APPENDIX G

FIELD WASTE

The accumulation and disposal of waste of all types is a major problem on the modern battlefield. Not only does this waste impact on military operations, but it also serves as a breeding ground for rodents and arthropods. Further, the accumulation of waste contributes to environmental contamination.

Section I. OVERVIEW

G-1. General

All waste is disposed of in an environmentally acceptable manner consistent with good sanitary engineering principles and accomplishment of the unit mission. While operating outside the continental United States (OCONUS), either in training or actual contingency operations, the theater commander determines the applicability of both US and HN policies.

G-2. Responsibility for Disposal of Waste

a. Depending on the nature and volume of the waste created, units generating the waste are 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. Further, units generating large amounts of waste, such as hospitals or MTFs, 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.

G-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) is generated by all military units. Medical waste is only generated by medical elements, such as treatment, research, and laboratory.

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

- Paper and plastic products (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 wastes which are ignitable, corrosive, reactive, or toxic, especially POL and some chemicals, and which require special handling, transportation, disposal, and documentation. Supporting engineer and PVNTMED personnel can provide guidance and assistance in the handling and disposing of hazardous waste.

c. *Medical Waste.* This is waste produced in an MTF (nongeneral) which contains pathogens of sufficient quantity and virulence to result in an infectious disease in a susceptible host.

d. *Human Waste.* This waste is composed of feces and urine.

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

Section II. GENERAL AND HAZARDOUS WASTE

G-4. General

General and hazardous waste are produced by all military units. The information contained in this appendix on these types of waste is minimal.

G-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 amount of waste generated, and thus, lessen the burden on the disposal system.

G-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, however, that

vehicles used to transport waste must be properly cleaned and sanitized before being used for other operations. During training exercises, supporting engineer assets 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 and a breeding ground for disease-carrying rodents and arthropods. This class of solid waste must be removed and disposed of after every meal. Burial of this type of 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 other POL products are classified as hazardous waste. 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

G-7. General

A component of medical waste, *infectious waste* is defined as any waste generated by an MTF capable of producing infectious disease. For a waste to be infectious, it must contain (or potentially contain) pathogens of sufficient virulence to result in an infectious disease in a susceptible host.

G-8. Responsibility for Disposal of Medical Waste

a. Medical treatment facility commanders, assisted by their PVNTMED assets, are responsible for implementing policies for medical waste management to include medical waste—

- Identification.
- Detection.
- Segregation.
- Handling.
- Storage.
- Disposal.

b. The medical company commander, a physician, is responsible for ensuring that procedures to control the spread of infectious diseases are instituted and enforced within the facility.

Infectious control procedures are established to preclude the spread of infection within the MTF and to prevent the spread of infectious disease outside the facility.

G-9. Types of Medical Waste

All medical waste may be subject to an infectious nature. Other than the initial triage, treatment, and further evacuation of these patients, the medical company does not generate a significant amount of this type of medical waste. There are six types of medical waste requiring specific handling and disposal techniques.

a. Isolation Waste. This waste is generated by patients who are isolated to protect others from highly communicable disease. It includes all discarded materials contaminated with blood, excretions, exudates, or secretions.

b. Microbiological Waste. This waste comes from cultures and stocks of infectious agents from medical laboratory elements, such as specimens or discarded vaccines from treatment areas.

c. Blood and Blood Products. This waste results from the use of all blood and blood-related products including blood bags, blood tubes, and other material contaminated with blood.

d. Contaminated Sharps.

(1) This particular waste includes, but is not limited to, used—

- Hypodermic needles and syringes.
- Pipettes.
- Glass tubes.
- Broken glassware.
- Scalpel blades.

(2) In addition to the physical hazards of sharps, there is the potential for transmission of pathogenic organisms from puncture wounds. Unused sharps also should be considered dangerous since the same puncture hazard exists.

e. Surgical Waste. Surgical waste is the material that has been contaminated as the result of surgical procedures. Examples of this category include—

- Soiled dressings.
- Used sponges.

- Contaminated drainage tubes.
- Soiled surgical drapes and gloves.
- Other material discarded after completion of a procedure.

f. Pathological Waste. This waste is comprised of human or animal tissue, organs, body parts, and fluids removed during a surgical procedure. Human corpses (remains), however, are not considered pathological waste and are handled by MA elements.

G-10. Sources of Medical Waste

a. The major sources of medical waste are patient care areas. In the medical company, this includes the EMT and triage areas, dental treatment area, the 72-hour patient-holding area, and the medical laboratory element. In the event that a surgical detachment is collocated with the medical company (or the surgical squads organic to the airborne/air assault division medical companies), additional medical waste will be generated by this element.

b. The actual amount of medical waste generated by the unit is dependent on the—

- Intensity of the tactical situation.
- Number of casualties (patient work load).
- Types of medical conditions.
- Complexity of medical procedures.
- Patient-holding considerations.

G-11. Handling and Transporting Medical Waste

a. Proper handling is the key to an effective waste program. Segregation of infectious waste from general waste at its source is a must. Procedures for handling medical waste are—

- Personnel who transport and dispose of infectious waste wear a disposable mask, butyl rubber apron, and gloves.
- Infectious waste is collected in double-lined impervious containers with tight fitting lids, if available; otherwise, double plastic bags are used. The containers are clearly labeled as infectious waste. All bags are sealed after being filled to only two-thirds capacity; they are 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 infectious waste from general waste is the use of distinctly colored bags (red) for infectious waste, if available (AR 40-5).

- Sharps are placed in a rugged, clearly marked, puncture resistant container.
- 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.
- Infectious waste is removed from the point of generation and is disposed of at least every 24 hours.

b. The transportation of medical waste within an MTF is in rigid, leak proof containers, marked and used exclusively for its transport. Vehicles used to transport medical waste to disposal sites should not be used for the transportation of rations, clean laundry, or medical supplies. Before the vehicle is used for other purposes, it must be thoroughly cleaned and sanitized using a 5 percent chlorine solution (48 ounces of chlorine granules in 5 gallons of water).

G-12. Disposing of Medical Waste

The purpose of properly treating and disposing of medical waste is to render it nonpathogenic and make it inaccessible. Depending on the quantity and type of waste, command policies, availability of disposal facilities, and engineer support, a variety of options exist. Every effort should be made to use the safest and most complete method of disposing of these materials.

a. Training and Tactical Deployment. During training deployment in CONUS and training and 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 small 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 MTFs) for treatment and disposal according to command policies. While this option does not provide the most ideal training, it may be the only viable option available. 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), when available. This technique 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°F (121 degrees Celsius [C]) under 15-17 pounds of pressure per square inch (psi), 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 manufacture's instructions or technical manual.

c. Controlled Incinerations. 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 G-1) is a field expedient when no other option is available. For the medical company to build and use this incinerator, there should be no immediate plans to move the unit location. 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 hospital 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, 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.

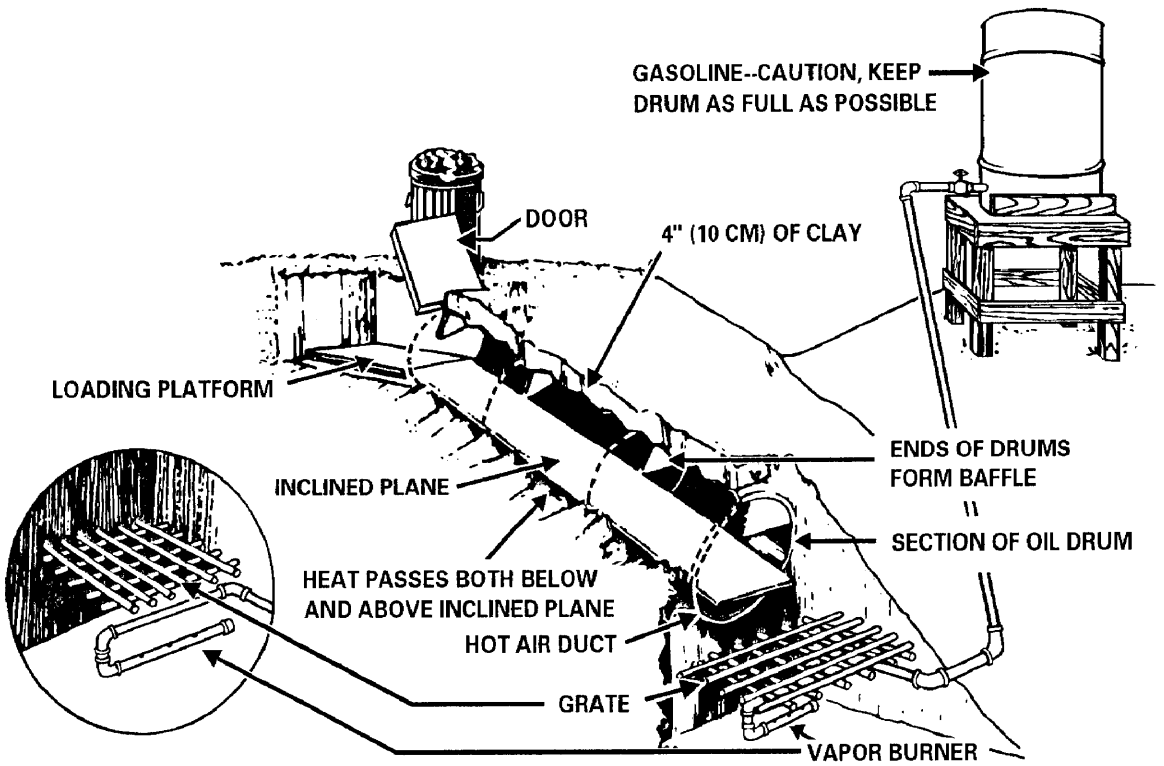

Figure G-1. Improvised inclined plane incinerator.

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 the design and construction of the waste disposal site. The waste must be covered immediately after disposal to ensure inaccessibility. All previous options are considered before accepting burial as the final option. Close coordination with PVNTMED personnel and HN authorities is essential.

Section IV. HUMAN WASTE

G-13 General

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 at MTFs 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.

G-14 Responsibility for Disposal of Human Waste

The unit commander is responsible for providing the appropriate human waste disposal facilities. However, commanders of field MTFs may require engineer support 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 MTF in an area with permanent or semipermanent latrine facilities already constructed and connected to an established sewage system. However, this may only be possible in some areas designated as deployment sites. In many instances, it may be possible 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 unit 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 unit'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 FM 21-10 and FM 21-10-1.

(2) *Location.* Location of MTF latrines is a compromise between the requirement for physical separation from dining facilities, water sources, and the like, and convenience of access for staff and ambulatory patients. Multiple latrine sites may be required depending on the size of unit area and distances between patient care, administrative, and sleeping areas.

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

(4) *Closing and marking.* The closing and marking of latrines is accomplished according to command policy and good field sanitation practices.

G-15. Patient Facilities

As the medical company has a limited holding capability, most of the patients treated and held at the MTF are ambulatory patients. However, due to the tactical situation, inclement weather, or other contingencies, litter patients may have to be held for periods greater than 72 hours. The unit TSOP should, therefore, include instructions for both types of patients.

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 holding areas for convenience of access, while still maintaining distances from the dining facilities, water sources, and the like.

b. Nonambulatory patients require the use of bedpans and urinals. Disposal of fecal material and urine and sanitation of bedpans and urinals for the nonambulatory patient is a major

concern. A designated area is established for bedpan cleaning and sanitizing. The sinks or handwashing facilities within the MTF should not be used for bedpan/urinal disposal or washing. An area should be established similar to that of a mess kit laundry line, using metal garbage cans and immersion heaters. One container must have warm soapy water, while the other container has clear boiling rinse water. These containers must be clearly marked for use in cleaning bedpans and urinals only.

Section V. WASTEWATER

G-16. General

a. Water usage results in the production of wastewater which requires disposal. Depending on the source, wastewater may contain—

- Suspended solids and particulate matter.
- Grease.
- Organic material.
- Dissolved salts.
- Biological, pathological, and pathogenic organisms.
- Toxic elements.

b. Just the volume of wastewater alone, without consideration of the various contaminants, can cause significant operational problems in the field environment.

G-17. Requirement for Disposal

a. All wastewater and water-soluble 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.

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 the development of rodent and arthropod breeding sites. Further, large volumes of wastewater in an AO can impact adversely on functions of US military units and may even aid an adversary in locating and identifying them.

G-18. Responsibility for Disposal

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

G-19. Wastewater Sources and Collection

Medical treatment facilities generate a significant volume of wastewater corresponding to the volume of water consumed for the various functional areas. A conservative estimate of wastewater volume for planning purposes is that 80 percent of all water used (other than for human consumption) will end up as wastewater. The largest volumes of wastewater are generated by support operations of MTFs such as laundry, shower, and food service operations. While this type of wastewater is not unique to MTFs, it will contribute to an enormous volume requiring collection and disposal. On the other hand, wastewater generated from direct patient care functions is unique to the MTFs 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 MTF that contribute to the complexity of collection.

a. Field Sinks. Field sinks are the primary source of wastewater for staff hand washing, 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. If wastewater collection cans are not used, the sinks must be connected to drains that lead to soakage pits or sewer systems; otherwise, the wastewater will collect at the immediate exterior of the MTF shelter. If not collected, the volume of wastewater will result in an unacceptable pooling throughout the MTF area.

CAUTION

Extreme care must **be taken to ensure that the 5-gallon cans used for wastewater are not mistaken or confused with the 5-gallon cans used for potable water. Clear labeling and safe-distance separations between the two are critically essential.**

b. Medical Treatment Facility Sources. Sources of wastewater other than sinks are limited and will generate relatively small volumes of wastewater. 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 litters, ambulances, and other medical materiel.

c. Field Showers.

(1) While not an actual part of the MTF, quartermaster field showers may be collocated with or near the MTF to support both patients 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 MTF.

(2) If quartermaster support is not available, field expedient showers must be established by the medical company (FM 21-10 and FM21-10-1). The medical unit 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 MTFs to provide support and can present an inordinate wastewater disposal problem. 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 an MTF and closer to a water source. In effect, this reduces or removes a portion of the wastewater disposal problem within the immediate MTF area. (Preventive medicine personnel must ensure that laundry personnel are trained in and properly implement the procedures for handling contaminated linens.)

e. Field Kitchen. Army field kitchens are also significant sources of wastewater. In addition to the volume, the grease and particulate matter in wastewater from a field kitchen must be dealt within 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, commanders may obtain technical assistance from the supporting PVNTMED element.

G-20. Disposal of Wastewater

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

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

- Geological conditions (type of terrain and soil characteristics or depth of 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 area number of wastewater disposal alternatives that an MTF commander may select. These include—

- Connection to an established sanitary sewer system.
- Collection and holding of wastewater for engineer or HN removal to a fixed wastewater treatment facility.
- Engineer-constructed semipermanent wastewater collection and disposal system.
- Unit-constructed field expedient wastewater disposal system.

c. In many OCONUS noncombat operations, especially in the more developed countries, use of existing disposal facilities should be the method of choice. Even in some contingency operations, preplanned siting of MTFs can take advantage of preestablished connections to the existing sewer system. 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. Traps and filters are required to remove grease and particulate matter that would adversely affect the operation of the wastewater pumps.

d. If use of a HN sewer system is possible but direct connection is not readily available, an alternate approach is to collect wastewater in storage containers. Then the collected wastewater can be removed to a sewage treatment plant or to a sanitary sewer system access by the supporting engineers or a HN agency. As these storage containers are not part of the MTFs 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. 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 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 FM 21-10 and FM 21-10-1 and from PVNTMED personnel.

f. In arctic environments, or when geological or climatic conditions are such that soakage or evaporation is not possible, the only field expedient alternative may be to collect the wastewater in tanks or drums for removal by Army engineer or HN operators.