APPENDIX C

FIELD WASTE

The accumulation and disposal of waste of all types is a major concern on the modern battlefield. Improper handling and disposal of field wastes can adversely impact military operations by leaving an operational footprint, causing health and sanitation problems to include serving as breeding grounds for rodents and arthropods that cause disease. Further, the accumulation of waste contributes to environmental contamination.

Section I. OVERVIEW

C-1. General

Army policy is that all solid and hazardous waste will be disposed of in an environmentally acceptable manner consistent with good sanitary engineering principles and the accomplishment of unit mission. While operating OCONUS, either in training or actual contingency operations, the theater commander will determine the applicability of both US and host-country policies.

C-2. Responsibility for Disposal of Waste

a. Depending on the nature and volume of waste created, units generating the waste are normally responsible for its collection and disposal.

b. Certain types of waste require special handling that may be beyond the capability of the unit or facility. Units generating larger amounts of waste, such as hospitals, may not have the resources or equipment to properly dispose of solid waste. In these cases, supporting engineer units should be contacted to provide waste disposal support.

C-3. Categories of Waste

Waste can be subdivided into five distinct categories: general waste (including solid waste), hazardous waste, medical waste, human waste, and wastewater. Nonmedical solid waste (general and hazardous waste) can be generated by any military unit. Medical waste is only generated by medical elements, such as treatment, research, and laboratory. Supporting engineer and PVNTMED personnel can provide guidance and assistance on the handling, processing, and disposing of waste.

a. *General Waste*. This category includes all waste not specifically classified as medical waste or hazardous waste. It includes such items as—

- Paper and plastic products (which are by far the most abundant solid waste generated in a field environment).

- Garbage (generated by dining facilities).
- Scrap material (wood, metal, and so forth).

b. Hazardous Waste. This includes waste which is either ignitable, corrosive, reactive, or toxic, especially POL and some chemicals. Hazardous waste usually requires special handling, transportation, disposal, and documentation, or treatment to render it nonhazardous.

c. Medical Waste. There are two types of medical wastes; nonregulated and regulated. Nonregulated medical waste is defined as solid material generated from the direct result of patient diagnosis, treatment, or therapy which requires no further treatment and can be disposed of as general waste. An example of this type of medical waste includes soiled dressings, bandages, disposable catheters, swabs, used disposable drapes, gowns, masks, gloves, empty used specimen cups, and gauze or cotton rolls, to include saliva soaked and blood-tinged gauze. Regulated medical waste (RMW) is defined as medical or laboratory wastes which is potentially capable of causing disease in people and may pose a risk to individuals or public health if not handled or treated properly.

d. Human Waste. This waste is comprised of feces and urine.

e. Waste Water. This includes liquid waste generated by laundry, shower, food service, and routine MTF operations.

Section II. GENERAL AND HAZARDOUS WASTE

C-4. General

General and hazardous waste are produced by all military units. Control and disposal of these types of waste requires planning and the development of the unit's standing operating procedures.

C-5. Sources of General and Hazardous Waste

a. The primary sources of general and hazardous waste are—

- Routine troop support operations.
- Maintenance and motor pool operations.
- Administrative functions.
- Dining facility operations.

- Medical treatment facilities.

b. In all of these operations or functions, a major effort must be made to reduce the amounts of waste generated and, thus, to lessen the burden on the disposal system.

C-6. Disposal of General and Hazardous Waste

Most general waste is buried or burned by the generating element. It can be transported in organic vehicles to a waste disposal point (sanitary landfill). It is important to remember that vehicles used to transport waste must be properly cleaned and sanitized before being used for ration or patient transportation operations. During training exercises, supporting engineers are responsible for the construction and operation of the landfills.

a. Putrescible waste from dining facilities, while not hazardous or infectious in and of itself, can become both a serious aesthetic problem, as well as a breeding site for disease-carrying rodents and arthropods. This class of solid waste must be removed and disposed of after every meal. Burial of this type waste should be at least 30 yards (or meters) from the food service facility. Normally, one garbage pit is required per 100 soldiers per day (FM 21-10-1).

b. Used oil and POL products are classified as hazardous wastes. Disposal methods for this waste must comply with federal, state, local, and HN regulations. Military engineer and PVNTMED support elements can advise on required disposal procedures.

Section III. MEDICAL WASTE

C-7. General

Regulated medical waste is the category of medical waste which requires special handling, treatment, and/or disposal. Classes of RMW are as follows:

a. *Class 1—Culture Stocks and Vaccines*. Cultures and stocks of infectious agents and associated biologicals, including cultures from medical and pathological laboratories, discarded live and attenuated vaccines, and culture dishes and devices used to transfer, inoculate, and mix cultures. (All other laboratory waste except Class 2 and Class 3 is considered general waste.)

b. Class 2—Pathological Waste. Human pathological wastes, including tissues, organs, body parts, extracted human teeth, and body fluids removed during surgery or autopsy and during other medical procedures as well as specimens of body fluids.

c. Class 3—Blood and Blood Products.

(1) Free-flowing human blood, plasma, serum, and other blood derivatives that are wastes (for example, blood in blood bags, blood and/or body drainage in suction containers).

(2) Items such as gauze or bandages, saturated or dripping with human blood, including items produced in dental procedures, such as gauze or cotton rolls saturated or dripping with saliva.

NOTE

The following items saturated or dripping with blood are not subject to the requirements of this regulation: Products used for personal hygiene, such as diapers, facial tissues, and sanitary napkins.

d. Class 4 and 7—All Used and Unused Sharps. Sharps used in animal or patient care or treatment in medical, research, or support laboratories (including hypodermic needles, syringes (with or without the attached needle), Pasteur pipettes, scalpel blades, blood collection tubes and vials, test tubes, needles attached to tubing, and culture dishes [regardless of presence of infections agents]). Other types of broken or unbroken glassware that were in contact with infectious agents (that is, used slides and cover slips).

e. Class 5—Animal Waste. Animal carcasses, body parts, bedding contaminated or suspected of contamination with infectious agents. Road kills, euthanatized animals, and animals dying of natural causes are not considered Class 5 (Animal Waste).

f. Class 6—Isolation Centers for Disease Control (CDC) Risk Group IV Waste. Biological waste and discarded materials contaminated with blood, excreta, or secretions from humans or animals isolated to protect others from highly communicable diseases. Disease agents classified in CDC Risk Group IV are considered highly communicable.

C-8. Responsibility for Disposal of Medical Waste

a. The hospital commander is responsible for implementing polices for medical waste management to include—

- Identification.
- Segregation.
- Handling.
- Storage.
- Disposal.
- Transportation.

b. The hospital commander will normally designate a member of his staff to serve as the Infectious Disease Control Officer. This officer assists the hospital commander in establishing infectious disease control procedures. Infectious disease control procedures are established to preclude the spread of infection within the hospital and to prevent the spread of infectious disease outside the facility.

c. The PVNTMED adviser is responsible for providing the commander with technical guidance on properly managing medical waste.

d. Medical treatment personnel are responsible for the proper identification, segregation, and handling of medical waste generated during patient care.

e. Supply and Service Division is responsible for the handling, transportation, and disposal of the medical waste.

C-9. Source of Medical Waste

The major source of medical waste is patient care areas, especially the emergency room or EMT/triage areas, ORs, and ICUs. Medical wards and laboratories are also medical waste generators. The actual amount of medical waste generated is dependent on the intensity and nature of medical operations.

C-10. Handling and Transporting Medical Waste

a. Proper handling is the key to an effective hospital waste program. Segregation of RMW from general waste at the point of generation is a must. Procedures for handling medical waste are as follows:

- Personnel who transport and dispose of RMW wear a disposable mask, butyl rubber apron, and gloves.

- Regulated medical waste is collected in double-lined impervious containers lined with leak-resistant bags; otherwise, double plastic bags are used. The containers are clearly marked as RMW. All bags are sealed after being filled to only two-thirds capacity, then sealed by lapping the gathered open end and binding it with tape or a closure device. This ensures that liquid waste cannot leak. A method of segregating RMW from general waste is the use of distinctly colored bags (red) for RMW, if available (AR 40-5).

- Sharps are placed in a rigid, puncture-resistant container, clearly marked with the universal biohazard symbol.

NOTE

Needle/syringe clippers are not authorized for use.

- Blood, blood products, and semisolid waste are placed in unbreakable capped or stoppered containers.

- Medical waste is stored in designated areas, either secured or under direct physical control.

- Regulated medical waste is removed from the point of generation and is disposed of at least every 24 hours.

b. The transportation of medical waste within the hospital is in rigid, leakproof containers, marked and used exclusively for its transport. Vehicles used to transport medical waste to disposal sites must not be used to transport rations, clean laundry, or medical supplies, or used for other purposes until after they have been thoroughly cleaned and sanitized using a 5 percent chlorine solution (48 ounces of chlorine granules in 5 gallons of water).

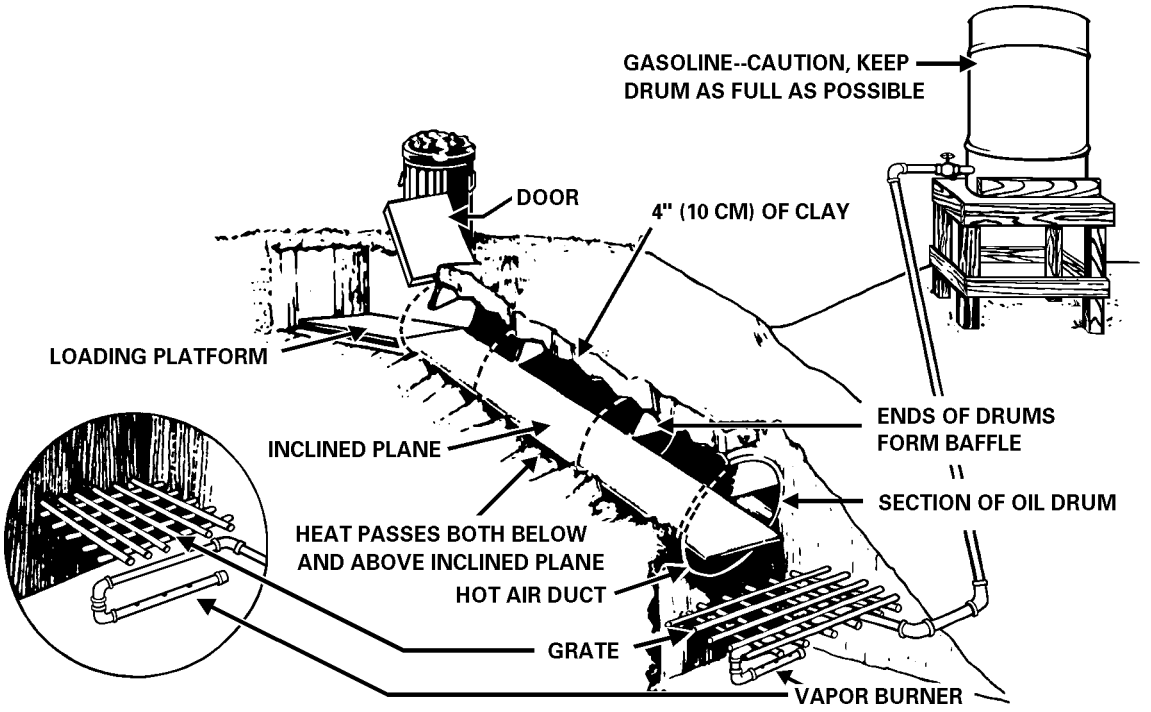
C-11. Disposal of Medical Waste

The purpose of properly treating and disposing of medical waste is to render it nonpathogenic, unrecognizable, and to make it unusable (sharps). Depending on the quantity and type of waste, command policies, and availability of disposal facilities and engineer support, a variety of options exists. Every effort should be made to use the safest and most complete method of disposing of this waste.

a. Training and Tactical Deployment. During training deployment in CONUS and training/ tactical deployment in many OCONUS locations (such as European), the HN environmental regulations are such that disposal of medical waste via field expedient methods is not permitted. Furthermore, the quantities and types of medical waste generated during training are relatively limited due to the limited amount of actual patient care. As such, the option of choice is to haul the medical waste, via military vehicle or contract services, to fixed installations (preferably large fixed medical facilities) for treatment and disposal according to command policies. While proper field medical waste techniques are difficult or against regulation to train in the field, it is still important to plan for during operations. The requirements for segregating and handling waste are critical and remain an essential part of training.

b. Steam Sterilization. Some types of medical waste, especially in small quantities, can be rendered nonpathogenic by autoclave (steam sterilization). This technique or system is particularly appropriate for small amounts of waste generated in EMT areas and the laboratory element (for example, contaminated dressings, needles, syringes, cultures, culture plates, pipettes, and blood tubes). To ensure complete disinfection, the steam sterilizer must operate at a minimum of 250 degrees Fahrenheit (121 degrees centigrade), under 15-17 pounds of pressure per square inch, for 45 minutes. Two factors must be kept in mind when using the autoclave—the size of the load placed in the chamber and the exposure time. There are a number of different types of autoclaves; therefore, for detailed information on the operation of a specific autoclave, refer to the manufacturer's instructions or TM. DO NOT autoclave waste in a sterilizer that is used to prepare sterile packs or instruments for medical uses. Also, some plastics (red bags) and sharps containers may melt during an autoclave cycle, causing uncontained waste to stick to the autoclave. It may be necessary to use autoclave bags that can withstand the physical conditions produced by the sterilizer.

c. Controlled Incineration. Incineration is the method of choice for most types of medical waste, but it must be controlled. Burning medical waste requires incinerators specifically designed for the various types of medical waste. During OCONUS mobilization deployment, an inclined plane incinerator (Figure C-1) is a field expedient method when no other option is available. For the hospital to build and use this incinerator, there should be no immediate plans to relocate the hospital. This field expedient incinerator is a controlled open air burning method that can be used for burning small amounts of medical waste; however, command approval must be given prior to its use. Thorough consideration must be given to all available options before deciding to implement the open air burning method.



THIS INCINERATOR WILL DISPOSE OF TRASH AND MEDICAL WASTE FROM A FH/GH OR A SMALLER-SIZED MTF. THE COMBUSTION ACHIEVED BY THIS INCINERATOR AND THE FACT THAT IT IS NOT AFFECTED BY LIGHT RAIN OR WIND MAKES IT AN EXCELLENT IMPROVISED DEVICE. TIME AND SKILL, HOWEVER, ARE REQUIRED IN BUILDING IT. A SHEET METAL PLANE IS INSERTED THROUGH TELESCOPED OIL DRUMS FROM WHICH THE ENDS HAVE BEEN REMOVED. A LOADING OR STOKING PLATFORM IS BUILT; THEN ONE END OF THE PLANE DRUM DEVICE IS FASTENED TO IT, THUS CREATING AN INCLINED PLANE (FM 21-10-1). A GRATE IS POSITIONED AT THE LOWER END OF THE PLANE, AND A WOOD OR FUEL OIL FIRE IS BUILT UNDER THE GRATE. AFTER THE INCINERATOR BECOMES HOT, DRAINED WASTE MATERIAL IS PLACED ON THE STOKING PLATFORM. AS THE WASTE DRIES, IT IS PUSHED DOWN THE INCLINE IN SMALL AMOUNTS TO BURN. FINAL COMBUSTION TAKES PLACE ON THE GRATE. THE OPERATOR OF THIS DEVICE MUST WEAR GLOVES, A BUTYL RUBBER APRON, AND A DISPOSABLE MASK.

Figure C-1. Improvised inclined plane incinerator.

NOTE

In all cases, ash from waste incineration must be buried.

d. Disposal by Burying. As a last resort, and with command approval, medical waste can be buried. Engineer support is required for construction of the waste disposal site. The waste must be covered immediately with refuse (trash) then sealed to ensure the waste is not accessible to scavenging. All previous options are considered before accepting burial as the final option. Close coordination with PVNTMED personnel and HN authorities are essential.

Section IV. HUMAN WASTE

C-12. General

Correct human waste (feces and urine) disposal is essential to prevent the spread of diseases caused by direct contact, contamination of water supplies, or dissemination by rodents or arthropods. It is even more critical in a hospital environment because patients are more susceptible to diseases transmitted through fecal contact. All human waste must be disposed of in a manner consistent with command policy and good sanitary engineering practices.

C-13. Responsibility for Disposal of Human Waste

The hospital commander is responsible to provide human waste disposal facilities. This may require the supporting engineer element to assist in the construction of latrine facilities.

a. Field Medical Treatment Facilities. In some locations, construction and use of actual field expedient waste facilities may be prohibited. In this case, one option is to obtain engineer support. The option of choice is to establish the hospital in an area with permanent or semipermanent latrine facilities already constructed and connected to an established sanitary sewer system. However, this may only be possible in areas designated as deployment sites. In many instances, it may be possible for hospitals to contract waste removal or latrine facilities through a HN support contract. Procedures will vary depending on the command policy and local (HN) agreements, but waste will still have to be separated into types by the unit. The use of chemical or self-contained toilets is another option instead of constructing field expedient latrines. In all types of arrangements, the hospital field sanitation team and PVNTMED personnel are responsible for monitoring the achievement of field sanitation requirements (FM 21-10-1).

b. Field Expedient Facilities.

(1) *Type selection.*

(*a*) The type of field latrine selected for a given situation depends on a variety of factors, such as—

- Number of personnel (staff and patients).
- Duration of stay at the site.
- Geological and climatic conditions.

(*b*) Supporting PVNTMED personnel and the hospital's field sanitation team can assist the commander in determining the appropriate type of latrines, their locations, and size.

(*c*) Specific guidance on selection criteria is provided in FMs 21-10 and 21-10-1.

(2) *Location*. Latrines should be located in a manner which prevents the contamination of food and water. Hospital latrines are located at least 100 yards (90 meters) downwind (prevailing wind) from the hospital food service facility, at least 100 feet (30 meters) from any ground water source, and at least 30 yards from the hospital perimeter but within reasonable distance for easy access (FM 21-10-1). For the FH/GH, multiple latrine sites are required due to the size of hospital layout and distances between patient care, administrative, and sleeping areas.

(3) *Maintenance*. Sanitation and maintenance of the hospital's latrine facilities are critical to prevent disease transmission. Handwashing facilities must be placed at each latrine.

d. *Closing and Marking*. Closing and marking of latrines will be IAW command policy and good field sanitation practice as stated in FMs 21-10 and 21-10-1.

C-14. Patient Facilities

a. Ambulatory patients will use the same latrines as the staff. The number of latrines established will be based on both the number of staff and the anticipated patient load. However, male and female latrines are required. Latrines need to be close enough to the ward areas for convenience of access while maintaining distances from dining facilities, water sources, and the like.

b. Nonambulatory patients require the use of bedpans and urinals. Disposal of fecal matter and urine and the sanitation of bedpans and urinals are major concerns. The sinks within the hospital will not be used for disposal of waste or for washing bedpans and urinals. One or more of the hospital latrines should be designated for emptying bedpans and urinals. Once the bedpans and urinals are emptied, they are washed (using a brush) with the wastewater disposed of in the latrine or designated area. An area should be established similar to that of a mess kit laundry line using metal garbage cans and immersion heaters. One can must have warm soapy water and the other can must have clear boiling water. These cans must be clearly marked for use in washing bedpans and urinals only. The bedpans are then sanitized by submerging into boiling water for 30 seconds.

WARNING

A hook or some device should be used to prevent contact with the boiling water and hot bedpans or urinals.

The bedpans and urinals are then placed on tent pegs or some hanging device to air dry.

NOTE

Personnel working with immersion heaters should be aware of the safety precautions and be trained in immersion heater lighting and operation.

An alternative consideration is the use of plastic bedpan liners. If plastic liners are used, they will reduce the requirement for cleaning and sanitizing the bedpan. The plastic liners will then be managed as solid waste.

Section V. WASTEWATER

C-15. General

Water usage generally results in the production of wastewater which requires disposal. Depending on the source, wastewater may contain suspended solids and particulate matter, organic material, grease, dissolved salts, biological, pathological, and pathogenic organisms, and toxic elements. Just the volume of wastewater alone, without consideration of the various contaminants, can cause substantial operational and health related issues if not properly managed and disposed.

C-16. Requirement for Disposal

a. All wastewater and waterborne wastes generated in a field environment must be collected and disposed of in a manner that—

- Protects water resources from contamination.
- Preserves public health while minimizing mission impairment or adversely impacting on the readiness of the force.

- Protects the local environment from harm.

b. When operating OCONUS, units may have to comply with applicable HN laws and procedures; this is determined by the theater commander. In an actual contingency operation, the theater commander (with input from the command surgeon) determines the applicability of local environmental laws in the AO. Irrespective of laws and regulations, proper disposal of wastewater is essential to protect the health of the force by precluding contamination of water supplies and development of rodent and arthropod breeding sites.

C-17. Responsibility for Disposal

Units generating wastewater in the field are responsible for their own wastewater collection and disposal. Large volume wastewater generators, such as hospitals, may require engineer support. Theater combat engineers will provide support during OCONUS deployments or contingency operations. In any case, the hospital commander has the final responsibility for coordinating disposal of his unit's wastewater.

C-18. Wastewater Sources and Collection

Hospitals generate a significant volume of wastewater corresponding to the volume of water consumed. A conservative estimate of wastewater volume for planning purposes is that 80 percent of all water used (other than human consumption) will end up as wastewater. The largest volumes of wastewater are generated by support operations of the hospitals such as laundry, shower, and food service operations. While this type of wastewater is not unique to a hospital, it contributes to an enormous volume requiring collection and disposal. However, wastewater generated from direct patient care functions is unique to the hospitals and may be contaminated with blood, other body fluids, particulate matter, and potentially infectious organisms. In addition to the quantity of wastewater, an added problem is the multiplicity of sources within the hospital that contribute to the complexity of collection.

a. Field Sinks. Field sinks are a primary source of wastewater from staff handwashing, patient hygiene, instrument cleaning, and the like. This liquid waste is generated intermittently and the volume is highly variable depending on the functional area and patient work load. The sinks can operate with the drain line placed in an empty 5-gallon water can. This can must be periodically emptied into a disposal system.

NOTE

Extreme care must be taken to ensure that 5-gallon cans used for wastewater are not mistaken or confused with 5-gallon cans used for potable water; clear labeling is critically essential.

If wastewater collection cans or the DEPMEDS wastewater collection system are not used, the sinks will drain to the immediate exterior of the hospital shelter, resulting in an unacceptable pooling of wastewater throughout the hospital area.

b. Medical Treatment Facility Sources. Sources of wastewater other than the sinks are limited and will generate relatively small volumes of waste liquids. In most cases, this wastewater can be collected and discharged into a nearby sink. An exception may be the water used for facility and major equipment sanitation; for example, wastewater from washing OR tables, OR floors, litters, ambulances, and other medical materiel.

c. Field Showers.

(1) While not an actual part of the hospital system, quartermaster field showers may collocate or be near the hospital to support both patient and staff. These showers may also support personnel of other units within the area. The quartermaster personnel operating field showers are responsible for wastewater collection and disposal. In some situations, the disposal of this wastewater may be in conjunction with that of the hospital.

(2) If quartermaster support is not available, hospital personnel must provide their own showers (FMs 21-10 and 21-10-1). The hospital is responsible for the collection and disposal of this wastewater.

d. Field Laundries. The field laundry is one of the largest generators of wastewater. Field laundries may be collocated with or near hospitals to provide support and can present an inordinate wastewater disposal problem. It is estimated that the hospital patient laundry supply requirements will be 77 pounds per patient per week. Laundry support requirements for each soldier is estimated to be 15 pounds per week. Like the showers, quartermaster personnel operating laundries are responsible for wastewater collection and disposal. Because of the large volume of water required for laundry operations, the facility may have to be located away from a hospital and closer to a water source. In effect, this location would reduce or remove what may be a wastewater disposal problem from the immediate area of the hospital. (Preventive medicine personnel must ensure that laundry personnel are trained in and properly implementing procedures for handling contaminated linens.)

e. Field Kitchen. Army field kitchens are also significant sources of wastewater. In addition to the volume, the greases and particulate matter in wastewater from a field kitchen must be dealt with in a much more deliberate manner. For instance, grease traps must be constructed to remove food particles and grease from the kitchen wastewater before disposal. Information for the construction and operation of the filter and baffle grease traps is provided in FM 21-10 and FM 21-10-1. Also, hospital commanders may obtain technical assistance from the supporting PVNTMED element.

C-19. Disposal of Wastewater

a. In disposing of wastewater, a number of factors should be considered. These include—

- Volume and characteristics of the wastewater.
- Operational considerations (for example, duration of stay in a given location and the intensity of combat operations).

- Geological conditions (for example, type of terrain and soil characteristics, or depth of the water table).
- Climatic conditions.
- Availability of engineer support.
- Accessibility of established sewage collection, treatment, and disposal systems.
- Applicability of command environmental programs.

b. In light of the above factors, there are a number of wastewater disposal alternatives that a hospital commander may select. These include—

- Connection to established sanitary sewer system.
- Collection and holding wastewater for engineer or HN agency removal to a fixed treatment facility.
- An engineer-constructed, semipermanent wastewater collection and disposal system.
- A unit-constructed field expedient wastewater disposal system (FM 21-10-1).

c. In many OCONUS noncombat operations, especially in the more developed countries, use of existing installation disposal facilities should be the method of choice. Even in some contingency operations, preplanned siting of hospitals can take advantage of preestablished connections to the existing sewer system. Coordinate with the local waste disposal facility prior to connecting to the sewer system or dumping waste into the system to ensure the facility can handle the extra waste and for compliance with environmental laws. Assistance from supporting engineers is required to establish the necessary connections and access to the sewer system. However, grease traps or filters may still have to be used in some areas, such as the dining facility's wastewater stream. Traps and filters will be required to remove grease and particulate matter that would adversely affect the operation of the wastewater pumps.

d. If use of a HN sewer is possible, but direct connection is not readily available, an alternate approach is to consolidate and collect wastewater in containers for eventual removal to a sewage treatment plant or a sanitary sewer access by supporting engineers or HN agency. As these storage containers are not part of the hospital's TOE and the wastewater tank trucks and pumping equipment are not standard engineer equipment, this option requires extensive prior planning and coordination.

e. All AMEDD personnel are required to know how to construct and operate field expedient waste facilities. For the hospital, some engineer support in the form of excavation equipment is almost always required. This requirement will be due, in part, to the inordinate volumes of wastewater generated by the hospital and its associated (kitchen, shower, and laundry) facilities. Engineer support must be coordinated and included in the site preparation planning.

f. Traditional field expedient methods of wastewater disposal consist of soakage pits, soakage trenches, and/or evaporation beds. The effectiveness of these methods depends on the geological conditions and the climate. While these disposal devices, especially soakage pits, are generally constructed for small volumes of wastewater, with proper design and operation they can be effective for larger volumes. Because these methods result in final disposal, it is necessary to remove grease, particulate matter, and other such organic material that could reduce the effectiveness of the process. Guidance on designs and construction of these devices is available in FMs 21-10 and 21-10-1 and from supporting engineer and PVNTMED personnel.

g. In arctic environments, or when geological or climatic conditions are to such extreme that soakage or evaporation is not possible, the only alternative may be to collect the wastewater in containers and coordinate removal with Army engineers or use HN operators.