HAZARDOUS MATERIALS Compliance

Clear explanations to help you safely and legally ship and transport hazmat

J. J. Keller & Associates, Inc.®
Since 1953

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Introduction

Hazardous Materials Compliance was developed as a companion publication to the *Hazardous Materials Regulations* to assist everyone in the hazardous materials community better understand and comply with the Hazardous Materials Regulations.

The Hazardous Materials Regulations, 49 CFR Parts 105 through 180, which are issued by the Pipeline and Hazardous Materials Safety Administration (PHMSA) of the U.S. Department of Transportation (DOT), are very detailed and complicated. In this book, we provide easy-to-understand, plain-language information so users can gain a better understanding of the Hazardous Materials Regulations and what is required.

Generally speaking, the topics are presented in a manner in which a hazmat employee would use the Hazardous Materials Regulations to prepare a shipment for transportation. The first topic, Regulating Agencies, gives a broad overview of the responsibilities for each of the agencies involved with regulating hazardous materials. The next several topics address training, classifying, packaging, marking, labeling, documentation, and placarding of hazardous materials. The last few topics are more supportive in nature and provide information on incidents, security plans, registrations/permits, and agency contacts.

Revision bars, like the one at the left of this paragraph, are used in this publication to show where significant changes were made on update pages. The revision bar next to text on a page indicates that the text was revised. The date at the bottom of the page tells you when the revised page was issued.

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Marking

ez Explanations™
summaries from the J. J. Keller® subject-matter experts

This chapter of the book will familiarize you with the marking requirements for non-bulk and bulk packages, freight containers, and transport vehicles. Most marking requirements are found in Subpart D of Part 172.

Markings provide important information about the contents of a packaging, freight container, or transport vehicle and help warn of the hazards posed by that material during transport. Markings give additional information, not provided by labels or placards, about the hazardous material in a package or vehicle.

Scope

Anyone offering a hazardous material for shipment must mark their package according to the applicable sections of the Hazardous Materials Regulations (HMR).

Regulatory Citations

- 49 CFR Part 172 Subpart D — *Marking*

Key Definitions

Bulk packaging: Other than vessels or barges, and including transport vehicles or freight containers, are packagings in which hazardous materials are loaded with no intermediate form of containment and which have:

- A maximum capacity greater than 119 gallons (450 L) as a receptacle for a liquid;
- A maximum net mass greater than 882 pounds (400 kg) and a maximum capacity greater than 119 gallons (450 L), as a receptacle for a solid; or
- A water capacity greater than 1,000 pounds (454 kg), as a receptacle for a gas.

A Large Packaging in which hazardous materials are loaded with an intermediate form of containment, such as one or more articles or inner packagings, is also a bulk packaging.

Cargo aircraft only: Means an aircraft that is used to transport cargo and is not engaged in carrying passengers. The terms cargo aircraft only, cargo-only aircraft, and cargo aircraft have the same meaning.

Limited quantity: When specified as such in a section applicable to a particular material, means the maximum amount of a hazardous material for which there is a specific labeling or packaging exception.

Marking: Is a descriptive name, identification number, instructions, cautions, weight, specification, or UN marks, or combinations thereof, required by the HMR on outer packagings of hazardous materials.

Non-bulk packagings: Have:

- A maximum capacity of 119 gallons (450 L) or less as a receptacle for a liquid;
- A maximum net mass of 882 pounds (400 kg) or less and a maximum capacity of 119 gallons (450 L) or less as a receptacle for a solid;

- A water capacity of 1,000 pounds (454 kg) or less as a receptacle for a gas; or
- A maximum net mass of 882 pounds (400 kg) or less for a bag or a box conforming to the specification packaging requirements in subpart L of part 178.

Technical name: Means a recognized chemical name or microbiological name currently used in scientific and technical handbooks, journals, and texts. Generic descriptions are authorized for use as technical names provided they readily identify the general chemical group, or microbiological group. Examples of acceptable generic chemical descriptions are organic phosphate compounds, petroleum aliphatic hydrocarbons, and tertiary amines. For proficiency testing only, generic microbiological descriptions such as bacteria, mycobacteria, fungus, and viral samples may be used. Except for names which appear in subpart B of part 172 of this subchapter, trade names may not be used as technical names.

Summary of Requirements

- It is the shippers responsibility to ensure the hazardous materials are marked in accordance with the HMR.
- Bulk and non-bulk packagings are required to have certain information displayed.
- Packagings that contain materials with certain properties or require specific handling instructions must be marked appropriately.

In Depth

Marking (49 CFR §172.300)

Marking requirements apply to non-bulk and bulk packagings transported by rail, air, vessel, and highway. Certain requirements specifically apply to transport vehicles and freight containers.

The individual who prepares non-bulk packages of hazardous material for transport is responsible for marking the package. This responsibility includes:

- Checking that any relevant markings already displayed are in the correct location and are in accordance with the regulations.
- Removing or obliterating any markings which are not applicable or which may reduce the effectiveness of the required markings.
- Applying any new markings in accordance with the regulations.

In most cases, the responsibility for marking bulk packagings, freight containers, and transport vehicles rests with the individual initiating the shipment. The carrier is responsible for replacing identification number markings that are lost, damaged, or destroyed during transit.

Did You Know

Markings are different form labels even though they may be applied to packages like labels. Hazard warning labels relate the hazard class or division of the material contained in the package. Markings give additional information about the hazardous material in the package to help communicate the hazards.

Marking

Prohibited Markings (49 CFR §172.303)

No packaging may be marked with a proper shipping name or identification number unless the packaging contains the identified material or its residue.

Marking Specifications (49 CFR §172.304, §172.308)

To withstand the conditions normally encountered during transportation, all markings must be:

- Durable,
- In English,
- Printed on, or affixed to, the surface of a package, or on a label, tag, or sign,
- Displayed on a background of sharply-contrasting color,
- Unobscured by labels or attachments, and
- Located away from any other markings, such as advertising, which could substantially reduce their effectiveness.

Manufacturer/Specification Packaging Marking (49 CFR §178.503)

In addition to the markings that will be covered in the remainder of this section, most authorized packaging for hazardous materials must be marked with a UN packaging marking (for non-bulk packaging) or a specification packaging marking (such as DOT 406). For more information on these markings refer to the previous section, Packaging.

4G/Y145/S/83

USA/RA

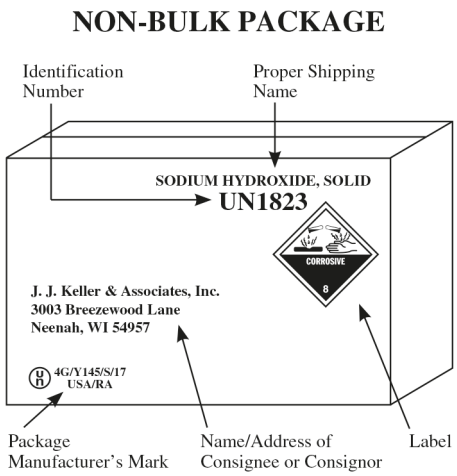
Non-Bulk Markings (49 CFR §172.301)

Most non-bulk packagings must be "marked" with the following information:

- Description/proper shipping name;
- Technical name(s), when required;
- Identification number (preceded by "UN" or "NA" or "ID," as appropriate);
- Consignee's or consignor's name and address;
- DOT-SP, when required.

Marking

Description/Proper Shipping Name (49 CFR §172.301)



The description/proper shipping name as shown in Column (2) of the Hazardous Materials Table must be marked on the non-bulk package.

Abbreviations are usually not allowed in a proper shipping name marking. Two specific exceptions include:

- "ORM" in place of "Other Regulated Material"; and
- Abbreviations which appear as part of the authorized description in Column (2) of the Hazardous Materials Table.

Technical Names (49 CFR §172.301)

Any package that contains hazardous materials described by a proper shipping name preceded by the symbol "G" in Column (1) of the Hazardous Materials Table must be marked with the technical name in parenthesis in association with the proper shipping name. However, a technical name should not be marked on the outer package of a Division 6.2 material.

Examples: Flammable liquids, n.o.s. (ethanol)

Identification Number (49 CFR §172.301)

The identification number shown in Column (3) of the Hazardous Materials Table, for the description/proper shipping name being used, must be marked on the package. The appropriate "UN" or "NA" or "ID" prefix must be included.

Identification numbers marked on non-bulk packagings must meet size requirements. The identification numbers must be at least 0.47 inches (12 mm) high. On smaller packages, 8 gallons (30 L) or less, 66 pounds (30 kg) maximum, or cylinders with a water capacity of 16 gallons (60 L) or less, the numbers must be at least 0.24 inches (6 mm) high. For even smaller packages, capacity of 1.32 gallons (5 L) or 11 pounds (5 kg) or less, the size of the numbers must be a size appropriate for the size of the package.

Name and Address (49 CFR §172.301)

The consignee's or consignor's name and address must be marked on the package unless:

- The package is transported by highway only, and will not be transferred from one motor carrier to another; or
- The package is transported as part of a carload lot, truckload lot, or freight container load and the entire contents of the rail car, truck, or freight container are shipped from one consignor to one consignee.

Special Permit Packagings (49 CFR §172.302)

The special permit number is required to be plainly and durably marked on the packaging if it is authorized for use under a special permit. The package should be marked DOT-SP (followed by the special permit number).

Example: DOT-SP-12345

Marking

Hazardous Substances (49 CFR §172.324)

Non-bulk packagings which contain a reportable quantity of a hazardous substance must be marked with the letters "RQ" in association with the proper shipping name.

Example: RQ, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (DIAZINON), UN3077

PCBs (40 CFR §761.40, §761.45)

Polychlorinated biphenyls (PCB's) are hazard substances which must be transported in compliance with the Hazardous Materials Regulations and special additional requirements of the Environmental Protection Agency (EPA).

The Hazardous Materials Regulations require the proper shipping name, identification number and RQ to be marked on each non-bulk package.

The EPA regulations require the package to be marked with the PCB mark illustrated to the right (minimum size 6 x 6 inches). This PCB mark may be reduced proportionateley to a minimum of 2 x 2 inches to fit on PCB articles or equipment.

An even smaller rectangular PCB mark may be used on small packages. This small rectangular PCB mark may be proportionately reduced to a minimum of 0.4 x 0.8 inches to fit on PCB articles or equipment.

The EPA regulations also require a vehicle to be marked on each side and each end with this marking, if transporting PCB containers that contain more than 99.4 pounds (45 kg) of liquid PCB's in concentrations of 50 ppm to 500 ppm.

Large Quantities of Non-Bulk Packages (49 CFR §172.301)

A transport vehicle or freight container containing only a single hazardous material in non-bulk packages must be marked, on each side and each end with the identification number specified for the material, subject to the following:

- Each package must be marked with the same proper shipping name and identification number;
- The aggregate gross weight of the hazardous material is 8,820 pounds (4,000 kg) or more;
- All of the hazardous material is loaded at one loading facility; and
- The transport vehicle or freight container contains no other material, hazardous or non-hazardous.

The above requirement does not apply to Class 1 materials, Class 7 materials, or non-bulk packagings for which identification numbers are not required, such as ORM-D materials.

Large Quantities of Non-Bulk Poison Inhalation Hazards (49 CFR §172.313)

A transport vehicle or freight container loaded at one loading facility with 2,205 pounds (1,000 kg) or more of non-bulk packages containing a material poisonous by inhalation (in Hazard Zone A or B), having the same shipping name and identification number, must be marked with the identification number specified for the material, on each side and each end.

Marking

If the transport vehicle or freight container contains more than one inhalation hazard material that meets the above identification number marking requirement, it must be marked with the identification number for only one material. That one identification number is determined by the following:

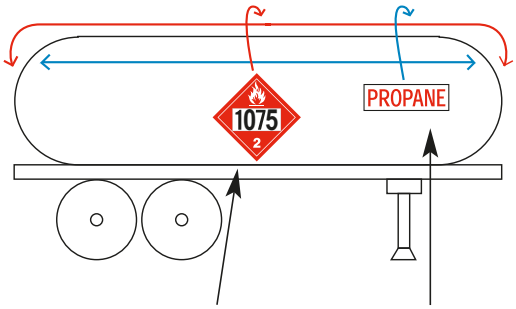
- For different materials in the same hazard zone, the identification number of the material having the greatest aggregate gross weight.
- For different materials in both Hazard Zone A and B, the identification number for the Hazard Zone A material.

Bulk Markings (49 CFR §172.302, §172.326, §172.328, §172.336)

Unless specifically excepted, all bulk packagings of hazardous materials must be marked with the identification number(s) of the contents. These numbers, unless otherwise provided, must be marked:

- On each end and each side of a packaging having a capacity of 1,000 gallons (3,785 L) or more.
- On two opposite sides of a packaging with a capacity of less than 1,000 gallons (3,785 L).
- On each end and each side of a tube-trailer motor vehicle.

CARGO TANK



Identification number on placard, orange panel, or white square-on-point configuration. Display on all 4 sides.

Common name or proper shipping name for Class 2 materials. Display on all 4 sides.

There are three ways in which identification numbers may be displayed:

		
On an orange panel.	Across the center of a primary hazard placard.	On a white square-on-point configuration (diamond-shaped) — with the same outside dimensions as a placard (If the material is in a class that does not allow identification numbers on placards or require placards).

If the identification number markings on a portable tank or cargo tank are not visible, the transport vehicle or freight container used to transport the tank must also be marked with the numbers, on each side and each end.

When a tank is permanently installed within an enclosed cargo body of a transport vehicle or freight container, the identification number marking need only be displayed on the sides and ends of the tank that are visible when the enclosed cargo body is opened or entered.

Identification numbers are not required on the ends of portable tanks and cargo tanks having more than one compartment if hazardous materials having different identification numbers are transported in the compartments. The identification numbers on the sides of the tank must be displayed in the same sequence as the compartments containing the materials they identify.

When a bulk packaging is labeled instead of placarded, the identification number markings may be displayed on the bulk packaging in the same manner as would be required for a non-bulk packaging.

Special permit packagings (49 CFR §172.302)

DOT-SP (followed by the special permit number) is required to be marked on the packaging if it is authorized for use under a special permit.

Portable tanks (49 CFR §172.326)

In addition to displaying the applicable identification number (as described above), portable tanks must be marked with:

- Material's proper shipping name — on two opposite sides. For water transport the size of the shipping name must be 65 mm or more.
- Owner or lessee's name.

IBCs (49 CFR §172.514)

When an IBC is labeled instead of placarded, the IBC may display the proper shipping name and identification number markings as required by 172.301(a)(1) for non-bulk packagings. These smaller markings may be used in place of the identification number marking on an orange panel, placard, or white square-on-point configuration.

Cargo tanks (49 CFR §172.328)

In addition to the identification number, cargo tanks (except for certain nurse tanks) which are used to transport gases (Class 2 material) must be marked on each side and each end with the proper shipping name or appropriate common name of the gas.

Examples: CARBON DIOXIDE, REFRIGERATED LIQUID or REFRIGERANT GAS

Each specification cargo tank that successfully completes a test/inspection must be marked with the date (month and year) and the type of test/inspection completed. This marking must be displayed near the specification plate or anywhere on the front head. The type of test/inspection may be abbreviated as follows:

- V for external visual inspection/test
- I for internal visual inspection
- P for pressure test
- L for lining inspection
- T for thickness test
- K for leakage test

- K-EPA27 for EPA Method 27 leakage test

Examples: 2-12 **P V L**

10-13 **K-EPA27**

Tank cars (49 CFR §172.330)

In addition to the identification number, tank cars — when required by a special provision to the Hazardous Materials Table or by Section 172.330 — must be marked on each side with the proper shipping name or appropriate common name.

In addition to the identification number marking, multi-unit tank car tanks must be marked on two opposing sides with the proper shipping name or appropriate common name.

Shipping name change (49 CFR §172.302)

If the proper shipping name for a hazardous material in a bulk packaging has been changed, the bulk packaging may not need to be remarked if:

- The bulk packaging was marked before October 1, 1991, in conformance with the Hazardous Materials Regulations in effect on September 30, 1991; and
- The marking contains the same key words as the current proper shipping name in the Section 172.101 Hazardous Materials Table.

Example: A tank car marked “ANHYDROUS AMMONIA” does not need to be remarked “ANHYDROUS AMMONIA, LIQUEFIED”

Petroleum sour crude oil (49 CFR §172.327)

A bulk packaging used to transport petroleum crude oil containing hydrogen sulfide (sour crude oil) in sufficient concentrations that the vapors may present an inhalation hazard must be marked with the GHS toxic pictogram or a warning statement such as “Danger Possible Hydrogen Sulfide Inhalation Hazard.” The marking must be displayed at each location (manhole, loading head) where exposure to hydrogen sulfide vapors may occur.

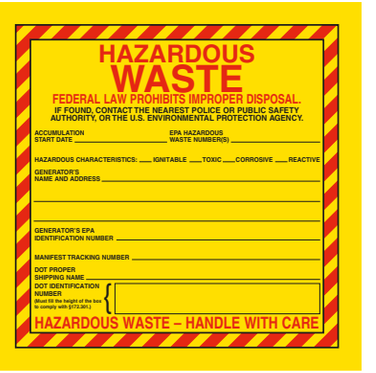
Additional Marking Requirements

Additional markings may be required depending on the hazardous material being transported or the type of package used.

Marking

Hazardous wastes (49 CFR §172.301)

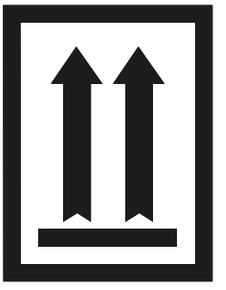
Proper shipping names marked on non-bulk packages of hazardous waste are not required to include the word "waste" if the EPA marking shown to the right is displayed in accordance with 40 CFR Section 262.32.



Liquids in combination packagings (49 CFR §172.312)

Combination packagings that have inner packagings which contain liquid hazardous materials, single packaging fitted with vents, or open cryogenic receptacles, must be marked with orientation arrows. These arrows must be displayed on two opposite vertical sides of the packaging — with the arrows pointing in the correct upward direction.

Orientation arrows are not required on packages which contain:



- Inner packagings of cylinders;
- Flammable liquids in inner packagings of one liter or less prepared as a limited quantity or consumer commodity, except for transport by air;
- Flammable liquids in inner packagings of 4 fluid ounces (120 mL) or less prepared as a limited quantity or consumer commodity, when packed with sufficient absorption material between the inner and outer packagings to completely absorb the liquid contents, when transported by air.
- Liquids contained in manufactured articles (e.g., alcohol or mercury in thermometers) which are leak-tight in all orientations;
- Hermetically sealed inner packagings.
- Liquid infectious substances in primary receptacles not exceeding 1.7 ounces (50 mL).

Inhalation hazards (49 CFR §172.302, §172.313)

Packagings which contain materials poisonous-by-inhalation must be marked "INHALATION HAZARD" in association with the required labels or placards or the proper shipping name. The INHALATION HAZARD marking is not required if the package bears a poison gas or poison inhalation hazard label (or placard), displaying the words "Inhalation Hazard."

INHALATION
HAZARD

This marking on bulk packages must be on two opposite sides, and have:

- A minimum width of 0.24 inches (6 mm) and a minimum height of 3.9 inches (100 mm) for rail cars.

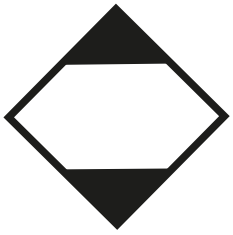
- A minimum width of 0.16 inches (4 mm) and a minimum height of 1 inch (25 mm) for portable tanks with capacities of less than 1,000 gallons (3,785 L) and intermediate bulk containers.
- A minimum width of 0.24 inches (6 mm) and a minimum height of 2 inches (50 mm) for cargo tanks and other bulk packagings.

Poisons (49 CFR §172.313)

Non-bulk plastic outer packagings used as single or composite packagings for Division 6.1 materials must be permanently marked with the word "POISON" — either by embossing or other durable means. This marking must be at least 0.25 inches (6.3 mm) in height and located within 6 inches (150 mm) of the closure of the packaging.

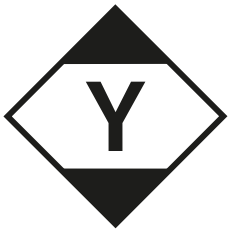
A package containing a Division 6.1 (poison) material in Packing Group III may be marked "PG III" adjacent to the POISON label.

Limited quantity (49 CFR §172.315)



A package containing a limited quantity of hazardous materials is required to be marked with one of the following:

1. Non-air packages containing a limited quantity must display the square-on-point limited quantity marking. A package displaying the limited quantity marking is not required to be marked with the proper shipping name or identification number, unless the material is a hazardous substance or hazardous waste.



2. Packages meeting the requirements for air transport must display the square-on-point "Y" limited quantity marking. A package displaying the "Y" limited quantity marking is required to be marked with the proper shipping name and identification number when transported by air. Packages displaying the square-on-point "Y" limited quantity marking are authorized for transport by all modes of transportation.

The width of the border forming the square-on-point marking must be at least 2 mm. Each side of the marking must be at least 100 mm. If package size requires a reduced size marking, then each side of the marking may be reduced to no less than 50 mm. For cargo transport units transported by water, each side of the marking must have a minimum size of 250 mm.

Before January 1, 2021, a limited quantity properly marked as an ORM-D is not required to be marked with the square-on-point limited quantity marking.

ORM-Ds (49 CFR §172.316)

Packages that contain a material classed as a consumer commodity (ORM-D) must be marked on at least one side or end with the ORM-D designation — immediately following or below the proper shipping name.

The ORM-D marking must be within a rectangle that is approximately 0.25 inches (6.3 mm) larger on each side than the designation.

Before January 1, 2021, packages of ORM-D material may be marked with the ORM-D marking. Starting on January 1, 2021, only the appropriate square-on-point limited quantity marking may be used and the ORM-D marking must not be used.

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