Hazmat Shipper Starter Guide

Lion's 10 Steps™ to the Basics of Hazardous Materials Shipping and Transportation in the United States.

This guide is not intended to replace comprehensive training on US DOT's hazmat shipping regulations. US DOT requires hazmat training for all "hazmat employees" at 49 CFR Part 172.

LION TECHNOLOGY INC.®

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What's Inside

Step 1: Classification

Classification is the first and most important step in the shipping process. An incorrect classification will lead to mistakes in every subsequent step—naming your material, selecting packaging, offering placards, etc.

Hazardous materials are categorized into nine "Hazard Classes," with some classes further divided into "divisions." Below, see all of the hazmat classes/divisions and where to find classification criteria for each one.

1.1 Explosives (Mass explosion hazard)
49 CFR 173.50

1.2 Explosives (Projection hazard)
49 CFR 173.50

1.3 Explosives (Predominately fire hazard)
49 CFR 173.50

1.4 Explosives (No significant blast hazard)
49 CFR 173.50

1.5 Explosives (Very insensitive; blasting agents)
49 CFR 173.50

1.6 Explosives (Extremely insensitive)
49 CFR 173.50

2.1 Flammable gas
49 CFR 173.115

2.2 Non-flammable compressed gas
49 CFR 173.115

2.3 Poisonous gas
49 CFR 173.115

3 Flammable liquid
49 CFR 173.120

4.1 Flammable solid
49 CFR 173.124(a)

4.2 Spontaneously combustible materials
49 CFR 173.124(b)

4.3 Dangerous when wet material
49 CFR 173.124(c)

5.1 Oxidizers
49 CFR 173.127(a)

5.2 Organic peroxides
49 CFR 173.128

6.1 Poisonous materials
49 CFR 173.132

6.2 Infectious substances
49 CFR 173.134

7 Radioactives
49 CFR 173.403

8 Corrosives
49 CFR 173.136

9 Miscellaneous (includes lithium batteries)
49 CFR 173.140

Learn more about lithium batteries.

Packing Groups

To distinguish between "levels" of danger, most hazardous materials are assigned to a Packing Group (PG) within their class or division.

- **PG I** "great danger"
- **PG II** "medium danger"
- **PG III** "minor danger"

Example: While both are flammable liquids assigned to Class 3, jet fuel (PG I) poses a greater danger than perfume (PG II or III).

More on This Topic:

Classifying Hazmat Mixtures [49 CFR 173]

OSHA (GHS) vs. DOT Hazmat Classification

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Step 2: Choosing a Proper Shipping Name

After you've assigned a hazard class to your material, **it's time to give it a name**. The HMR require shippers to accurately identify and describe the material using the most accurate and precise shipping name available (49 CFR 173.22).

The 49 CFR 172.101 Hazmat Table contains the list of shipping names to choose from, listed in Roman type.

The Proper Shipping Name is used for more than describing your material. Once you've chosen a name, it will guide you as you choose:

- What packaging you may use.
- Required marks and labels.
- Appropriate emergency response actions.
- Special provisions or reliefs that may apply.

An appropriate name for your material may depend on the physical state, properties, and intended uses of your material. Names range from **specific-use names** (e.g., Ammonium nitrate based fertilizer) to **chemical names** (e.g., Nitrobenzene) to **general hazard class descriptions** (e.g., Flammable liquid, n.o.s).

For guidance on choosing the most accurate shipping name, see **49 CFR 172.101(c).**

In some cases, a Proper Shipping Name must be supplemented with more information, such as the technical name of the hazardous ingredient(s).

A Note on Naming Hazardous Wastes

If your material is a waste under DOT regulations—that is, if it requires the use of the Hazardous Waste Manifest—you add the word "waste" in front of the Proper Shipping Name (e.g., waste acetone), unless "waste" is already part of the Proper Shipping Name you've chosen. [49 CFR 172.101(c)(9)]

Air and Vessel Shipments

To name a material for air or vessel transport, shippers must follow additional regulations for those modes of transport (i.e., the IATA *DGR* and the *IMDG Code*).
[49 CFR 171, Subpart C]

More on This Topic:

DOT Rules for Modifying Hazmat Shipping Names

Are Generic Names and N.O.S. Names the Same Thing?

The Four Types of Hazardous Waste Shipments

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Step 3: Packaging

A cardboard box can hold some hazardous materials, but not all of them.

Selecting an authorized, appropriate packaging for your material has obvious and serious implications for transportation safety. If the package leaks, reacts, or ignites in transit, the consequences can be and often are lethal and destructive.

To ensure your material survives its journey, you must choose a packaging that's been authorized to contain it.

Beyond the type of packaging you use, this step also requires you to determine:

- The standards or specs the package must meet.
- Safe procedures for filling and closing the packaging.
- How much of a material can be in a package.
- Any restrictions on packaging different hazardous materials together.
- Instructions provided by the packaging manufacturer.
- Any additional requirements that apply.

Types of packagings that may be authorized for hazardous materials transportation (depending on the material) include boxes, jerricans, totes, drums, cylinders, portable tanks, and cargo tanks.

Hazmat packagings can be made from all kinds of materials—metals, plastic, wood, glass, fibreboard, etc.—and what the packaging is made of matters. For example, if you're shipping a chemical that corrodes steel, a steel drum is **not** a good choice of packaging.

More on This Topic:

When Can I Re-use Hazmat Packaging?

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Shipping Hazmat by Ground—Ops

Hazmat Packager

Step 4: Marking and Labeling

In an emergency, the labels and marks you place on a hazmat package will guide the actions of a responder who may be facing great danger. These marks and labels are also used to inform the handling of your package by carriers, supply-chain personnel, customers, and users.

Hazmat marks and labels must:

- Accurately communicate what your material is.
- Meet size and measurement specifications.
- Be displayed properly on the package.

A Label Is

A diamond-shaped or square/rectangular-shaped indicator of the hazard class of the material and any special handling or loading procedures that must be followed.

Labels must meet exacting specifications for design, size, and color. [49 CFR 172.407]

A Mark Is

Information printed on the package or communicated with a graphic, text, or both that provides more specific information about the material.

Typically, the following must be **marked** on a hazmat package:

- The identification number of your material
- The Proper Shipping Name
- Identification of a responsible party

In some cases, additional information is required.

Your shipment may require overpack, limited quantity, inhalation hazard, heat sensitivity, marine pollutant, and other additional marks.

Marking the RQ
RQ stands for reportable quantity, and it must be marked on packages that contain a quantity of material that, if it were released, would present an environmental hazard. If your material has an RQ, the RQ will be indicated in Appendix A to the 172.101 Table.

More on This Topic:

How Small Is Too Small for Hazmat Markings?

PHMSA Addresses 2-MM Border for Hazmat Labels

Less Famous Hazmat Marks and Labels

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Shipping Hazmat by Ground—Ops

Hazmat Packager

Step 5: Shipping Papers

Called a bill of lading, a shipping paper, a declaration, a manifest, an invoice, or a shipping order, among others, the documentation of your hazardous materials shipments serves two critical functions in hazmat transportation:

- They put all of the information about your shipment—class, name, packaging, emergency response actions, and more—in one place for the driver of the vehicle (and any emergency responders or law enforcement who may encounter the vehicle).

- They serve as your record of what you shipped and are needed to meet US DOT recordkeeping requirements found at 49 CFR 172.201.

Three elements of the shipping paper that are critical to safe hazmat transportation are the **basic description**, **the emergency response information**, and the **Shipper's Certification**.

I. The Basic Description

The basic description is made up of four elements, **to be presented in this exact order**, without modifications or additions, unless the HMT stipulates otherwise:

- UN/NA identification number
- Proper Shipping Name
- Hazard Class
- Packing Group

(Example: UN 1090, Acetone, 3, II)

(49 CFR 172.202)

III. Shippers Certification

This is where you put your good name on the line—literally. When you sign your name on hazmat shipping papers, you certify under the laws and regulations that **your shipment has been properly classified, named, packaged, marked, labeled, and placarded.** (See 49 CFR 172.204.)

Comprehensive hazmat training is **critical** for those who **sign hazmat shipping papers**.

The shipping papers must also indicate the total quantity of the material being shipped, the type and quantity of packages offered, and other information. More about shipping papers, including other required elements, formatting, and recordkeeping requirements, are found in 49 CFR 172.200–205.

II. Emergency Response Information

To assist emergency responders in the event of a release, fire, or other emergency, shipping papers must include:

- Proper emergency response actions for first responders (e.g., a copy of the appropriate Emergency Response Guidebook (ERG) page).

- A 24-hour phone number that responders can call to gain additional information about the material shipment (49 CFR 172, Subpart G).

Since July 5, 2016, the emergency response phone number must be presented using numbers only. Phone numbers with letters in them (e.g., 1-800-4HAZMAT) are not permitted.

Step 6: Placarding

Placards are a widely recognized indicator of hazardous materials on a vehicle. When motorists see a hazmat placard, they know basic information about what's on the truck. For emergency responders, placards provide critical hazard information at a glance, from a distance, to guide their response actions and ensure safety.

Even though placards are displayed on the vehicle, **it is the shipper's responsibility to offer placards** when required.

Placards are required in the following situations:

- For **bulk** packagings, like the tanker trucks we see on the highway, a placard is required unless the 49 CFR regulations indicate otherwise by way of an exception or relief.
- **For most non-bulk** shipments, the vehicle must be placarded if there are more than 454 kg (1,001 lbs.) of hazmat on a single vehicle.
- Any quantity of **high-consequence materials** like high explosives, poison gas, and others.

The full regulations for hazmat placards are found in 49 CFR 172, Subpart F.
For rules on displaying placards on a vehicle, see 49 CFR 172.504(a) and 172.516.

More on This Topic:

Rules for Placarding Hazmat Shipments

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Shipping Hazmat by Ground—Ops

Hazmat Loading Dock Worker

Step 7: Loading & Transport

Now that you know what your material is and have clearly communicated that information with marks, labels, and shipping papers, it's time to get the shipment where it needs to go. One big consideration that impacts how you may load your shipment is your material's compatibility with other hazardous materials on the vehicle. (See 49 CFR 177.848.)

In addition to segregating and separating incompatible materials, your shipment must be loaded and transported based on the mode of transportation you use—highway, rail, air, or vessel. As you can imagine, procedures for safely loading an airplane differ from those for safely loading a truck.

Where to find requirements in 49 CFR:

Rail
49 CFR Part 1

Air
49 CFR Part 175

Vessel
49 CFR Part 176

Highway
49 CFR Part 177

PHMSA isn't the **only** Federal or international body with rules for transportation hazardous materials. Other regulatory agencies who maintain relevant requirements include the:

- Federal Motor Carrier Safety Administration (FMCSA).
- Federal Aviation Administration (FAA).
- Federal Rail Administration (FRA).
- US Coast Guard (USCG).
- Federal Maritime Commission (FMC).

Air and Vessel Shipments

When you ship by air or vessel, US DOT authorizes you to use alternative, international transport standards to prepare and offer your shipment.

Manuals authorized under 49 CFR 171, Subpart C include the ICAO *Technical Instructions* (TI) or the IATA *Dangerous Goods Regulations* (for air) and the *International Maritime Dangerous Goods Code* (for vessel).

More on This Topic:

Hazmat Shipping Regulations—Domestic vs. International

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Shipping Hazmat by Ground—Ops

Hazmat Loading Dock Worker

Step 8: Emergencies and Incidents

Incident Reporting

In the event that your material spills, leaks, or is otherwise released in transit, an incident report may be required. This can include:

- Immediate telephone or online notification per 49 CFR 171.15.
- Written incident reports per 49 CFR 171.16 (DOT Form 5800.1).
- Notification to local, State, or Federal authorities.

For details about who must report incidents, when, and what information is required, see 49 CFR 171.15 and 171.16.

Learn more about PHMSA's incident reporting requirements.

Hazmat Security Plans

As a shipper, you may be required by US DOT to maintain a Hazmat Security Plan. A security plan is required when you offer:

- Any quantity of certain high-level hazardous materials.
- A bulk quantity of certain hazardous materials in a single package (e.g., cargo tanks for bulk shipments).
- A placarded load of certain materials.

To determine if you need a hazmat security plan, check 49 CFR 172.800 for a full list of materials and quantities that require a plan.

More on This Topic:

US DOT's Security Planning Requirements

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Step 9: Recordkeeping and Administration

DOT Registration

DOT requires registration for any shipper who offers **even a single load of hazardous materials that requires a placard.**

Stricter registration requirements apply to shippers of certain high-consequence substances, like:

- Radioactive materials.
- Division 1.1, 1.2, or 1.3 explosive materials.
- Poisonous-by-inhalation materials.
- Large-capacity bulk packagings.

Registration can be done by mail or submitted online.

Hazmat Shipping Papers

Hazmat shipping papers must be retained for two years after the material is accepted by the initial carrier (49 CFR 172.201).

Copies of the Hazardous Waste Manifest must be kept for 3 years (40 CFR 262.40(a)).

4 Other Areas to Consider Are:

Hazmat Training Records – Employers must retain records of hazmat employee training "as long as that employee is employed by that employer as a hazmat employee *and for 90 days thereafter*." [49 CFR 172.704(d)]

Special Permits – You're allowed to do it differently because your way is equally safe. (49 CFR 107, Subpart B)

Approvals – You can't do it unless you get clearance. (49 CFR 107, Subpart H)

Exceptions – The regulations allow you to do things differently in certain situations (you can find exceptions throughout the 49 CFR hazmat regulations).

Training on This Topic:

DOT Hazmat Ground Shipper Certification

Step 10: Keeping up with Changes

As technology and transportation evolve, the hazmat regulations change too. US DOT regularly updates its 49 CFR regulations to keep pace with international standards. These "Harmonization Rulemakings" occur every two years and can have a major impact on the way shippers prepare and offer shipments.

In addition to regularly harmonizing with international requirements, US DOT can change its hazmat regulations at any time, for any reason. Often, these changes are phased in over time to give shippers a chance to prepare, but not always.

Lion offers resources to inform industry professionals of coming changes to the hazardous materials, environmental, and safety regulations.

Lion Membership

Membership is included with all Lion EH&S online courses, webinars, and workshops.

Lion Members get up to 365 days of access to valuable tools and updates, including:

- Access to the Finder Q&A service for fast answers to compliance questions.
- Monthly summaries of relevant hazmat, environmental, and safety regulatory activity.
- Training material updates throughout the year.
- Access to exclusive recorded webinars on industry topics.
- Periodic bulletins on changing requirements that impact you.

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Get the Hazmat Training You Need

Logistics professionals nationwide trust Lion for reliable, up-to-date hazmat training to keep ground, air, and vessel shipments moving safely, on time, and in compliance.

Hazmat Ground Shipper Certification (DOT)

Develop a step-by-step approach to navigate and apply the 49 CFR Hazardous Materials Regulations (HMR) for ground shipments.

Hazmat Air Shipper Certification (IATA)

Build on your 49 CFR expertise and get training to use the IATA *DGR* and prepare compliant hazardous materials air shipments.

Hazmat Vessel Shipper Certification (IMDG)

Learn the unique *IMDG Code* requirements you must know to ship hazardous materials by vessel.

US DOT requires training once every three years for all hazmat employees (49 CFR 172, Subpart H).

The IATA *DGR* requires training every 24 months for hazmat air shipping employees (IATA *DGR* 1.5).

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