

# **TRANSPORTATION OF HAZARDOUS MATERIALS**

## **1.0 INTRODUCTION**

Preventing spills, fires and explosions of hazardous materials during transportation is a major goal of the U.S. Department of Transportation (DOT).

"Hazardous material" is defined as 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, and which has been so designated. These materials are listed in 49 CFR 172.101.

"Hazardous substance" is defined as any material that is listed in the appendix to the "Hazardous Materials Table" of 49 CFR 172.101, including mixtures and solutions of that material. It is also a material whose quantity, in one package, equals or exceeds the reportable quantity (RQ) for that material.

"Hazardous waste" is defined as any material subject to the hazardous waste manifest requirements of EPA regulations specified in 40 CFR 262.

"Reportable Quantity" (RQ) is an established threshold, given in pounds (and kilograms), above which certain regulatory requirements take effect - specifically, an RQ is the quantity noted in column 3 of the appendix to 49 CFR 172.101 for any material defined in column 1 of the appendix.

In order to protect the environment, the public, and employees from such incidents, DOT has developed and adopted rigorous standards for packaging and identifying hazardous materials that are shipped by any mode of transportation. This module will briefly discuss general DOT classifications and requirements for packaging and shipping hazardous materials.

The DOT standards must be followed if you ship hazardous chemicals or samples by any means of transportation. DOT standards must also be followed for any chemical, sample or hazardous material you may take with you (or check in your baggage) on a flight by scheduled or chartered aircraft. Some materials (such as nitric acid) are considered so hazardous that they are totally prohibited from being shipped or carried on aircraft.

According to EPA's existing policy, dated February 16, 1979, each Assistant Administrator is responsible for developing specific procedures to ensure compliance with DOT regulations. In addition, DOT regulations apply to persons, including federal employees, who are engaged "in" or "affect" commerce. While an EPA employee in a government vehicle may not be engaged "in" commerce, that employee certainly still has the potential to affect commerce, especially in the event of an accidental release of a hazardous material. As a result, DOT regulations regarding the transportation of hazardous materials apply to EPA employees engaged in these activities. Note that there are some exceptions to DOT regulations for environmental samples. These exemptions

apply to preserved water samples and can be found in the footnotes to Table II in 40 CFR 136.3.

From this module you should gain a basic understanding of the framework of the DOT regulatory scheme as it applies to the transportation of hazardous materials. This will include the ability to classify a material as hazardous, assign it a hazard class, and prepare that material for shipment. These skills will be especially appropriate when dealing with environmental samples where the regulations are not as straight forward.

### **Learning Objective**

At the end of this module, you will be able to describe the DOT standards for preparing and shipping hazardous materials so as to protect public health and the environment.

## **1.1 General Requirements**

DOT regulations (CFR 49) specify that no person may offer a hazardous material for transportation by any commercial carrier within the United States unless that material meets a series of specific safety requirements.

Shipments of hazardous material must first be properly classified for their hazards. The DOT regulations require that "each person who offers a hazardous material for transportation shall describe the hazardous material on the shipping paper" and shall include details on the classification of the material. Hazardous materials must be prepared and packaged safely for shipment, and the packages and shipping containers must be marked and labeled to show the hazards of the contents.

The DOT regulations also include requirements for loading vehicles and for marking vehicles with warning placards and material identification numbers.

DOT has established specific definitions of hazardous materials. DOT recently broadened its regulations to define and regulate hazardous substances and hazardous waste. These terms are defined in the following paragraphs.

## **1.2 HM181-Performance Oriented Packaging Standards; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative**

DOT has recently adopted HM181 which is a major revision to the regulatory scheme by which hazardous materials must be shipped in the United States. It was an effort to bring the DOT regulations in line with the international standards that are used by most other countries and thereby ease the burden on international commerce. This standard includes revisions to hazard classification, documentation and packaging requirements and is now in effect.

## **1.3 HM126F-Training for Safe Transportation of Hazardous Materials**

DOT has also implemented a new training standard for employees involved in the transportation of hazardous materials. That standard is called HM126F and is now fully in effect. Training requirements are discussed in Section 12 of this module.

## 2.0 CLASSIFICATION OF HAZARDS

Hazards may be categorized by the DOT Hazard Classes and prioritized according to the DOT hazard precedence chart.

### 2.1 DOT Hazard Classes

The DOT regulations list and define twenty-six different hazard classifications and divisions. These classifications and divisions of hazardous materials are listed in Table 1.

The DOT regulations define each of the classifications and divisions of hazardous materials and provide convenient tables listing these classifications for many commonly used materials (Refer to 49 CFR 172.101). However, the regulations apply to all materials which meet any of the specific definitions, whether or not they are listed in the tables. In preparing to ship a material which may be hazardous, first look to see if it is listed in the tables; if it is not, determine whether it is hazardous by any DOT definition.

**Table 1: Hazardous Material Classifications**

Class 1 - Explosives	
Division 1.1	Mass explosion hazard
Division 1.2	Projection hazard
Division 1.3	Fire hazard and minor blast hazard or projection hazard
Division 1.4	Minor explosion hazard
Division 1.5	Insensitive explosive substance; mass explosion hazard
Division 1.6	Extremely insensitive article; no mass explosion hazard
Class 2 - Gases	
Division 2.1	Flammable gas
Division 2.2	Non-flammable, non-poisonous, compressed gas
Division 2.3	Poisonous gas
Class 3 - Flammable and Combustible	

Liquid	
Class 4 - Flammable Solid	
Division 4.1	
Division 4.2	Flammable solid
Division 4.3	Spontaneously combustible
	Dangerous when wet
Class 5 - Oxidizer and Organic Peroxide	
Division 5.1	
Division 5.2	Oxidizer
	Organic peroxide
Class 6 - Poisonous Material and Infectious Substance	
Division 6.1	Poisonous material
Division 6.2	Infectious material
Class 7 - Radioactive Material	
Class 8 - Corrosive Material	
Class 9 - Miscellaneous Hazardous Material	
Other Regulated Material (ORM-D)	

## 2.2 DOT Hazard Precedence

In order to classify the major hazard or hazards of materials which are not listed in the tables, the DOT regulations establish a priority order of hazards.

The precedence chart in Table 2 outlines the order of hazards associated with hazardous materials exhibiting more than one hazard.

**Table 2: Precedence Chart**

1.	Class 7	(Radioactive materials, other than limited quantities)
2.	Division 2.3	(Poisonous gases)
3.	Division 2.1	(Flammable gases)
4.	Division 2.2	(Non-flammable gases)
5.	Division 6.1	(Poisonous liquids, Packing Group I, poisonous by inhalation only)
6.	Division 4.2	(Pyrophoric material)
7.	Division 4.1	(Self-reactive material)
8.	Materials meeting more than one of the following hazards must refer to an additional precedence table in 49 CFR 173.2a.	
	Class 3 (Flammable liquid) Class 8 (Corrosive materials) Division 4.1 (Flammable solids) Division 4.2 (Spontaneously combustible materials) Division 4.3 (Dangerous when wet) Division 5.1 (Oxidizers) Division 6.1 (Poisonous liquids or solids other than Packing Group I, poisonous by inhalation)	
9.	Combustible liquids	
10.	Class 9	(Miscellaneous hazardous materials)

This information could be used to help you classify a material not listed in the table. For example, you determine that a material not listed in the tables meets the definitions for "Poisonous Liquid" and "Corrosive Liquid" and you are not sure how to classify it. Since "Poisonous Liquid" appears on the priority list before the other hazard, you must classify the material as "Poisonous Liquid."

### 3.0 DOT HAZARDOUS MATERIALS TABLE

The "Hazardous Materials Table" in Section 172.101 of 49 CFR is the basic reference for using the DOT shipping regulations. The table lists all of the regulated hazardous materials alphabetically by their proper shipping names. Other information needed to properly classify, label, and package the hazardous material is given or referenced in the "Hazardous Materials Table." The table is broken down into the following ten columns:

- Column 1 has five symbol designations:
  - "+" fixes the proper shipping name
  - "A" aircraft transportation
  - "D" proper shipping name for domestic transportation
  - "I" proper name for international transportation
  - "W" material offered for transportation by vessel.

- Column 2 lists the proper shipping name of materials designated as hazardous materials.
- Column 3 contains a designation of the hazard class corresponding to each proper shipping name. A material for which the entry in this column is "Forbidden" is prohibited from being offered or accepted for transportation unless the materials are diluted, stabilized or otherwise modified to reduce the hazards to an acceptable level.
- Column 4 lists the identification numbers assigned to hazardous materials. Numbers preceded by "UN" indicate proper shipping names appropriate for use in international shipments. Numbers preceded by "NA" indicate the names are not recognized for international shipments but may be used for shipments to and from Canada.
- Column 5 references the applicable packing group for the material. For materials assigned packing groups, this column specifies one or more packing groups for the materials. Packing Groups I, II, and III indicate the degree of danger presented by the material as being great, medium, and minor, respectively.
- Column 6 specifies the label(s) required to be applied to each package, unless the package is exempted from labeling by Subpart D of 173. The first label reflects the primary hazard, while other labels indicate subsidiary hazards.
- Column 7 references special provisions containing packaging provisions, prohibitions, exceptions, or other requirements that apply to the materials, packaging or transportation modes.
- Column 8 (8A,8B,8C) specifies packaging exceptions and authorizations for non-bulk and bulk packaging.
- Column 9 references quantity limitations for air and rail transportation.
- Column 10 specifies vessel storage requirements.

## **4.0 PACKAGING OF HAZARDOUS MATERIALS**

"Packaging" is defined as the assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of DOT regulations. Packaging, as defined by DOT, includes containers, portable tanks, cargo tanks, and tank cars including tanks with multiple compartments.

### **4.1 Standard Requirements for All Packages**

DOT specification packaging for shipping hazardous materials is required to be designed, constructed and content limited, so that under normal transportation conditions:

- There will be no significant release of the hazardous materials to the environment
- The effectiveness of the packaging will not be substantially reduced
- There will be no mixture of gases or vapors in the package which could rupture the packaging.

In addition, under HM181, the DOT has revised its packaging standards to incorporate the "Performance Oriented Packaging" standards based on the UN "Recommendations for the Transportation of Dangerous Goods." These standards require that all packaging be able to pass a series of tests (e.g., drop, stack, vibration.)

#### **4.2 Specific Packaging Requirements**

Some hazardous materials are also assigned a packing group. The packing group, combined with the hazard class, determine the specific packaging needed for the hazardous material. Packing groups are meant to deal with the differing degrees of hazard associated with materials that have common hazard classes. For example, not all flammable liquids have the same degree of flammability. In general:

- Packing Group I - Great Danger
- Packing Group II - Medium Danger
- Packing Group III - Minor Danger.

In addition to the General Requirements for Packagings and Packages that all hazardous materials packages have to meet, some specific additional requirements apply to bulk and non bulk packages. Additional requirements for bulk packages are found in 49 CFR 173.24 (b) and those for non bulk packages are found in 49 CFR 173.24 (a).

### **5.0 MARKING AND LABELING**

Marking and labeling regulations require that each person who offers for transportation a hazardous material shall mark and label the package to meet DOT requirements.

Marking must include the following:

- Proper shipping name of the material
- Identification number assigned to the material
- EPA-required markings if the material is a hazardous waste
- Special markings if the package contains liquid materials
- The required hazard label or labels
- Cosignee's or cosignor's name and address
- "Cargo Aircraft Only" label if required or if shipment is not permitted aboard passenger-carrying aircraft.

## **5.1 Proper Shipping Name**

The "proper shipping name" for a hazardous material is the name which has been assigned and listed in the DOT regulations. The proper shipping name is usually the technical name for the material, but there are some exceptions. For instance, characteristic shipping names may be used for trade materials or mixtures (e.g., flammable liquid, N.O.S., corrosive liquid, N.O.S.). It is necessary to check the DOT listing and use the name specified there.

If the proper shipping name for a mixture or solution that is a hazardous substance does not identify the constituents that make it hazardous, the name or names of such hazardous constituents must be entered with the proper shipping name on each package (e.g., Elvisene, contains benzene and toluene).

The shipper is responsible for selecting the most appropriate proper shipping name for the material, and as a result, must understand the shipping paper requirements in detail.

## **5.2 Identification Number**

The package is to include the four-digit identification number listed in the DOT "Hazardous Materials Tables," preceded by UN or NA as appropriate. (The numbers preceded by UN are associated with descriptions considered appropriate for both international and domestic shipments, and those preceded by NA with descriptions appropriate for shipments within the United States and Canada.)

## **5.3 EPA Required Markings**

If a material is designated a hazardous waste according to EPA regulations, the waste container must be marked as "HAZARDOUS WASTE."

## **5.4 Marking for Hazardous Liquids**

Liquid hazardous materials must be packed with closures upward. The outside package must be legibly marked with package orientation markings on two opposite vertical sides to indicate the upward position of the inside packaging.

## **5.5 Hazard Class Labels**

Each package must be clearly labeled with the required diamond-shaped hazard warning label. Labels must be printed or affixed on the surface of the package near the proper shipping name. Labels may be placed on a securely attached tag or affixed by other suitable means to a cylinder, packages with irregular surfaces that prevent affixing a label, and packages which have dimensions less than those of the required label and which contain no radioactive material.



Required labels for hazardous materials are specified in Column 6 of the "Hazardous Materials Table" in 49 CFR 172.101. The labels correspond to the material's "Proper Shipping Name."

## **5.6 Inhalation Hazards**

Certain materials are designated as Poison Inhalation Hazard (PIH) by the DOT regulations. Packages containing these materials must indicate on the package that the material inside presents an inhalation hazard.

## **5.7 Multiple Label Requirements**

When primary and subsidiary labeling is required, labels must be displayed next to each other on at least two sides or two ends of each package (other than bottom). The need for two labels will be expressed in Column 6 of the "Hazardous Materials Table."

Subsidiary risk labels, the labels listed after the first in Column 6, are displayed without the hazard class number in the bottom corner of the label.

## **6.0 SHIPPING PAPERS**

Each person who offers a hazardous material for transportation must describe the hazardous material on the shipping paper in an exact and specific manner.

Shipping papers which describe hazardous materials must include the following information at a minimum:

- DOT proper shipping name
- Hazard class
- The UN/NA identification number
- The packing group, if necessary
- The total quantity
- A 24-hour emergency response telephone number
- RQ for each hazardous substance, where applicable.

The required entries for the description of a hazardous material on the shipping paper must be in a prescribed sequence. The sequence is: Proper Shipping Name, Hazard Class, Identification Number, and Packing Group (if appropriate). For example, the sequence for gasoline would be 3, UN1203, PG II. The total quantity may be placed before and/or after the basic description.

If the shipping paper includes descriptions of hazardous and non-hazardous materials, the description of the hazardous materials must be:

- Entered first on the shipping paper

- Entered in a color ink that contrasts with the non-hazardous entry
- Identified by an X or RQ (as appropriate) before the Proper Shipping Name in a column headed "HM".

A 24-hour emergency response phone number is provided by the shipper for use in the event of an emergency involving the hazardous material. This must be the phone number of the person offering the hazardous material for transportation or the number of an agency or organization capable of, and accepting responsibility for, providing the detailed information concerning the hazardous material(s) in the shipment (e.g., Chemtrec).

The shipper of the hazardous material is required to sign a statement on the shipping paper certifying that the shipment is properly classed, packaged, marked, labelled and in proper condition for transportation by a particular mode. DOT regulations specify the wording required for shipper's certification for several different types of hazardous materials shipments. The shipper's certification must be legibly signed by a principal, officer, partner or employee of the shipper or his agent.

When shipping hazardous waste, the same requirements apply as well as the EPA requirements specified in 40 CFR 262.20. In these cases, a hazardous waste manifest and a shipping paper are the same item.

## **7.0 PLACARDING OF VEHICLES**

DOT regulations require shippers to provide, and carriers to use, placards for vehicles carrying any amount of hazardous material (Table 1 Materials) in the following hazard classes:

- |                            |           |
|----------------------------|-----------|
| • Explosives               | 1.1 - 1.3 |
| • Poison Gases             | 2.3       |
| • Dangerous When Wet       | 4.3       |
| • Poison Inhalation Hazard | 6.1       |
| • Radioactive (III)        | 7         |

In addition, DOT regulations require shippers to provide, and carriers to use, placards for vehicles transporting more than 1000 pounds of the remaining hazard classes (49 CFR 172.504 Table 2 Materials) in one load. In the event that a mixed load shipment has more than 1000 pounds of total hazardous material but not more than 1000 pounds of any one hazard class, a Dangerous placard may be applied instead of specific individual hazard class placards. In addition, if 5000 pounds or more of one category of material is loaded at one loading facility, the placard specified in Table 2 of 49 CFR 172 must be applied. There are a few exceptions to the placarding requirements which include: etiologic agents, consumer commodities, and limited quantities of hazardous materials that are so designated on the shipping paper.

Placards are required on both sides and both ends of vehicles and rail cars except in the direction of another vehicle or rail car if it is coupled.

## **8.0 LOADING OF VEHICLES**

DOT regulations for loading vehicles can be used as guidelines for EPA field activities. Any container or package of hazardous material placed in a vehicle should be secured against movement within the vehicle in which it is being transported, and should be braced or secured to prevent movement against other containers of hazardous material. In addition, segregation requirements for shipments of multiple hazard classes must be met.

Reasonable care should be taken to prevent undue rise in temperature of containers and their contents during transit. All reasonable precautions must be taken to keep fire away from the vehicle when loading or unloading.

It is a common agency practice for employees to transport concentrated chemical preservatives, neat samples of pesticides and other samples in sedans, vans and station wagons in the same air space as the traveller. Usually in this situation, the quantities of these types of materials should not pose an undue threat to the driver and/or passengers. However, care must be taken to secure the materials in the vehicles and to comply with segregation requirements if applicable.

## **9.0 GENERAL PROCEDURE FOR THE PREPARATION OF HAZARDOUS MATERIALS FOR TRANSPORTATION**

The figure presented in Appendix A outlines the steps that can be followed to adequately classify, prepare, and ship a hazardous material. The user is encouraged in all cases to consult the DOT regulations for specific requirements.

## **10.0 SHIPPING SAMPLES**

DOT regulations were not intended to cover shipment of samples collected by the EPA. However, the Agency has deemed it prudent to comply with the regulations for shipment of all samples which may be hazardous.

Samples which must be transported for laboratory analysis may, if a reasonable doubt exists as to the hazard class and labeling requirements, be given a tentative classification based upon the:

- Definitions of hazards in the DOT regulations
- Highest ranked hazard classifications in which it fits
- The shipper's knowledge of the material.

The designation of samples as "hazardous" is based on judgement of the conditions where the sample is taken and the possibility that the samples may be hazardous in transportation or to personnel receiving the samples in the laboratory. If a sample can be hazardous in transportation, as defined by the DOT regulations, it must be packaged and identified according to the regulations.

If the sample does not meet DOT definitions but may be hazardous to personnel handling and receiving it, it should be packaged and identified to the same standards.

## **10.1 Environmental Samples**

In general, "environmental samples" are those that are not expected to be grossly contaminated with high levels of toxic or hazardous materials (e.g., pH less than 2 or greater than 12.5, flash point less than 140°F or if Toxicity Characteristic Leaching Procedure (TCLP) limits are exceeded in field screening). Examples of environmental samples are those taken from streams, ponds or wells and from the ambient air.

Some environmental samples that are preserved with hazardous materials such as nitric acid or sulfuric acid are exempted from DOT regulations. This applies to samples where the concentrations of the preservatives are below certain levels. The specific exemptions are listed in the EPA regulations, 40 CFR 136.3, Table II, footnote 3. Note that although these samples may be exempted from DOT regulations, airborne couriers may still impose additional restrictions on their shipment and as a result, the sample may still be considered hazardous if it is shipped by air.

For example, Federal Express specifies that dangerous goods be handled in accordance with the International Air Transport Association's (IATA) regulations. In some cases, these are more stringent than DOT's requirements and should be consulted prior to offering a hazardous material for shipment by air. This is addressed in detail in the National Enforcement Investigations Center's Standard Operating Procedures for Packaging, Marking, Labeling, and Shipping of Samples, dated 6/29/93.

Environmental samples should be packaged just as securely as hazardous samples, mainly to protect the integrity of the sample. However, no DOT labeling should be used, no DOT shipping papers are required, and there are no restrictions on the mode of transportation (unless dry ice is used for preservation).

## **10.2 Hazardous Samples**

"Hazardous samples" are those that are taken where high concentrations of hazardous materials are suspected. For example, soil or water at spill and/or hazardous waste sites, samples from drums or tanks, and leachates from hazardous waste sites. Water sources such as pits, ponds, lagoons and sampling wells could also be contaminated.

### ***10.2.1 Classification Overview***

Samples of hazardous materials must first be classified into the DOT categories of hazards. Then the samples must be packaged, and marked and labeled. Finally, the samples must be shipped as specified in DOT regulations.

If the material in the sample is known or can be identified in the field, determination of the DOT hazard class and required labeling can be done simply by reference to the DOT regulations. If, however, the specific hazards of a sample cannot be determined with certainty in the field, informed judgment must be used.

### ***10.2.2 Classifying Unknown Suspected Hazardous Materials***

There are several steps which should be taken to judge the appropriate DOT class of a material that is suspected of being hazardous. The procedure for classification of hazards includes simplified steps that can be used by agreement between EPA and DOT. This procedure should be used only when reliable identification of the material cannot be made in the field. The purposes of using this procedure are to meet DOT regulations as well as to provide protection for field and laboratory personnel. If a material fits within the definition for a particular class of hazard, the sample should be classified accordingly and subsequent handling, packaging, labeling and shipment should comply with the corresponding DOT regulations for that class. Following is a description of the steps included in this procedure:

#### ***1. Is the material likely to be an "Explosive"?***

If the sample has been taken from the waste stream or effluent of a plant manufacturing explosives, it would be prudent to handle, package and ship the sample as if it were an "Explosive Material."

#### ***2. Is the material likely to be radioactive?***

If the sample has been taken from an area known to be naturally radioactive or to be contaminated with radioactive waste, and it is not possible to make radiation measurements, it would be prudent to handle, package, and ship the sample as if it were a "Radioactive Material."

#### ***3. Is the material likely to be a "Poisonous Gas" or a "Poisonous Liquid"?***

Most of the materials classified as "Poisonous Gases" are gases at 20°C (68°F) or less. They pose a health hazard during transportation, have a LC<sub>50</sub> less than 5000 ml/m<sup>3</sup> and are further subdivided into Hazard Zones A through D.

If the material is in a compressed gas cylinder or is for any reason suspected of being in the class of "Poison Gas," precautions must be taken before sampling to prevent release of any of the extremely dangerous material. Protection must be provided for the person

taking the samples and for everyone else who may be exposed if the poisonous material is released while a sample is being taken.

Most materials classified as poisonous material are materials other than a gas, cause extreme irritation in confined areas and fall into categories of toxicological animal data for oral, dermal, and inhalation studies.

***4. Is the material likely to be a compressed gas, which could be a "Flammable Gas" or a "Non-flammable Compressed Gas"?***

If the material is not in a compressed gas cylinder or other pressurized container, the material is not likely to be a compressed gas in either hazard class. If the material is likely to be a compressed gas, judge whether it is a "Flammable Gas" or a "Non-flammable Gas," and handle, package, and ship it as required for a material in that hazard class.

For samples containing unknown materials which may be hazardous but which do not fall into any of the previously listed classes, EPA generally will classify, package and ship them as a "Flammable Liquid."

***5. Is there any way to be certain that the material is not a "Flammable Liquid"?***

Use the labeling that will, in your judgment, most accurately describe the hazard of the sample, if it can be determined not to be a flammable liquid. Use of a hazard label that is reasonably descriptive of the expected hazards of the samples will assist in safe handling of the sample in the laboratory and will avoid developing a disregard of the "Flammable Liquid" hazard label.

If the material is considered hazardous but has none of the previously listed hazards, it should not be packaged as a flammable liquid, but should be classified in one of the other DOT hazard classes:

- Flammable solid
- Miscellaneous hazardous material
- Poisonous material and infectious substances
- Corrosive material
- Oxidizer and organic peroxide.

***10.2.3 Communicating Hazards of Samples***

For protection of both field and laboratory personnel, we believe it is important for every person taking a sample to communicate the hazards of the sample. DOT labels do not give enough information about combinations of hazards or unique characteristics of field samples. Therefore, we recommend use of several channels of communication about unusual or particularly hazardous samples. Important precautionary information includes

a written note accompanying the sample, information written on the outer container holding the sample, or a phone call to the laboratory being sent the sample.

### **10.3 Samples and Hazardous Materials to be Shipped or Taken on Aircraft**

Samples and chemicals to be shipped or taken on aircraft deserve special attention. DOT regulations prohibit shipment of certain hazardous materials and Federal law prohibits the carriage of hazardous materials aboard aircraft in your luggage or on your person. Violations can result in severe penalties of up to \$25,000 and 5 years imprisonment.

Any chemicals or solvents that need to be rapidly transported to or from a field site can be shipped by aircraft if you comply fully with DOT regulations. Samples and materials that cannot be shipped by any passenger--carrying aircraft can, in many cases, be shipped by cargo-only aircraft. In addition, many airborne carriers (e.g., Federal Express) require hazardous materials to be shipped in accordance with the regulations of the International Air Transport Association (IATA). In some cases these standards are more restrictive than DOT. Therefore, when using one of these carriers, consult the IATA book or the carrier's dangerous goods representative to find out how to properly ship hazardous materials on their airplanes.

### **10.4 Recommendations**

Taking solvents and analytical chemicals to the field and bringing samples back to the laboratory entails the risk of having a container break or leak during the trip. If this occurs there can be loss of material, risk of injury to personnel, and contamination of equipment and the environment.

Packaging hazardous materials to prevent spills or leakage is as important for the protection of EPA employees as it is for carrier employees. Marking and labeling packages and containers of hazardous materials should be routine within EPA, even for materials which may never be shipped by a carrier.

Every EPA vehicle which carries hazardous materials or hazardous samples must have a properly filled out shipping paper indicating the hazardous materials being carried in the vehicle. In case of an accident, the list would provide information on hazardous materials in the vehicle. In addition, the DOT Emergency Response Guidebook could serve as the source of emergency information that the driver is required to have on the materials in the shipment.

## **11.0 TRANSPORTATION EMERGENCIES**

In the event of an emergency during transportation of a hazardous material, certain precautions need to be taken. Emergency response information specific to the hazardous material(s) being transported must be presented on the shipping paper and/or in another document in conjunction with the shipping paper (e.g., Material Safety Data Sheet). This

emergency response information must be kept in the same place as the shipping papers (e.g., the driver's side pocket).

The following minimum information is required:

- The description of the material
- Immediate health hazards
- Risks of fire or explosion
- Immediate precautions to be taken in the event of an incident
- Immediate methods for handling small or large fires
- Initial methods for handling spills or leaks in the absence of fire
- Preliminary first aid measures.

In the event of an emergency, notification may have to be made to the DOT at (800) 424-8802 or the Center for Disease Control (CDC) at (404) 633-5313 (for spills of etiologic agents). An event should be reported if it involves:

- A fatality
- Injuries requiring hospitalization
- Property damage in excess of \$50,000.00
- Evacuation of the public for more than one hour
- One or more major transportation arteries shut down for more than one hour
- The operational flight plan of an aircraft is altered
- Fire, breakage, spillage or suspected contamination involving radioactive materials
- Fire, breakage, spillage, or suspected contamination involving etiologic agents
- Releases of a marine pollutant exceeding 450L (119 gal) for liquids or 400kg (882 lbs) for solids
- A situation exists of such nature that, in the judgement of the carrier, it should be reported even if it does not meet any of the above criteria.

The following information should be included in the reports:

- Name of reporter
- Name and address of carrier
- Phone number where reporter can be contacted
- Date, time, and location of incident
- Extent of injuries, if any
- Classification, name, and quantity of hazardous material (hazmat) involvement
- Type of incident, nature of hazmat involvement, and whether a continuing danger to life exists at the scene.

In addition, a subsequent written report must be filed with the DOT in accordance with 49 CFR 171.16.

### **11.1 24-Hour Emergency Response Notification**



When a hazardous material is offered for transportation, the shipper is required to provide a 24-hour emergency response telephone number for use in the event of an emergency involving the hazardous material. The number must be the number of the person offering the hazardous material for transportation or the number of an agency or organization capable of and accepting responsibility for providing the detailed information concerning the hazardous material (e.g., CHEMTREC). Note that Chemtrec is a service setup by the Chemical Manufacturers' Association and is available for use by subscribers to that service only. Chemtrec can be contacted at (202) 483-7616 for information and (800) 424-9300 for emergencies only.

## **11.2 DOT Emergency Response Guidebook**

The DOT emergency response guidebook was developed for use by first responders. It provides material specific information on the hazards of materials and actions recommended in the event of an accident or spill. This book may be used to meet the requirements for emergency information stated above. To use the book, do the following:

- Read the instructions.
- Look at the book sideways and notice the different colors. The colored sections correspond to:
  - **Yellow:** listing of hazardous materials by UN ID number
  - **Blue:** alphabetical listing of the same hazardous materials found in the yellow section
  - **Orange:** response guidelines for different materials
  - **Green:** initial isolation and protective action distances.
- Find the material in either the yellow or blue section, depending on the information you have at hand (UN ID# or name of hazardous material).
- Go to the guide number in the orange section for that material and follow the guidance provided.
- If the material is shaded, also refer to the green section for additional guidance on downwind hazards.

## **12.0 EMPLOYEE TRAINING**

According to the DOT's training standard, HM126F, found in 49 CFR 172.700, all hazmat employees must receive a certain level of training based on their job functions. Hazmat employees have duties requiring them to become involved in the process of transporting a hazardous material. Employees to whom this standard applies range from clerks who fill out shipping papers to drivers of trucks transporting the hazardous materials.

Training is required on an initial basis and as a refresher course every two years. The four components of the training standard are:

- **General Awareness:** The purpose of this is to familiarize employees with the reason for training and the DOT regulations. They should be able to identify and recognize hazardous materials and interpret labels.
- **Function Specific:** The purpose of this is to provide the employee with training on the DOT regulations as they specifically apply to that person's job.
- **Safety:** The purpose of this is to familiarize employees with emergency response procedures, personal protective measures, first aid, remedial control measures, and the physical and health hazards of the materials. Where employees have already received this information in other training courses (e.g., those required by OSHA or EPA), this training will not be needed.
- **Driver:** This is to ensure that drivers are knowledgeable of the materials, emergency response expectations, loading and unloading procedures, and safe vehicle operations.

### **13.0 SUMMARY**

This module has outlined the general requirements of DOT regulations that may apply to personnel, including: classification of hazards; packaging, marking and labeling; shipping papers; loading and placarding vehicles; and employee training. This module also described how EPA has interpreted the regulations for handling environmental samples and hazardous waste samples.

You should now be able to determine whether or not a material is hazardous, and if so, be able to properly prepare that material for shipment. This includes environmental samples.

When preparing a hazardous material for shipment, ask yourself the following questions:

- Do I know what the proper shipping name is for that material?
- Does the shipping paper include the proper shipping name, hazard class, UN number, packing group, 24-hour emergency phone number and shipper certification?
- Does the label on the package match the hazard class on the shipping paper?
- Have I selected the proper packaging for this material?
- Do I have enough material shipped where placards are required?

Remember, refresher training requirements need to be met every two years.

## EXERCISE

Answer the following as True or False.

1. \_\_\_\_\_ DOT regulations include requirements for loading vehicles and for marking vehicles with warning placards.
2. \_\_\_\_\_ A hazardous material is a substance which is capable of posing a reasonable risk to health, safety, and property when transported.
3. \_\_\_\_\_ Hazardous material classifications for gases and explosives are 1 and 2, respectively.
4. \_\_\_\_\_ Combustible liquids appear after flammable gases on the hazard precedence chart.
5. \_\_\_\_\_ Packing as defined by DOT, includes containers, portable tanks, cargo tanks, and tank cars.
6. \_\_\_\_\_ Marking must include the consignee's or cosigner's name and address.
7. \_\_\_\_\_ The proper shipping name is always the technical name for the material, with no exceptions.
8. \_\_\_\_\_ Each package must be clearly labeled with the required diamond-shaped hazard warning label.
9. \_\_\_\_\_ Shipping papers which describe hazardous materials must include the total quantity present.
10. \_\_\_\_\_ DOT regulations were not intended to cover shipment of samples collected by the EPA.
11. \_\_\_\_\_ Environmental samples should be packaged just as securely as hazardous samples.
12. \_\_\_\_\_ Classifying unknown or suspected hazardous materials involves laboratory analysis before the sample can be packaged properly.
13. \_\_\_\_\_ Emergency response information should be kept in the same place as the shipping papers, in the passengers door side pocket.
14. \_\_\_\_\_ The DOT Emergency Response Guidebook can be used to meet the requirements for emergency information.

15. \_\_\_\_\_ The four components of the DOT training standard are: general awareness, function specific, safety, and driver.

## **EXERCISE KEY**


Answer the following as True or False.


1. **T** DOT regulations include requirements for loading vehicles and for marking vehicles with warning placards.
2. **F** A hazardous material is a substance which is capable of posing a reasonable risk to health, safety, and property when transported.
3. **F** Hazardous material classifications for gases and explosives are 1 and 2, respectively.
4. **T** Combustible liquids appear after flammable gases on the hazard precedence chart.
5. **F** Packing as defined by DOT, includes containers, portable tanks, cargo tanks, and tank cars.
6. **T** Marking must include the consignee's or cosigner's name and address.
7. **F** The proper shipping name is always the technical name for the material, with no exceptions.
8. **T** Each package must be clearly labeled with the required diamond-shaped hazard warning label.
9. **T** Shipping papers which describe hazardous materials must include the total quantity present.
10. **T** DOT regulations were not intended to cover shipment of samples collected by the EPA.
11. **T** Environmental samples should be packaged just as securely as hazardous samples.
12. **F** Classifying unknown or suspected hazardous materials involves laboratory analysis before the sample can be packaged properly.
13. **F** Emergency response information should be kept in the same place as the shipping papers, in the passengers door side pocket.
14. **T** The DOT Emergency Response Guidebook can be used to meet the requirements for emergency information.
15. **T** The four components of the DOT training standard are: general awareness, function specific, safety, and driver.


## **APPENDIX A: GENERAL PROCEDURES FOR THE PREPARATION OF HAZARDOUS MATERIALS FOR TRANSPORTATION**

 Preparation of HAZMAT for Transportation

## **APPENDIX B: DOT HAZMAT MARKING, LABELING, & PLACARDING GUIDE**

 HAZMAT Placarding and Labeling Guide, Cover

 HAZMAT Warning Labels

 HAZMAT Warning Placards

 International Placards and Labels