

Responding to Ethanol Incidents



Instructor Guide



Copyright Information

Responding to Ethanol Incidents

First Edition 2008.

Revised: March 2008 v. 7.21

Printed in the United States of America

The safety statements, procedures, and guidelines contained in this course manual are current as of the publication date. Prior to using the safety statements, procedures, and guidelines contained in the course manual, it is advised that you confirm the currency of these statements, procedures, and guidelines with the appropriate controlling authorities.

The development of this training program was supported by a grant awarded to the International Association of Fire Chiefs (IAFC) by the United States Fire Administration (USFA). The IAFC wishes to thank the USFA for its ongoing commitment to the health and safety of hazardous materials first responders.

The IAFC would also like to thank Captain Gary Pope (ret.), Captain Steve Hergenreter, and the Ethanol Emergency Response Coalition (EERC) for their assistance with the content development and program review.

Pictures on the cover are the property of the Texas Engineering Extension Service/Emergency Services Training Institute (TEEX/ESTI).

Table of Contents

Module 0: Introduction 0-1	Module 4: Storage and Dispensing Locations..... 4-1
About This Course..... 0-1	Introduction4-3
Course Goal..... 0-1	Terminal Storage of Ethanol-Blended Fuels4-3
Course Overview..... 0-1	Bulk Plant and Distribution Facilities4-5
Target Audience..... 0-2	Retail Dispensing Stations4-6
Delivery Method 0-2	Summary.....4-7
Course Prerequisites..... 0-2	Activity 4.1—Ethanol in Your Jurisdiction.....4-9
Course Length..... 0-2	Worksheet 4.1: Ethanol in Your Jurisdiction.. 4-10
Course Materials..... 0-2	
Administrative Information 0-3	
Module 1: Ethanol and Ethanol-Blended Fuels 1-1	Module 5: Fire Fighting Foam Principles and Ethanol-Blended Fuel 5-1
Introduction..... 1-3	Introduction5-3
History of Ethanol-Blended Fuels 1-5	Basic Foam Principles.....5-3
Common Ethanol-Blended Fuel Mixtures..... 1-5	What is Foam?5-3
Summary 1-6	Why Use Foam?.....5-4
Module 2: Chemical and Physical Characteristics of Ethanol and Hydrocarbon Fuels 2-1	How Foam Works5-4
Introduction..... 2-3	What is Foam Not Effective On?5-5
Activity 2.1—Definitions 2-4	What is Foam Effective On?5-6
Worksheet 2.1: Definitions..... 2-5	Foam Terminology.....5-8
Characteristics of Gasoline (A Hydrocarbon) 2-8	Types of Foam.....5-8
Characteristics of Ethanol (A Polar Solvent) 2-8	Foam Characteristics.....5-9
Activity 2.2—Comparison of Gasoline and Ethanol..... 2-11	Foam Proportioning and Delivery Systems.....5-10
Characteristics of Ethanol-Blended Fuels 2-13	Application Techniques5-16
Summary 2-14	Foam and Ethanol and Ethanol-Fuel Blends ...5-17
Module 3: Transportation and Transfer of Ethanol-Blended Fuels 3-1	Foam Recommendations for Fire Departments5-18
Introduction..... 3-3	Summary.....5-21
Transportation and Placarding 3-3	References.....5-22
Activity 3.1—Ethanol Spill Emergency 3-10	
Summary 3-12	Module 6: Ethanol-Blended Fuel Emergencies 6-1
	Introduction6-3
	Detection and Monitoring6-3
	Personal Protective Equipment (PPE)6-4

Activity 6.1—Incident Procedures.....	6-8
Worksheet 6.1: Non-Fire Spill and Leak Procedures	6-9
Worksheet 6.2: Fire Incident Procedures With Ethanol-Blended Fuel Spills.....	6-10
Summary	6-12
Module 7: Tank Farm and Bulk Storage Fire Incidents	7-1
Introduction.....	7-3
Tank Farm and Bulk Storage Fire Operations...	7-3
Preplanning	7-4
Summary	7-5
Activity 7.1—Ethanol Emergency Procedures.....	7-6

Index of Figures

The following figure has been reprinted with permission from the Federal Emergency Management Agency (FEMA):

Figure 3.1: MC-306/DOT-406 Cargo Tank 3-3

Department of Transportation (DOT) *Emergency Response Guidebook*, available online at <http://hazmat.dot.gov/pubs/erg/gydebook.htm>:

Figure 3.3: Flammable Placard 3-4

Figure 3.4: UN 1203 Placards for Gasoline-Blended With up to 10 Percent Ethanol 3-5

Figure 5.9: United Nations' (UN) 1203 Placard for E-10 or Gasoline 5-19

Figure 5.10: UN 3475 Placard for E-85 5-19

Figure 5.11: North American (NA) 1987 Placard for E-85, E-95, or E-100 5-19

The following figure has been reprinted with permission from *Storage Tank Emergencies*, Copyright 1997 by Michael Hildebrand & Gregory G. Noll:

Figure 4.2: Underground Horizontal Tank 4-7

The following figures have been reprinted with permission from Steve Hergenreter:

Figure 3.5: DOT 111 General Service Tank Car 3-5

Figure 3.6: DOT 111 With Placard 3-6

The following figures have been reprinted with permission from Chauncey Naylor:

Figure 5.2: In-Line Eductor 5-12

Figure 5.3: In-Line Indicator 5-12

Figure 5.4: Bypass Eductor 5-13

The following figures are property of the Texas Engineering Extension Service (TEEX)/Emergency Services Training Institute (ESTI):

Figure 3.2: Overturned MC-306/DOT-406 Cargo Tank 3-4

Figure 3.7: NFPA 704 Diamond 3-7

Figure 3.8: NFPA Diamond for E-100, E-95, E-85, and Gasoline 3-8

Figure 3.9: Transport Truck 3-11

Figure 4.1: Cone Roof Storage Tank 4-4

Figure 5.1: Foam Production 5-5

Figure 5.5: Bypass Indicator 5-13

<i>Figure 5.6:</i>	<i>Foam Proportioning Nozzles With Air-Aspirator</i>	<i>5-14</i>
<i>Figure 5.7:</i>	<i>Air Aspirating Nozzles</i>	<i>5-15</i>
<i>Figure 5.8:</i>	<i>Non-Air Aspirating Nozzles</i>	<i>5-16</i>
<i>Figure 6.1:</i>	<i>Firefighter Wearing Full Set of Protective Clothing</i>	<i>6-7</i>

Module

0

Introduction

Welcome/Instructor:

Module Time: 30 minutes

During this portion of the course, you should facilitate the following activities:

- *Introduction of instructors*
- *Introduction of course participants*
- *Overview of participant manual and other resources*

About This Course

Course Goal

Upon the successful completion of this course, participants will have knowledge related to ethanol and ethanol-blended fuels, including their use, chemical and physical characteristics, transportation, and transfer.

Course Overview

Course topics include:

- Module 0: Introduction
- Module 1: Ethanol and Ethanol-Blended Fuels
- Module 2: Chemical and Physical Characteristics of Ethanol and Hydrocarbon Fuels
- Module 3: Transportation and Transfer of Ethanol-Blended Fuels
- Module 4: Storage and Dispensing Locations
- Module 5: Fire Fighting Foam Principles and Ethanol-Blended Fuel

- Module 6: Ethanol-Blended Fuel Emergencies
- Module 7: Tank Farm and Bulk Storage Fire Incidents

Target Audience

This course is designed for individuals who will respond to ethanol-related emergencies as well as those who work at fixed-facilities and transport fuel.

For additional information please visit the following Web sites:

- <http://www.iafc.org/>
- <http://www.dtnethanolcenter.com>

Delivery Method

Course delivery method consists of:

- lecture with PowerPoint presentations,
- case studies, and
- participant discussions.

Course Prerequisites

None

Course Length

6 hours

Course Materials

Instructor Note:

You will need the following materials to teach this course:

- Responding to Ethanol Incidents *video*
- *Worksheet 2.1*
- *Table 2.1*
- *Figure 3.9*
- *Worksheet 4.1*
- *Flip chart or white board*
- *Worksheets 6.1 and 6.2*

Administrative Information

Instructor Note:

At this point in the course, familiarize participants with the following:

- *Facility safety*
- *Restroom facilities*
- *Exits*
- *Refreshments*
- *Available resources*

Instructors will use this portion of the course time to familiarize you with facility safety and convenience features as well as any additional resources or equipment available to you.