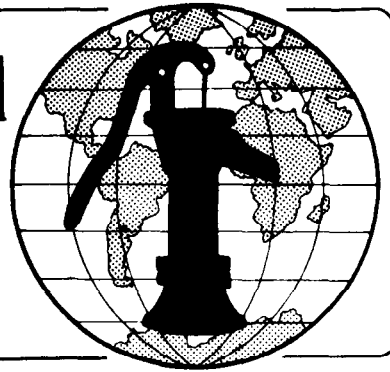


# Water for the World



## Constructing Aqua Privies Technical Note No. SAN. 1.C.4

An aqua privy is an underground watertight vault filled with water that receives excreta and washwater from a drop-pipe, allows solids to settle to the bottom, and discharges effluent to a soakage pit. Constructing an aqua privy involves excavating two pits, building a vault from concrete or brick and mortar, installing a concrete slab with a drop-pipe, installing an overflow pipe and a vent pipe, laying sewer pipe from the vault to the soakage pit, and building a soakage pit.

With careful maintenance, a properly constructed aqua privy can last 10-20 years or more. This technical note describes each step in constructing an aqua privy. Read the entire technical note before beginning construction.

### Materials Needed

The project designer must provide three papers before construction can begin:

1. A location map similar to Figure 1.
2. Design drawings similar to Figures 2 and 3.
3. A materials list similar to Table 1.

After the project designer has given you these documents and you have read this technical note carefully, begin assembling the necessary workers, supplies and tools.

### Useful Definitions

**EFFLUENT** - Settled sewage; in an aqua privy, liquid flowing from the vault to a seepage pit.

**FLOW LINE** - The highest level to which liquid can rise in an aqua privy.

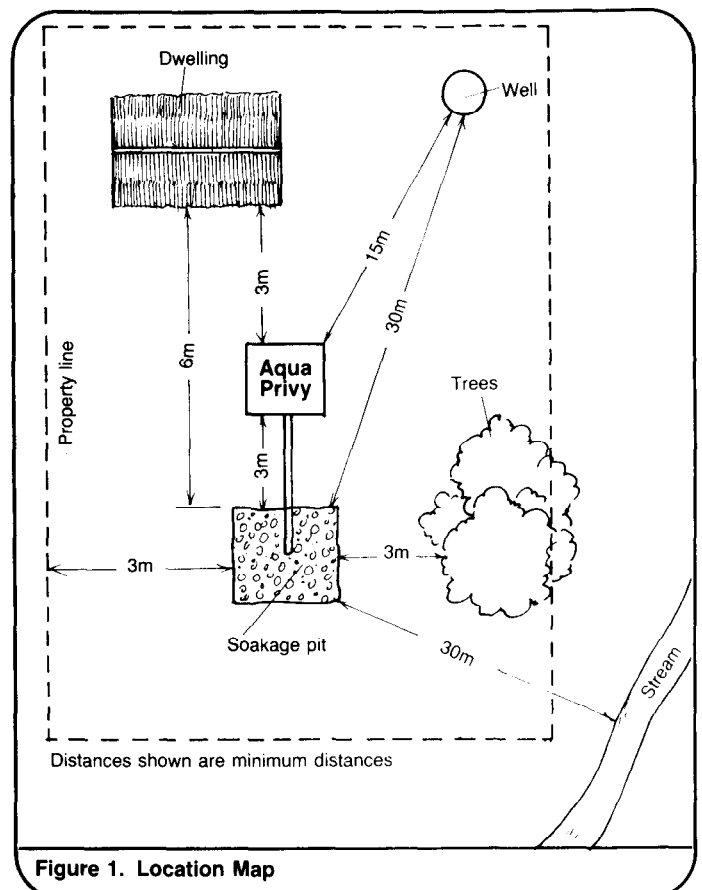


Figure 1. Location Map

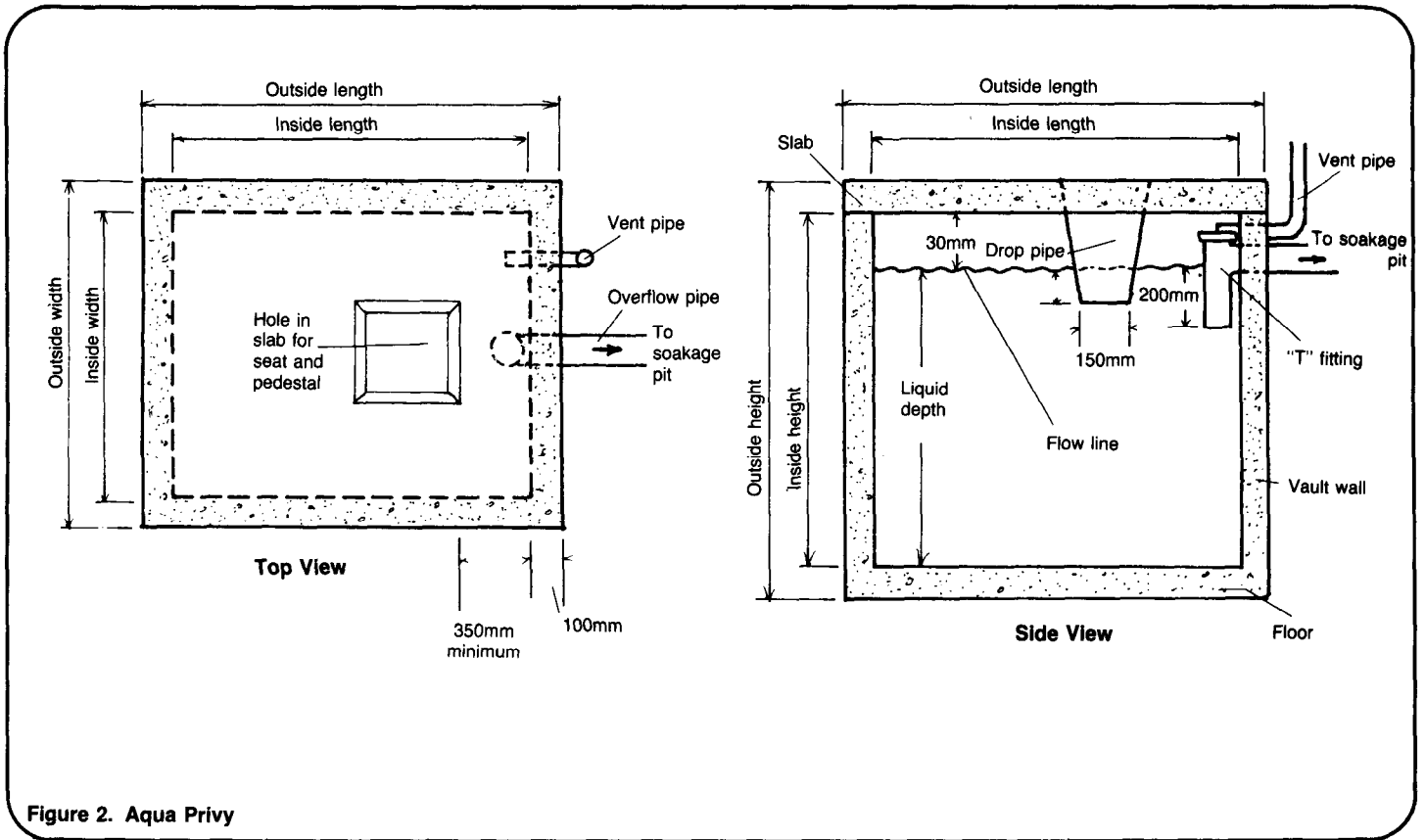


Figure 2. Aqua Privy

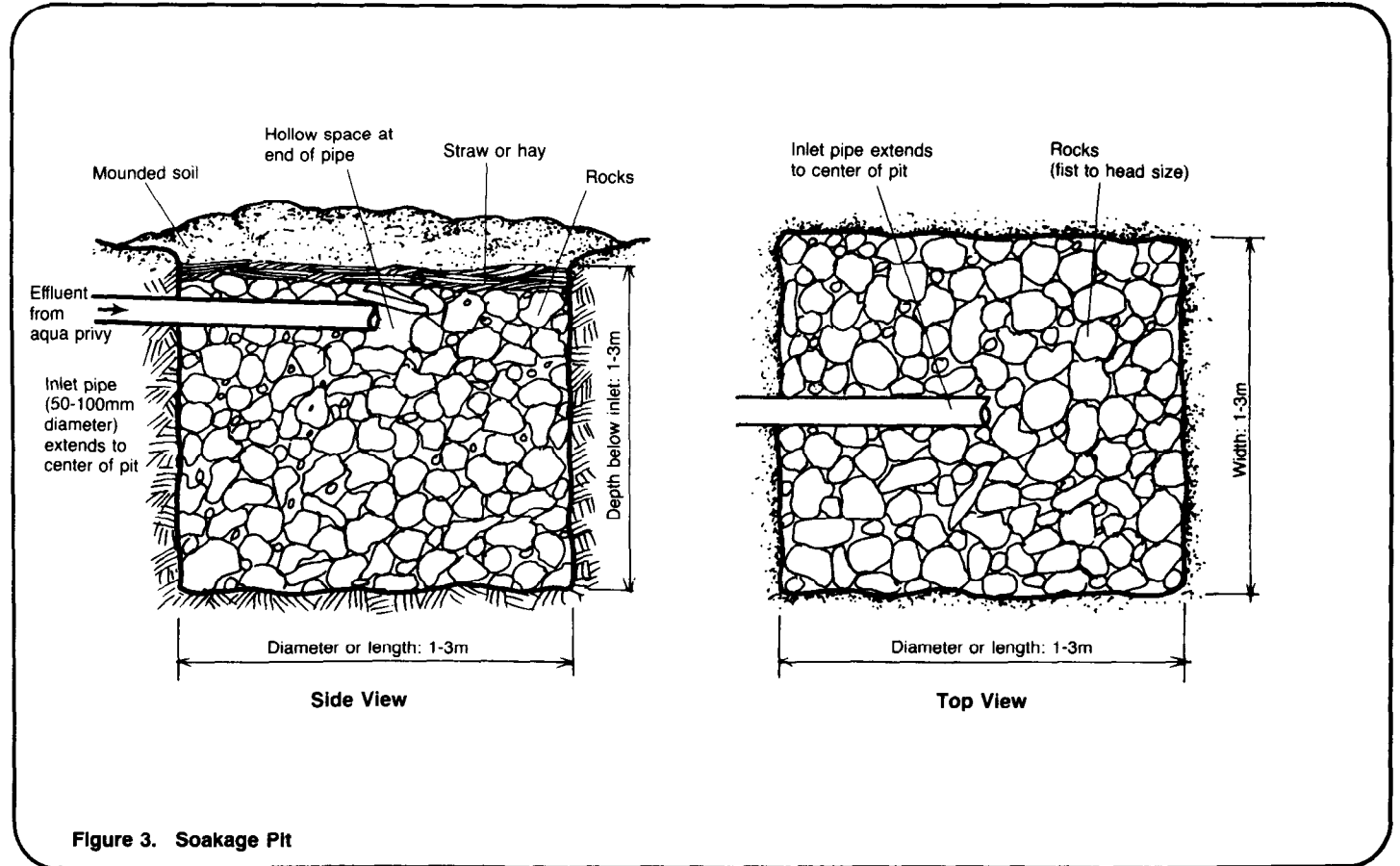


Figure 3. Soakage Pit

**Table 1. Sample Materials List for Aqua Privy**

Item	Description	Quantity	Estimated Cost	
Labor	Foreman	1	---	
	Worker (skilled with concrete)	1	---	
	Worker (unskilled)	1	---	
Supplies	Wood (for forms)	---	---	
	Nails (for forms)	---	---	
	Cement (Portland)	---	---	
	Sand (clean, sized fine to 6mm)	---	---	
	Gravel (clean, sized 6-25mm)	---	---	
	Water (clear)	---	---	
	Reinforcing material	---	---	
	Overflow pipe (vitrified clay, 100mm diameter)	---	---	
	Elbow fitting (vitrified clay, 100mm diameter)	---	---	
	Vent pipe (galvanized metal, 25mm diameter)	---	---	
	Drop-pipe (galvanized metal, 400mm long)	---	---	
	Materials for soakage pit: rocks	---	---	
	straw	---	---	
	Tools	Measuring tape	1	---
Hammer		1	---	
Saw		1	---	
Shovels		2	---	
Trowel		1	---	
Container for mixing concrete		1	---	
Carpenter's level (optional)		1	---	
Carpenter's square (optional)		1	---	
Tar or equivalent (for sealing slab to vault)		---	---	
Total Estimated Cost =			---	

**Caution!**

1. When excavating in loose soil, or when digging deeper than 1.5m, shore up the sides of the pit to prevent a cave-in that could be fatal to a worker in the pit.

2. Build the aqua privy and soakage pit to the exact dimensions and at the site specified by the project designer.

**Construction Steps**

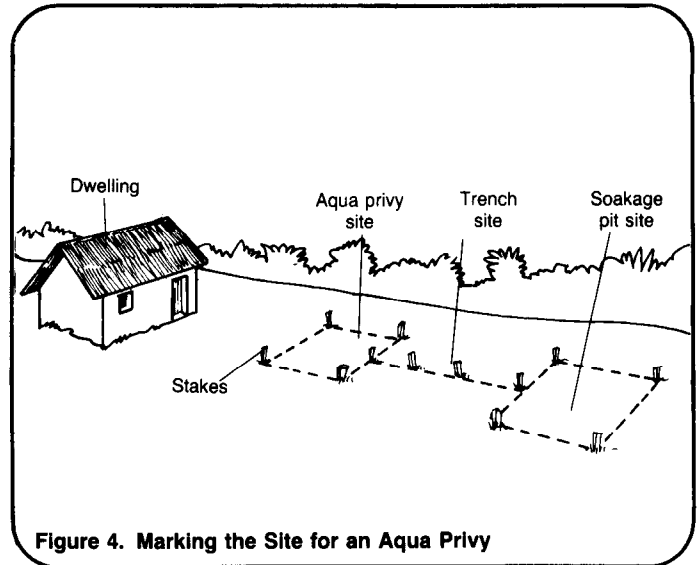
Depending on local conditions, availability of materials, and skills of workers, some construction steps will require only a few hours, while others may take a day or more. Read the construction steps and make a rough estimate of the time required for each step based on local conditions. You will then have an idea of when specific workers, materials, and tools must be available during the construction process. Draw up a work plan similar to Table 2 showing construction steps.

**Building a Concrete Aqua Privy**

1. Assemble all laborers, materials, tools, and drawings needed to begin construction. Study all drawings carefully.

2. Using the location map and a measuring tape, locate the sites for the aqua privy vault, soakage pit, and overflow pipe, and mark them on the ground with wooden stakes or sticks as shown in Figure 4.

3. Dig the hole for the aqua privy vault. The depth is the same as the outside height of the vault. Allow a working area of at least 0.3m around all sides.



4. Level the bottom of the hole and tamp it down. Spread 50-100mm of gravel, pebbles or crushed rock on the bottom of the hole.

5. Build forms for the floor as shown in Figure 5.

6. Mix concrete to the correct proportions. A common mix by volume is one part cement to two parts sand to three parts gravel plus enough water to make a fairly stiff mix. Mix until the sand and gravel are evenly coated with cement and water.

7. Pour in concrete until the forms are about half full. Then lay in reinforcing material such as steel rods, wire mesh or bamboo strips and pour in concrete until the forms are full. Smooth the surface with a trowel.

**Table 2. Sample Work Plan for Concrete Aqua Privy**

Time Estimate	Day	Task	Personnel	Tools and Materials
1 hour	1	Lay out system on ground	Foreman, present during entire construction; 1 laborer	Measuring tape, stakes, drawings
8 hours	1	Dig hole for aqua privy vault	2 or more laborers	2 or more shovels
2 hours	2	Spread gravel; build floor forms	2 laborers	Gravel, wood, hammer, saw, nails
4 hours	2	Mix and pour concrete for floor	2 laborers	Cement, sand, gravel, water, mixing container, reinforcing material, trowel
----	2-6	Cover; keep moist for 4 days	2 laborers	Wet straw
2 hours	3	Build form for slab	2 laborers	Wood, hammer, saw, nails
3 hours	3	Mix and pour concrete for slab	2 laborers	Cement, sand, gravel, water, container, reinforcing material, trowel
----	3-7	Cover; keep moist for 4 days	2 laborers	Wet straw
8 hours	7	Remove floor forms; build wall forms; allow for overflow and vent pipes; position reinforcing material	2 laborers	Wood, hammer, saw, nails, reinforcing material
5 hours	8	Mix and pour concrete for walls	2 laborers	Cement, sand, gravel, water, trowel, container
----	8-12	Cover; keep moist for 4 days	2 laborers	Wet straw
9 hours	13	Remove wall forms; mortar "T" fitting; dig trench; lay overflow pipe	2 laborers	"T" fitting, overflow pipe, mortar, shovels
----	14-15	Build soakage pit	See "Constructing Sumps, Soakage Pits and Trenches," SAN.1.C.7	
7 hours	16	Mortar drop-pipe in place; fill vault with water; install slab	2 laborers	Drop-pipe, mortar, tar
----	17-18	Build privy shelter	See "Constructing Privy Shelters," SAN.1.C.3	

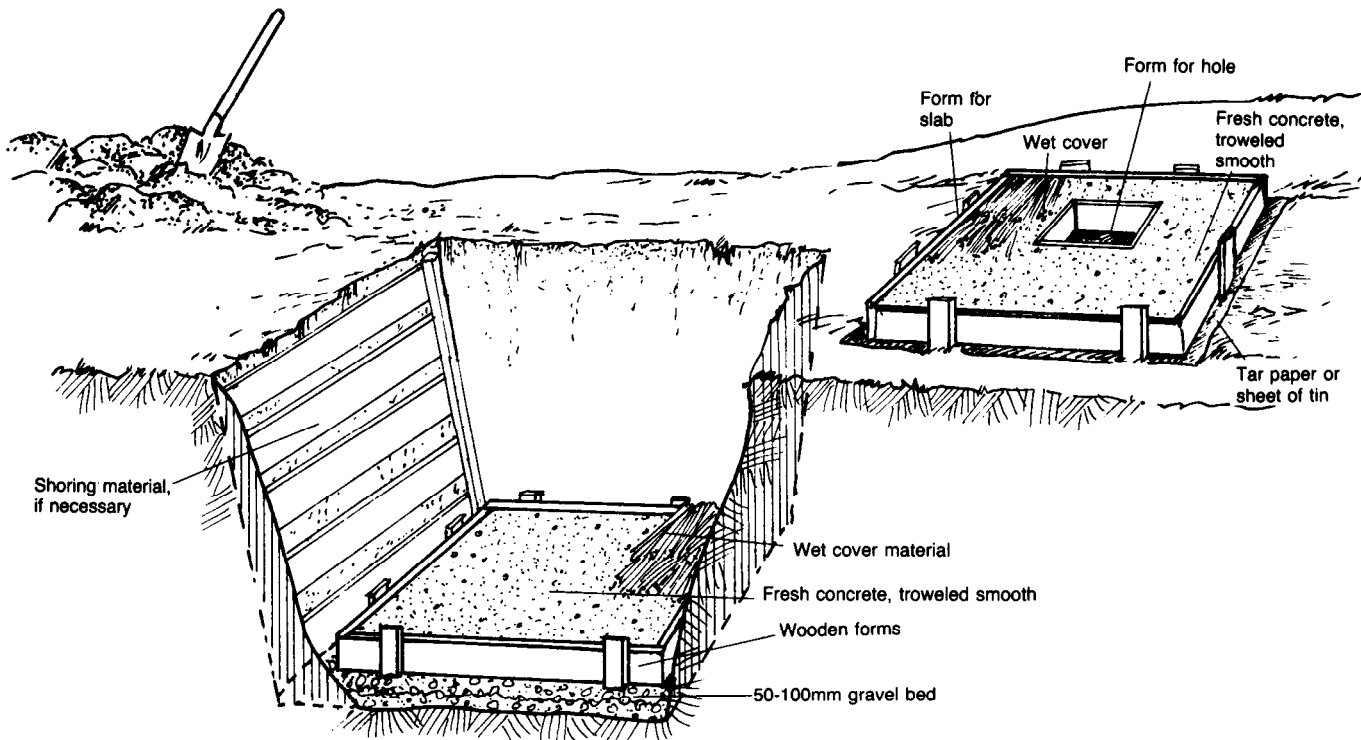


Figure 5. Fresh Concrete in Floor and Slab Forms

8. Cover the fresh concrete with wet straw, burlap bags, or equivalent, and keep moist for three to seven days. See Figure 5.

9. While the concrete floor is setting, build the forms for the slab. For details on slab construction, see "Constructing Slabs for Privies," SAN.1.C.1. The slab will be similar to the one for an off-set pit, with two exceptions: instead of installing a chute at an angle, install a drop-pipe extending straight down; the rear edge of the sitting or squatting hole is 450mm from the rear edge of the slab.

10. Half-fill the slab forms with concrete, lay in reinforcing material, and fill the forms the rest of the way. Smooth with a trowel and cover with wet straw or burlap. Keep moist for three to seven days. See Figure 5.

11. When the concrete floor has set, remove the cover material and the forms. Build the wall forms in place. Make two openings in the rear wall--one for the vent pipe and one for the overflow pipe. Make the vent pipe opening near the top corner of the wall. The position of the overflow pipe is critical, because it determines the flow line in the vault. The distance from the bottom of the overflow pipe to the floor of the vault must equal the liquid depth of the vault. The distance from the bottom of the overflow pipe to the top of the wall must be 300mm. Be certain these measurements are correct before pouring concrete. See Figure 6.

12. Position reinforcing material in the wall forms. Brace the forms to prevent them from collapsing when the concrete is poured. Coating the forms

with oil or grease will make them easier to remove so they can be used again.

13. Mix and pour the concrete into the wall forms. Be certain the concrete fills all voids in the forms. Use a steel rod or stout stick to work the concrete between the reinforcing material and the forms. Smooth the tops of the walls with a trowel.

14. Cover the tops of the walls with wet straw or burlap and keep them moist for three to seven days. See Figure 6.

15. Remove the cover material and wall forms.

16. Mortar the "T" fitting and overflow pipe in place. Attach about 0.6m of vent pipe in place. Mortar the joints between walls and floor. See Figure 7.

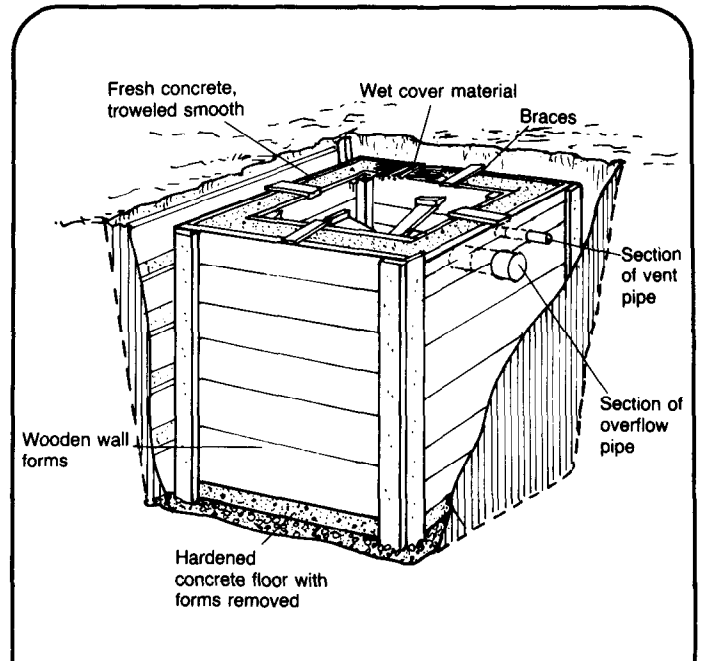


Figure 6. Fresh Concrete in Wall Forms

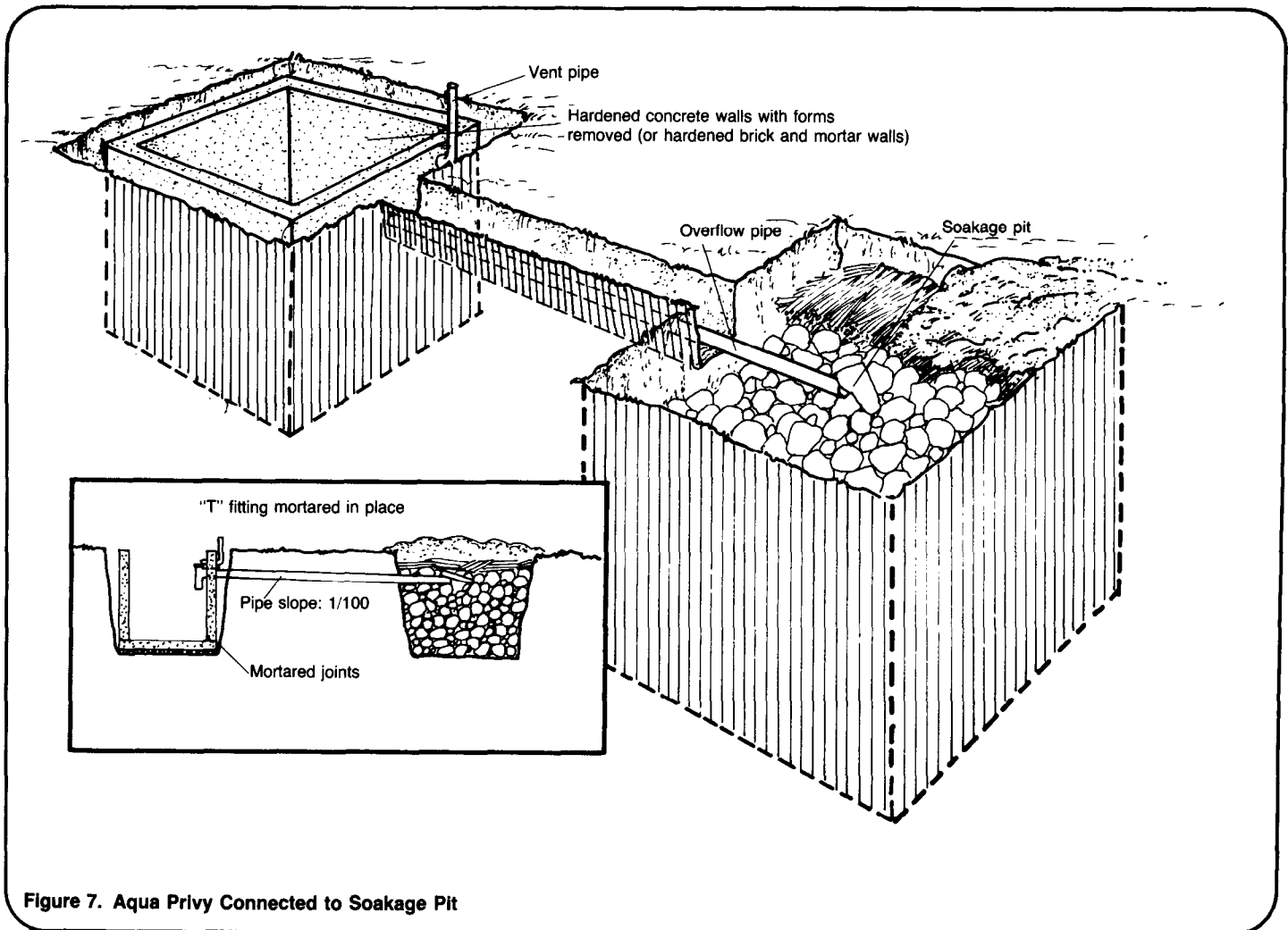


Figure 7. Aqua Privy Connected to Soakage Pit

17. Excavate the trench line from the vault to the soakage pit site. The trench should be as straight as possible and slope evenly downward from the vault to the pit site, with a downward slope of about 1 in 100 (one unit down for every 100 units in distance).

18. Lay the overflow pipe in the trench and mortar all sections together. Cover with soil.

19. Excavate the soakage pit. See "Constructing, Operating and Maintaining Sumps, Soakage Pits and Trenches," SAN.1.C.7 for complete details. Remember that the effective depth of the soakage pit is measured downward from the end of the pipe, not from the surface of the ground. Fill in the pit with rocks, extend the pipe to the center of the pit, cover with straw, and mound with soil. See Figure 7.

20. Use soil to fill in the space between the aqua privy vault walls and the sides of the hole. Be careful not to disturb or damage the overflow pipe.

21. Remove the cover material and forms from the slab. Mortar the drop-pipe in place and set the slab over the vault. The drop-pipe should enter the water to a depth of at least 100mm. Waterproof the edges of the slab where they meet the vault. Use tar or an equivalent, not mortar, because the slab will eventually have to be removed. See Figure 8.

22. Fill the vault up to the flow line with water.

23. If there are any additions to the slab, build them now. See "Constructing Slabs for Privies," SAN.1.C.1.

24. Build a shelter around the aqua privy. See "Constructing Privy Shelters," SAN.1.C.3.

25. Attach the remaining sections of vent pipe to the rear wall or roof of the shelter. See Figure 8.

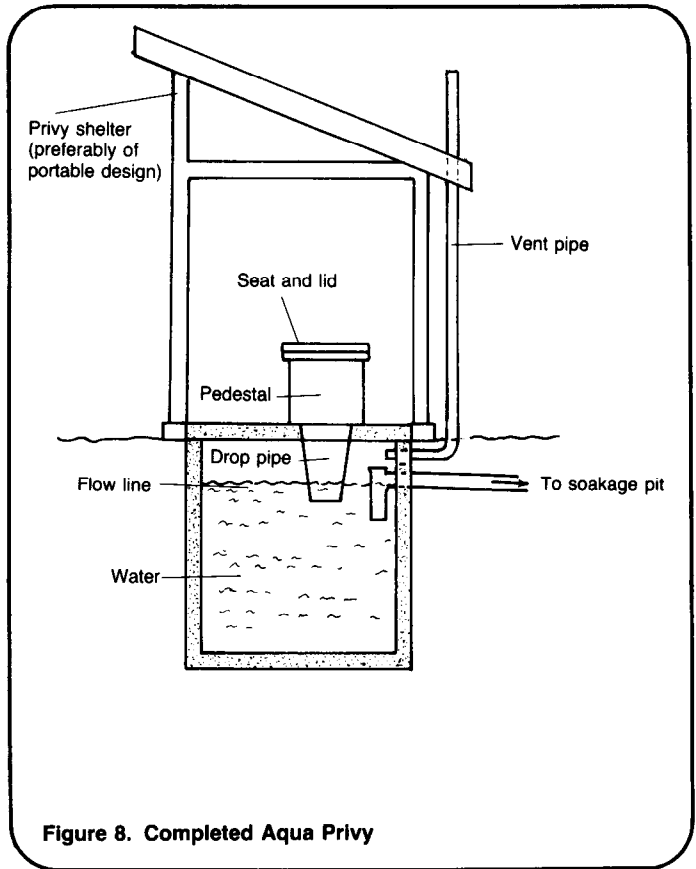


Figure 8. Completed Aqua Privy

### Building a Brick and Mortar Aqua Privy

1. Follow steps 1-10 for "Building a Concrete Aqua Privy."

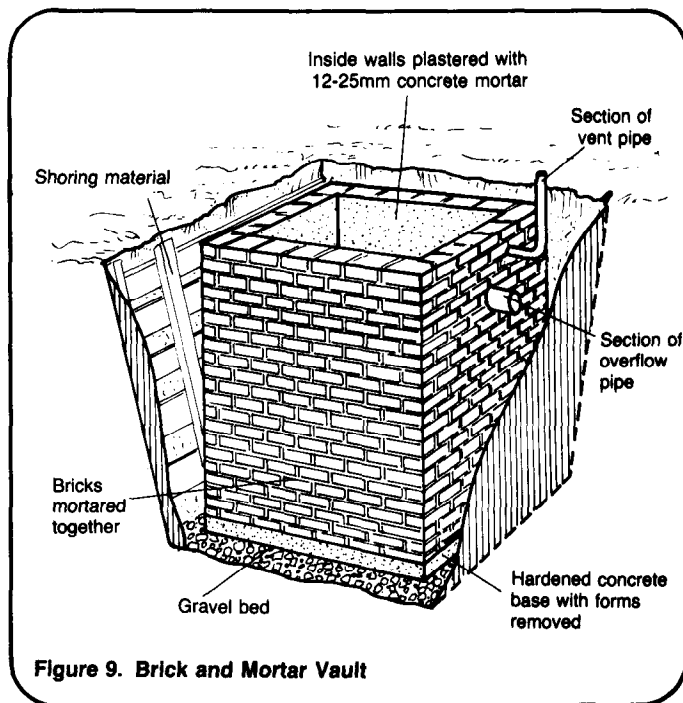
2. When the concrete floor has set, remove the cover material and the forms. Begin laying up the walls of the vault using bricks or concrete blocks and mortar. See Figure 9. A common mortar mix by volume is one part cement to three parts sand and enough water to make a workable mix.

3. When the rear wall reaches the flow line elevation, mortar a section of overflow pipe in place. Continue laying up the walls. Before the walls reach their design height, mortar a section of vent pipe in place near one corner of the rear wall. Continue laying up the walls until they reach the design height. If open bricks or blocks are used, fill in the top course with mortar.

4. Allow one to three days for the mortar to set.

5. Mortar the "T" fitting and overflow pipe in place. Attach about 0.6m of vent pipe in place. Plaster the inside of the vault with two 10mm coats of cement mortar. This will ensure that the vault is waterproof. See Figure 9.

6. Follow steps 17-25 for "Building a Concrete Aqua Privy."



**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.