6.

Strategies for Difficult Situations

This chapter presents a range of technical options for 1st and 2nd phase emergency implementation for difficult situations. It should be used to identify possible solutions for a specific situation. The final choice of option should be decided upon only after CONSULTATION with the intended users.

In some situations there may be specific challenges which make implementation of an emergency excreta disposal programme especially difficult, making it impossible to use traditional technologies.

Such difficult situations include:

- where the water-table is very close to the ground surface, limiting excavation;
- where groundwater sources are likely to be contaminated easily;
- where there is hard rock close to the surface, making excavation very difficult;
- where people are used to water-based systems but the soil and ground is non-absorbent;
- where the ground is so soft that pit walls collapse before an adequate depth can be reached;
- in crowded peri-urban or urban environments where there is little available space and limited accessibility;
- in flood-affected areas; and
- where toilets are not wanted or accepted by the community.

The technical solutions for excreta disposal in difficult situations, such as those described above, are limited. If conditions are obviously unsuitable a strong case may need to be made to support the movement of people to a more suitable site. However, often there is no other option to these sites and alternative solutions will need to be found.

6.1 High water-tables

Generally, the base of the pit must be at least 1.5m above the wet-season water-table to prevent contamination, but in some geological conditions this may be insufficient. If there is a conflict between latrine provision and water supply it is usually easier and cheaper to develop another water source than to provide alternative excreta disposal facilities. This may not always be possible, however, and wherever the groundwater level is high, protective measures should be taken, especially where groundwater is used as a source of drinking water.

In situations where the groundwater is less than 1m from the surface it is virtually impossible to prevent contamination of the groundwater, therefore greater attention should be paid to ensuring that people do not drink water from shallow wells without treating the water in some way.

If groundwater resources are not exploited for water supply in the area, the prevention of groundwater contamination should be of secondary importance to the provision of adequate excreta disposal facilities.

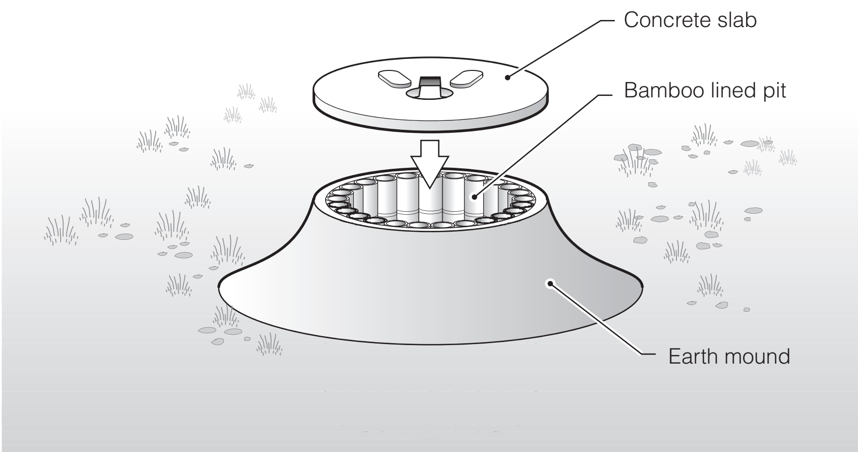
Where the water-table is high **and** groundwater is used as a water source, there are a number of excreta disposal options that can be applied, including:

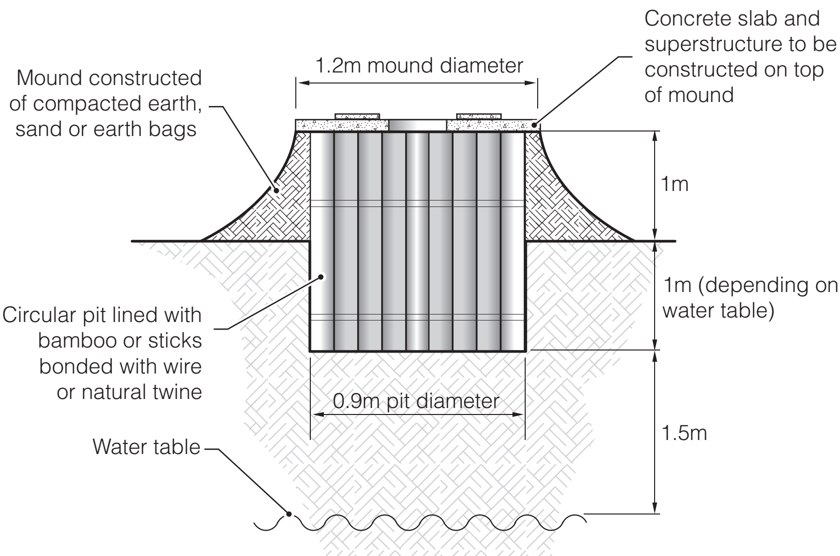
- **Raised pit latrines** – widespread solution, relatively simple to construct, require emptying, may be single or twin-pit;
- **Sand-enveloped pit latrines** – relatively time-consuming to construct, require suitable sand, can be combined with a raised pit;
- **Sealed pits or tanks** – must be water-tight, can be above or below ground, relatively expensive;
- **Dehydrating or composting latrines** – can be raised or shallow twin-pit, work best where people are already accustomed to their use or where there is agricultural activity; and

- **Septic-tanks or aqua-privies** – can be above or below ground, relatively expensive, require water and space.

Raised pit latrines

The most common solution for excreta disposal in areas of high water-table is to build raised pit latrines. These can be in the form of simple pit latrines or VIP latrines in which the pit is built upwards above ground level using bricks, blocks, stone, concrete rings, corrugated-iron culverts or earth-covered bamboo or wood reinforced mounds (see Figures 6.1 and 6.2 for examples). This increases cost and construction time considerably and family members may be unable to construct this type of latrine by themselves. To prevent contamination of groundwater, the bottom of the pit should be **at least** 1.5m above the water-table level. It is especially important to know how many people will be using the latrines and to calculate the rate of solid and liquid accumulation in the pit, to size them appropriately. A large number of small-capacity latrines, wide rather than deep, are preferable to fewer large-capacity latrines.





Cross-section through latrine

Figure 6.1. Raised bamboo lined latrine

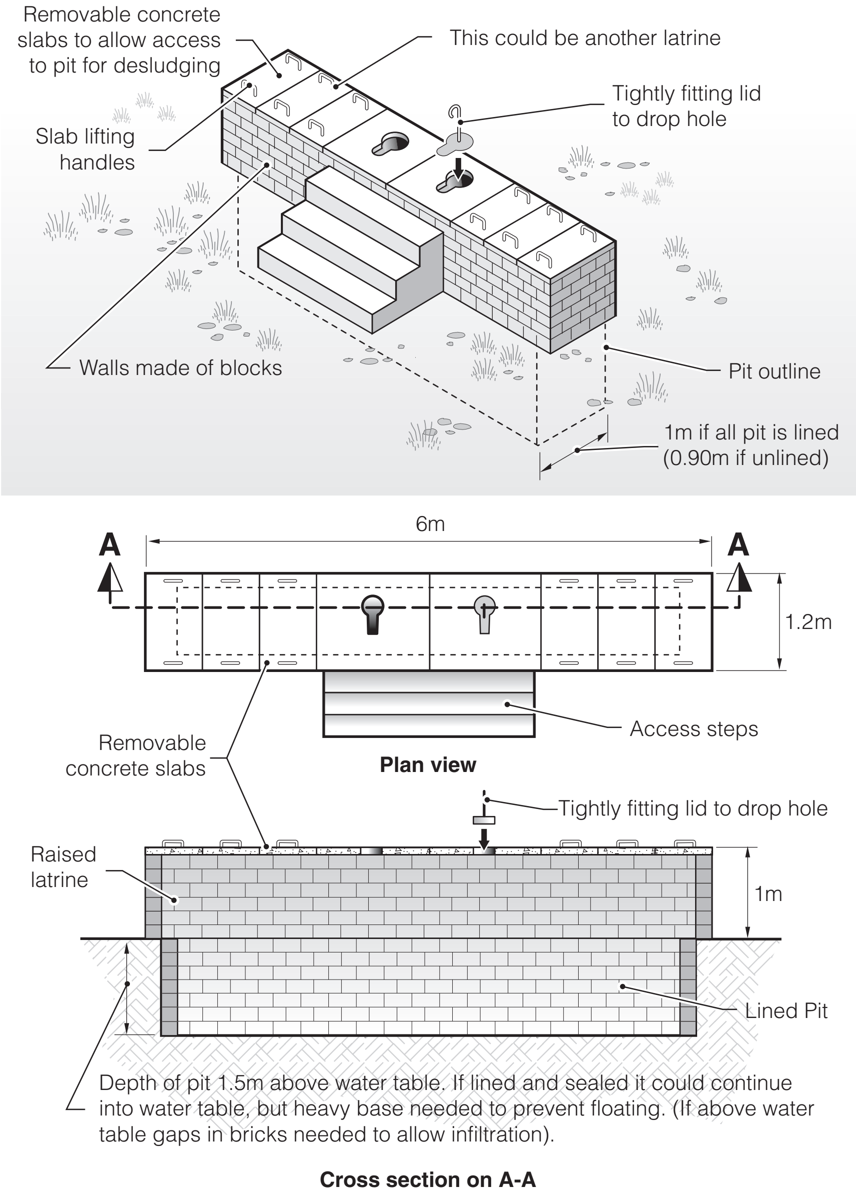


Figure 6.2. Raised block latrine

Using the same concept as the raised pit latrine, mounds or platforms could be built whereby people can defecate directly into buckets or drums which can be emptied manually.

Sand-enveloped pit latrines

Where there is a high risk of groundwater contamination, and it is important to prevent this, a sand envelope can be constructed around a lined latrine pit to reduce pollution (see Figure 6.3). This envelope is usually about 0.5m thick and acts as a filter to minimize the transmission of disease-causing micro-organisms. It should not be assumed that this will stop contamination completely. Where the risk of pollution of nearby groundwater sources is especially high, and there is no viable alternative, it may be appropriate to construct sand-enveloped raised pit latrines.

Eco-San and twin-pit latrines

Eco-San latrines can be used in areas of shallow groundwater. These normally consist of two chambers and are raised above the ground to facilitate easy emptying. One chamber is used until it is full, at which point it is sealed and the second chamber is used. If the contents of the first are left to stand for 1-2 years the waste will be relatively safe to handle and the pit can be emptied. Chambers must be sized so that each takes 1-2 years to fill in order to allow the contents of the first to decompose while the second is being used. Once both pits are full the first can then be emptied and used again.

Eco-San latrines can be urine-diverting or non-urine-diverting (see Section 5.3). The objective is to reduce excreta to a safe re-usable state, either by dehydrating the waste (in a urine-diverting latrine) or by encouraging bacteria, worms, or other organisms to break down organic matter to produce compost (in a non-urine-diverting latrine). The final product can then be used for soil conditioning for agricultural purposes.

Eco-San is most successful in emergency situations where the users are already accustomed to its use and there is significant agricultural activity in the area. Even where this is not the case, however, it can sometimes be used in areas of shallow groundwater if an appropriate consultation process is followed (see Box 6.1).

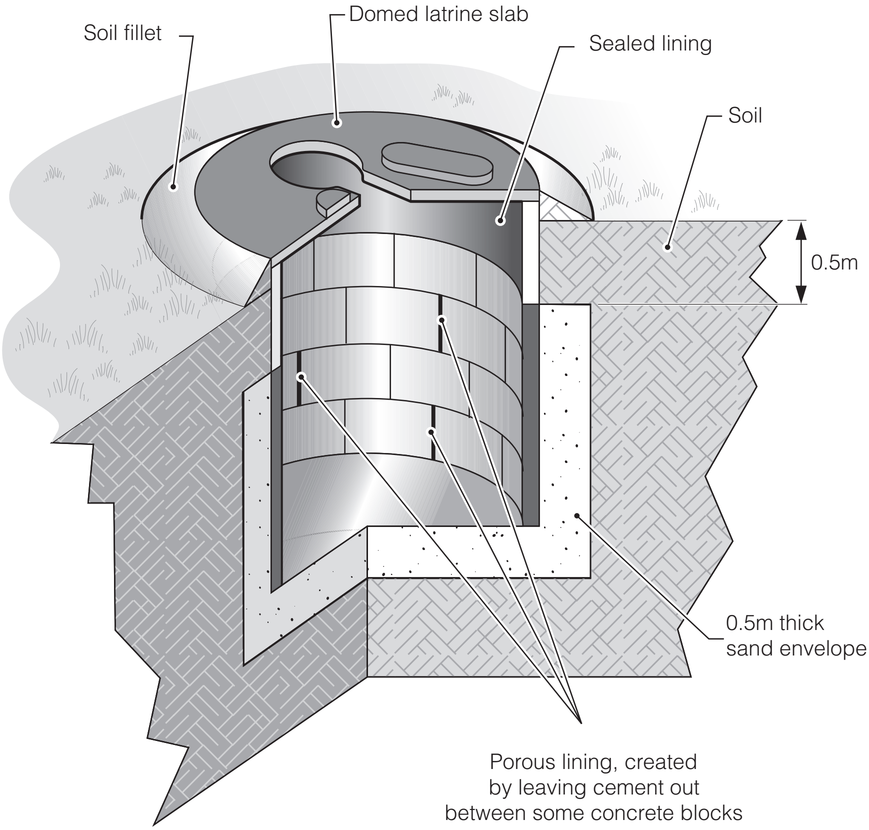


Figure 6.3. Sand-enveloped latrine

Box 6.1.

Twin-pit composting latrines in Nepal

In March 1992 around 90,000 people fled persecution in Bhutan and became refugees in the lowlands of Eastern Nepal. An initial rapid assessment indicated that communal latrines were not proving to be very effective with widespread evidence of open defecation and pollution of shallow tube wells. Following consultation, it was decided that twin-pit composting latrines should be constructed in order to deal with the shallow water-table, each shared between two families so that they would take responsibility and feel ownership of latrines and so that solids accumulation did not exceed shallow-pit capacity.

The immediate impacts of this decision included:

- moving from communal latrines to shared family latrines initially reduced and, subsequently, virtually eliminated open defecation;
- in conjunction with improvements in water supply and hygiene promotion, health problems related to excreta-related diseases started to decrease to manageable levels.

Longer-term impacts included:

- health improved to an acceptable level for the area;
- over a nine-year period, latrine costs were kept to an affordable level as investments are only required for maintenance;
- local government and other agencies were very satisfied with the latrine design – which was subsequently introduced to local communities in villages surrounding the camps;
- the refugee community was very satisfied with the latrine design and most participated in pit emptying on a voluntary basis.

Composting latrines were introduced to communities with no previous knowledge of such systems, initially for technical reasons, but with results that were not expected by many people. These latrines have proved to be popular with the users over many years without major change or problems occurring. In this regard the decision to choose this design early on was the right one.

Double-vault Eco-San latrines should be designed so that the time taken to fill one vault or pit is one to two years. Where it is not feasible to dig a deep pit, it may be easier and cheaper to dig several shallow pits side by side and move the latrine superstructure. If groundwater almost reaches the ground surface, or there is a risk of flooding, both excreta chambers can be constructed entirely above ground (see Box 6.2). Twin-pits can also be used in conjunction with VIP latrines or pour-flush latrines where pits can be off-set but still require emptying.

Sealed pits/tanks

Groundwater contamination can also be prevented if the disposal pit or tank is fully lined and sealed, so that the contents are unable to infiltrate into the surrounding ground. This can be done using locally available materials such as concrete, cement blocks, bricks, plastic tanks, Oxfam tanks, and concrete or metal culvert rings. The construction of fully lined pits is expensive and time-consuming, however, and is likely to be impractical where family latrines are desired. The second disadvantage is that such pits will need to be emptied relatively regularly, as no infiltration can occur.

Septic-tanks and aqua-privies

Septic-tanks and aqua-privies can also be used where the water-table is high. These minimize groundwater contamination by reducing pathogens in the waste, especially if the final effluent is discharged on the ground surface of agricultural land. Such systems are most appropriate where water is available in reasonably large quantities and where water is used for anal-cleansing.

Septic-tanks can be constructed above or below ground but, if below ground, the weight of the tank must be sufficient to prevent flotation due to high groundwater. Sufficient weight is most easily achieved by constructing a thick concrete base to the tank. A simple relationship to calculate the depth of concrete required for the base is:

$$\textbf{Depth of concrete base (D)} = \frac{\textbf{Height of tank (H)}}{\textbf{2.4}}$$

(Where the density of concrete is taken as 2.4kg/m^3.)

Using this method, a tank of height 1.5m would require a base depth of 0.6m. This method assumes that the ground is completely saturated and that the total hydrostatic uplift will be countered by the weight of the concrete base alone (the walls and roof are not included). Consequently, this method carries a significant degree of safety and may involve significantly more mass concrete than the minimum required.

For a reinforced-concrete septic-tank, a more accurate calculation for a more efficient design is as follows:

$$\mathbf{D} = \frac{(LWH/2.4) - 2WHt - 2HLt - LWt - 0.8Ht(W - 2t)}{LW}$$

Where: **D** = minimum depth of concrete base required

L = total external length of tank

W = external width of tank

H = height of tank (without base or roof)

t = thickness of tank walls

This assumes that all the tank walls (including the dividing chamber wall) and the roof are constructed from reinforced concrete (of density 2.4kg/m^3) and that all the walls are of equal thickness.

An alternative approach to prevent flotation as a result of uplift is to create a width toe by extending the base of the tank on all sides so that it is wider than the walls. For example, for a tank of width 1.0m and length 3.0m, the dimensions of the base might be 1.6m by 3.6m, creating a 300mm lip around the tank walls. The 300mm space around the tank is then filled with soil so that the weight of soil above the edges of the base assists in overcoming uplift. However, this design is more difficult to construct.

Box 6.2.

Elevated compost latrine construction in El Salvador

The first foundation of the latrine – a pit is excavated and filled with rock. Reinforcement iron rods are placed around the pit and a second 3/8” reinforcement is placed where the prepared concrete blocks (100 x 200 x 400mm) are arranged.

Structure of the latrine is raised with concrete blocks and steps going up to a reinforced-concrete floor.

Completed latrine with two polyethlyene seats and a zinc-aluminum laminate superstructure.

6.2 Flooding

Flood disasters as a result of hurricanes, cyclones and heavy rainfall may lead to enormous human suffering, loss of life and economic damage. There are different types of flooding events that cause different problems; we can define three main types of flood:

- **Rapid-onset floods** – these include flash floods, tidal surges, high runoff from heavy rainfall, dam bursts and overtopping, canals and rivers bursting their banks; typically water rises to dangerous levels within 48 hours.
- **Slow-onset floods** – prolonged rainfall causing low-lying areas to gradually become flooded over a matter of days or weeks.
- **Annual seasonal flooding** – many communities around the world are flooded annually and may be under water for some considerable time each year.

While the majority of deaths associated with flooding are directly attributable to rapid-onset floods, many deaths also occur from diseases immediately after flood events as a result of unsanitary environments and contaminated water. Good and appropriate excreta disposal in these situations can have a profound effect on the health of the affected populations.

To ensure an environment free from faecal contamination, three main areas must be addressed:

1. promotion of good excreta disposal practices by the affected population through the involvement of the community in the design and siting of the latrines;
2. prevention of overflowing of raw sewage from pits and septic tanks during flooding which would result in a very serious environmental-health hazard; and
3. provision of adequate excreta disposal facilities for displaced people during flooding.

Particularly if sanitation systems are already inadequate, flooding can have **serious consequences**. Sewage may be washed into houses and damage to sanitation systems can contaminate water supplies. The combined effects of open sewage and reduced opportunities for good personal hygiene also favour the spread of infections causing diarrhoea, such as cholera and gastrointestinal viruses. Countries with a good infrastructure for drainage and disposal of human waste have far fewer direct health problems during flood disasters, showing the importance of taking measures for disaster preparedness.

Flood-response strategy

There is no single solution for excreta disposal in response to a rapid-onset flood event. The optimum solution will depend on local cultural practices, environmental issues and what local materials are available for use.

Public consultations and awareness programmes are essential to inform people of the possible knock-on effects of floods and establish what it is and isn't possible for the community to do. If a community truly understands the enormous public health risks associated with poor sanitation they themselves can often find more creative, low-cost solutions than most NGOs can.

Even in a 1st phase emergency, hygiene and public health promotion is a crucial component of response. The population needs to be involved in decision-making and implementation as much as possible right from the start. People need to know why it is important to remove or contain the excreta and the different ways in which this can be done. They should be consulted as far as possible on the siting, design and use of any excreta disposal system proposed.

Possible excreta disposal solutions for flood-prone areas for first- and second-phase emergency response are summarized below.

1st Phase options for rapid-onset floods

- **Over-hung toilets** – in floods where there is still flowing water or a river nearby, one of the quickest ways to eliminate the public health risk is to excrete directly in the river. Before this option is selected it is essential that a sanitary survey of downstream water use is conducted to ensure that it does not present a major health risk for people downstream. Cubicles should be quickly erected for this as in most cultures privacy is a major concern, especially for women. It is also important that construction is sound and that latrines are accessible and safe for users including young children, the elderly and disabled people.

- **Floating latrines** – similar in principle to over-hung latrines, floating latrines are designed so that faeces fall directly into a river or into floodwaters. The base of the latrine superstructure is commonly made from timber/bamboo so that it floats like a raft (see Photograph 6.1).
- **Portable chemical toilets** (Section 4.8) – this is an expensive short-term option and depends on the local availability of such toilets. Chemical toilets require regular servicing and emptying and a contractor to do this; it is also necessary to have a flat, stable surface on which to place each unit.
- **Bucket latrines** (Section 4.6) – a number of large buckets/containers or barrels with squatting slabs of some sort over the top can be set up so people can defecate in them. These need to be provided in makeshift cubicles, using cloth, plastic sheeting or local building materials, and need to be emptied daily. A safe system of bucket collection and final disposal of excreta is essential if this option is to have minimal negative impacts.
- **Plastic bags** (Section 4.7) – in the immediate aftermath of some flood events, such as those in Bangladesh in 1998, people can defecate in plastic bags and then float them away. This is an emergency short-term measure only and if the bags are not collected and disposed of properly, or a river does not take them out to sea, this would constitute a serious health risk.
- **Temporary dismountable latrines** (Box 6.3) – where flooding has damaged existing sanitation facilities, temporary latrines that can be disassembled after use and reused elsewhere can be constructed locally. These are designed to be assembled above a pit latrine with urine separation to a soakaway. They can also be raised if there is a continued threat of flooding or to prevent groundwater contamination in areas with high water-tables.

Photograph 6.1. Floating latrine in Indonesia

Box 6.3.

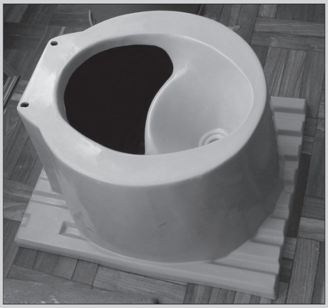
Dismountable latrines in flooded areas of Eastern Bolivia

The San Julian region in Eastern Bolivia is prone to periodic flooding. Often, traditional pit latrines and water-flush systems are destroyed by floodwaters following such events. Following recent floods in March 2006, a novel, communal latrine unit was used that can be disassembled and moved to a new location if required. The unit was manufactured locally off-site, and planned for installation in locations such as schools and other community buildings.

The design incorporates two-drop-holes and a urinal for males; two-drop-holes for females, handwashing facilities and an external laundry basin. The unit was designed to be placed on a dry pit 4m long, 0.9m wide and 2.5m deep, and is fitted with four urine-separation toilet bowls connected to a soakaway

Key design features:

- Located in communal buildings
- Dry pit (raised in flood zones)
- Urine-separation toilet pedestal
- Dismountable (can be moved)
- High-quality units
- Integrated handwashing and laundry facilities



2nd Phase options

- **Raised latrines** (Section 6.1) – there is a variety of ways to raise latrines (including using earth, mud bricks, cement blocks and concrete structures depending on what is locally available) and it is normally necessary to raise them by only 1–1.5m above ground level. If this option is selected as part of a flood-response strategy, it is important not to forget the house; if the house is submerged then people will flee their houses anyway. There are numerous examples of excreta disposal programmes where implementing agencies have raised latrines above the level of the users' houses.
- **Sealed pits or tanks** – such pits may need dewatering before construction can go ahead; 1m^3 pre-cast ferrocement tanks can usually be manufactured fairly easily or plastic tanks can be used with appropriate fittings for desludging. This is the preferred option for institutions such as schools and hospitals; when used for houses one tank can serve a number of houses. (N.B. These are not septic-tanks since they only contain the waste for a limited period and then need to be emptied. They do not treat sewage prior to discharge to a soakfield or sewerage system, as in a septic-tank.)
- **Raised water-tight tanks** – where there is a need to prevent human excreta being washed into surface water and/or a need to prevent groundwater contamination, raised water-tight tanks may be used. These are constructed above ground and excreta is contained in a water-tight plastic or ferrocement tank. Facilities for desludging are required.
- **Eco-San latrines** (Section 5.3) – not recommended for areas that flood frequently (see Box 6.4) but for where floods have subsided (but digging pits is impossible). Where people do not have a history of excreta reuse, it will take a long time to raise awareness of the process initially and, later, for using the waste when the first container is full.
- **Low-cost sewerage system** – if there is sufficient water available, and large-bore drainage pipes, from 200mm to 3m in diameter, then people can defecate directly into special holes in the pipe, and water will be released periodically to wash the sewage into a sump for desludging or for pumping out to sea. Washing areas could also be plumbed into these sewage drains to help the effluent flow.

Box 6.4.

Elevated compost latrines in Dominican Republic

In the second-phase response to flood-affected communities in Dominican Republic, 210 latrines were built, some for individual families and some shared between three to six families. The public-health promotional work before, during and after the construction was extensive and latrines were generally used properly and kept clean.

The latrines had to be elevated, as the water-table was less than 1m below ground-level, and composting latrines were deemed appropriate as there were other latrines of this design in the area and any other solution involving desludgeable tanks would not be sustainable. The normal rate of solids accumulation was approximately $0.06m^3$/person/year. Therefore, based on three families comprising 15 people, latrines were designed with a combined volume of the two compartments of $1.44m^3$, allowing for 20% reduction over a 2-year period.

After one year (or when the first compartment was full) the users were expected to move the toilet pedestal from the drop-hole of the first compartment to the drop-hole of the second. Since the area was prone to flooding, the compartments were sealed with breeze blocks to prevent floodwater entering and to ensure that the contents of the compartment were kept dry to facilitate adequate decomposition. Users were expected to crack open the breezeblocks of the first compartment to remove the compost and then reseal them.

There was concern over whether people would cement up the breezeblocks once they had cracked them open to extract the compost. Some felt that some kind of door or panel might have been more appropriate and sustainable than sealing with blocks, while others argued that this would not be watertight. This illustrates the problem of using composting latrines in flood-prone areas.

- **Small-bore sewage systems** – in crowded settlements prone to flooding, small-bore sewage systems can remove the sewage from densely populated areas but, unless this is constructed properly, it can be prone to flooding itself. Many developing countries also face the problem of lack of sewage treatment for these low-cost systems.
- **Sewage-treatment system** (Section 5.8) – on-surface package wastewater treatment systems can also be used in flood-affected areas, but these are relatively high-tech, high-cost solutions.

Where latrines are situated in areas prone to seasonal flooding, the **pits need to be sealed** to stop the sewage mixing with the groundwater and polluting water sources. This can be done with cement-plastered bricks or blocks, ferrocement or concrete rings. Where flooding can be excessive, **tight-fitting lids should be put on the squat-hole** so that the sewage cannot rise up out of the hole. **Water-seals** can also be used to prevent solids escaping when the tank/pit has become waterlogged.

In some cases flood events can actually have a positive effect by encouraging people to use latrines (see Box 6.5).

Box 6.5.

Flooding as an impetus for latrine use in Nepal

A survey of flood-affected areas in Nepal found that less than 50% of the affected population initially had access to toilets. However, changes in their environment as a result of flooding, such as relocation of villages, denial of access to forests and riversides by the Government – and refusal by landowners to allow defecation on their land – resulted in an unprecedented acceptance and demand for latrines at the village level, even among groups who had never previously used latrines.

6.3 Rocky areas

The solutions suggested for high water-table and flood-affected areas are also applicable to rocky areas.

In addition, for first-phase emergency response in areas where the ground is extremely rocky – making it virtually impossible to dig trenches or cover faeces with soil – **intensive defecation areas** may be needed. In this case a defecation area is set up and each time a person goes to use it they are given a shovel with a cupful of burned lime to take with them. They then sprinkle half of the lime on the sand before defecating on top. The rest of the lime is used to cover the faeces, which are then scooped up on the shovel and taken out to be put in a covered container at the side of the fenced-off area. Staff empty the containers into an off-site pit, or load them onto a truck for disposal elsewhere. As with other public toilet facilities, water and soap should be provided at the defecation area for washing hands. When the sand layer becomes depleted as users scoop up faeces, it should be covered again. This method was used in Goma in 1994.

Also in Goma in 1994, people were encouraged to use existing fissures in the rock for excreta disposal. However, these became full very rapidly. If using rock fissures, extra care should be taken that it is not likely to contaminate an aquifer, especially where groundwater is used for drinking. If mechanical diggers are available, larger pits can be excavated in soft and brittle rock and can be adapted into septic-tanks.

6.4 Urban environments

It is particularly difficult to provide effective excreta disposal when working in a large urban environment. Normally, the first strategy is to make use of or rehabilitate any existing latrines; this may involve isolating part of the sewer system if some parts are damaged. If the sewer is still in operation, a simple emergency option is to construct drop-hole latrines directly over open inspection covers, to allow excreta to drop directly into the sewer. If there is insufficient wastewater discharge to flush the sewer, water tankers can be used to flush them once or twice a day.

If there is large-scale damage to the sewerage system, attempts should be made to locate septic-tanks and set up temporary latrines which feed into them. In some situations it may be possible to hire portable toilets, but these require desludging almost daily in crowded sites, and should only be considered if regular desludging can be guaranteed.

Another technical solution is to use concrete culverts, by blocking off the ends of a row of culverts, digging them in to the ground and making squat-holes in the top of the culverts. If set on a slight gradient, the ’tube‘ can be desludged from one end. Tanks such as Oxfam tanks can also be dug into the ground and used as desludgeable excrement containers.

Emergency wastewater treatment systems can also be used in urban environments (see Section 5.8), though this is rarely the most appropriate option.

In urban areas it is better to concentrate on communal areas such as markets or transit centres rather than attempt to provide family latrines for everyone. Discussions with community groups should help to identify where the risks are and whether there are possible solutions, such as several families sharing one latrine or public latrines at key locations.

Sewerage systems

Sewerage systems are not common in emergency situations, although they may be used where the affected population remains or relocates in an urban area. Most sewerage systems need at least 20 to 40 litres of water per user per day to be flushed into the system (Adams, 1999). In addition, pumped sewerage systems and sewage-treatment works may require a back-up power supply to keep the system running. This may be a major undertaking.

Where it is necessary to construct a small-scale sewerage system, for example, to feed a septic-tank for several households or for an institution, the following design conditions should be noted:

- Sewage pipes below the water-table should be avoided where possible, to prevent ingress of groundwater, or increased groundwater contamination.
- Pipes in unsaturated ground should be laid in a trench with 200mm of sand below and 300mm above.
- Waste pipes should always be situated below water pipes to minimize potential contamination.

- Pipes should have a minimum diameter of 100mm and should be installed with a fall of approximately 1:40. If the use of smaller-diameter pipes is unavoidable, then a greater fall is needed, i.e. about 1:30 for 75mm pipes.
- Roding eyes should be placed at all upstream termini, intersections of pipes, elbows of 45° or greater, high points in the system and every 30m along straight pipe runs. These allow access for the use of rods to prevent and remove blockages.

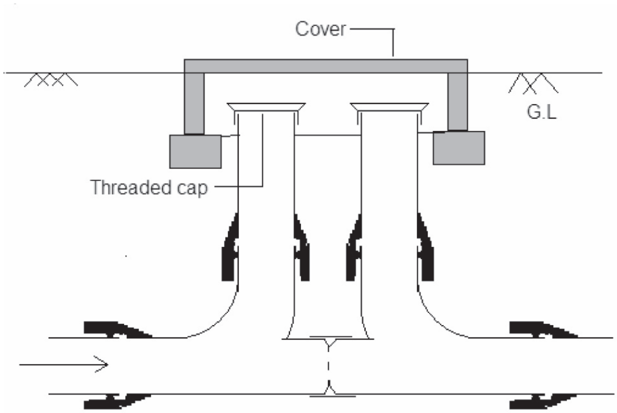


Figure 6.4. Roding eyes - double

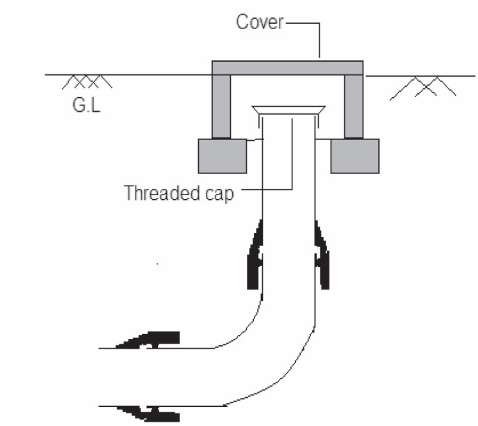


Figure 6.5. Roding eyes - single

- Two or three rocker pipes should be used whenever a pipe exits a static structure to allow for slight movement.

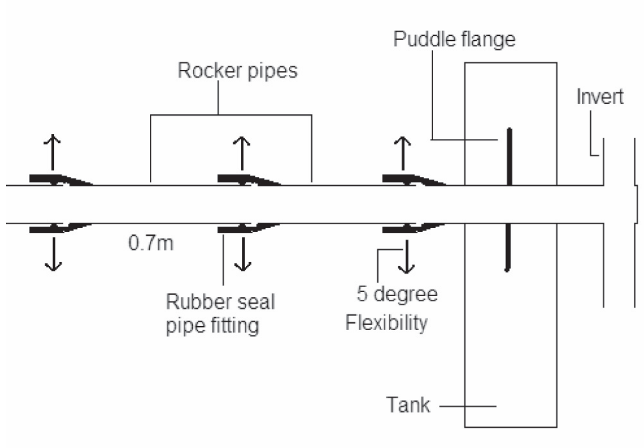


Figure 6.6. Rocker pipes

- If the pipe run has to turn greater than a 90° bend, then turning in 45° stages helps to prevent blockages.

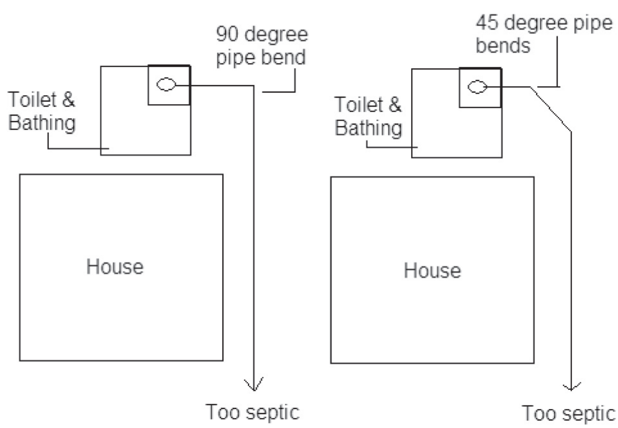


Figure 6.7. 45 Degree pipe bends

See **Appendix 4.10** for a bill of quantities for a sewerage network and infiltration system for five houses.

6.5 Where toilets are not wanted

There can be various situations where people don't want to use toilets or latrines. This normally occurs where latrines are not usually used outside emergency situations and the people themselves do not want to begin using them – or where the local government or landholder does not want to see any form of permanent sanitation system.

The **cat method** is an option for communities who are not familiar with latrines and do not want to use them, such as nomadic communities. This approach encourages people who defecate on the ground to cover up faeces as soon as possible with soil, and provides the necessary tools, such as small hoes, to do this. These hoes provide another incentive to participate in the excreta disposal programme as they can also be used for farming. While other measures are preferable, the cat method is an effective alternative that ensures safe disposal of excreta and does not force latrines on people who do not want them.

Hygiene promotion is particularly important in promoting this method as it emphasizes the importance of covering up faeces so that vectors do not contaminate the local environment. This method can also be used in designated defecation areas along with health promotion and handwashing programmes, or in rural marginalized areas where it is very difficult to obtain any kind of material to construct latrines.