

Introduction



- Preventing spills, fires and explosions of **hazardous materials** during transportation is a major goal for the U.S. Department of Transportation (DOT).
- DOT developed and adopted standards for packaging and identifying **hazardous materials** that are shipped by any mode of transportation.
- DOT standards must be followed if you ship hazardous chemicals or samples.
- DOT standards must also be followed for any chemical, sample or **hazardous** material you may take with you (or check in your baggage) on aircraft. Some materials (such as nitric acid) are considered so hazardous that they are totally prohibited from being shipped or carried on aircraft.

Learning Objectives



- At the end of this module, you will be able to :

- Classify materials as hazardous
- Assign **hazard classes**
- Describe **DOT** standards for preparing and shipping hazardous materials.

DOT Regulations



- While an employee in a government vehicle may not be engaged in commerce, that employee still have 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 all employees.
- 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.

General Requirements



- 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. 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.

Test your knowledge

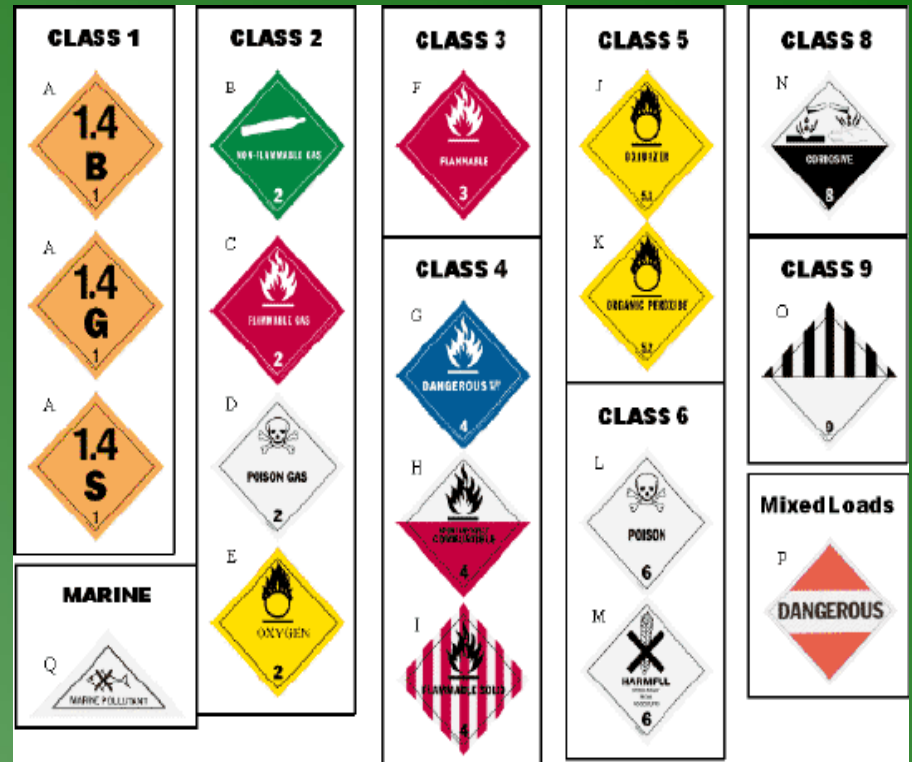
- DOT regulations include requirements for loading vehicles and for marking vehicles with warning placards

- True

- False

Hazard Classifications

- DOT regulations identify nine hazard classes, several of which are subdivided into divisions.
- DOT regulations define each of the classifications and divisions with tables classifying many commonly used materials. These tables are in 49 CFR 17.101.
- The DOT 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.



DOT Hazard Classes

- Class 1 Explosives
- Class 2 Gases
- Class 3 Flammable and Combustible Liquids
- Class 4 Flammable Solid
- Class 5 Oxidizer and Organic Peroxide
- Class 6 Poisonous Material and Infectious Substance
- Class 7 Radioactive Material
- Class 8 Corrosive Material
- Class 9 Miscellaneous Hazard Materials
- ORM-D Other Regulated Material (ORM-D)

DOT Hazard Precedence

- The DOT hazard order-of-precedence information shown is used to determine how a material is described when that material meets the definition of more than one hazard class.

- (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 (nonflammable gases).**
- (5) Division 6.1 (poisonous liquids), Packing Group I, poisonous-by-inhalation only.**
- (6) A material that meets the definition of a pyrophoric material in Sec. 173.124(b)(1) of this subchapter (Division 4.2).**
- (7) A material that meets the definition of a self-reactive material in Sec. 173.124(a)(2) of this subchapter (Division 4.1).**
- (8) Class 3 (flammable liquids), Class 8 (corrosive materials), Division 4.1 (flammable solids), Division 4.2 (spontaneously combustible materials), Division 4.3 (dangerous when wet materials), Division 5.1 (oxidizers) or Division 6.1 (poisonous liquids or solids other than Packing Group I, poisonous-by-inhalation). The hazard class and packing group for a material meeting more than one of these hazards shall be determined using the precedence table in paragraph (b) of this section.**
- (9) Combustible liquids.**
- (10) Class 9 (miscellaneous hazardous materials)**

Hazardous Materials Table, 49 CFR Section 172.101

- The Hazardous Materials lists regulated hazardous materials alphabetically by their proper shipping names (2). It is divided into ten columns and provides information needed for classifying, labeling, and packaging. This table is the basic reference for using the DOT shipping regulations.

§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	
							(8A) Excep- tions	(8B) Non- bulk	(8C) Bulk	(9A) Passenger aircraft/rail	(9B) Cargo air- craft only	(10A) Location	(10B) Other
	Acetaldehyde	3	UN1089	I 3		A3, B16, T11, TP2, TP7	None	201	243 ..	Forbidden	30 L	E	
A	Acetaldehyde ammonia	9	UN1841	III 9		IP6, IP6	155 ..	204 ..	240 ..	200 kg	200 kg	A	34
	Acetaldehyde oxime	3	UN2332	III 3		B1, B3, T4, TP1	150 ..	203	242 ..	60 L	220 L	A	

Test your knowledge

- To identify the DOT shipping requirements for a solution of acetone and methanol, you would use:
 - DOT Hazard Precedence Chart
 - Hazard Classification Table
 - Hazardous Material Table
 - 29 CFR

Packaging of Hazardous Materials



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

Marking and Labeling Hazardous Material

- Regulations for the marking and labeling of hazardous material packages include the following requirements:
- Shipping Name
- Inhalation Hazards
- Identification Number
- Multiple Label Requirements
- EPA Required Markings
- Exemption Packaging
- Markings for Hazardous Liquids
- Shipper & Consignee Name and Address
- Hazard Class Labels
- Cargo Aircraft Label

Test your knowledge

- The three degrees of danger represented by the three packing groups are great, medium, and minor.

- True

- False

Shipping Papers

HAZARDOUS WASTE
FEDERAL LAWS PROHIBIT IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE OR
PUBLIC SAFETY AUTHORITY OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY (1)

GENERATOR INFORMATION:
NAME (2) _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
EPA ID NO. (3) _____ EPA WASTE NO. (5) _____
ACCUMULATION START DATE (4) _____ MANIFEST DOCUMENT NO. (6) _____

[_____ (7) _____]

D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX
HANDLE WITH CARE!

Printed By: Job Safety Supply Inc., Janesville WI 53547-1388 Reorder No. 438

- Each person who offers a hazardous material for transportation must describe the hazardous material on the shipping paper in an exact and specific manner. Information required to complete the shipping paper can be obtained from the Hazardous Materials Table in 49 CFR section 172.101.
- When shipping hazardous waste, the EPA requirements of 40 CFR 262 must be followed. In these cases, the EPA regulations require hazardous waste manifest, which substitutes for the shipping paper. Part 262 also references several DOT requirements of 49 CFR 172.

Test your knowledge

- If incorrect information is entered on the shipping paper, it can affect:
 - Emergency personnel who need product and emergency response information
 - Safety of carrier personnel
 - Amount of material transported
 - Packing group

Placarding of Vehicles



- DOT regulations for vehicles carrying hazardous materials require placards 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. These placards are specified for hazardous materials in accordance with Tables 1 and 2 of 49 CFR 172.504 Placarding Tables.
 - 49 CFR 172.504 Table 1
 - 49 CFR 172.504 Table 2
 - Hazardous Materials Placards

Dangerous Placard



- If a mixed-load shipment has more than 1,000 pounds of total hazardous material, but not more than 1,000 pounds of any one hazard class, a “Dangerous” placard may be applied instead of specific individual hazard class placards.
- 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.

Loading of Vehicles



- DOT regulations for loading vehicles can be used as guidelines for field activities:
 - Secure containers or packages containing hazardous materials against movement within the vehicle
 - Brace or secure containers or packages to prevent movement against other containers of hazardous material
 - Meet segregation requirements for shipments of multiple hazard classes
 - Take reasonable care to prevent undue rise in temperature of containers and their contents.
 - Take precautions to keep fire away from the vehicle when loading or unloading.

Preparing Hazardous Materials for Transportation



- Steps for classifying, preparing, and shipping hazardous material.
- 1- DOT HM? Packing Group?
- 2- Shipping Name?
- 3- Proper Packaging and Label?
- 4- Shipping Papers? Placards?
- 5- Properly Loaded?
- 6- Special Services for a Response?

Test your knowledge

- A “dangerous” placard is NOT sufficient for mixed-load shipments that:
 - Have more than 1,000 pounds of a single hazardous material
 - Are greater than 500 pounds
 - Contain corrosive materials in excess of 100 pounds
 - Are transported only by highway

Shipping Samples

- 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.

Shipping Samples



- 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.

Environmental Samples



- Environmental samples of air, soil, and water are generally not contaminated with high levels of toxic or hazardous materials (e.g., pH less than 2 or greater the 12.5, flash point less than 140 F, Toxicity Characteristic Leaching Procedure (TCLP) limits exceeded in field screening).
- Examples of environmental samples are those taken from streams, ponds, or wells, and from the ambient air.

Exemptions to DOT Regulations

- DOT has determined that certain environmental samples preserved with hazardous materials, such as nitric acid or sulfuric acid, are not subject to hazardous material 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.
- Environmental sample 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).

Shipping by Air



- Although some samples are exempt from DOT regulations, airborne couriers may still impose additional restrictions on their shipment. 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 Operation Procedures for Packaging, Marking, Labeling, and Shipping of Samples, dated 6/29/93.

Hazardous Samples



- Examples of potentially hazardous samples include:
 - Soil or water at spill and hazardous waste sites
 - Samples from drums or tanks
 - Leakages from hazardous waste sites
 - Water sources such as pits, ponds, lagoons, and sampling wells.

Classification Overview

- Prior to transporting hazardous materials:
 - 1. Classify the hazardous material samples into the DOT categories of hazards
 - 2. Package, mark, and label the samples
 - 3. Ship the samples as specified in DOT regulations.
- If the material in the sample is known or can be identified in the field, the DOT hazard class and required labeling can be determined by referencing the DOT regulations.
- If the specific hazards of a sample cannot be determined with certainty in the field, informed judgment must be used.

Classifying Unknown Suspected Hazardous Materials

- When a material is suspected of being hazardous, but does not fit within the definition for any particular class of hazards, a judgment must be made.
- DOT and EPA have agreed upon the set of **five steps** (or questions) shown here to assist in determining the most appropriate DOT hazard class for a suspected material.
- 1- Material likely to be an explosive?
- 2- Material likely to be Radioactive?
- 3- Material likely to be a Poison Gas or Liquid?
- 4- Material likely to be Compressed Gas?
- 5- Is there any way to ensure the material is NOT a flammable liquid?

Communicating Hazards of Samples



- 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, use several channels of communication about unusual or particularly hazardous samples.
- Important precautionary steps include:
 - Sending a written note with the sample
 - Writing information on the outer container holding the sample
 - Calling to the laboratory receiving the sample.

Samples and Hazardous Materials to be Shipped or Taken on Aircraft



- 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.
- Many airborne carriers 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 to their airplanes.

Recommendations

- You can minimize risks of transporting hazardous materials by:
 - Packaging hazardous materials to prevent spills or leakage
 - Marking and labeling packages and containers of hazardous materials, even for materials which may never be shipped by a carrier
 - Properly completing shipping papers indication the hazardous materials being carried in the vehicle
 - Carrying the DOT Emergency Response Guidebook in vehicles to serve as the source of emergency information in case of an accident.

Test your knowledge

- Environmental samples should be packaged as securely as hazardous samples.

- True

- False

Transportation Emergencies: Required Information



- Emergency response information, specific to the hazardous material being transported, must be presented on the shipping paper and in another document in conjunction with the shipping paper such as the [Material Safety Data Sheet](#). This emergency response information must be kept in the same place as the shipping papers, for example, in the driver's side pocket.

Transportation Emergencies: Events to Report

- An event should be reported to DOT or the Center for Disease Control (CDC) if it involves any of the following:
 - 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 (882lbs) for solids
 - A situation exists of such nature that, in the judgment of the carrier, it should be reported even if it does not meet any of the above criteria.

Transportation Emergencies: Information to Include in the Report



- The information listed on the clipboard should also be included in reports to DOT or [CDC](#).
- A subsequent written report must be filed with the DOT in accordance with 49 CFR 171.16.

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 only by subscribers to that service.

DOT Emergency Response Guidebook

- To use the DOT Emergency Response Guidebook, do the following:
 - Read the instructions
 - Look at the book from the side 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.

Test your knowledge

- In the event of an emergency, what information should be reported to DOT?
- Name and phone number of reporter
- Type of incident
- Destination of HAZMAT extent of injuries
- Date, time, and location of incident
- Name and address of carrier
- Name, title and emergency phone number of shipper
- Classification, name, and quantity of HAZMAT

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. 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
 - Function Specific
 - Safety
 - Driver

Summary

- Now that you have completed this module, you should:
 - Be able to determine whether or not a material is hazardous
 - Know that proper preparation of hazardous materials for shipping means that:
 - The shipping paper includes the proper shipping name, hazard class, UN number, packing group, 24-hour emergency phone number and shipper certification
 - The label on the package matches the hazard class on the shipping paper
 - The proper packaging material has been selected for the shipment
 - Placards must be used if the amount of the specific hazardous material being shipped is enough to require them.

- You have completed the module:
 - Transportation of Hazardous Materials.