

Water for the World



Water Treatment in Emergencies Technical Note No. RWS. 3.D.5

The treatment of water supplies in emergency situations is important to protect people's health. When natural disasters, drought, or social unrest cause a loss of supply of potable water or when, for any other reason, a water supply is disrupted or a supply change is necessary, measures should be taken quickly to provide for a safe water supply.

This technical note discusses the use of several methods for emergency water treatment. Many are similar to simple household purification methods which are described in "Designing Basic Household Water Treatment Systems," RWS.3.D.1. Community members should be instructed in the best methods to use to make water potable during emergencies. Read the entire technical note to evaluate the type of treatment most appropriate to local circumstances.

The design process for emergency water treatment should result in a list of materials needed to provide the appropriate disinfection of water during the time potable supplies are cut off. A sample list for a water boiler appears in Table 1. A list of sources of chlorine and their strengths is in Table 2.

Table 1. Sample Materials List for Boiler System

Item	Description	Quantity	Estimated Cost
Labor	Emergency workers	—	—
	Unskilled labor	—	—
Supplies	200-liter steel drum	—	—
	20cm pipe nipple	—	—
	Valve	—	—
	Large funnel	—	—
	Cement blocks or bricks	—	—
	Filler plug	—	—
Tools	Solder	—	—
	Drill or punch	—	—

Total Estimated Cost = —

Useful Definitions

CLARIFICATION - The process of removing suspended matter and other forms of turbidity from water.

CONTAMINANT - An impurity which makes water unfit for human consumption or domestic use.

DISINFECTION - Destruction of harmful microorganisms present in water through physical (such as boiling) or chemical (such as chlorination) means.

TURBIDITY - Cloudiness in water caused by particles of suspended matter.

When dealing with a disruption in the water supply, the major effort should to go toward getting the system back into operation as quickly as possible. Until operation can begin again, emergency treatment measures should be undertaken.

Usually a source of water that must be used in an emergency is contaminated. Therefore, the water should be disinfected before people drink it. Various methods are available for disinfection during emergencies. The choice of methods will depend on the resources available in each community or region.

Boiling

Boiling destroys all forms of disease organisms in water. It can be used whether water is clear or turbid and even if it contains a large amount of organic matter. For boiling to be effective, water must be brought to a rolling boil; that is, the water must be bubbling rapidly. Boiling water to disinfect it is a very good method of disinfection if fuel is available to heat the water. Individuals can boil

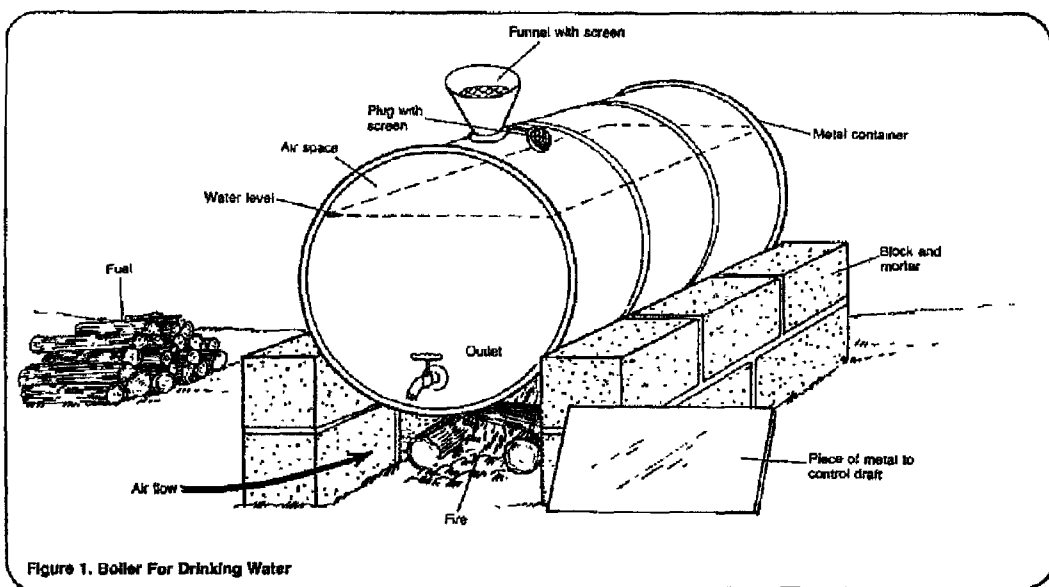


Figure 1. Boiler For Drinking Water

ater in small containers. Water should be stored in the same container which it is boiled to prevent any contamination that could occur from pouring water into a different container.

To boil a large quantity of water that can serve a large group of people, a boiler similar to that shown in Figure 1 can be built. For the boiler, build a simple brick or concrete block fireplace and position it so that the prevailing wind goes between the bricks from the front to the back of the tank. Then, place a 200-liter steel drum or another suitable tank over the fireplace. Laying the tank on its side, make a hole approximately 20mm in diameter on the top side close to the outlet edge as shown. This hole will serve as the inlet. Use a funnel with a small filter screen placed in the hole to fill the tank with water.

Place a valve on the front of the tank. Use a metal valve that can withstand the heat of the boiling water. A small plug should be placed in the inlet hole when the funnel is moved. The plug should fit loosely that steam can escape during boiling.

The boiler system is good not only for boiling but also for storage. A large amount of fuel is needed, however, to boil the large quantities of water in the tank. Where fuel is abundant, this method is a very good form of disinfection for two or three days. Where fuel is in short supply, another method must be chosen.

Chemical Disinfection

Chlorination of water is one of the most widely accepted methods of chemically disinfecting water under emergency situations. Before chlorinating water from an emergency supply, water may need to be filtered. Chlorine is ineffective against organisms embedded in solid particles. Before turbid water is chlorinated, it should either be poured through a clean cloth or stored to permit the settling of particles. The clarified water can then be disinfected. In some cases, a small temporary dam can be built across a small stream. The reservoir formed can provide adequate settling. The reservoir will provide easy access to the water either manually or through installation of an intake and a pump. Whenever possible, choose an emergency source that is not subject to high

Iodine tablets are made commercially and may be available in many areas. For water disinfection, follow the instructions on the packets. If instructions do not come with the iodine, a general rule to follow is to add one tablet to each liter of water.

Summary

Water which is used for drinking, cooking or brushing teeth should be properly disinfected to prevent sickness. Therefore, adequate planning is necessary to ensure that sufficient quantities of potable water are available for all who need it. The guidelines below should be followed when attempting to provide water for people in emergency situations.

1. Restrict the use of the available potable water to basic needs. People may have to bathe less often and ration

the amount of water used for cooking and drinking. Never let supplies fall to a dangerously low level if possible.

2. Attempt to either put the old system into operation quickly or else search for a new source. If a new source is chosen, make sure that it is either well-protected from contamination or can be protected, and that water can effectively be delivered to those who need it.

3. If a protected source is not available, dig a temporary well or choose a source which is accessible and can be easily treated. Before choosing a source, make sure that there is a way to disinfect it. Water must either be boiled or chemically disinfected before it can be drunk.

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.