SANITATION IN EMERGENCY CAMPS

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CHAPTER I

INTRODUCTION

This paper grew out of a need for technical orientation on the measures to take to provide temporary housing for thousands of persons whose homes had been partially or completely destroyed. The paper examines factors of vital importance to the sound installation of an emergency camp and makes several general recommendations for good sanitation.

The first part of this paper describes in detail several emergency measures that can be useful in helping disaster victims who whill need support and protection.

It also takes up what features should be looked for in locating and establishing a campsite, a matter of basic importance since the development and sound operation of the installation will depend on them.

In later sections, the report makes general remarks and gives practical information about drinking water, disposal of excreta, disposal of waste and certain other matters of interest to good sanitation. Information on these topics was drawn from books and documents designed to lay the tehcnical foundation for a detailed analysis of emergency camps. These matters ware considered the most important for the existing population.

The studies for this report covered only camps set up in Guatemala City during the days after the earthquake of February 4, 1976. These camps operated for approximately one to four months after that disaster.

Another study looked at a temporary housing camp which was designed to function for two to three years while the central government was finding solutions for Guatemala's housing crisis.

The breadth and emphasis of the study depended on the characteristics and conditions found in the camps examined. For this reason, the second

part of this paper consisting of Chapters VII and VIII gives more detailed information about the entire research process and the problems encountered. These problems underscored the need to have skilled people willing to help the affected community during an emergency.

CHAPTER II

GENERAL REMARKS

1. Earthquakes

An earthquake is a sharp movement of the earth's crust which can be caused by the following factors :

a) Explosions deep in the earth known as plutonic earthquakes.
b) Volcanic action, producing a volcanic earthquake
c) Slippage of layers of the earth's crust along a fault, known as a tectonic earthquake.

The latter type is the kind of earthquake that occurred on February 4, 976 in Guatemala. This is the most frequent and destructive type of earthquake. It is accompanied by tremors of varying intensities before and after the main quake.

Damage caused by earthquakes

a) Breaking and twisting of water and sewer pipes.
b) Damage to water catchment, treatment, storage and distribution facilities.
c) Damage to pumping stations.
d) seepage and water contamination.
e) Breaking of septic thanks and cesspools.
f) Massive destruction of housing.

2. Emergency measures in earthquakes

2.1. If in a rough hut : (temporary housing made of materials such as wood, plastic, paper, sheet metal, plywood, cardboard and others).

a) Attempt to find a site far from obvious problems and hazards (walls ready to fall, buildings in poor shape, etc.). If in the streets, do not block cars ; stand in the middle of the road.
b) Have enough clothes to keep warm.
c) Avoid using open flames inside, particularly gas or propane lanterns, since these might cause a fire.
d) If water is available, keep it in plastic containers ; glass and ceramic containers are very dangerous because they break easily.

e) Do not expose plastics to fire because they are very inflammable.

2.2. Drinking water

a) If the water is not known to be clean, boil it for five minutes if if is less than ten liters. For larger amounts increase the time from five to twenty minutes.
Other disinfection measures are :
- 0.5 cc of zeolite per liter of water
- 4 mg of HTH per liter of water
- 10 drops of Ugol's solution per liter of water
- 1 halazone tablet per 10 liters of water.

Keep water in closed containers to avoid contamination by dust, flies and so forth.

b) If the water is the city supply, the more chlorine, the better.

2.3. Disposal of excreta

a) Use latrines
b) Cover them when not in use to avoid flies.
c) Wash hands well after defecating.

2.4. Disposal of solid waste

a) Keep accumulated trash away from housing
b) Keep garbage and trash in closed containers to keep out flies.
c) If solid waste is not being collected, bury it or burn it to avoid flies and rodents.
d) Sweep regarlary both inside and outside the housing unit.

2.5. Other matters of interest to sanitation

a) Protect food from flies, cockroaches and rodents
b) Consume perishable foods (milk, meat, seafood, canned goods) as quickly as possible if no refrigeration is available.
c) Wash hands before eating any food.
d) If there are any open tombs in nearby cemeteries, close them immediately.
e) As soon as tremors stop, put all fallen objects back in place.
f) Respect authorities and do not promote rumors that lead to panic or fear.

3. General comments about emergency camps

After a natural disaster such as an earthquake, temorary shelter is essential. This type of shelter should be safe and provide minimal conditions of environmental hygiene.

To make the best choice of a rumpsite, consider the following :

a) the time it will be used.

b) Adequate floor space

c) Adequate altitude.

Take into account any need to adapt to the region where the camp is established. The different type of camp tents are :

- Explorer
- Backpacker
- Camper (see figure n°1).

4. Site of camp

The campsite should be of sufficient size and meet certain basic requirements. It should be high and clear so there is no morning fog, and have an adequate slope to allow rainfall to run off easily. The land should be corered by grass and be of sandy composition to imporve water absorption. Avoid clay soil at all costs because, even if it has grass cover, it will become a quagmire after the cover is gone. The site should have no loose sand and be free of dense vegetation and high shrubs. It should also be far from mosquito-breeding areas and free of nettles and poisonous plants.

The site should be protected from prevailing winds and ideally shoul have natural tree protection on the western and norther sides. This means the tents will be exposed to the sun during the morning hours.

Do not place tents directly under the trees because when it rains, water will continue to fall from the trees after the rain has stopped. Another reason is that that dead limbs can fall on a tent or a person.

Water should be available within a reasonable distance. This would

be water not only for drinking but also for bathing and washing.

The campsite should be a safe place. It should not be located in a gully or ravine because a storm could flood it. The site should not be below a cliff or steep rock or in places where dry grass would present a potential fire hazard.

The ambient temperature should not be extreme ; proper temperatures affect the comfort level and effectiveness of the occupants. The air should be free of impurities and foul odors and ventilation should be adequate to keep the air pure and the temperature at the desired level.

Other considerations are :

- Protection against against health-endangering noise
- Natural and artificial lighting, from the standpoints of both quality and quantity.
- Room enough for physical exercise and active and passive recreation, and precautions against accidents, especially those involving children and old people.

Privacy should be ensured to eliminate permanent sources of irritation and certain forms of neurosis.
Proper measures should be taken against insects and for correct disposal of excreta, trash and garbage.

5. General requirements for a camp installation (2)

5.1. The campsite should be far from mosquito-breeding areas and garbage dumps, and have good access roads.

5.2. The topography should promote easy drainage. Grass-covered fields help to hold down dust ; thick, brush-covered areas should be avoided.

5.3. Narrow valleys and gullies subject to floods should be avoided.

5.4. Areas next to commercial and industrial zones which are exposed to noise, foul odors, polluted air and so forth should be avoided.

5.5. Sufficient space (30 to 40 square meters per person) and basic public services should be available.

5.6. The side should be a reasonable distance from an abundant source of good water.

5.7. Tents should be placed in rows along both sides of a roadway ten meters wide.
This will give traffic a minimum of two meters on both sides of the road to avoid the tent support poles.

5.8. Each tent should have a minimum floor space of three square meters per inhabitant.

5.9. Tents should be at least eight meters apart so that people can move freely around them. This is also a fire prevention measure.

5.10. Small tents are preferred for a small number of occupants.

5.11. The residential sector of the camp should be located in the direction of the prevailing wind.

5.12. Provide kerosene stoves with instructions and recommendations to avoid fires and explosions ; use these stoves only when community kitchens are not available.

5.13. Natural ventilation should be sufficient in the tents.

5.14. Battery or kerosene lamps should be used to light the tents and streets.

5.15. If no drinking water system is available, tanks capable of holding at least 200 liters should be located at distances of 100 meters. Thanks holding more than 3,00 gallons can help to control water quality.

5.16. Garbage cans of 50 to 100 liters capacity and with tight sealing lids, or plastic bags with metal or plastic ties, should be provided for every four to eight tents (25 to 50 persons).

5.17. Latrines and other types of human waste elimination systems should be located behind the tents.

5.18. Double-sided wash basins three meters long should be provided for every 50 persons.

5.19. Drainage ditches should be dug around the tents and along the sides of the road.
Water supply points should have good drainage to prevent mud-holes.

5.20. When campsites are used for long periods, the streets should be sprayed with oil to keep down dust.

5.21. Sanitation regulations should be established and strictly enforced.

5.22. The camp should be divided into two sectors : one for residents and the other for public services (field hospitals, schools, recreation centers and so forth).

5.23. To treat and combat transmissible diseases, large campsites should be avoided or should be subdivided into independent units containing no more than 1,000 persons.

5.24. The campsite should be cleaned regularly, following an established schedule.

All of these general requirements wre considered in examining the camps installed in Guatemala City after the earthquake of February 4, 1976. These camps are discussed in the second part of this paper.

CHAPTER III

DRINKING WATER

Potable water of water for human consumption should meet the bacteriological, physical and chemical requirements set by international standards. The water should also be available in sufficient quantity and be accessible.

1. Water requirements (2)

a) For field hospitals and first aid posts, 40 to 60 liters per person per day.
b) Group dining centers, from 20 to 30 liters per person per day.
c) Emergency camps, from 15 to 20 liters per person per day.

Unless the amount of drinking water is strictly rationed, no limits should be put on water consumption. If water is rationed, the rationing should be properly regulated and strictly enforced.

2. Sources

The water source should be as close as possible to the camp.

2.1. Necessary information about water source.

The following should be taken into account :

a) The suitability of the water source should be checked by a competent person with full knowledge of health characteristics and the physical and chemical properties of water supplies and sources. The same applies to all operations relating to water distribution and adequate laboratory controls.

b) A brief description of the water supply should be prepared. The following data are necessary to do this :
   - the name of the owner of the water source
   - brief description of the sources and charging areas
   - description of ease or difficulty of storage.

c) A summary report of all relevant data concerning the sanitary conditions of the water supply should be made after the field reconnaissance is done. The most appropriate choice should be made.

2.2. Types of sources :

a) Municipal systems

When municipal water systems are not too damaged and are still operating, the only measure to take is to increase the amount of chlorine to reduce the risk of contamination by crossed lines or interconnections caused by broken sewer and water pipes.

b) Private systems

Water from the wells of different types of factories can be used. Usually these are located at different locations in a city and can be connected to a distribution system.

c) Springs and wells

Springs near the disaster area may be used but the water will have to be treated, depending on the quality of the source. If a well can be drilled easily and good quality water is found, the only requirement is proper disinfection.

3. Treatment

The only treatment that can be done quickly in an emergency for non-municipal systems is disinfection, proper storage of the water and efficient distribution. Depending on the quality of the water source, portable equipment can be obtained later en for coagulation, sedimentation, flitration and disinfection of the water.

4. Storage

Water storage tanks can be improvised when the situation allows. Canvas, nylon and plastic storage devices, with varying capacity (one to ten cubic meters) can also be used. These should be covered to keep out algae, dust, insects and so forth. The inlet should be high in the container and the spigots should be approximately ten centimeters off the bottom of the tank. A drain should also be placed in the bottom of the tank.

5. Distribution

When distribution tanks are not available, water has to be distributed by tank truck (by fire departments, the army, dairies, factories and others). These trucks should have a capacity of three to six

cubic meters which is enough water for 300 persons per trip.

5.1. Sanitation problems in water supplies that should be avoided

Supplies of surface water.

a) Lack of or insufficient chlorine
b) Crossed water lines or similar problems
c) Lack of reserve capacity at the plant, requiring overcharging of some units.

Underground water supplies :

a) The water source may be subject to flooding.
b) Clay pipes or other permeable pipes in which the water may become contaminated.
c) Location of latrines, absorption pits, septic tanks and surface absorption systems, drainage, and animal housing close to the sources.
d) Discharge of industrial waste, either in the watershed or in underground strata.

Pumping Stations :

a) Leaks in the suction pipes.
b) Insufficient well protection against surface or subsurface contamination.

6. Water quality

6.1. Physical and chemical analysis (see figure n°2).

In emergencies, little time is available and results are needed urgently, therefore, the following is recommended :

a) Determine residual chlorine
b) Determine the pH.
c) Turbidity
d) Color
e) Nitrates

These preventive measures can be performed with portable equipment. If a laboratory is not too far away, it can detect any harmful substances that might be present.

Taking, transport and preservation of sample (11)

For general chemical analysis of water, a minimum sample of two liters is required. The sample should be in a chemically clean glass (neutral) bottle with a polished stopper or a polyethylene lines plastic stopper. Beofre filling it, it should be rinsed three times with the water that is going to be analyzed.

The sample should be sent as promptly as possible to the laboratory and kept fresh during transport. No more than 72 hours should pass between the time the sample is taken and the start of the analysis. When the sample is taken, the water temperature, pH and residual chlorine should be recorded.

6.2. Bacteriological analysis (11)

A bacteriological analysis of the water should be made. This is because the number of E-Coli bacteria is closely related to the number of pathogenic bacteria. This helps to determine whether the water analyzed is or is not bacteriologically safe.

In taking the sample, all precautions should be observed to make sure the water to be studied is representative and to prevent accidental contamination while the sample is being taken. Sterilized glass bottles with a polished glass stopper or a threaded metal stopper should be used. It shoudl be protected by a kraft paper or tin foil cover.

If the water to be sampled contains chlorine, chlorides or ozone, 0.1 ml of a 3 % solution of sodium thiosulphate solution should be put in the bottle before it is sterilized. Figure 2 shows clearly how to take samples.

Preferably, the analysis should begin within one hour of taking the sample but in no case should this time exceed 24 hours.

When a laboratory exists nearby, portable equipment with membrane filters should be used. These make it possible to filter the samples and incubate the filtered material at the site and to obtain coli counts which are extremely useful in emergency analysis.

6.3. The following quality standards are for water sources : (3)

Physical quality :

Maximum color value	300 units
Turbidity	no general limit

Chemical quality :

- Compounds that affect potability.

	Maximum acceptable concentration
Total solids	1,500 mg/lt.
Iron	50 mg/lt.
Manganese	5 mg/lt.
Copper	1.5 mg/lt.
Zinc	1.5 mg/lt.

- Components hazardous to health

Nitrate	45 mg/lt.
Fluoride	1.5 mg/lt.

- Toxic substances

Phenolic compounds	0.002 mg/lt.
Arsenic	0.05 mg/lt.
Cadmium	0.01 mg/lt.
Chrome	0.05 mg/lt.
Chlorides	0.2 mg/lt.
Lead	0.05 mg/lt.
Selenium	0.01 mg/lt.

- Chemical indicators of contamination :

Chemical demand of oxygen (QDO)	10 mg/lt.
Biochemical demand of oxygen (BDO)	6 mg/lt.
Total excluded nitrogen, NO_3	1 mg/lt.
Chloroform extract	1.0 mg/lt.

Figure 2

Taking Water Samples

1. Taking water samples for bacteriological analysis. Figures 1 and 2.
   If the sample is taken in homes, buildings or from public faucets, the mouth of the facet should be flamed first to kill any germs it might contain. Let the water run freely for some time and then fill the bottle without touching it to the faucet (beneath drawing). Flame the faucet before taking the sample.

2. If the sample is taken from a stream, the bottle should be submerged to a minimum depth of 15 centimeters and the mouth of the container placed in the direction of the flow to keep any water that has contacted the hands from entering the bottle.
   (above the drawing).
   100 cc bottle with mouth for polished stopper.

3. One way to take samples for chemical analysis :
   When the volume of water is large, the sample should be taken with the equipment shown in figure 3. The jug is lowered to a considerable depth, a cord attached to the stopper is pulled to remove the stopper and to fill the bottle. The bottle is filled when no more air bubbles are seen.
   (legend for drawing 3, from top to bottom, left to right)
   cord to pull stopper
   cord to hold container
   recipient, 2 to 5 liters
   stopper
   weight.

Bacteriological quality standards :

I. Bacteriological quality that does not require more N.M.P. of bacteria than simple treatment of disinfection
Coliforms per 100 ml 0-50

II. Bacteriological quality that requires treatment methods (coagulation, filtration, disinfection) 50-5,000

III. Severe contamination requiring more active treatment 5,000-50,000

IV. Very severe contamination that makes the water unacceptable unless special treatment is used. This type of source can be used only as the last resort. More than 50,000

6.4. Quality standards for the water to be drinkable : (11)

	Maximum desirable concentration	Maximum tolerable concentration
Color	5 units	50 units
Turbidity	5 units	25 units
Total solids	5,000 mg/lt.	1,500 mg/lt.
pH	7.0 to 8.5	6.5 to 9.2
Phenolic compounds	0.001 mg/lt.	0.002 mg/lt.
Total hardness	100 mg/lt $CaCO_3$	500 mg/lt $CaCO_c$
Calcium	75 mg/lt	200 mg/lt
Chlorides	200 "	600 "
Copper	0.05 "	1.5 "
Iron	0.1 "	1.0 "
Magnesium	30 "	150 "
Manganese	0.05 "	0.5 "
Sulfate	200 "	200 "
Zinc	5.0 "	15 "
Fluorides	0.6 "	1.5 "

Bacteriological standards :

1. In the course of a year, 95 % of the samples may not contain any colon bacteria in 100 ml.
2. No sample may contain any E. coli in 100 ml.
3. No sample may contain more than 10 colon bacterio per 100 ml.
4. In no case should colon bacteria be found in any two consecutive 100 ml samples.

NOTE : (11)

If the number of colon bacteria exceeds 3 per 100 ml, the water wil be considered unfit for consumption without disinfection. This means chlorination is necessary.

CHAPTER IV

DISPOSAL OF EXCRETA

1. Importance to Sanitation

Removal of excreta is a fundamental part of camp sanitation. It is a basic measure because poor excreta disposal can contaminate both and water and lead to a marked increase in the number of transmissible and parasitic diseases.

The technical purpose of excreta disposal is, therefore, to isolate the feces so that the infectious diseases they contain cannot move on to a new host.

2. Social consequences

Excreta cannot be disposed of properly unless the concerned takes part in this work. A sanitation educator also has to participate to maintain proper control of the xcreta disposal system. As part of the municipal health services, these agents take the initiative to promote public action and to give the necessary technical guidance.

3. Camp latrines

A community system is necessary for disposal of excreta. Such a system is the only solution for problems of inadequate latrine construction and cleanliness. The camp inhabitants are those who have to take charge for maintaining and operating these services.

4. Factors involved in latrine construction

Excreta decomposes into odorless, harmless and stable products. The process consists of reduction of complex organic compounds such as proteins and urea into simples, stable products. This reduces the volume and the mass by up to 80 % in one year. The products are gases such as methane, carbon i.e. an hydride, ammonia and nitrogen which dissipate into the atmosphere. Soluble materials also seep into the soil. This process can be done by anaerobic and aerobic bacteria.

These bacteria work on all inert vegetable or animal organic matter

but especially on nitrogenous, sulfurous and carbonated compounds.

When a latrine is used for two or three months in a camp, the amount of volume reduced is small, and this factor should be taken into account.

4.1. Quantity of feces

The recommended design can hadle 1 kg per person per day or 1 lt per person per day.

4.2. Contamination of soil and underground water

Soil can be contaminated directly by feces. Feces can also be carried by rain-fall or irrigation systems, wind and by insects and rodents. Bacteria die quickly but the eggs of hookworms, for example, can survive up to five months in moist, sandy soil.

4.3. Placement of latrines

Latrines should be below and at least 15 meters from water wells. The bottom of the latrine should be at least 1.5 meters above the water table.

Latrines should be located on dry, well drained soild and above the flood level. The area around the latrine should be kept free of all plant life as well as waste and refuse.

4.4. Spreading flies

The hairy parts of flies pick up filth and living organisms as well as bacteria. These can be deposited on human food. Because flies do not like dark palces, a latrine can be controlled for flies by placing a lid over it and keeping it closed all the time.

Lids should be kept in place at all times to prevent flies and other animals from entering the latrine and to keep down odors.

4.5. Other considerations

A technical study of latrine placement and construction should be made. Local materials should be used in this construction.

The type of latrine should be appealing, should be kept apart from other buildings and kept clean.

Separate facilities should be provided for men and women. One latrine hole should be provided for every 15 persons and one urinal for every 25 men.

The latrine should be simple, acceptable and economic to build, maintain and replace. When a certain type of latrine is selected or built,

a careful study should be made of all of its parts. An acceptable balance will have to be found between the cost and the components that ensure hygiene and acceptability.

4.6. The basic requirements for a latrine (16) are :

a) the topsoild should not become contaminated
b) Underground waters that may enter springs or wells should not be contaminated.
c) surface water should not be contaminated.
d) excreta should not be accessible to flies or other animals.
e) New excreta cannot be handled.
f) Installations should be free of smells
g) the type of latrines collected should be of simple design and economical construction and operation.

5. Suitable types of latrines

Many types of latrines can be built in times of emergency. Some are those recommended by Wagner and Lanoix (16) (well latrines, blind ditch, drilled ditch, ditch latrine and others) or those recommended by M. Assor (2) (low latrines, deep latrines, long latrines, portable latrines and others). This paper has considered only sanitary, dry well latrines whose construction is suitable for emergency periods (see figures 3 and 4).

CHAPTER V

WASTE DISPOSAL

Prompt elimination of solid waste is important because if it is not done, serious problems will arise. The following are a few of them :

a) Foul smells
b) Soil and water polution
c) Formation of breeding grounds for flies, mosquitos, cockroaches and others.
d) Sources of attraction for rats, mice, dogs and others.

These problems can lead to contamination of food by flies and by dust which can spread infectious diseases and intestinal parasite infections.

1. Storage of waste

Containers for mixed waste should not exceed 120 liters in capacity. Ideally, they should have side openings to make management easier. They should be built of galvanized metal, which can be washed, and be waterproof. They should also have tight lids. The recommended number of containers is three or four for every 100 persons, located at some 30 centimeters above ground level on metal or wood supports.

2. Collection of waste

Cities or the central government should be in charge of organizing waste collection. The trash collectors can be the same persons who do this work during normal times. Daily collection is recommended because of the heavy concentration of persons in a camp. The trash collection equipment should be the same as that used in normal times.

3. Elimination of waste

If waste is collected, it should be transported to existing disposal sites. If there is no regular garbage collection system, the camp should have an appropriate site for this purpose. This would be a sanitary landfill or burning and burial of ash and noncombustible waste.

3.1. Sanitary landfill

A sanitary landfill is a ditch 3 meters wide, 20 meters long, and 1.5 to 1.8 meters deep. This ditch should be placed perpendicular to the prevailing winds.

The ditch can be dug by mechanical equipment (a tractor). The trash can be compacted by the same equipment and covered every day with 15 centimeters of soil. The recommended final soil cover is 60 centimeters.

3.2. Burning and burial in ditches

Ditches can be dug hand or with ditching equipment. The recommended size is 0.85 meters wide, 2.5 meters deep and 10 meters long. Trash is thrown into the ditch every day and burned, and then covered with 10 cm of soil. The ditch can be covered by wood or concrete. If it has a lid, the ditch should be kept covered of all times. Once the waste comes to approximately 30 cm below the surface level, it should be filled and the lid should be used for the next ditch that is built.

CHAPTER VI

OTHER MATTERS OF INTEREST TO SANITATION

1. Food hygiene

In both emergency and normal times, Central American countries have to carry out a different type of food hygiene control. It is always necessary to inspect food for appearance, physical condition, taste and smell to make sure these properties and qualities are normal. The following inspections should be made :

a) inspect to see whether food is still fit for human consumption
b) inspect to see whether food is adequate for animal consumption if unfit for human consumption.
c) inspect to see whether extent of decomposition makes sanitary disposal necessary.

If dining is communal, food storage and distribution should be properly regulated. The following measures should be taken :

a) Proper cleanliness and health of all personnel handling food.
b) Food should be protected against insects and rodents.
c) Conditions in kitchens and dining rooms should be hygienic
d) Under no conditions should those who have or are carriers of any disease that is transmissible through food, especially gastro-intestinal diseases, be allowed to cook or distribute food.
e) Persons who handle food should be taught to change bad habits such as coughing, sneezing or speaking above food, spitting on the ground, handling money along with food, dirtying their hands, or nails, or not whasing their hands.
f) Food handlers should also be made aware of how important their job is for public health and of the serious harm that can occur if they act negligently.
g) Food should be kept away from dust, insects and rodents by using glass containers, shelves, covered containers, bottles and so forth.
h) All sources of contamination must be eliminated from ustensils and other surfaces with which food can come into contact.

In food preservation, supplementary measures should be taken to make food last longer or to seen that it is sterilized. The types of food that are eaten in a camp depend on what is available. These can be grouped as follows :

a) Highly perishable foods.
This group includes meat, milk, fish, eggs and others. Beef, veal, pork, chicken, mutton, seafood and others decompose easily and therefore should be consumed as quickly as possible.
Milk should be boiled ; otherwise, powdered or pasteurized milk should be served.

b) Moderately perishable foods.
This group includes vegetables and fruits.

c) Slightly perishable foods.
This group includes canned and dried foods which keep perfectly well for months. Still, certain precautionary measures have to be taken with these, especially those in dented or inflated cans. These foods may be decomposing and could be producing a highly poisonous product.

Generally speaking, canned foods are an easy and sure way of feeding part of the population easily and without risk. Virtually all of these foods are under strict sanitary control during their processing. The processing uses preventive techniques which prevent the contamination of these foods.

2. Control of insects and rodents

The basic conditions of an emergency camp promote greater populations of insects and rodents. Basically this is attributable to poor sanitation. Dangerous animals that should be destroyed are fleas, flies, cockroaches, lice, accros, scorpions, mosquitoes, chiggers, bedbugs, ghats and ticks. Others are mice, rat and snakes ; roaming dogs and cats should also be eliminated.

These problems have to be eliminated because persons who have been affected by a disaster are usually depressed and problem animals can lead to even worse emotional stress.

If large numbers of these insects or rodents appear, immediate action can be taken for persons, clothing, bed clothing, personal objects and others by available physical and chemical methods (DDT and cyclohexene hexachloride).

3. Environmental requirements

Ventilation :
Human beings need an airflow of approximately 16.5 cubic meters per hour
Solar light :
The visible light spectrum stimulates the processes of oxidation and exchanges of gases. This raises the rate of growth and development of human beings. Therefore, camps should have at least three hours of solar light per day reaching all tents.
Noise :
Noise from machinery operating around the camps makes it difficult to rest and sleep. Sounds higher than 60 decibels are bothersome. To avoid vegetative, psychic and somatic changes and minor mental disturbances, sounds should not exceed 80 decibels during the day and 60 at night. Sound levels between 90 and 120 decibles produce major disturbances and, above those levels, permanent deafness with attendant physiological and psychic problems.

4. Education of disaster victims

People who live in emergency camps usually have little knowledge of basic sanitation. Disaster victims have to be educated about this. Otherwise, they will make poor or inadequate use of the camps installations.

In the aftermath of a natural disaster, people react either pessimistically or optimistically, but some are disturbed or terrorized by what has happened. They lapse into a state of prostration. Consequently, they have to be educated to resolve this problem.

The educator has to take the victims level of education into account as well as his customs and habits. The recommended approach is to take a persuasive attitude aimed at winning the confidence of the victims so that they will be more cooperative. Take care to avoid an authoritarian posture because this may be harmful.

The government, through the Ministry of Health, should organize an education group to work at all times. The purpose of this group is to develop sanitary education programs which have to be put into practice, whether there is an emergency or not. The education group would plan measures to take in emergencies. These would be ways of attacking the problems caused by a natural disaster. Improvisations could not be used because they are not desirable in an emergency.