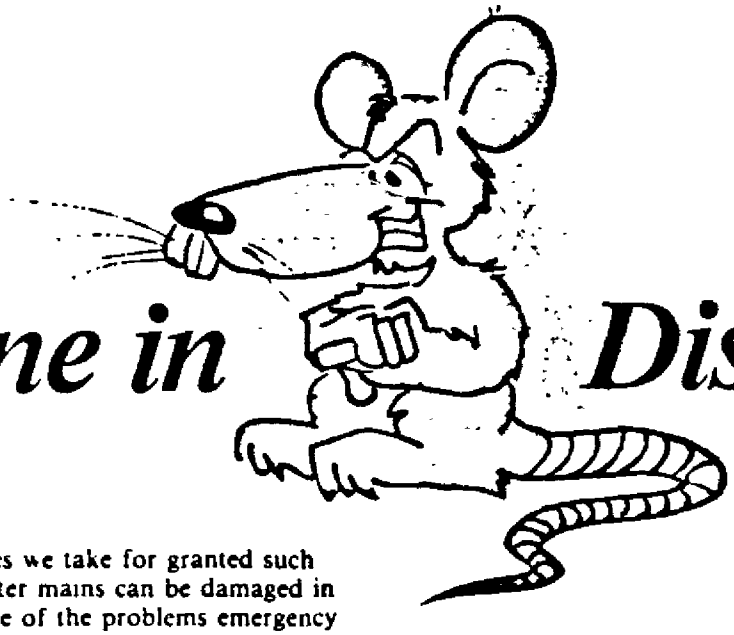


Hygiene in Disasters

by Larry Coyne

Illustration Jocelyn Rimmer

Many of the services we take for granted such as sewers and water mains can be damaged in disasters. And one of the problems emergency planners have to address, especially in evacuating people to community emergency accommodation in the wake of a hurricane, tornado, flood or chemical accident, is the disposal of body wastes.

The same applies to families who take temporary refuge in damaged dwellings. Human body wastes contain a concentrated variety of deadly viruses, bacteria and poisonous chemicals. If human wastes enter the water supply, the resultant concentration and spread of bacteria could cause sickness and death. Human excrement also attracts cockroaches, rats and other vermin that can carry dysentery, typhoid and plague. There is no doubt that improper waste disposal in the aftermath of a disaster is a good way of causing an outbreak of disease.

To avoid disease it is imperative that waste matter and the pests it can attract be kept away from food and water supplies.

Makeshift Toilets

To preserve the health and morale of those in a confined space without a toilet or special chemicals for treating excrement and urine, human wastes should be removed before they produce much gas. A garbage can with a lid or bucket covered with plastic will not hold the pressurized gas caused by decaying feces. The following means of disposal are listed in increasing order of effectiveness:

- Use a 23-L paint can, a bucket, or large waterproof wastebasket to collect urine and excrement. It should be tightly covered when not in use; a piece of plastic tied near the top keeps out insects and reduces odours. When such waste containers are full or begin to smell while covered, put them as far away from the shelter as possible — still covered to keep out flies. For some people, especially the elderly, a toilet seat or padding could be placed on top of the pail. An improvised seat of plywood serves well.
- If it looks as though you are going to be confined to your temporary shelter for some time, dig a waste-disposal pit about one metre away, down-wind. The pit should be surrounded by a ring of mounded, packed earth about [illegible] high, to keep surface rainwater from runni
- A better system is to have all occupants use the bucket only for urination, and defecate into a plastic bag. Urine contains few harmful organisms and can be safely dumped outside.

Two layers of the thin plastic used to cover freshly dry-cleaned clothes will serve to hold the bowel movements of several persons. Gather the plastic around the excrement to form a bag-like container. Tie the plastic closed near its upper edges with a string or narrow strip of cloth. Do not tie it so tightly as to be gas-tight. Each day's collection should be placed outside. As time passes, the gas will leak out the tied end of the plastic covering. Flies will be attracted in swarms, but they will not be able to get into the plastic to contaminate their feet or to lay eggs. And because rotting excrement is so attractive to flies, occupants will be bothered less by these dangerous pests.

Use a hose-vented, 23-L can or bucket lined with a heavy plastic bag; cover tightly with a plastic lid when not in use. In this type of toilet, the vent-hose protrudes through a hole near the top of the paint can, and is taped to seal it to the can. Such a hole can be easily cut with a chisel or a sharpened screw driver. The hose is long enough to extend outside the shelter. Its outer end should be secured about 15 cm above ground level, to prevent water from running into it during a heavy rain. Since the toilet-can is tightly covered, foul gases will escape through the hose to the outdoors.

With its opening tied shut, a large plastic trash bag containing as much as 15 bags of waste can be lifted out of the toilet-can and placed outside.

Nervousness, combined with the effects of unaccustomed food and water, can cause even healthy persons to vomit. Vomiting is certain to cause both morale and health problems. In crowded emergency acommodations, the sight and smell of vomit will make others throw up. Vomit should be handled like excrement. Plastic bags, well distributed throughout the living quarters, are the best means of catching vomit and keeping it off the floor. Once contained, it should be placed outside.

A portable toilet available at commercial camping equipment stores is another option.

Any of these toilets could be used as outlined above, including the procedure for emptying the bag when full. The commercial portable toilet would prove more comfortable and streamlined than the 23 L can.

Chemical Toilets

Chemical toilets function much better than make-do buckets and pails but they require more space for the storage of chemicals and water. Ideally, the chemical toilet should be used only for liquid wastes while using plastic bags for feces.

To limit odours in your makeshift toilet, you can use chemicals designed for use in chemical toilets. Companies that sell portable chemical toilets also sell the chemicals for them. You can improvise your own chemicals from formaldehyde and methyl alcohol. Rubbing alcohol by itself can also be used.

Cesspools, Septic Tanks

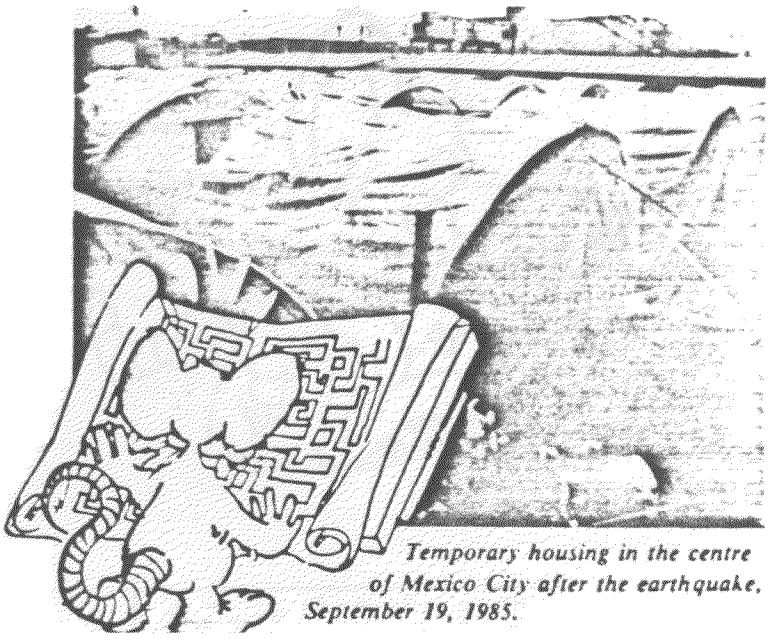
If there is a source of water in projected shelters, it should be possible to install a standard flush toilet in it. With extra work a septic system or even a crude cesspool could be added to contain the effluent. Such a self-contained system would bring about a great improvement in hygiene, as well as morale.

Cesspools are the forerunners of the modern septic tanks. A cesspool consists of a deep hole dug two or three metres deep in the earth with the walls lined with bricks. The bottom is left open to the earth and covered with 0.5 m of sand, gravel, and rock. The top of the hole is covered airtight to allow anaerobic bacteria to "digest" waste and to keep surface water out. Sewage drains into this pit through a sewer pipe.

A cesspool is safe to use only if it is well away from water supplies, and large enough to handle the amount of sewage coming into it. Cesspools were, and possibly still are, used as receptacles for the human waste of whole villages. They performed a good job of treating human wastes by using bacteria to break down the sewage before it travelled far into the earth. However, over a decade, the sludge builds up in a cesspool, and it must eventually be abandoned and a new one dug.

The septic tank is similar in concept to the cesspool. It is made so that the sludge can be cleaned out periodically and water is allowed to seep from it back into the surrounding soil after it has been purified.

Septic tanks are built up in a series of two chambers. (See Figure 1.) The first chamber collects all the waste and uses anaerobic bacteria to digest the sludge. The second chamber holds the processed effluent until it is full, then the liquid is forced out as more waste enters the system. The discharge from the second chamber is then routed through a pipe into "vitrification beds" of gravel. The vitrification beds expose the water to the air and sunlight which kill most harmful bacteria. The water passes from the vitrification beds into the surrounding earth.



Temporary housing in the centre of Mexico City after the earthquake, September 19, 1985.

Theoretically, a septic tank can go on forever. However, sludge does accumulate and prolonged continuous use will require cleaning. The adequate size of a septic tank depends on the number of people using it. To alter capacity, only the length and width should be varied, since the depth is critical for bacterial action. The depth of liquid in the tanks should be 1.2 m with 0.3 m of air space over it. Capacity of the septic tank should be 0.3 to 0.4 m^3 per person using the system.

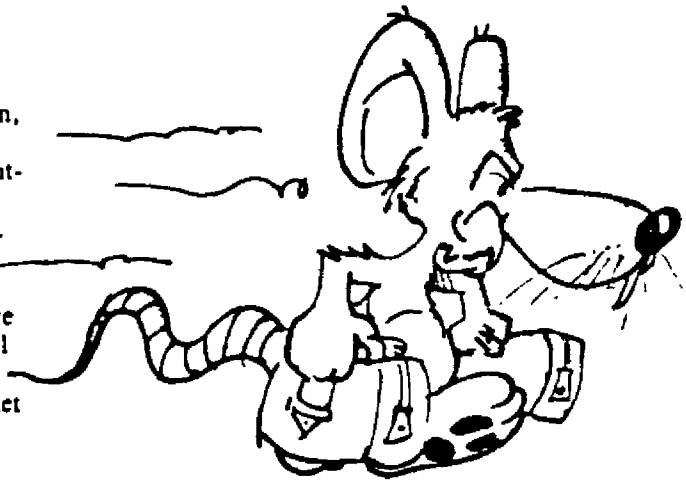
To ensure that the vitrification field is properly sized conduct the following test: Dig down 60 cm in the area where the underground vitrification field will be placed. Next, pour water into the hole to a depth of 15 cm and record the time it takes for the water to completely disappear. Divide this time by 15 to establish the average time it takes for 1 cm of water to sink into the earth. The following table gives you the required size of your vitrification field.

Vitrification Field Size								
Time for 2.5 cm fall to seep (minutes)	2	3	4	5	10	15	30	60
Square metres size needed	4.6	5.5	6.5	7.5	9.3	12	16.7	22.3

This table gives the vitrification field size for ONE person using the septic system. You should multiply the size figure by the total number of people projected to use it. If a large number of people is projected, it is more efficient to build several vitrification fields and connect them by Ts rather than making one very large and inefficient field.

Waste Water

It is of utmost importance for personal hygiene that those in emergency accommodation with normal amenities wash their hands carefully and frequently. This will generate a lot of waste water. Water in toilet or hot water tanks can be used if water mains are broken, as happens frequently in floods or earthquakes. In addition, the washing of food during its preparation will add to the quantity of waste water. In basement or separate outdoor shelters, you could install a hose with a funnel entrance leading to a drain point away from the shelter.



If it is not possible to do this, waste water will have to be treated in some way as garbage, and an additional receptacle for it must be placed alongside the garbage can. Waste water can of course, be thrown into the toilet if you have installed a regular toilet discharging to a cesspool or septic tank.

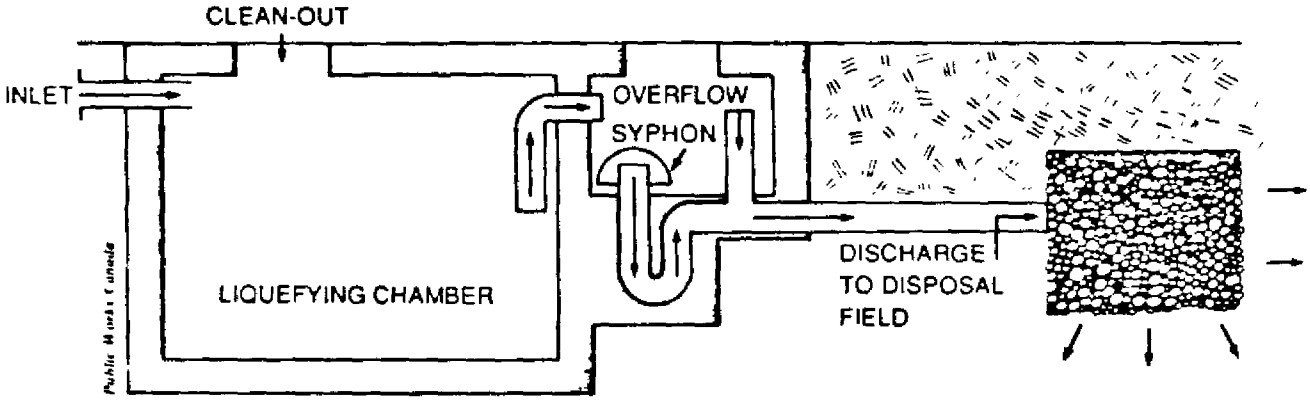


Figure 1: Vertical section through a concrete septic tank.

How to Keep Clean with Limited Water

There may be a time, whether as a result of a flood, tornado, chemical accident or an explosion, when you may be confined to emergency accommodation with a limited supply of water. Under these conditions, and particularly in hot weather, it is essential that you know how to keep clean and prevent skin diseases from posing serious problems. The following special hygiene measures should be followed:

- Wash off sweat and dead skin. (When it is hot and humid, dead skin is continuously rubbing and flaking off and starting to decay.) Your skin can be kept fairly clean by rinsing off each day with just a cup of water, while rubbing gently with a small cloth. Use about two-thirds of the precious water for the first rinse, starting from the face down and gently rubbing neck, armpits, stomach, groin, rinse off again, using bare fingers. If boiling water is available, sterilize washcloths every day by boiling them for a few minutes.
- Sleep as cool and bare as practical, to dry the maximum skin area.
- If practical, sit and sleep only where other members of your family do and avoid use of bedding by more than one family.
- Avoid infection from toilet seats by disinfecting with a strong chlorine solution and then rinsing, by covering with paper, or by not sitting down.
- Wash or disinfect clothing as often as practical, especially underwear and socks. Disinfecting clothing, not laundering it, is the most important health objective under difficult shelter conditions. Dipping clothing into boiling water disinfects it. Unless plenty of water is available for rinsing, do not disinfect clothing by putting it in a chlorine bleach solution.
- Wear shoes or sandals when walking about, to prevent fungus infections of the feet. ■

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