

# Carcass Management Course Off-site Incineration Module



**United States  
Department of  
Agriculture**



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## Overview

Welcome to the Off-site Incineration Module of the online Carcass Management Course. While completing this module, you may encounter references to the Emergency Management Tools; Health, Safety, and Personal Protection Equipment; Secure Transport; and to Biosecurity, which are broadly covered in their own separate training modules. These modules are found in the Introduction Modules, beginning with the Orientation Module.

This training module is presented from the perspective that you have already used the MLCh Tool (Matrix, Decision Loop, and Checklist) explained in the Emergency Management Tools Module and selected off-site incineration as the preferred carcass management option.

Effective management of animal carcasses and associated materials is a critical component of a successful response during an animal health emergency. Carcass management measures contain, treat, or destroy contaminated or potentially contaminated materials in order to:

- Prevent spread of a disease outbreak to protect the nation's agricultural industry
- Protect the environment by preventing carcass waste products from contaminating soil, water, and air
- Protect decaying carcasses from insects and scavengers which can transport pathogens to other locations
- Safeguard public health by removing potentially contaminated food products from the human food supply
- Safeguard animal health by removing potentially contaminated feed from the animal feed supply

## Objectives

This module presents the material in four different lessons:

- Introduction
- Evaluation
- Planning
- Operations

Upon completing this module, you should be able to:

- Describe off-site incineration as a method for carcass management
- Identify the advantages and disadvantages of off-site incineration
- Consider environmental risks associated with off-site incineration
- Obtain regulations governing incineration by consulting with state officials
- Identify factors used to evaluate off-site incineration as a carcass management option
- List critical elements when planning use of off-site incineration
- Recognize key components of off-site incineration operations

## Introduction Lesson Overview

Definition: Off-site incineration is the process of burning carcasses materials at temperatures high enough to destroy contaminants and combusting organic material into gases consisting nominally of carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). It includes transporting carcasses to a permitted municipal incinerator, medical infectious waste incinerator, hazardous waste incinerator, or pathological waste incinerator, processing the carcasses through the incinerator, and subsequent disposal of the residual ash in an appropriate landfill.

The general process of Incineration is as follows:

- The carcasses are off-loaded, moved into the incineration plant, reduced in size to facilitate processing if necessary, and placed into the incinerator in batches
- Controlled high-temperature flame combustion volatilizes and destroys the organic contaminants
- Flue gases may pass through a secondary combustion chamber for further heating, depending on the type of incinerator
- Combustion results in a dense white residue or inert ash low in carbon and a gaseous emission which is often filtered or scrubbed prior to release to the atmosphere

**Figure 1. Off-site Incineration Facility**



## Introduction Lesson Contents

This lesson is divided into the following sections:

- Description – Presents the key features of incineration as a carcass management option by using high temperature combustion
- Types Of Combustion Units – Lists several types of combustors that may be used to burn waste
- Advantages – Describes the benefits of using off-site incineration
- Disadvantages – Covers the difficulties and possible drawbacks associated with use of off-site incineration

## Description

Thermal methods use high-temperature combustion to destroy animal carcasses and associated animal materials. Incineration has been used historically as a carcass management option and continues to be utilized throughout the world, including the Foot and Mouth Disease outbreak in the United Kingdom in 2001.

Combustion is a rapid, exothermic reaction between a fuel and oxygen. In incineration, the fuel is predominately a waste material and the oxygen source is air. The flame zone of a well-designed incinerator is sufficiently hot to break down all organic molecules. Inorganic molecules may undergo transformations as well (e.g., oxidation)

(Source: [Waste Incineration & Public Health](#))

Fixed-facility incineration can include small and large incineration facilities. Fixed-facility incineration is wholly contained and, usually, highly controlled. These units are usually permitted by the state and must operate in compliance with the [Clean Air Act](#).

Typically fueled by diesel, natural gas, or propane, fixed-facility incinerators are, in essence, chambers in which the incineration process is contained.

- Fixed-facility incineration of carcasses has been described as a convection process in which carcass material is burned to ash in a controlled atmosphere
- Most designs of fixed-facility incinerators are fitted with afterburner chambers designed to completely burn residual hydrocarbon gases and carbonaceous particulate matter exiting from the main combustion chamber

### Types of incinerators

- Rotary Kiln
- Fluidized Bed
- Stoker
- Dual-chamber modular units
- Liquid Injection
- Multiple Hearth
- Catalytic Combustion
- Waste-Gas Flare
- Direct-Flame

## Description (cont.)

Of these, Rotary Kiln and Fluidized Bed are the most likely to be used for carcass management because of their prevalence in industry, their large scale use, and their versatility. Only these two types will be discussed further. Some characteristics of these include:

### Rotary Kiln:

- Rotates waste in cylindrical container, enabling thorough mixing with air
- Maintains operating temperatures from 1500-3000°F (800-1650°C)
- Has greatest resistance to high temperatures
- Is flexible - can handle liquid, sludge, solid, or gases in very large quantities
- Can be mobile for onsite treatment

### Fluidized Bed:

- Vessel contains inert granular material that acts theoretically as a fluid when gases are injected up through the material bed from nozzles
- Operating temps from 1400-1800°F (750 -1000°C)
- Can handle liquid, sludge, solid, or gases
- Waste enters through nozzles
- Offers nearly isothermal operation
- Cannot handle wastes that melt and slag, disrupting fluidization



## Types of Combustion Units

There are several types of combustors that may be used to burn waste. These include:

1. Large municipal waste combustor.
2. Small municipal waste combustor.
3. Hospital/medical/infectious waste incinerator.
4. Commercial and industrial solid waste incineration unit.
5. Other solid waste incinerator.
6. Sewage sludge incinerator.
7. Hazardous waste incinerators and manufacturing waste incinerator.
8. Boilers and industrial furnaces that burn solid waste.
9. Industrial, commercial, and institutional boilers that do not burn solid waste.

Combustors in categories 1-6 are regulated under Section 129 of the Clean Air Act. Combustors in categories 7 and 8 are regulated under the Resource Conservation and Recovery Act (RCRA), and the Toxic Substances Control Act (TSCA). Combustors in category 9 are regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAP) program.

**Figure 2. Small Fixed-facility Incinerator**



## Advantages

Incinerators have been used for years to incinerate both whole carcasses and carcass material. Incineration plants are capable of taking preprocessed, relatively homogenous carcass material.

Advantages of fixed-facility incineration include:

- Fueled by readily available diesel, natural gas, or propane
- Process is controlled and contained
- Carcasses become an inert ash that is acceptable for landfill disposal
- Newer incinerators have afterburner chambers to reduce hydrocarbon gases and particulate matter
- Destroys almost all pathogens including those that are difficult to destroy, such as prions and bacterial spores
- Facilities dedicated to the incineration of animal remains generally have the capacity to accommodate volumes up to as much as 625 lbs. /hr.

**Figure 3. Private Facility Incinerator**



## Disadvantages

Disadvantages of fixed-site incineration include:

- Limited ability to process larger animals, which may have to be reduced in size for processing. The size restrictions are due to both feed door size limitations and the improved combustion that can be achieved by size reduction of the animal carcass material
- The incinerator must be permitted as a commercial operation to accept infected material from off-site sources
- Commercial medical/infectious waste incinerators typically require waste to be packaged in specific containers
- There are a limited number of commercial medical infectious waste incinerators in the U.S. A map of commercial/industrial solid waste incinerator locations can be found at this [EPA website](#).
- Hazardous waste incinerators typically require waste to have a heating value of at least 5000 BTU/lb. Animal waste usually has a heating value of approximately 1000 BTU/lb. and requires substantial fuel to maintain an appropriate temperature.

## Disadvantages (cont.)

- Carcasses are approximately 70% water but the preferred waste is around 25% water, so waste incineration facilities may refuse them
  - This is an important system parameter that affects the burn chamber temperature and fuel use rate together
  - Carcasses with high water content may lead to low burn temperatures and high smoke emissions
  - High moisture content has a major effect on chamber temperatures and load cycle time
- Cleaning and disinfection of a fixed incineration facility presents a considerable challenge and it is essential for operators to be trained in biosecurity procedures
- Small animal carcass incinerators, which may be used on farms for fallen stock, may reach a throughput of only 110 lbs. per hour and would not be permitted to take waste from off-site
- Overloading can contribute to smoke and odor problems and potentially result in non-compliance with permits
- Overloading can cause temperatures to drop below optimal levels to achieve destruction of pathogens and fully combust the animal carcass material
- Air pollution is a concern; emission control devices such as afterburners and scrubbers can reduce air pollution by providing secondary combustion of the resulting smoke and capturing particulate matter and acid gases
- Only properly permitted and sized incinerators should be used during an animal health emergency to ensure all pathogens are inactivated
- Municipal waste incinerators may not have the capacity to accept waste from an outbreak response because of the amount of routine waste they are required to process

## Evaluation Lesson Overview

This lesson contains information to help assist you in determining if off-site incineration is a suitable method for disposing of carcasses following an animal health event. For purposes of incineration, carcasses are considered pathological waste. As defined by federal regulation, pathological waste includes waste material consisting of only human or animal remains, anatomical parts, and/or tissue, the bags/containers used to collect and transport the waste material, as well as animal bedding.

Factors in the evaluation include:

- Knowing and understanding applicable regulations
- Identifying the waste stream
- Evaluating the fixed-facility incineration site
- Recognizing the environmental impact

## Evaluation Lesson Contents

This lesson presents the following information:

- Regulations – Covers many of the key regulations governing operations of fixed-site incinerators
- Waste Stream Evaluation – Contains questions one can use to assess the material on the infected premises to determine suitable management options
- Incineration Site Evaluation – Has information including questions to assess whether or not off-site incineration is suitable for carcass management
- Environmental Impact – Includes a discussion of potential environmental impacts, important biosecurity considerations, and public health considerations
- Biosecurity – Lists a series of measures and considerations to keep disease agents out of healthy livestock and poultry populations and prevent the spread of disease agents from infected groups to uninfected groups
- Public Health – Includes a brief discussion of public health considerations and questions associated with use of incineration facilities

## Regulations

All waste materials slated for carcass management and/or transport must be correctly classified by an experienced waste manager prior to carcass management to assure that appropriate carcass management and transportation methods are selected. The classification of the waste will depend upon the specific type of incident and the federal agency with primary authority. The Secure Transport Module has additional information regarding transport regulations.

Below are some of the considerations for classifying and transporting waste:

- Solid Waste - Most animal related waste generated during a response to an animal health incident will be classified as “solid waste” for management purposes
- Medical And Infectious (solid) Waste - A portion of the waste material associated with a response to an animal health emergency may be classified as medical and/or infectious waste, such as used sharps or needles, and will be subject to state regulations
- Hazardous Materials - If carcasses are moved under US Department of Transportation authority, infectious waste (including carcasses, bedding, etc. which can cause disease or death in animals or humans) is classified as hazardous material unless a special classification is obtained
  - Hazardous material will require special packaging, manifesting, and transport to an appropriate facility approved to accept the materials.
  - It is important to note that the hazardous material classification for transportation is not the same as hazardous waste under RCRA
- Permitted Movement – When infected carcasses are permitted to move under APHIS/state authority, they will require DOT designation as hazardous material
  - In compliance with [49 CFR 105.5](#) and [49 CFR 173.134](#), as well as, other related 49 CFR requirements, and
  - In compliance with incident-specific state and federal requirements for biosecurity, transport method, chain of custody, and cleaning/disinfection (e.g., using VS Form 1-27)
  - Refer to the [NAHEMS Guidelines: Quarantine and Movement Control](#) for additional information

## Regulations (cont.)

The EPA defines a hazardous waste as: “waste that is dangerous or potentially harmful to our health or the environment”. Planning and response efforts for waste classification should include consultation with a certified waste management professional, familiar with all disposal regulations in the affected areas. Additional regulations include:

- [Clean Air Act](#) for air emissions
- The U.S. Occupational Safety and Health Administration ([OSHA](#)) has set requirements and recommendations for those engaged in hazardous waste operations involving disease-causing organisms
- [Resource Conservation and Recovery Act](#) (RCRA) for solid waste processing
- Use of personal protective equipment in hazardous waste operations can be found at [29 CFR 1910.134](#) and [29 CFR 1910.156](#)
- Title [40 CFR 262.11](#) requires any person generating waste must determine if that waste is hazardous and follow strict protocols if it is
- The [EPA Hazardous Waste](#) site provides guidance on medical-infectious waste, which includes all materials generated at health care facilities, such as hospitals, clinics, physician’s offices, dental practices, blood banks, and veterinary hospitals/clinics, as well as medical research facilities and laboratories
- State Departments of Health and Environmental Quality issue regulations that determine which wastes are considered ‘regulated’ or require special handling. Check the Regulated Medical Waste [RMW State Locator](#) to find the classifications.



## Waste Stream Evaluation

Different facilities may only be able to process certain materials and not others. The sooner carcasses are managed following the death of the animal; the easier they will be to transport. The following are issues one should consider before contacting the incineration facilities.

- What types of affected material?
  - Carcass: type, size, number and condition
  - In-barn manure/litter: type, volume, moisture content, density
  - Stored manure/litter: type, volume, moisture content, density
  - Feed? Quantity and location
  - Eggs? Quantity and condition
  - Bedding? Non-infected manure compost?
  - Paper products? Other debris?
- In what physical state are the materials?
  - Putrefaction results in the gradual dissolution of tissues into gases and liquids
- How much material needs to be disposed?
  - If you have more material than incinerators within a control area are able or willing to take, you may have to locate other facilities outside the control area
  - The material from a large outbreak may have to be sent to multiple facilities as capacities are reached

## Incineration Site Evaluation

Hazardous waste, municipal solid waste, pathological waste and medical/infectious waste incinerators are highly regulated and may be suitable for emergency carcass management.

- When considering using an off-site facility, evaluate the distance of the incineration site to the affected premises
- The closer the proximity, the less risk of spreading disease and more trips between premises and the incineration site that can occur per day

Even though carcass management by incineration may be an allowed option, and a suitable facility may be located in close proximity to the affected premises, incinerator operators may not be willing or able to accept animal carcasses due to operating permit restrictions, facility limitations, and concerns about public perception or legal liability. Incineration plants could lack the capacity to handle large numbers of carcasses, in addition to the plant's routine processing obligations.

- There is often reluctance by facility owners/operators to accept infected carcasses, even when the waste is within the scope of their permit
- Also, off-site incineration facilities that accept animal carcasses, may not be open for access when needed or when convenient
- Off-site incineration facilities may already have contractual obligations to receive waste from other sources, which may impact their available surge capacity for use during an animal health emergency

## Incineration Evaluation Questions

The next few questions can help you evaluate the suitability of facilities for disposing of infected carcasses:

- Can a vehicle C&D station be constructed at the site?
- How far is the incineration facility from the infected site? Optimally, any carcass management operation will be located within the designated control zone.
- Does the facility have all of the permits required to dispose of this type of material? If not, can waivers or emergency exemptions be safely used?
- Does the facility have a good history of compliance with its permits?
- Does the facility typically handle carcasses and byproducts? Do these materials need to be processed in any fashion before the facility will or is able to accept them? If so, can it be done without spreading contamination?
- What are the incinerator operator's perceptions of an animal disease? Will it accept diseased carcasses?
- Can a contract be negotiated between the company and the government for carcass management services?
- What surrounds the incineration operation? Are there any surrounding livestock farms or residential neighborhoods that would be vulnerable to exposure? Knowing this would aid in developing a transport route to the site and help limit public resistance to the process.
- Are the operators trained and medically cleared to wear any required personal protective equipment?

## Incineration Evaluation Questions (cont.)

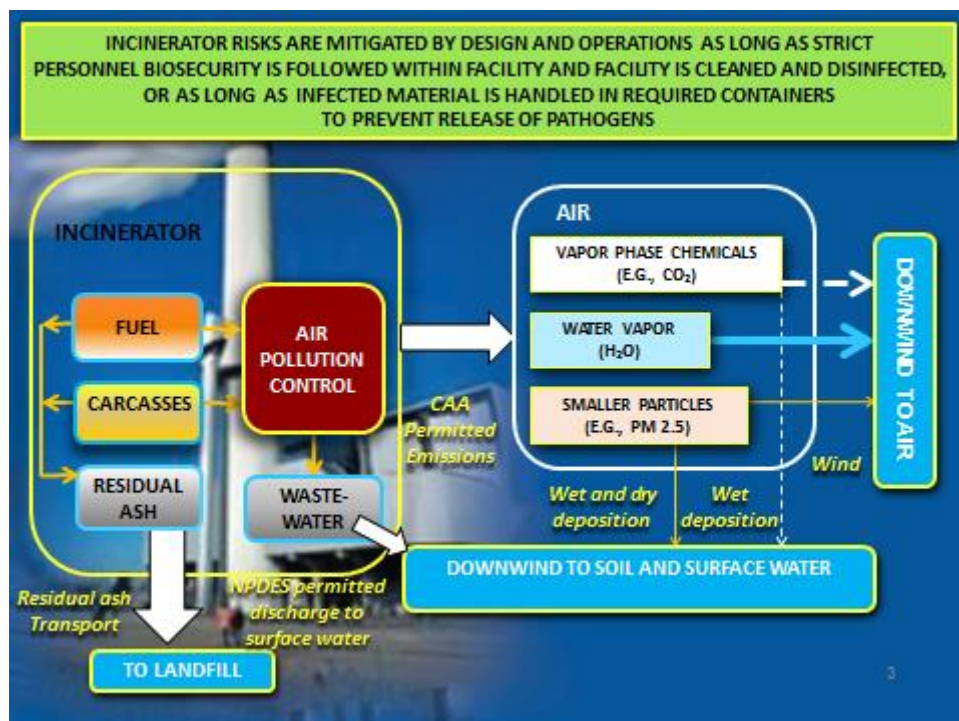
- Is the site completely secure at all times? What security measures are in place? Procedures must be in place to prevent the disturbance of animal carcasses received at the carcass management facility. Examples could be fencing surrounding the facility or some means of preserving the waste through refrigeration.
- What actions does the facility take to reduce nuisance odor and vermin? Ensuring that the operation is following through on their stated procedures, and that these procedures are effective, may reduce any negative publicity surrounding the carcass management activities.
- How are records kept at the incineration facility? It is important that the facility track the amount of waste incinerated, and that the material was maintained at the appropriate temperature for the required time to ensure pathogen inactivation.
- Does the facility have a means of establishing the weight and/or volume of the materials being delivered? Since any carcass management effort will involve monitoring the total amount of diseased material being disposed of, it is imperative that a facility have accurate and easily accessible truck scales or some other means to determine how much material is being processed.
- Is an agreement already in place with the incinerator company to accept infected carcasses during an emergency? This will help speed up implementation of the carcass management process.

## Environmental Impact

Fixed-facility incineration generates air emissions and ash. Both waste streams can be harmful to human health and the environment if not managed properly. Operation of the fixed-facility incinerator by knowledgeable and trained personnel is critical to reduce negative environmental impacts.

- Scrubbers or other emission control devices may be required to control particulates and other air pollutants
- The ash must be disposed in accordance with all solid and hazardous waste requirements
- Cleaning and disinfection of a fixed incineration facility presents a considerable challenge so it is essential for operators to be trained in biosecurity procedures
- Fixed-facility incineration may take place on an affected premises if an incinerator has been installed. This decreases disease transfer associated with transportation of waste material.
- The high temperature of incineration is capable of destroying prions but the unit must not be overloaded because it can cause temperatures to drop below optimal levels and contribute to increased smoke and odor

Figure 4. Incinerator Potential Risks (Click on Image to Enlarge It)



## Environmental Impact Questions

- Does the incineration facility operator have a plan in place to dispose of ash generated through the incineration process?
  - Will ash be considered contaminated or hazardous waste?
  - Can the ash be contained at a municipal solid waste landfill?
- Are air emission control devices and afterburners installed on the incinerators to process the smoke?
- Is the facility in compliance with all permit requirements?
- Does record keeping meet the regulatory requirements?
- Who will keep the records?
  - This is important to identify who may be legally liable, in case there is an environmental release in the future

## Biosecurity

Biosecurity is a series of management practices designed to prevent the introduction and spread of disease agents on an animal production facility. During an animal disease emergency, biosecurity measures are necessary to keep disease agents out of healthy livestock and poultry populations and prevent the spread of disease agents from infected groups to uninfected groups within the same population.

Below are some biosecurity considerations. For more comprehensive biosecurity information, refer to the Biosecurity Module.

- Plans must be in place to prevent disease spread during transportation. For more information see the Secure Transport Module.
- Workers who handle infectious carcasses need to take proper precautions and should be equipped with appropriate PPE in accordance with site-specific plans. Refer to the Health, Safety, & PPE Module.
- In cooperation with appropriate public health agencies, personnel should be monitored afterward for signs of illness if pathogen of interest may be or has the potential to be zoonotic

### NOTE

The agent causing the disease may not be the only agent that poses a risk to personnel. Other potential risks may occur from *Salmonella*, *Campylobacter*, Q fever and coliforms.

- Cleaning and disinfection of a facility after it has processed infectious material presents a considerable challenge
- Proper storage for carcasses awaiting management should prevent scavenging by wildlife and access by other vectors
- A certain degree of site security would likely be inherent to an incineration facility (e.g., fencing, central entrance, vermin/pest control, etc.)
- The incinerator must reach adequate temperatures to inactivate pathogens of concern (for prions, at least 1560°F or 850°C for a minimum of 15 minutes. If possible, a higher temperature of 1,830° F (1000°C) should be reached to optimize the likelihood that TSE agents are rendered noninfectious).

## Public Health Considerations

During an animal disease outbreak, there is a possibility of generating massive amounts of contaminated biomass which can have a severe impact on public health and/or the environment.

A comprehensive understanding of the type and strain of disease and pathogen associated with the decision to depopulate and dispose of animals is essential. This will prevent further spread of the disease and will safeguard human and animal health.

Biosecurity and cleaning and disinfection protocols will be largely based on the type and strain of pathogen present.

Care must be taken to conduct operations in such a manner that public health is protected.



## Public Health Questions

The next few questions can help evaluate public health concerns when using incineration facilities:

- Are the operators familiar with environmental regulations managed at the state level?
- Will air pollution become a problem?
- Is the ash generated by this method managed in a manner that avoids water pollution?
- Does cleaning and disinfection of the fixed incineration facility meet biosecurity measures?
- Are personnel trained to reduce environmental impacts, such as preventing overloading of the incinerator that can contribute to odor problems?

## Planning Lesson Overview

This lesson contains information to help you plan for off-site incineration of carcasses resulting from an animal health emergency. Planning is essential to ensure that the carcass management task is carried out efficiently and unimpeded by lack of resources. Successful management of a large number of contaminated animal carcasses requires proper planning to protect workers, the general public, and the environment.

Important considerations include:

- Properly classifying and characterizing the waste material
- Identifying and contacting facilities and owners having suitable fixed-site incineration capabilities
- Finding adequate carcass storage facilities
- Assessing availability of secure transportation

## Planning Lesson Contents

The material in this lesson is divided into the following sections:

- Personnel – Highlights personnel planning requirements and related issues such as health, safety, and biosecurity
- Waste Classification – Discusses waste characterization and factors necessary to determine whether a facility can accept the waste stream
- Identifying Facilities – Describes planning considerations for selecting and using an off-site incineration facility
- Materials, Supplies, and Equipment– Provides a list of equipment and supplies which might be needed for off-site incineration
- Temporary Carcass Storage – Provides several considerations for temporary carcass storage until carcass management can commence
- Secure Transportation – Presents important questions to consider before transporting carcasses
- Off-site Incineration Suitability – Lists considerations to determine the suitability of an off-site incineration facility

**Figure 5. Briefing the Carcass management Team**



## Personnel

There are certain personnel planning aspects that are common to all carcass management options. Those aspects include human health and safety, biosecurity, and physical security, as described below.

- Health and safety – Planning to implement off-site incineration as a carcass management option should include measures to protect workers and the public from hazards associated with loading infected materials for transport, transporting the materials, and disposing materials at the incinerator. Refer to the Health, Safety, & PPE Module.
- Biosecurity – Use of an off-site incinerator must include strict biosecurity measures to minimize disease spread when transporting and handling infected materials. Refer to the Biosecurity Module and Secure Transport Module.
- Physical Security – Planning efforts should consider security of personnel at the infected premises, security of infected material during transport, and security at the incineration facility. Below are some ideas for minimizing physical security risks:
  - Providing a single entry point to the infected premises
  - Providing badges to all authorized personnel entering the infected premises
  - Signing in and out of the premises
  - Sealing truckloads at the origin and ensuring the seals are unbroken at the destination
  - Separating routine incineration operations from emergency operations for infected materials

## Waste Classification and Characterization

Classification is a determining factor in considering whether a proposed facility is permitted to accept the waste. Because regulations may vary between states, do not assume all states' regulations are similar. This is particularly relevant if waste generated during a response is transported across state lines. Consult a certified waste management professional when classifying waste for regulatory purposes.

Response personnel should perform the following:

- Identify all waste materials designated for management (in accordance with the site-specific carcass management plan, if available)
- Mark waste materials and verify with the Disposal Group Supervisor or their designee that all designated materials are to be disposed of
- Sort materials by type (recyclables, putrescible waste, debris, and potentially hazardous waste)
- Stage the various waste materials in suitable areas and containerize or enclose in secondary containment putrescible or wet materials to avoid leaching to the environment. Waste materials may require tarp or shelter covering.
- Estimate the quantities of each waste type and record the information
- Characterize and label each waste type in accordance with all applicable local, state, and federal regulations
  - Improper waste management can result in criminal penalties for responsible parties (includes fines or imprisonment)
  - Improper waste management can create environmental contamination, can threaten public health, and can result in clean-up liabilities

## Identifying Facilities

For help in locating incineration facilities, you may access the Incident Waste Decision Support Tool ([I-WASTE DST](#)) to search for carcass management facilities in each state and/or U.S. Environmental Protection Agency (EPA) region. Contact identified facilities to ensure operators will accept carcasses and the conditions of acceptance. Obtain this information in writing.

Incineration Site Evaluation – The facility must be constructed and operated in accordance with applicable regulations and the conditions of its operating permit.

Cost Considerations – The use of a fixed-facility incinerator may be costly; the charge is approximately \$460-\$2000 per ton of carcass material in the U.S.

Time Considerations – The amount of combustion time required depends on the carcass load for each batch and the capacity of the fixed-facility incineration system. For example, it may take 10 hours to incinerate 5,000 pounds of carcasses in a fixed-facility incineration unit with a throughput of 500 pounds per hour. However, the next batch cannot be reloaded until the previous batch has cooled (approximately 10 hours).

Therefore, the effective throughput would be 10 hours processing time, plus 10 hours cooling time = 20 hours per 5000 lbs. or 250 lbs. /hr.

## Material, Supplies, and Equipment

The Disposal Group must identify all necessary materials, supplies, and equipment to carry out the chosen site-specific carcass management method(s).

The list is provided as an example of the types of materials, supplies, and equipment which might be needed for off-site incineration:

- Personal protective equipment
- Personnel, supply, and equipment decontamination equipment
- Secure transport equipment (driven by trained drivers)
- Vehicle cleaning and disinfection equipment
- Vehicle liners, such as plastic sheeting or specialized bags
- Loading equipment
- Absorbent material to prevent leakage

**Figure 6. Example Supplies Needed for Cleaning and Disinfection**



## Material, Supplies, and Equipment (cont.)

- Regulatory authority approved containers, including sharps containers
- Bio hazardous waste bags and containers, if applicable Note: use biohazard bags only for identified biohazard waste. Putting non-biohazard waste into biohazard bags results in excess expenses for carcass management.

### **Biohazard Waste**

Includes plastic ware such as pipettes or pipette tips, culture plates, specimen vials, etc. that are contaminated with biological specimens, bacterial and cell culture material, or nucleic acids. It also includes towels and bench paper that are biologically contaminated (i.e., used where samples or cultures are opened and manipulated). It may also include culture or sample containers (e.g. plastic tubes of blood) that are contaminated with biological materials. The categories are based on the UN assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods ([UNECE](#)).



## Temporary Carcass Storage

When the Euthanasia Group generates mortalities at a faster rate than the Disposal Group can process them, some means of temporary carcass storage must be provided. It is important to identify where carcasses can be collected and stored until carcass management can commence. For related guidance, refer to EPA regulations regarding storage and collection of solid waste [40 CFR 243.200-1\(a\)](#).

Considerations for temporary storage include:

- Can the storage area be secured to prevent unauthorized access, scavengers, odors, rapid decomposition, and potential disease spread to susceptible species?
- Will the carcasses be stored using refrigeration or some other stabilization method such as grinding and preserving them in containers?
  - If so, are the equipment, supplies and materials available?
- Will the storage capacity be sufficient to accommodate the difference between the maximum expected euthanasia rate and the maximum carcass management rate?
  - If not, avoid euthanizing animals at a rate that exceeds carcass management and storage capacity
  - When maximum carcass management and storage capacities are reached, curtail euthanasia until adequate capacity is available
  - Consult with Incident Coordination Group leadership for strategies to minimize the number of animals to be euthanized and managed

## Temporary Carcass Storage (cont.)

- Can wastewater and storm water runoff be controlled from the storage facilities?
- Outline a recordkeeping system for identifying and tracking all carcasses and other materials entering and exiting the storage facilities
- Can the storage facility be adequately cleaned and disinfected during and/or after the response?
- Can storage containers be made leak-proof?
- Is there sufficient space for heavy equipment which may be needed to move large loads?
- What safeguards will be used to protect soil and groundwater from a release of leachate?
- Do safeguards meet all applicable local, state, and federal regulations?
- Ensure the storage method will contain leachate, account for precipitation, address pressure buildup, and avoid uncontrolled release of gases and pathogens
- Consult a certified waste management professional for assistance

## Secure Transportation

Transport vehicles will be needed to move carcasses and other materials to the carcass management site. If the waste must travel on public roads, it should be transported in closed, leak-proof trucks or dumpsters. Secondary containment may be needed, depending on the type of waste being transported. Consult a certified waste management professional when developing this section of the carcass management plan. Some transport planning considerations are listed below:

- Does the facility have the needed equipment to unload the material?
- Have the carcass management facilities agreed in writing to accept the type and amount of waste you plan to send them and are they permitted appropriately?
- Are all permit, agreement, and/or contract conditions delineated and will the shipments meet the conditions? If not, what corrective actions would be needed?
- Are haulers to be used for the response properly equipped to haul carcasses in accordance with all applicable laws?
- Are transport vehicles designed to handle the materials to be transported?
- Are the drivers adequately trained?
- Can two-way communications be maintained with the hauler during transport?
- Do shipments require law enforcement escorts?
- Will travel routes from the premises to the carcass management site avoid other susceptible farms, road construction, neighborhoods, and densely populated areas?
- Has an alternate travel route been identified?
- What procedures will be followed if the vehicle is damaged during transit?
- How is the waste classified for transport? What DOT packaging standards apply? Are all standards consistently met, including labeling, placarding, and manifesting?
- How will transport vehicle traffic be minimized into the Control Area?

For more information, refer to the Secure Transport Module.

## Off-site Incineration Suitability

Members of the carcass management team must contact or visit the incineration facility and/or the appropriate state regulatory authorities to ensure it is operated in accordance with all applicable laws and regulations. It is important to contact the incineration facility in advance to discuss waste acceptance policies, conditions, and cost.

The carcass management team should ask the following questions when considering the suitability of the off-site incineration facility:

- Are incinerator personnel trained, equipped, and certified to handle the waste in a biosecure manner or will trained contractors be required?
- Is there an existing contract or agreement in place with the incineration facility?
- Does the receiving facility have sufficient space for incoming vehicles to avoid causing traffic disruptions on access roads?
- Does it have a secure location for transport vehicles, freezers, or other means of storage if there is a delay of more than one day?
- Does the facility have sufficient additional capacity to accept the carcasses while handling their normal routine daily waste quantity?
- How will vehicle unloading be performed in order to avoid releasing biological agent(s) to the environment?
- How will vehicles be cleaned and disinfected after materials have been offloaded at the carcass management site?
- How will the wastewater from the disinfection process be collected and disposed of?
- Can the incineration facility be cleaned and disinfected if needed?

## Operations Lesson Overview

This lesson contains general procedures in preparing for and disposing of carcasses by utilizing an off-site incinerator. The following topics will be addressed:

- Incineration procedures
- Secure transport
- Health and safety
- Biosecurity

Critical steps used during recent U.S. animal disease outbreaks are also included.

**Figure 7. Carcass management Team Wearing PPE**



## Operations Lesson Contents

This material in this lesson is presented in a step-wise manner that provides detailed instructions and key steps based on the criteria and measures instituted during recent U.S. animal disease outbreak responses.

- Incident Management – Provides general guidelines to the Disposal Group personnel when dealing with an animal emergency situation
- Off-site Incineration Preparation – Lists steps for assessing facility readiness and need for operational modifications to accept infected biomass
- Infected Premises Preparation – Lists steps for assessing facility readiness to begin activities
- At the Incineration Facility – Gives guidance for management of infected carcasses upon delivery to an incineration facility

## Incident Management

All Disposal Group personnel should familiarize themselves with the approved site-specific carcass management plan. The Disposal Group Supervisor will review the plan with the Disposal Group and brief them on all relevant aspects of the carcass management effort. For further guidance, see the [FAD PReP APHIS Foreign Animal Disease Framework: Roles and Coordination](#)

1. The Incident Coordination Group (ICG) / Incident Management Team (IMT) will ensure there is a system in place to identify carcass management team members with the required expertise.
2. The Disposal Group Supervisor, Disposal Coordinator, or other assigned official will verify credentials, training, and security clearances and arrange just-in-time training as needed for carcass management team members.
3. The Disposal Group Supervisor will prepare briefings and reports for the Operations Section Chief.
4. The Safety Officer will brief all responders on safety precautions and will provide a briefing on the nature of the disease and other circumstances affecting the response.
5. The Safety Officer or Biosecurity Officer will brief all responders on biosecurity protocols.
6. Plans should be developed to be sure that all onsite carcass management related personnel are briefed on safety requirements, site conditions, and tasks.
7. The Public Information personnel will develop material, such as Frequently Asked Questions, to address public concerns.

## Off-site Incineration Preparation

1. Identify permitted pathological waste incinerators in the vicinity of the affected premises. Use [EPA's I-WASTE Tool](#).
2. Contact identified facilities and ensure operator will accept catastrophic FAD mortalities, and the conditions of acceptance.
3. Verify the availability of adequate carcass storage facilities such as refrigerated rooms, transport vehicles, freezers or other means of carcass preservation if needed.
4. Consider treating carcasses at infected premises to inactivate pathogen prior to transport so waste will be more readily accepted.
5. Identify haulers who:
  - o Are equipped to haul carcasses in accordance with State and Federal laws
  - o Can provide secure, leak proof, transport for the infected carcasses and contaminated materials
  - o Possess vehicles in good mechanical condition and capable of carrying the load without difficulty
  - o Have vehicles which can be covered with a tarpaulin if they do not have closed tops
  - o Employ licensed drivers adequately trained (see [49 CFR 172](#) and [49 CFR 173](#) for further guidance)
  - o Have an emergency plan which addresses spills/excess leakage; vehicle break-downs; traffic accidents; adverse weather conditions; terrorist attacks



## Infected Premises Preparation

1. Develop a communication plan between the farm and the incineration facility with a single point of contact to coordinate arrival times and incinerator resources.
2. Upon arrival at the farm, the truck driver should remain in the vehicle with the windows closed throughout the loading and unloading process. If the driver must leave the truck before that time, proper biosecurity procedures should be followed.
3. Use containers recommended by the incineration company, or use leak-resistant roll-off containers in accordance with incineration company requirements.
4. Allow a minimum of one foot of headspace at the top of the trailer to allow for expansion of the material.
5. Securely fasten a tarp over the trailer/roll-off container to prevent damage to the load during highway transport. The tarp must be capable of being cleaned and disinfected.
6. Check trailers/roll-off containers for leakage before leaving the farm.
7. Before leaving the farm, clean vehicles - including tires, wheel wells and undercarriages – to remove organic material. Thoroughly spray the vehicle with a disinfectant registered by the EPA and labeled for the pathogen of concern.
8. Give the truck driver all appropriate paperwork and transport the load to the facility.
9. Contact staff at the facility with the time the truck left the farm and an estimated time of arrival.
10. Trucks must travel to the incinerator under permit by USDA on a route specified by the State Veterinarian, USDA, or other designated official.
11. When trucks arrive, check in and obtain a receipt.
12. Proceed to off load area.
13. Prior to off-loading, inspect the vehicle for signs of leakage.
14. Any problems or deviations in these procedures are to be reported to the government site manager immediately.

## At the Incineration Facility

1. All employees in the carcass management area will wear PPE in accordance with CDC, OSHA, the incident-specific Health and Safety Plan, or other established guidelines.
2. Check in at weigh station or receiving area.
3. Obtain receipt for weight of load and any disposal fees.
4. Proceed to unloading area as directed by facility staff.
5. The truck driver should remain in the vehicle with the windows closed throughout the unloading process. If the driver must leave the truck before that time, proper biosecurity procedures should be followed.
6. The carcasses should be contained until they are processed.
7. Incinerate the carcasses in accordance with facility protocols.
8. Ensure the facility follows all biosecurity requirements.
9. Proceed to designated C&D station to disinfect vehicle before leaving the facility.
10. Properly clean and disinfect the incineration operation prior to resuming routine operations.

## Summary

Congratulations! You have completed the Off-site Incineration Module. In this module, you have learned to:

- Describe off-site incineration as a method for carcass management
- Identify the advantages and disadvantages of off-site incineration
- Consider environmental risks associated with off-site incineration
- Obtain regulations governing incineration by consulting with state officials
- Identify factors used to evaluate off-site incineration as an option
- List critical elements when planning use of off-site incineration
- Recognize key components of off-site incineration operations

Please click [here](#) to download the certificate of completion for this module. You can enter your name on the certificate and save or print it for your records.