



Adding hazardous material placards to a tank car can increase the realism of your freight car fleet, but only if you first understand the significance of each marking. Jeff Wilson photo

A MODELER'S GUIDE TO HAZARDOUS MATERIAL MARKINGS

Add prototype “hazmat” placards to your modern freight cars

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NORTH AMERICAN RAILROADS are some of the largest haulers of hazardous material, commonly called hazmat. If you're watching a freight train roll by, and you know what to look for, you'll likely observe the United States Department of Transportation (USDOT) mandated (since 1990) markings applied to all types of tank cars, covered hoppers, and intermodal equipment hauling hazardous material.

Recently, model train manufacturers have begun to include authentic hazmat markings on factory-decorated modern freight cars. But many modelers also want to add the appropriate markings to their existing fleet. To do so, you'll need to have a cursory understanding of hazmat regulations.

HAZMAT REGULATIONS

To accurately model hazmat markings, you'll first need to understand how hazardous substances fall under one of the nine hazard classifications listed in **fig. 1**. Additionally, the USDOT requires that all hazardous substances must be grouped into divisions. For example, the compressed gas class includes two divisions, flammable and non-flammable gases.

In addition to maintaining a classification and division, each hazardous substance also receives a four-digit number, ranging from 0001 to 3500. This is called a UN number, and it is assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods. The number is specific to each

FIG. 1 HAZMAT CLASSES

- CLASS 1** Explosives
- CLASS 2** Compressed gases
- CLASS 3** Flammable liquids
- CLASS 4** Flammable solids
- CLASS 5** Oxidizers
- CLASS 6** Poisons
- CLASS 7** Radioactive materials
- CLASS 8** Corrosive liquids
- CLASS 9** Miscellaneous

The United States Department of Transportation (USDOT) categorizes hazardous substances transported by rail into nine different classifications.



FIG. 2 PLACARD PLACEMENT. Placards must be displayed on all four sides of both road and railroad equipment in such a way that first responders can quickly identify the hazardous contents.



substance. Examples of UN numbers used on tank cars includes nos. 1075 for liquefied petroleum gas/propane, 1170 for ethanol, 1203 for gasoline, and 1993 for diesel fuel/fuel oil. You can view a comprehensive table of UN numbers online at www.environmentalchemistry.com.

HAZMAT MARKINGS

Both the class and UN number appear on hazmat placards applied to both road and railroad equipment. A placard is a 12" x 12" diamond. As shown in **fig. 2**, placard colors, graphics, and lettering all relate to one of the nine classes and divisions of hazardous materials. Transportation regulations state that



FIG. 3 SPECIAL RULES. When transporting more than one class of hazardous material, at least one of which is over a certain weight or in bulk packaging, truck trailers can be required to display an interesting array of placards.

all vehicles carrying hazardous materials in excess of certain weights must have the appropriate placard applied to all four sides of the equipment.

Sounds simple so far, right? A tank car full of gasoline would receive a placard suitable for gasoline. However, the subject can get complicated, as special regulations apply to equipment carrying multiple substances and sometimes only one substance.

Intermodal containers and trailers are examples of equipment that can readily carry multiple substances. In cases like these, special requirements are based on the weight of each substance as well as the combined weight of all the hazardous substances transported in a train.

Based on USDOT regulations, roadway equipment can display a DANGEROUS placard in place of the individual class placards when the weight of an individual substance does not exceed 2,205 pounds. If one substance exceeds that weight, it must have its own placard along with the DANGEROUS placard. This application can be seen in **fig. 3**.

As most railroad cars carry only one substance, they're considered to be carrying in bulk. Bulk packaging has its own unique rules, applicable to any equipment hauling only one



FIGS. 4 AND 5 BULK PLACARD. The bulk placard (left) displays the unique UN number in the center. A variation of the bulk placard is to use a standard placard with a separate orange panel (right) displaying the UN number.



FIG. 6 PLACARDS FOR COVERED HOPPERS. Though not as common as on tank cars, placard frames are sometimes also found as standard equipment on covered hoppers that can carry hazardous loads.



FIG. 7 CONTAINER AND TRAILER PLACARDS. Nearly all rubber-wheeled equipment, including box trailers, feature metal placard frames, hinged flip-style placards, or a combination of both.



FIG. 8 SELF-ADHESIVE PLACARDS. Where equipment has no placard mounting hardware, such as a container, loads display a self-adhesive placard affixed in the same locations you would expect to find a placard frame.



FIG. 9 NON-STANDARD PLACEMENT. The standard application for a placard is along the lower half of the equipment. Containers often have placards placed high on the sides where they can't be obstructed by the sides of well cars.

substance or equipment carrying a substance in specialized packaging, such as portable tanks or containers.

This application requires a placard displaying the UN number in place of the class name or the standard placard used in conjunction with an orange panel displaying the UN number in black. See **figs. 4** and **5** above. These are the most common applications used in model railroading, as most freight cars are considered bulk packaging.

MODELING HAZMAT MARKINGS

Placards are simple details you can easily add to improve the accuracy of freight cars made in all sizes and scales. Almost all tank cars, many covered hoppers, and some intermodal equipment have placard holders or frames built into the car. A placard frame is just that – an open metal frame designed to hold a paper placard.

As previously shown in **fig. 2** on page 29, tank cars generally have placard frames mounted on a stem welded to the end framework of the right side of the car in addition to each end. The placard frame is commonly included as a model kit part, but these can also be added using Detail Associates part no. 6237 or Plano Model Products part no. 310 for HO scale cars, along with JnJ Trains part no. 4 for N scale cars.

Unlike the stem mounting used on tank cars, the placard frames on covered hoppers are generally mounted directly to the car sides. See **fig. 6**. Because the recessed ends of a covered hopper don't readily accommodate a placard frame, it isn't uncommon to see frames mounted to the upright structural beams of the ends. Another option is to mount the frame along the end crossover platform.

Modern intermodal vehicles such as trailers and some 53-foot containers have placard frames installed on each side and end during construction.

Unlike railroad equipment, rubber-wheeled equipment can have two different styles of placard frames. One version is a standard metal frame for cardboard placards (**fig. 7**) and the second is a hinged assembly containing each of the common placards. In the latter case, a driver can simply flip through the hinged assortment to find the appropriate placard and then secure it using built-in clips. See **fig. 3** on page 29.

You can add the simple open frame to HO scale models using Plano Model Products no. 311 etched-metal placard frames, or add the hinged style to both HO and N scale models using decal sets. Frame placement may vary to accommodate the graphics applied to the equipment. Generally, the frames

are located along the lower edge of the both sides and front end, and mounted to the right side door on the rear of the trailer or container.

In other cases the vehicle, either road or rail, may not be equipped with any apparatus to hold placards. In this situation, the vehicle bears a self-adhesive placard, like that seen in **fig. 8**, typically applied in the same locations you would expect to find a placard frame.

One non-standard placard application is commonly found on containers transported in well cars. As shown in **fig. 9** on the previous page, containers riding in well cars may have the self-adhesive placards mounted high on the sides of the container rather than along the lower edges, so they won't be obscured by the sides of the car.

Whether you're filling placard frames or using the self-adhesive style, almost all variations of common placard requirements can be fulfilled using decal sets available from Microscale Industries. See **fig. 10**. Two sets of placards suitable for both road and railroad equipment are nos. 840 (available in HO and N scales) and 975 (HO scale only).

You will want to add details and realistic weathering effects to the car prior to applying placard decals. Next, apply the water-slide decals to the frames or body using a setting solution that allows the film to conform to uneven frame surfaces, exterior posts, or rivet detail.

On some modern trailer models, you'll find that placard frames are printed directly onto the sides. As shown in **fig. 11**, place the placard decal directly over the printed frame to identify the hazardous disposition of this load.

In other cases a manufacturer may have supplied incomplete markings on a factory-decorated car. In **fig. 12** you see a Walther tank car decorated with the UN number listed in the orange panel. While this is correct, the car was missing the required Class 9 bulk commodity placard, which I added using a Microscale decal.

RULES FOR HAZMAT LOADS

Adding hazmat markings on model equipment results in a more accurate and visually interesting roster. These markings can also open new possibilities for modeling the load-handling practices in accordance to prototype railroad operating rules and regulations.

Due to the danger of these loads, every railroad applies operating rules to moving hazmat shipments. As evident from the rule book shown in **fig. 13**, many prototype rules are often lengthy and complex. However, there are some rules that can be easily adapted for use in model railroading.

Several rules address the placement of a hazardous car within a train. For example, a loaded hazmat car can't be placed next to an occupied locomotive or caboose. Another rule states that hazmat cars must be placed at the middle of the train, no closer than the sixth car from an occupied engine or caboose, when train length permits. Yet another rule precludes placing a hazmat car next to a loaded flatcar or cars with mechanical refrigeration equipment.

Using these rules will add a challenge for yardmasters when assembling trains, requiring them to plan the placement of any hazardous cars. Applying these same rules in local freight operations will require a crew to place a buffer car between their locomotive and any hazardous cars, often giving them extra switching moves to meet the requirement of the rules. This and many other safety precautions and actions stem from the simple addition of accurately applied hazardous material placards and markings. **HITMR**



FIG. 10 PLACARD DECALS. Adding placards to model railroad equipment is as easy as applying the appropriate marking from a commercial decal sheet. Setting solution helps the decal lay over factory-molded placard frames.



FIG. 11 FLIP-STYLE PLACARD. To create a flip-style placard, such as the one on this Athearn trailer, simply center the decal inside the printed placard. This lets a portion of the silver edge show.



FIG. 12 FACTORY-APPLIED MARKINGS. Current model makers will often apply partial markings to modern equipment. You can apply additional markings and data included in various decal sets.

Notes: (1) Each platform of an articulated intermodal rail car is considered as one car for train placement purposes. (2) A business car is considered an occupied caboose for train placement purposes. (3) A buffer car can be either: • A non-placarded rail car; or • A rail car with a placard or marking shown in Column A. (4) An engine (working or not working) must not be used as a buffer car. II. Any rail car placarded with square white backgrounds: EXPLOSIVES 1.1, EXPLOSIVES 1.2, POISON GAS, or POISON must be next to and ahead of any rail car occupied by guards or technical escorts accompanying the car. Rail cars occupied by guards or technical escorts must be the last car behind any rail car placarded EXPLOSIVES 1.1 or EXPLOSIVES 1.2. III. Any rail car placarded RADIOACTIVE must not be placed next to a rail car carrying unshielded film. IV. For residual tank cars placarded with a square white background, use Column G placement restrictions. V. Only Class 2.3, ZONE A and Class 6.1, PGI, ZONE A hazardous materials must be placarded with square white backgrounds.						
Any car	Other loaded cars (not tank cars)	Tank cars: Hazmat IV	Loaded	Any loaded tank	Any loaded tank	Any loaded tank
A	B	C	D	E	F	G
Restrictions						
1. When the train length permits, a placarded car must not be nearer than the sixth car from an engine or occupied caboose.						
2. When the train length does not permit, place the placarded car not the middle of the train, but not nearer than the second car from an engine or occupied caboose.						
3. An engine or occupied caboose:						
4. A loaded tank car except placarded TPC/CP/CPC equipment, auto carriers, and other specially-equipped cars with tie-down devices for handling vehicles.						
5. A loaded bulkhead flatcar or open top car when any of the lading protrudes beyond the car ends or, if shifted, would protrude beyond the car ends.						
6. Any rail car, motor, or container, with temperature control equipment or internal combustion engine in operation.						
7. Any rail car placarded EXPLOSIVES 1.1 or EXPLOSIVES 1.2.						
8. Any rail car placarded RADIOACTIVE.						
9. Any loaded rail car placarded POISON GAS on the square white background or POISON on the square white background.						

FIG. 13 RULES OF THE RAILROAD. As shown in this excerpt from a railroad rule book, requirements for handling hazmat cars can be rather complex. However, they're easily adapted for a layout of any size or scale.