

APPENDIX 5

Guide to DOT and NFPA PLACARDS

The United States Department of Transportation (DOT) requires transporters to display diamond-shaped placards on the exterior of their vehicles when carrying hazardous materials above certain weight limits. These placards represent the type of hazards presented by the materials being carried, according to the hazard class they fall under. There are nine hazard classes specified by DOT, several of which are subdivided into divisions. These divisions segregate special types of material hazards within a hazard class.

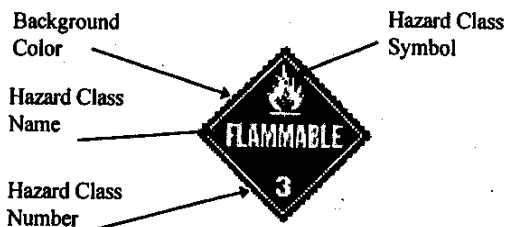
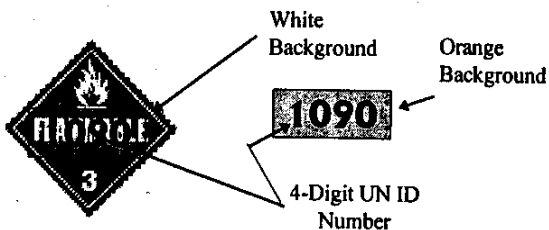
Placards are diamond-shaped markers, 10-3/4 inches on each side, which consist of four major components; the hazard class symbol, the hazard class number, the background color, and (to a lesser degree) the United Nations ID number or the hazard class name. These four components can be used to determine the hazards presented by a material in transport, usually from a safe distance away.

The hazard class symbol is located in the top corner of the diamond and is specific to the hazard presented by the material.

The hazard class number (and the division number for Class 1 and Class 5 materials) is located in the bottom corner of the diamond, and is specific to its hazard class or division.

The background color provides the background for the placard and corresponds to a specific hazard presented by the material.

The hazard class name, as well as the United Nations (UN) ID number, may or may not be present. If the hazard class name is present, it will be located in the center of the placard between the hazard class symbol and the hazard class number. If the UN ID number is present, it will either be located in the center of the placard between the hazard class symbol and the hazard class number, or immediately adjacent to the placard itself. UN ID numbers will be four digits long, and will be black on a white background (if located in the center of the placard) or black on an orange background (if located adjacent to the placard). Keep in mind that neither of these markings may be present. It is therefore important to be familiar with the other placard components.



The following list provides DOT definitions for the specified hazard classes and divisions, as well as examples of the specific placards utilized. Any material which falls into any of these DOT classes will require placarding in transport if it exceeds certain weight limits.

Class 1 (explosives)

Explosive means any substance or article, including a device, that is designed to function by explosion (i.e., an extremely rapid release of gas and heat) or that, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion. Explosives in Class 1 are divided into six divisions. Each division will have a letter designation (located where the * is on the placards). All of these placards have orange backgrounds.



Division 1.1 consists of explosives that have a mass explosion hazard. A mass explosion is one that affects almost the entire load instantaneously. Examples: black powder, dynamite, and TNT.

Division 1.2 consists of explosives that have a projectile hazard but not a mass explosion hazard. Examples: aerial flares, detonating cord, and power device cartridges.

Division 1.3 consists of explosives that have a fire hazard and either a minor blast or a minor projectile hazard, or both, but not a mass explosion hazard. Examples: liquid-fueled rocket motors and propellant explosives.



Division 1.4 consists of explosive devices that present a minor explosion hazard. No device in the division may contain more than 25 g (0.9 oz) of a detonating material. The

explosive effects are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause instantaneous

explosion of the entire contents of the package. Examples: line-throwing rockets, practice ammunition, and signal cartridges.



Division 1.5 consists of very insensitive explosives. This division comprises substances that have a mass explosion hazard but are so insensitive that there is

very little probability of initiation or of transition from burning to detonation under normal conditions of transport. Examples: prilled ammonium nitrate fertilizer-fuel oil mixtures (blasting agents).



Division 1.6 consists of extremely insensitive articles that do not have a mass explosive hazard. This division comprises articles that contain only extremely insensitive

detonating substances and that demonstrate a negligible probability of accidental initiation or propagation.

Class 2 (compressed gases)



Division 2.1 (flammable gas) RED BACKGROUND COLOR. Any material that is a gas at 20°C (68°F) or less and 101.3 kPa (14.7 psi) of pressure; a material that

has a boiling point of 20°C (68°F) or less at 101.3 kPa (14.7 psi) and that (a) is ignitable at 101.3 kPa (14.7 psi) when in a

mixture of 13% or less by volume with air; or (b) has a flammable range at 101.3 kPa (14.7 psi) with air of at least 12% regardless of the lower limit. Examples: inhibited butadienes, methyl chloride and propane.



Division 2.2

(nonflammable, nonpoisonous compressed gas, including compressed gas, liquefied gas, pressurized cryogenic gas, and compressed gas in

solution) GREEN BACKGROUND COLOR. Any material (or mixture) that exerts, in the packaging, an absolute pressure of 280 kPa (41 psia) at 20°C (69°F).

A cryogenic liquid is defined as a refrigerated liquefied gas having a boiling point colder than -90°C (-130°F) at 101.3 kPa (14.7 psi) absolute. Examples: anhydrous ammonia, cryogenic argon, carbon dioxide, and compressed nitrogen.



Division 2.3 (poisonous gas)

WHITE BACKGROUND COLOR. A material that is a gas at 20°C (68°F) or less and a pressure of 101.3 kPa (14.7 psi or 1 atm), a material that has a boiling

point of 20°C (68°F) or less at 101.3 kPa (14.7 psi), and that (a) is known to be so toxic to humans as to pose a hazard to health during transportation; or (b) in the absence of adequate data on human toxicity, is presumed to be toxic to humans because, when tested on laboratory animals, it has an LC₅₀ value of not more than 5,000 ppm. Examples: anhydrous hydrogen fluoride, arsine, chlorine, and methyl bromide.

Hazard zones associated with Division 2.3 materials:

Hazard zone A: LC₅₀ less than or equal to 200 ppm.

Hazard zone B: LC_{50} greater than 200 ppm and less than or equal to 1,000 ppm.

Hazard zone C: LC_{50} greater than 1,000 ppm and less than or equal to 3,000 ppm.

Hazard zone D: LC_{50} greater than 3,000 ppm and less than or equal to 5,000 ppm.

Class 3 (flammable liquid)



(Flammable liquid) **RED BACKGROUND COLOR**

Any liquid having a flash point of not more than 60.5°C (141°F).

Examples: acetone, amyl acetate, gasoline, methyl alcohol, and toluene.

Hazard zones associated with Class 3 materials:

Hazard zone A: LC_{50} less than or equal to 200 ppm.

Hazard zone B: LC_{50} greater than 200 ppm and less than or equal to 1,000 ppm.

A combustible liquid (**RED BACKGROUND COLOR**) is defined as any liquid that does not meet the definition of any other hazard class and has a flash point above 60°C (140°F) and below 93°C (200°F). Flammable liquids with a flash point above 38°C (100°F) may be reclassified as a combustible liquid.

Examples: mineral oil, peanut oil, and No. 6 fuel oil.

Class 4 (flammable/reactive materials)

Division 4.1 (flammable solid) **RED AND WHITE STRIPED BACKGROUND COLOR.** Any of the following three types of materials:

- (a) Wetted explosives - explosives wetted with sufficient water, alcohol, or plasticizers to suppress explosive properties.
- (b) Self-reactive materials - materials that are liable to undergo, at normal or elevated temperatures, a strongly exothermic decomposition caused by excessively high transport temperatures or by contamination.
- (c) Readily combustible solids - solids that may cause a fire through friction and any metal powders that can be ignited.

Examples: magnesium (pellets, turnings, or ribbons) and nitrocellulose.



Division 4.2 (spontaneously combustible material) **WHITE TOP HALF AND RED BOTTOM HALF BACKGROUND COLOR.** Any of the following materials:

- (a) Pyrophoric material - a liquid or solid that, even in small quantities and without an external ignition source, can ignite within 5 minutes after coming in contact with air.
- (b) Self-heating material - a material that, when in contact with air and without an energy supply, is liable to self heat.

Examples: aluminum alkyls, charcoal briquettes, magnesium alkyls, and phosphorus.



Division 4.3 (dangerous when wet material) **BLUE BACKGROUND COLOR.** A material that, by contact with water, is liable to become spontaneously flammable

or to give off flammable or toxic gas at a rate greater than 1 L per kg of the material per hour. Examples: calcium carbide, magnesium powder, potassium metal alloys, and sodium hydride.

Class 5 (oxidizers)



Division 5.1 (oxidizer) **YELLOW BACKGROUND COLOR.** A material that may, generally by yielding oxygen, cause or enhance the combustion of other

materials. Examples: ammonium nitrate, bromine trifluoride, and calcium hypochlorite.



Division 5.2 (organic peroxide) **YELLOW BACKGROUND COLOR.** Any organic compound containing oxygen (O) in the bivalent -O-O- structure that may be considered a

derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals.

Division 5.2 materials are assigned to one of seven types:

Type A - organic peroxide that can detonate or deflagrate rapidly as packaged for transport. Transportation of type A organic peroxides is forbidden.

Type B - organic peroxide that neither detonates nor deflagrates rapidly, but that can undergo a thermal explosion.

Type C - organic peroxide that neither detonates nor deflagrates rapidly, and cannot undergo a thermal explosion.

Type D - organic peroxide that detonates only partially or deflagrates slowly, with medium to no effect when heated under confinement.

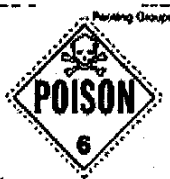
Type E - organic peroxide that neither detonates nor deflagrates, and shows low or no effect when heated under confinement.

Type F - organic peroxide that will not detonate, does not deflagrate, shows only a low, or no, effect if heated when confined, and has low or no explosive power.

Type G - organic peroxide that will not detonate, does not deflagrate, shows no effect if heated when confined, has no explosive power, is thermally stable, and is desensitized.

Examples: dibenzoyl peroxide, methyl ethyl ketone peroxide, and peroxyacetic acid.

Class 6 (poisons)



Division 6.1 (poisonous material) **WHITE BACKGROUND COLOR.** A material, other than a gas, that is either known to be so toxic to humans as to afford a hazard to health during

transportation, or in the absence of adequate data on human toxicity, is presumed to be toxic to humans, including

that cause irritation. Examples: aniline, arsenic compounds, carbon tetrachloride, hydrocyanic acid, and tear gas.

Division 6.2 (infectious substances) WHITE BACKGROUND COLOR. A viable microorganism, or its toxin, that causes or may cause disease in humans or animals. Infectious substance and etiologic agent are synonymous with each other. Examples: anthrax, botulism, rabies, and tetanus.

Class 7 (radioactives)



(radioactive materials)
YELLOW TOP HALF,
WHITE BOTTOM HALF
BACKGROUND COLOR.
A radioactive material is
defined as any material
having a specific activity

greater than 0.002 microcuries per gram (uCi/g). Examples: cobalt, uranium hexafluoride, and "yellow cake."

Class 8 (corrosive)



(corrosive materials)
WHITE TOP HALF AND
BLACK BOTTOM HALF
BACKGROUND COLOR.
A corrosive material is
defined as a liquid or solid
that causes visible

destruction or irreversible alterations in human skin tissue at the site of contact, or a liquid that has a severe corrosion rate on steel or aluminum.

Corrosivity is measured by pH, which ranges from 0 (highly acidic) through 7 (water, neutral) to 14 (highly basic). Acids attack tissues aggressively. Bases (also referred to as alkaline and caustic) attack tissues less aggressively in general;

however, they are fat soluble and therefore have a greater potential to affect subcutaneous layers.

Examples: nitric acid, phosphorus trichloride, sodium hydroxide, and sulfuric acid.

Class 9 (miscellaneous)



BLACK AND WHITE STRIPED TOP HALF, AND WHITE BOTTOM HALF BACKGROUND COLOR. A miscellaneous hazardous material is defined as a material that

presents a hazard during transport, but that is not included in another hazard class, including (a) any material that has an anesthetic, noxious, or similar property that could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties; and (b) any material that is not included in any other hazard class, but is subject to the DOT requirement (a hazardous substance or a hazardous waste).

Examples: adipic acid, hazardous substances (e.g., PCBs), and molten sulfur.

In summary:

Class 1: Explosives

Orange background, bursting ball symbol

Class 2: Compressed Gases

2.1 Flammable Gas

Red background, flame symbol

2.2 Non-Flammable Gas

Green background, cylinder symbol

2.3 Poison Gas

White background, skull and crossbones symbol

Class 3: Flammable Liquids

Red background, flame symbol

Class 4: Flammable Materials

4.1 Flammable Solids

Red and white striped background, flame symbol

4.2 Spontaneously Combustible

White top half and red bottom half background, flame symbol

4.3 Dangerous When Wet

Blue background, flame symbol

Class 5: Oxidizing Materials

5.1 Oxidizers

Yellow background, burning "O" symbol

5.2 Organic Peroxides

Yellow background, burning "O" symbol

Class 6: Poisonous Materials (other than gases)

6.1 Poisons

White background, skull and crossbones symbol (or corn stalk symbol)

6.2 Infectious Substances

White background, biohazard symbol

Class 7: Radioactive Materials

Yellow top half and white bottom half background, propeller symbol

Class 8: Corrosives

White top half and black bottom half background, test tube pouring liquid on steel rod and hand symbol

Class 9: Miscellaneous

Black and white stripe top half and white bottom half background, no symbol

DOT exempts certain materials from placarding requirements when in transport. These materials are designated "Otherwise Regulated Materials," abbreviated "ORM". Prior to the HM-181 standards, these materials were designated ORM-A, ORM-B, ORM-C, ORM-D, and ORM-E. Today, only the ORM-D materials remain.

ORM-D Material

An ORM-D material is a material that presents a limited hazard during transportation due to its form, quantity, and packaging.