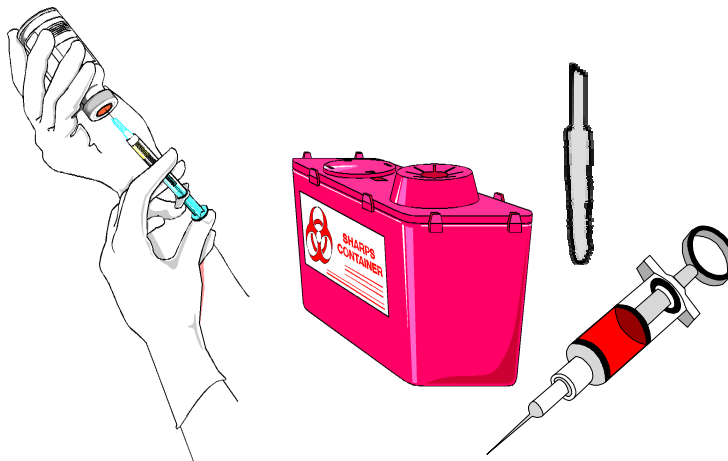




A Commander's Guide To
***REGULATED MEDICAL
WASTE MANAGEMENT***
At Army Medical Treatment Facilities



TG 177
September 2001

U.S. Army Center for Health Promotion and Preventive Medicine



A COMMANDER'S GUIDE TO
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MANAGEMENT**
AT ARMY MEDICAL TREATMENT FACILITIES

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A COMMANDER'S GUIDE TO REGULATED MEDICAL WASTE MANAGEMENT AT ARMY MEDICAL TREATMENT FACILITIES (MTF)

PREFACE

PURPOSE

This document provides current information and guidance regarding the management of regulated medical waste at Army medical treatment facilities.

TECHNICAL ASSISTANCE

Requests for additional assistance and guidance may be directed to the Hazardous and Medical Waste Program at the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) at DSN 584-3651 or commercial (410) 436-3651.

SUGGESTED IMPROVEMENTS

The proponent of this guide is USACHPPM. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-TS-EHM, Aberdeen Proving Ground, MD 21010-5403.

INTRODUCTION

This guide is intended for use by Medical Treatment Facility (MTF) Commanders. It will help the Commander take a proactive role in regulated medical waste management by:

- Providing an overview of present regulations and guidelines,
- Offering insight to future regulations,
- Presenting a quick summary of treatment and disposal options, and
- Summarizing State regulations and listing State points of contact.

The document leads the Commander through a logical thought process by posing questions and offering some realistic and practical answers. While this guide is of importance to the Commander, it also is of great value to the Commander's staff. This guide is based on regulation and should not be construed as a policy document. Commanders should establish policy that has not already been defined by Federal, State, local or Army regulations.

WHY IS REGULATED MEDICAL WASTE MANAGEMENT AN ISSUE?

Highly publicized issues such as medical debris washing up on beaches and increasing numbers of AIDS and Hepatitis B and C cases have focused public attention on medical waste. Improper management of medical waste raises concern over the health risk posed by its infectious character, the potential safety hazards posed by needles and other sharps, and the aesthetic degradation of exposed environments.

Currently available data do not suggest that improper hospital waste disposal has caused disease or that stricter regulation of these wastes will negate beach wash ups or disposal mistakes. In fact, with proper handling, treatment, and disposal, medical wastes are believed to offer minimal health and environmental risks. Though not all medical wastes are infectious, it is their potential infectiousness that has roused public concern and spurred legislation.

WHAT IS REGULATED MEDICAL WASTE?



Though there is no universally accepted definition for regulated medical waste, the definitions offered by regulatory agencies are similar. The Environmental Protection Agency (EPA), the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO) and the Occupational Safety and Health Administration (OSHA) agree that "regulated medical waste" includes those wastes with the potential for causing infection and for which special precautions are prudent. We use the EPA's definition as the basis for this guide.

Some State and local regulations use a similar, general definition. Others list categories of waste that are considered infectious.

The Army uses the term regulated medical waste as the preferred description for what some people know as infectious waste. Other military services and various regulatory organizations may use other terms to represent this waste stream. The Army's use of the term is derived from the original EPA definition. The meaning of the term is defined in the Army's MEDCOM Regulation 40-35, Management of Regulated Medical Waste (RMW). The term is consistent with the proper shipping name required by the U.S. Department of Transportation when shipping RMW (see pages 12 and 13). Other terms may be appropriate for out of continental United States (OCONUS) locations.

In 1986, the EPA published its "Guide for Infectious Waste Management." This guide provided a list of recommended as well as optional infectious waste categories. Two years later, Congress mandated the EPA to determine which medical wastes would be regulated under the Medical Waste Tracking Act of 1988 (MWTa). This Act has expired and is thus obsolete. The EPA's final rule, 40 CFR 259 (now expired and no longer in the Code of Federal Regulations), regulated the same wastes as were recommended in the 1986 guide, with one exception. The Act included an "unused sharps" category. This category, however, is regulated for hazards other than its infectious character. Although the guide is obsolete, it still provides a good description of infectious waste categories. The following table, taken from the guide, lists the different classes of infectious waste as outlined in MEDCOM Regulation 40-35.

REGULATED MEDICAL WASTE CATEGORIES

<u>Waste Class</u>	<u>Examples</u>	
Category 1 - Cultures and stocks of infectious agents and associated biologicals	Specimens from medical and pathology laboratories. Includes culture dishes and devices used to transfer, inoculate, and mix. Also includes discarded live and attenuated vaccines.	
Category 2 - Pathological waste	Tissues, organs, body parts, and body fluids removed during surgery and autopsy.	
Category 3 - Human blood and blood products	Waste blood, serum, plasma and blood products.	
Category 4 - Contaminated sharps	Contaminated hypodermic needles, syringes, scalpel blades, Pasteur pipettes, and broken glass.	
Category 5 - Contaminated animal carcasses, body parts and bedding	From animals intentionally exposed to pathogens in research, biologicals production, or in vivo pharmaceuticals testing.	
Category 6 - Isolation waste	Generated by hospitalized patients isolated to protect others from communicable disease	
Category 7 - Unused sharps	Hypodermic needles, suture needles, syringes, and scalpel blades. Included for consistent sharps handling regardless of contamination.	

WHAT IS NOT REGULATED MEDICAL WASTE?

The decision to handle wastes as infectious is made by the Infection Control Committee and is based on applicable State and local regulations.

GENERAL WASTE - Is solid material intended for disposal that is produced as the direct result of patient diagnosis, treatment, or therapy. Such waste is generated in patients' sleeping, treatment, therapy, or isolation rooms (except where the patient is isolated for a CDC Class 4 disease) and rooms used for diagnostic procedures, doctors'

offices, and nursing units. Examples of items that may be included in this category are soiled dressings, bandages, disposable catheters, swabs, and used disposable drapes, gowns, masks, gloves, feminine hygiene products, soiled diapers, and empty used specimen containers. This waste requires no further treatment and is disposed of as general waste. Local or State regulations further define what is RMW or solid waste.

HAZARDOUS WASTE, which is listed or identified in Title 40 Code of Federal Regulations (CFR), Part 261.3, is regulated under specific EPA standards. Hazardous waste is not included in the regulated medical waste category. Conversely, regulated medical waste, is not classified as a hazardous waste, nor is it regulated by the EPA.

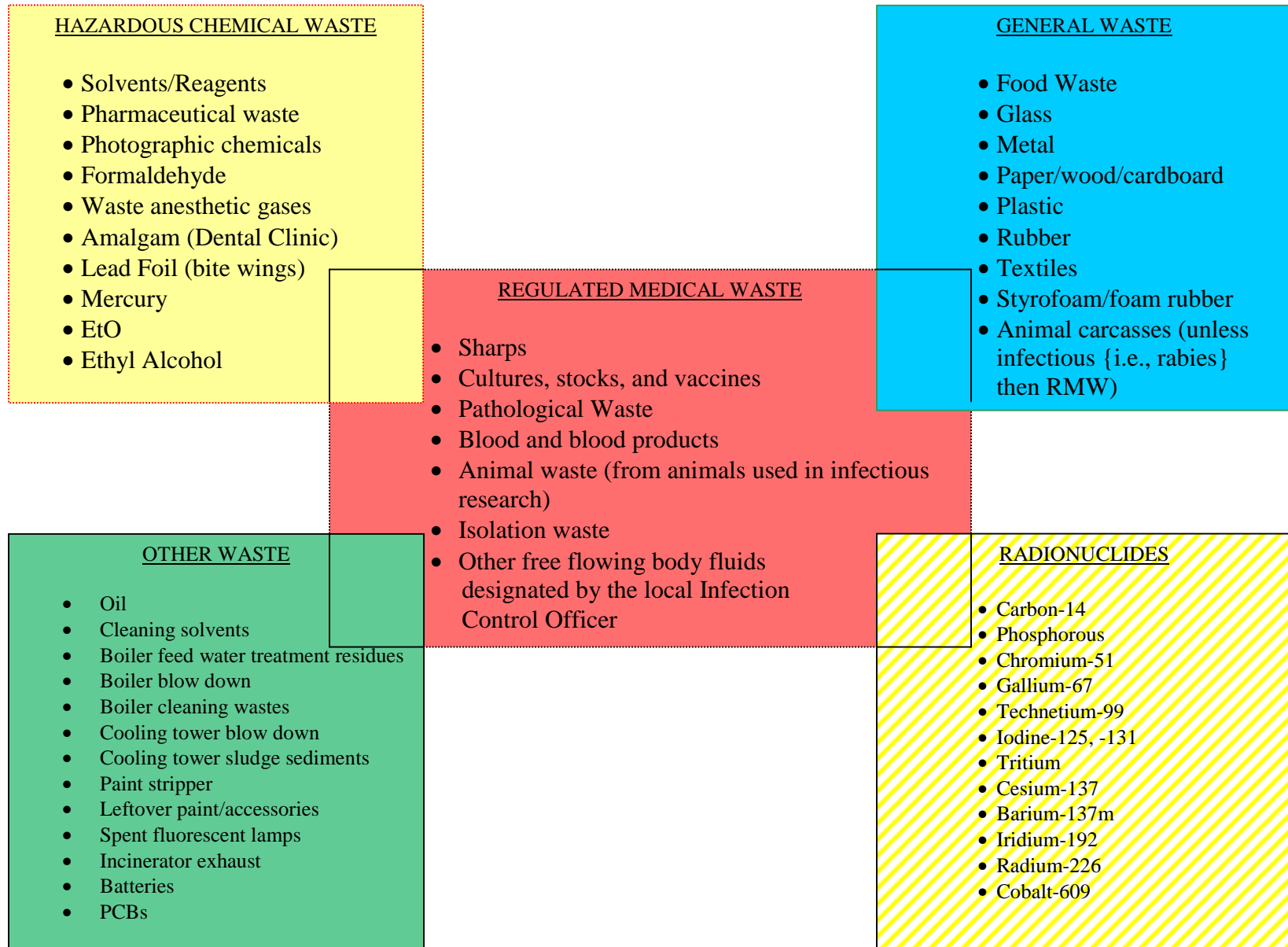
RADIOLOGICAL WASTE is regulated by the Nuclear Regulatory Commission (NRC), the Department of Transportation (DOT), state agencies, and the EPA. It is not included in the regulated medical waste category.

OTHER REGULATED MEDICAL WASTE includes those medical wastes generated within the MTF that are regulated for reasons other than their infectious character (e.g., unused syringes, pharmaceutical wastes, and those pathological wastes which are not designated as infectious) and are not included in the infectious waste category. The classification and management of pharmaceutical wastes is addressed in USACHPPM's Military Environmental Information Source (MEIS) CD-ROM, and is available at most MTFs as well as on-line at <http://chppm-www.apgea.army.mil/newmidi/>.

MIXTURES of waste streams should be managed with all the precautions applicable to each of the waste components.

The following figure shows the relationship of regulated medical waste to the remainder of the solid waste streams within the MTF. The overlapping areas represent both mixtures of waste streams and wastes that pose more than one hazard. Mixtures occur when wastes are not properly segregated and the potential for cross-contamination is introduced. Multiple hazards are inherent in some wastes that are not mixtures. An example would be a syringe used to inject radioactive tracers into an infected patient. This syringe must be handled with all the precautions applicable to RMW and radiological wastes, along with special precautions for sharps.

MTF WASTE STREAMS

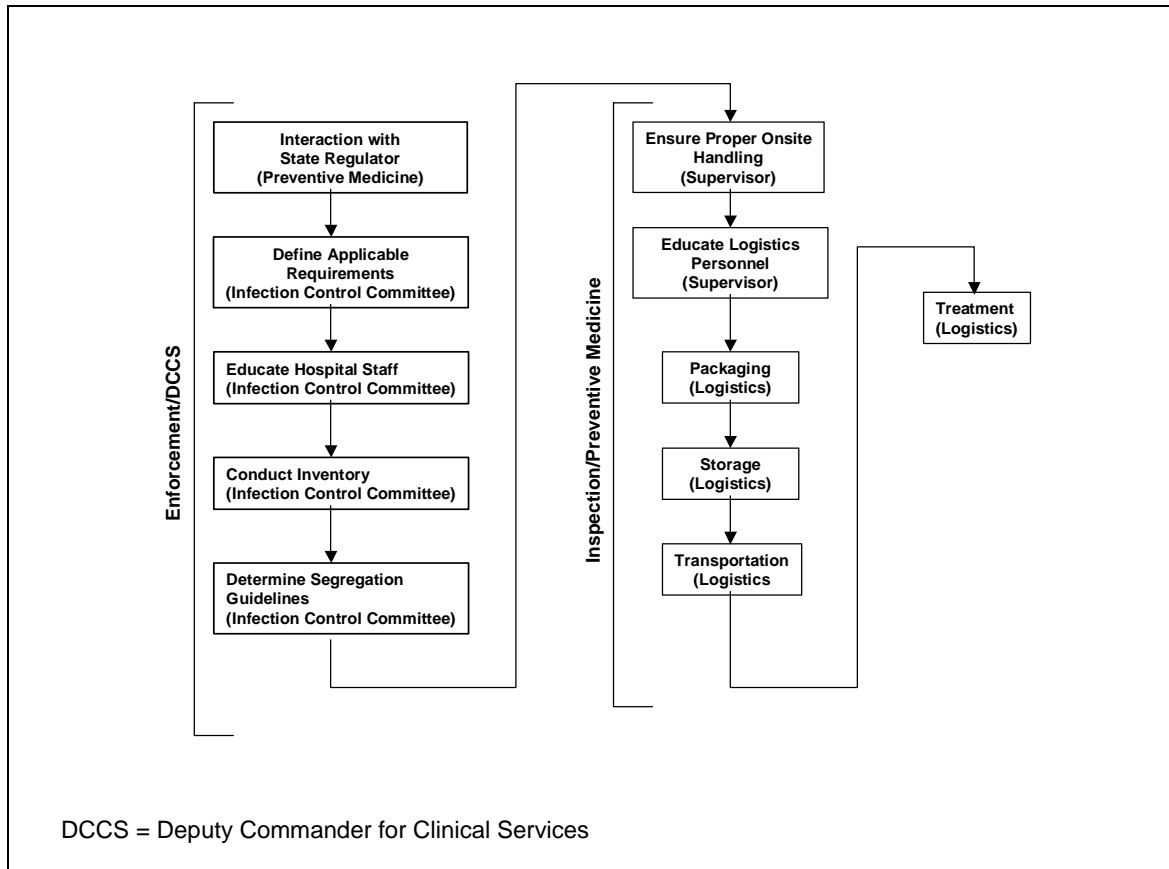


RESPONSIBILITIES

WHAT ARE THE MAJOR AREAS OF RESPONSIBILITY?

The diagram depicts the major areas of responsibility when managing infectious waste and lists the responsible party. This is a general diagram and is not necessarily applicable to all situations.

MAJOR AREAS OF RESPONSIBILITY



WHAT ARE THE EXISTING REGULATIONS AND GUIDELINES?

The EPA Guide for Infectious Waste Management defines and categorizes infectious waste and describes effective waste management and treatment options. Many of these guidelines were incorporated into this document and are described in later sections.

The CDC provides pertinent infection control guidelines in four separate reports (ref 4,5,6,7). The most significant recommendation in these reports is the application of "Universal Precautions." Military medical care providers use the term "Standard Precautions," which includes and expands on the CDC's Universal Precautions. This guidance suggests that blood and body fluid precautions be used for all patients

regardless of their infection status. Universal precautions stem mainly from the need to minimize exposure to the viruses responsible for causing AIDS and Hepatitis B. In effect all free flowing blood, blood products, body fluids containing visible blood, and other specific body fluids such as cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, vaginal secretions, and semen should be handled with universal precautions and managed as regulated medical waste. Again, appropriate State regulations must be consulted. When dealing with etiologic agents coordination between infection control, local, and state health departments is essential.

The OSHA has responded to petitions for federal standards regarding regulated medical waste management and includes some aspects in its standard, 29 CFR 1910.1030, Occupational Exposure to Bloodborne Pathogens. The following items are discussed in the rule:

1. The application of "Universal Precautions" to prevent contact with blood and other potentially infectious materials.
2. Infectious waste container requirements.
3. Requirements regarding color coding and labeling of infectious waste containers.
4. Requirements for the disposal of sharps.
5. Decontamination requirements for solid and liquid infectious wastes.
6. Controlled access to areas that pose a potential biological hazard.
7. Use of the universal biohazard symbol to identify the actual or potential presence of a biological hazard.
8. Training requirements for all employees with occupational exposure.
9. Recordkeeping requirements.

Army Regulation 40-5 (ref 9) describes the areas of responsibility and the requirements for management of regulated medical waste at MTFs. The requirements are general and are not intended to incorporate specific state regulations. In fact, since the current publication of AR 40-5, the majority of states have enacted/revised regulated medical waste management regulations or laws of their own.

Nearly all 50 states regulate medical waste to some extent. These regulations are extremely diverse and vary from simple definitions to stringent treatment, storage, and disposal requirements. A list of state points of contact is provided in Appendix A. The regulatory climate is constantly changing and it is incumbent upon the individual installations to stay informed. We recommend you maintain a dialogue with your state contact, especially regarding the status of regulated medical waste regulation. Military organizations must comply with military regulations and also applicable Federal, State and local regulations.

DEFINING REGULATED MEDICAL WASTE

Commanders must be able to comply with stringent regulated medical waste regulations. The first step towards preparation is to determine a local MTF definition for regulated medical waste.

The definitions that were discussed earlier were offered as guidelines only. Each individual facility must incorporate these Federal, and any applicable State or local definitions into a single working definition for the facility. A facility regulation, memorandum, or SOP, that specifically defines the categories of waste to be considered infectious, must be developed.

REGULATED MEDICAL WASTE INVENTORY

The next logical step is to conduct a regulated medical waste inventory at the MTF.

WHICH DEPARTMENTS WITHIN MY FACILITY GENERATE REGULATED MEDICAL WASTE?

First, determine what wastes are generated by which department, and more specifically, which departments generate regulated medical waste. The next table shows the five common waste streams within a Medical Treatment Facility and lists the departments that are most likely to generate these wastes.

DEPARTMENT WASTE STREAM BREAKDOWN Potential Waste Streams

<u>Department</u>	<u>Radioactive</u>	<u>Hazardous</u>	<u>General</u>	<u>Infectious</u>
Admissions			X	
Emergency		X	X	X
Laboratory/Pathology		X	X	X
Clinic			X	X
Cafeteria			X	
X-Ray	X	X	X	X
Radiology	X	X	X	
Outpatient			X	X
Laundry		X	X	X
Podiatry			X	
Mental Health			X	
Oncology		X	X	X
ICU		X	X	X
CCU		X	X	X
Obstetrics			X	X
Operating Room		X	X	X
Central Supply		X	X	
EN&T			X	X
Storage Waste		X	X	X
Necropsy		X	X	X
Isolation			X	X
Patient Room			X	X
Housekeeping		X	X	
Nuclear Medicine	X	X	X	X
Nurses Station			X	
Pharmacy		X	X	X
Immunization		X	X	X

WHAT TYPES OF REGULATED MEDICAL WASTES ARE GENERATED?

Second, determine what types of regulated medical wastes are generated. This step is needed to determine future packaging requirements and also to determine volume and mass.

The following examples demonstrate how this information can be used:

- Supply those departments, which generate waste syringes and sharps with puncture resistant containers.
- Normally, liquid wastes may be disposed of through the sanitary sewer system. When this is not an option, however, supply those departments generating liquid wastes with leak proof containers.
- Liquid and glass wastes are heavy, whereas dressings and sheets are relatively light. Supply departments, which generate heavier wastes with sturdier containers.

HOW MUCH REGULATED MEDICAL WASTE IS GENERATED?

Finally, volume and mass estimates are needed to determine the size and adequacy of on-site waste treatment facilities and the cost of off-site disposal.

Waste treatment units such as incinerators and autoclaves must be able to handle the waste loads with minimum storage time. These units have load and capacity limits for safe and efficient operation. The size of the waste stream will dictate the capacity of new treatment units. In addition, local/state permitting requirements should be investigated and costs to obtain any required permits should be included in the total acquisition estimates.

Transport and disposal contractors normally charge the generator per pound of waste. Accurate weight estimates are needed to reliably determine costs.

Two factors will greatly influence the amount of regulated medical waste generated: the categories of regulated medical waste that are included in the definition, and the emphasis placed on waste stream segregation. Though commanders may choose to include additional wastes as infectious; Federal, State, and local regulations will define what must be included. **Commanders can impart the greatest influence on amounts generated by emphasizing segregation efforts.**

Even command emphasis will be ineffective if the waste generators and handlers do not understand the procedure. Employees must be informed of the potential health and safety hazards and trained in appropriate handling and disposal methods.

TRAINING

A training program which assures knowledge and understanding of the desired waste handling process is a necessity. Members of the Infection Control Committee should develop and implement a training program for hospital staff. Though the contractor normally conducts the training of contracted housekeeping personnel, the Committee should oversee it. Specific state or local training requirements may be included as part of the contract. Annual refresher training is also required. Document all the training programs, to include topics of discussion and names of those in attendance.

WASTE SEGREGATION, PACKAGING, AND STORAGE

WHAT GUIDELINES SHOULD I FOLLOW FOR THE SEGREGATION AND ACCUMULATION OF REGULATED MEDICAL WASTE?

Federal, State and local regulations will ultimately determine the minimum standards of a regulated medical waste management program. Commanders, however, have the option to expand on these regulations and develop a program that will best serve their facility and community. MEDCOM Regulation 40-35 provides the following guidance as a minimum.

Segregate RMW from general waste at its point of origin. Tie the bag securely to provide a barrier between waste and worker. The bag is the primary barrier for bagged medical waste, and the sharps container is the primary barrier for sharps waste.

Put regular trash and recycling containers at appropriate locations in the workplace to aid convenience and to minimize improper segregation. Use RMW bags on an "as needed" basis. In most instances, they are not placed in clinic/patient rooms unless they are required for a specific procedure or case.

Deposit RMW in leak proof, puncture resistant, plastic bag lined receptacles. Bags used must be sturdy, tear resistant, 3 mils in thickness, and of an installation-specific color that denotes RMW (generally red). Bags less than 3 mil may be used as interim bags at selected work locations when RMW is not heavy or is rarely generated (e.g., some lab activities and some clinics) **provided** that these thinner bags are collected in 3-mil bags prior to being transported within the MTF.

NOTE: Any State requirement regarding the thickness or strength of the RMW bag must be met. Meeting the State requirement takes precedence over the thickness and strength requirement of MEDCOM Regulation 40-35.

When sealing, the bag will not be shaken or squeezed in an attempt to reduce volume. RMW will never be compacted prior to disposal. Sealed bags (or containers) of RMW should be marked at the point of generation with the location of generation, date when sealed, and point of contact (POC).

Carry sealed bags by their necks to the transportation cart. Do not lift or hold bags by the bottom or sides. Carry bags away from the body. Ensure bags are not broken, opened, or dropped. Never throw bags into carts or from one individual to another.

Wear gloves appropriate for the task when handling bagged RMW. If necessary, obtain guidance from Infection Control, PVNTMED Service, and Safety.

Category 1 - Cultures and Stocks. Separate microbiologic waste (cultures and stocks of etiologic agents) from general waste for disinfection/sterilization. Liquid Class 1 RMW (e.g., liquid culture media) may be either steam sterilized and disposed of in the sanitary sewer system or kept in its original glass container and placed in the sharps container for treatment and disposal without using the sanitary sewer system.

Category 1 - Vaccines. Deposit full, partially full, or empty vials of vaccine in sharps containers. Carpules from dental procedures may also be placed in sharps containers.

Category 2 - Pathological Waste. Dispose of pathological waste inside an RMW container lined with a plastic bag or double bagged in RMW bags.

Category 3 - Blood and Blood Products. Dispose of breakable containers of bulk blood or blood products in rigid, puncture-resistant, leakproof containers. Use plastic RMW bags to dispose of bulk blood or blood products, such as blood bags and blood filter tubing, and items saturated, dripping, or caked with blood. Remove needles from the tubing (avoiding unsafe manipulation) and place in a sharps container for disposal.

Category 4 and 7 - Sharps. Discard all sharps directly into a rigid puncture-resistant, plastic sharps container immediately after use. Discard disposable needles and syringes intact, and do not cut, break, bend by hand, or recap using a two-hand method. To prevent unauthorized removal of its contents, The U.S. Army Medical Command requires MTFs to manage sharps containers by either locking the container to a mounting device that is securely fastened to the building structure, or locating the container in an area that is under continuous visual supervision of ward or clinic personnel (ref 10). The requirement is found in paragraph 4-20, AR 190-51. Locate sharps containers as close as practical to the use area. The size (volume) of the sharps container will be determined by the activity serviced by that container and must meet the requirements of paragraph 9b(3)(e) of MEDCOM Reg 40-35. Remove and seal the sharps container when it either is 3/4 full or is filled to the line indicated by the manufacturer. Sharps containers mounted on the wall will be positioned at a height to reflect safe use and safety standards for patients and visitors.

Category 5 - Animal Waste. Contaminated animal carcasses, body parts, and bedding of animals that are known to have been exposed to infectious agents during research (including those produced in veterinary facilities), production of biologicals, or testing of pharmaceuticals must be incinerated.

Category 6 - Isolation Waste (CDC Class 4). Consult the Infection Control Officer (ICO) for specific instructions on handling waste with etiologic agents in CDC Class 4 (shown at Appendix B).

STORAGE

Though RMW should be treated as soon as possible, some temporary storage is inevitable. Some states have very specific guidelines regarding storage areas and times. The following guidelines are provided.

Store RMW, excluding pathological waste, in the RMW storage area. The main holding area for the MTF will be secured, properly identified, and kept clean and free from pests (e.g., insects, rats, and animals). Soiled utility rooms need not be secured when RMW (other than sharps) is collected there.

Storage of RMW should not exceed 5 days: point of generation 1 day, storage area 3 days, and transport vehicle 1 day. Sharps containers are exempt from these time guidelines. Seal the sharps containers when they are 3/4 full and/or picked up for disposal. Unusual or extenuating circumstances will be taken into consideration to allow brief or minor variances from these times.

Refrigerate pathological waste generated at the hospital in the morgue freezer prior to pick up for disposal. Keep pathological waste generated at the Veterinary Clinic in the clinic freezer prior to pick up for disposal. The recommended maximum time for freezer storage of any RMW is 30 days.

TRANSPORTATION OF REGULATED MEDICAL WASTE

WHAT GUIDELINES SHOULD I FOLLOW FOR THE HANDLING AND TRANSPORTING OF REGULATED MEDICAL WASTE?

The following recommendations are based on EPA guidelines. Sources will vary and, once again, State and local regulations should be consulted for minimum standards.

Within the Medical Treatment Facility:

Carts used to transport RMW within the MTF should not be used for any other purpose. Carts used to transport RMW will be constructed of readily cleanable material, plastic, or stainless steel. Carts will be closed whenever possible.

Clean carts and any other reusable containers used to transfer RMW using an EPA-registered hospital detergent-disinfectant. Housekeeping personnel generally are responsible for timely transportation of waste within the MTF, maintenance of carts, and

the cleaning on a weekly basis, or more frequently if needed. If a spill occurs, the cart will be cleaned immediately.

Put bags of RMW in leak proof, rigid containers and mark the containers with the universal biohazard symbol. Red bags do not need to be marked with the universal biohazard symbol unless required by State or local regulations.

From outlying clinics on-post:

RMW from outlying medical, dental, and veterinary service buildings within the health service area will be collected on a schedule approved by the MTF's environmental, infection control, and safety officials.

Privately owned vehicles should never be used to transport regulated medical waste from outlying clinics to on-post treatment or storage areas. Only government vehicles that are easily cleaned and disinfected should be used for this purpose. A closed bed pickup truck that affords both public protection and barrier protection to the driver would be ideal. An appropriate spill kit must also be located in the vehicle.

DRIVER TRAINING

There may be a requirement for drivers to receive driver training or augmentive training to transport regulated medical waste in a government vehicle. Consult the installation licensing section for further guidance.

WHAT GUIDELINES SHOULD I FOLLOW WHEN SHIPPING REGULATED MEDICAL WASTE OFFSITE?

All commanders must be aware that neither responsibility nor legal liability ends when wastes leave the facility. Waste generators are responsible for assuring proper treatment and disposal of their wastes. Commanders must, therefore, ensure all in-house and contracted waste handlers meet the requirements for the safe transport and disposal of regulated medical wastes.

When reusable containers are used for transport of bagged waste, ensure containers are disinfected after each use. Single use containers are usually destroyed as part of the treatment process.

“Backhauling” is the practice of accepting a payload to haul back, once the initial payload has been delivered. This is more profitable than running a truck back empty. For example, a truck delivers crates of bananas to a warehouse. Then it hauls empty boxes and crates from the warehouse to a waste-burning incinerator. Another example is a truck that delivers refrigerated foods to the hospital cafeteria and then hauls regulated medical waste from the hospital to a waste treatment facility. Though backhauling is not presently illegal, clearly there are some instances where it is inappropriate. Due to the potential for cross contamination, we recommend that all backhauling practices involving regulated medical waste be prohibited. If backhauling of RMW is allowed, then the vehicle must be sanitized at the end of the RMW trip and

before hauling non-RMW items. An inspection of the contractor's facility would be necessary to ensure the sanitation is performed. An inspection of this kind may not be practical.

RMW is defined by the DOT as a hazardous material. When transported in commerce (e.g., over public roads), RMW will be prepared for shipment following the requirements in 49 CFR 172, 173, and 177.

Shipping papers will be prepared IAW 49 CFR 172.200 and carried IAW 49 CFR 177.817. They will be signed by a DOD certifying official IAW DOD 4500.9-R, Defense Transportation Regulations, Part II, Chapter 204. The person signing the shipping papers must successfully complete an approved DOD hazardous materials certification course and shall be appointed in writing by the activity or unit Commander, to include scope of authority. The shipping papers used to transport hazardous materials in a government vehicle are the DD Form 836, (Dangerous Goods Shipping Paper/Declaration And Emergency Response Information For Hazardous Materials Transported By Government Vehicles/Containers Or Vessel) and DD Form 626 (Motor Vehicle Inspection (Transporting Hazardous Material)). The DD Form 626 must accompany the DD 836 when transporting hazardous material in a government vehicle.

Packagings (i.e., outer containers) must be rigid, leak resistant, impervious to moisture, strong enough to prevent bursting during handling, and sealed to prevent leakage during transport. Sharps containers must be able to fit within the outer packaging when off-post transport is involved. Outer containers must meet the DOT requirements for UN specification packaging as required by 49 CFR 173.197. The outer container will display the DOT Infectious Substance label whenever the military uses in-house personnel and equipment (i.e., not contractors) to transport RMW over public roads. An example is when medical personnel move RMW from outlying clinics to the main hospital using State or Interstate highways. The requirements of this paragraph are optional when moving RMW between buildings that are within the boundaries of the installation (i.e., "on post"). Completed packages should also meet the weight limitations specified in the RMW contract, if applicable.

Persons who transport RMW over public roads will receive the driver training specified in 49 CFR 177.816 and AR 600-55. A commercial driver's license (CDL) is not required provided the gross weight of the vehicle used is less than 26,001 pounds. All military and civilian drivers of U.S. government-owned vehicles must have a valid State driver's license and a military driver's license (OF 346).

WHAT ARE MY REGULATED MEDICAL WASTE TREATMENT OPTIONS?

Though treatment options are somewhat limited at this time, new techniques are being tested and will be available in the future. Some common treatment methods are defined and discussed in this section and the next table presents a comparison of their characteristics. This section also mentions some newly developed techniques. Permitting requirements should be investigated as part of any treatment alternatives review.

PROS AND CONS OF VARIOUS REGULATED MEDICAL WASTE TREATMENT METHODS

Treatment Method	Pros	Cons
Incineration	Suitable for almost all wastes	Operation is complex
	80-95% volume reduction	Requires large volumes to be cost effective
	Can recover energy	Testing is difficult and expensive. Ash must be tested periodically for EPA HW characteristics Strictly regulated (e.g., emissions) High capital, operational, maintenance costs, and permits
Steam Sterilization	Effective for wastes that allow steam to penetrate	Not effective for high density wastes
	Relatively easy to operate	Only 20% volume reduction
	Affordable with smaller quantities	Treated waste is odorous; no change in appearance
	Moderate capital and operational costs, low maintenance costs Few legal requirements other than routine testing for efficacy of treatment. Treated waste is managed as General Waste	
Gas Vapor Sterilization	Effective for wastes which allow gases to penetrate	No volume reduction, or change in appearance.
	Onsite use is cost effective	High safety risk
	Few legal requirements	High risk of toxic gas release to air High operational costs
Chemical/Mechanical Disinfection	Treats virtually all wastes	Routine testing may be difficult
	80% volume reduction	High risk of chemical discharge to water
	Moderate capital cost	May not be well accepted legally No change in appearance

Modified and Reprinted From Reference 11

Every year disposal companies and their vendors devise new processes or techniques to treat and dispose of regulated medical waste. No one method is suitable for all MTFs. Therefore, this guide does not provide specific recommendations. If you need help finding a new or different treatment method for your MTF, technical assistance is available from USACHPPM's Hazardous and Medical Waste Program (see page 1).

INCINERATION is the combustion of wastes under excess air conditions to form ash, noncombustible residues, and off-gases. The volume of wastes incinerated has increased in recent years due to the reluctance of the disposal industry to deal with medical wastes. Approximately 60% of all hospital waste generated in the United States is incinerated on-site.

Incineration is effective in treating all types of regulated medical waste, and provides the additional advantage of reducing disposal volume by as much as 95%.

Incinerators can be very efficient, but it is essential that operating personnel understand all operational constraints. Here are some things to remember when treating by incineration:

- The EPA requires that chemotherapy wastes be incinerated in hazardous waste, not infectious waste incinerators.
- Maintain operating temperatures to ensure good burnout, meet air pollution requirements, and maximize the kill of infectious agents.
- All operators must be properly trained and certified. Incorporate pollution control devices such as a baghouse or scrubber to lower the particulate content and acidity of emissions.
- Do not overload the incinerator. As a rule of thumb, no more than 50% of the incinerator's volume should be charged at once and the largest item charged should be 10% of the incinerator's volume.
- Monitor the contents of the waste stream to avoid temperature surges caused by wastes with high plastics content.
- Periodically test the ash to determine whether it is a non-hazardous solid waste or a hazardous waste (40 CFR 261.2 and 40 CFR 262).
- Do not incinerate infectious wastes in the beginning or end of the burn cycle. This will prevent the release of pathogens through the stack or into the ash residue.
- An operating permit will be required before waste can be treated.

NOTE: Veterinary crematoriums are not designed or permitted to incinerate medical waste and should not be used for RMW.

STEAM STERILIZATION also known as AUTOCLAVING is the treatment of infectious waste with saturated steam at a sufficiently elevated temperature to kill infectious agents. This is performed within an enclosed vessel known as an autoclave. Of the two models available on today's market, gravity displacement and pre-vacuum, the pre-vacuum model is reportedly more effective.

Steam sterilization can effectively treat all wastes that can be penetrated by steam. However, when used to treat pathological wastes, it is normally required that they be rendered unrecognizable before disposal. Some things to remember when operating an autoclave are:

100% saturated steam is more efficient than either supersaturated or superheated steam. Monitor the autoclave to ensure recommended saturations and temperatures are maintained.

Trapped air dilutes steam and lessens the penetration of the wastes; therefore, loosen all bottle caps on large bottles and open any heat-resistant packages prior to sterilization.

Low density wastes are easily penetrated and require short residence times. However, high density items such as body parts require prolonged residence times. It is essential that wastes be maintained at the required temperature and specific residence time to adequately treat all waste components.

Monitor pressure gauges and thermometers throughout each treatment cycle.

Testing may need to be conducted to monitor the effectiveness of the treatment. Record and keep the results.

GAS/VAPOR STERILIZATION is a treatment process whereby medical dressings, surgical instruments, supplies, and sometimes wastes, are sterilized by a vaporized chemical in a sealed chamber. Ethylene Oxide (ETO) and formaldehyde, both probable carcinogens, are commonly used for this purpose. For this reason, the EPA strongly cautions against using this method for widespread use in treating medical waste.

Testing may need to be conducted to monitor the effectiveness of the treatment. Record and keep the results.

CHEMICAL DISINFECTION is the inactivation of waste by the addition of limited quantities of chemicals. Hydrogen peroxide, chlorine bleach, acids, alcohols, quaternary ammonium compounds, and ketones are commonly used. Surfaces, utensils and medical supplies are chemically disinfected on a widespread basis; however, this method is not recommended for the treatment of waste or wastewater. The following chemical disinfectants have been shown to be effective in inactivating HIV in laboratory testing: sodium hypochlorite, 0.1 -0.5% available chlorine; chloramine 2%; ethanol 70%; 2-propanol (iso-propyl alcohol) 70%; polyvidone iodine 2.5%; formaldehyde 4%; glutaraldehyde 2%; and hydrogen peroxide 6%.

MICROWAVE DISINFECTION is a treatment method in which wastes are continuously irradiated with microwaves. This method disinfects with low energy costs and no harmful emissions.

MEDICAL WASTE TO ENERGY facilities have been proposed and are being investigated as viable options to the medical waste disposal problem. Such facilities would incorporate state-of-the-art destructive technology to successfully sterilize and significantly reduce the volume of medical waste. They could feasibly avoid air emission problems and even generate steam or electricity for energy. Due to moisture content, pathological wastes would not be disposed of in this manner. Any consideration along these lines must be carefully coordinated with installation environmental and DPW officials.

AUTOCLAVE/ENCAPSULATION is a recently introduced treatment and disposal system that has been implemented at some installations. The system is used to collect and dispose of syringes and other sharps. The sharps are decontaminated by steam and then encapsulated in an impervious, compact, plastic shell.

The references used in this guide give additional information in this area. All references are listed at the end of the document.

SUMMARY

Recent awareness of the potential damage to health and environment has made regulated medical waste management an area of substantial concern. MTF Commanders are forced to make management decisions without concrete guidance.

The Federal government is not planning to regulate this waste stream; however, most State governments have enacted regulation. Rather than reacting to these rapid changes, Commanders should attempt to implement proactive regulated medical waste management programs.

ABOUT USACHPPM

The U.S. Army Center for Health Promotion and Preventive Medicine is part of the U.S. Army Medical Command. It provides advice and assistance in the following areas:

- Environmental Quality and Management
- Entomological Sciences
- Radiation and Health Physics
- Occupational Health
- Industrial Hygiene and Hazard Management
- Sanitation and Hygiene
- Laboratory Analysis

To help with general environmental and health needs, USACHPPM has subordinate commands at Fort Meade, Fort McPherson, and Fort Lewis. The main Center at Aberdeen Proving Ground performs larger consultations and specialized work.

Any official representative can request USACHPPM's services.

REFERENCES

1. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA/530-SW-86-014, EPA Guide for Infectious Waste Management, 1986.
2. U.S. Environmental Protection Agency, 40 CFR 261, Identification And Listing Of Hazardous Waste, revised as of July 1, 1999.
3. Model Guidelines for State Medical Waste Management, The Council of State Governments, 1992.
4. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Recommendations for Prevention of HIV Transmission in Health-Care Setting, 21 Aug 1987.
5. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Update: Universal Precautions for Prevention of Transmission of Human Immunodeficiency Virus, Hepatitis B Virus, and Other Bloodborne Pathogens in Health-Care Settings, 24 Jun 1988.
6. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, CDC Guideline for Isolation Precautions in Hospitals, 1996.
7. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, CDC Guideline for Infection Control in Hospital Personnel, September 1983.
8. Code of Federal Regulations, Title 29, Section 1910.1030, Occupational Exposure to Bloodborne Pathogens
9. Headquarters, Department of the Army, Army Regulation 40-5, Preventive Medicine, 15 October 1990.
10. AR 190-51, 30 September 1993, Security of Unclassified Army Property (Sensitive and Nonsensitive)
11. Reinhardt, PA., "A Comparison of Incineration with Other Treatment Methods for Infectious Waste", Symposium On Infectious And Hazardous Waste Programs, University of Wisconsin, Madison, WI, March 28-30, 1989.
12. MEDCOM Regulation 40-35, 22 November 1999, Management of Regulated Medical Waste (RMW).
13. U.S. Environmental Protection Agency, Guidance for Evaluating Medical Waste Treatment Technologies, Final Report, January 1993.
14. Hazardous and Medical Waste Program Web Site, <http://chppm-ww.apgea.army.mil/hmwp/>
15. USACHPPM Web Site, <http://chppm-www.apgea.army.mil/>
16. Code of Federal Regulations, Title 49, Transportation, Parts 100-185.

APPENDIX A STATE POINTS OF CONTACT

A Alabama Department of Environmental Management
Montgomery Office
1400 Coliseum Boulevard
Montgomery, AL 36110-2059
Information: 334-271-7700
www.adem.state.al.us

Alaska Department of Environmental Conservation
Compliance Assistance Office
555 Cordova Street
Anchorage, AK 99501
800-510-ADEC (in Alaska only)
907-269-7586 outside Alaska
www.state.ak.us/local/akpages/ENV.CONSERV/dsps/compasst/answers.htm

American Samoa Government
Environmental Protection Agency
American Samoa Government
Pago Pago, American Samoa 96799 USA
011-684-633-2304
www.samoanet.com/asg/asgexec97.html

Arizona Department of Environmental Quality
3033 North Central Avenue
Phoenix, AZ 85012
602-207-2300
toll free in Arizona: 800-234-5677
www.adeq.state.az.us

Arkansas Department of Pollution Control and Ecology
8001 National Drive
Little Rock, AR 72209
501-682-0744
www.adeq.state.ar.us

C California Environmental Protection Agency
Secretary for Environmental Protection
555 Capitol Mall, Suite 525
Sacramento, CA 95814
916-445-3846
www.calepa.ca.gov

Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
4300 Cherry Creek Dr. South
Denver, CO 80220-1530
303-692-3300
http://governor.state.co.us/gov_dir/cdphe_dir/ic/haz.html

Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
860-424-3000
<http://dep.state.ct.us>

- D Delaware Department of Natural Resources and Environmental Control
Hazardous Waste Management Branch
89 Kings Highway
P.O. Box 1401
Dover, DE 19903
302-739-3689
www.dnrec.state.de.us/frames1.htm

District of Columbia Department of Consumer and Regulatory Affairs
Hazardous Waste
2100 M.L. King
SE, Rm. 203
Washington, D.C. 20020
202-645-6080
www.dkra.org

- F Florida Department of Environmental Protection
3900 Commonwealth Blvd. M.S. 10
Twin Towers Office Building
Tallahassee, FL 32399-2400
950-921-1222
<http://www.dep.state.fl.us/dwm>

- G Georgia Department of Natural Resources
Environmental Protection Division
Hazardous Waste Management Branch
205 Butler Street, S.E.
Floyd Towers East, Suite 1154
Atlanta, GA 30334
888-373-5947
www.ganet.org/dnr/environ

Guam Environmental Protection Agency
Solid and Hazardous Waste Division
P.O. Box 2999
Agana, Guam 96910
Overseas Operator: Commercial call 671-646-8863/64/65

- H Hawaii State Department of Health
Environment Management Division
Solid and Hazardous Waste Branch
919 Ala Moana Blvd, Room 212
Honolulu, Hi 96814
1-808-586-4226
www.hawaii.gov/lrb/gd/gddoc.html

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- I Idaho Division of Environmental Quality
1410 North Hilton
Boise, ID 83706
208-373-0502
www.state.id.us/deq/ro t/mainintro.htm
- Illinois Environmental Protection Agency
Division of Land Pollution Control
1021 N. Grand Ave. E.
Springfield, IL 62702
217-782-3397
www.epa.state.il.us
- Indiana Department of Environmental Management
Office of Solid & Hazardous Waste Management
P.O. Box 6015
Indianapolis, IN 46206-6015
317-233-3656
www.state.in.us/idem/oshwm
- Iowa Department of Natural Resources
Henry A. Wallace Bldg.
503 E. 9th. St.
Des Moines, IA 50309
515-281-8934
www.state.ia.us/government/dnr/organiza/epd/index.htm
- K Kansas Department of Health and Environment
Bureau of Waste Management
Hazardous Waste Section
Forbes Field, Building 740
Topeka, KS 66620-0001
785-296-1590
- Kentucky Division of Waste Management
Hazardous Waste Branch
14 Reilly Road
Frankfort, KY 40601
502-564-6716
www.state.ky.us/agencies/nrepc/waste/programs/hw/hwhome.htm
- L Louisiana Department of Environmental Quality
Hazardous Waste Division
P.O. Box 82178
Baton Rouge, LA 70884-2178
225-765-0355
www.deq.state.la.us
- M Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017
207-287-7688
www.state.me.us/dep

Maryland Environmental Service
2011 Commerce Park Dr.
Annapolis, MD 21401
410-974-7281
www.mes.state.md.us/content/services/wmanagement.htm

Commonwealth of Massachusetts - Executive Office of Environmental Affairs
Department of Environmental Protection - Boston Office
1 Winter Street
Boston, MA 02108
617-292-5500
www.state.ma.us/dep

Michigan Department of Environmental Quality
Waste Management Division
John Hannah Building, First Floor
608 West Allegan Street
Lansing, MI 48933
517-373-2730
www.deq.state.mi.us/wmd

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194
651-296-6300
www.pca.state.mn.us/waste/index.html

Mississippi Department of Environmental Quality
Office of Pollution Control
P.O. Box 10385
Jackson, MS 39289-0385
601-961-5171
www.deq.state.ms.us/newweb/homepages.nsf

Missouri Department of Natural Resources
Hazardous Waste Program
P.O. Box 176
Jefferson City, MO 65102
800-334-6946
www.dnr.state.mo.us/deq/hwp/homehwp.htm

Montana Department of Environmental Quality
1520 E. Sixth Avenue
Helena, MT 59620
406-444-2544
www.deq.state.mt.us/index.html

N Nebraska Department of Environmental Quality
1200 "N" Street, Suite 400
Lincoln, NE 68509
402-471-2186
www.deq.state.ne.us/RCRA.nsf/pages/RCRAMain

Nevada Department of Conservation and Natural Resources
Division of Environmental Protection
333 West Nye Lane
Carson City, NV 89706
702-687-4670
www.state.nv.us/cnr

State of New Hampshire
Department of Environmental Services
Waste Management Division
6 Hazen Drive
Concord, NH 03301
603-271-2900
www.des.state.nh.us/waste_intro.htm

New Jersey Department of Environmental Protection
Division of Solid & Hazardous Waste
P.O. Box 421
401 E. State Street
Trenton, NJ 08625
609-984-6880
www.state.nj.us/dep/dshw

The New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
2404 A. Galisteo
Santa Fe, NM 87505
505-827-1557
www.nmenv.state.nm.us

New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
50 Wolf Road
Albany, NY 12233-7250
518-457-6934
www.dec.state.ny.us/index.html

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Hazardous Waste Section
401 Oberlin Road
Suite 150
Raleigh, NC 27605
919-733-2178
<http://www.enr.state.nc.us>

- O Ohio Environmental Protection Agency
Division of Hazardous Waste Management
Lazarus Government Center
P.O. Box 1049
Columbus, OH 43216-1049
614-644-2917
www.epa.state.oh.us/dhwm/distsco.htm

Oklahoma Department of Environmental Quality
Waste Management Division
P.O. Box 1617
Oklahoma City, OK 73101-1677
405-702-5100
www.deq.state.ok.us/waste/index.html

Oregon Department of Environmental Quality
811 SW Sixth Ave.
Portland, OR 97204
503-229-5696
www.deq.state.or.us

P Pennsylvania Department of Environmental Protection
Division of Hazardous Waste Management
Bureau of Land Recycling and Waste Management
P.O. Box 8471
Harrisburg, PA 17105-8471
717-787-6239
www.dep.state.pa.us/dep/deputate/airwaste/wm/HW/HW.htm

Puerto Rico Environmental Quality Board
Office of the Governor
Solid, Toxic and Hazardous Waste Program
P.O. Box 11488
Santurce, Puerto Rico 00910
809-725-8992

R State of Rhode Island and Providence Plantations
Department of Environmental Management
235 Promenade Street
Providence, RI 02908-5767
401-222-2797
www.state.ri.us/dem/pg1.htm

S SC Department of Health and Environmental Control
Environmental Quality Control
2600 Bull Street
Columbia, SC 29201
803-898-3900
www.scdhec.net/eqc

South Dakota Department of Environment and Natural Resources
Waste Management Program
523 East Capital Avenue
Pierre, SD 57501
605-773-3153
www.state.sd.us/denr/denr.html

T Tennessee Department of Environment and Conservation
Division of Solid/Hazardous Waste Management
5th Floor, L&C Tower
401 Church Street
Nashville, TN 37243-1535
615-532-0780
www.state.tn.us/environment/swm/index.html

Texas Natural Resource Conservation Commission
Office of Waste Management
P.O. Box 13087
Austin, TX 78711-3087
512-239-2330
www.tnrcc.state.tx.us

U Utah Department of Environmental Quality
Division of Solid and Hazardous Waste
P.O. Box 144880
Salt Lake City, UT 84114-4880
801-538-6170
www.eq.state.ut.us/eqshw/dshw-1.htm

V Vermont Agency of Natural Resources
Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
Waterbury, VT 05671- 0404
802-241-3888
www.anr.state.vt.us/dec/wmd.htm

Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219
804-698-4000
www.deq.state.va.us/info

U.S. Virgin Island Government of U.S. Department of Health
St Thomas, Virgin Islands 00802
809-774-9000

W Washington Department of Ecology
300 Desmond Drive
Lacey, WA 98503
360-407-6702
www.ecy.wa.gov

West Virginia Division of Environmental Protection
Office of Waste Management
1356 Hansford St.
Charleston, WV 25301
304-558-5929
www.dep.state.wv.us

Wisconsin Department of Natural Resources
Bureau of Waste Management
810 W Maple St
Spooner, WI 54801
715-635-2101
www.dnr.state.wi.us/org/aw/wm/index.htm

Wyoming Department of Environmental Quality
122 West 25th Street, Herschler Building
Cheyenne, WY 82002
307-777-7758
<http://deq.state.wy.us/>

APPENDIX B

CDC CLASSIFICATION OF ETIOLOGIC AGENTS ON THE BASIS OF HAZARD: CLASS 4

Listing not all inclusive:

Junin
Machupo virus
Lassa virus
Borna disease virus
Crimean-Congo hemorrhagic fever
Swine vesicular disease
Vesicular exanthema virus
Marburg virus
Ebola virus
Tick-borne encephalitis virus complex
 Kyasanur forest disease
 Omsk hemorrhagic fever
 Russian Spring-Summer encephalitis
 Central European encephalitis viruses
Alphaherpesvirinae
Genus Simplexvirus: Herpes B virus (Monkey B virus)
Pseudorabies
Turkey rhinotracheitis
African swine fever virus
Avian Influenza
Genus Morbillivirus: Rinderpest
Newcastle disease virus (velogenic strains)
Peste des petits ruminants
Genus Aphthovirus: Foot-and-mouth disease
Genus Enterovirus: Teschen disease virus
Chordopoxvirinae (poxviruses of vertebrates)
Small pox (alastrim)
Genus Capripoxvirus
Sheeppox
Goatpox
Lumpy skin disease
Genus Orthopoxvirinae
Monkey pox
Variola
African horse sickness virus
Hog cholera virus
Sabia virus