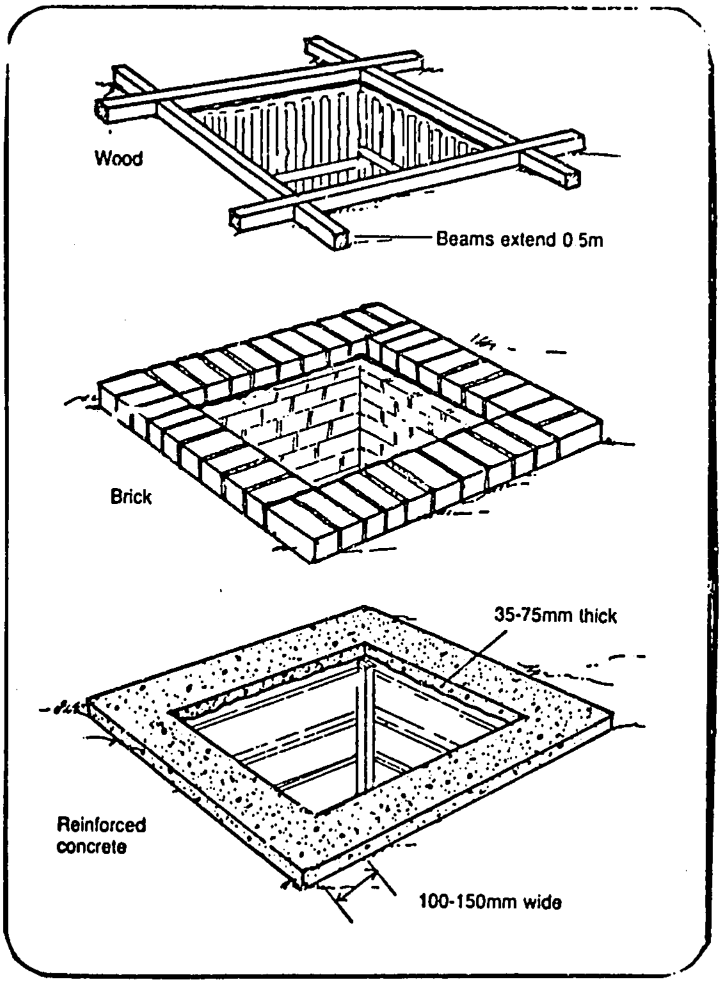
The concrete's final strength will result in part from how long it is moist cured. As can be seen from the Graph 8C-1, concrete will eventually reach about 60% of its design strength if not moist cured at all, 80% if moist cured for 3 days, and almost 100% if moist cured for 7 days. If concrete is kept moist, it will continue to harden indefinitely.

GRAPH 8C-1

Compressive Strength of Concrete



Examples of Latrine Bases



TEAM INSTRUCTIONS FOR CONSTRUCTION OF A CONCRETE BASE

Your team will be:

1) Constructing a wood form for a concrete base.

2) Cutting a shelf.

3) Pouring and placing concrete into the form.

Prepare for this activity by determining in what order you will do specific tasks and who will do what. Be aware of each other's skills and of individual needs to learn specific construction tasks.

The pit is 1 meter square.

1) Measure and draw a line at least 150 mm away from the pit hole parallel to each side of the pit (see Handout 9-3).

2) Dig a shallow shelf around the edge of the pit 75 mm deep out to the line measured above. Make the outer edge as vertical as possible since this will serve as the outer form when pouring the base.

3) Bend a length of reinforcement bar (re-bar) (8 mm) into a square with sides measuring 1.15 m.

4) Cut 2 pieces of 50 x 150 mm or 50 x 200 mm lumber into 1 m lengths. Cut 2 pieces of 50 x 150 mm or 50 x 200 mm lumber into 1.05 m lengths. Nail four pieces together in the shape of a square. Cut 2 poles 2 m long and nail them across the top of the square as seen in Figure 2 below.

5) Place square form over the top of the pit. After the shelf has been dug, the inner form constructed and placed, and the re-bar bent into squares, you are ready to mix the concrete.

6) Mix concrete using the same preparation figures as described for the slab preparation in Session 8.

7) Wet the ground and pour the first layer of concrete on the shelf with a thickness of 20 to 30 mm.

8) Place 8 mm re-bar square in the trench on top of the first concrete layer.

9) Pour the remaining concrete over the re-bar until it is level with the ground surface. To ensure concrete settling properly, periodically vibrate the poured concrete with a stick.

10) Finish and smooth off the top of the base.

11) Cover the poured concrete and let set for 1-1/2 days.

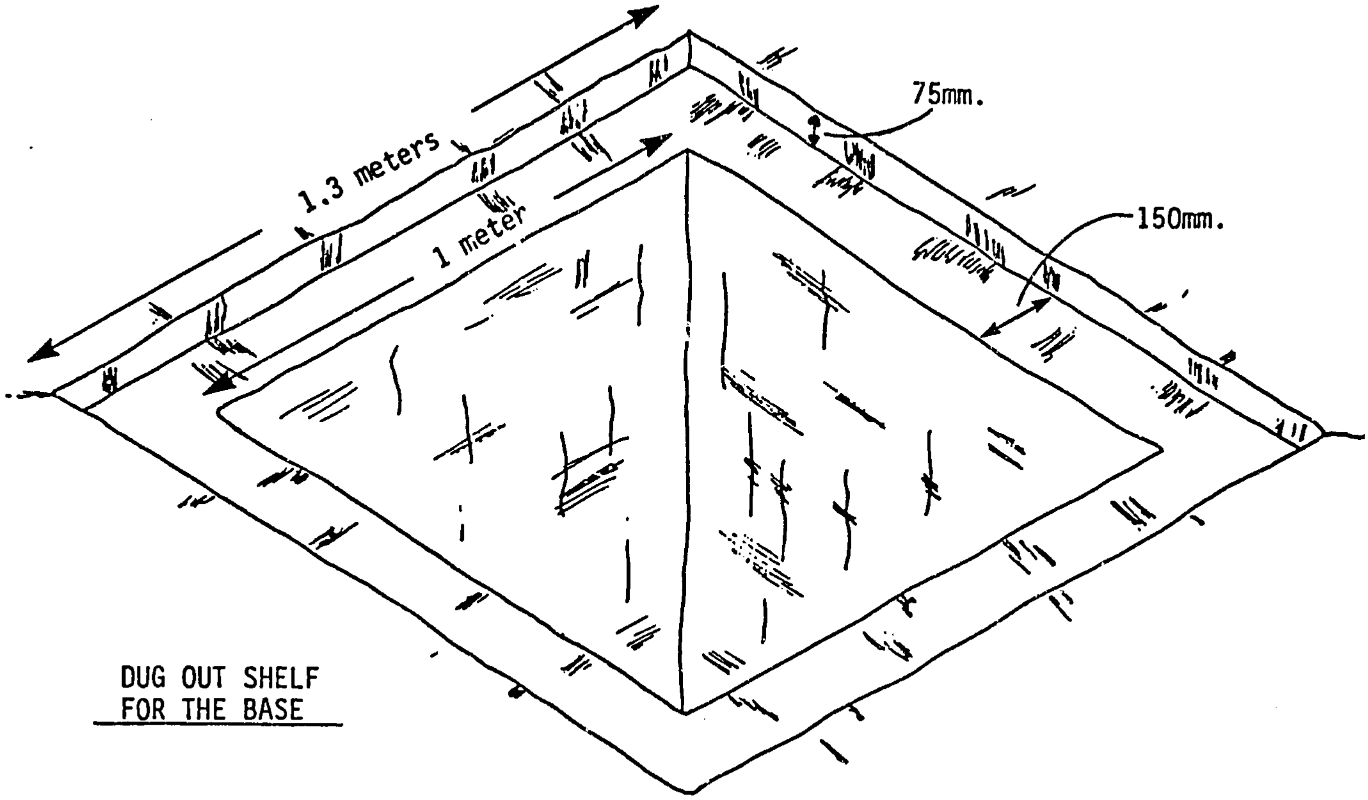
12) Remove inner forms.

<u>MATERIALS NEEDED</u> (Per construction team)

Cement (.013 m^3)
Sand (.026 m^3)
Gravel (.052 m^3)
Wood 50 mm x 150 mm x 45 mm
Nails
Used mctor oil
Wire
2 poles 2 meters long

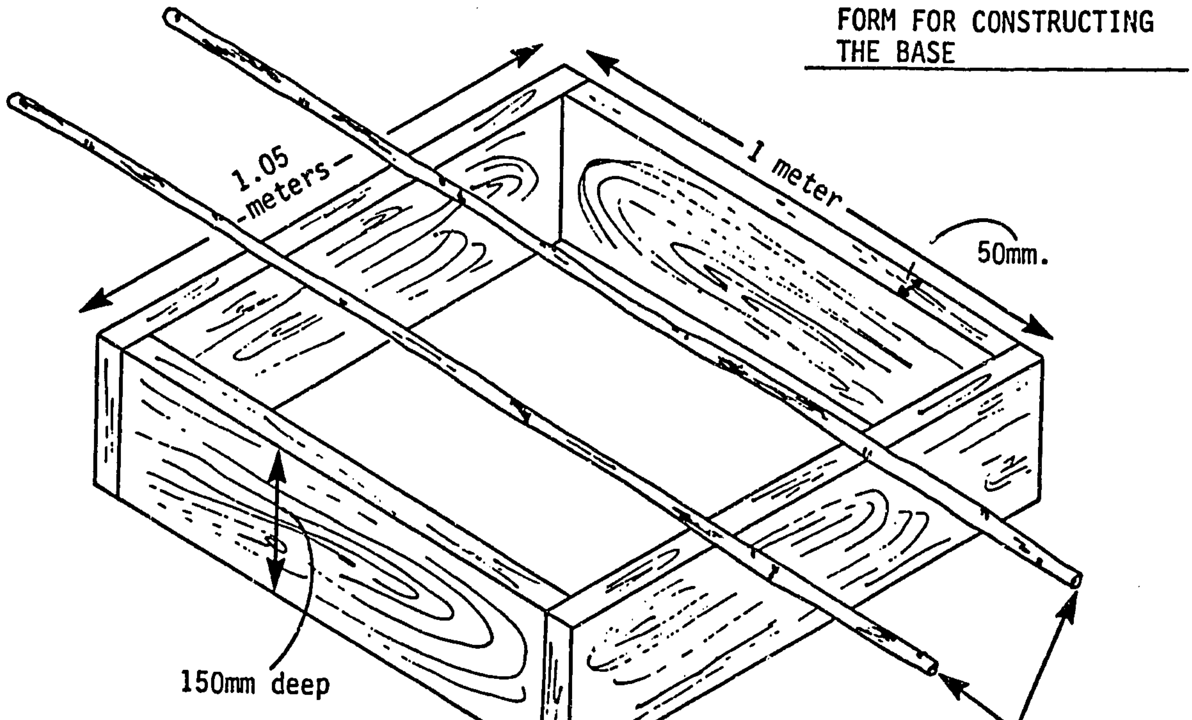
<u>TOOLS NEEDED</u>

Axe or Shovel
Tape measure
Saw
Hammer
Trowel

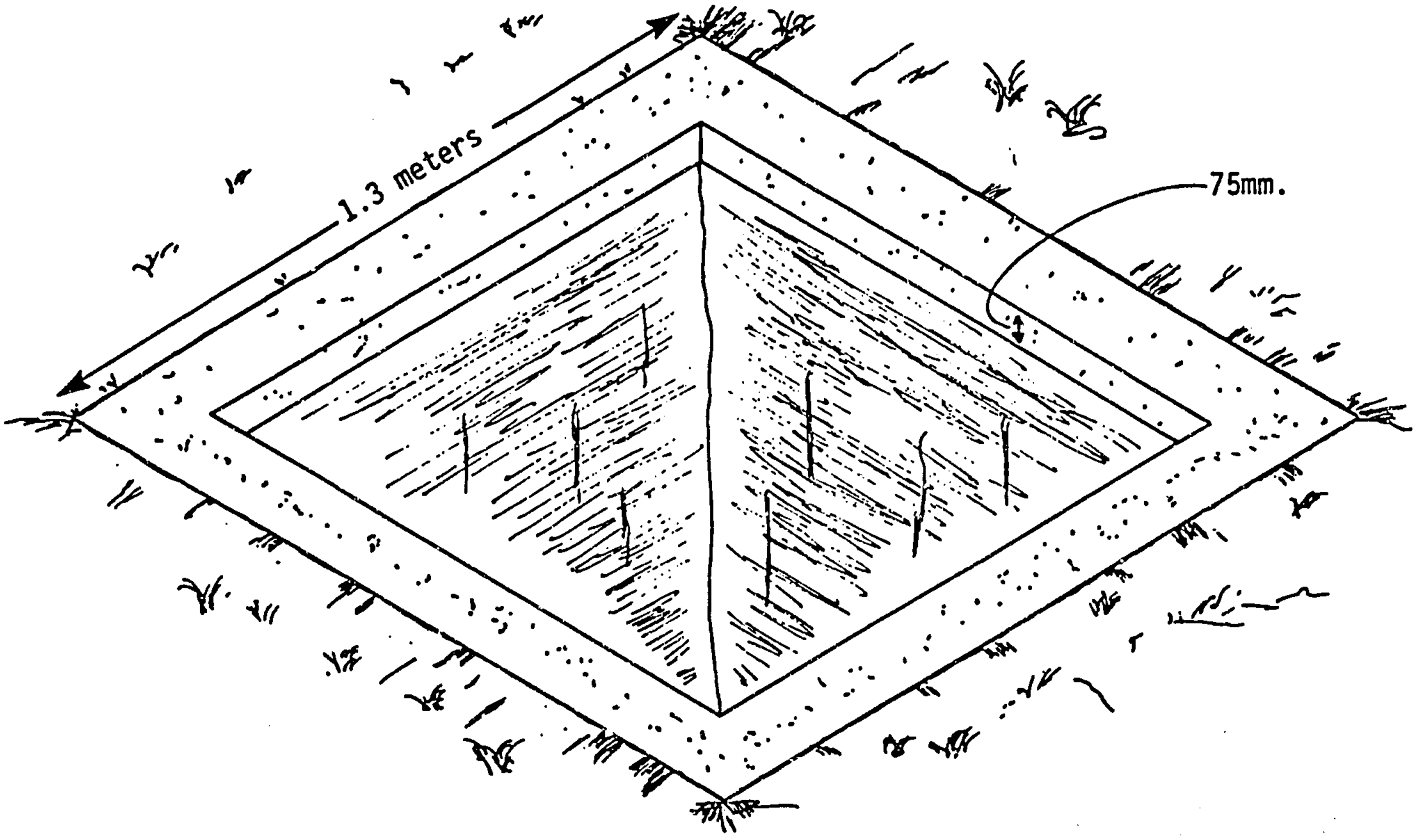


DUG OUT SHELF
FOR THE BASE

FORM FOR CONSTRUCTING
THE BASE



Latrine Base Construction



COMPLETED CONCRETE BASE

INSTRUCTIONS FOR LINING A SQUARE OR RECTANGULAR PIT WITH LOGS, POLES OR BAMBOO

Logs, Poles or Bamboo Lining

1. Check materials and make sure you have sufficient lining materials on site.

2. Cut logs or poles to a length equal to the depth of the pit. Poles should reach from the bottom of the pit to the base. The poles should be treated to protect them against rot and insects.

3. Cut 2 cross poles for each side. They should be equal in length to the width of each side.

4. Place the poles vertically along the side of the pit. They should be spaced 25 to 75 mm apart.

5. Nail or tie the cross poles in place about 0.5 meter from the top and bottom of the pit (Handout 10-3).

6. Nail or fit the lining of each side together at the corner of the pit.

7. Clean up the work site and return the tools.

Materials

Measuring tape
Logs, poles, or bamboo
Hammer and nails or rope and knife
Pencil
Saw, machete or axe
Bailing wire or nylon cord

INSTRUCTIONS FOR LINING A SQUARE PIT WITH CEMENT OR BRICK

Brick or Concrete Block Base

1. Check materials to ensure you have all the necessary materials on site.
2. Discuss the danger of stacking bricks too closely to the latrine (i.e. they might fall on the person working in the pit).
3. Bricks or blocks can be lowered in a bucket attached to a rope. Make sure the rope and bucket can handle the weight of the load.
4. Stack the cement blocks or bricks up the side of the pit to the slab base. Mortar the vertical space between the bricks (Handout 10-3).
5. For additional strength the last two layers of bricks are mortared together.
6. Check the progress of the work daily.

Materials for Cement or Brick Lining

Concrete blocks or brick
Sand
Cement
Trowel
Measuring tape
Shovel
Bucket and rope

PIT LINING

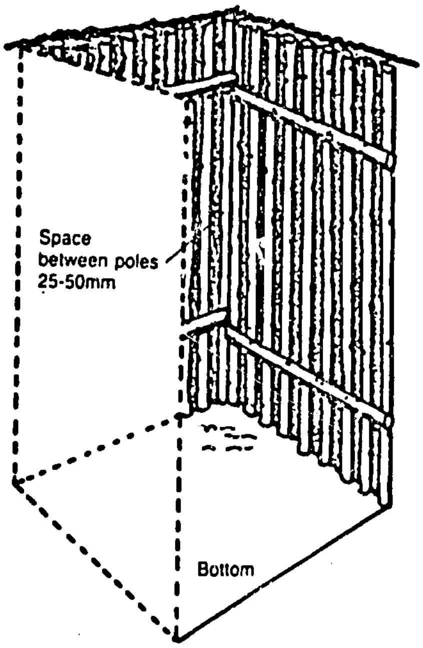


Fig. 1 Log, pole or bamboo pit lining.

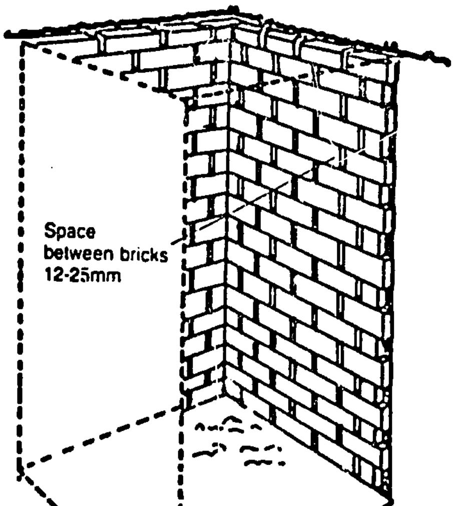


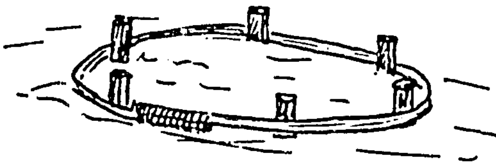
Fig. 2 Brick, stone or concrete block lining.

INSTRUCTIONS FOR LINING A CIRCULAR PIT WITH LOGS, POLES OR BAMBOO

1. Check materials and make sure you have sufficient lining materials at the sites.

2. Cut logs or poles to a length equal to the depth of the pit. Poles should reach from the bottom of the pit to the base. The poles should be treated to protect them against rot and insects.

3. For the circular pit, make three 80 cm diameter reinforcing rings out of green wood or young bamboo trees. Do this by scribing an 80 cm circle on the ground, and driving six wood stakes along the circle to make a form. Wrap the green wood or bamboo around the stakes until they overlap about 30 cm. Tie these together with wire or nylon rope. The green wood or bamboo strips used should be 12-15 mm diameter and 3.5 m long.



Wall Reinforcing Ring Construction

Completed Ring

4. Place the poles vertically along the side of the pit. They should be spaced 25 to 75 mm apart.

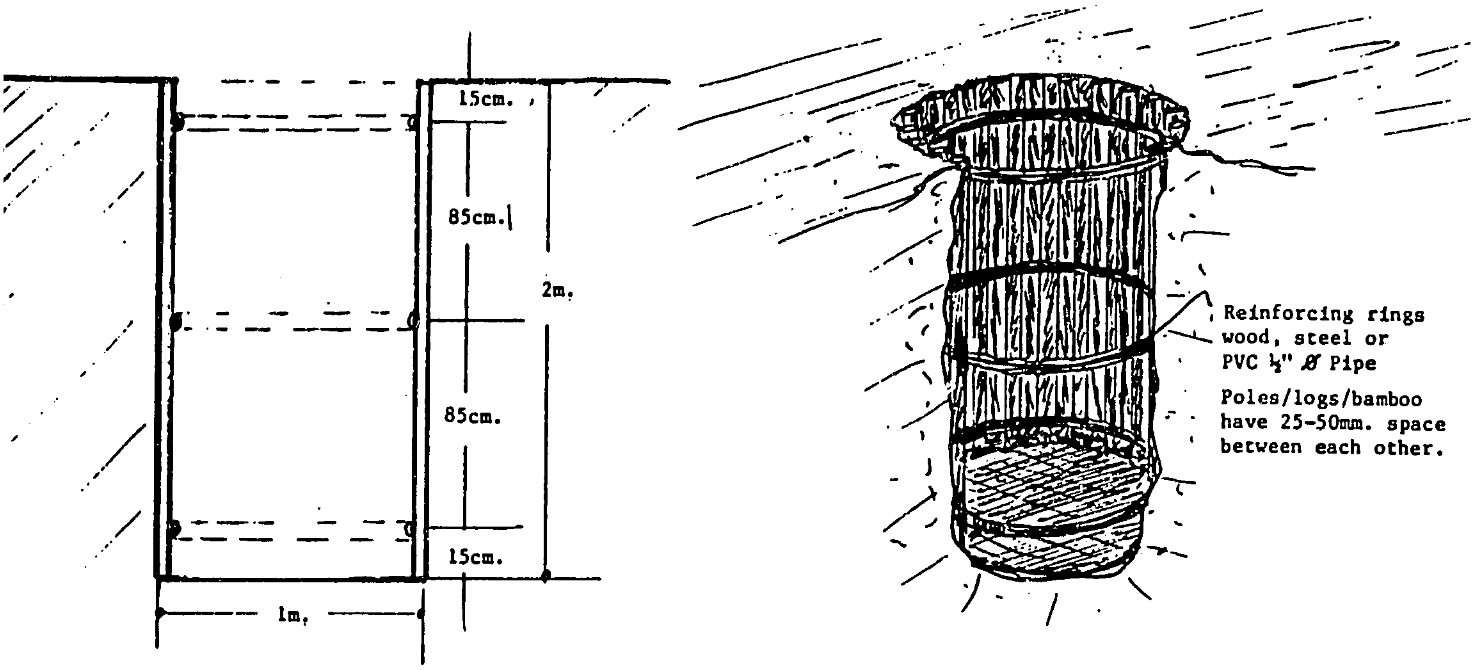
5. Slip the rings into position as shown in Handout 10-5, Figure 1. That is 15 cm from the bottom, halfway up the wall (1 m) and 15 cm from the top of the wall.

6. Nail or bind the rings to several poles around the pit to prevent slipping. (Later normal earth movement and pit filling material will press the lining against the rings and hold them securely in position.)

Materials

Measuring tape
Logs, poles or bamboo
Hammer and nails or rope and knife
Pencil
Saw, machete, or axe
Bailing wire or nylon cord

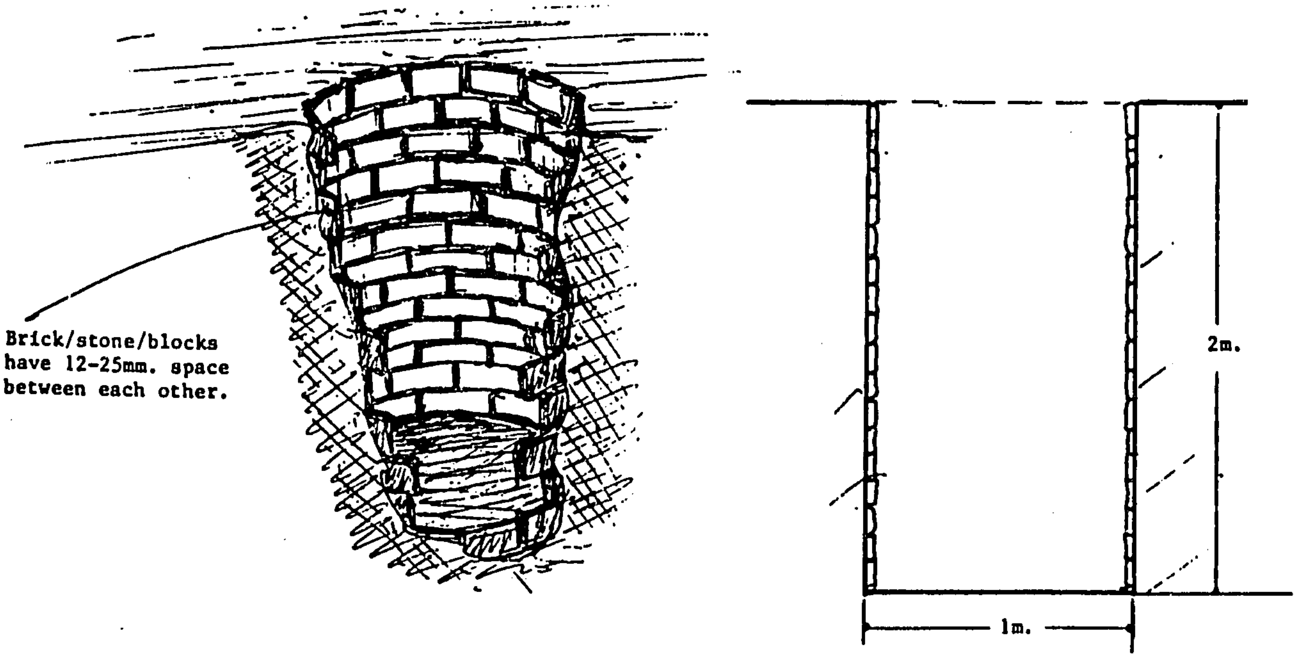
Note: Please refer to Figure 2 of Handout 10-5 as well as Handout 10-2 for developing instructions for lining a circular pit with brick.



Side View with pole and reinforcing rings in position

Cutaway View of Completed Pit

Figure 1. LOG, POLE OR BAMBOO PIT LINING



Cutaway View of Completed Pit

Side View with bricks in position

Figure 2. BRICK, STONE OR CONCRETE BLOCK LINING

TEAM INSTRUCTIONS FOR INSTALLING A SLAB

Your team will remove the slabs from the forms, transport the slabs to the latrine site and mount them on the base. Make sure all materials and tools are at the site. If a vehicle is needed to transport the slab, consult with the trainers.

1. Remove the slabs from the forms. Try not to damage the forms so they can be used another time. Use a hammer to gently tap the form away from the concrete.

2. The slab must then be transported to the construction site. If the distance is short the slab can be transported on two sturdy poles. If a longer distance is involved a push-cart or truck should be used.

3. Remember each slab will weigh more than 150 kilograms. Do not drop the slabs and be sure to tie them down or cushion them if they are transported by truck. You will need to determine the most appropriate way to transport the slab.

4. Before placing the slab on the base, cover the top of the base with 1-2 inches of mud or clay soil to provide a seal between the two parts. The mud should be damp and plastic, but not wet. Place the mud in the base so that it is level.

5. If the pit lining has not yet been completed it must first be completed before mounting the slab.

6. Gently place the slab on the base.

7. If the slab is not level the base must be readjusted. Small rocks can be used to support the slab at a level position and to fill in any empty spaces between the base and the slab.

8. Walk on the edges of the slab to set it down in the mud. Use extra mud to seal the edges all around.

9. Mix a small amount of concrete and pour for the foot-rests. Make sure to cure for three days.

Materials and Tools

Sand
Cement
Small stones
Clay soil or mud
Transport vehicle if needed
Trowel
Bucket
Hammer
Foot-rest forms
Used motor oil

Water for the World

Operating and Maintaining Privies

Technical Note No. SAN. 1.0.1

A privy consists of a pit to hold excreta, a slab with a squatting hole or a seat and pedestal, and a shelter to give the user privacy. There is little operation of a privy except for using it. Maintaining a privy involves cleaning the slab weekly, repairing the privy as needed, and eventually filling the pit with soil and moving the slab and shelter to a new pit.

Routine maintenance of a privy is important, because a poorly maintained privy can become unsightly, smelly, unsanitary, and a breeding place for flies. This technical note describes how to operate and maintain a privy.

Useful Definition

EXCRETA - Human body wastes.

Materials Needed

For operating a privy: lid; anal cleansing materials; and bucket of water for a pour-flush privy.

For cleaning a privy: brush; mop or palm fronds, bucket, and soapy water; or ashes and whisk broom.

For repairing a privy: shovel; the same tools and materials needed to construct the privy shelter and slab, that is, hammer, saw, nails, boards, fly-proof screen, bamboo, wire, bricks, and mortar.

For moving a privy: shovels; cart and draft animals for moving the slab; tools for disassembling the shelter.

Operating a Privy

Be certain the privy has a lid over the squatting hole or the seat and pedestal, anal cleansing materials, and a box or jar of ashes or dry soil. After each use of the privy, use a small can or coconut shell to sprinkle ashes or soil through the hole. This will help eliminate odors and prevent fly-breeding. See Figure 1. If it is a pour-flush toilet, water must be readily available. The easiest way to take care of this is to keep a bucket in the shelter. Users should be taught to pour enough water into the pour-flush bowl after each use to flush the contents of the bowl into the pit and to replace the water seal. The lid should be put back on after every use to keep flies and odors out of the shelter and the shelter door, if there is one, should be kept closed at all times. Re-supply the privy with anal cleansing materials and water as needed.

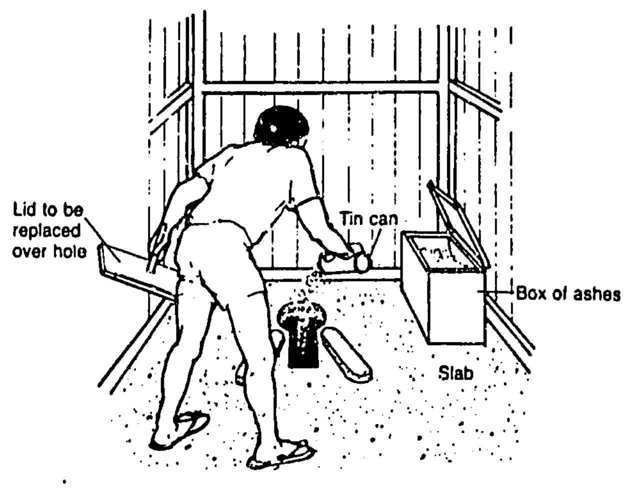


Figure 1. Sprinkling Ashes After Using Privy

Figure 2. Cleaning Privy Slab

Cleaning a Privy

Clean the privy slab at least once a week. Keep a brush in the shelter to clean the squatting hole or seat. Wash the slab with a mop or palm fronds and soapy water, if it is available, as shown in Figure 2. If water and a mop are unavailable or unacceptable, sprinkle ashes on the slab to absorb moisture and excreta. Then brush or sweep the dirty ashes into the hole.

Repairing a Privy

Inspect the privy slab, the shelter, and the grounds around the privy at least once a month. Examine the slab for cracks, excessive wear, or other damage. Repair minor damage at once with the same materials used to construct the slab. If there appears to be major damage, consult the project designer or the person who supervised construction before attempting repairs.

Examine the lid. If it no longer completely covers the hole due to damage or excessive wear, repair it or replace it with a new one.

Examine the inside and outside of the shelter, including the walls, roof, door and hinges, vent pipe, fly-proof screens, and so on. Check for damage or excessive wear. Repair minor damage at once with the same materials used for construction as shown in Figure 3.

Look for signs of termites getting into the shelter where it touches the ground. If termites are found, they must be killed or they will eat any parts of the wooden shelter they can reach. If there are not many termites, large amounts of boiling water may be effective in killing them. Scrape away the tops of the tunnels they have made

Figure 3. Privy Maintenance

in the wood and pour the water along the tunnels. If the termite infestation is large and they have burrowed deep into the wood, a chemical will be needed to kill them. Termites are very sensitive to drying, so if their tunnels are exposed to the air during a dry period, they may be killed. This method is of no use in hot, rainy weather.

Examine the ground around the privy for erosion caused by surface water or holes caused by animals digging. Fill in holes with soil. If necessary, dig shallow trenches or build small dams to divert surface water away from the privy site.

Moving a Privy

When the contents of the pit reach 0.5-1.0m below the privy slab, begin preparations for a new pit or another excreta disposal method. The site, size, and dimensions of the new pit should be determined by the project designer (see "Designing Pits for Privies," SAN.1.D.2).

When the contents of the pit are within 0.5m of the privy slab, the pit must be abandoned. Remove the slab and the shelter. Fill in the pit with soil and mound about 0.6m to allow for settling as shown in Figure 4. After a few weeks plant vegetation over the pit site.

Depending on the condition they are in, the slab and shelter may be used for the new privy. Four to six people can load the slab on a cart and haul it to the new pit. Or, place round poles under the slab to act as rollers and drag it to the new site if it is nearby. Take the shelter down and reassemble it over the new pit and slab. If this is not possible, use salvageable parts of the old shelter to construct or repair the new shelter.

The cleaning and maintenance of a privy may be done by the privy users or by a designated worker who may care for several privies. Keep a maintenance record similar to Table 1 showing dates, locations of privies, and tasks.

Figure 4. Moving Privy to New Location

Table 1. Sample Maintenance Record for Privies

Date	Location	Task
4 May '82	School	Cleaned three privies. Inspected. Okay.
5 May '82	Mendoza house	Cleaned privy. Inspected privy and grounds. Repaired screens.
5 May '82	N'Kruma house	Privy cleaned by family. Inspected privy. Okay.
7 May '82	Nixon house	Cleaned privy. Inspected privy and grounds. Filled in hole near privy. Repaired lid and door.
9 May '82	Al Hafar house	Cleaned privy. Inspected privy. Okay. Contents of pit about 1.0m from slab. Notified project designer.
11 May '82	School	Cleaned three privies.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

1982

Water for the World

Constructing Privy Shelters
Technical Note No. SAN. 1.C.3

A privy shelter is a screen or structure that gives the person using the privy privacy. Depending on the design, a shelter can protect the user from the weather and keep out flies, rats, scavenging dogs, and other pests. Constructing a privy shelter involves assembling necessary labor, materials, and tools; building the shelter to the dimensions specified by the project designer; and building any special features.

A properly constructed shelter can last 5-10 years or more. This technical note describes each step in building a shelter. Read the entire technical note before beginning construction.

Materials Needed

The project designer must provide three papers before construction can begin:

1. A plan view of the shelter similar to one or more of Figures 1-4, and 8a and 8b, showing the correct dimensions of the shelter.

2. A detailed view of any special features similar to one or more of Figures 5-7.

3. A detailed materials list similar to Table 1, showing all necessary labor, supplies and tools.

After the project designer has given you these documents and you have read this technical note carefully, begin assembling the necessary laborers, supplies and tools.

Construction Steps

Depending on local conditions, availability of materials, and skills of workers, some construction steps will require only a few hours, while others may take a day or more. Table 2 shows a sample work plan for building a privy shelter including time estimates for each step. Draw up a similar work plan with rough time estimates based on local conditions. You will then have an idea of when specific workmen, supplies, and tools must be available during the construction process.

For a simple screen shelter:

1. Assemble all laborers, supplies, tools, and drawings needed to begin construction. Study all drawings carefully.

2. Cut corner posts or uprights to the correct lengths.

3. Set corner posts or uprights firmly in the ground in a vertical position around the privy slab to a depth of 0.3-0.6m as shown in Figure 9a. Thoroughly tamp the ground after the posts are in place.

4. Build or weave together the screening material and secure it to the corner posts with vine, wire, or equivalent. Begin at the end corner post and work your way around the screen. The screen should touch the ground and be as high as the tops of the corner posts as shown in Figure 9b.

For a bamboo shelter with roof or roof and door:

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Build a foundation around the privy slab from bamboo poles 50-100mm in diameter. Notch the ends of the poles, fit them together, and tie them with wire or vine, as shown in Figure 10a.

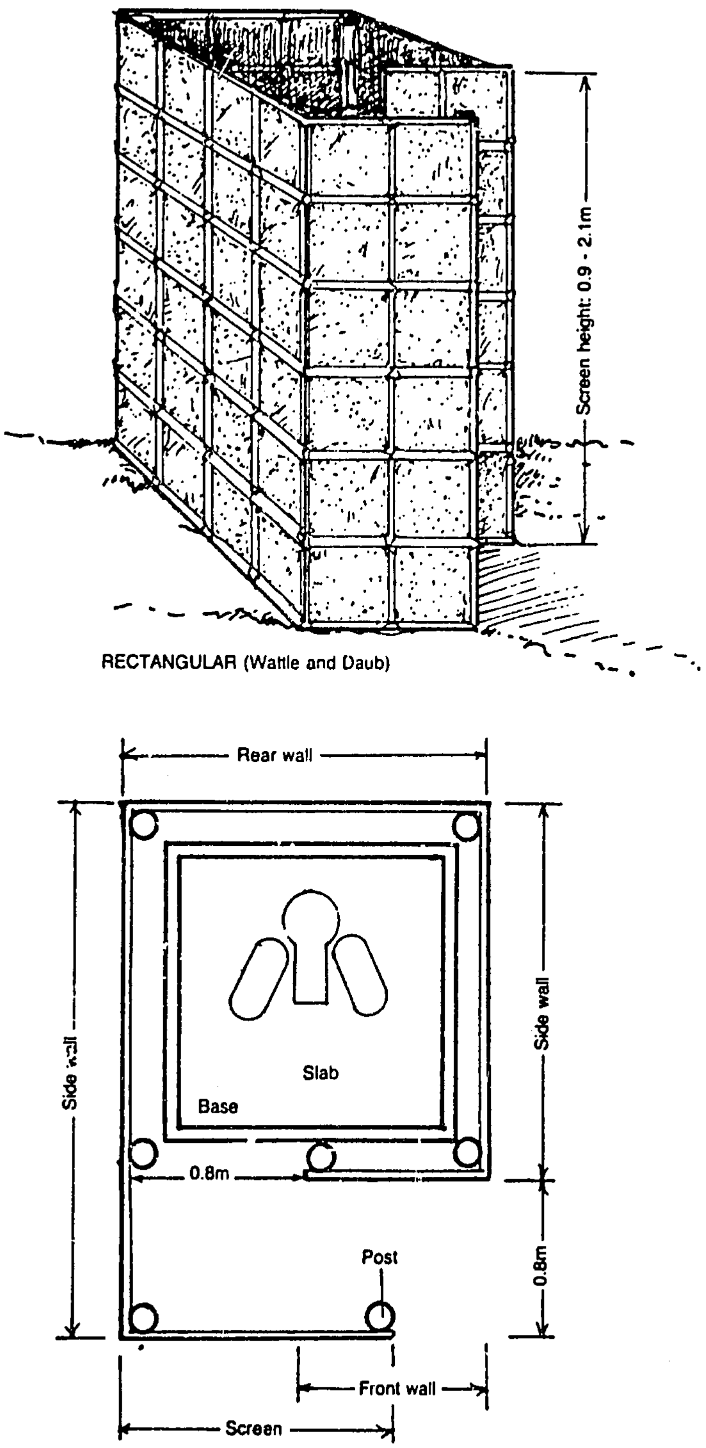


Figure 1. Simple Screen Shelters

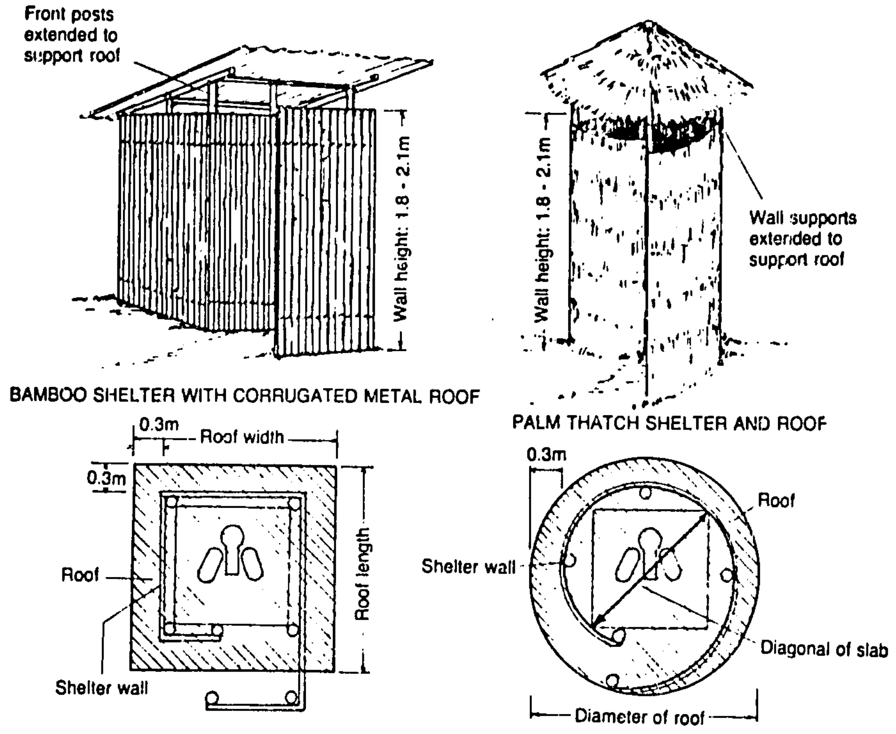


Figure 2. Privy Shelters with Roof

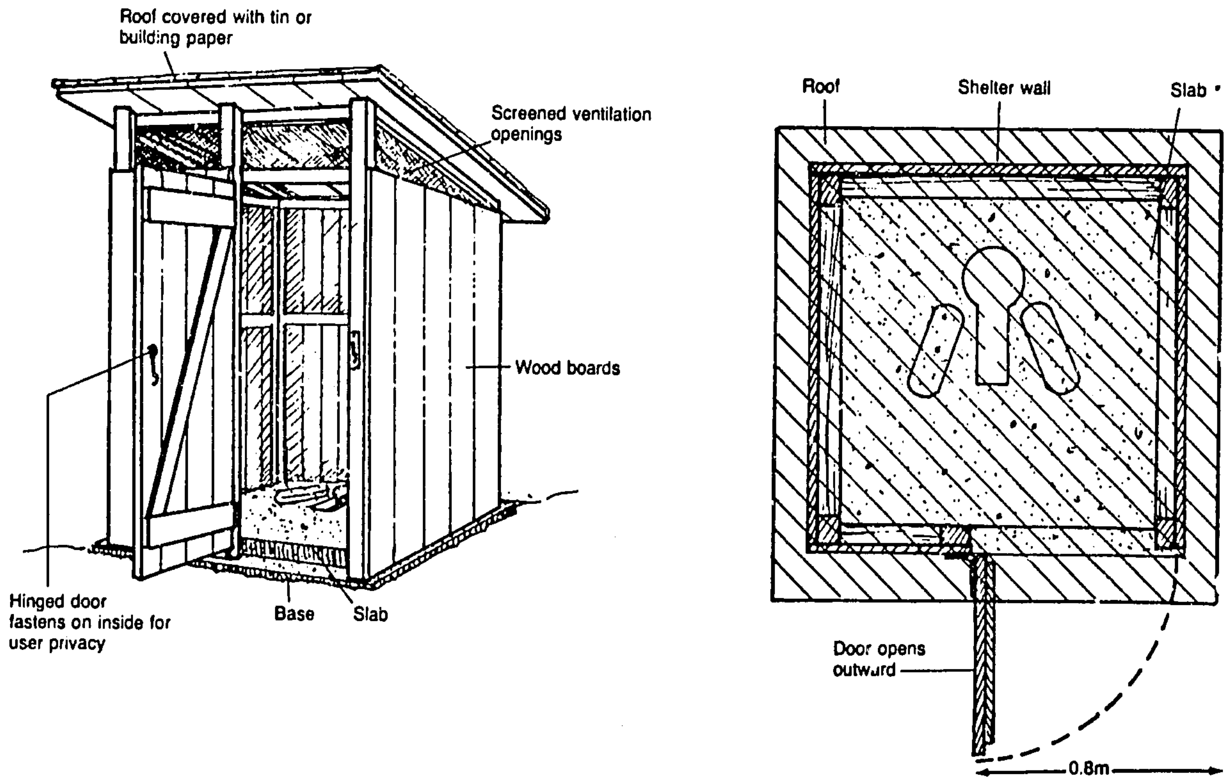


Figure 3. Fly-Proof with Screening and Door

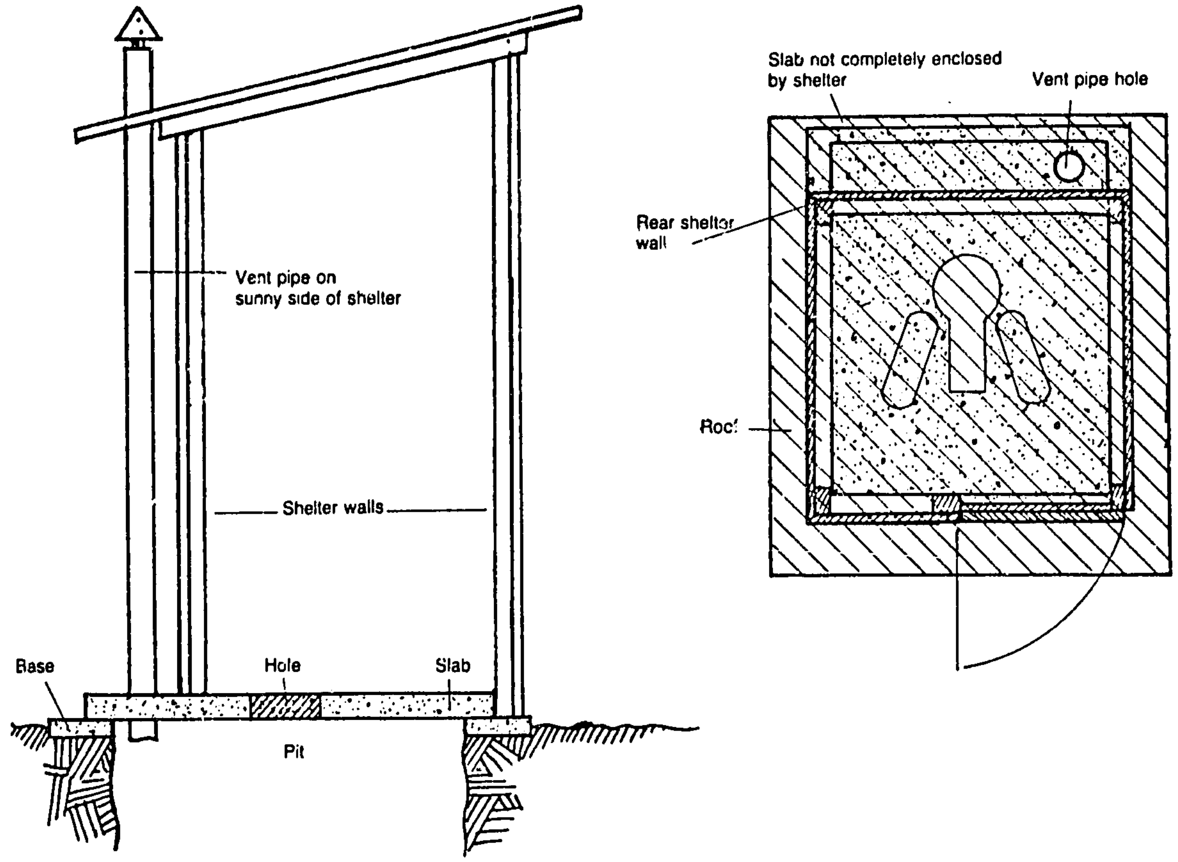


Figure 4. Shelter for Ventilated Privy

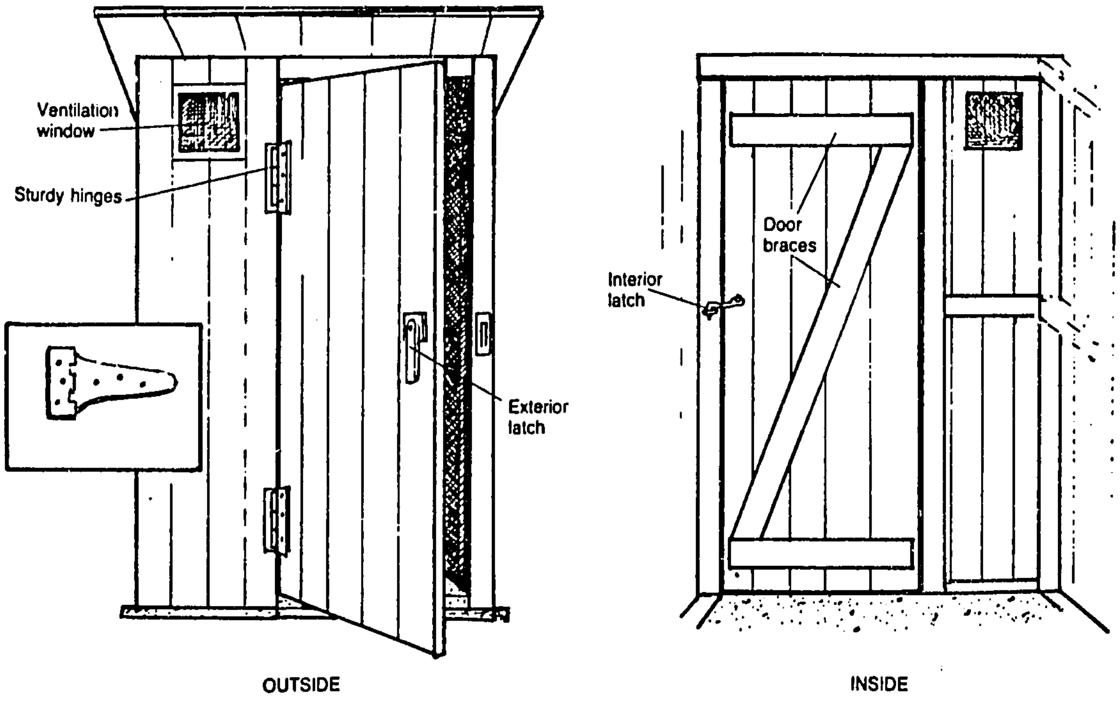


Figure 5. Detail of Door for Fly-Proof Shelter

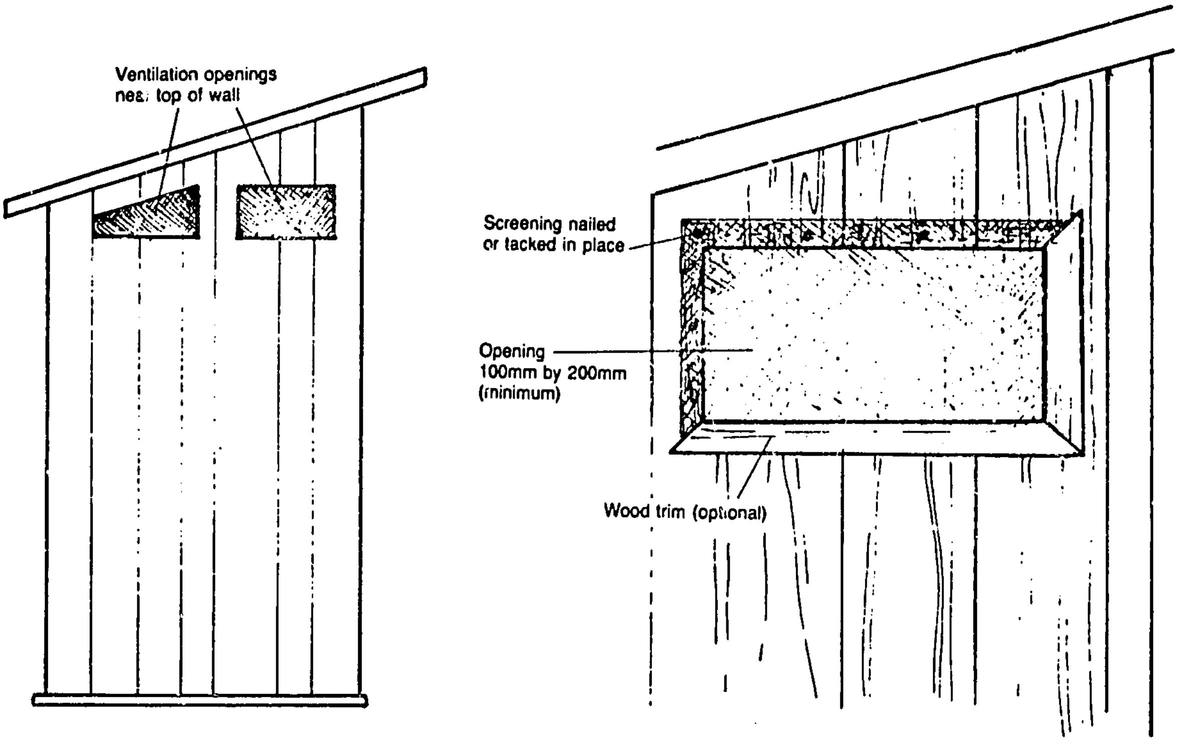


Figure 6. Fly-Proof Screening Covering Ventilation Openings

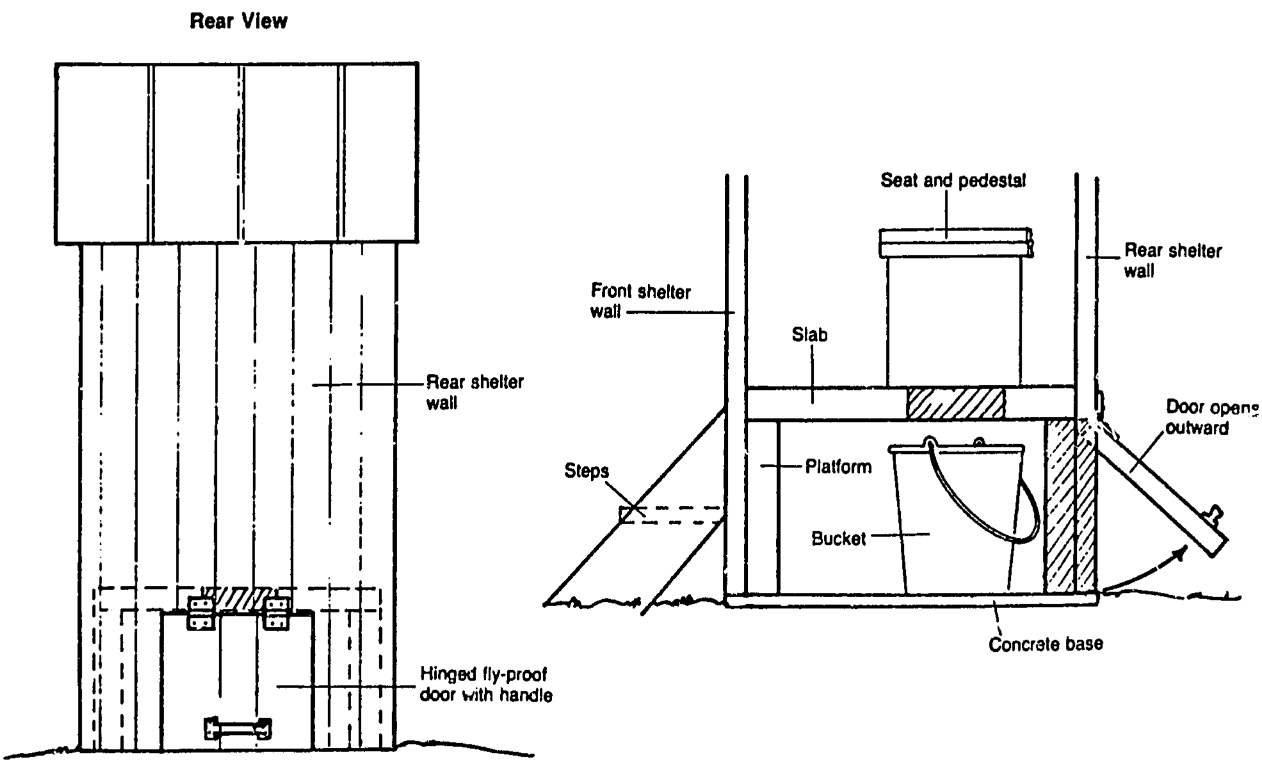


Figure 7. Detail of Shelter for Bucket Latrine

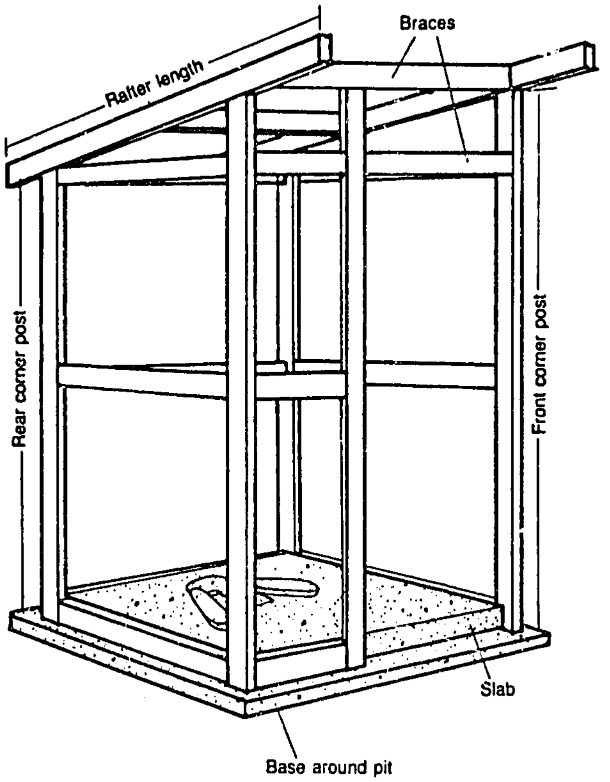


Figure 8a. Typical Shelter Framework Using Lumber

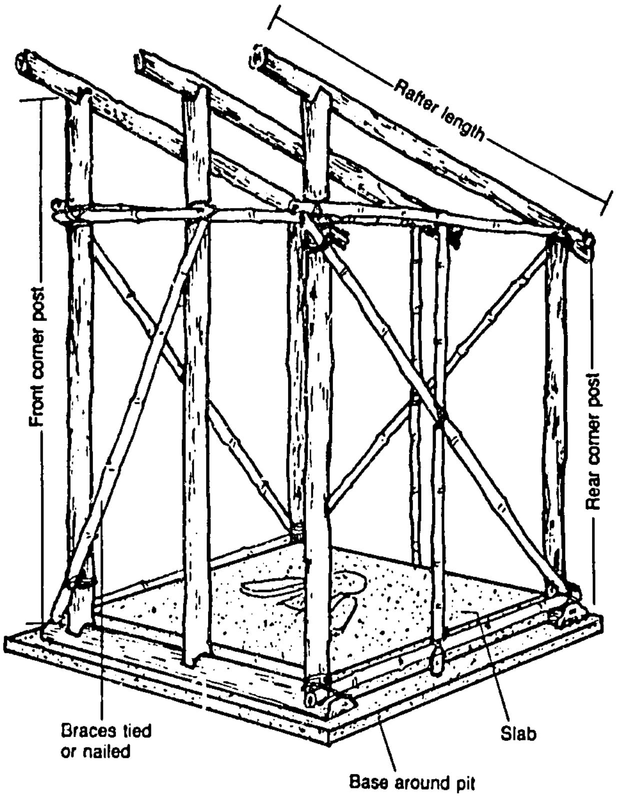


Figure 8b. Typical Shelter Framework Using Logs, Poles or Bamboo

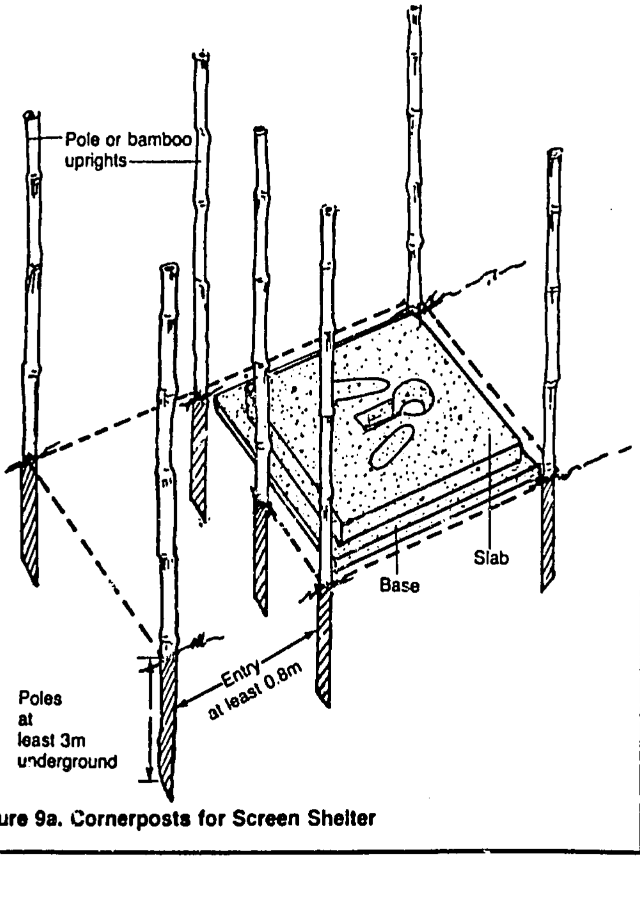


Figure 9a. Cornerposts for Screen Shelter

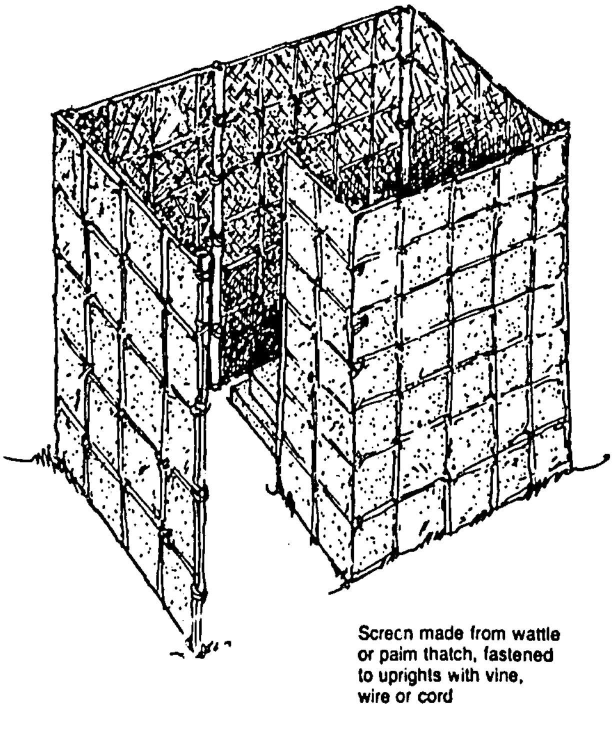
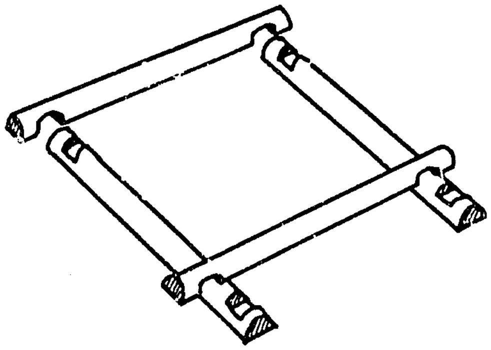
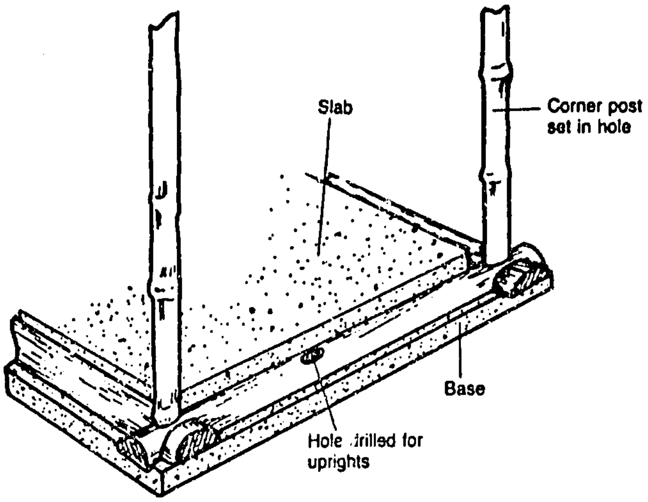


Figure 9b. Completed Screen Shelter



a. Poles notched to fit together



b. Poles on concrete base

Figure 10. Foundation for Bamboo Shelter

Table 1. Sample Materials List for Privy Shelter

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	______
	Laborer (carpentry skills)	1	______
Supplies	Foundation: logs, 1.5m long, 100mm diam.	4	______
	Corner posts: wood beams, 1.8m long, 50mm diam.	4	______
	Walls: wood boards, various lengths, 25mm thick	$13.2m^2$	______
	Roof: Corrugated metal	$4.2m^2$	______
	Screens flyproof for ventilation openings, 150 x 250mm	12	______
	Metal hinges	2	______
	Latch	1	______
	Nails	______	______
	Other	______	______
Tools	Measuring tape	1	______
	Hammer	1	______
	Saw	1	______
	Carpenter's level or equivalent (not essential but very useful)	1	______
	Carpenter's square or equivalent (not essential but very useful)	1	______
	Other	______	______

Total Cost = ______

Do Not Use The Quantities in the Sample - Calculate your Own

Table 2. Sample Work Plan for Building a Wood Privy with a Door

Time Estimate	Day	Task	Personnel	Tools and Materials
1 hour	1	Build foundation	Foreman; laborer with some carpentry skills	2 hammers; saw; nails; measuring tape (these will be needed throughout construction); 4 wood beams, 100mm by 100mm
1½ hours	1	Erect corner posts, uprights, and crossbraces	"	8 boards, 50mm by 100mm; 10 boards, 50mm by 50mm
½ hour	1	Build rafters	"	2 boards, 50mm by 100mm
3 hours	1	Build walls	"	14 square meters of boards, 25mm by 150mm
2 hours	2	Build roof	"	4 boards, 50mm by 50mm; 5 square meters of tin sheets; tin snips
1 hour	2	Build door and attach hinges and latch	"	1.7 square meters of boards, 25mm by 150mm; 3 boards, 25mm by 100mm; 2 metal hinges; screws and screwdriver; eyelet-and-hook latch
½ hour	2	Pick up scrap lumber, nails, and other leftover material	"	

3. Drill or cut holes in the foundation for the corner posts and uprights. Erect the posts, making sure they are vertical, and secure them to the foundation with wire or vine. Leave at least 0.8m space for the entryway or doorway. See Figure 10b. For a shelter with a door, the corner post and upright on each side of the doorway serve as the door frame.

4. Secure the crosspoles to the corner posts with wire or vine. The top crosspoles should be placed at the designed height of the walls. If the roof is raised for ventilation, the top crosspoles will be 100-150mm below the tops of the corner posts. For a shelter with a door, one crosspole will define the top of the doorway, which should be at least 2.0m high.

5. Secure the rafters to the corner posts with wire or vine. Rafters should extend about 0.3m beyond the front and rear walls.

6. Begin the screening wall, if there is one, by erecting two uprights as shown in Figure 11a. Bury the ends at least 0.3m in the ground and thoroughly tamp. Secure the crosspoles to the uprights.

7. Build the shelter walls and screening wall with bamboo, as shown in Figure 11b. Secure the bamboo to the crosspoles and uprights with wire or vine.

8. Build the roof with bamboo strips and palm thatch, as shown in Figure 11b. Start at the lower edge of the roof and work toward the higher edge, overlapping the thatch or palm leaves. The roof should extend about 0.3m beyond all walls.

9. Build a door, if there is one, with bamboo as shown in Figure 12. Attach the hinges, fasten the door to the door frame, and attach a latch, as described in the section on building special features.

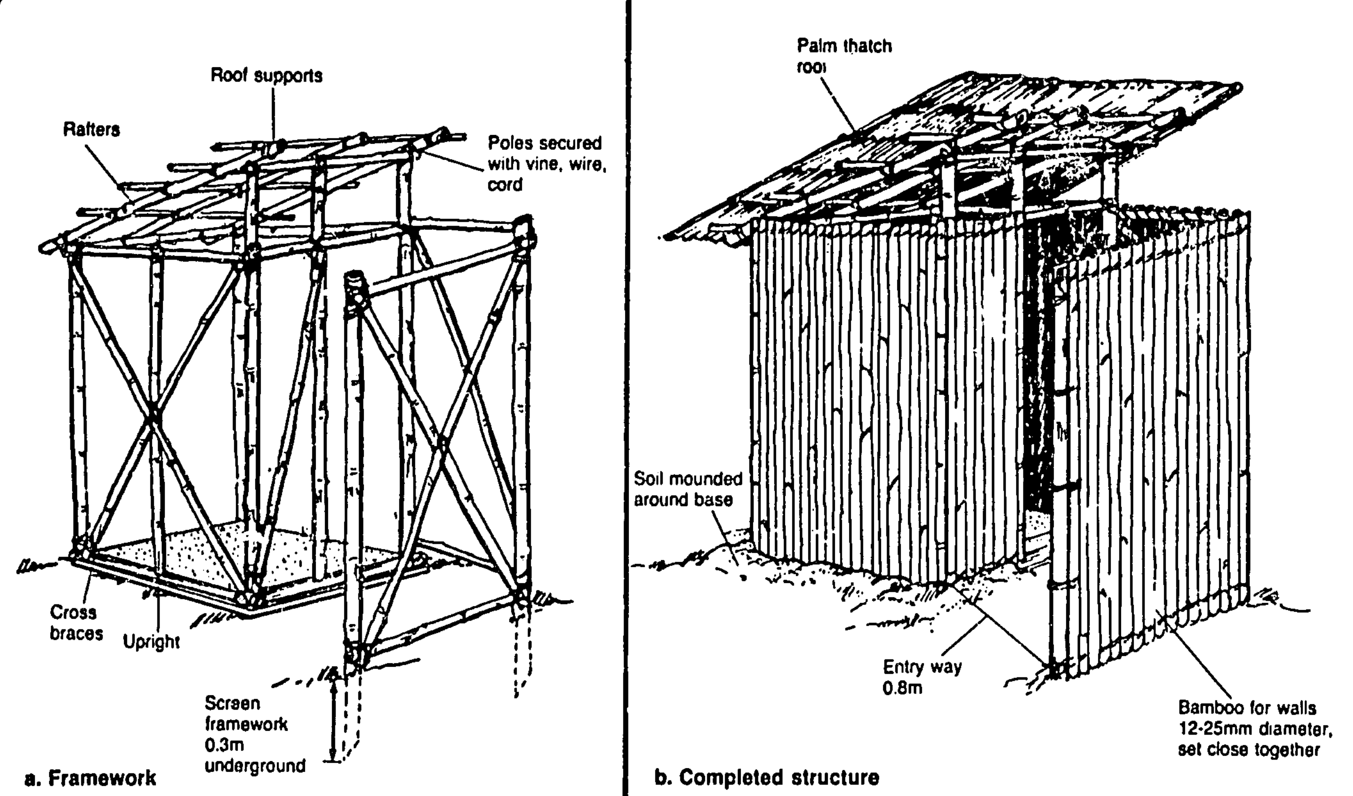


Figure 11. Construction of Bamboo Shelter with Screen and Roof

10. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screens, as described in the section on building special features.

11. Mound soil around the bottom of the walls to help keep out pests.

For a wood shelter with a roof or roof and door:

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Build a foundation around the privy slab from wood beams 50-100mm in diameter as shown in Figures 13a and 13b.

3. Erect the corner posts and uprights, making sure they are vertical, and nail them securely to the

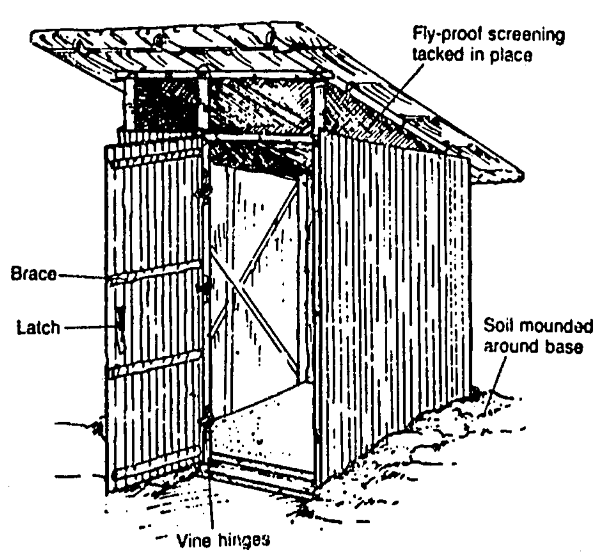


Figure 12. Bamboo Shelter with Door

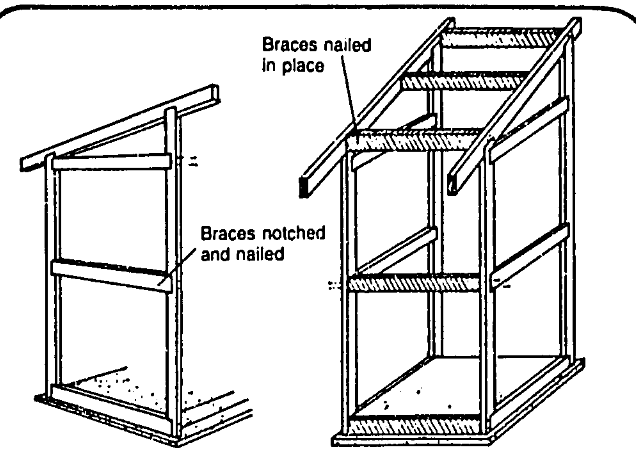
foundation. Leave at least 0.8m space for the entryway or doorway, as shown in Figure 14. For a shelter with a door, the corner post and upright on each side of the doorway serve as the door frame.

4. Nail crossbraces to the inside edges of the corner posts and uprights. The top crossbrace should be at the designed height of the walls. If the roof is to be raised for ventilation, the top crossbraces will be 100-150mm below the tops of the corner posts. For a shelter with a door, one crossbrace will define the top of the doorway, which should be at least 2.0m high.

5. Nail the rafters on top of the cornerposts. The rafters should extend about 0.3m beyond the shelter walls.

6. Begin the screening wall, if there is one, by erecting two uprights as shown in Figure 14. Bury the ends 0.3-0.6m in the ground and thoroughly tamp. Nail crossbraces to the inside edges of the uprights.

7. Build the walls and screening wall by nailing boards to the outside edges of the corner posts and uprights, as shown in Figure 15.



a. Side wall and rafter showing position of base   b. Joining two side walls with braces (rear view)

Figure 13. Framework for Wooden Shelter

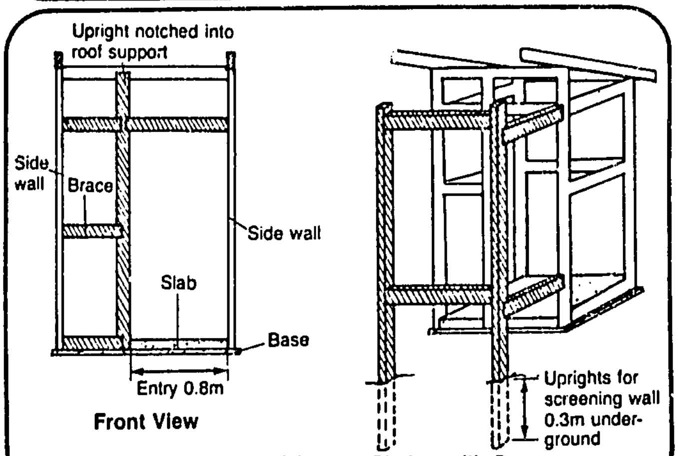
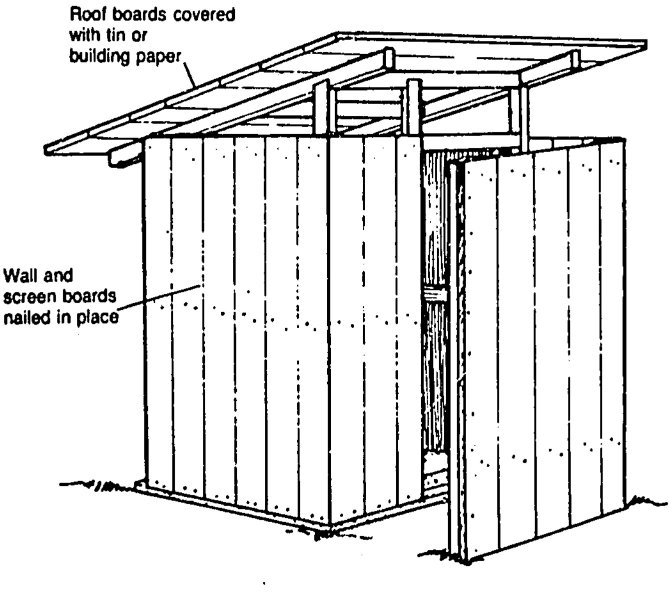
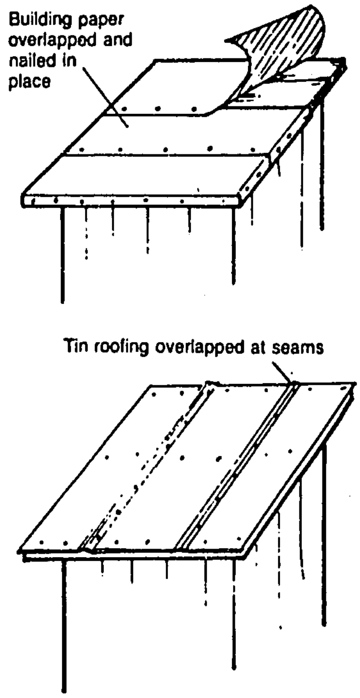


Figure 14. Framework for Wooden Shelter with Screen





Roof detail

Figure 15. Completed Shelter

8. Build the roof by nailing crosspieces to the rafters, then nailing tin sheets to the crosspieces. Start from the lower edge of the roof and work toward the higher edge, overlapping the tin sheets as shown in Figure 15. The roof should extend about 0.3m beyond all walls.

9. Build a door, if there is one, with wood boards as shown in Figures 3 and 5. Attach the hinges, fasten the door to the door frame, and put on a latch as described in the section on building special features.

10. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screens as described in the section on building special features.

For a brick and mortar shelter with a roof or roof and door:

Since brick and mortar shelters should stand for more than 10 years, they are recommended for use with offset pit privies or compost toilets, which generally last that long. Because of the weight of brick and mortar shelters, they are not recommended for use with ventilated pit privies in which the back wall of the privy rests on the privy slab.

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

2. Mortar a row of bricks to the base of the pit, mortaring the inside edge of the bricks to the privy slab.

3. Mortar a second row of bricks overlapping the first row as shown in Figure 16. Leave at least 0.8m space for the entry.

4. For a shelter with a door, build the door frame with wood beams 50mm thick by 100mm wide, and set it in place with a temporary brace as shown in Figure 17. Fasten L-shaped metal strips to each side of the door frame

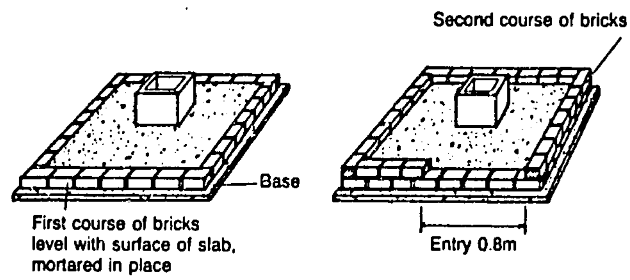


Figure 16. Foundation for Brick Shelter

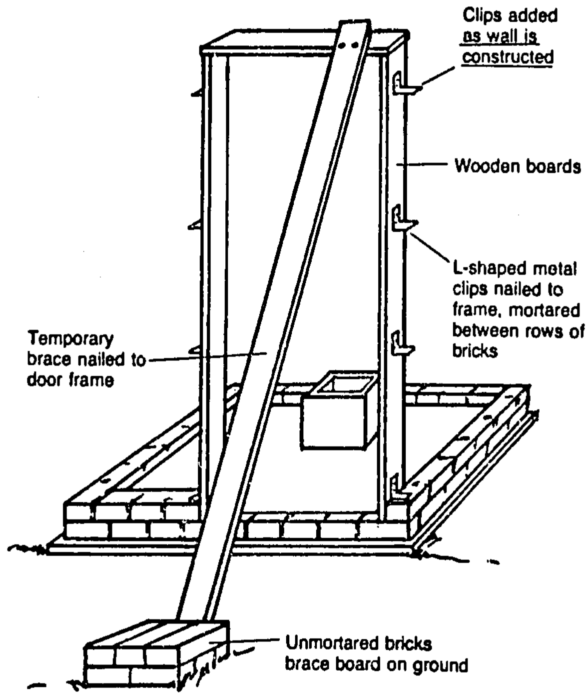


Figure 17. Framework for Entry or Door

with nails or screws. The horizontal part of the strip will be mortared between the rows of bricks to hold the frame in place. Attach a second pair of L-shaped strips when the walls reach about half their height, and a third pair when the walls reach nearly the total height.

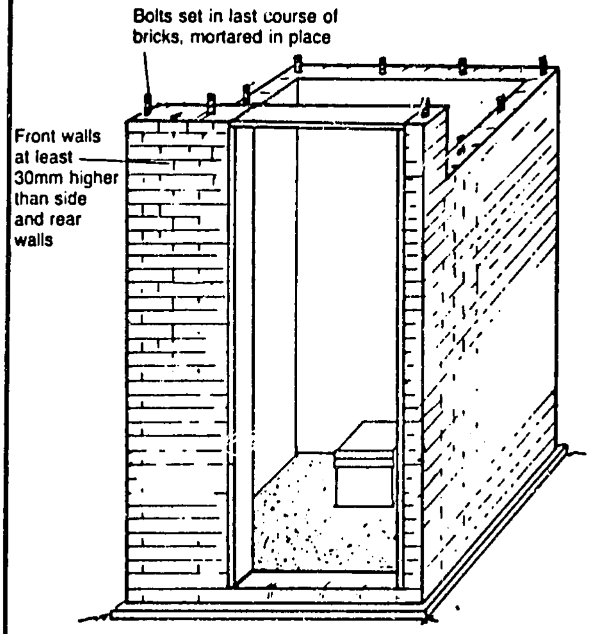


Figure 18. Constructing Brick Shelter

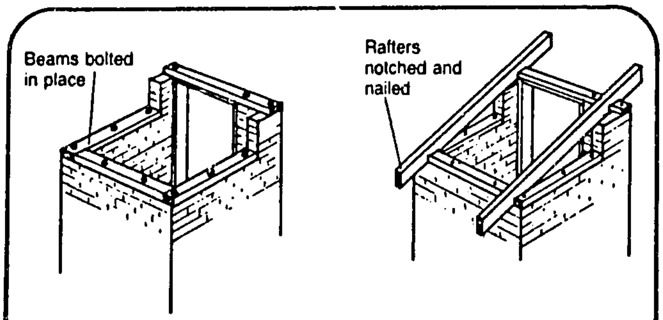


Figure 19. Roof for Brick Shelter

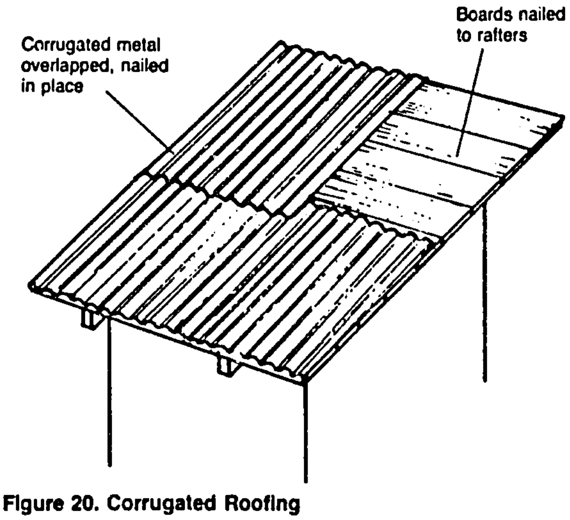


Figure 20. Corrugated Roofing

5. Continue laying rows of bricks up to the design height of the walls, being careful to keep the walls vertical.

6. Place bolts about 12mm diameter by at least 100mm long in the top bricks near the corners of each wall as shown in Figure 18. Mortar the bolts in place with the threaded ends up.

7. Allow a day or two for the mortar to set. Remove the temporary brace.

8. Drill or burn holes in wood beams 50mm thick by 100mm wide, matching the size and location of the holes to the bolts sticking up from the bricks. Set these top beams in place and fasten them to the bolts securely using nuts as shown in Figure 19.

9. Nail the rafters to the top beams. The rafters should extend about 0.3m beyond the walls as shown in Figure 19.

10. Build the roof by nailing cross-pieces to the rafters and nailing corrugated metal sheets to the cross-pieces. The furrows in the metal should be lined up in the direction of the roof slope. Start from the lower edge of the roof and work toward the higher edge, overlapping the corrugated sheets as shown in Figure 20. The roof should extend about 0.3m beyond all walls.

11. Build a screening wall, if there is one, by nailing uprights to the wood beam foundation. Nail the crossbraces to the uprights and to the top beam of the shelter. Nail the boards to the uprights as shown in Figure 21a.

12. Build a door, if there is one, with wood boards as shown in Figure 21b. Attach the hinges, fasten the door to the door frame, and put on a latch, as described in the section on building special features.

13. If the shelter has a door and is to be made fly-proof, cover all ventilation openings with screen as described in the section on building special features.

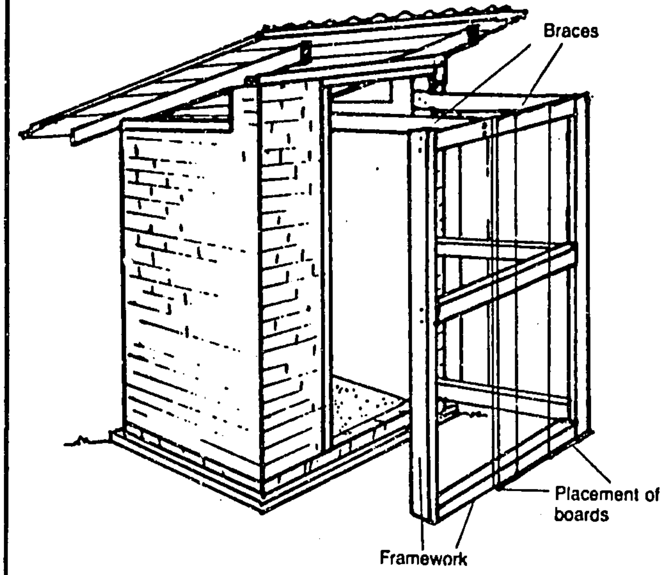


Figure 21a. Brick Shelter with Screening Wall

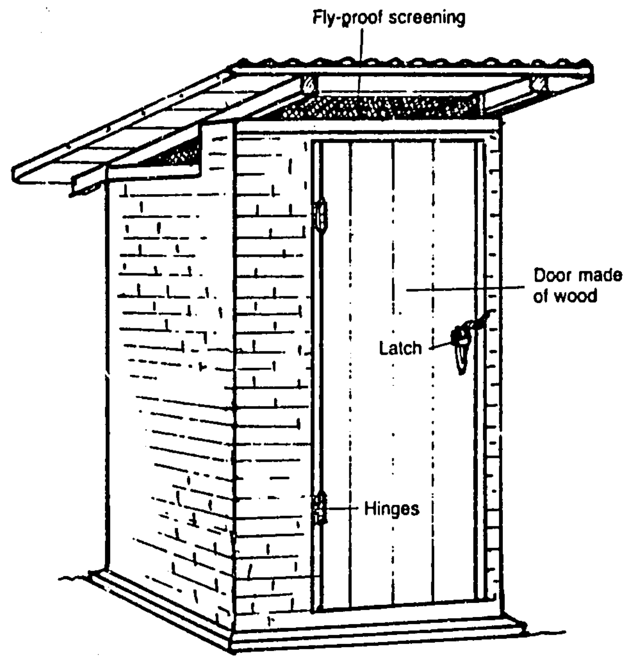


Figure 21b. Brick Shelter with Door

Building Special Features

Ventilation Openings. If the roof is not raised above the walls for ventilation, and ventilation openings are desired, cut openings near the tops of the walls. The openings should be about 200mm wide by 100mm high and spaced around the walls about 150mm apart as shown in Figure 6.

Screens. Screens covering ventilation openings must have mesh no larger than 2mm in order to keep out flies. Screens should be made of rust-proof material such as bronze, copper, plastic, or aluminum. If the screens are not rust-proof, paint them to prevent rust.

To cover a ventilation opening, cut a section of screen large enough to overlap the opening by 25mm on all sides and nail it in place as shown in Figure 6.

Door Hinges. Before attaching the hinges, hold the door in place and mark the door and the door frame where the hinges should be placed. Hinges should be about 150mm from the top of the door and 250mm from the bottom. They should be placed so that the door opens outward, if this is culturally acceptable.

If you are using prefabricated metal hinges with removeable pins, remove the pin from each hinge and separate the two halves. Attach one half with screws or nails to the door frame and the other half to the door. Raise the door in place, fit the halves of the hinges together, and reinsert the pin in each hinge.

If you are using a strap hinge, install it on the door. Lift the door into place and use a temporary support to hold it off the floor in its correct position. Accurately mark the proper location of the hinge on the door frame. Take the hinge apart and install the frame half. Then, hang the door.

For hinges of stiff leather such as soles of discarded boots or sandals, nail the hinges to the door, raise the door in place, and nail the hinges to the door frame.

For hinges made of vine, raise the door in place and tie the vine around the bamboo poles of the door and door frame. Leave enough slack so the door can be easily opened and closed.

Door Latch. For an eyelet-and-hook latch, secure the eyelet to the inside

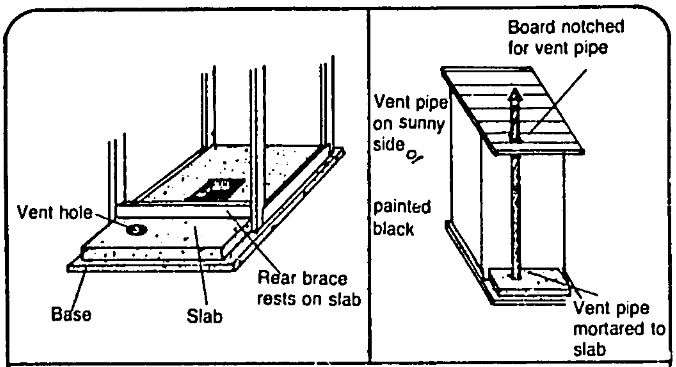


Figure 22. Constructing a Ventilated Shelter

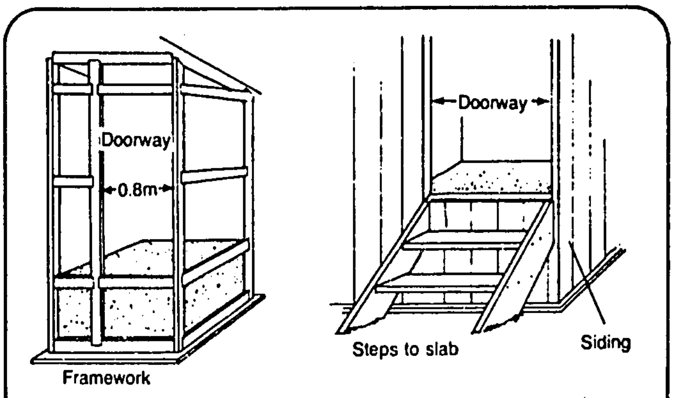


Figure 23. Construction of Shelter for Bucket Latrine

of the door frame, and attach the hook to the inside of the door. The latch should be just above the middle of the door. For a bar latch, nail a piece of wood to the inside of the door. For a peg-and-loop latch, fasten the bamboo peg to the inside of the door frame and tie the vine loop to the inside of the door.

Vent Pipe. The vent pipe is mortared to the vent hole in the privy slab and attached to the shelter roof or the wall, if extra support is needed. The pipe should be vertical. If the roof overhangs the vent hole, cut a hole or notch in the roof to accommodate the vent pipe as shown in Figure 22. Attach the vent pipe to the roof and wall with either a metal band and screws, wood and nails, wire, or vine.

Shelter for Off-set Pit Privy. The foundation for the shelter must rest on the ground and abut the platform which supports the privy slab. Level the ground and thoroughly tamp it before building the foundation. The bottom of the privy walls begin at the foundation and completely enclose the platform. The bottom of the doorway or entryway begins at the privy slab and is higher than the foundation. For additional details see "Constructing Slabs for Privies," SAN.1.C.1.

Shelter for Bucket Latrine. The foundation for the shelter rests on the platform base and abuts the platform. Build the shelter walls to completely enclose the platform. The bottom of the entryway is level with the privy slab as shown in Figure 23. A fly-proof door for removal of the bucket

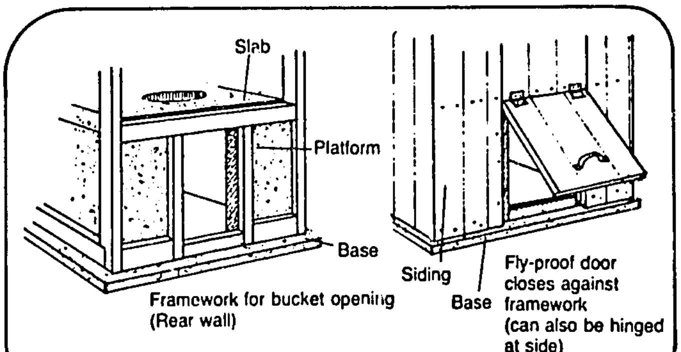


Figure 24. Rear Opening for Bucket Latrine

must be built into either the rear of the platform or the rear wall of the shelter. The door should have hinges and a latch to keep it tightly closed. If the door is built into the platform, leave an opening in the rear shelter wall as shown in Figure 24. For additional details, see "Constructing Bucket Latrines," SAN.1.C.5.

Shelter for a Compost Toilet. The foundation for the shelter rests on the base of the double vault and abuts the vault. Build the shelter walls to completely enclose the platform. The bottom of the entryway is level with the privy slab as shown in Figure 25. Airtight doors will be built into the rear of the vault. Leave openings in the rear shelter wall to allow access to these doors as shown in Figure 25. For additional details, see "Constructing Compost Toilets," SAN.1.C.6.

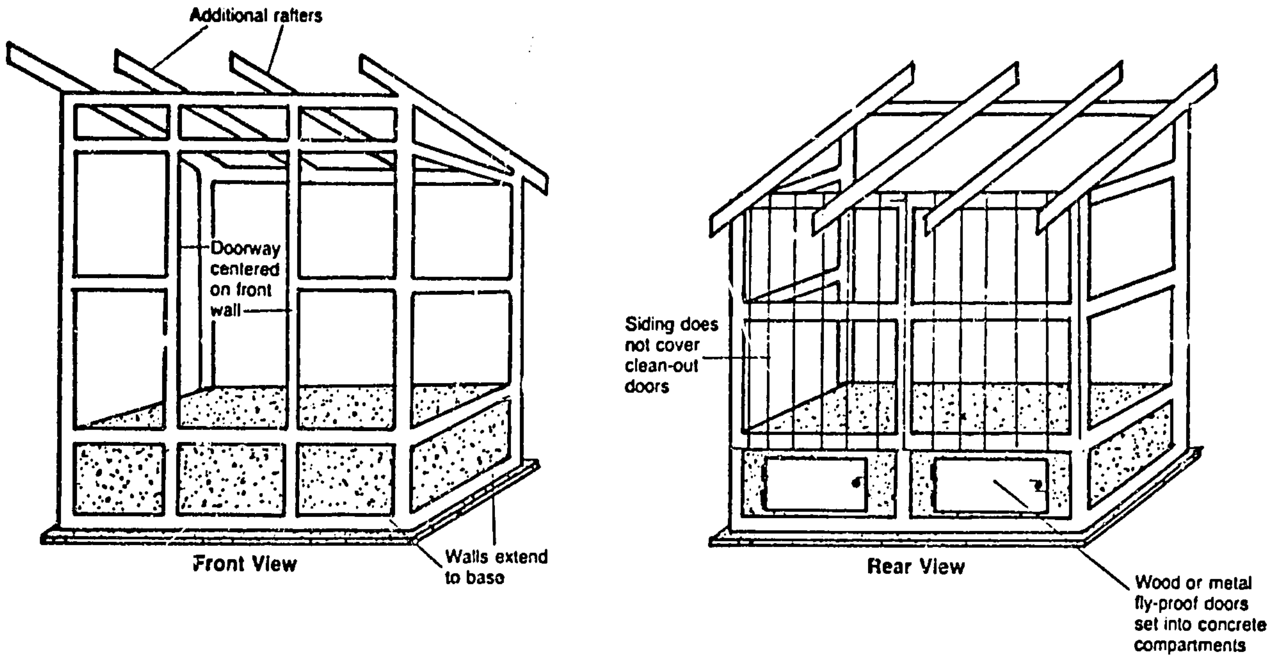


Figure 25. Framework Pattern for Composting Toilet

TEAM INSTRUCTIONS FOR COMPLETING THE LATRINE CONSTRUCTION

Review with the team the activities needed for completion of the shelter. They are listed on the handout from the previous session, Team Instruction for Shelter Construction. Besides completing the shelter the following activities should be carried out:

1. Build a mound around the latrine base to prevent rainwater from entering the pit.
2. Pack the mound in order to prevent erosion. Explain to the homeowners that planting vegetation and placing rocks around the latrine will also aid in erosion control.
3. Instruct the user on the maintenance and use of the latrine as planned by your team. The user needs to know what to do when the latrine fills up and how the slab can be moved to another location.
4. If the shelter has not yet been completed by the end of the morning give detailed instructions to the homeowner/labor crew on the necessary steps needed to finish the job.
5. The team should pick up all building debris and trash and return all tools.
6. If the homeowner/labor crew continue the construction over the next few days you should return to the site to inspect the work and provide further direction if needed.

PROJECT LEARNING WORKSHEET

The three most important things I learned during this project were:

Three things I would do differently next time are:

As a team leader I learned:

As a team member I learned:

SELF-ASSESSMENT INVENTORY

Rank yourself in terms of how well you feel you do each of these tasks now. This is for your use to help you in your learning. Please be accurate and honest with your answers.

	Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
1. Community Mobilization				
1. Identify existing infrastructure in a community and its relationship to a sanitation project.	4	3	2	1
2. Work with appropriate community leaders and/or groups to initiate a sanitation project.	4	3	2	1
3. Identify and address social customs and practices relating to sanitation projects.	4	3	2	1
4. Gather information regarding current sanitation practices.	4	3	2	1
5. Investigate the history of past sanitation projects in the community. Evaluate the reason for their success or failure.	4	3	2	1
6. Plan culturally appropriate approaches for introducing the idea of latrine use to different groups in the village (leaders, men, women, etc.).	4	3	2	1
7. Identify and locate number of homes and other buildings in community.	4	3	2	1
8. Identify the resources accessable to the community necessary to initiate a successful project. These resources include materials, labor, tools, equipment, funds, transportation and leadership.	4	3	2	1
9. Present information concerning alternative methods and costs to provide sanitation facilities.	4	3	2	1

	Do Well (4)	Do Okay (3)	Diffi-cult to do (2)	Can't do (1)
10. Assist the villagers to make decisions and develop a plan which defines the project scope and provides time frames.	4	3	2	1
11. Describe methods that will be used to assure that villages understand their reponsibilities before, during, and after construction of sanitation facilities.	4	3	2	1
12. Devise strategies for obtaining and allocating resources.	4	3	2	1
2. Project Development				
1. Identify local environmental diseases, their symptoms, means of transmission, and prevalence.	4	3	2	1
2. Use a sanitation project as a strategy for designing and implementing health education at the village level.	4	3	2	1
3. Develop strategies for educating and discussing with the community:				
a. the need for and use of a latrine	4	3	2	1
b. how disease is spread	4	3	2	1
c. dangers of animal waste	4	3		1
d. the importance to health of handwashing	4	3	2	1
e. discuss methods of solid waste disposal	4	3	2	1
3. Design				
1. Select from 5 types of latrines.	4	3	2	1
2. Size a communal latrine pit.	4	3	2	1
3. Size an individual latrine pit.	4	3	2	1
4. Select a latrine for use where there is water nearby.	4	3	2	1
5. Select a latrine site in relation to a potable water source.	4	3	2	1

	Do Well (4)	Do Okay (3)	Diffi- cult to do (2)	Can't do (1)
6. Discuss social restraints which may hinder a latrine project and possible solutions to those restraints.	4	3	2	1
7. Determine equipment needs.	4	3	2	1
8. Determine material quantities.	4	3	2	1
9. Determine costs.	4	3	2	1
10. Procure material.	4	3	2	1
11. Determine human resource needs.	4	3	2	1

4. <u>Construction</u>

1. Schedule construction in a proper sequence	4	3	2	1
2. Assess geological conditions.	4	3	2	1
3. Construct a latrine pit.	4	3	2	1
4. Be able to prepare and use a correct mix of sand, gravel, water and cement for a concrete slab.	4	3	2	1
5. Pour a concrete latrine slab with reinforcing.	4	3	2	1
6. Build a wood/soil latrine slab.	4	3	2	1
7. Build a latrine superstructure.	4	3	2	1

5. <u>Monitor and Follow-up</u>

1. Develop a plan for continued operation and maintenance of latrine(s).	4	3	2	1
2. Develop a strategy for relocating latrines as required.	4	3	2	1

		Do Well (4)	Do Okay (3)	Difficult to do (2)	Can't do (1)
3.	Develop a strategy for the construction of additional latrines if needed.	4	3	2	1
4.	Identify follow-up health education activities necessary to encourage continued use of latrines.	4	3	2	1
5.	Establish a mechanism to monitor the use of latrines.	4	3	2	1
6.	Identify problems that affect the use of latrines and develop strategies to overcome them.	4	3	2	1
7.	Evaluate and analyze the project upon completion.	4	3	2	1

INSTRUCTIONS FOR INSPECTING LATRINES

a) Pick three latrines and inspect their construction.

b) Write down the dimensions and materials used for the base, slab, lining, and shelter. Note any other special features.

c) Identify the location of the latrine (in relation to water, kitchen, house, etc.).

d) Determine what if any health risks are posed by these latrines.

e) Choose one latrine that needs to and can be realistically improved.

f) If appropriate try to determine the homeowner's willingness to improve the latrine. Plan how to provide the homeowner with suggestions for improvement.

g) Develop an improvement plan which includes:

- a diagram of the proposed improvements
- specific estimates of tools, materials, labor needed
- a cost estimate (if possible)

h) Report briefly your suggested improvements to the rest of the group.

CASE STUDY - ZYE VILLAGE

The local health official of Zye has told you that there are numerous recent cases of diarrhea in the village and asks that you meet with village representatives to see about improving sanitation for the village.

The meeting with the village chief, school master, one of the local merchants, and a spokeswoman, Ms Zy, ended with the following information.

1. The community wanted sanitation improvements and had raised the equivalent of US $321 to support a project.

2. There are 41 occupied households without latrines.

3. Five houses are occupied by elderly persons and six by widows with young children. Two additional families are from another area, and the chief and Ms Zy specifically requested that they not be included, at least as far as the community funds were involved.

4. There are no communal latrines in public places such as the primary school and the dispensary. Following the meeting, you, the local health official, and the chief conduct a sanitary survey which validates the information concerning the number of households. The two households the chief does not want served both have many small children. You also learn the following:

   - there is a sand and gravel deposit nearby;
   - the soil is generally adequate for waste disposal;
   - there is a government controlled forest adjacent to the village;
   - the stream flows year around;
   - locally made brick is available at 5 cents a brick.

5. The community obtains water from protected wells within the town.

You know from previous projects that cement will cost about $8 a bag, re-bar about $2 for each slab and that it takes 1,600 bricks to build a shelter. Past experience indicates that a half bag of cement is needed per slab.

The government has a rural sanitation program that will give a cement latrine slab free to a family if the shelter is made of brick, lumber, or concrete block and built to specifications.

During your visit to the area you are impressed with the overall closeness and interest of the community in improvement projects.

RESOURCES CHECKLIST

Materials	Quantity	Cost
<u>Latrine Pit</u>		
Wood for lining		
-		
-		
-		
<u>Slab Base</u>		
-		
-		
-		
-		
<u>Latrine Slab</u>		
Cement		
Re-bar		
-		
-		
<u>Slab Forms</u>		
Lumber		
Nails		
-		
-		
Total Materials Cost		

Activity/Labor	*Skills & number of persons	Time	Cost
Excavation of pit			
Lining pit			
Construction of slab base			
Construction of slab forms			
Latrine slab			
Pouring the slab			
Installing the slab			
Transportation of materials			
		Total Labor Cost	

* Mason
Carpenter
etc.

Tools	Quantity	Cost
Shovels		
Saw		
-		
-		
-		
-		
-		
-		
-		
Total Tool Cost		

Equipment	Quantity	Cost
Truck		
Push-cart		
-		
-		

Total Project Cost

Material

Labor

Tools

Equipment

Total

EVALUATION FORM

A. Goal Attainment: Please circle the appropriate number to indicate the degree to which the workshop goals have been achieved.

I can now:

o Define sanitation and understand the impact of latrines.	1 Low	2	3	4	5 High
o Understand the impact of sanitary waste disposal on the spread of disease.	1 Low	2	3	4	5 High
o Develop strategies and approaches for educating communities about latrines and related sanitation issues.	1 Low	2	3	4	5 High
o Understand and identify critical steps for mobilizing a community for any latrine project.	1 Low	2	3	4	5 High
o Identify community factors related to the construction, acceptance, and use of latrines	1 Low	2	3	4	5 High
o Assess local physical conditions relating to improved sanitation.	1 Low	2	3	4	5 High
o Identify human and material resources needed to construct latrines and determine their availability.	1 Low	2	3	4	5 High
o Develop strategies to help the community to make an appropriate choice among alternative types of latrines.	1 Low	2	3	4	5 High
o Develop a plan for a latrine project.	1 Low	2	3	4	5 High
o Construct a latrine appropriate for a community.	1 Low	2	3	4	5 High
o Identify strategies for the continued operation, maintenance, repair, and replacement of latrines.	1 Low	2	3	4	5 High
o Develop a plan to implement a latrine project "back home."	1 Low	2	3	4	5 High

B. Workshop Feedback and Learning: Please answer the following questions as fully as possible so that the trainers can learn how effective the workshop methodology was.

1. What have been the most positive things about this workshop? Comments:

2. What have been the most negative things about this workshop? Comments:

3. What one thing stands out as important to you in this workshop? Comments:

4. What things have you learned that you did not know before? Comments:

C. Workshop Organization and Training

1. What comments do you have about the way the workshop was planned and organized?

2. What can be done in the future to improve a workshop like this?

3. What specific steps in developing a latrine project do you feel you will need to learn more about in order to successfully promote and develop a project in the future?

4. What comments do you have about the trainers?

5. Is there anything else you would like to say?

TEAM INSTRUCTIONS FOR TIMBER SLAB CONSTRUCTION

Time: Approx. 2 hours

Your task begins after the pit is constructed and fully lined. Your team will be building a timber slab directly over the pit.

1) Check to be sure the appropriate quantity and quality of logs are available for a log platform (Drawing 1). Check that all other supplies are available and ready.

2) Go over the attached drawings with your team members.

3) Determine location of the shelter opening so that the squatting hole can be appropriately placed. The shelter opening must be facing north or south. The choice between north or south direction should be based on privacy needs. See Drawing 3 for location of squat hole in north or south opening of shelters (superstructure).

4) Be sure platform is built across the pit in a manner that allows a vent pipe to be closest to the equator to receive maximum sunlight. The shelter is on the side of the vent pipe away from the equator. The squatting hole is placed in the middle of the platform if the shelter and vent pipe are on the same side. If they are on opposite sides, the squat hole needs to be at the extreme opposite end of the slab.

5) Begin to form the slab by placing two logs each 2.3 m long and 10 cm in diameter along the pit 30 cm apart (see Drawing 1). Place these logs so that their upper surface is flush with the ground level. This will require removing soil at both ends of the pit.

6) Place the 1.2 meter long logs across the longitudinal logs so there are no gaps (see Drawings 1 and 2). Nail these logs to the longitudinal logs using 15 cm-long nails.

7) Form openings for the vent pipe and squat hole in the selected places (see drawings). Make these openings by using pairs of shorter logs (10 cm) and placing them so they come to the inner edge of the two longitudinal logs. This will leave two 20-cm by 30-cm holes in the platform.

8) Surfacing or finishing material will be put on the slab after the shelter is completed.

MATERIAL LIST

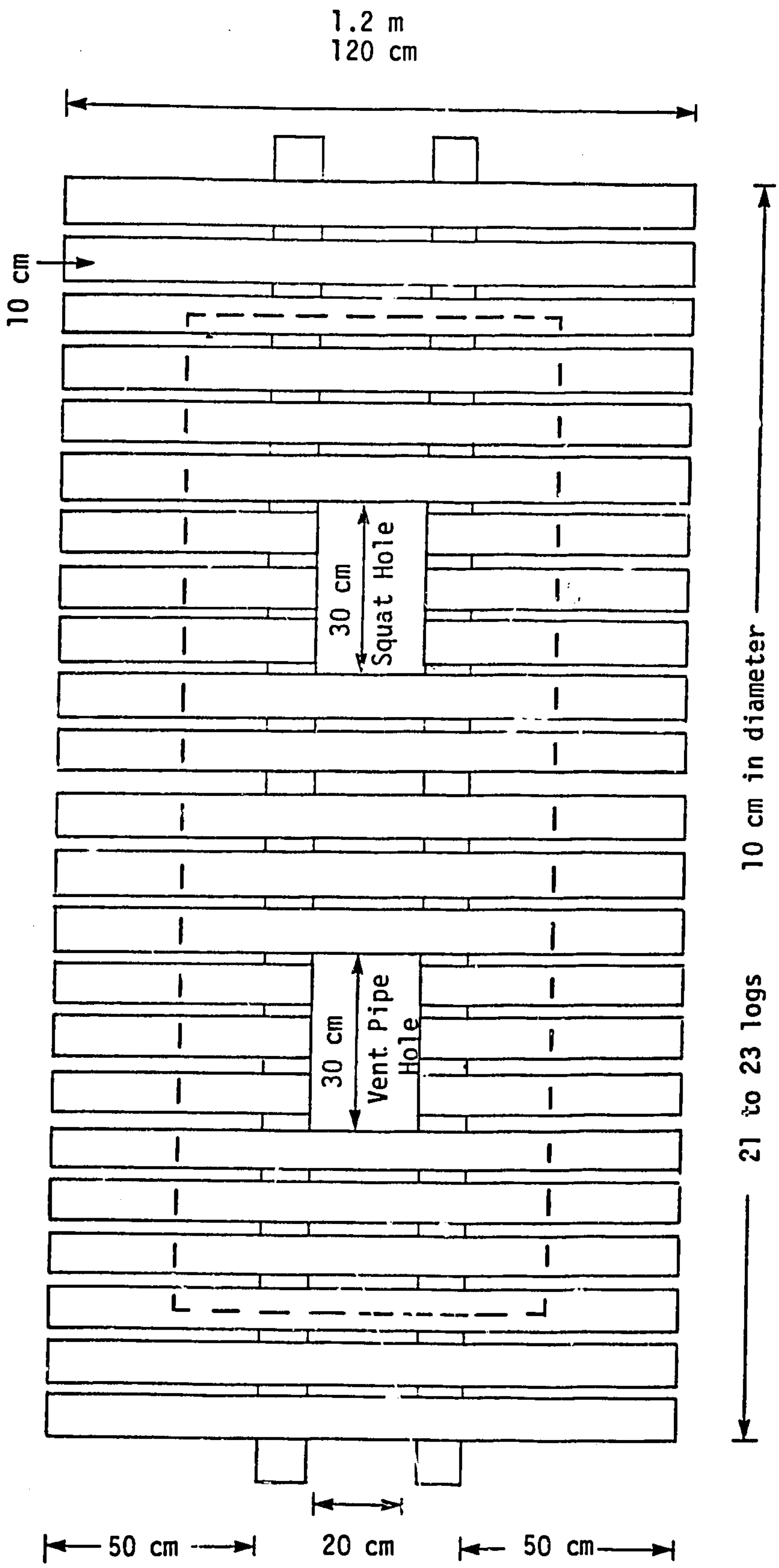
Logs/Timber - 12 logs 50 cm long
17 logs 1.2 m long
2 logs 2.3 m long
Logs must be 10 cm in diameter. Logs must be resistant to termites and insect-proof

Nails/Spikes - 46 - 15 cm long
or wire to tie

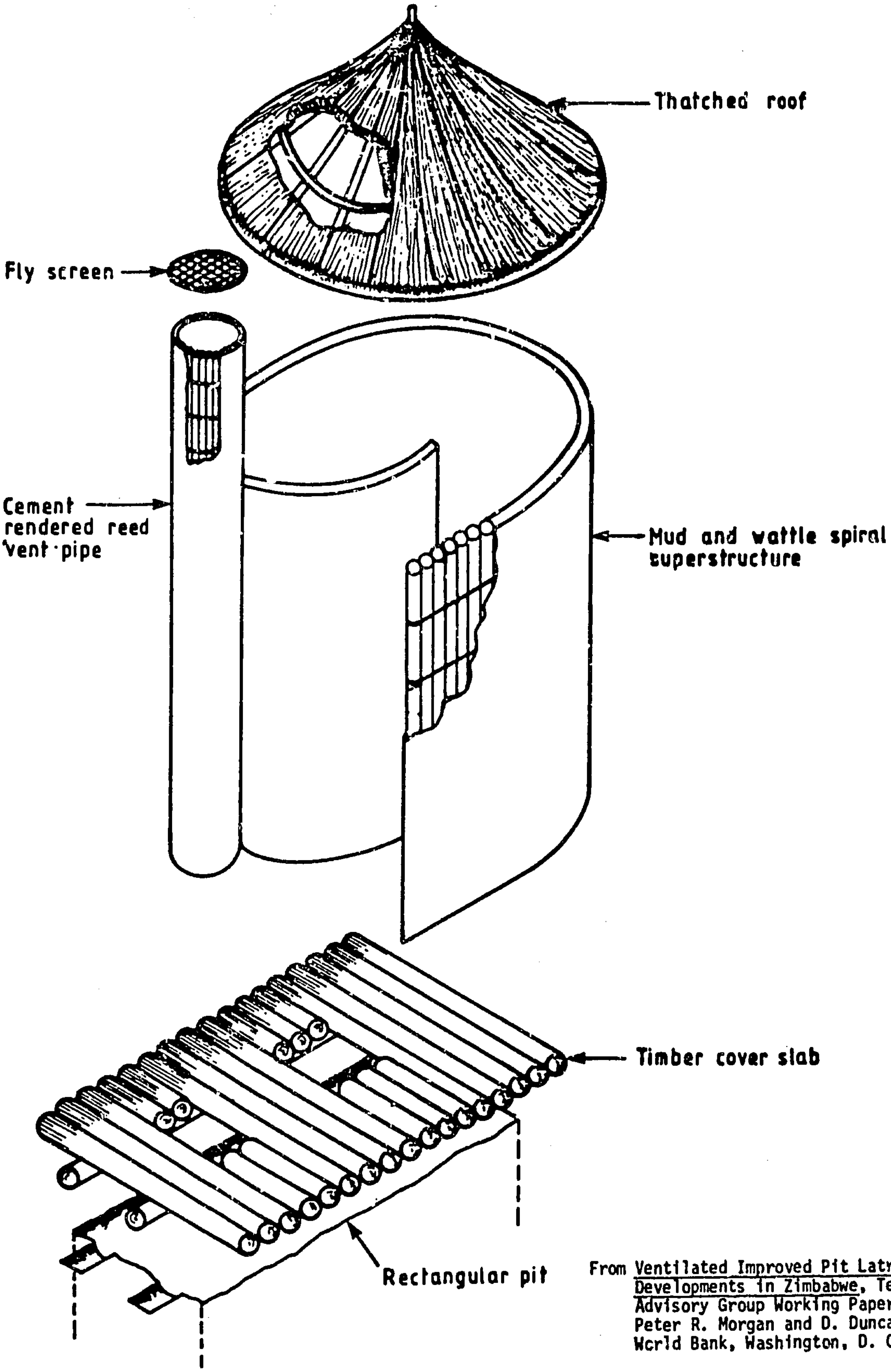
TOOLS

2 shovels
2 hammers
2 saws
1 axe
1 measuring tape (2 meters)

DRAWING 1



PLAN VIEW
TIMBER PLATFORM
ZIMBABWE - TYPE LATRINE



From Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982

Drawing 2: Exploded schematic diagram of mud and wattle spiral VIP latrine.

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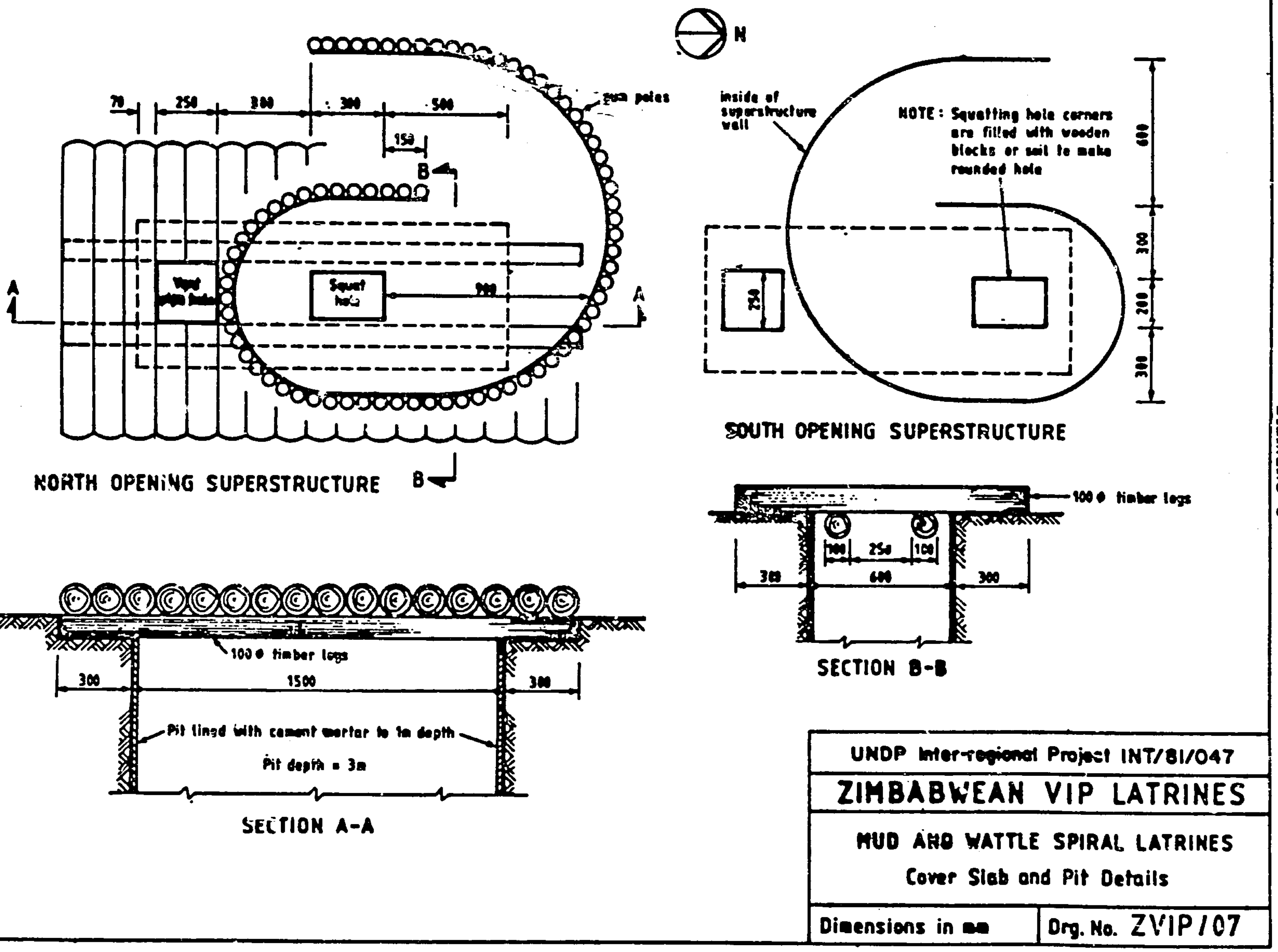


DRAWING 3

Handout A-1, p.5

TEAM INSTRUCTIONS FOR VENT-PIPE INSTALLATION

These instructions describe how to build the vent pipe and plaster the first half of the circumference. The second half will not be plastered until the shelter is built and the vent pipe can be tied to it. Review drawings carefully before beginning construction.

1) Make a mat 2.4 m by 0.9 m from local reeds, which should be 2.4 m long and 2 to 3 cm in diameter. Tie the reeds together by weaving under and over the reeds with string or wire.

2) Make four or five rings 28 cm in diameter from green sapling.

3) Roll the mat around the rings, spaced evenly along the mat, to form a vent pipe of 28 cm internal diameter. Tie the ends together with wire.

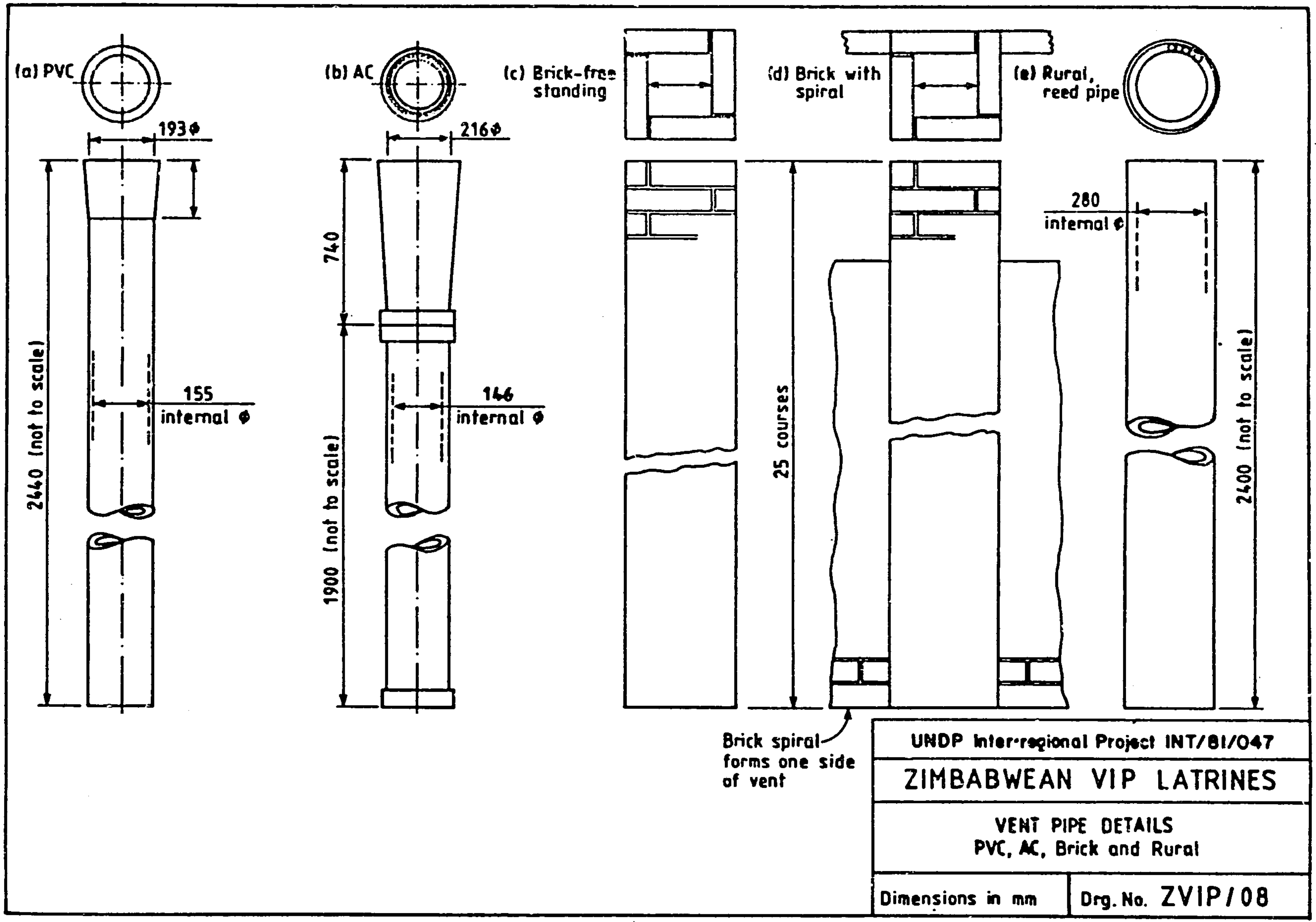
4) Wire fly screen to one end of vent pipe.

5) Use cement mortar, (1 part cement, 6 parts sand) to plaster half the circumference of the pipe.

6) Put the pipe in a safe place to dry. Pick a drying location where it will be safe from damage until the shelter is built. The shelter should be completed in the next few days.

<u>MATERIALS NEEDED</u>

local reeds 2.4 m long
string or wire
green sapling
cement mortar
wire cutters
cement trowel



From *Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe*, Technology Advisory Group Working Paper Number Two, Peter R. Morgan and D. Duncan Mara, World Bank, Washington, D. C. 1982

TEAM INSTRUCTIONS FOR MUD AND WATTLE LATRINE SHELTER

Your team will be constructing a shelter from logs and poles and covering it with mud and wattle. You will also construct a thatch roof to close in the shelter.

To complete the shelter, the slab and vent pipe will also be plastered and the vent pipe attached to the shelter.

Review drawings with your team. Then do the following:

1) Use 30-40 timber poles (1.8 m long - 5 to 8 cm diameter) and form a spiral shape (see Drawings). Five or six of the poles need to be pointed at one end so they can be firmly wedged between and nailed to slab logs.

2) Tie logs together using number 18-gage (1.219 mm) wire. Keep the upper sections of the logs in place by fastening green sapling rings around them.

3) Nail lower sections of logs into cover slab in spiral shape as shown in drawings.

4) Review drawings of roof. It needs to be made from sapling poles 3 cm in diameter which are pliable and can be shaped appropriately.

5) The roof is shaped like a cone. For the bottom ring (roof base) shape poles into circular form. The diameter of the roof base is 2 m. The top point of the cone is 0.5 m above the plane of the base.

6) Weave and tie 1.2 m long gum poles, extending from the base to the top point between five rings spaced 22.5 cm apart.

7) Use straw or grass to make a dense, thick thatch. Tie it to the roof. Make sure thatch is thick enough to keep the inside of the shelter dark in order to lessen its attraction for flies.

8) Tie vent pipe to superstructure.

9) Tie roof to superstructure.

10) Begin application of mud to superstructure.* Plaster everything with mud both inside and out. Have your team leader check with trainers for appropriate soil to use.

11) Cover slab with plaster so that the floor slopes in all directions toward squat hole.

12) Allow mud to dry. Replaster and fill any cracks which appear.

13) Plaster all surfaces with thin coat of cement mortar.

14) Paint slab and vent pipe with black bitumastic paint.

15) Cover exposed parts of slabs with soil which should be placed to slope gradually away from latrine.

16) Plan or instruct homeowner to plant grass to protect area from erosion.

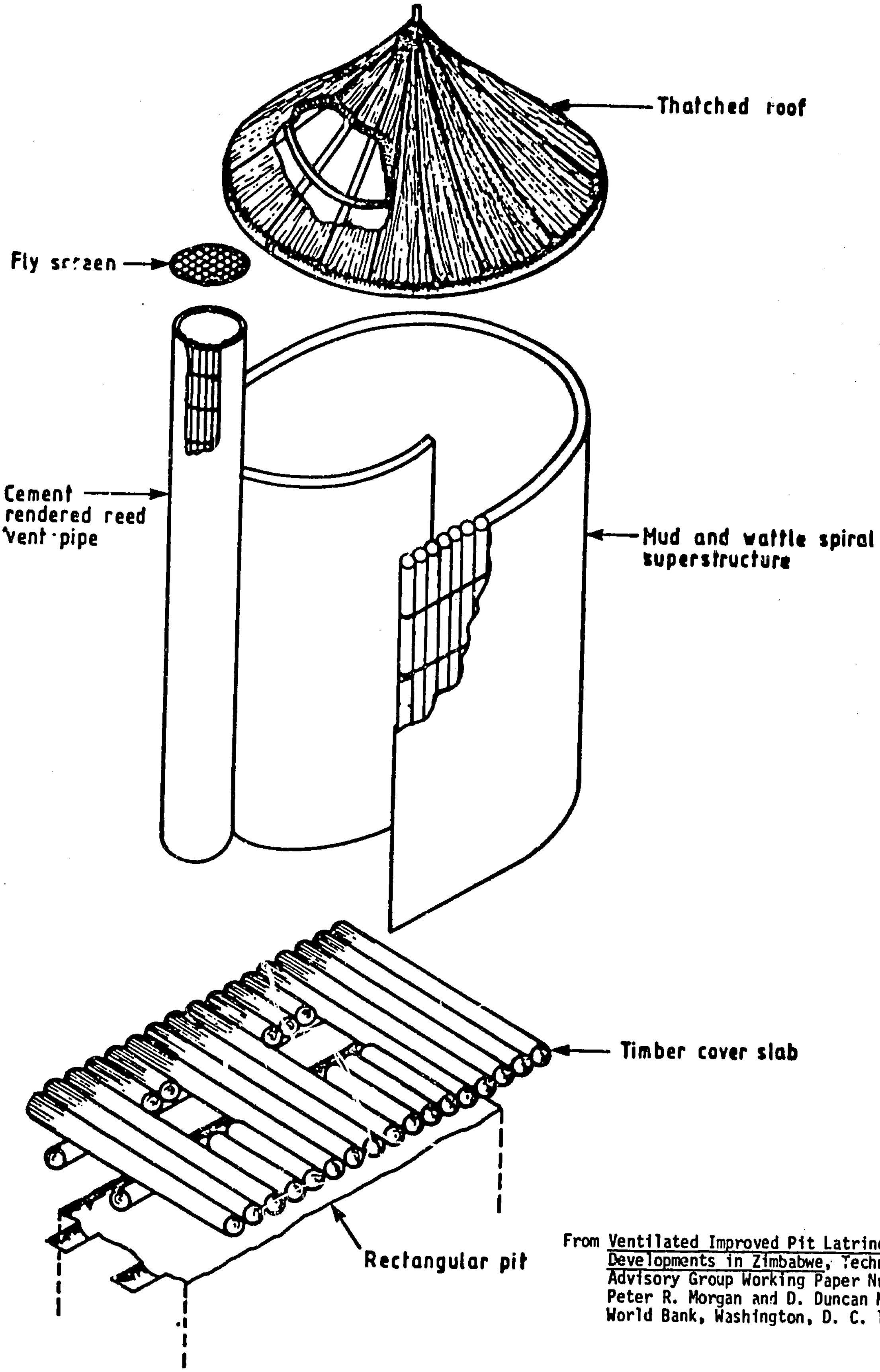
MATERIALS NEEDED FOR TASK

timber poles - 30 to 40, 1.8 m long, 5 to 8 cm in diameter
18 swg wire
nails 8 cm long
green sapling rings, 5 needed
gum poles - 3 cm diameter x 1.2 m long-26 are needed
thatch material (straw or grass)

Tools Needed

2 hammers
2 saws
1 measuring tape (2 meter)
2 pairs of pliers
3 cement trowels
2 paint brushes
2 shovels
1 bucket marked in liters

* In some areas traditional plastering material is not soil from the ground. Instead they use soil from termite hills which has good adhesive properties and durability. Check with trainers beforehand to determine best soil to use here.



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Exploded schematic diagram of mud and wattle spiral VIP latrine.

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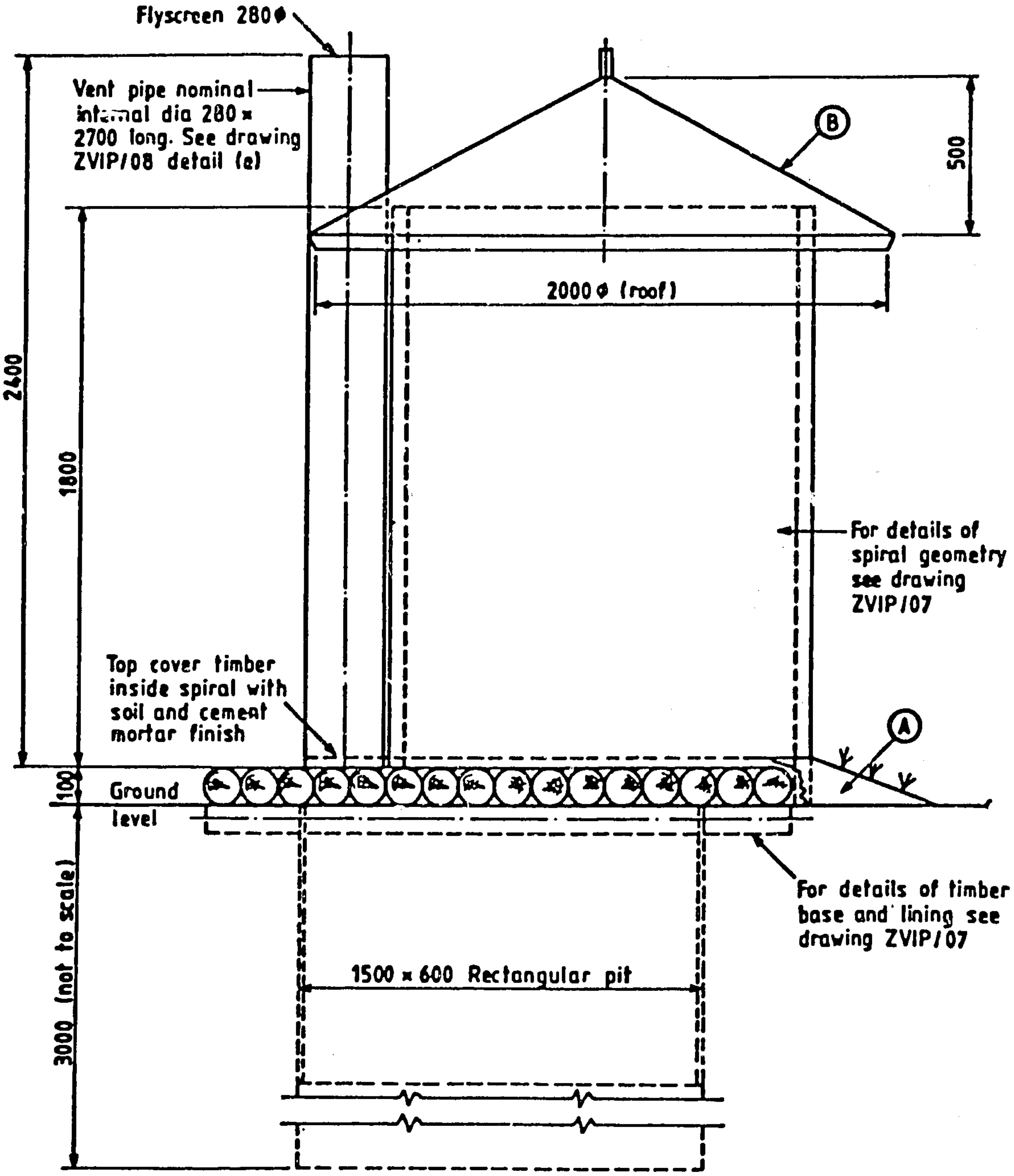


(A) For drainage cover exposed timber with soil and plant grass.

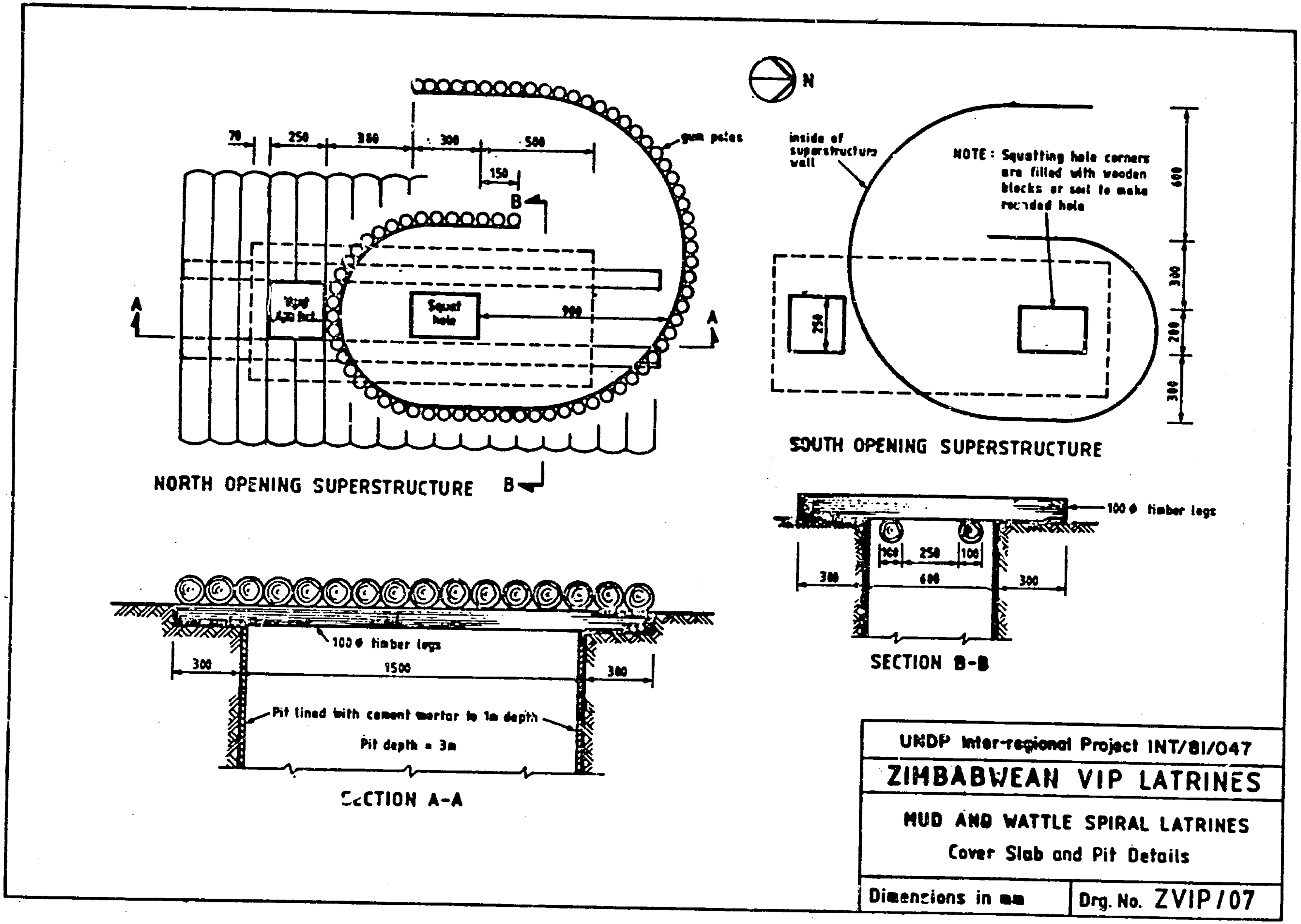
(B) Roof details - Straw or grass thatch on 30 dia. gum pole structure with five circular ties. Gum poles cut to 1200 length.

UNDP Inter-regional Project INT/81/047

ZIMBABWEAN VIP LATRINES

MUD AND WATTLE SPIRAL LATRINE
General Arrangement

Dimensions in mm | Drg. No. ZVIP/06



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