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# CU Hazardous Waste Training – How to Dispose of Chemical Waste at Pee Dee REC


Presented by The Office of Research Safety

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# Two Laws to Remember:

## Resource Conservation and Recovery Act (RCRA)

This is the law most associated with hazardous waste. Under RCRA, a waste can be hazardous if it is Listed (i.e. identified by name on one of several lists) or characteristic (is not listed, but has some hazardous property, like flammability). RCRA requires generators to ensure and fully document that the hazardous waste they produce is properly identified, managed on-site for no more than 90 days and transported to a RCRA-permitted treatment, storage or disposal (TSD) facility.

***These RCRA requirements are administered by the South Carolina Department of Health and Environmental Control (SCDHEC) and implemented under the South Carolina Hazardous Waste Management Regulations, SCHWMR***.

## Comprehensive Environmental Response, Clean up, and Liability Act (CERCLA )

CERCLA is a federal law which makes it illegal to dispose of any material which is harmful to the environment. No lists or characteristics are included; it's up to the individual disposing of the waste to determine if it is environmentally unfriendly.

There are other environmental laws which govern the release of materials into the air and water such as The Toxic Substance Control Act (TSCA), The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), The Clean Air Act (CAA) and The Clean Water Act (CWA).

# Hazardous Waste Generator Status

## Conditionally Exempt Small Quantity Generators (CESQGs)

- must identify all the hazardous waste generated
- may not accumulate more than 1,000 kilograms (220 lbs) of hazardous waste or 1kg (2.2) lbs of acutely hazardous waste at any time
- must ensure that hazardous waste is delivered to a person or facility who is authorized to manage it (TSDF)

## Small Quantity Generators (SQGs)

- above plus
- generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste or 1kg (2.2) lbs of acutely hazardous waste per month (>220lbs but <2200lbs)
- may accumulate hazardous waste on-site for 180 days without a permit (or 270 days if shipping a distance greater than 200 miles)
- quantity of hazardous on-site waste must never exceed 6,000 kilograms
- must comply with the hazardous waste manifest and pre-transport requirements
- must comply with the preparedness and prevention requirements and the land disposal restriction requirements
- must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. SQGs are not required to have detailed, written contingency plans.

## Large Quantity Generators (LQGs)

- above plus
- no limit of waste generated per month or onsite at any given time
- may only accumulate onsite for 90 days prior to shipping to a TSDF
- All liquids must be in secondary containment
- must have a written contingency plan
- generators must be trained
- annual trainings for Hazardous Waste Managers

# 40 CFR Part 262 Subpart K: Academic Laboratories Rule

- Labs typically operate under the satellite accumulation area (SAA) regulations of 40 CFR 262.34(c)
- Subpart K provides alternate RCRA generator regulations for managing hazardous waste in academic labs
- Each eligible academic entity must develop a laboratory management plan (LMP)
- States must adopt this rule (SC adopted in 2013)
- Rule is optional for academic institutions, must notify DHEC if you are opting into the rule.

**Rationale:**

- Hundreds of different hazardous wastes that vary over time
- Small amounts of each hazardous waste
- Many individuals generating hazardous waste in many labs (i.e., many points of generation)
- Individuals generating the hazardous waste are often students, who
  - Have inherently high turnover (thus difficult to train)
  - Lack the expertise & accountability of a professional workforce

**Solution:**

- Require trained professionals to make the HW determination instead of students
- Allow HW determination to be made after initial point of generation
- Any material in the laboratory that has the potential to be HW is managed as HW in the laboratory

**Benefits:**

**Acute Hazardous Wastes**

- **Subpart K** - 6 reactive P-listed acute hazardous wastes (unused commercial chemical products) •
  - If 1 quart is exceeded in lab, must be removed within 10 calendar days
    - 1. P006 – Aluminum phosphide
    - 2. P009 – Ammonium picrate
    - 3. P065 – Mercury fulminate
    - 4. P081 - Nitroglycerine
    - 5. P112 - Tetranitromethane
    - 6. P122 – Zinc phosphide (> 10%)

- **RCRA SAA -** 124 P-listed acute hazardous waste chemicals (unused commercial chemical products)
  - If 1quart is exceeded in SAA, must be removed within 3 days

**Both Subpart K and RCRA SAA**
all 124 P-listed chemicals have 1 kg/month threshold that triggers LQG status

## Hazard Determinations

**Subpart K** - Eligible Academic Entity can choose when and where to make HW determination:

- In the laboratory (but after the time of initial HW generation), or
- Within 4 calendar days of arriving at an on-site Central accumulation area (CAA = 90/180/270 day area), or Interim status or permitted treatment, storage, or disposal facility (TSDF)
- **Individuals making the HW determination must be "trained professionals "**

**RCRA SAA** - Generator must make HW determination at the point of generation

- The time and place HW is first generated
- **Individuals generating the HW generally make the initial HW determination**

**Waste Determination**

## Laboratory Clean-outs

**Subpart K** - Regulatory incentives to conduct laboratory clean-out are provided:

- Laboratory clean-out waste has no volume limit--must remove all laboratory clean-out waste after 30 days
- HW generated during a laboratory clean-out that is unused commercial chemical product does not have to be counted toward generator status
- Incentives can be used one time per laboratory per 12 months (calendar year)

**RCRA SAA** - No incentives to conduct laboratory clean-outs are provided:

- If exceed 55 gallons of HW, must remove the excess within 3 days
- All HW generated in a laboratory clean-out must be counted toward generator status
- Laboratory clean-outs will often increase generator status (e.g. from SQG to LQG)

## Container Management

**Subpart K** –

- Containers must be in good condition
- Contents must be compatible with container
- Containers must be kept closed except:
  - When adding, removing, or bulking unwanted materials 
  - Working container* may be open until end of procedure or shift, whichever is first
  - When venting of a container is necessary 
    - For operation of equipment such as HPLCs
    - To avoid pressure build-up

**RCRA SAA –**

- Containers must be in good condition
- Contents must be compatible with container
- Containers must be kept closed except:
  - When adding or removing HW

**Downsides:**

**Lab Management Plan**

**Subpart K -** Two-part LMP is required

- Contents of Part I are enforceable
  - 2 elements
    - Identify options for container labeling
    - Identify option for regular removal of unwanted material from laboratories
- Contents of Part II are not enforceable
  - 7 elements
    - Best intended practices for laboratory HW management
    - Container management
    - Generator Training
    - Handler Training
    - Waste Removal Schedule
    - Hazardous Waste Determinations
    - Laboratory Clean-Outs
    - Emergency Prevention

Contents of Part I of LMP are Enforceable

- you can be held in violation if your practices vary from the LMP procedures you develop

Contents of Part II of LMP are Not Enforceable

- you can NOT be held in violation if your practices vary from the LMP procedures you develop

**You can be held in violation if all 9 required elements are not reasonably addressed in your LMP**

**Laboratory clean-outs must be documented**

- Identify laboratory cleaned out
- Start and end date of laboratory clean-out
- Volume of laboratory clean-out hazardous

**Training:**

- Training records must be kept for Laboratory workers, students, and trained professionals (as required by existing generator regulations)

- Training that is “commensurate with duties” is required for all laboratory personnel which includes
  - Laboratory workers, and 
  - Students
- Training required for personnel outside lab (trained professionals)
  - Must have standard RCRA generator training, pursuant to their generator status
  - Trained professional at CESQGs must train to SQG standards

## Waste Removals from Labs

**Subpart K** - Time-driven removals of unwanted materials from laboratory:

- All containers must be removed from the lab at a regular interval not to exceed 6 months, or
- Rolling 6 months: each container must be removed within 6 months from the container's accumulation start date
- **AND** Volume-driven removals of unwanted materials from lab:
  - 10 days to remove unwanted materials if 55 gallons (or 1 quart of acute reactives) is exceeded


**RCRA SAA -** Volume-driven removals of HW from SAA:

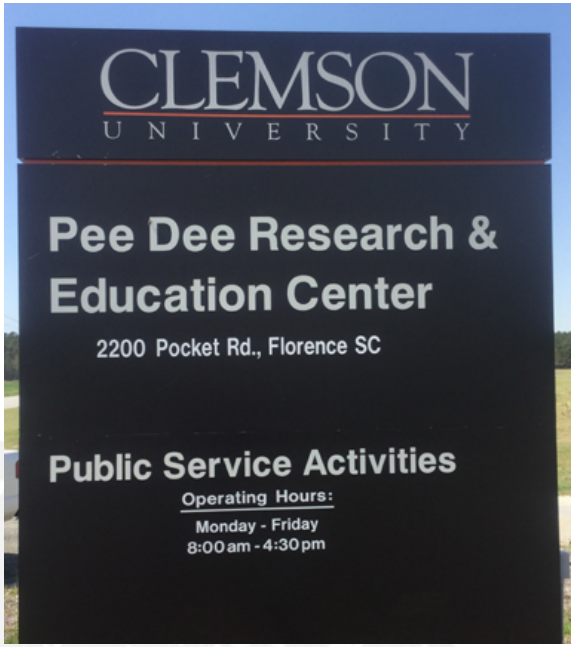
- 3 days to remove the excess of 55 gallons of hazardous waste, if 55 gallons of HW (or 1 quart acute HW) is exceeded

## Central Accumulation Area

**Must have a Central Accumulation Area (CAA) managed by the trained professional.**

When waste is removed from the lab whether time driven or volume driven and the lab management plan states the hazard determination will be made at the CAA instead of the lab where it is generated, the trained professional must do the following:

- Must date the container when it arrives at CAA, which starts the
  - 4-day clock for HW determination
  - 90- or 180-day clock for accumulation time
  - Must determine whether the unwanted material is a HW within 4 days of arriving at the on-site CAA
  - If it's a HW, must add the words "hazardous waste"
    - Must go on the "affixed or attached to" container label
  - Can delay adding the HW code until immediately prior to off-site shipment
    - Can go on "affixed or attached to" label or "associated with" label




# Pee Dee REC Generation Status

## CESQG operating under Subpart K

# Pee Dee REC Laboratory Management Plan

Effective May 12, 2014 Pee Dee REC, EPA ID #SCD982140154 shall manage hazardous waste in accordance with 40CFR262 Subpart K; this plan becomes effective therewith.

Part I

1- **Container Labeling**. § 262.206 (a)(1-2) Only containers approved by CU's Hazardous Materials Program and/or Pee Dee REC's Safety and Compliance Officer shall be used for chemical waste- ***no exceptions are permitted.*** The Generator shall label containers prior to use as follows: Each container shall bear the label "**WASTE**"- in indelible ink- on the container. All chemicals permitted in a specific container shall be listed in indelible ink- on the container-under the label.

2- **Waste Removal.** § 262.206 (a)(1-2) On the opposite side of the container from the "**WASTE**" label, the Generator shall- in indelible ink- record the date the container was placed in service in the form month/day/year. The Generator will notify the Safety and Compliance Officer of each container as soon as it is put into service. § 262.208 (a)(2) A waste container shall be removed from a lab within 6 months of the accumulation start date or when full whichever comes first (part II-4 below).

Part II

1. **Container Management.** § 262.206 (b) Additional chemicals may be added to a container label list, but only with the Pee Dee REC's Safety and Compliance Officer's approval. Waste containers shall be kept closed unless adding or removing waste. Working containers- open beakers 2 gallons or smaller- may be open during the work day, but must be emptied and cleaned at days end. A container used for in-line collection (connected by tube to, for example, an HPLC) may be vented. Funnels that attach to the container and have a closable lid may be used permanently.

2. **Generator Training.** § 262.207 Training sufficient to permit implementation of this plan for waste generators, people working in the labs including students, shall be provided by CU's Hazardous Materials Manager and/or Pee Dee REC's Safety and Compliance Officer.

3. **Handler Training.** § 262.208 Waste may only be removed from, or handled outside, the generating lab by a
"trained professional"- Pee Dee REC's Safety and Compliance Officer, CU's Hazardous Materials Manager or his/her designee or the University's Hazardous Waste Removal Contractor. These trained professionals shall be current per § 262.34(d)(5)(iii): *"The generator must ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relevant to their responsibilities during normal facility operations and emergencies."*

4. **Waste Removal Schedule.** § 262.208 (a)(2) An individual container will be removed within six months of its accumulation start date or when full whichever comes first. 262.208 (c) Each container end date will be documented in an electronic calendar that will notify the Pee Dee REC's Safety and Compliance Officer of the approaching time limit. 262.208 (d) At the moment that hazardous waste exceeds 55 gal or that acutely hazardous waste exceeds 1 quart in a particular laboratory, the researchers of that laboratory must immediately notify the Pee Dee REC's Safety and Compliance Officer so that the event can be documented (including date that excess occurred), and all waste removed within 10 calendar days.

5. **Hazardous Waste Determinations.** § 262.209 (a) (2), § 262.211 Upon removal, containers will be brought directly to the central accumulation area by the Pee Dee REC's Safety and Compliance Officer where the words "Hazardous Waste", the hazard characteristics, and codes will be applied within 4 calendar days.

6. **Laboratory Clean-outs.** § 262.213 Each laboratory in the facility may use the clean-out option to remove all unwanted-unused or off-spec commercial chemicals, without having the quantity count against generator status, annually using 30 calendar days. § 262.213 (4) The start and end dates of a lab Clean-Out including waste volume collected and lab identification will be documented and retained indefinitely. §262.214 (6) Clean- outs will coincide with and be an optional part of our annual laboratory inspections.

7. **Emergency Prevention.** §262.214 (7)(i) Contact information will be posted next to each telephone in each lab. A facility alarm system monitored by a trained professional will be tested annually. (ii) (iii) A list of peroxide forming chemicals including expiration dates will be on hand and entered into an electronic calendar (see Part II-4) that will notify the Pee Dee REC's Safety and Compliance Officer of an upcoming expiration date. Those that are not dated or if expired will be removed from the laboratory, but if properly labeled and in-date may continue to be used when tested at 3 or 12 month intervals. (iv) Unknown chemicals will be removed if not identified in a timely manner.

## Waste Generation Log

Used to document amount of waste generated each calendar month for Generator status documentation

| Please log your waste when placing it in this container. | | |
|---|---|---|
| Date | Chemicals/Constituents | Amount |
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RCRA Hazardous Wastes

Characteristic:

- Ignitable – Flammable (flash point <140 degrees or <24% alcohol aqueous solution) and Oxidizers
- Corrosive – pH <2 or >12.5
- Toxic – D-List (heavy metals, chloroform, pyridine, etc)
- Reactive – Safety Data Sheets, DWW, Spontaneously Combustible, etc

Listed:

- F- List – Spent solvents from non specific sources
- K-List – Specific Sources, normally doesn't apply to CU
- P-List – Acutely Toxic (unused, off spec)
- U-List - Toxic (unused, off spec)

## Inherently Waste-Like

Something may become a waste because it is discarded, abandoned, or considered inherently waste-like:

- Not managed as a valuable raw material or product
- Open with physical contaminants (leaves or dirt)
- Container in very poor condition
- Exposed to the elements
- Stored improperly
- Newer product or materials used prior to the container of concern
- Not labeled or identified as to the contents and hazards


**Pharmaceutical Wastes**

Disposal of pharmaceuticals, DEA Controlled or Non-controlled drugs/substances, is managed by the Hazardous Waste Management Facility. Guidance for disposal is located in the CU Hazardous Waste Management Manual. You may also contact the Hazardous Materials Manager for assistance with this waste stream.

Note: **Sanitary Sewer Disposal of Controlled Substances and Pharmaceuticals is forbidden at Clemson University.**


## Unknowns

The potential exists for containers of unknown material to be discovered. These unknowns can be accepted by the Hazardous Waste Officer conditionally, but may be returned to the generating department for chemical analysis if the hazardous waste contractor cannot categorize the waste through on-site tests. Without knowledge of the container contents, appropriate disposal options cannot be determined.

DO NOT GUESS AT THE IDENTITY OR “CREATE” A NAME FOR AN UNKNOWN!

A wrongly identified waste, if released accidentally to the environment, if exploding during disposal, or if causing the fouling of an incinerator pollution control system, not only will harm life and property, but could result in potential litigation. Likewise, the indiscriminate discarding of unknown chemical substances can have equally serious consequences.

If an unidentified container is discovered, the following steps shall be taken:

- Mark the container with the words “Awaiting Administrative Determination” and date the container.
- Initiate a hazardous waste pickup.
- Immediately notify Pee Dee REC’s Safety and Compliance Officer to arrange for the container to be relocated to the Central Accumulation Area (CAA).

## Empty Containers

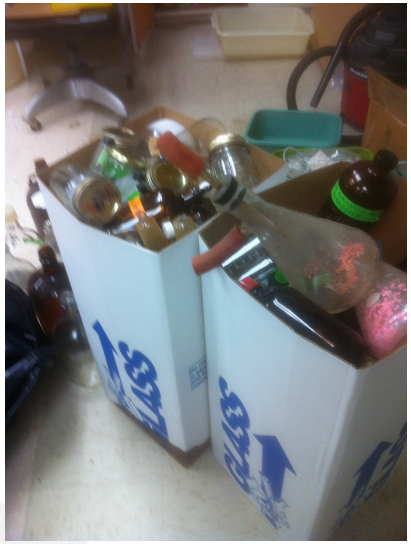
An empty container is any container which has been emptied using all normal practices and contains no more 1 inch in the bottom of the container or 3% by weight of total capacity of the container if under 119 gallons or 0.3% if over 119 gallons and did not hold any acutely toxic (P-listed) waste.
These empty containers must be defaced, marked empty and then may be placed in the regular garbage.
An empty container that has held a P-Listed waste must be managed as a Hazardous Waste!


## Broken Glass Boxes

Broken glass and other sharp items shall be disposed of in rigid, puncture resistant containers to protect persons collecting the waste materials. These containers must be properly labeled. They should never be filled to the point where any material is protruding, or so that the weight of the carton would present a lifting hazard. Check to ensure that the container is intact and sound before attempting to lift. Securely tape the container before depositing in the dumpster. Ensure that **only clean** (not contaminated) glass is deposited to these containers.

No Needles
No contaminated pipettes
No contaminated glassware
No radioactive materials (must be disposed of as Radioactive Waste)
No chemicals (must be disposed of Hazardous Waste)
No biological materials (must be disposed of as Biohazard Waste)
BROKEN MERCURY THERMOMETERS MUST BE DISPOSED OF AS HAZARDOUS WASTE!

Also make sure that the box does not have a Biohazard symbol on it or is lined with a Biohazard bag.




Unacceptable


Acceptable


## Reacting Hazardous Waste

If a chemical effluent is generated and is still reacting at the end of a procedure, it is not yet a hazardous waste! It will not become a hazardous waste until the reaction/process is completed.

During the time the effluent is reacting, the generator should:
Place the collection **CONTAINER** labeled with the chemical constituents in a safe place (such as the chemical fume hood) inside Secondary Containment;
Loosely cap the container until the reaction has stopped;
Place a sign on the container that says:

**"Caution: Contents Under Pressure, Loosely Capped Container"**

When the reaction has completed, the generator should tightly close the cap, label the container with a Hazardous Waste label and declare the waste to the Hazardous Waste Officer with the Office of Research Safety for removal from the Satellite Accumulation Area to the Hazardous Waste Management Central Accumulation Area in the same manner as non-reacting hazardous waste is declared.

The Pee Dee REC's Safety and Compliance Officer will not collect waste that is still reacting; that waste is still considered to be "in process" until the reaction has finished.

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## Spill Incident Response

A written emergency plan should be established and communicated to all personnel in your laboratory by the Pee Dee REC's Safety and Compliance Officer. It should include procedures for ventilation failure, evacuation, medical care, reporting, and drills. There should be an alarm system to alert people in all parts of the facility including isolation areas such as walk-in cold rooms.

Only when allowed by the Department Head, Safety and Compliance Officer and your PI and when you have been trained to safely do so, should you attempt to clean up a small spill.

Appendix C of the CU Lab Safety Manual gives detailed information for laboratory chemical spill clean up procedures.  However in the event of an acutely hazardous or large spill, Clemson University maintains a Remediation contract which can and should be utilized.

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**The Office of Research Safety provides online training in the following areas:**

Hazardous Materials Shipping
Biological Safety
Biological Safety Cabinets
Bloodborne Pathogens
Chemical Hygiene
Hazard Communication
Hazardous Waste Management
Laser Safety
Safety Data Sheets

http://www.clemson.edu/research/safety/

**In person training is also available upon request in any of these subjects**.

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# Hazardous Materials Shipping

# Hazardous Materials Regulations

*49 CFR Parts 105-110 and 171-180*
*Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA)*
*Federal Aviation Administration (FAA)*

*IATA (International Air Transport Association)*

- **Mandates training** requirements for persons who prepare hazardous materials (hazmat) for shipment or who transport hazmat in commerce.
- The training **must ensure** that each hazmat employee is:
  - ✧ **Familiar** with the HMR
  - ✧ Able to **recognize and identify** a hazardous material
  - ✧ **Understands** the **specific** HMR requirements applicable to **their job function**
  - ✧ **Knowledgeable** about emergency response and accident prevention

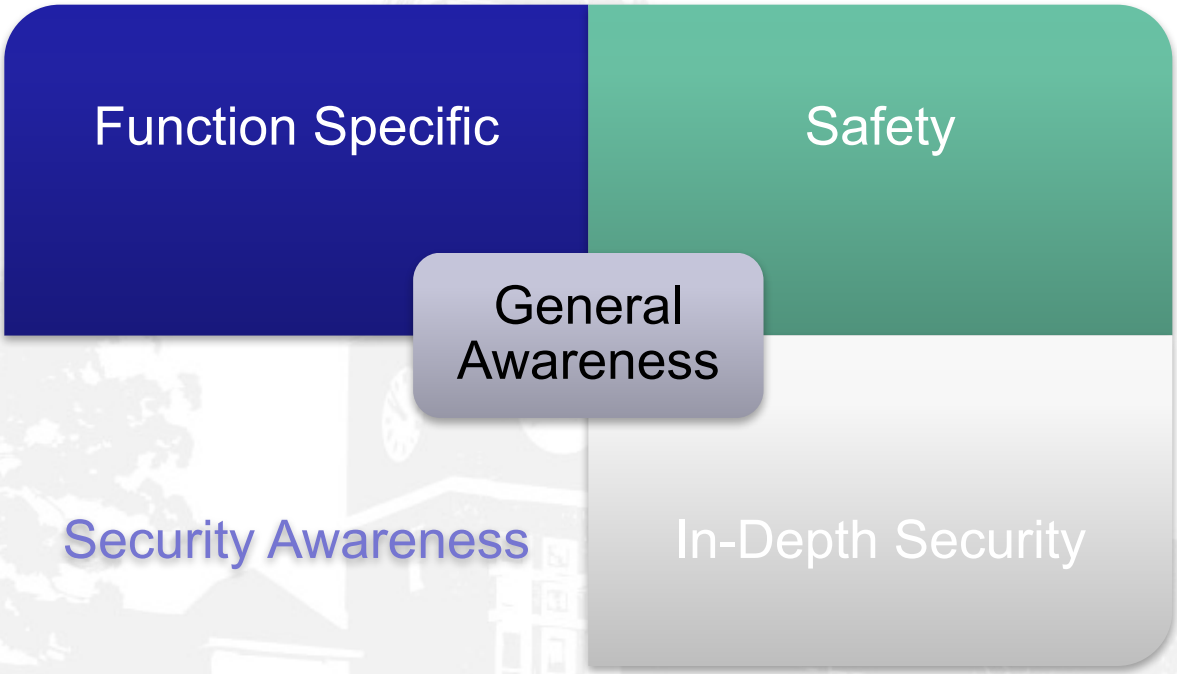
**Definitions:**

1. **Hazmat Employer** is a person who uses one or more employees in connection with:
   - Transporting hazmat in commerce
   - Causing hazmat to be transported or shipped in commerce
   - Representing, marking, certifying, selling, offering, reconditioning, testing, repairing or modifying packaging as qualified for use in the transportation of hazmat.

2. **Hazmat Employee** means a person who is employed by a hazmat employer and who directly affects transportation safety including:
   - an owner-operator of a motor vehicle which transport hazmat
   - A person (including self-employed person) who:
     - Loads, unloads, or handles hazmat
     - Tests, reconditions, repairs, modifies, marks, or otherwise represents packaging as qualified for use in the transportation of hazmat
     - Prepares hazmat for transportation
     - Responsible for safety of transporting hazmat
     - Operates a vehicle used to transport hazmat

The HMR requires all hazmat employees be trained including hazmat employers with direct supervision of hazmat transportation functions.

This training must include:



# Certification at Clemson University

To become certified to shipped hazardous materials, all shippers must:

- attend either classroom or online trainings presented or approved by Research Safety.
- Pass a written examination with a score of 80% or better

Once training and testing have been completed the shipper will be issued a Certificate that is signed by the instructor and Research Safety's Hazardous Materials Manager or his/her designee. The shipper must keep the certificate on file as well as supply a copy to the Hazardous Materials Manager for filing in the office of Research Safety.

**Note: Retraining is required every 3 years**