

SAMPLE METHODOLOGY FOR COMPUTING UNIT/FORCE WATER REQUIREMENT

1. Company (160 men)	
Drink + P. Hyg + Food + Veh = Unit Factor	(5.2 + 2.7 + 3.0 + 0.3 = 11.2 G/M/D)
Unit Factor x Unit Str. = Co. Consumption	(11.2 x 160 = 1792 gal/day)
Consumption + 10% Waste = Co. Requirement	(1792 + 179 = 1971 gal/day)
2. Battalion (750 men)	
Unit Factor + Heat Treat = Bn Factor	(11.2 + 1.0 = 12.2)
Bn Factor x Bn Str = Consumption	(12.2 x 750 = 9150)
Consumption + 10% Waste = Hn Requirement	(9150 + 915 = 10,065 gal/day)
3. Brigade (3500 men)	
Bn Factor + Cent. Hyg = Bde Factor	(12.2 + 1.3 = 13.5)
Bde Factor x Bde Str = Bde Consumption	(13.5 x 3500 = 47,250)
Consumption + 10% Waste = Bde Requirement	(47,250 + 4725 = 51,975)
4. Division (16,000 men)	
Bde Factor + Hosp + Ldry + Grav + Constr = Div Factor	(13.5 + 1.0 + 2.0 + 0.2 + 1.5 = 18.2)
Div Factor x Div Str = Div Consumption	(18.2 x 16,000 = 291,200)
Consumption + 10% Waste = Div Requirement	(291,200 + 29,120 = 320,320)
5. Corps/Force (men)	
Navy Service Factor x Non self-sustaining Str = Reqt	(24.4 x = (N))
USMC Service Factor x Non self-sustaining Str = Reqt	(19.5 x = (MC))
Army Service Factor (incl. waste) x Army Str = Reqt	(17.2 x = (A))
USAF Service Factor x Non self-sustaining Str = Reqt	(21.5 x = (AF))

N + MC + A + AF = Total Requirement for Force Support

- Note: 1. Non self-sustaining strength = Number of personnel to support
 2. Service Factor is outlined in Table 9-4

Table 9-5.

negative follow-up samples are obtained. Retesting requires 300 milliliters of water be tested for each 100 ml original positive sample. Follow-up testing is accomplished as follows.

(1) In a distribution system, take a 100 ml follow-up sample from the original positive spigot, take one from within 5 outlets upstream of the original positive sample and one from within 5 outlets downstream. If the original positive sample was at the end of the distribution line, two samples will be collected downstream (within 5 outlets) from the original positive

sampling site.

(2) Distribution systems with a single outlet, tankers, trailers, bladders, Lyster bags and 5 gallon cans will have three 100 ml samples taken from the original positive sampling site. When testing the three 100 ml samples from a single testing site, using the membrane filter technique, it is optional to filter each 100 ml through a single filter or the three 100 ml samples (300 ml) may be filtered through a single filter.

e. The water is considered safe to use when the set of follow-up samples are total coliform negative.

Section III. FOOD SERVICE IN THE FIELD

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9-16. Importance of Sanitary Practices in the Handling of Food.

1. The conditions under which food is transported, stored, prepared, and served can have a direct bearing

on the success or failure of a military mission. Consumption of food contaminated with disease causing microorganisms can result in outbreaks of foodborne illness and compromise the combat readiness of the unit. All personnel who handle food must maintain the highest stan-

dards of personal hygiene and sanitary practices.

2. In the field, all the factors which normally contribute to foodborne illness outbreaks, such as improper storage and holding temperatures, inadequate protection of food from contamination, and poor food handler personal hygiene, are exacerbated. Supervisory responsibilities and individual attention to sound sanitary practices become increasingly important. Whenever possible, food service sanitation regulations set forth in Chapter 1 of this manual will be followed.

9-17. Transportation of Food.

1. Vehicles used for transporting food must be clean and completely enclosed, if possible. Clean tarpaulins, boxes, bags, etc., may be used to protect food from contamination by dust, dirt, and the elements.

2. Vehicles used for transporting garbage, trash, chemicals, petroleum products, or similar materials will not be used for transporting food unless they have been properly cleaned and sanitized.

3. If bulk quantities of perishable foods are to be transported over considerable distances, refrigerated containers must be used.

4. Perishable food products must be stocked at a level commensurate with the capacity of the food service storage facilities of the unit.

9-18. Storage.

1. All food items are to be inspected by the food service officer (FSO), or his designated representative, at the time of receipt. These inspections are usually limited to identity, count, and condition. If the fitness of any item appears questionable or the food item has been purchased on the local market or under contracts which require inspection at destination, the FSO must request an inspection of the item from the MDR. Accepted food items will be stored immediately. Unaccepted items will be disposed of in accordance with Chapter 1 of this manual. Otherwise, any food determined unfit for human consumption by the MDR will be surveyed as garbage.

2. Field refrigerators and freezers are available for use but internal space is limited. Temperature controls may not always be accurate and exposure to the elements puts a tremendous strain on the working parts. Creating a shade and dust barrier can improve these conditions tremendously. Careful monitoring of internal temperatures and maintenance of temperature logs are mandatory. One internal and one external thermometer is required on all bulk storage refrigerators/freezers. An external, high temperature alarm system is strongly recommended. Temperature readings must be taken and logged at least once per meal period (at least 3 times each day). Resupply of spoiled rations may take several days; therefore, reading and logging of cold storage temperatures every three hours is recommended. Care must be given to menu planning to help ease refrigerated space requirements.

3. Refrigerated space should be emptied and thoroughly cleaned at least once per week. These spaces

must be defrosted whenever the frost accumulation on the cooling coils exceeds $\frac{1}{4}$ of an inch thick.

4. Perishable foods must be refrigerated or frozen at temperatures noted in Chapter 1 of this manual. As a general rule, field reefers will be maintained at or below 40 degrees Fahrenheit (F). Freezers will be maintained at or below 0 degrees F.

5. Semi-perishable foods such as potatoes, onions, lettuce, etc., must be stored in a dry place on dunnage/pallets to allow for air circulation and to protect them from decay, spoilage, and vermin infestation. Screened food boxes may be used to keep such items as bread for short periods of time. These screened boxes can be suspended to permit free circulation of air.

6. Nonperishable/canned foods, such as canned vegetables, dried beans, flour, sugar, etc., must be palletized to allow for air circulation and minimize harborage for vermin. These items also need protection from the elements. Improper storage will result in the loss/destruction of the product. The contents of any can showing signs of deterioration will be disposed of as garbage.

7. All storage spaces should be inspected regularly for evidence of vermin infestation.

9-19. Preparation and Serving.

1. As in garrison, messmen working in a field galley must receive food handlers' physicals as specified in Chapter 1 of this manual. Due to the many problems associated with field exercises and special problems with sanitation, screening of food handlers is very important. Freedom from disease, acne, cuts/scratches, and a high level of personal hygiene is essential. Food service physicals will be given prior to deployment. This will also afford an opportunity to establish contact with and ensure proper training of mess supervisory personnel. Handwashing stations for mess men and cooks must be readily available with soap and water, figures 9-4 and 9-5.

2. Foods will be handled in accordance with Chapter 1 and the following:

a. Potentially hazardous foods should be avoided in a field situation. The lack of clean preparation areas, inadequate spaces for refrigeration, unreliable electrical supplies, and the potential for contamination dramatically increases the potential for a foodborne illness outbreak. Improperly handled potentially hazardous food items must be discarded as garbage.

b. Chopping and grinding of meat in the field is prohibited. When meats need to be pre-sliced, they will be carefully protected and refrigerated or cooked immediately.

c. Frozen foods should be thawed under refrigeration. Foods may be thawed at room temperature when no refrigeration space is available. The following conditions must be met when thawing at room temperature:

(1) The product must be cooked as soon as possible once thawed.

(2) The room temperature must not exceed 80° degrees Fahrenheit (26.7° C).

(3) Meat, poultry and fish must remain in their original sealed wrappers or containers.

HAND WASHING DEVICE NO. 10 CAN

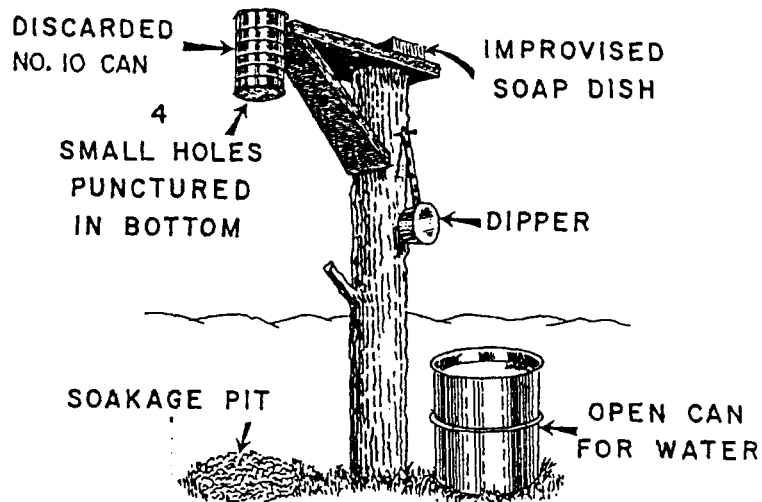


Figure 9-4.

A hand washing facility which is suitable for installation near latrines and messes is easily improvised using a perforated number 10 can sprinkler, small can dipper and open oil drum as a clear water reservoir. The soap dish may be fabricated using a small can which has been split and sharp edges turned down.

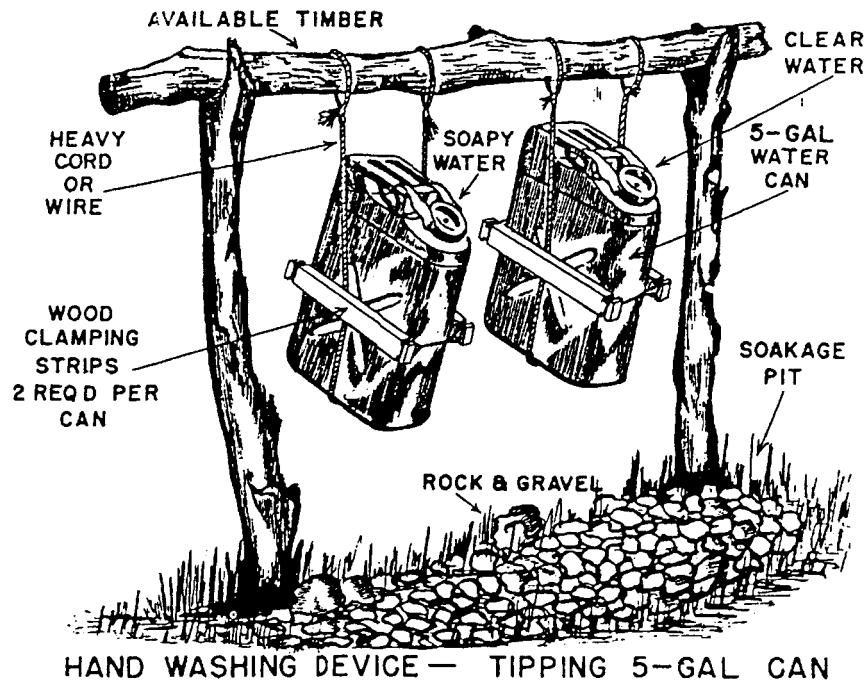


Figure 9-5.

A hand washing facility which is suitable for installation near latrines or messes is easily improvised using 5-gallon water cans. The cap of the cans may be perforated with $\frac{1}{4}$ inch holes to conserve washing water.

(4) Proper precautions are taken to ensure potentially hazardous foods are not allowed to remain at room temperature once thawed.

(5) The Medical department representative is notified.

(6) Thawed foods must never be refrozen.

d. Serving lines in field messes usually are unable to maintain proper holding temperatures and refrigerated space is at a premium. Therefore, due to the increased potential for food contamination in the field mess, the saving of leftovers is strictly prohibited. All leftovers must be disposed of as garbage.

e. Ice machines at field messes are to be scrupulously maintained. These units must not be operated as self service types of equipment. Use an ice scoop made of impervious material. Store the scoop in a metal bracket inside the ice storage bin. Mount the bracket at a level at which the scoop will not be covered with ice when the bin is full. The scoops are to be properly washed and sanitized at least daily. The use of ice chests by individuals or groups will be discouraged. Bacteriological testing requirements are discussed in Chapters 1 and 6 of this manual.

f. Sandwiches should be prepared as close as possible to serving time. Condiments such as mayonnaise, relish, etc., will be provided in individual packets only and applied by the patron. Salad type fillings, such as egg, tuna and poultry, are prohibited.

g. Care must be exercised with fruits and vegetables obtained from the local economy, particularly in areas where "night soil" is used as a fertilizer. These products must be soaked in a 100 ppm FAC solution for 15 minutes or a 50 ppm FAC solution for 30 minutes and thoroughly rinsed with potable water before serving.

h. Self-service areas are authorized for prepackaged items such as individual cartons of milk, salt, pepper, syrup, catsup, mustard, and mayonnaise. Individual cartons of milk must be displayed in drainable trays containing ice. Ensure the top portion of the carton is not submerged in the ice.

i. All food, except self-service items, must be served by a physically qualified and properly trained cook or messman.

j. When items requiring refrigeration are placed on the serving line, they must be placed on the line in small quantities and replenished as needed.

k. Foods requiring hydration, such as powdered eggs, must be handled as fresh food items once they are hydrated.

3. The "Four Hour Time Rule" must be strictly enforced in the field. Potentially hazardous foods, which have been held at temperatures between 40 degrees F. and 140 degrees F. for more than four hours cumulative time must be disposed of as garbage. Remember to keep hot foods hot (140 degrees F. or above) and cold foods cold, 40 degrees F. or below.

9-20. Mess Facilities and Equipment.

1. Advance base/field messes range from primitive (i.e., where personnel sit on the ground to eat after receiving their rations, cooking accomplished in a tent) to a semipermanent structure with plumbed in water,

concrete decks and portable galley equipment. Some of these field messes have stainless steel surfaces for food preparation, whereas only wooden surfaces may be available in others. Regardless of the type of structure, cleanliness will be the key to the prevention of foodborne illness outbreaks. The following provides general guidance and should be used in conjunction with chapter 1 of this manual:

a. Vat cans, ovens, stoves, grills, and other food preparation and serving equipment must be thoroughly cleaned and sanitized after each meal period.

b. All needed repairs must be made as soon as practicable.

c. All food contact surfaces must be cleaned and sanitized as described in Chapter 1 of this manual.

d. All food service equipment is to be installed up off the ground and protected from contamination by dust and vermin.

e. Wooden surfaces should be covered with clean, heavy wrapping paper or waxed paper. Discard the paper after each meal period. If paper is not available, surfaces must be wiped down and scrubbed with an approved sanitizing solution and air dried after each meal period.

f. When pesticides are used, the directions on the label are to be strictly adhered to. Use caution when applying pesticides in the food service areas. All food and food contact surfaces are to be properly protected during spraying and dusting operations. Pesticides are not to be stored in a food service area at any time. Pesticides are to be applied only by certified personnel. Chapter 8 of this manual gives detailed information on pesticide application and pest control programs.

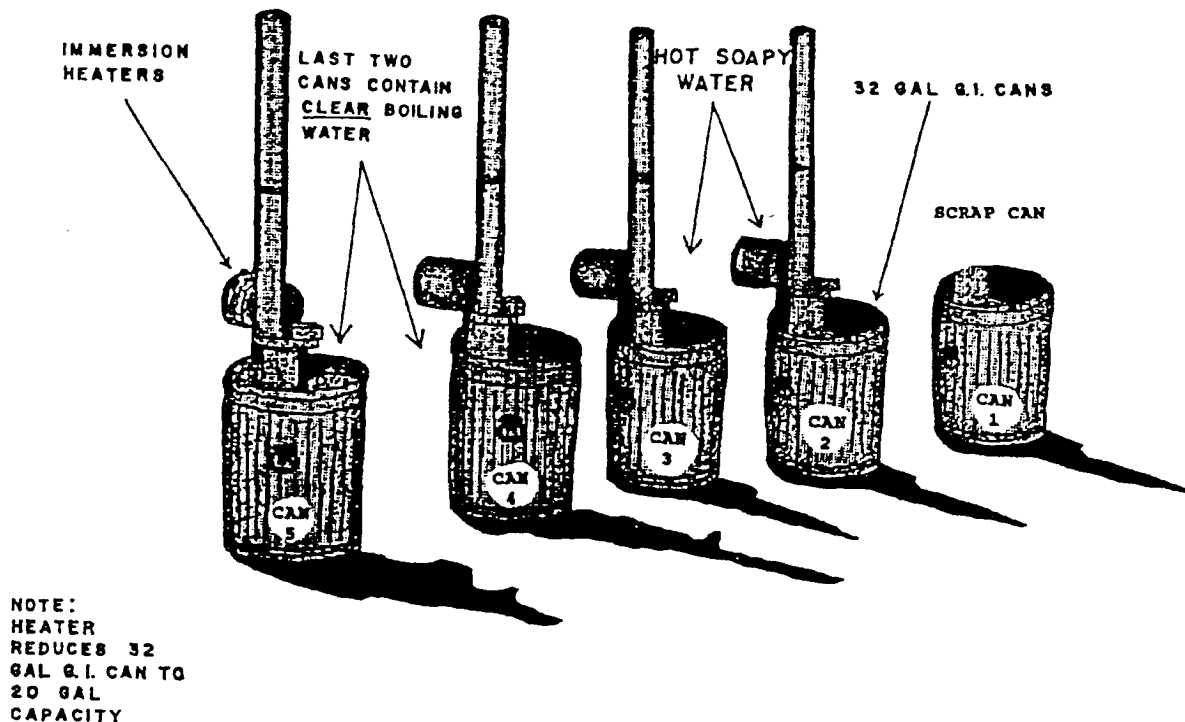
g. The use of disposable eating utensils is encouraged. The benefits of reduced disease risk, and water/fuel savings outweigh the solid waste disposal disadvantage.

2. Insulated food containers (vat cans) are used to transport, store, and serve hot or cold foods. Each container has three aluminum inserts and a tight fitting cover. Inserts must always be used and are to be filled to capacity (5 1/3 liters/5 2/3 quarts). Inserts of hot food and inserts of cold food must be placed in separate containers.

a. Preparation, filling, pre-heating and pre-chilling of the container must be accomplished prior to placing inserts with food into the container. This is accomplished by filling the container with 2 quarts of boiling water, ice water, or crushed ice, covering the container, and letting it stand for 30 minutes before use. After filling, each container must be labeled across the top of the container lid with the item, date and time of preparation, and number of servings. Foods held for over four hours must be discarded as garbage.

b. Cleaning of vat cans is critical and should be performed before and after every use. Vat cans should not be immersed in water. Inserts and rubber gaskets must be removed and washed with soap and water then rinsed in boiling water. After gaskets have been washed and rinsed, they should be placed flat side down on the container to dry to prevent warping.

3. A field dishwashing unit can be set up by using five (5) metal GI cans (approximately 32 gallon size) and



5 CAN DISHWASHING BATTERY

Figure 9-6.

immersion heaters. A long handled brush is to be attached to wash cans number two and three. To avoid burns, hooks made from coat hangers can be used for clipping metal trays in the fourth and fifth cans.

a. The dishwashing battery, as illustrated in figure 9-6, is set up in the following manner:

- (1) First GI can is for collecting garbage.
- (2) Second GI can is for prewash and will contain a hot detergent solution and a brush.
- (3) Third GI can is for washing and will contain a hot detergent solution and a brush.
- (4) Fourth GI can is for rinsing and will contain clean hot water held at a rolling boil.
- (5) Fifth can is for the final sanitizing rinse and will contain clean hot water held at a rolling boil.
- (6) Mess gear will be air dried only. No dish cloths are permitted.
- (7) The water in the cans must be changed as often as necessary to ensure proper cleaning.
- (8) Each can must be permanently marked as to its use (e.g., garbage, prewash). These cans must never be used for any other purpose.
- (9) A similar unit can be set up for pots and pans using one can for wash, one can for rinse and one can for sanitizing rinse. Dip and drain racks or a suitable alternative will have to be devised to prevent hands from contacting boiling water.

b. The field dishwashing area must be away from the food preparation and serving area so that carbon monoxide, smoke, and soot do not blow back into the

food service areas. Immersion heaters also present an explosion hazard.

3. In emergency situations where hot water is not available, messing utensils can be sanitized by immersion in a 50 ppm FAC solution for 60 seconds.

4. The entire food service area will have proper drainage to eliminate or prevent standing water.

9-21. Galley Waste Disposal.

1. Soakage pits.

a. Soakage pits must be constructed to dispose of waste water from the food service area. Special attention is to be given to the separation of grease and scrap food particles from the waste water. Grease must be contained and not allowed to enter drainage ditches, evaporating beds, leaching fields, or soakage pits as grease will clog the soil, preventing the absorption of the water. It will also attract vermin, provide a breeding site for flies, and give off offensive odors. Diagrams of soakage pits and trenches and grease traps are found in article 9-27 of this chapter.

b. Determine the required soakage pit size (volume) by considering these factors: duration of the operation, number of personnel involved, amount of drainage generated per day, expected period of use, and absorbent quality of the soil substrate.

2. Collect and properly dispose of solid wastes such as garbage, metal cans, plastic, and cardboard. Methods of

disposal consist of compacting, burial or burning and in many cases local contractor recycling. In peacetime, local civilian health authorities must be consulted prior to selecting a disposal method. The method to be employed may vary from area to area depending on environmental and tactical situations. Solid wastes are not to be buried or burned in close proximity to the galley or messing areas.

3. The proper disposal of liquid and solid wastes will greatly enhance pest control operations in any given area. Further waste disposal guidance is contained in section IV of this chapter.

9-22. Meal, Ready to Eat (MRE).

1. The MRE was designed as the replacement item for the more familiar Combat Rations or C Rations. They are lighter, less bulky, and easier for personnel to transport. There are several different menus available.

2. The MRE presently has a shelf life of 48 months. Routine inspection schedules must be established to ensure adequate stock rotation and suitability for use of the product. There are no special storage requirements established for the MRE's. However, they must be stored off the deck and not stacked more than three pallets high without the use of storage aids. Inspect the MRE's by taking a random sample of the oldest stock. Use a square (approximately 36" x 36") of smooth white paper for a surface on which to inspect case contents. Remove sleeve from the MRE case. Open the case and invert it, dumping the MRE's onto the paper. Rap case sharply to knock out any insects or debris onto paper. Collect insect specimens for identification. Inspect MRE menu bags individually. Check menu bag for punctures caused by spoons packed within each bag. Check for miscellaneous penetrations caused by knives, staples, etc. Inspect the folds and seams of the bag for insect debris and penetration. Most insect penetrations will be found along folds and seams. Note: The menu bag is the outer bag containing a list of the components within the MRE.

3. MREs are subject to infestation by boring/chewing insects such as *Rhyzopertha dominica* (lesser grain

borer), *Trogoderma variabile* (warehouse beetle), *Lasioderma serricorne* (cigarette beetle), *Tribolium castaneum* (red flour beetle), and *Tribolium confusum* (confused flour beetle). This infestation would most likely occur in MRE cases that are stored for long periods of time and/or those located in the least lighted area of the storerooms or warehouses. Once the integrity of the outer or menu bag has been breached, any small insect can invade the bag. Components are rarely penetrated, however, the insects may explore a poor seal in a component package. Most susceptible components are peanut butter and cocoa beverage powder.

4. The practice of heating entrees in a container of hot water and then using the water for hydration of food or drink is to be discouraged. This is due to the possibility of laminates leaching into the water.

9-23. T-Rations.

1. Tray packs are the main component of T-Rations. They are semi-perishable food items which provide nutritionally adequate hot meals while reducing the manpower, fuel and water requirements for feeding. The tray packs are hermetically-sealed half-size steam table containers in which up to 36 servings of food, depending on product, have been thermally processed and can be transported and stored without refrigeration. Contents can be easily heated in and served directly from the tray packs.

2. The tray pack serves as a storage, heating, and serving vessel. They are heated by immersion in boiling water from 15 to 45 minutes. During heating, some swelling of cans is expected. Overheating (especially vegetable products) causes excessive swelling. If tray packs become extremely cold or frozen from arctic conditions, heating time will have to be adjusted. Frozen tray packs may show degradation of texture when prepared.

3. After initial heating, *unopened* tray packs may be retained for re-use under the following conditions:

- a. They must be marked with the time and date of initial heating.
- b. They must be used at the *next* meal period or discarded.

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Section IV. WASTE DISPOSAL METHODS IN THE FIELD

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9-24. Medical Importance of Waste Disposal. In the field large amounts of all types of wastes are generated each day. If the wastes are not disposed of properly, the camp will quickly become an ideal breeding area for flies, rats, and other vermin. Diseases such as dysentery, typhoid, cholera, and plague could compro-

mise the integrity of the unit. Zoonotic diseases, such as rabies, could occur from exposure to infected animals as they scavenge for food.

9-25. Types of Waste. The term wastes include all types of refuse resulting from the living activities of

humans or animals. The following types of wastes will be discussed in this section:

1. Human Wastes (feces and urine)
2. Liquid Wastes (bathing and liquid kitchen wastes)
3. Garbage (peelings, slicings and other semisolid or solid organic material resulting from food service operations)
4. Rubbish (boxes, cans, paper, and plastics)

9-26. Responsibilities.

1. Unit commanders, through the engineering section, are responsible for the disposal of wastes generated within their areas. When waste disposal facilities are not provided, the commander must arrange for their construction, operation and closure.

2. Medical department personnel should provide technical assistance in the fabrication, location, and maintenance of field waste disposal facilities. PREVMED personnel must inspect the facilities prior to their initial use to ensure proper construction and location and then on a daily basis to ensure the facilities are being run in a sanitary manner.

9-27. Disposal of Human Waste.

1. The devices for disposing of human wastes in the

field vary with the tactical situation, soil conditions, water table, weather conditions, availability of materials, and local environmental regulations.

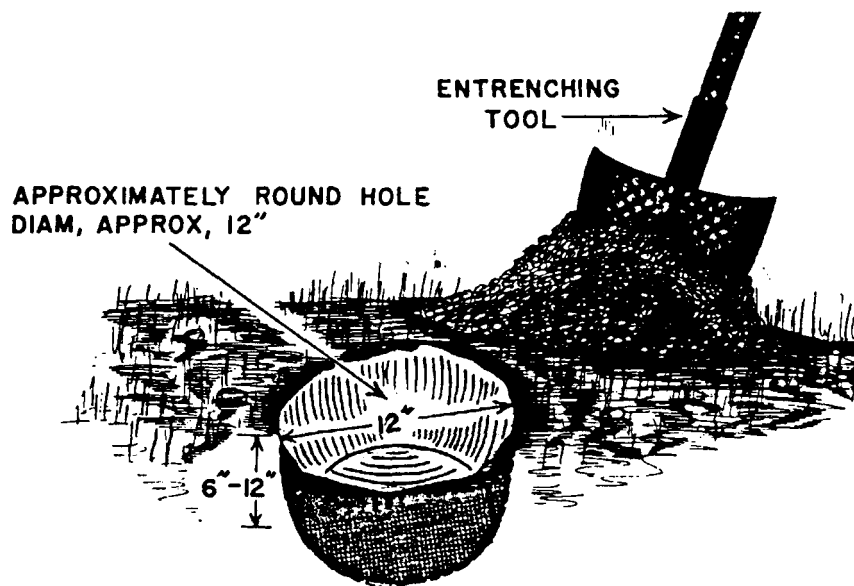
a. When troops are on the march, each person uses a "cat hole" device during short halts. It is dug 8 to 12 inches in diameter and 6 to 12 inches deep and is covered and packed down after use, figure 9-7.

b. In temporary bivouacs (1 to 3 days), the straddle trench, figure 9-8, is used unless more permanent facilities are provided.

c. In permanent camps, one or more of the devices in paragraph 4, below, are constructed. Straddle trenches are used while more permanent facilities are being built. In training situations, portable chemical toilets may be required by local public health law.

2. In determining the type of latrine to be constructed, consideration must be given to the length of stay, the water table, and soil conditions. For example, if the water table is high, then the depth of a deep pit latrine may cause contamination of underground water supplies. A burn out latrine would be more appropriate in this situation. During peacetime, contact the local public health department prior to use to ensure burning is lawful.

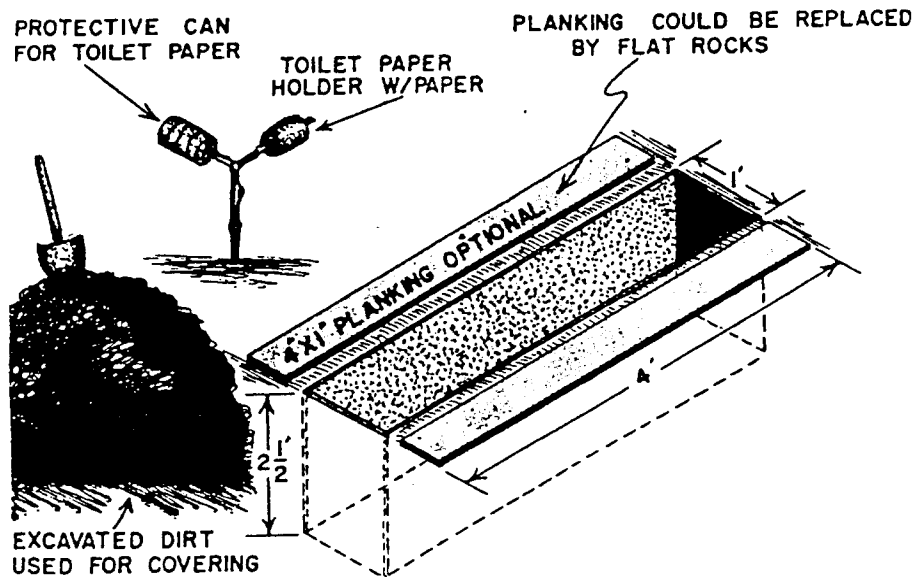
3. In determining the location for latrines, give consideration to protecting food and water supplies from contamination as well as providing convenient access-



CAT HOLE

Figure 9-7.

The cat hole is used for the disposal of individual human excreta in situations where other latrines are not available such as when on the march and at short halts. The hole has a diameter of 8 to 12 inches and a depth of 6 to 12 inches. The feces are deposited and immediately covered with tightly compacted earth which was originally removed from the hole.



STRADDLE TRENCH

Figure 9-8.

Trenches are built 1 foot wide, 2½ feet deep, and 4 feet long. Boards may be placed along both sides of the trench to provide footing. Rolls of toilet paper, set on posts, are kept dry covering with cans, as illustrated. Unless there is natural concealment, a wood or canvas screen will be constructed to provide privacy and a wind break. Earth, removed in digging the trench, is piled at one end for prompt covering.

bility. Select a location which is at least 100 feet from the nearest natural water source, at least 100 yards from food service areas, and 50 feet from berthing areas. Common sense implores that the selected site be reasonably near the user.

4. Design and Construction of Human Waste Disposal Devices

a. **Straddle Trench Latrine.** This temporary latrine is made by digging a trench 1 foot wide, 2½ feet deep and 4 feet long. It will serve 25 people and accommodate two people at one time. Additional trenches will be at least two feet apart. There are no seats in this type of latrine, but boards may be placed along both sides of the trench to provide better footing. The removed earth is placed at the end of the trench and each person promptly covers their excreta and toilet paper using their own entrenching tool. The trench will be closed when filled to within one foot from the top of the trench. To close, spray the excreta with an approved insecticide, fill the trench with several layers of dirt compacting each layer, and mound the dirt at least one foot above ground level. Tactical situation permitting, post a sign indicating the type of latrine and the date closed, figure 9-8.

b. **Deep Pit Latrine.** This temporary latrine is made by constructing a latrine box over a pit. The standard latrine box has four holes (seats), is 8 feet long and 2½ feet wide at the base, and is mounted on two 6-inch planks. One, 4 seat, deep pit latrine is required for every 50 people. Seats will be covered with fly-proof, self-closing lids. Cracks in the wood will be fly-proofed by nailing strips of wood or metal over the openings,

sandbagging, or by using oil soaked burlap. A metal deflector will be secured to the inside surface of the front panel of the box to prevent urine from soaking into the wood. Skin contact surfaces will be sanded smooth. The pit is dug 2 feet wide and 7½ feet long and up to a maximum of 6 feet deep. (Alternately, a 5 foot square, 4 seat latrine can be placed over a 4 foot square pit up to 6 feet deep). As a guide, allow 1 foot of depth for each week of planned usage and one foot for dirt cover. Close as noted in 4.a. above, figure 9-9. The deeper the pit, the greater the chances of it caving in!

c. **Burn-Barrel Latrine.** The burn-barrel (burn out) latrine has been used extensively over the past several years in major operations. It is desirable where the soil conditions are hard, rocky or frozen making digging difficult and where water tables are high. A screen (#18 mesh) enclosed building can be constructed of plywood, and suitable framing lumber. This structure usually contains 2 to 4 toilet seats built over 55 gallon drums that are cut in half. A burn barrel is placed under each seat. Note correct placement of barrels in Figure 9-10. All barrels will be "primed" with 3 inches of diesel fuel prior to placing them into service. This allows the fecal matter to become oil soaked enhancing complete thermal destruction of fecal matter during the daily (or more often if needed) burn out process. The oil also serves as an insect repellent and obnoxious odor deterrent. (Caution!! Ensure that "NO SMOKING" is conspicuously posted inside and outside of the structure)

When a barrel is 1/2 to 2/3 full it must be removed from the structure and burned out. Encourage personnel

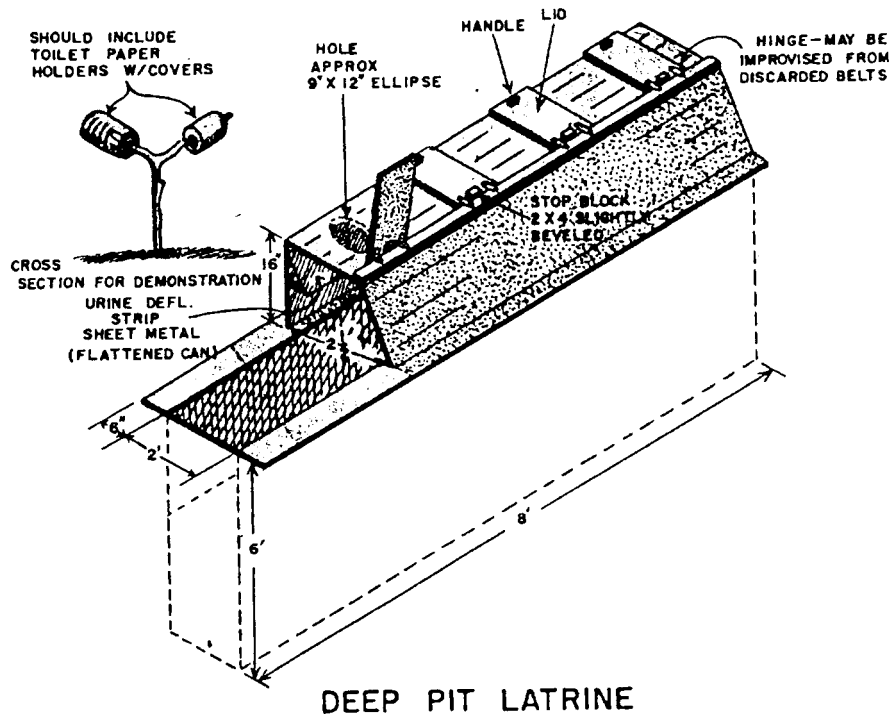


Figure 9-9.

A pit, 7½ feet long and 2 feet wide, is dug to conform to the standard size latrine box which is 8 feet long and 2½ feet wide. The depth of the pit will depend on the length of stay. The illustration shows stop blocks, to ensure self-closing lids, a metal urine deflector strip, and a method of keeping the toilet paper dry. It is best to provide a separate urinal at each male deep pit latrine.

TYPICAL BURN BARREL LATRINE

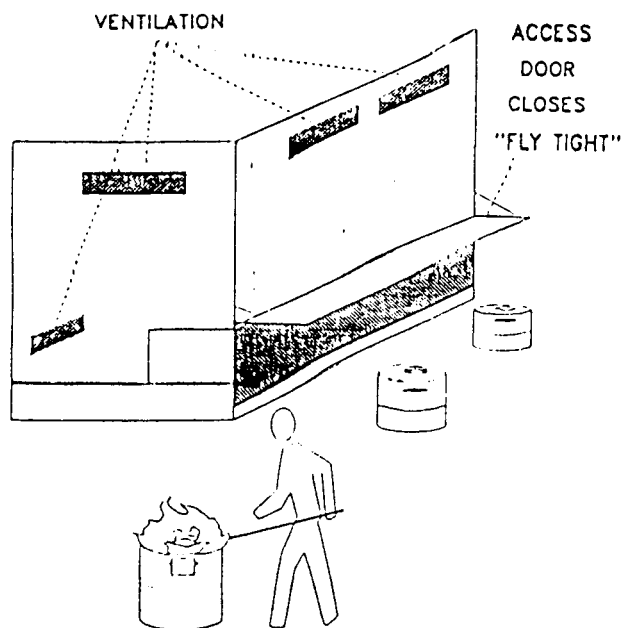
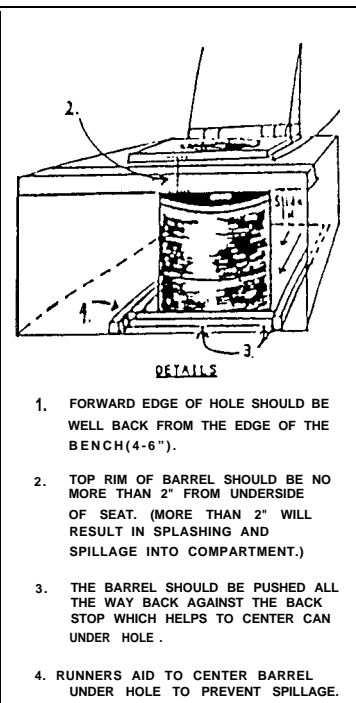


Figure 9-10.



to use urine soakage pits or other methods of urine disposal instead of burn barrel latrines since additional fuel will be required to promote complete burning. Mix 4 parts diesel fuel to one part gasoline (mogas) until the contents of the barrel is sufficiently covered. Ignite the barrel with a long stick or pole used to stir the mixture. Sticks or poles that are less than 4 feet in length must be replaced. Burning must be continued until the contents of the barrels are reduced to a fine ash, which may take more than one attempt. Burial of ashes to a depth of 12 inches is acceptable. Scattering the ashes over ground surfaces is not recommended.

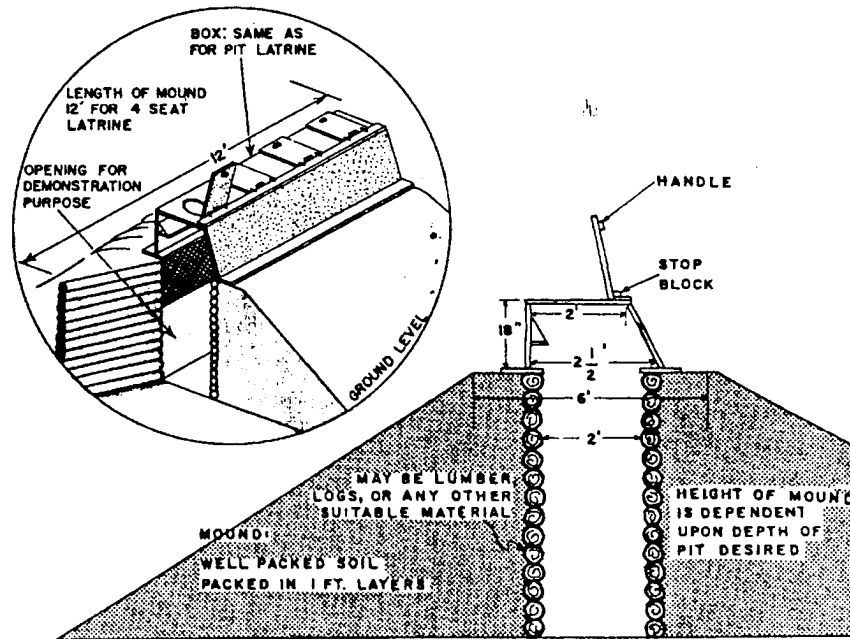
d. Mound Latrines. These temporary latrines are indicated when higher ground water levels or rock formations prevent the digging of a deep pit. By mounding the earth, it is possible to then dig a deep pit and still not intrude into the groundwater or rock. The top of the mound is at least 6 feet wide and 12 feet long so that a standard 4 seat latrine box can be placed on top of it. The mound is formed in approximately 1 foot layers with the surface of each layer compacted prior to adding the next layer. When the mound has reached the desired height, a deep pit is dug into it. The side walls are reinforced with timbers or scrap wood, figure 9-11.

e. Bored Hole Latrines. These temporary latrines require specialized drilling equipment and are, therefore, seldom used. An 18 inch diameter hole is bored to a depth of 15 to 20 feet. The hole is covered with a one seat latrine box and fly-proofed. Bored hole latrines are

constructed on the basis of 8 per 100 people, figure 9-12.

f. Urine soakage pit. This temporary latrine is most effectively used in sandy soils. It is dug 4 feet square by 4 feet deep. The pit is filled to within 6 inches of ground level with any of the following materials; large rocks, flattened tin cans, broken bottles, rubble, bricks or other suitable contact material. Ventilation shafts will be inserted into the pit to within 6 inches of the bottom. The shafts will extend 6 to 12 inches above ground level. This allows air to circulate through the-pit and lessens odors. Six urine tubes, made of 1 inch by 36 inch pipe, are then inserted into the pit. The tubes are inserted, at a slight angle, about 8 inches below ground level, which leaves about 26 inches above ground level. A screened funnel, made of moisture proof material, is placed in the top of the tube. Oil soaked burlap is then spread over the pit and covered with 6 inches of compacted earth. One pipe will accommodate 20 men, figure 9-13.

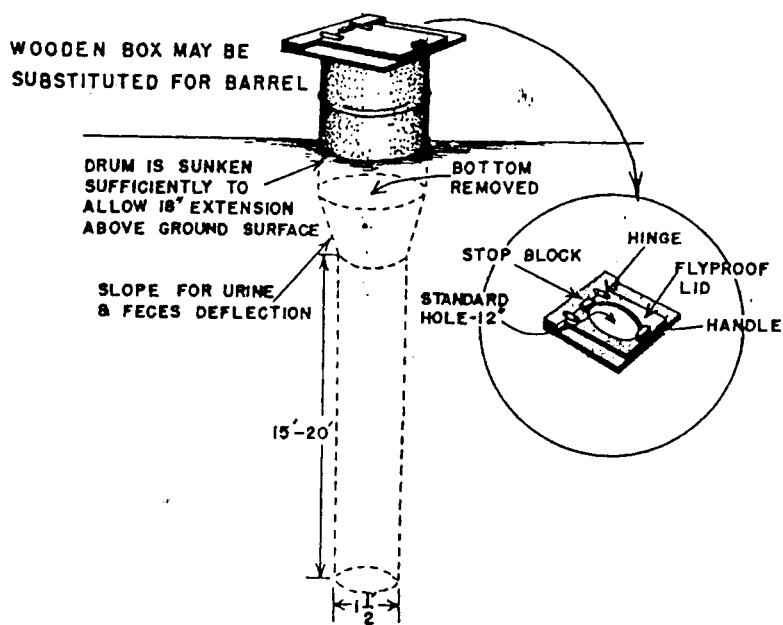
g. Urine Troughs. This type of latrine is made when construction materials are readily available. A 10 foot long, "V" or "U" shaped trough is made of sheet metal or wood. Wooden troughs are lined with moisture proof materials. A splashboard is inserted in the middle of the trough. A drain trough or pipe is attached to one end to drain urine into a soakage pit. One urine trough is designed to serve 100 men, figure 9-14. Construct it so the side with the drain trough or pipe is slightly lower than the other to ensure proper drainage.



MOUND LATRINE

Figure 9-11.

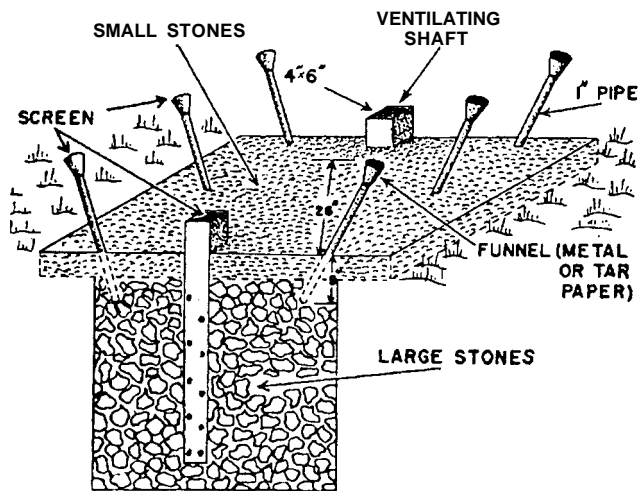
This latrine may be used where ground characteristics (high water table, frozen or rocky ground) are such that a deep pit latrine cannot be constructed. After a crib of timbers or wood planking is built, earth is compacted around the "pit" to form a mound.



BORED HOLE LATRINE

Figure 9-12.

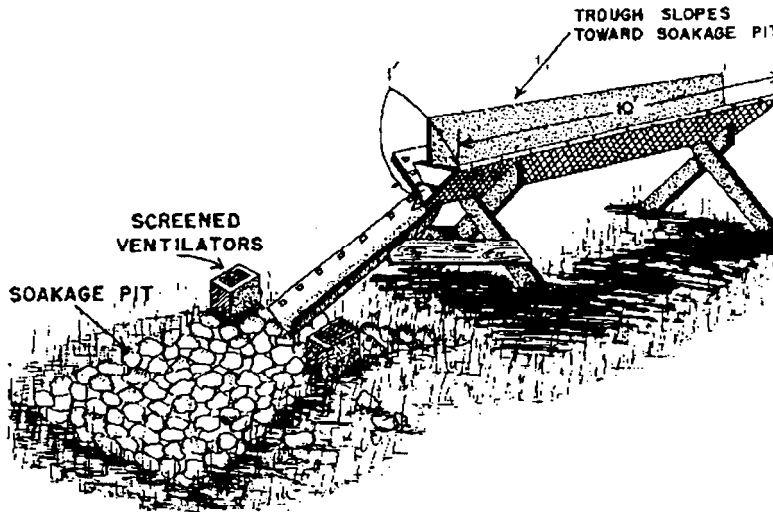
This latrine may be used for small units in isolated areas if facilities are available for boring the deep hole. Because mechanical equipment is required for its construction, it is not too often utilized.



URINE SOAKAGE PIT

Figure 9-13.

This reproduction shows salvaged pipe and improvised funnels and depicts a soakage pit with a cross section view showing construction. This pit is filled with rocks, flattened cans, broken bottles, bricks and other material. For clarity of illustration, the 6 inches of earth covering the oil-soaked burlap have not been shown. Note the same ventilating shafts as shown on the illustration of the soakage pit. (The shafts, with the openings screened, extend from 6 to 12 inches above the surface of the pit to within 6 inches of the bottom of the pit.) The surfaces of the shafts that extend below the level of the ground are perforated with one inch holes.



TROUGH URINAL

Figure 9-14.

This figure illustrates a trough urinal with splashboard and soakage pit. This urinal is made of wood and tar paper, or may be improvised of tin, galvanized iron, or any other suitable material.

h. Urinoils. These permanent type latrines are very sanitary and less odorous than other urine disposal methods. The urinoil is a screened 55 gallon drum designed to receive and trap urine and to dispose of it into the soakage pit. Urine entering through the screen is deposited on a surface of waste oil and then sinks to the bottom. As urine is added, the liquid level rises in a 3 inch diameter pipe until it overflows into a 1½ inch diameter pipe which drains into the soakage pit. The oil acts as an effective barrier against odors and flies. A covered windbreak must be constructed around the urinoil to protect it from flooding with rain water. Fresh sand or dirt must be spread around the barrel periodically. One urinoil serves 100 men, figure 9-15.

i. Chemical toilets. This type of latrine is usually obtained as a contracted service. Close scrutiny of the contractor's pumping and cleaning services is mandatory for maintaining sanitary facilities. PREVMED

Chemical Toilet Requirements

# of Personnel	# of Chemical Toilets
1 to 15	1
16 to 35	2
36 to 55	3
56 to 80	4
61 to 110	5
111 to 150	6
Over 150	Add 1 toilet for each additional 40 persons.

Note: When females are not involved in the exercise, urinals may be substituted for some of the seat type latrines. The number of seats, in such cases, will not be reduced to less than 2/3 of the number specified in this chapter.

Table 9-6.

personnel will maintain a current telephone number for the contract service. When used, chemical toilets will be ordered at the ratio displayed in Table 9-6.

5. Maintenance of Latrines

a. After latrines have been constructed, they should be enclosed in shelters to facilitate insect control, routine cleaning, privacy, and protection from flooding with rain water.

b. To prevent surface runoff from flooding the latrines, dig drainage ditches around them.

c. Provide sufficient amounts of toilet paper daily. Protect the paper from moisture, i.e. cover rolls with inverted tin cans.

d. Install a simple, easily operated, hand washing device outside each latrine, and keep these devices filled with hand soap and potable water.

e. Sweep and scrub all surfaces of each latrine daily. Disinfect the seats with a mild chlorine solution.

f. Provide a convenient trash receptacle inside latrine enclosures and empty daily.

g. Provide and maintain butt kits outside each latrine and empty daily.

h. Construct urine tube screens in the shape of a cone. Install with the apex of the cone pointing up.

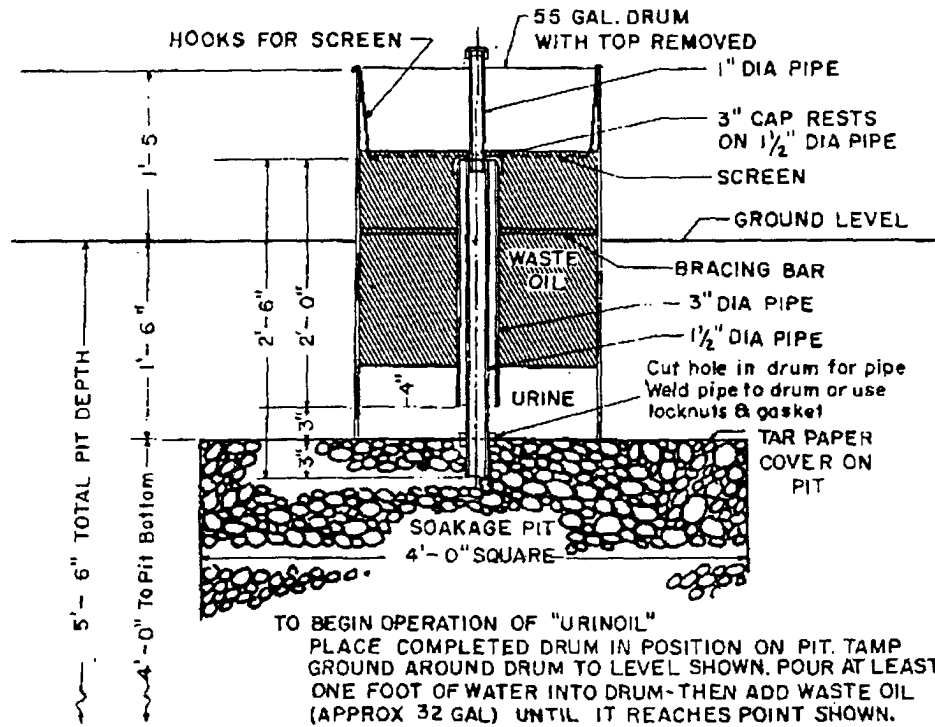
i. Keep doors and seat lids closed when not in use.

j. Mark or number each latrine to facilitate the cleaning and inspection schedules.

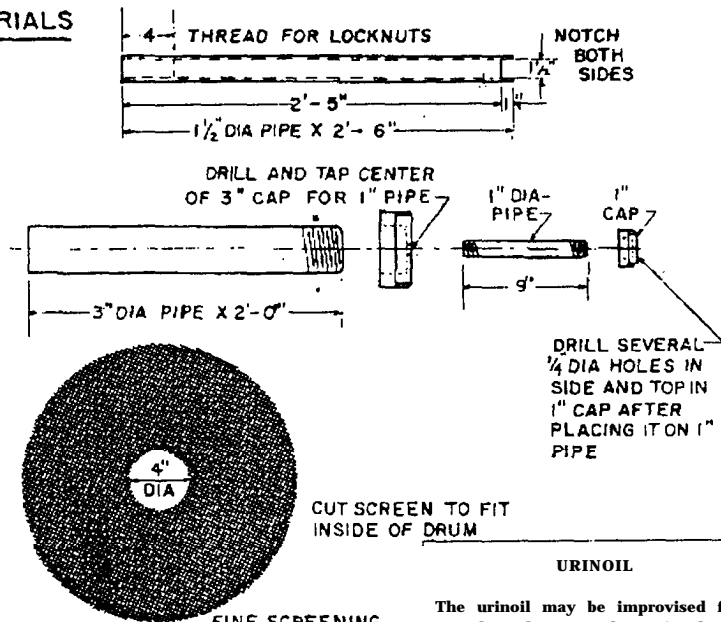
k. When a latrine pit becomes filled with wastes to within 1 foot of ground level, or if it is to be abandoned. Close the latrine as follows:

(1) Using an approved, residual insecticide, spray the pit contents, the side walls and the ground surface for about 2 feet extending out from the mouth of the pit.

(2) Fill the pit to ground level with successive



MATERIALS



URINOIL

The urinoil may be improvised from a 55-gallon drum as shown in the drawing. The urinoil should be placed on a soakage pit when possible, or installed with a French drain.

Figure 9-15. Urinoil

layers of earth, packing each layer down before adding the next one. Then mound the pit over with at least one foot of compacted dirt, and spray again with insecticide.

(3) When the tactical situation permits, mark the closed latrine by placing a rectangular sign on top of the mound stating, "LATRINE CLOSED (date)."

9-28. Disposal of Liquid Waste.

1. In the field, bathing and liquid field mess wastes are disposed of in the soil by means of either a soakage pit or soakage trench. In order for the soil to absorb liquid field mess wastes the grease, scrap food, and other suspended solids must first be removed. Grease traps are designed for this purpose and must be constructed between the field mess and each pit, trench, or evaporation bed. In places where heavy clay prevents the use of soakage pits or trenches and the climate is sufficiently hot and dry, evaporation beds are used. In either case, inspections should ensure standing water does not lead to the breeding of disease vectors.

2. Design and Construction of Liquid Waste Disposal

Devices:

a. Soakage pits, for field messes, are constructed like urine soakage pits (without urine tubes), that is, 4 feet square, 4 feet deep and filled with a suitable contact medium. One soakage pit will service a field mess serving 200 people or less. If the mess is to remain operational for 2 weeks or more, two pits will be constructed and used on alternating days. Each washing or drinking device will have a soakage pit under it. Pits are also recommended under water trailers. These pits may vary in size depending on the size and water volume of the device, figure 9-16. Soakage pits will eventually become clogged. When this happens, simply close the pit and dig a new one. A soakage pit is closed in the same manner as a urine soakage pit and marked, "SOAKAGE PIT CLOSED (date)."

b. Soakage trenches are used when the ground-water level or a rock formation prevents the use of a soakage pit. A soakage trench consists of a central pit which is 2 feet square and 1 foot deep. A trench is dug outward from each side of the pit. The trench is at least 6 feet long, 1 foot wide and 1 foot deep at the end nearest

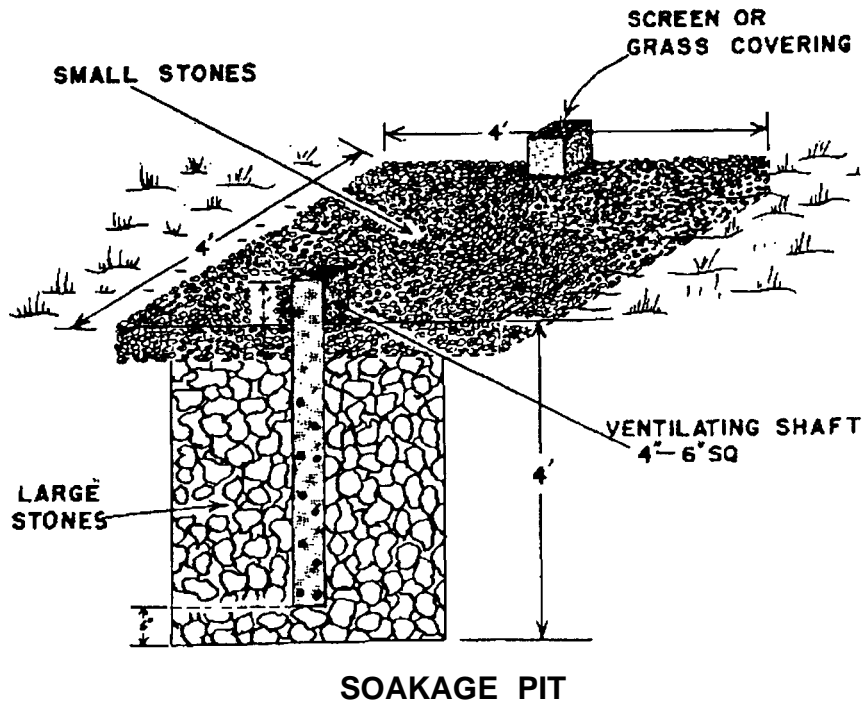
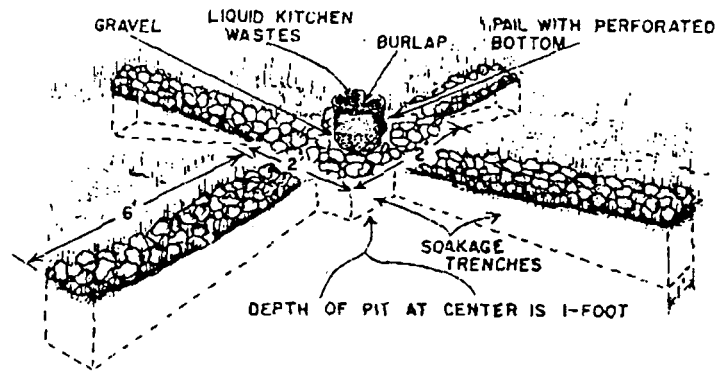


Figure 9-16.

The soakage pit is used to dispose of all types of liquid wastes where the soil is capable of absorbing moisture. The pit is dug 4 feet square and 4 feet deep. The hole is filled with any of the following materials: rocks, flattened tin cans, rubble, bricks, broken bottles, or any other suitable contact material. The liquid waste is held in void spaces until it seeps into the ground. A layer of small gravel or crushed stones may be placed on the surface of the stone.

Ventilating shafts made of scrap materials 4 to 6 inches square may be used but are not essential to satisfactory operation of a soakage pit. When the shafts are used to introduce air into the pit, they extend 6 to 12 inches above the surface and to within 6 inches of the bottom of the pit. Numerous holes are interspersed in the sides of the underground sections. The top of these shafts are covered by screen, straw, or grass.



PAIL GREASE TRAP

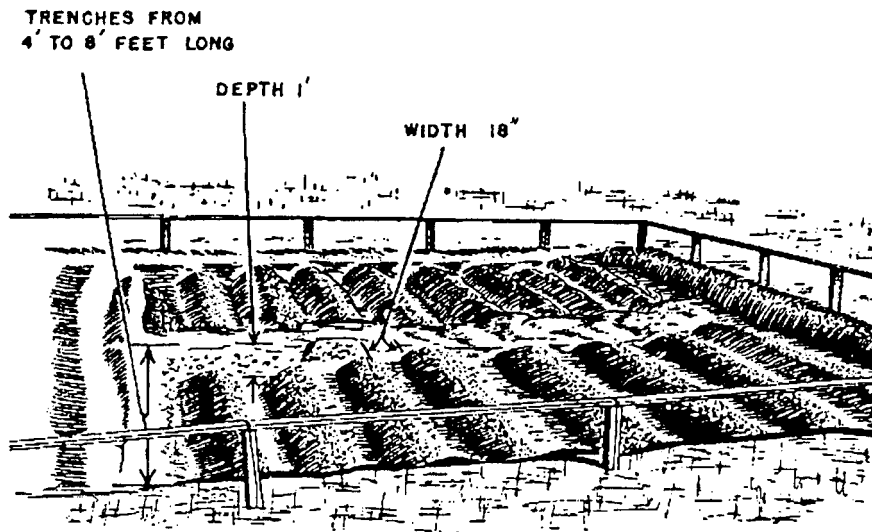
Figure 9-17.

This grease trap utilizes crossed soakage trenches and a pail. For normal operation, two such devices will be constructed and used on alternate days.

the pit with a gradual downward slope to 1½ feet deep at the end farthest away from the pit. The bottom of the structure is filled with a suitable contact medium such as small rocks. Trenches are closed in the same manner as soakage pits. Figure 9-17 shows a soakage trench with a pail type grease trap.

c. Evaporation beds are constructed to allow 3 square feet of evaporation area per person, per day, for field mess wastes and 2 square feet per person, per day,

for bathing wastes. Each bed is constructed in the same manner and spaced so that wastes can be easily distributed to any one of them. An 8 foot by 10 foot rectangle is marked off. The top soil is scraped and used to form a dike around the perimeter of the bed. The bed is then spaded to a depth of 10 to 15 inches and raked into a series of ridges and depressions with the ridges about 6 inches higher than the depressions. In operation, one bed is flooded with liquid wastes to the top of the ridges. This



EVAPORATION BED

Figure 9-18.

This sanitary device is used to dispose of liquid kitchen wastes in locations where soakage pits and grease traps are impractical. Evaporation beds are recommended for periods of short duration in hot, dry climates where soakage pits cannot be dug or where the soil is too hard (frozen or rocky) to absorb moisture.

is equivalent to an average depth of 3 inches over the bed. The liquid wastes are then allowed to evaporate and percolate. After 3 or 4 days, the bed is usually dry enough to permit respading and reforming. Other beds are flooded on successive days and the same sequence of events is followed, figure 9-18.

d. Grease traps must be constructed between the field mess and each soakage pit, trench or evaporation bed.

(1) Filter grease trap. A 55 gallon drum, with the top removed and the bottom perforated is used. It is filled two thirds full with three layers of material. Crushed rock or large gravel is placed on the bottom, progressively smaller gravel in the middle, and a 6 inch layer of sand, ash, charcoal or straw is placed on top. The top of the drum is covered with burlap to strain out the larger pieces of debris. The burlap is removed daily, burned or buried, and replaced with a clean piece. The internal filtering material is removed, buried, and replaced at least once a week. The barrel will be installed in the center of a soakage pit or trench about 2 inches below ground level, figure 9-19.

(2) Baffle grease trap. The baffle grease trap is the most effective device for removing grease. It consists of a watertight container divided into three equal sized chambers by hanging baffles. The lower edge of the first baffle hangs to within 1 inch of the bottom of the container. The second baffle hangs to a point half the depth of the box. The outlet pipe (2" diameter) is inserted 6 to 8 inches below the upper edge of the last (exit) chamber and extends outward to the center of and 1 foot below the surface of a soakage pit or trench. The outlet pipe may also terminate in an evaporation bed.

The liquid waste is strained before it flows into the entrance chamber of the trap. Before the trap is put into service, it is filled with cool water. The cool water causes the grease to solidify and rise to the surface where the baffle prevents it from reaching the outlet and flowing into the soakage area. The trapped grease is skimmed from the first (entrance) and second chamber at least daily and buried. The trap must be emptied and scrubbed with hot, soapy water as often as necessary to keep it operating efficiently, figure 9-20.

9-29. Garbage Disposal.

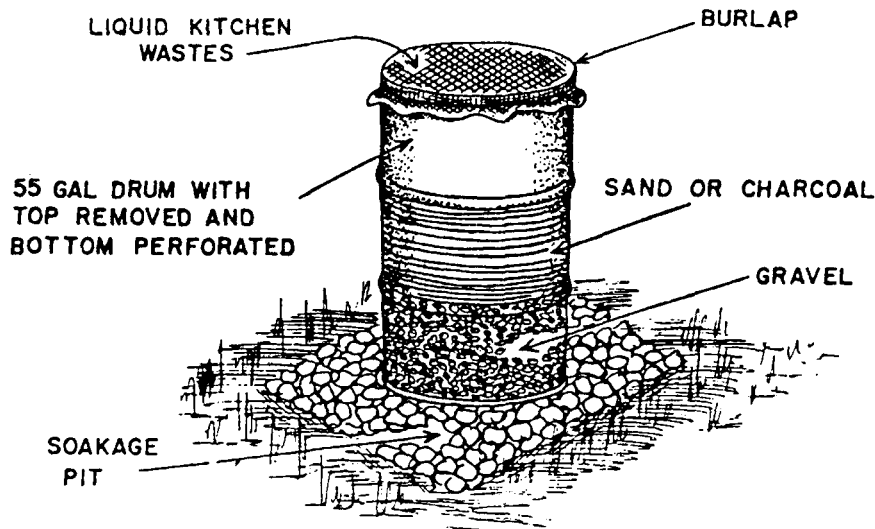
1. Garbage is the solid or semisolid wet wastes resulting from the preparation, cooking and serving of food.

2. Garbage is disposed of by burial or incineration. In either case, the tactical situation must be considered before proceeding.

a. Burial. When troops are on the march or in camps for less than one week, garbage is disposed of by burial in pits or trenches. Burial must be at least 100 feet away from any natural water source and from the field mess (further if insects, vermin or odor become a problem).

(1) Pits. Pits are preferred for overnight halts. They consist of a 4 foot square pit that is 4 feet deep and will service 100 people for one day. When the pit is filled with garbage to within 1 foot from the top, it is covered with compacted dirt and mounded with an additional 1 foot of dirt.

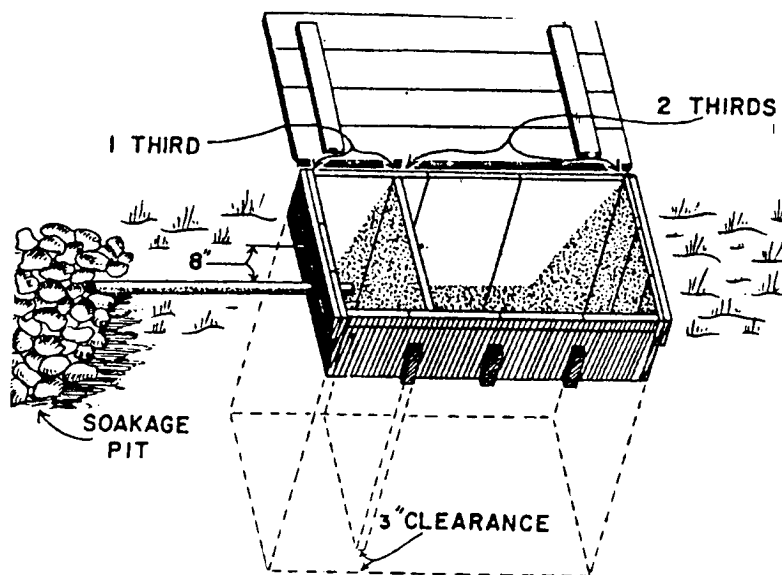
(2) Continuous trench. A continuous trench is used for stays of 2 days or more. The trench is dug 2 feet wide, 4 feet deep and long enough to accommodate the



FILTER GREASE TRAP

Figure 9-19.

This grease trap may be used in place of the baffle type. It will effectively remove grease from liquid kitchen waste, although the top layer of sand will require frequent replacement.



BAFFLE GREASE TRAP

Figure 9-20.

In this illustration the box-type baffle grease trap is shown. A baffle may be used in a box, drum, or barrel in the construction of a grease trap. Salvage boxes or barrels may be reinforced and/or treated to serve this purpose. One baffle extends half the depth of the box and the other baffle extends within one inch of the bottom of the box. The water is poured into the box on the side nearest the half baffle and the grease remains on the surface of the first two sections of the trap. The pressure of the fluid forces the grease free water under the last baffle board and out the pipe into the soakage pit.

next day's garbage. When the first section is full, it is covered and mounded, then another section is dug to accommodate the next day's garbage. The process can be repeated indefinitely.

b. Incineration. Incineration is the garbage disposal method often used in camps that will be used for 1 week or more. Wet materials will not burn easily and tend to disrupt the incinerator air draft. Therefore, it is necessary to separate the liquid from the solids. Separation is done by straining the garbage through a coarse strainer such as an old bucket or 55 gallon drum with holes punched in the bottom. The liquid is run through a grease trap and into a soakage pit. The solids are incinerated. Incinerators must be located at least 50 yards from the camp area and away from flammables.

(1) Inclined plane incinerators will handle the garbage of an entire battalion. Their effectiveness in combustion and the fact that they are somewhat protected from wind and rain makes them excellent improvised devices. A sheet metal plane is inserted through three telescoped 55 gallon drums from which the ends have been removed. The drums are laid on an incline. The metal plane is extended about 2 feet beyond the upper end of the inclined drums and serves as a loading or stoking platform. A grate is placed at the lower end of the inclined drum/plane mechanism. A wood or oil fed fire is provided under the grate. After the incinerator becomes hot, drained garbage is placed on the stoking

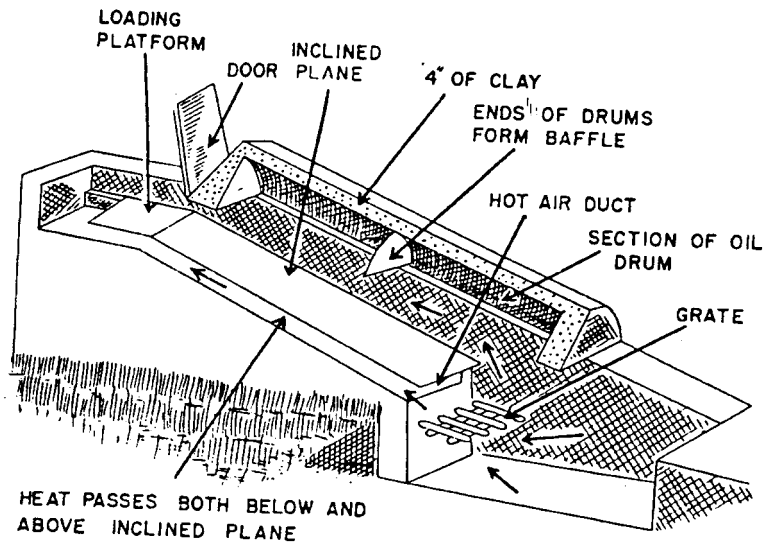
platform. As the garbage dries, it is pushed down the plane in small amounts and is burned on the grate, figure 9-21.

(2) Barrel incinerators. A barrel incinerator is made from a 55 gallon drum by cutting out both ends, punching many holes near the bottom, and inserting metal rods or small pipes through the barrel, several inches above the holes. The metal rods serve as a grate; the punched holes allow for air draft. The barrel is supported several inches above the ground on stones, bricks, or dirt filled cans so that a fire can be built under it. Drained garbage is added in small amounts and burned, figure 9-22.

9-30. Rubbish Disposal.

1. Rubbish is dry, disposable waste resulting from almost all of man's activities.

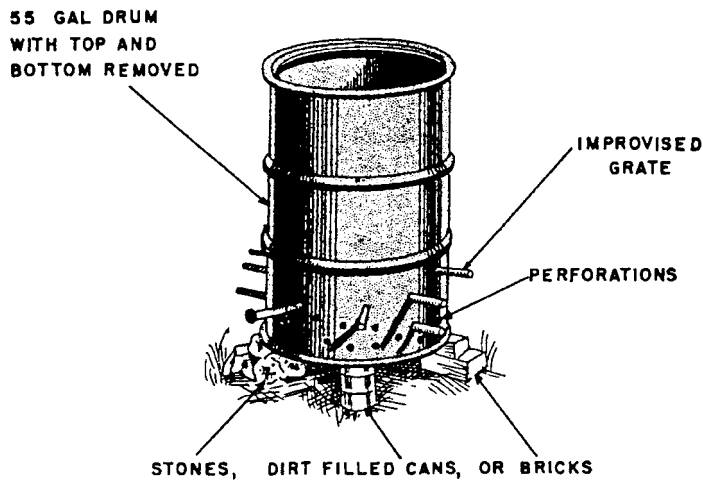
2. Rubbish which for tactical reasons cannot be hauled to a proper disposal site is either buried or incinerated depending on the field situation. For short stays, rubbish is buried in pits with the garbage taking care to flatten cans and break down boxes. In camps where the length of stay is expected to be over one week, the rubbish is incinerated, and the ash and noncombustibles are buried with the garbage. Barrel incinerators are commonly used for rubbish incineration.



INCLINED PLANE INCINERATOR

Figure 9-21.

This incinerator can be very useful in temporary camps. Garbage is placed on the loading platform and fed continuously down the inclined plane towards the grate. This device is particularly useful for burning wet garbage in places where it cannot be buried.



BARREL INCINERATOR

Figure 9-22.

This incinerator is easily improvised and will effectively consume small amounts of garbage and combustible refuse. A grate is made of scrap pipe inserted in the holes as shown. An alternate method is to create a grate by simply punching holes in the bottom of the barrel. Instead of trenches to supply draft, the barrel could be elevated on supports of bricks or stones.