

TRANSPORTING HAZARDOUS MATERIALS SAFELY

THE UNIVERSITY OF MONTANA

REVISED OCTOBER 2007

It is the policy of The University of Montana that any employee who ships or receives hazardous materials must have the required documented training prior to shipping hazardous materials. Shipping hazardous materials includes offering hazardous materials to a shipper and the necessary document preparation. It is the offerer's responsibility to ensure that the material is packed, labeled and documentation completed prior to shipment on a carrier. Receiving hazardous materials from a vendor (i.e., an order from Sigma, Baker, etc.) via FedEx, UPS etc. does not require training. Shipping the same material back for return or shipping non-hazardous materials with dry ice does require training as follows. It is a departmental decision as to how best meet the requirements. One or more individuals may be trained within a department and only those individuals may do final packing and document preparation for everyone who ships hazardous materials within the department or everyone within a department who ships hazardous materials may take the training and do their own packing and document preparation. If you pack the materials and/or sign the shipping paper, you are an offerer and must take the training.

Training Requirements

Each hazmat employee must be initially trained, and periodically retrained at least every three years in three areas:

1. General awareness/ familiarization training designed to provide familiarity with requirements of the [Hazardous Materials Regulations](#) (HMR) and to enable the employee to recognize and identify hazardous materials;
2. Function-specific training concerning requirements of the HMR which are specifically applicable to the functions the employee performs;
3. Safety training concerning emergency response information, measures to protect the employee from the hazards posed by materials, and methods and procedures for avoiding accidents.

The university is required to:

- Ensure that each hazmat employee is provided with training.

- Provide familiarity with the requirements.
- Enable employees to recognize and identify hazardous materials.
- Provide safety and security awareness training.
- Document training program.
- Retain training records for as long as employee is employed
- Provide a written test
- Keep training records in a centralized location

Persons offering hazardous materials for transportation, persons who transport hazardous materials, or who package, label, mark, load, unload or handle hazardous materials are required to receive "function specific" training.

Employees at UM who should be included in this training are:

- Loading Dock/Receiving area personnel
- Employees who sign for, open and unpack packages of hazardous materials directly from a carrier (Chemistry Stores, Campus Stores)
- Employees who prepare Hazardous Materials for transport (this includes field researchers who may ship other wise non-hazardous samples on dry ice)

Goals of the training include:

- To recognize hazardous material and be familiar with legal requirements for transport
- To ensure safe receipt and handling
- Prevent spills, exposures and accidents
- To familiarize employees with the additional requirements for preparing hazardous material for transport
- Test and certify your training

What Is a Hazardous Material?

Hazardous Material is legally defined by class, characteristic and name. The following are some of the materials considered hazardous:

- Most laboratory chemicals
- Solvents
- Alcohol
- Certain cleaners
- Certain pesticides
- Certain paints
- Chemical samples
- Acids
- Compressed gases and lecture bottles
- Dry ice
- Biological samples
- Infectious substances
- Radioactive materials

Recognizing Hazardous Materials

§172.101 Hazardous Materials Table		
Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division
(1)	(2)	(3)
	Aerosols, flammable, n.o.s. (engine starting fluid) (each not exceeding 1 L capacity)	2.1
	Aerosols, non-flammable, (each not exceeding 1 L capacity)	2.2
	Aerosols, poison, each not exceeding 1 L capacity	2.2

Learn to recognize shipments of hazardous materials. To find out if the shipment includes hazardous materials, look at the shipping paper. Does it have:

- An entry with a proper shipping name, hazard class, and identification number?
- A highlighted entry, or one with an X or RQ (Reportable Quantity) in the hazardous materials column?

Other indications include:



The shipment may arrive in a vehicle bearing a [Department of Transportation](#) (DOT) placard on its side. A placard is a 11-by-11 inch diamond-shaped sign placed on the four sides of a vehicle that carries hazardous material. There are over 25 different placards used to ship hazardous material including a placard for each hazard class and division. (See the DOT Chart 11: Hazardous Materials Marking, Labeling & Placarding Guide for examples of placards and labels.) A placard is only required for large quantities, so not all vehicles carrying

hazardous material will be placarded.



The container is in a DOT-approved package. DOT specifies performance standards for cardboard boxes, metal cans and other containers. DOT-approved packages usually have a “DOT” or “UN” notation marked on its exterior.



The package bears a hazardous material label. A label is a 4-by-4 inch diamond-shaped sticker placed on the package. There are over 35 different labels used to ship hazardous material. The package might not be labeled if it is marked “Limited Quantity” or “DOT-E” followed by a number.



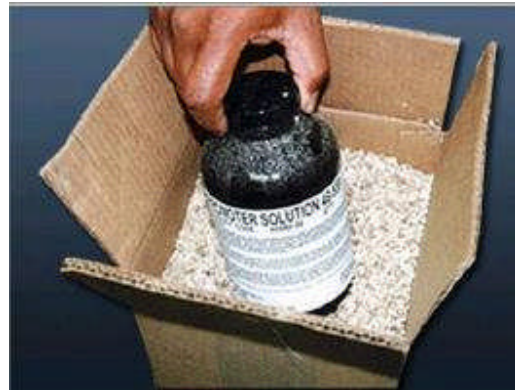
Adjacent to the label, the package is marked according to [DOT](#) specifications. This marking is specified in [DOT](#) regulations, and includes the material’s shipping name and UN number, and sometimes notations to specify certain hazards or package handling considerations. “DRY ICE (1.8 KG) UN 1845” and “ACETONE UN 1090“ are examples of [DOT](#) markings.

Hazardous material must be noted on the shipping paper or bill of lading with highlighting, by being listed first or by being marked with an “X” in the “HM” column. Not all hazardous material is shipped this way. The regulations exempt small amounts, exempt containers, or certain products. For example, although liquid nitrogen is classed as miscellaneous hazardous material, certain shipments are exempt.

HM	No. of Units	Shipping Description	Total Quantity
RQ	20 Boxes	RQ, Ammonium dichromate, 5.1, UN1439, PGII	170 kg
X	10 Boxes	Butyric Acid, 8, UN2820, PGIII	205 kg
X	4 Drums	Flammable Liquids, n.o.s., UN1993, PGI (Furan & Acetone)	200 gal

Safety Tips When Receiving or Unpacking Hazardous Materials:

- Look at the shipping papers to ensure that the papers are in order and for any special handling instruction. Notify the shipper if the package or shipping paper does not match its contents. Ask that future shipments be properly identified.
- Inspect packages for any type of damage or discoloration.
- Check the package for special handling requirements (such as Personal Protective Equipment).
- **DO NOT TOUCH** a container that is open, leaking, weeping, broken or if the hazardous material is not otherwise contained.
- **DO NOT** expose yourself to hazardous materials unless you are trained to use them.
- Handle packages carefully to prevent accidents.
- Store package in an upright position, out of pedestrian traffic, until it is delivered or picked up by the appropriate recipient.
- Carry packages securely.
- Don't use mechanical lifts or carts unless you have been trained.
- Open the correct end of the package.



Preventing Emergencies

Examine exterior of all packages before accepting them. If any problems are observable, **DO NOT ACCEPT** the shipment. Damaged, wet or leaking packages are the responsibility of the transporter. Call Public Safety at 243-4000 if

hazardous material has spilled on UM property. They in turn will notify additional responders as necessary.

- **Simple spills** (one which you can safely clean up yourself)

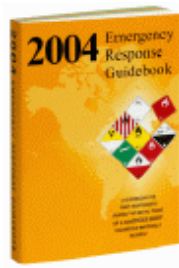
To clean up a simple chemical spill (i.e., one which you can safely clean up yourself):

- Alert people in the immediate area of the spill;
- Wear protective equipment, including safety goggles, gloves and a long sleeved shirt or other protective clothing;
- If spilled material is flammable, turn off ignition and heat sources.
- Avoid breathing vapors from the spill;
- Apply spill pillow/pads or other absorbent material, first around the outside of the spill, encircling the material, then absorb to the center of the spill;
- Sweep/shovel up absorbent material and place into a sealed, leak proof bag or container;
- Dispose of all materials (gloves, brooms, paper towels) used to clean up the spill in a sealed container as well; and
- Label and dispose of all bags or containers as hazardous waste. Contact the Environmental Health and Risk Management office at 243-4503 for pick-up and disposal.
- **High hazard spill** (one which you can't safely clean up yourself)

Do NOT attempt to clean up a spill if any of the following conditions apply:

- More than one chemical has spilled;
- The quantity spilled is greater than one liter;
- The substance is unknown or you are uncertain of the hazards of the substance; or
- You are uncomfortable in the situation.

Preparing for Emergencies



You should have close at hand:

- [Emergency Response Guidebook](#) This is primarily intended for over the road shipments and is not required at The University of Montana but passing familiarity is required by DOT as part of this training.
- [Access to material safety data sheets](#)
- Spill absorbents
- PPE (i.e., gloves) to clean up a spill
- Plastic bags or containers to place spill waste material
- Listing of Emergency phone numbers

Necessary Information for a 4000 Call

- Name
- Building and room number
- Address
- Type of emergency (i.e., Fire, Spill, Explosion)
- Any injuries
- DO NOT HANG UP!

Emergency Response on Campus

Call UM Police at x4000 for:

- High hazard spills (i.e., Spills that you can't safely clean up yourself)
- Fires
- Explosions
- Injuries

Emergency Response Guidebook Overview



The [Emergency Response Guidebook](#) is divided into four sections: **Yellow, Blue, Orange and Green.**

You can identify the material by using **Yellow** section of ERGB by...

- The 4-digit number on a placard or orange panel or
- The [4-digit ID number](#) (after UN/NA) on shipping document or package.

Identify material by using **Blue** section of the ERGB by...

- Using the [name of the material](#) on a shipping document, placard or package.

Identify material by using **Orange** section of the ERGB by...

- Look up material's 3-Digit Guide Number from either: yellow section or blue section
- Then, turn to orange section, look for 3-Digit Guide Number in upper corners of the pages
- Follow the instructions listed for potential hazards, public safety and emergency response

If the index entry is highlighted in either **Yellow** or **Blue**...

- Look for the ID Number and Name of material in the green section
- If necessary begin protective action
- Follow the instructions in "Table of Initial Isolation and Protective Action Distances" in the green section

Environmental Health and Risk Management at 243-4503 can provide:

- Spill preparedness consultation
- Spill cleanup training
- Assistance in locating a material safety data sheet (MSDS)
- Evaluation of a situation to determine how to clean up the spill

It is important to report all large spills and hazardous material incidents to Environmental Health and Risk Management.

Laws for the Transport of Hazardous Material

- Written by the U.S. [Department of Transportation](#) (DOT)
- Found in [Title 49](#) of the Code of Federal Regulations (CFR)
 - For air transport, also see:
 - International civil aviation organization (ICAO) technical instructions
 - International air transport association (IATA) dangerous goods regulations

What Is Required for Transporting Hazardous Material?

There are 5 basic requirements:

- Placarded vehicle (sometimes)
- Approved packaging
- Special labeling
- Specific marking
- Noted and described on shipping paper

Is the Material I Plan to Ship a [DOT](#) Hazardous Material?



- Yes, if it was shipped to you as a DOT hazardous material which will be noted on the shipping paper or if the package is DOT labeled or marked
- Yes, if it is listed in the DOT Hazardous Materials Table
- Yes, if it has a “UN” number, which refers to the DOT Hazardous Materials Table
- Yes, if it exhibits a characteristic of a Hazardous Material
 - Explosive
 - Gas
 - Organic peroxide
 - Radioactive
 - Flammable
 - Corrosive
 - Dangerous when wet
 - Combustible
 - Oxidizer
 - Poison
 - Infectious, etc.

HMIG, HMIS or NFPA ratings higher than “1” are probably hazardous.

If you still aren't certain, check the Material Safety Data Sheet (MSDS) or call Environmental Health and Risk Management at 243-4503.

Preparing Hazardous Materials for Shipment



If you prepare or package a shipment, you must receive function-specific training in:

- Approved packaging materials and procedures
- Labeling packages
- Marking packages
- Preparing shipping papers
- Emergency response contact information

Definitions

- **HAZARDOUS MATERIAL**

According to [49 CFR 171.8](#), the definition of a hazardous material is:

"A substance or material, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce."

- **"HAZARDOUS SUBSTANCE"**

According to 49 CFR 171.8, the definition of a hazardous substance is:

Material, including mixtures and solutions that are:

- listed in Appendix A to 172.101
- equals or exceeds the "Reportable Quantity" (RQ)
- mixtures that equal or exceed the RQ

- **"HAZARDOUS WASTE"**

According to 49 CFR 171.8, the definition of a hazardous waste is:

"Material that is subject to the Hazardous Waste Manifest Requirements of the EPA, 40 CFR part 262."



- **MARINE POLLUTANT**

- Material listed in Appendix B 172.101
- Solutions or mixtures that equal or exceed; 10% by weight for materials listed in appendix B
- 1% by weight that are identified as severe marine pollutants.

- **ELEVATED TEMPERATURE MATERIAL**

Material when transported in bulk that meets certain temperature classifications.

- **HAZMAT EMPLOYEE**

- A person who is employed by a HazMat employer.
- A person who in the course of employment directly affects hazardous materials transportation safety.
- An owner/operator of a motor vehicle, which transports hazardous materials in commerce.
- A person who during the course of employment
 - Loads, unloads or handles hazardous materials
 - Prepares hazardous materials for transportation
 - Transports hazardous material
 - Operates a vehicle used to transport hazardous materials.

- **HAZMAT EMPLOYER**

- A person who uses one or more of its employees in connection with:
 - Transporting hazardous materials in commerce
 - Causing hazardous materials to be transported in commerce or,

- Representing, marking, certifying, selling, offering, testing, manufacturing, reconditioning repairing, or
- Modifying containers, drums, or packaging as qualified for use in the transportation of hazardous materials.
- Includes an owner/operator of a motor vehicle, which transports hazardous materials in commerce.
- Any department, agency or instrumentality of the United States, a State, a political subdivision of a State, or Indian tribe engaged in an activity described in this definition.

Hazardous Materials Table (HMT)

Material found in the Hazardous Materials Table (172.101) has been deemed hazardous for the purpose of transportation by the [Department of Transportation \(DOT\)](#).

§172.101 Hazardous Materials Table													
(1) Sym-bols	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class or division	(4) Identifica-tion Numbers	(5) PG	(6) Label Codes	(7) Special provisions (§172.102)	(8) Packaging (§173.***)			(9) Quantity limitations		(10) Vessel stowage	
							Excep-tions (8A)	Non-bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo air-craft only (9B)	Location (10A)	Other (10B)
	Acetaldehyde	3	UN1089	I	3	A3, B16, T11, TP2, TP7	None	201 ..	243 ..	Forbidden	30 L	E	
A	Acetaldehyde ammonia	9	UN1841	III	9	IP8, IP6	155 ..	204 ..	240 ..	200 kg	200 kg	A	34
	Acetaldehyde oxime	3	UN2332	III	3	B1, IB3, T4, TP1	150 ..	203 ..	242 ..	60 L	220 L	A	

- Only Hazardous Materials will be found in table 172.101
- If material in question is not found (in table), look under a different name
- The term forbidden in column 3 precludes the material from shipment in any form of transportation. In column 9, it precludes only the type of aircraft noted, passenger, cargo or both.
- Don't assume...if you have questions, call!!!

What is included on the Hazardous Materials Table?

Hazard class or division	Identification Numbers	PG	Label Codes	Special provisions (§172.102)
(3)	(4)	(5)	(6)	(7)
8	UN1715	II	8, 3	A3, A6, A7, A10, BP2, IB2, T7, TP2
3	UN1090	II	3	IB2, T4, TP1

Transported By:
 A – Air
 H – Highway
 R – Rail
 W – Water

Transported In:
 B – Bulk Packaging
 N – Non-Bulk Packaging
 Y – Intermodal (IM) Portable Tanks
 TP – Portable Tanks

- **Column 1** A, D, G, I, W, +
- **Column 2** Hazardous materials descriptions and Proper shipping name
- **Column 3** Hazard Class
- **Column 4** UN/NA ID Number
- **Column 5** Packing group (PG)
- **Column 6** Labels Code
- **Column 7** Special Provisions
- **Column 8** Packaging
- **Column 9** Quantity Limitations
- **Column 10** Vessel Stowage

Proper Packaging

The first step in selecting proper packaging is to turn to the Hazardous Materials Table. Identify the material's proper shipping name, hazard class, and identification number in columns 2, 3, and 4.

Hazardous materials descriptions and proper shipping names	PG	Label Codes	Special provisions (§172.102)	(8) Packaging (§173.***)		
				Excep-tions	Non-bulk	Bulk
(2)	(5)	(6)	(7)	(8A)	(8B)	(8C)
Carbon dioxide, refrigerated liquid		2.2	T75, TP5	306 ..	304 ..	314, 315 ..
Carbon dioxide, solid or Dry ice	III	None ..		217 ..	217 ..	240 ..
Carbon disulfide	I	3, 6.1 ..	B16, T14, TP2, TP7, TP13	None ..	201 ..	243 ..

The second step is to determine the packing group in Column 5. The packing group is indicated by the letters PG plus the roman numerals I, II, or III. These reflect the degree of danger within certain hazard classes. Packing Group I represents the greatest danger, Packing Group II represents a medium danger, and Packing Group III represents a minor danger. Packaging specification requirements are determined alphabetically. PG 1 materials require “x” rated packaging, PGII materials require “x” or “Y” rated packaging and PGIII materials require “x” “y” or “z” rated packaging.

Now follow across the HMT to Column 8 “Packaging (Section 173.***).” Column (8A) provides exceptions to the packaging requirements if certain conditions are met. Column (8B) provides authorized packaging for non-bulk, and Column (8C) provides authorized packaging for bulk. To find the reference section, please replace the asterisk after 173 in the heading with the references found in Columns (8A), (8B), and (8C). Remember that Column (8A) lists exceptions, not exemptions.

General labeling requirements for non-bulk packages:

172.400 subpart E: Communicating the Hazard

- All packages containing hazardous materials must be labeled.
- Primary and subsidiary labels



- [Placement of Label](#)
 - Affixed to the surface (other than the bottom) of the package
 - Located on the same surface and near the proper shipping name
 - Multiple labels (primary and secondary) placed within 6 inch
 - Affixed to background of contrasting color
 - Liquids must have UP arrows on two opposite sides
- Multiple labels
- Labels are of certain size, color and durability
 - Must be durable and weather resistant

- Able to withstand 30 days of transportation encounters
- Must be of certain size
- Must be of certain color
- Primary label must have hazard class or division number of certain size
- Label may contain manufacture information outside solid line inner border with print no larger than 10-point

Package Markings



General marking requirements for non-bulk packages:

- Proper shipping name
- Identification number
- Name and address of consignor and consignee
- Must be durable and in English
- Visible, on a contrasting background with no obstructions
- Package containing liquids must be marked on two opposite sides

If required, the technical names must be marked on the package when the hazardous material is a mixture or solution of two or more hazardous materials. Identify the technical names of at least two components most predominant to the hazards. Place the technical names in parentheses in association with the proper shipping name. Make sure the proper shipping name is in Roman text. It may be either capitalized or lower case letters.

Shipping Papers

Click on the link below to see a copy of FedEx dangerous goods declaration.

<http://www.fedex.com/us/services/pdf/ShippersDecColumnsBW.pdf>

172.200: Description of hazardous material:

All shipping papers must accurately describe and identify the hazardous materials in this sequence:

1. Proper shipping name (no abbreviations are allowed)
2. Hazard class or division
3. ID number
4. Packing group
5. Total quantity

These five items are known as the hazardous material's basic description.

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification Numbers	PG
(1)	(2)	(3)	(4)	(5)
	Acetaldehyde	3	UN1089	I
A	Acetaldehyde ammonia	9	UN1841	III
	Acetaldehyde oxime	3	UN2332	III
	Acetic acid, glacial or Acetic acid solution, with more than 80 percent acid, by mass	8	UN2789	II
	Acetic acid solution, not less than 50 percent but not more than 80 percent acid, by mass	8	UN2790	II

Shipping papers must be kept on file by the shipper for a minimum of 1 year.

The proper shipping name is located in Column 2 of the HMT. Proper shipping names are written in Roman type only. It's critical that the proper shipping name be spelled correctly on shipping papers. Proper response to hazardous material incidents depends on the correct identification of the material.

The Hazard Class or Division is located in Column 3 of the HMT. The hazard class of a hazardous material is indicated either by its class or division number, its class name, or by the letters "ORM-D".

The Identification Number is located in Column 4 of the HMT. The 4-digit identification number provides quick identification of all hazardous materials. Identification Numbers preceded by "UN" are descriptions of materials for domestic and/or international shipments, while numbers preceded by "NA" describe material designated for shipments within the United States or between the US and Canada.

The Packing Group is located in Column 5 of the HMT. The packing group number is written in roman numerals and on the shipping paper the letters PG may be placed before the number. Packing Group One indicates the greatest level of danger, while Packing Group Three indicates the lowest level of danger. The complete shipping description is made up of the previous four items: proper shipping name, hazard class, UN/NA ID number and packing group.

A hazardous material and a non-hazardous material may be placed on the same shipping paper; however, the hazardous material entries must be entered first, or entered in a color that clearly contrasts with any description of a material not subject to the regulations. Highlighting is authorized on reproduced copies of a shipping paper, or the hazardous material may be identified by an "X" in a column captioned "HM." Instead of an "X," the letters "RQ," for Reportable Quantity, may be entered in this column to identify a hazardous substance.



An emergency response telephone number must be entered on the shipping paper immediately after each hazardous material description; or if the telephone number applies to all hazardous materials listed on the shipping paper, entered only once, in a clearly visible location, and with an indication that the number is for emergency response information.

Examples:

- Ethanol, 3, UN 1170, PG II
- Flammable liquids, n.o.s. (Xylene and Benzene), 3, UN 1993, PG II

Sometimes the Shipper Can Help

Contact the shipper you intend to use:

- Tell them fully and accurately what you wish to ship, including if your package contains dry ice or liquid nitrogen. Follow this link for a dry ice shipment checklist:
http://www.iata.org/NR/ContentConnector/CS2000/SiteInterface/sites/whatwedo/dangerousgoods/file/english_dry_ice_checklist.pdf
- FedEx Dangerous Goods Shipping Page:
<http://www.fedex.com/us/services/options/dangerousgoods/hidden.html>
- Follow their packaging, labeling and marking instructions precisely
- On the shipping paper, describe the contents fully and accurately. Follow the shipper's instructions for describing the hazard material and class

Biological Samples in Liquid Nitrogen “Vapor Shippers”

Vapor shippers are exempt from packaging and labeling requirements, however the sample may have additional requirements. Contact the Biological Safety Office. Charge package according to manufacturer's instructions, then pour off excess liquid nitrogen.

If sample is exempt:

- Package must be marked “DOT exempt” and prepared properly.
- Tell shipper that package contains liquid nitrogen, but package is exempt.

A Reminder: If You Transport Hazardous Materials

People who drive vehicles transporting hazardous materials in commerce on public highways require additional training in:

- Placarding vehicles
- Segregation & compatibility
- Control of shipping papers
- Responding to transport emergencies
- Contact Environmental Health and Risk Management at 243-4503 for more information

Summary

Check your shipments: do they contain hazardous materials? If so, take special care. Hazardous material shipments should only be handled by trained, knowledgeable staff.

- Don't accept any damaged or leaking packages.
- Prepare for emergencies. Keep spill supplies on hand. Take time to review response and cleanup procedures now.
- Remember that individuals who knowingly and willfully violate a provision of the Hazardous Materials Transportation law can be personally fined/and or imprisoned.
- Don't be afraid to ask for help.

Your Qualifications

After this training and exam, you are legally certified to:

- Unload and handle packages of hazardous material
- Sign for, open and unpack shipments of hazardous material
- Prepare or offer hazardous material for transport

Without additional training, you may not:

- Load or operate a vehicle transporting hazardous material in commerce

Additional Resources:

- [Dangerous Goods Shipping](#), FedEx
- [UPS Guide for Shipping Ground and Air Hazardous Materials](#)
- [Hazardous, Restricted, and Perishable Mail](#), U.S. Postal Service

For more information call:

- Central Receiving for outgoing shipments at 243-6151

- Environmental Health and Risk Management at 243-4503 for chemicals and chemical products, radioactive materials, or for radioactive material related training
- The Biological Safety Officer at 243-6395 for training in shipping/receiving infectious substances, biological products and diagnostic specimens

[Transporting Hazardous Materials Exam](#)

Transporting Hazardous Materials SafeluUMOct2007
