

Module

3

Transportation and Transfer of Ethanol-Blended Fuels

Terminal Objective

Upon the successful completion of this module, participants will be able to describe how ethanol-blended fuels are transported and transferred and where the most likely points for error in these actions will exist.

Enabling Objectives

1. List common modes of transportation for ethanol-blended fuels.
2. Describe the United Nations'/Department of Transportation (UN/DOT) markings that will allow responders to identify ethanol-blended fuel transports.
3. Discuss the likelihood and potential locations of incidents involving ethanol-blended fuels and national resources available to provide that information.

Instructor Note:

Module Time: 45 minutes

Materials: Figure 3.9



Introduction

Given that an increased percentage of all fuel transportation-related incidents are likely to involve ethanol or ethanol-blended fuels, it is essential that emergency responders be able to quickly and effectively identify their presence at the scene of an incident.

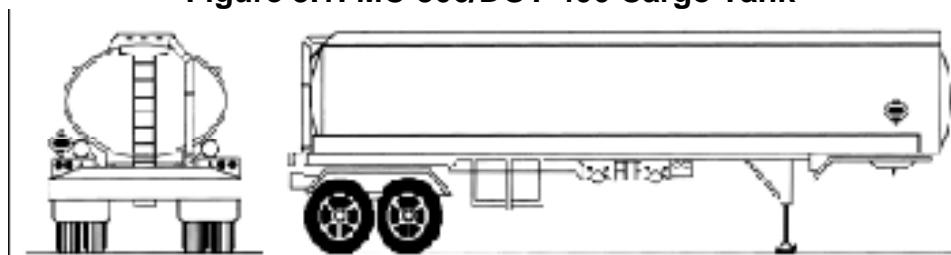
Instructor Note:

Ask participants, in your jurisdiction where is the greatest likelihood of an emergency involving E-85 or ethanol transportation?

Transportation and Placarding

Since both gasoline and ethanol-blended fuels have very similar physical and chemical characteristics, they will be transported in the same general types of containers and tanks. The most prevalent style of transport of the blended fuels that emergency responders will encounter will be by MC-306 and Department of Transportation (DOT)-406 style road tankers (see Figures 3.1 and 3.2). These tankers are non-pressurized and have a capacity up to 9,000 gallons.

Figure 3.1: MC-306/DOT-406 Cargo Tank



Instructor Note:

On the drawing there are outlets on the underside of the trailer for on- and off-loading the product. Depending on the types of product being carried, the MC-306 is divided into compartments.

In addition to the outlets and piping on the bottom, you can see vents and caps on the top side of the trailer which can fail or leak as a result of rollover accidents. Properly marked 10 $\frac{3}{4}$ -inch placards should be visible on all four sides making identification of the product easier.

Figure 3.2: Overturned MC-306/DOT-406 Cargo Tank



DOT has classified hazardous materials according to their primary danger and has assigned standardized symbols to identify the classes. Materials are grouped by their major hazardous characteristics; however, many materials will have other hazards as well. Ethanol and ethanol-fuel blends are in the flammable liquids category. Placards for flammable liquids have a red background with a white flame and the word “Flammable” on them (see Figure 3.3).



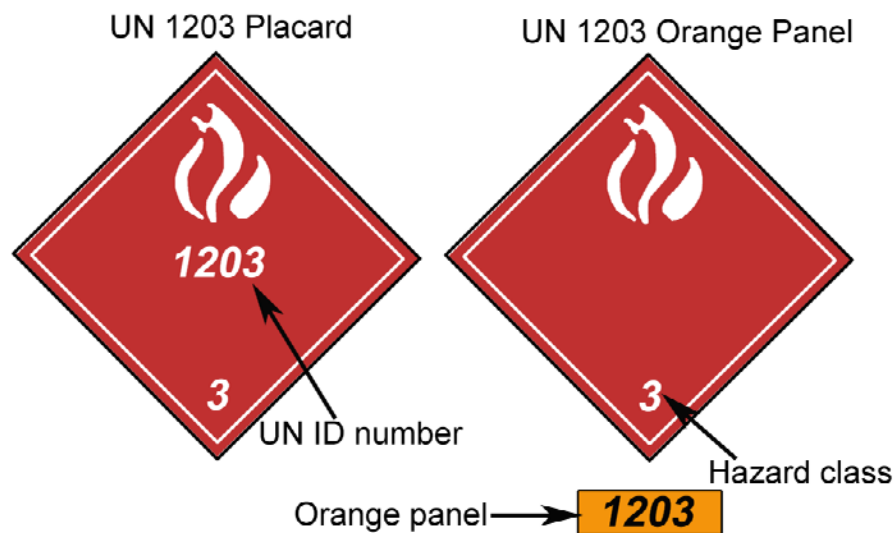
Figure 3.3: Flammable Placard

Figure 3.3: Tankers carrying ethanol and ethanol-fuel blends will generally be placarded with a flammable placard or United Nations’ (UN) 1203 flammable placard when transporting lower ethanol concentrations up to and including E-10 blended fuels. The E-85 ethanol blend will carry a new designation for ethanol-blended fuels: UN 3475 identification. The E-95 (denatured or Fuel Ethanol) ethanol-blended fuel will be placarded with a UN or North American (NA) 1987 flammable placard (see Figure 3.4).

Instructor Note:

Explain that the UN number is a four-digit identification number on the placard or orange panel. By looking up the UN identification number in the Emergency Response Guidebook (ERG), you can find hazard response information about the material.

Figure 3.4: UN 1203 Placards for Gasoline-Blended With up to 10 Percent Ethanol



Rail tanks will be identified similarly. The different regulatory groups have addressed placarding and labeling of the various concentrations of ethanol and gasoline blends.

Pressure and vacuum relief devices will be the same as those that are currently found on gasoline-style transport tankers. Nearly all of these fuels are bottom loaded and unloaded by the standard 4-inch quick connect or direct connections. Valving is internal to the tanks with breakaway piping and remote shut-off controls, and vapor recovery systems. (See Figures 3.5 and 3.6).

Figure 3.5: DOT 111 General Service Tank Car

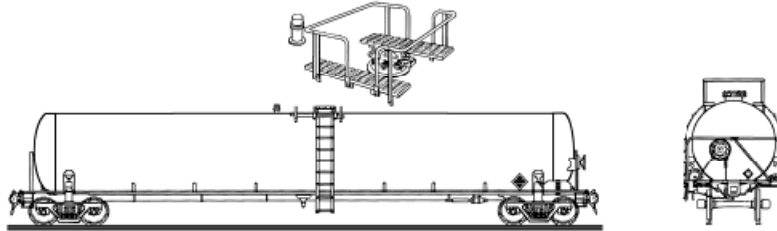


Figure 3.6: DOT 111 with Placard



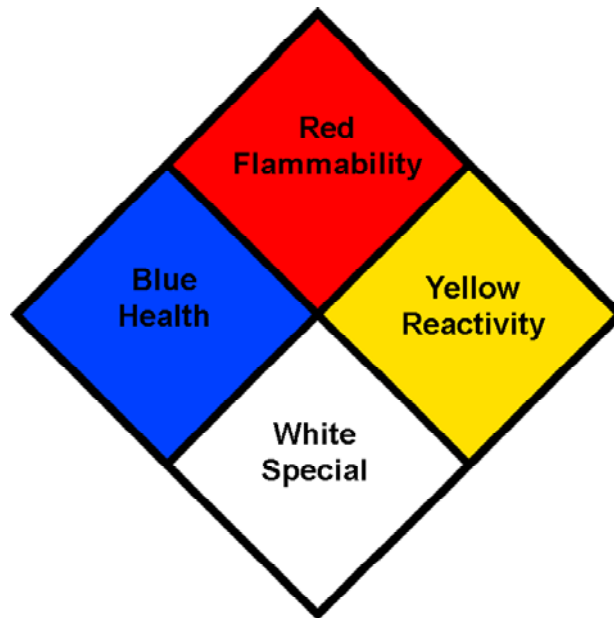
The majority of the fuel ethanol (E-95) is transported from the production facilities to the storage depots by rail. Most of the ethanol transports by rail will be in a non-pressurized (general service) tank car; these tank cars have a capacity of approximately 30,000 gallons. There is some fuel ethanol transported by waterway on board barges or freighter ships. At this time very small

amounts of ethanol-blended fuel are being experimentally transported by pipeline to evaluate the feasibility of larger-scale pipeline transfers.

Storage depots that do not have rail access receive E-95 by road tankers. There is some transfer of fuel ethanol from rail tanks directly to road tankers called *trans-loading*. This is considered to be an interim process until permanent transfer facilities can be provided. Trans-loading has the greatest potential for transfer problems due to a lack of permanent fixtures or safety equipment. Emergency responders should be aware of this process occurring in their areas.

One more marking system of interest to emergency responders is the National Fire Protection Association (NFPA) 704 diamond (see Figures 3.7 and 3.8). The NFPA 704 marking system is based on the “704 diamond” and is the system used for identifying hazardous materials found within facilities. The NFPA 704 system uses colors, numbers, and special symbols to indicate the presence of hazardous materials. Each colored square indicates the type of hazard, and the higher the number (0–4), the greater the hazard. For example, the number 4 in the blue health square indicates that a very short exposure could cause death or major residual injury.

Figure 3.7: NFPA 704 Diamond



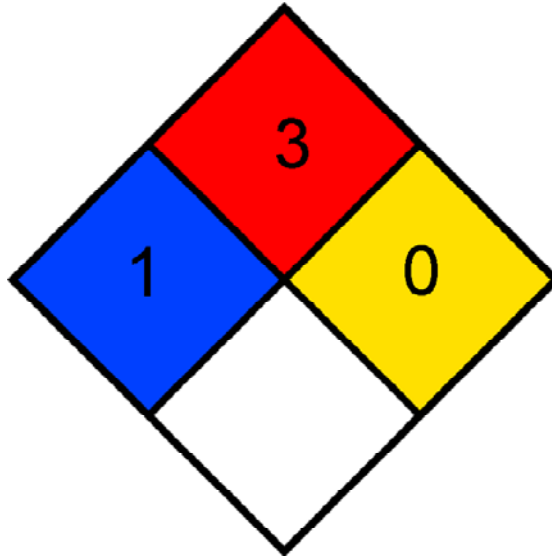
- Health: Blue
- Flammability:
- Reactivity:
- Special: White (special notice)

Red

Yellow

Ethanol, including E-95 and E-85, is represented by a 1 in the blue health square, indicating slight to moderate irritation. It is also represented by a 0 for reactivity (yellow) and a 3 for flammability (red) indicating high flammability with ignition likely under most conditions. There is no commonly accepted special character (white) for ethanol, though one may be appropriate.

Figure 3.8: NFPA Diamond for E-100, E-95, E-85, and Gasoline



As most emergency response agencies are aware, most incidents involving hazardous materials occur during transportation and transfer operations. Emergency responders should be aware of areas or routes where large shipments of ethanol and ethanol-blended fuels routinely pass. E-95 has now become the leading single hazardous material transported by rail, recently surpassing liquefied petroleum gases and hydrochloric acid solutions. Unit train shipments containing 75–100 cars of E-95 are now commonly seen on some key rail routes leaving from the Midwest and carrying products to various population and distribution centers throughout the country. Most of the Midwest and other ethanol production facilities have access to rail sidings. However, many of the bulk storage fuel depots do not have rail sidings. For this reason much of the E-95 is trans-loaded to tanker trucks for distribution to bulk storage facilities via highways.

Placards are able to indicate high-concentration ethanol-blended fuels. But the current state of placarding does not provide sufficient information to distinguish between gasoline and E-10 gasohol. While historical info has shown that gasoline and E-10 fires could be addressed similarly, alcohol resistant foams have shown show superior performance across the entire range of ethanol blended fuels.

A good resource to assist in preparing for potential transportation-related hazardous materials events is the Transportation Community Awareness and Emergency Response (TRANSCAER) Web site (<http://www.transcaer.com>). TRANSCAER is a voluntary national outreach effort that focuses on assisting communities prepare for and respond to a possible hazardous material transportation incident. A critical element of this is the flow study which is designed to identify shipments of hazardous materials that either originate or are destined to pass through a specific region. By using the data collected, responders will be able to enhance emergency planning capabilities.

Instructor Note:

Make sure that participants understand the importance of this topic.

Discuss situations where responders cannot reliably distinguish between products based on placarding alone.

Activity 3.1—Incident Procedures

Purpose

To become familiar with the correct order of steps in the following procedures and the rationales behind them.

Instructor Note:

Time: 15 minutes

Materials: Worksheets 3.1 and 3.2

Instructor Directions:

1. *Have participants attempt to properly order the steps in the following procedures.*
 2. *Participants can work individually or in groups.*
 3. *Use Worksheets 3.1 and 3.2.*
- After participants have put the procedures in order, go over the correct order and then discuss the rationales behind each.*

Participant Directions

1. Use Worksheets 3.1 and 3.2 to properly order the steps in the procedures.
2. You can work individually or in groups.
3. Be prepared to discuss the correct order and the rationales behind each step.

Worksheet 3.1: Non-Fire Spill and Leak Procedures

- A. Establish a safety zone using conventional detection devices. Normal gas detection meters will still detect the Lower Explosive Limit (LEL) of the gasoline component since the gasoline has a lower LEL than ethanol. Since both the gasoline component and the ethanol component are heavier than air, predict the vapor travel to be down and to lower levels of elevation.
- B. Determine which approach to use:
- If the ethanol-blended fuel is spilled on dry surface, “oil only” absorbents, pads, and booms will contain the product. Plugging containers or over-packing may also be considerations.
 - If the ethanol-blended fuel is spilled into waterway, the ethanol will precipitate out of the fuel mixture and blend with the water. Depending on water to ethanol quantities, the water/ethanol solution will become non-flammable at high water ratios. The ethanol will become essentially inseparable from the water in field conditions. The remaining gasoline components will remain on the surface of the water and can be contained with normal “oil only” booms or underflow dam systems.
 - If vapors present a problem at the spill location, covering the spill with foam should be a consideration. Foam, however, can make remediation and cleanup more difficult.
- C. Cleanup and remediation can be accomplished with standard booms, absorbents, and pads keeping in mind that if water or foam is present, it will take a two-step process.
- D. Attempt to identify the product by placards, labels, shipping documents, and other identifying factors, staying upwind and uphill and using appropriate PPE. Physical properties will also aid in identification. High concentrations of ethanol will give the fuel a lighter color and a “sweeter” odor.

Answer:

- D*
- A*
- B*
- C*

Activity 3.2—Ethanol Spill Emergency

Purpose

To allow participants to determine the hazards associated with an ethanol emergency.

Instructor Note:

Time: 15 minutes

Materials: Figure 3.9

Instructor Directions:

1. Allow the participants to work in groups of two to three for this activity.
2. Participants should read the scenario and determine the resources available, immediate hazards, and possible actions to take.
3. After 10 minutes call time, and randomly call on groups to provide their answers.
4. Participants should mention the following:
 - What type of vehicle is this?
 - **Answer:** MC-306/DOT-406
 - List common placards that you might find on this vehicle.
 - **Answers:**
 - 1203 placard
 - 1987 placard
 - UN 3475
 - UN 1203 orange panel
 - What other resources might be helpful to responders in this incident?
 - **Answers:**
 - ERG
 - Material Safety Data Sheet (MSDS)
 - What are the immediate concerns and hazards?
 - **Answers:**
 - Potential for fire
 - Environmental issues with runoff or fuel leaching into the soil
 - Potential sources of ignition to trigger a fire such as the welding facility nearby or overhead power lines
 - Trees and vegetation as fuel for possible wildfire

Instructor Directions (continued):

— *What possible actions might you take at this point in the situation?*

• *Answers will vary depending on the knowledge of the class, but should include:*

— *Confirming product identify*

— *Determining the amount of the product left in the tank*

This last question is to allow participants to begin thinking about mitigation techniques. Remind participants that we are operating at an awareness level. The scene will soon be operating under the National Incident Management System (NIMS) and the incident command structure.

Participant Directions

1. For this activity you will work in groups of two to three.

2. Read the following scenario, and answer the questions:

— What type of vehicle is this?

— List common placards that you might find on this vehicle.

— What other resources might be helpful to responders in this incident?

— What are the immediate concerns and hazards?

— What possible actions might you take at this point in the situation?

Scenario

A transport truck (see Figure 3.9) delivering fuel to the Gas 'N Matches retail site is involved in a hit and run accident. The driver advises you that the truck is carrying 3,000 gallons of fuel. There is a leak from one of the discharge pipes on the bottom of the trailer. Fuel is leaking onto the ground and running downhill toward a small welding facility.



Figure 3.9: Transport Truck

Summary

Instructor Note:

Ask participants:

- *Is there a potential for one or more ethanol emergencies in your jurisdiction?*
- *What are the most likely types of ethanol emergencies you can see occurring in your jurisdiction (gas station incidents, production incidents, rail incidents, truck transportation incidents, etc.)?*
- *Have there been recent ethanol emergencies in your jurisdiction?*
- *What occurred and what was the actions and impact to the community?*
- *There are a variety of sources from which an emergency responder can glean information about chemicals involved in spill or fire incidents. Among them are Material Safety Data Sheets (MSDS), NIOSH Pocket Guide to hazardous Chemicals, UN numbers, DOT placards, and NFPA 704 placards. E-95 has become the leading hazardous material transported by rail. Transfer of this fuel commonly occurs via highways as well.*
