

Handling Drums and Containers



Terminal Learning Objectives

At the end of this section, you should be able to:

- Identify hazards associated with handling drums and containers, and how to avoid them;
- Describe precautions and inspection procedures to take prior to handling drums and containers;
- Determine appropriate action to take prior to moving shock-sensitive, radioactive, and leaking, open, or damaged drums and containers;
- Explain safe procedures for handling lab packs and overpacking; and
- State whether or not you are a “hazmat employee” as defined by the Department of Transportation and require additional training.

Introduction

Drums and other hazardous waste containers pose several hazards that can result in injury if mishandled.

Hazards encountered during the handling process include:

- Exposure to chemicals or radiation;
- Fire or explosion; and
- Physical injury as a result of:
 - Moving heavy containers by hand; or
 - Working around stacked drums, heavy equipment, or deteriorated drums.



About This Section

This section focuses on practices and procedures for the safe handling of drums and other hazardous waste containers during hazardous waste site operations.

It is intended to aid the Project Team Leader in setting up a waste container handling program.

In addition to what is covered in this section, the Project Team Leader should also be aware of all pertinent regulations that apply to handling drums and containers.

Let's look closer at these now.



OSHA, EPA, and DOT Regulations

OSHA regulations (29 CFR Parts [1910](#) and [1926](#)) include general requirements and standards for storing, containing, and handling chemicals and containers.



[EPA regulation 40 CFR, Part 265](#) specifies requirements for types of containers, maintenance of containers and containment structures, and design and maintenance of storage areas.



DOT regulation [49 CFR, Parts 171 through 178](#) also contains specifications for containers and procedures for shipping hazardous wastes.

Handling Drums and Containers

The appropriate procedures for handling drums and containers depend on the contents and the condition of the drum or container.

Over the next few slides we will discuss considerations for handling drums and containers where the contents are known and, later in this section, discuss considerations for handling drums and containers where the contents are unknown.



Hazardous Materials can be Heavy

The first issue with handling drums and containers that contain hazardous materials or hazardous waste is the excessive weight of the containers.

For example, if a plastic 55-gallon drum is filled with water, the drum would weigh over 475 lbs.

This weight is based upon the weight of water (8.34 lbs./gallon) times 55 gallons, plus 20 lbs. for the drum itself.

Let's say that a 55-gallon drum was full of 50% sulfuric acid. Then the weight would be over 660 lbs. since a gallon of 50% sulfuric acid weighs approximately 11.7 lbs.

100% sulfuric acid weighs 15.33 lbs. per gallon, which would make a 55-gallon drum full of this product weigh over 860 lbs. Handling these types of containers is no easy task.

Knowledge Check

Moving Extremely Heavy or Large Objects

Moving large, heavy loads may be required during hazardous waste site operations.

There are significant safety issues that should be considered prior to using lifting devices, both for the operators of the diverse "lifting" devices and for workers in proximity to them.

Crane, derrick, and hoist safety hazards are addressed in specific standards for the general industry, marine terminals, longshoring, gear certification, and the construction industry.

Over the next two slides we'll show you two short animations on the dangers of working around cranes.

The first animation will show you how a worker dies working around a crane while the second animation will show you how to prevent the fatality.

Video – Example of a Deadly Crane Accident

Video – Preventing a Deadly Crane Accident

Moving Drums: Equipment

Moving drums or heavy containers can be very complicated and may require special equipment, such as:

- A drum grappler attached to a hydraulic excavator—The drum grappler is the preferred piece of equipment for drum handling. It keeps the operator removed from the drums so that the likelihood of injury if the drums detonate or rupture is lower. If a drum is leaking, the operator can stop the leak by rotating the drum and placing it in an overpack;
- Small front-end loader—this piece of equipment can load manually or be equipped with a bucket sling;
- Rough terrain forklift; or
- A hand truck designed specifically for handling drums or containers.

Maximizing Worker Safety

The following procedures can be used to maximize worker safety during drum and container handling and movement:

- Train personnel in proper lifting and moving techniques to prevent back injuries;
- Ensure vehicles used to move drums have sufficient rated load capacity;
- Protect the vehicle operator with heavy splash shields;
- Determine the most appropriate sequence in which the various containers should be moved;
- Exercise extreme caution in handling drums that are not sound, tightly sealed, or labeled; and
- Ensure all operators have a clear view of the roadway when carrying drums.

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Unlabeled Containers

Waste site personnel should assume unlabeled drums or containers contain hazardous materials until their contents are identified.

They should also keep in mind that drums and containers are often mislabeled, particularly those that are reused.

Site workers should use a systematic approach, such as a checklist developed beforehand, to handle drum or container assessments.

Doing so will maintain consistency, allowing you to review the assessments quickly, and limit the odds of missing something critical during an assessment.

As with all HAZWOPER operations, safety is the top priority when moving unlabeled drums and containers.

Knowledge Check

Visual Inspection

Drums and containers should be inspected visually *before* handling them to gain as much information as possible about their contents.

The visual inspection should be performed from a safe distance.

Depending on the results of the Site Characterization and Analysis process, atmospheric monitoring should be considered around the drums and containers of unknown contents if the containers are approached.

This would involve using instruments such as a radiation detector, a combustible gas indicator, an oxygen monitor, and a photo ionization detector.



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Inspection Procedures: Visual Clues

When conducting a visual inspection, be sure to examine the following:

- Type of drum or container (metal, plastic, or fireboard);
- Labels, placards, or markings (radioactive, explosive, corrosive, toxic, flammable, caution, etc.);
- Signs of deterioration, such as corrosion, rust, and leaks;
- Signs that the drum is under pressure, such as swelling and bulging;
- Signs of crystallization around any openings; and
- Signs of leaks (sounds, vapor clouds, plumes, or stains).

Inspection Procedures: Container Area

Conditions in the immediate vicinity or surrounding area of the drums or containers may provide clues about the contents and their associated hazards.



In addition to checking the drum or container as previously described, you should also check the immediate area around the drum or container for the following:

- Discoloration;
- Dead animals or vegetation; and
- Spider webs.

Container Assessment

The results of the visual inspection can be used to determine:

1. If any hazards are present and the appropriate procedures; and
2. Which drums or containers need to be moved in order to be opened and sampled.

Consider asking important questions, such as:

- What equipment will be needed?
- What PPE will employees need?
- Can the container be moved safely?

Be sure your assessment covers all possible safety hazards and you account for those hazards prior to handling or moving the container.

Knowledge Check

Developing a Plan

Since handling drums and containers can be very dangerous, every step of the operation should be carefully planned, based on all of the information available at the time.



A preliminary plan should be developed which specifies the extent of handling necessary, the personnel selected for the job, and the most appropriate procedures based on the hazards associated with the probable drum contents as determined by visual inspection. This plan should be revised as new information is obtained during drum handling.

Why Handle Drums and Containers?

The purpose of handling drums and containers is to:

1. Alleviate any obvious problems that might impair worker safety, such as radioactivity, leakage, or the presence of explosive substances;
2. Orient drums for potential sampling; and
3. If necessary, to organize drums into different areas on site to facilitate characterization and remediation action.

Handling may or may not be necessary, depending on how the drums and containers are positioned at a site.

Since accidents occur frequently during handling, particularly initial handling, drums should only be handled if necessary.

Shock-sensitive (Explosive) Wastes

If you notice powder deposits, discoloration, and crystallization around the cap of a drum or container, the material may be potentially explosive.

Simply opening the container could create enough friction to cause an explosion.

OSHA requires that crystalline material be handled as a shock-sensitive waste until the contents are identified.

Shock-sensitive hazardous waste containers are extremely dangerous and must only be handled by those who are specifically trained to do so.

It is important to note that OSHA has specific legal guidelines for dealing with shock sensitive wastes in section (j)(5) of the [HAZWOPER Regulation](#) that must be considered.

Radioactive Wastes

If a drum or container exhibits radiation levels above normal background levels, more characterization is required by someone with radiation cleanup training.

It is important for workers to avoid handling drums that are determined to be radioactive until persons with expertise in this area have been consulted.

OSHA requires in 29 CFR 1910.120(j)(4) that...



Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

Again, the only way to know if radiation is present or not is to monitor for it.

Leaking, Open, or Deteriorating Containers

Dealing with leaking, opened, or deteriorated drums or containers may pose an immediate risk to personnel or the environment.

Because no two situations are the same, there is no best way to handle a damaged drum.

Appropriate action, or non-action, is taken with the safety of personnel at the forefront.

If safe action can be taken, one, or a combination, of the following techniques may be used to correct the situation:

- Transfer the contents to an intact, compatible container;
- Place the leaking or potentially leaking container inside a larger container; or
- Repair or plug the leaking container.

Knowledge Check

Container Transfer

Transferring the contents of a damaged container to another container is one method of dealing with a hazardous waste.

The procedure always begins with consideration and control of potential hazards.

The main advantages of transferring are that the material can be repackaged in a safer container and doing so may allow recovery of the product.

The disadvantages are that transfer is time consuming and equipment/supplies intensive.



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When to use Container Transfer

Transfer of a hazardous substance from one container to another can be accomplished either by gravity flow or by pumping.

Transferring may be the method of choice if:

- It can be done safely;
- It can be done before the contents escape;
- Time is not of primary importance; and
- Moving or repairing the drum is prohibited by the type or extent of damage or deterioration.



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Opening Drums and Containers

An opening area, separate from the site operation, may be required if drums or containers will be opened during site operations.

In these cases, use the following procedures to enhance the efficiency and safety of container opening:

- Use appropriate Personal Protective Equipment (PPE);
- Keep personnel at a safe distance from the drums being opened;
- Make special container opening equipment, monitoring equipment, and fire suppression equipment available as needed; and
- Monitor the atmosphere continuously during opening.

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Other Container Opening Procedures Include:

- If the drum or container shows signs of swelling or bulging, perform all steps slowly;
- Relieve excess pressure prior to opening and, if possible, do it from a remote location using devices such as a pneumatic impact wrench or hydraulic penetration device;
- If pressure must be relieved manually, place a barrier such as explosion-resistant plastic sheeting between the worker and drum to deflect any gas, liquid, or solid that may be expelled as the bung is loosened; and
- Open exotic metal drums—for example, stainless steel and polyethylene or polyvinyl chloride (PVC)-lined drums—through the bung by removal or drilling.

(continued on next slide)

More Container Opening Procedures Include:

- Exercise extreme caution when manipulating these containers;
- Do not open or sample individual containers within lab packs;
- Reseal open bungs and drill openings as soon as possible with new bungs or plugs to avoid vapor generation;
- If an open drum cannot be resealed, place the drum in an overpack; and
- Decontaminate equipment after each drum to avoid mixing incompatible wastes.



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Knowledge Check

Drums or Containers Under Pressure

Pressurized drums are also extremely hazardous. OSHA requires in 29 CFR 1910.120(j)(5)(v) that...

Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

Once these conditions are met, if a pressurized drum has to be moved, whenever possible handle the drum with a grappler unit constructed for explosive containment. Either move the bulged drum only as far as necessary to allow seating on firm ground or carefully overpack the drum.

HAZWOPER Worker Performing Lab Pack Services

In situations where waste site workers are disposing of hazardous waste in lab packs, it is important that those workers understand the requirements.



In addition to the worker safety requirements that OSHA has for employees handling hazardous chemicals, lab packs are also regulated by Federal and State EPA regulations for disposal and DOT regulations for container specifications and shipping.

If you are required to perform lab pack operations as a HAZWOPER worker, you should receive more training from your employer on the requirements in your area.

Knowledge Check

HAZWOPER Workers Finding Abandoned Lab Packs

Situations where waste site workers are required to dispose of lab packs that are found or abandoned on a hazardous waste site pose significant hazards.

OSHA has specific requirements in the HAZWOPER regulation on handling lab packs.

Per 29 CFR 1910.120(j)(6)(i)...

Lab packs shall be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

Per 29 CFR 1910.120(j)(6)(ii)...

If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

Lab Pack Considerations

Laboratory packs can be an ignition source because they may contain shock-sensitive materials.

These containers should be considered explosive or shock sensitive until otherwise characterized.

If you must handle these containers, take the following precautions:

- Make sure all non-essential personnel have moved a safe distance away before handling or transporting lab packs;
- Whenever possible, use a grappler unit constructed for explosive containment for initial handling of such drums; and
- Maintain continuous communication with the Site Safety Officer until handling operations are complete.

Other Lab Pack Considerations

If a lab pack must be opened, have a chemist inspect, classify, and segregate the bottles without opening them, according to the hazards of the wastes.

As previously stated, if any crystalline material is noted at the neck of any bottle, handle it as a shock-sensitive waste—some materials, such as picric acid, become shock sensitive with age.

Seek expert advice before attempting to handle the lab pack.

Palletize and secure the repacked drums to the pallet prior to transport.



Overpacking

Overpacking consists of placing a damaged drum into a larger container, often an 85-gallon steel or polyethylene drum.

The advantages of overpacking are that it is relatively fast and simple, while the disadvantages are that the damaged drum and contents are kept together and that the total package is now larger and more difficult to handle.

Overpacking is appropriate if:

- Time is of primary importance;
- The material cannot be transferred due to high viscosity, volatility, etc.; or
- Effective repairs cannot be made to the current container.

We'll look at two methods of overpacking on the next slides.

Knowledge Check

Overpacking: Method 1

Method 1: Sliding the damaged drum into the overpack.

The steps are:

1. Consider and control potential hazards;
2. Lay the salvage drum on its side next to the damaged or leaking container;
3. Lay the leaking drum on its side;
4. Slide the leaking drum, bottom first, into the salvage drum;
5. Push the leaking drum completely into the salvage drum—using a large, plastic drum liner can help move the container into the salvage drum; and
6. Stand the overpack drum upright.

Overpacking: Method 2

Method 2: Placing the overpack over the damaged drum.

The steps are:

1. Consider and control potential hazards;
2. Slide the salvage drum over the top of the leaking container—if possible, the leak, or bung end, is placed down;
3. Lay the drums on their side;
4. Stand the drums upright; and
5. Seal the salvage drum.



Shipping and Transporting Drums and Containers

We have touched on it already, but it is important to note that the Department of Transportation (DOT) has specific training requirements for the shipping and transportation of hazardous materials and hazardous waste.

Those training requirements are in addition to the OSHA HAZWOPER training you are receiving here.

Everyone who participates in transporting hazardous substances is considered by the DOT as a “hazmat employee.”

The training requirements for DOT-defined “hazmat employees” include “General Awareness,” Function Specific,” “Security Awareness,” and “Safety Training,” per 49 CFR.

HAZWOPER - Student Handout

Summary

When handling drums and containers, safety is always the first consideration.

One must determine the hazards of handling the drum or container, such as weight, contents, or the condition of the drum or container before determining the safest handling method.

Untested drums or containers with unknown contents should be treated as hazardous.

If your job involves transportation of hazardous materials in any way, you are also considered a “hazmat employee” and must receive DOT training in addition to HAZWOPER training.



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