TRANSPORTATION RAIL INCIDENT PREPAREDNESS & RESPONSE:
HIGH HAZARD FLAMMABLE TRAINS
STUDENT WORKBOOK
(REVISION 2.0, AUGUST 1, 2018)
The materials found in this program result from a partnership of multiple organizations to include:
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Special Thanks

The Department of Transportation’s Pipeline and Hazardous Materials Safety Administration collaborated with many organizations to compile the information found in this program. Representatives from federal agencies, public safety organizations, rail industry owners and operators, industry preparedness organizations and the response community provided valuable expertise and lesson learned to help make this project a valuable tool to better prepare responder’s in the preparation and response to rail accidents involving Hazard Class 3 flammable liquids. Special thanks are expressed to the following organization for playing a critical part in making the project possible:

- Federal Emergency Management Agency’s, United States National Fire Academy
- TRANSCAER®
- Association of American Railroads
- American Petroleum Institute
- Renewable Fuels Association
- Canadian National Railway
- Norfolk Southern Railway
- Cherry Valley Fire Protection District, Chief Craig Wilt
- United States Coast Guard (USCG)
- Unites State Environmental Protection Agency (EPA)
Transportation Rail Incident Preparedness & Response:  
High Hazard Flammable Trains  
Resource Fact Sheet

MISSION:
The Transportation Rail Incident Preparedness and Response High Hazard Flammable Trains resource materials provide critical information on best practices related to rail incidents involving Hazard Class 3 flammable liquids such as petroleum crude oil and ethanol. A key component of this initiative is to learn from past experiences and to leverage the expertise of public safety agencies, rail carriers, and industry subject matter experts in order to prepare first responders to safely manage rail incidents involving commodities such as crude oil and ethanol. The information and resources found in the TRIPR modules and scenarios supplement the information outlined in the “Commodities Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil.”

INTENT:
This U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) led program resulted from collaborative efforts to expand awareness on incident management lessons learned related to rail incidents involving Hazard Class 3 flammable liquids such as ethanol and crude oil. These resources offer a flexible approach to increasing awareness of first responders and emergency services personnel in pre-incident planning and response. The resources supplied are not intended to be a standalone training program but are offered to supplement existing programs.

DELIVERY:
All of the information is easily downloadable for public safety organizations and instructors. Each module contains a PowerPoint presentation, Student Workbook, and Instructor Lesson Plan. In addition to these materials, there are three interactive scenarios with animation and introduction videos to help instructor’s lead tabletop discussions. All information can be edited and modified to suit the instructor’s needs. The following is a direct link to the website: http://dothazmat.vividlms.com/tools.asp

BACKGROUND:
With an increase in the production and movement of commodities such as crude oil and ethanol by rail and highway, it is important that the risk of incidents be minimized through a strategic approach. U.S. crude oil production averaged 8.5 million barrels per day in 2014 and in 2015, according to Energy Information Administration projections, it will average 9.0 million barrels per day. This is a considerable increase since 2008 when the U.S. crude oil production fell to 5.0 million barrels. Along with the increase in production, the volume of crude oil moving by rail quadrupled in less than a decade. According to the Association of American Railroads, 9,500 carloads of crude oil were transported in 2008 compared to 407,761 carloads in 2013. Recent derailments involving crude oil shipments renewed focus on the safe transportation of bulk hazardous materials by rail. Denatured fuel ethanol, also referred to simply as “ethanol”, is also routinely transported by rail. Ethanol preparedness and response information is included to round out this information resource.
PHMSA and the Federal Railroad Administration (FRA) have been working with the U.S. Fire Administration (USFA), TRANSCAER®, the Association of American Railroads (AAR), rail industry owners and operators, the American Petroleum Institute (API), Renewable Fuels Association (RFA) and the emergency response community to address the hazards associated with incidents involving hazardous materials unit trains.

In May 2014, a Lessons Learned Roundtable forum and follow-up report gathered feedback from a panel of fire chiefs and emergency management officials from some of the jurisdictions that experienced a crude oil or ethanol rail transportation incident. The forum’s purpose was to share firsthand knowledge about their experiences responding to and managing these incidents. Further collaboration with stakeholders resulted in the development of the Crude Oil Rail Emergency Response Workgroup which subsequently created the Commodities Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil. The information in the reference sheet and the expertise shared during these collaborative efforts are the backbone of this program.

**HOW TO USE THIS PROGRAM:**

The program consists of an introduction and nine modules. The training modules focus on key response functions along and the three incident scenarios are provided for group-level discussions. Instructors and facilitators can use the program materials in several ways, including:

- Deliver all of the modules in one or more sessions.
- Deliver the modules as individual, stand-alone sessions. The final scenarios would then be the final capstone session.
- Deliver the scenarios as an individual, stand-alone session.

Organizations using this program are encouraged to involve other related stakeholders in its delivery. Depending upon the host organization and location, options may include public safety agencies, rail carriers, industry preparedness organizations, industry owners and operators, regional, state and federal emergency response partners, and product and container specialists.

Instructors and facilitators should have a basic understanding of the following topics for most effective use of these materials:

- Hazardous Materials Technician-level skills
- Flammable liquid firefighting and the use of Class B fire extinguishing agents
- Tank car design, construction and behavior
- Management of large, complex incidents

The lessons learned and information provided in this program are designed to be delivered through the instructional technique of “Learning by Questioning.” These instructional materials are provided as guidance to foster a deeper understanding of the topic and develop critical thinking skills and processes that will assist responders in identifying key considerations related to the planning, management and response to rail incidents involving high hazard flammable trains. Questions or comments can be submitted using the feedback button found on the website.
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0.0 Introduction

**Course Outline**

- 0.0 Introduction
- 1.0 Pre-Incident Planning and Preparedness
- 2.0 Incident Management Principles
- 3.0 Problem Identification
- 4.0 Hazard Assessment and Risk Evaluation
- 5.0 Select Proper PPE Clothing and Equipment
- 6.0 Logistics and Resource Management
- 7.0 Select and Implement Response Objectives
- 8.0 Clean-up and Post-Emergency Operations
- 9.0 Scenarios

**Objectives**

1. Outline planning and response considerations related to rail incidents involving Hazard Class 3 flammable liquids such as ethanol and crude oil.
2. Describe the physical and chemical characteristics of ethanol and crude oil.
3. Identify the key considerations associated with planning for and responding to incidents involving the transportation of flammable liquids by rail.
4. Describe the basic safety procedures to use when working in a railroad environment.

**Lesson**

**TRIPR Program Overview**

The Transportation Rail Incident Preparedness and Response High Hazard Flammable Trains resource materials provide critical information on best practices related to rail incidents involving Hazard Class 3 flammable liquids such as petroleum crude oil and ethanol. A key component of this initiative is to learn from past experiences and to leverage the expertise of public safety agencies, rail carriers, and industry subject matter experts in order to prepare first responders to safely manage rail incidents involving commodities such as crude oil and ethanol. The information and resources found in the TRIPR modules and scenarios supplement the information outlined in the
“Commodities Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil.”

This U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) led program resulted from collaborative efforts to expand awareness on incident management lessons learned related to rail incidents involving Hazard Class 3 flammable liquids such as ethanol and crude oil. These resources offer a flexible approach to increasing awareness of first responders and emergency services personnel in pre-incident planning and response. The resources supplied are not intended to be a standalone training program but are offered to supplement existing programs.

**Production and Rail Transport (Crude)**

Rail shipments of crude oil from shale reserves in states such as North Dakota and Colorado typically use High Hazard Flammable Liquid Unit Trains (HHFT). Each tank car carries approximately 30,000 gallons of this product.

According to the final rule issued on May 1, 2015, a HHFT is “A continuous block of 20 or more tank cars loaded with a flammable liquid or 35 or more tank cars loaded with a flammable liquid dispersed through a train.” Derailments involving high hazard flammable trains will typically be complex events, and will generate significant incident management issues. Derailments involving HHFTs will typically be complex events and will generate significant incident management issues. For example, given the usual length of these trains (over a mile long), derailments can cause road closures, create significant detours, and require response from more than one direction to access the scene of the incident.

**Safe Rail Transportation**

Despite the hazard in rail transport of Hazard Class 3 flammable liquids, the overall safety statistics show that most hazardous materials reach their destination without a release due to an accident. Even though rail transportation has never been safer, response partners need to be prepared and informed in the unlikely event that an incident does occur.
Crude Oil Characteristics

Petroleum Crude Oil
Sweet
CAS No. 8002-05-9
UN1267
DOT Hazard Class 3
FLAMMABLE LIQUID
Hazard Rating = High
ERG Guide No. 128

This placard indicates “Sweet” crude oil. This crude oil is considered “light, sweet crude” because of its low sulfur content. Light, sweet crude oil is typically assigned a DOT Packing Group I or II classification in accordance with Federal regulations. These packing groups mean that the material’s flash point is below 73 F (22.7 C); for Packing Group I materials, the boiling point is below 95 F (35 C). This means the materials pose significant fire risk if released from the package during an accident.

Petroleum Crude Oil
Sour
CAS No. 8002-05-9
UN3494
DOT Hazard Class 3
FLAMMABLE LIQUID
Hazard Rating = High
ERG Guide No. 131

This type of crude oil is considered “Sour” because of its higher content of Sulfur. The high Sulfur content makes this crude oil a potential toxicity hazard.

There are two other characteristics of crude oil that are useful to understand in a response. The first is viscosity, the second is specific gravity. Understanding these characteristics is important because they will help determine how the crude oil will behave if it is released to the environment.

The oil’s viscosity tells us how easily it will flow. Oils with higher viscosity are more likely to sit on land surface, while less viscous oils are more likely to flow through the surface. Because temperature has a major effect on a liquid’s viscosity, fluid viscosity is measured with temperature. The size of the liquid’s molecules will also affect the liquids viscosity. Think about putting a spoon in a jar of maple syrup at
room temperature - moving the spoon around requires more force than moving a spoon in a cup of coffee; but if you heat the jar of maple syrup, the spoon is much easier to move.

<table>
<thead>
<tr>
<th>Liquid @ 68° F</th>
<th>Viscosity (cP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1</td>
</tr>
<tr>
<td>Crude Oil (sg = 0.855)</td>
<td>7.5</td>
</tr>
<tr>
<td>Olive Oil</td>
<td>84</td>
</tr>
<tr>
<td>Light Machine Oil</td>
<td>102</td>
</tr>
<tr>
<td>Pancake Syrup</td>
<td>2,500</td>
</tr>
<tr>
<td>Ketchup</td>
<td>50,000</td>
</tr>
<tr>
<td>Peanut Butter</td>
<td>250,000</td>
</tr>
<tr>
<td>Tar or Pitch</td>
<td>30,000,000,000</td>
</tr>
</tbody>
</table>

A crude oil’s viscosity will determine how it might flow, but the crude oil’s specific gravity will compare its weight to water. This is an important property in emergency response – especially a response that may potentially involve a waterway, because whether or not the oil will float on water will determine response strategies. If the crude has a specific gravity of less than one, it will float on top of the water (it is also likely to be less viscous). If it has a specific gravity of greater than one, it will sink below the water. This is for the majority of specific oils.
**Hazard Summary Crude Oil**

Be aware of the product’s physical and chemical properties. Specific characteristics and composition of petroleum crude oil may vary between oilfields and between wells in the same oil reservoir. Behavior of crude oil may vary from that of gasoline (lighter/sweet crude oils) to diesel fuel (heavier/sour crude oils). There may be vapor released from the spilled and released product. Air monitoring is key to assessing the hazards at the incident site.

Expect to work in and around flammable atmospheres during the response. The more volatile materials in crude oil may be present in the air in high concentrations, creating an inhalation hazard. Some hazardous combustion and decomposition products include Carbon Monoxide, Nitrous Oxides, Sulfur Oxides, and Aldehydes.

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**Ethanol Characteristics**

**Ethanol**
Ethanol/Denatured Fuel Ethanol/ Ethanol Gasoline Mixture
UN1170, 1987, 3475
DOT Hazard Class 3
FLAMMABLE LIQUID
Hazard Rating = High
ERG Guide No. 127, 128

**Hazard Summary Ethanol**

Ethanol, under any of its four shipping names, is a flammable liquid – treat it as such. Like gasoline, denatured fuel ethanol’s greatest hazard as a motor fuel component is its flammability. It has a wider flammable range than gasoline (Lower Explosive Limit (LEL) is 3 percent and Upper Explosive Limit (UEL) is 19 percent). The flame and smoke from neat ethanol fires are not easily visible. Neat ethanol does not produce visible smoke and has a hard-to-see blue flame. However, ancillary materials involved in the fire produce smoke and flame. In a denatured form there is very little smoke, but a clearly visible orange flame. Because of its ability to burn without visible smoke, it is highly recommended to use a thermal imaging camera to identify whether a flame is truly present or not.

Denatured fuel ethanol is a polar solvent that is water-soluble and has a -5°F flash point and has a vapor density of 1.5, which indicates that it is heavier than air. Consequently, ethanol vapors do not rise, similar to vapors from gasoline which seeks lower altitudes. Denatured fuel ethanol’s specific gravity is
0.79, which indicates it is lighter than water and it has an auto-
ignition temperature of 689°F and a boiling point of 165-175°F.

**Planning Considerations**

Pre-incident planning and preparedness are critical to an effective
response. Well thought out drills and exercises that include the
hazmat shippers, railroads, industry, and response partners in your
community will be valuable sources of response capability
improvement. Establishing mutual aid agreements and robust
response structures prior to an event will be critical to the success of
a responding organization.

Include shippers and rail carriers in your pre-incident planning,
preparedness and coordination of response strategies, as well as
drills and exercises. Tank cars carrying crude oil or ethanol may also be found in general freight
(manifest) trains, made up of shipments of different commodities from different shippers.

Early and frequent communication between first responders and the railroad is critical. Communities
and response agencies must coordinate with the railroads in their area as they develop response plans,
conduct response exercises, and respond to a real world event. Responders must consider any
incompatibilities and reactivities between multiple hazardous materials in a manifest train incident. For
example, ethanol (ethyl alcohol) released from a rail car in a derailment should be kept away from
strong oxidizers.

**Response Considerations**

Response to unit train derailments of crude oil or ethanol requires specialized outside sources that may
not arrive at the scene for hours. Contact the railroad as soon as possible. In the event of an incident, it
may be a challenge to obtain necessary resources to safely and effectively extinguish a fire or control a
spill.

**Basic Railroad Safety**

Working on or around tracks is inherently dangerous. Here are a
few basic safety tips to ensure responder safety at the scene of a
rail response:

- Expect a train or rail equipment to move on any track from
either direction at any time.
- Watch for movement in both directions before crossing
tracks.
- Always contact the railroad to advise them of your
presence – they may not know you are on-scene...or that
they have a problem.
- Work with the railroad to ensure the track is red flagged –
the railroad’s means of providing protection by their
lockout-tag out process.
• Never put your feet on movable parts of a rail car, such as couplers, sliding sills or uncoupling levers.
• Never move equipment across tracks unless you are at an established road crossing or under the supervision of a railroad representative.
• Rail equipment ladders often curve around the profile of the car and the first step up is a long way off the ground. When stepping down from the last rung, DO NOT JUMP.
• A good plan is to use your own ladders. Block the feet and tie off all ladders at the top.

Summary

In this lesson we presented the following information:

• Planning and response considerations related to rail incidents involving Hazard Class 3 flammable liquids such as ethanol and crude oil
• Physical and chemical characteristics of ethanol and crude oil
• Key considerations associated with planning for and responding to incidents involving the transportation of flammable liquids by rail
• Basic safety procedures to use when working in a railroad environment

Resources and References

1.0 Pre-Incident Planning and Preparedness

**Objectives**

1. Explain the importance of pre-incident planning and preparedness.
2. Identify agencies and organizations that could provide technical assistance for enhancements to the community’s Emergency Response Plan.
3. Discuss the elements that should be included in an Oil Spill Hazmat Annex.

**Lesson**

**Pre-Incident Planning**

Pre-incident planning is required by federal law under the Emergency Planning and Community Right-to-Know Act (EPCRA). As well as being required by law, it helps establish relationships with other agencies prior to response; it requires facilities to report types and quantities of certain hazardous materials in a community; and results in responders being better prepared to deal with a major incident in their community.

EPCRA came into being in 1986 as a part of the Superfund Amendment and Reauthorization Act (SARA). It is often called “SARA Title III.” EPCRA also required the establishment of state/tribe emergency response commissions (SERCs/TERCs); in turn, SERCs/TERCs are responsible for appointing local emergency planning committees (LEPCs).

The Association of American Railroads (AAR) published circular OT-55N in August 2013. Section V of the circular directs AAR member railroads to provide information about hazardous commodities transiting a given community/area: in part, “Upon written request, AAR members will provide bona fide emergency response agencies or planning groups with specific commodity flow information covering at a minimum the top 25 hazardous commodities transported through the community in rank order.”

On May 7, 2014, the DOT issued an Emergency Restriction/Prohibition Order, Docket No. DOT-OST-2014-0067. In part, the Order requires any railroad carriers “who transport 1,000,000 gallons or more of crude oil in a single train in commerce within the United States... provide certain information in writing.
to the SERC in each state in which the railroad carrier operates trains transporting 1,000,000 gallons or more of crude oil.”

The notification must:

- Provide a reasonable estimate of the number of trains operating through each county in the state,
- Identify and describe petroleum crude oil expected to be transported,
- Provide applicable emergency response information required by 49 CFR part 172, Subpart G, and
- Identify routes over which material will be transported.

LEPCs are required to update their plans annually and must:

- Identify facilities and transportation routes of extremely hazardous substances;
- Describe emergency response procedures, on and off site;
- Designate a community coordinator and facility coordinator(s) to implement the plan;
- Outline emergency notification procedures;
- Describe how to determine the probable affected area and population by releases;
- Describe local emergency equipment and facilities and the persons responsible for them;
- Outline evacuation plans;
- Provide a training program for emergency responders (including schedules); and,
- Provide methods and schedules for exercising emergency response plans.

National Contingency Plan

The Oil and Hazardous Substances National Contingency Plan (NCP) and the National Response System (NRS) describe the promulgated federal regulation for response to oil and hazardous substance discharges are to be coordinated by the federal response agencies such as the United States Environmental Protection Agency and the United States Coast Guard.

The NCP emphasizes the importance of contingency planning and requires EPA and USCG Federal On-Scene Coordinators (FOSCs) to implement Area Contingency Planning across their national jurisdictions. Area Contingency Plans (ACPs) and Area Committees are comprised of local, State, Tribal, and federal agencies as well as major industry entities (pipelines, energy, manufacturing). Area Committees work together to ensure that discharge scenarios within their areas are described in the ACPs and that response planning provisions directed at those specific scenarios are developed and practiced in drills and exercises. These planning efforts and coordination can be a valuable element to add to pre-incident planning tool kit.

Organizations in a Position to Help

Collaboration is important in constructing a pre-incident game plan. Federal Agencies that will assist in pre-incident planning include but are not limited to:

- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- Federal Railroad Administration (FRA)
- U.S. Coast Guard (USCG)
- U.S. Environmental Protection Agency (EPA)
- National Response Teams (NRT) & Regional Response Teams (RRT)

Public Safety Organizations and Industries that have resources that will assist in pre-incident planning include but are not limited to:

- Transportation Community Awareness and Emergency Response (TRANSCAER®)
- Association of American Railroads (AAR)
- American Petroleum Institute (API)
- Renewable Fuels Association (RFA)
- Class I, II & III Railroads moving hazardous materials through a community

Other important organizations that you will need to coordinate pre-incident planning with include but are not limited to:

- State Emergency Response Commission (SERC)
- Local Emergency Planning Committee (LEPC)
- State Departments of Emergency Management and Environmental Protection
- State On-Scene Coordinators
- Local businesses and plants shipping, using, or receiving hazardous materials in bulk/large quantities

**Contact Information**

To find an LEPC, contact the SERC. The SERC is responsible for implementing EPCRA provisions within its state. These requirements include reviewing local emergency response plans, designating local emergency response planning districts, and appointing LEPCS. The following link serves as a resource to find the SERC contact in a particular state: [http://www2.epa.gov/epcra/state-emergency-response-commissions-contacts](http://www2.epa.gov/epcra/state-emergency-response-commissions-contacts).

<table>
<thead>
<tr>
<th>Class I Rail Carrier Emergency Operations Center Contacts</th>
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<tbody>
<tr>
<td>BNSF Railway</td>
<td>(800) 832-5452</td>
</tr>
<tr>
<td>Canadian National (CN) Railway</td>
<td>(800) 465-9239</td>
</tr>
<tr>
<td>Canadian Pacific (CP) Railway</td>
<td>(800) 716-9132</td>
</tr>
<tr>
<td>CSX Transportation</td>
<td>(800) 232-0144</td>
</tr>
<tr>
<td>Kansas City Southern (KCS) Rail Network</td>
<td>(877) 892-6295</td>
</tr>
<tr>
<td>Norfolk Southern (NS) Railroad</td>
<td>(800) 453-2530</td>
</tr>
<tr>
<td>Union Pacific (UP) Railroad</td>
<td>(888) 877-7267</td>
</tr>
</tbody>
</table>
Emergency Response Telephone Numbers

<table>
<thead>
<tr>
<th>Agency</th>
<th>Phone Number</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEMTREC®</td>
<td>(800) 424-9300</td>
<td></td>
</tr>
<tr>
<td>CHEMTEL, INC</td>
<td>(888) 255-3924</td>
<td></td>
</tr>
<tr>
<td>INFORTRAC</td>
<td>(800) 535-5053</td>
<td></td>
</tr>
<tr>
<td>3E Company</td>
<td>(800) 451-8346</td>
<td></td>
</tr>
<tr>
<td>NRC</td>
<td>(800) 424-8802</td>
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**Hazmat Oil Spill Annex**

Emergency response plans and procedures should be developed in close coordination with the railroad since they will play a critical role in response and recovery operations. Tests and drills should be conducted to exercise the plan at regular intervals to identify any issues that might require corrective action prior to an actual incident.

Ensure that the Oil Spill Hazmat Annex has considered railroad emergency response to include:

- Hazard analysis that identifies the potential risks to people and property
- Emergency contact lists
- Resource listings
- Equipment inventories
- Foam and water supply requirements for operations at remote sites
- Incident management system roles and responsibilities
- Mutual aid response assets
- Law enforcement scene security and control operations
- Support and recovery assets
Reference Sheet and Lessons Learned

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about pre-incident planning and preparedness?

☑️ Emergency responders should determine the rail carriers of hazardous materials moving through their communities and ascertain if crude oil is one of the products being transported. This can be accomplished by contacting the individual rail carrier and requesting a list of the hazardous commodities transported through the community via the Association of American Railroads (AAR) Circular No. OT-55 protocol. This information can assist in preparing emergency response plans and procedures.

☑️ Emergency responders should also contact the railroads to identify appropriate points-of-contact and the railroad’s hazardous materials response personnel that they are likely to interface with during an emergency. This can help to establish lines of communication and access to information and resources prior to an incident. The railroads can also provide extensive rail-specific emergency response training at no cost to emergency responders. Information may be obtained via the railroad’s web site or by contacting their media/public relations department.

☑️ Emergency responders should identify the appropriate 24-hour emergency contact numbers for the major (Class I) railroads and ensure they are listed in their emergency operations and response plans.

☑️ Emergency responders should establish contact with their state and local environmental protection agency representative(s) to identify potential air monitoring and spill control resource capabilities. These resources should be included in the organization’s emergency response plan.

☑️ Emergency responders should contact federal agencies such as the U.S. Coast Guard to determine the level of assistance that may be provided in the event of a spill in navigable waterways located in their jurisdiction. This resource, as well as other federal resources, can be contacted through the National Response Center (NRC) at 1-800-424-8802.

☑️ Organizations should include an Oil Spill Hazmat Annex in their emergency response plan that specifically addresses crude oil rail transportation emergency response operations. This annex should include:

- Hazard analysis that identifies the potential risks to people and property
- Emergency contact lists
- Resource listings
- Equipment inventories
- Foam and water supply requirements for operations at remote sites

LESSON LEARNED & RESPONDER TIPS

- Pre-incident planning and communication with all organizations, specifically shippers and carriers, is essential to learn about the products being transported and the availability of emergency response resources.

- Emergency response and public safety organizations need to understand capabilities and capacity to effectively manage an incident of this magnitude.

- Traditional structural firefighting strategy and tactics may not be effective in these situations; they need to be approached and managed as hazardous materials incidents and this concept needs to be reinforced in emergency response plans, procedures and training programs.
• Incident management system roles and responsibilities
• Mutual aid response assets
• Law enforcement scene security and control operations
• Support and recovery assets

**Summary**

In this lesson we presented the following information:

- The importance of pre-incident planning
- Agencies in place to assist in pre-incident planning
- Elements that should be included in an Oil Spill Hazmat Annex

**Resources and References**

1. API-AAR. *Response Safety Course: Crude Oil by Rail.*
3. CSX Transportation. *Emergency Response to Unit Train Incidents.*
7. U.S. DOT PHMSA. *Commodity Preparedness and Incident Management Best Practices – Crude Oil Transportation Emergency Response.*
2.0 Incident Management Principles

Objectives

1. Describe the critical tasks pertaining to initial site management and control in managing the response to a transportation accident involving Hazard Class 3 flammable liquids, such as crude oil and ethanol by rail.

2. Identify the key command and general staff positions that would be utilized for a rail incident and apply the National Incident Management System (NIMS) Incident Command System (ICS) as a framework to manage the event.

3. Describe how an All-Hazards Incident Management Team (AHIMT) may be used as a resource for managing large scale and complex incidents.

Lesson

National Incident Management System

The National Incident Management System (NIMS) establishes a scalable, flexible, and adaptable set of processes and procedures that emergency responders will use to conduct response operations. NIMS enables responders at all levels to work together more effectively and efficiently to manage events. NIMS provides a consistent framework for incident management at all jurisdictional levels regardless of the cause, size, or complexity of the incident. NIMS is not an operational incident management or resource allocation plan. The major components of NIMS are resource management, command and coordination, and communications and information management.

NIMS is a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work together seamlessly and manage incidents involving all threats and hazards in order to reduce loss of life and property and harm to the environment.

National Response System

Under the National Response System the US Environmental Protection Agency (USEPA) and the US Coast Guard (USCG):

- Have the authority to lead oil and hazardous substance response and local responders should expect their mobilization.
- Provide technical and contract support to local ICs early in an incident and will be prominent in Unified Command.
- Can direct all Responsible Party response actions.
- Coordinate with affected Tribes and States.
- Can mobilize highly trained Type 1 and 2 Incident Management Teams.
Can request and fund support from other states and federal agencies. (e.g., NOAA, NWS, USFW, OSHA, etc.)

**Incident Management Principles**

Establishing a site specific incident management system is not only an OSHA requirement, it is critical to your success. Tactics rely on local resources, geography, etc. For large, complex events such as these, organizing the use of Incident Management principles is as important as tactical objectives.

Initial site management and control will be a critical benchmark in managing the problem.

- Isolate and secure area/establish secure perimeter
- Communicate restricted area location
- Perform site assessment
- Set up Incident Command Post (ICP)
- Emergency Response Guidebook (ERG) reference will guide you on the best location for initial isolation and protective action zones, as well as the placement of the ICP.
- Follow initial guidance provided by the ERG if practical. Establish a Staging Area for responding equipment and personnel.

Emergency responders should anticipate a large number of liaison agencies operating at the scene (e.g., U.S. Coast Guard, Environmental Protection Agency, National Transportation Safety Board, and private contractors). In addition, nonemergency regional and municipal agencies may have a role to play and need to be integrated into the command structure.

**Incident Command System**

Every incident requires that certain management functions be performed. The problem must be identified and assessed, a plan to deal with it developed and implemented, and the necessary resources identified and deployed.

Five major management functions are the foundation upon which the ICS organization builds. These key Command and General staff functions include:

- Incident Command: Sets the incident objectives, strategies, and priorities. Has overall responsibility for the incident.
- Operations: Conducts operations to reach the incident objectives. Establishes the tactics and directs all operational resources.
- Planning: Tracks resources. Collects and analyzes information. Maintains documentation.
- Logistics: Provides resources and needed services to support the achievement of the incident objectives.
- Finance & Administration: Monitors costs related to the incident. Provides purchasing and accounting support.
The following positions support these Command and General Staff Positions:

- Public Information Officer
- Safety Officer
- Liaison Officer

At a minimum for a complex rail incident, the following NIMS command and general staff positions should be considered:

- Incident Commander
- Safety Officer
- Public Information Officer
- Liaison Officer
- Operations Section
- Planning Section
- Logistics Section
- Finance/Administration Section

ICS allows its users to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents.

**Unified Command**

Unified Command offers a shared understanding of priorities and restrictions. It gives a single set of incident objectives and allows for collaborative strategies. Unified Command gives improved internal and external information flow through reduction of duplication of effort and better resource utilization.

Unified command offers the following advantages:

- A single set of objectives is developed for the entire incident.
- A collective “team” approach is used to develop strategies to achieve incident objectives.
- Information flow and coordination are improved between all jurisdictions and agencies involved in the incident.
- All agencies with responsibility for the incident have an understanding of joint priorities and restrictions.
- No agency’s legal authorities are compromised or neglected.
- The combined efforts of all agencies are optimized as they perform their respective assignments under a single Incident Action Plan.
### Unified Command for Rail Incidents

In the Unified Command structure for a rail event the senior transportation officer or designee will act as the lead Railroad official with the lead local agency Incident Commander, Federal On-Scene Coordinator (EPA/USCG), and the State On-Scene Coordinators (SEOC).

In the Unified Command structure for a rail event, the senior transportation officer or designee will act as the lead Railroad official with the lead agency Incident Commander.

In the event of a large emergency where local, state, and federal responders initiate a UC structure, railroads will place a Senior Transportation Officer of the involved railroad into the UC and integrate its subject matter expertise into the Command and General staff positions as decided by the UC. Railroad resources that will require integration are likely to include:

- Railroad transportation staff
- Mechanical staff
- Engineering and Risk Management (Claims, Environmental, Hazmat, Police)
- Fire control staff and contractors

### Importance of Integrating Railroads

Railroad emergency responders are trained and prepared to operate using NIMS/ICS. Throughout the response to an incident, first responders should follow their incident command protocols. They should be prepared to integrate railroad personnel upon their arrival in order to have a smooth transition to unified command. While some amount of hazard assessment and initial response may take place, it is critical that responders communicate from the beginning with the railroad and recognize their process, resources, and capabilities.
**Railroad Resources**

The National Incident Management System provides the foundation needed to ensure that we can work together when responding to a large event. Using NIMS allows us to work together to prepare for, prevent, respond to, recover from, and mitigate the effects of crude oil rail incidents.

The railroad will integrate its response assets into the public safety NIMS structure. While the exact structure will vary based on the scope and nature of the incident scenario, it will often be integrated as the Railroad Branch within the Operations Section or Logistics Section.

The four major organizational components to a typical railroad response are:

- Transportation: Monitors the network, routes traffic, and schedules trains and crews.
- Mechanical: In charge of all rolling stock (railcars) and locomotives.
- Engineering: In charge of all infrastructure including track, signals, bridges, tunnels, etc.
- Safety or Risk Management: Contains emergency response functions such as police, Hazmat, Environment, Public Affairs, Claims, etc.

This is an example of how the railroad resources may be organized for a response to a rail accident. It will be up to the Unified Command structure to determine how the resources will be organized within the ICS system based upon the incident. Early attention to railroad resource integration will be key to response success.

In order to ensure all the right players are engaged and involved, it is important to include the Railroad into the response structure for a rail accident. Railroad responders understand their roles and have integrated ICS into their response structure. They have trained staff that align their terminology with NIMS. The railroad response functions should be included with the other basic ICS roles under the Unified Command construct.
**Hands on Classroom Activity**

Instructions: Consider a hypothetical situation for a rail incident in your jurisdiction and design a Unified Command Organization. Include key community response personnel and which agencies/organizations in your planning process. Explain how effective communications can be established and maintained across all disciplines, agencies and organizations. Use the space below to sketch your organization chart. Be prepared to explain the primary responsibilities and the position titles included at each level.
Incident Management Teams (IMTs)

Federal, State, and Regional Incident Management Teams (IMT) provide planning, logistics, and incident management support to the IC/UC. Regional and State IMTs have resources and capabilities to assist. USCG and EPA Teams, local responders, and railroad will integrate into an IMT as an incident progresses:

- USEPA and USCG may issue Administrative Orders for major incidents requiring significant resources.
- Federal On-Scene Coordinators (FOSCs) bring trained and experienced IMTs with them when they respond to manage events such as these. FOSCs are also empowered by the NCP to enlist and mobilize other special teams as they determine need. This includes USCG Strike Teams, EPA’s Environmental Response Team, and FEMA’s All Hazards Incident Management Teams (AHIMTs.)

All-Hazards Incident Management Team (AHIMT)

The U.S. Fire Administration (USFA) was tasked to develop an Incident Management Program that would prepare local emergency response personnel to organize and manage the chaos that follows a significant event. The All-Hazards Incident Management Teams (AHIMTs) were developed in response to this request. They merge military, national wildfire, and response organizations’ incident command principles.

AHIMT are valuable resources that can support major disasters and assist local and regional responders. They also have specialized capabilities related to Hazardous Materials, Search and Rescue, Explosive Ordinance Disposal, Tactical Operations, Aviation Units, and Public Safety. Type 1, 2, and 3 AHIMTs are resources at the state, regional, and federal level that can be valuable to emergency planning and preparation activities. It is important to include these resource considerations in your pre-incident planning efforts. If you plan on utilizing these resources, have a plan to request for them and fund them.

Due to the potential size, duration, and complexity of these incidents, ICs should consider the possibility of additional support from regional or state AHIMTs. AHIMTs are multiagency/multijurisdictional teams for extended incidents that are formed and managed at the local, state, or tribal level. They are designated teams of trained personnel from different departments, organizations, agencies, and jurisdictions. AHIMTs are deployed as teams representing multiple disciplines that manage major and/or complex incidents requiring a significant number of local, state, or tribal resources. They do not assume command of the incident; they help local officials manage incidents that extend into multiple operational periods and require a written Incident Action Plan. These incidents can include weather-related disasters, such as a tornado, earthquake or flood, or major hazardous materials incidents, such as train derailments.
What does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about incident management principles?

- Initial site management and control will be a critical benchmark in managing the problem.
- Isolate and secure the area. Establish a secure perimeter and entry control points to prevent unauthorized personnel from entering the scene. This can be accomplished with tape, barricades, traffic cones, or assigned fire service or law enforcement personnel.
- The location of the restricted area should be communicated to all impacted personnel operating on the scene. Begin a site assessment from a safe distance, upwind and uphill. An Incident Command Post (ICP) should be established outside the impacted area as soon as possible.
- Follow initial guidance provided by the Emergency Response Guidebook (ERG) if practical. Establish a Staging Area in the cold zone for responding equipment and personnel.
- The National Incident Management System (NIMS) should be the framework used to manage all incident operations. Information on NIMS can be obtained at http://www.fema.gov/national-incident-management-system. A Unified Command should be established that integrates those agencies and organizations with legal or jurisdictional responsibility. Liaisons should be provided at the ICP by assisting or cooperating agencies to ensure effective communication and coordination of resources.
- Due to the potential size, duration and complexity of these incidents, Incident Commanders should consider the possibility of additional support from regional or state All-Hazards Incident Management Teams (AHIMTs).
- Emergency responders should anticipate a large number of liaison agencies operating at the scene (e.g., U.S. Coast Guard, Environmental Protection Agency, National Transportation Safety Board, Chemical Safety Board, private contractors). In addition, non-emergency regional and municipal agencies may have a role to play and need to be integrated into the command structure.
- The railroad will integrate its response assets into the public safety NIMS structure. While the exact structure will vary based on the scope and nature of the incident scenario, it will often be integrated as the Railroad Branch within the Operations Section.
- Complex incidents may require activation of the jurisdiction’s Emergency Operations Center (EOC). The EOC should be fully staffed and the roles and responsibilities of all participating agencies must be clearly defined in the organization’s emergency response plan.

**Reference Sheet and Lessons Learned**

**LESSON LEARNED & RESPONDER TIPS**

- All agencies involved in emergency response operations need to understand NIMS, their specific role within NIMS, and must have a representative assigned to the Incident Command Post to facilitate communications and coordination with all response assets.
- A true Unified Command Structure is essential for managing incidents of this magnitude.
Summary

In this lesson we presented the following information:

- How to identify tasks pertaining to initial site command and control in managing the response to a transportation accident involving hazardous products such as crude oil and ethanol by rail
- Identification of the key command and general staff positions that would be utilized for a rail incident and application of the National Incident Management System (NIMS) Incident Command System (ICS) as a framework to manage events
- How an All-Hazards Incident Management Team (AHIMT) may be used as a resource for managing large scale and complex crude oil rail incidents

Resources and References

Objectives

1. Recognize, identify, and verify the presence of hazardous materials and the extent of the problem.
2. Determine the identity of the rail carrier involved.
3. Identify the critical information that needs to be gathered and forwarded to the railroad.
4. Identify options for determining wind and weather conditions affecting the incident and how weather conditions may affect the spilled and/or released commodity.

Lesson

General Service Tank Cars

These are the key features which help prevent the release of contents when a railcar is damaged in an accident. The following slides identifies some of the typical features of a DOT 111 general service tank car. High Hazard Class 3 Flammable liquids are also transported in CPC-1232 tanks cars. All new general service tank cars constructed after October 2015 must be built to the new DOT-117 specification, and over the next 5-10 years all tank cars used will be either retrofitted to an enhanced CPC-1232 standard or replaced with the new DOT-117 tank car. Contact your railroad personnel for detailed information about a tank car.
DOT 117 Specification Car:

- Full-height ½ inch thick head shield
- Tank shell thickness increased to 9/16 inch minimum TC-128 Grade B, normalized steel
- Thermal protection
- Minimum 11-gauge jacket
- Top fittings protection
- Enhanced bottom outlet handle design to prevent unintended actuation during a train accident

**Container Information**

All information related to an individual rail car is referenced by use of the car initials and number known as the ‘reporting marks.’ The car’s initials and numbers are stenciled on both left-hand sides on the car (facing the car) and on both ends of the car. Additionally, placards must be placed on the right-hand sides of the car (facing the car) and on both ends of the car.

**Identify the Problem**

It is important to recognize, identify, and verify the presence of hazardous materials at the incident site. Consider the following when trying to identify the type of hazardous material:

- Container shapes
- Container reporting marks and numbers
- Placards
- UN identification numbers
- Train consist
- Direct reading instruments
- Your senses
The following link contains information about hazardous materials markings, labeling, and placarding:


**Railroad Shipping Papers**

Railroad shipping papers and consists are used to aid in your size up and hazard assessment. The following is a list of critical information that can be gathered from these documents:

- Lists all the locomotives and cars in the order they are on the train.
  - **NOTE:** The upper box of shipping papers states whether trains are listed from front to back or back to front.
- The Conductor in the lead locomotive will have the consist.
- The Conductor can help you decode the consist.
- Consist can also be obtained by contacting the railroads’ 24-hour emergency number.
- List of all the cars, in order, on the train (list may begin with rear of train and move forward!)
- Sequentially listed followed by the car initials and number.
- Identify cars transporting hazardous materials.
- Look for the box of asterisks.
- Box of asterisks may have wording (i.e. ‘hazmat’, ‘dangerous’, ‘flammable’, etc.) or may be empty.
- Provide DOT shipping information.
• Package type (TC = Tank Car).
• 4 digit identification (UN/NA) number (1267 for a majority of crude oil/1170 or 1987 for Ethanol).
• Proper shipping name (Petroleum Crude Oil, Denatured Ethanol or Ethyl Alcohol)
• Hazard class (3 – flammable for crude oil)
• Packing group (PG I or II or III for crude oil)
• Provide 24-hour emergency contact number for the shipper of the material

**Verify the Hazmat**

Compare the railroad shipping papers to the cars in the train to verify information. In this example, car number 20 on the sequential list of cars is car number CBTX 743308 which matches the car number stencil on the car. The identification number, proper shipping name, and hazard class should match the placard. In this case, the red flammable liquid, class 3 placard with the numbers 1267 correlate with the shipping papers. There are various locations on tank cars where you may find the reporting marks and placards including both sides and both ends. Reporting marks may also be present on the tops and bottoms of tank cars.
Scene Size Up
When attempting to size up a scene, responders should:

- Locate ID numbers, placards, markings, and labels
- Identify and verify the hazmat
- Identify rail carrier, locate crew, and obtain train consist
- Have rail carrier stop train traffic
- Look for above ground and buried utilities within the rail corridor

Recognize, identify, and verify the presence of hazardous materials at the incident site using container shapes, container reporting marks and numbers, placards, UN identification numbers, train consist, direct reading instruments, and your senses.

Who Owns This Track?
Determine the rail carrier:

- Process starts before the incident
- Understand the Emergency Response Plan
- Talk with the train crew
- Report numbers in tank cars

Ask Rail
AskRail™ is a free mobile application that provides immediate access to accurate, near real-time information about railcars carrying hazardous materials on a train. It serves emergency responders who arrive first to the scene of a rail incident and helps them make informed decisions about how to respond.
to a rail incident. The app has two levels of functionality, depending on user permission: Single Car Lookup and Consist Lookup.

To gain access click the following link and request an account:

https://askrail.us

Critical Information to Pass On
Critical information for responders to pass on to the rail carrier:

- Extent of the damage seen
- Topography of the incident area
- Current weather conditions
- If photos can be taken and transmitted electronically, do so
- Any downed power or signal/communication lines, buried utilities or above ground switch heating systems

What’s the Weather?
Weather, as well as terrain, will drive where any spilled/released product will go. Monitor wind and weather conditions affecting the incident and determine how these factors influence the path of spilled/released commodity.

EPA and USCG FOSCs can arrange for sophisticated dispersion modeling plume information through the Defense Threat Reduction Agency (DTRA). These models can provide quickly and can be updated as weather conditions change and are integrated into a GIS viewer with population and sensitive receptor data. The National Oceanic and Atmospheric Administration (NOAA) on behalf of USCG can provide plume dispersion modeling for air inquiries and oil trajectory modeling for spills which occur along a navigable water or riverbed.
What does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about problem identification?

✓ Identify, confirm, and verify the presence of the hazardous material(s) and the extent of the problem. This can be done through shipping papers (i.e., train consist), placards, labels, container shapes, markings/colors and senses (e.g., observable plume).

✓ Identify the rail carrier and locate the train crew. The conductor will have the complete train consist immediately available at the scene. Maintain contact with the conductor and crew until they are relieved by a railroad official(s).

✓ Notify the rail carrier’s emergency operations center to have rail traffic stopped to avoid entering the location of the incident to avoid further risk to personnel operating at the scene. Request that a copy of the train consist or wheel report be sent to the ICP.

✓ Responding railroad officials may also have copies of the train consist. In the absence of shipping papers, emergency responders should use binoculars from a safe distance upwind, and try to locate any 4-digit identification numbers on the placards (or orange panels) displayed on the rail cars. If shipping papers, placards, markings, or labels are destroyed, the reporting marks and number on the railcar can be used to identify the commodities present.

✓ When contacting the railroad, provide the following information:
  • Your name, location, organization name and telephone number
  • Location of incident (provide the railroad with the DOT Crossing Number or the railroad milepost so the specific location can be identified)
  • Type and number of containers involved
  • Presence of markings, labels, reporting marks or placards on tank car
  • Presence of smoke, fire or spill
  • Extent of damage
  • Topography
  • Weather conditions
  • If pictures can be taken from a safe position, do so and send to a railroad representative as quickly as possible

✓ Be aware of utilities that commonly run next to or in the railroad right-of-way. As part of your scene size up, look for downed signal and communication lines, power lines, buried utilities and above ground switch heating systems.
In this lesson we presented the following information:

- How to recognize, identify, and verify the presence of hazardous materials and the extent of the problem
- How to determine the identity of the rail carrier involved
- Identification of the critical information that needs to be gathered and forwarded to the railroad
- Options for determining wind and weather conditions affecting the incident and how weather conditions may affect the spilled and/or released commodity

### Resources and References

1. 2-3 Safety Data Sheets/Material Safety Data Sheets (SDS/MSDS) for Petroleum Crude Oil/UN1267 and Ethanol/UN 1170
2. API-AAR. *Response Safety Course: Crude Oil by Rail.*
4.0 Hazard Assessment and Risk Evaluation

Objectives

1. Identify the factors that should be considered as part of the hazard assessment and risk evaluation process in managing an incident involving a high hazard flammable train.
2. Given the Department of Transportation (DOT) Emergency Response Guidebook (ERG), NIOSH Pocket Guide to Chemical Hazards, shipping papers/train consists or a Safety Data Sheets (SDS), locate the appropriate hazard information needed as part of the risk evaluation process.
3. Describe the factors to be considered in predicting the behavior of both the product and its container based on current and forecasted incident scene conditions.

Lesson

Basic Principles

Responders must understand the difference between a hazard and a risk.

- **Hazard:** A physical condition or practice that has potential for causing harm or adverse effects
- **Risk:** The probability for harm/adverse effects to occur from an exposure to the hazard

Use every identification and analysis tool at your disposal. Every hazard identified on scene presents a risk to responders.

Risk-Based Response Process

The Risk-Based Response Process is a systematic process by which responders:

- Analyze a problem involving hazmat
- Assess the hazards
- Evaluate the potential consequences
- Determine the appropriate response actions based upon facts, science, and the circumstances of the incident

Assessing the Hazards

Size up and assess the scene from a distance first. Identify UN/NA numbers, placards, orange panels, and container markings. When a safe assessment is made, approach the scene and identify shipping papers, train crew, and direct reading instruments. A few sources for hazard information are the DOT Emergency Response Guidebook.
The initial focus will be on the safety of responders involved in an incident and with the immediately and directly exposed public at the scene. Following this initial focus, the impact and potential impact to the downstream community and environment through identification of population centers, schools, nursing homes, etc., waterways, critical infrastructure (water, sewer, power) will be the next priority. This is all especially relevant when making determinations about offensive/defensive strategies.

Use hazard information sources to identify the hazards faced such as toxicity, flammability, corrosivity, reactivity, and radioactivity. Hazard consideration for the public health include air monitoring, water monitoring, downstream water intakes, and aquatic life.

**Evaluating the Risks**

Risk levels will vary from incident to incident and hour to hour. Factors affecting the risk include physical and chemical properties of the product involved, quantity of material, design and construction features of the container, proximity of exposures, surrounding environment and terrain, and available resources. Identify the condition and behavior of the container and tank car(s). Look for any mechanical stress as well as thermal stress such as fire.

When a container is breached and a product is released look for spill travel, vapor production, fire, and smoke. Secondary considerations are sharp, jagged metal, unstable rail cars, track and ballast, adjacent tracks, moving rail traffic, and utilities within the right of way.

Initial considerations to help estimate the potential impacts and consequences of the problem:

- How much product has been released and type of release?
- Where is the product going?
- Is the product on fire?
- Are other tank cars at risk of becoming involved?
- Are pressure relief devices actuated?
- Does the responder have the capability to safely apply cooling streams?
- Are adequate water/foam supplies and equipment available and can the flows be sustained?

Every incident will arrive at some outcome, whether responders intervene or not. The responder’s goal is to favorably change or influence the outcome of the incident. If responders cannot favorably change the natural outcome, defensive or non-intervention strategies may be the best option.
Non-pressurized tank cars in derailment scenarios involving intense pool fires or torch fires may be subject to container breach/failure through heat induced tears. In some incidents, these container breaches and failures have occurred within 20 minutes or less. This container behavior is a highly variable and unpredictable phenomenon. Emergency responders must be aware of this phenomenon and avoid rushing into heavy fire scenarios.

Key factors and information that should be integrated into the hazard and risk evaluation process include:

- Findings from the risk evaluation process must be shared between railroad and local responders.
- The majority of non-pressurized tank cars used for the transportation of flammable liquids are non-insulated tank cars.
- Non-pressurized tank cars involved in intense pool fires or torch fires are subject to heat induced tears. This can lead to a cascading sequence of events where the initial tank car failure leads to additional and multiple secondary fires and container failures.
- Container failure scenarios involving non-pressurized tank cars will have both similarities and differences from BLEVE scenarios involving pressurized containers. Similarities are the massive fireball and high levels of radiant heat that will occur in close proximity to the derailment scene. However, container tearing and fragmentation of non-pressurized tank cars has not been observed.
- Isolation perimeters and public protective action recommendations must consider the potential high levels of thermal and radiant heat.

Light sweet crude oil vaporizes much more quickly than other crude oils. This type of crude oil contains more light ends, it is more flammable, and more volatile than other crude oils. It is important to consider Air Monitoring to evaluate the risk and PPE requirements for your responders, the surrounding environment, and exposures.
When responding to a rail incident involving a Hazard Class 3 flammable liquids such as crude oil, the air monitoring for the following should be considered:

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<th>Spill:</th>
<th>Fire:</th>
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<tr>
<td>O₂</td>
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<td>Explosive Levels (LEL/UEL)</td>
<td>Carbon Monoxide</td>
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<td>H₂S</td>
<td>Explosive Levels (LEL/UEL)</td>
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<td>Sulfur and Nitrogen Oxides</td>
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<td>Particulates (smoke)</td>
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**Reference Sheet and Lessons Learned**

What does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about a Hazard Assessment and Risk Evaluation?

- The hazard assessment and risk evaluation process is a critical step to identify the level of danger posed by an incident involving the product(s), containers and their behavior, which is generally related to their physical and chemical properties.
- Risks refer to the probability of suffering harm or loss and are different at each incident and need to be evaluated by the Incident Commander.
- Emergency responders can use a number of reference materials such as the ERG, Safety Data Sheets (SDSs), and technical specialists available by contacting the shipper or railroad, or contacting the Chemical Transportation Emergency Center (CHEMTREC®) at 1-800-424-9300, or the 24-hour emergency contact telephone number required to be included on the shipping papers by the federal hazardous materials regulations.
- Evaluate the risks of personnel intervening directly in the incident. Consider the limitations of the people involved and the ability to have adequate resources available on site (e.g., sufficient firefighting foam concentrate, water supplies, appliances, equipment, trained personnel and technical expertise) and the ability to sustain operations for extended periods of time (hours or days).
- The level of risk will be influenced by the following factors:
  - Hazardous nature of the material(s) involved
  - Quantity of the material(s) involved
  - Type(s) of stress applied to the container and breach / release scenarios
  - Proximity of exposures and nature of terrain
  - Level of available resources (e.g., adequate foam supply, location of foam supply, response time and appliances/equipment)
Emergency response personnel need to consider the following factors that may influence the behavior of a hazardous material:

- Inherent properties and quantity of the material
- Design characteristics of the container
- Environmental factors (e.g., weather, topography, surrounding physical structures)

The following factors should be considered to help estimate the potential impact of the problem:

- Has the container been breached? If so, is product flowing?
- Where will the container and its contents go if released?
- Why are the container and its contents likely to go there?
- How will the container and its contents get there?
- When will the container and its contents get there?
- What harm will the container and its contents cause when they get there?
- How much material has been released? What is the proximity of the release to people, property and the environment?
- Is the material on fire? Are other tank cars at risk of becoming involved?
- Do you have the capability of successfully controlling fire spread, which in some cases may require a minimum of approximately 500 gallons per minute per exposed tank car?

Summary

In this lesson we presented the following information:

- Factors that should be considered as part of the hazard assessment and risk evaluation process in managing an incident involving a high hazard flammable train
- How to utilize the appropriate hazard information found in the Department of Transportation (DOT) Emergency Response Guidebook (ERG), NIOSH Pocket Guide to Chemical Hazards, shipping papers/train consists or a Safety Data Sheets (SDS)
- The factors to be considered in predicting the behavior of both the product and its container based on current and forecasted incident scene conditions

LESSON LEARNED & RESPONDER TIPS

- Do not underestimate the type of capabilities and resources that may be required in the first hour of a major derailment and fire scenario.
- If you don’t have the response resources to initiate and sustain an operation, then do not attempt any offensive operation.
- Life safety and exposure protection should be the priority.
- Responders will need product-specific data for decision-making when dealing with crude oil derailment scenarios.
Resources and References

3. Safety Data Sheets (SDS) for crude oil/UN1267 (various)
4. Sample train consists/wheel reports
5.0 Select Proper Personal Protective Clothing & Equipment

**Objectives**

1. Explain the importance of Personal Protective Clothing and Equipment (PPE) commonly used in incidents involving Hazard Class 3 flammable liquids such as crude oil or ethanol.
2. Outline PPE requirements and considerations for incidents involving Hazard Class 3 flammable liquids such as crude oil or ethanol.
3. Review resources and references to assist in selection.

**Lesson**

**Why Do You Need PPE?**

The use of Personal Protective Clothing and Equipment is required by 29 CFR 1910.120 and 29 CFR 1910.134. PPE is used to protect responders from fire, smoke, and vapors found at a derailment incident that are significant threats to the health of responders. National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) recommend against unprotected exposure of all skin to crude oil, dispersants, and other chemicals at the scene.

Structural firefighting protective clothing (SFPC) is acceptable skin, foot, and head protection in the initial stages of response. Self-contained breathing apparatus (SCBA) provides adequate face, eye, and respiratory protection.

**PPE Selection**

When selecting PPE, here are a few things that should be considered:

- Physical form of the contaminant (vapor, liquid, solid)
- Contaminant(s) identified or not
- Contaminant concentrations known or unknown
- Purpose and duration of response operations – fire vs. spill
- Operating conditions and environment (temperature, day/night, precipitation, etc.)
- Level/type of skin protection required

Always start with SCBA. SFPC will absorb liquids. PPE use will increase physiological stress on responders.

Some resources or references to employ when selecting PPE are:

- API Recommended Practice 98
- Emergency Response Guidebook
- NIOSH Pocket Guide to Chemical Hazards
So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about the selection of proper personal protective clothing and equipment?

- **Assure that emergency responders are using the proper personal protective equipment (PPE) and clothing equal to the hazards present. Structural firefighting protective clothing (SFPC) and positive-pressure SCBA should be the initial level of PPE selected.**
- **Rescue should be performed from an uphill and upwind location, if possible.**
- **Any changes in the level of PPE should be based on the results of air monitoring operations. Continuous monitoring with a combustible gas indicator and instruments capable of detecting toxic components of crude oil vapors (e.g., hydrogen sulfide, etc.) are important in ensuring site safety. These instruments can include detector tubes or photoionization detectors (PIDs).**

**CAUTION:** SFPC will provide thermal protection for fires involving crude oil; however SFPC is porous and will absorb liquids. For scenarios that do not and will not include the possibility of fire, such as spill control and clean-up activities, including decontamination, chemical liquid splash protective clothing protection and a compatible NIOSH-approved respirator may be required depending on the properties of the product.

- **Information and guidance on the selection of personal protective equipment for oil spill response is available in American Petroleum Institute (API) *Recommended Practice* (RP) 98 – *Personal Protective Equipment Selection for Oil Spill Responders*. Copies of the RP can be obtained by contacting API at (202) 682-8000 or on-line at www.api.org (Product No. G09801).

### Summary

In this lesson we presented the following information:

- The importance of Personal Protective Clothing and Equipment (PPE) commonly used in incidents involving Hazard Class 3 flammable liquids such as crude oil or ethanol
- PPE requirements and considerations for incidents involving Hazard Class 3 flammable liquids such as crude oil or ethanol
- Review resources and references to assist in selection

### Resources and References

6.0 Logistics and Resource Management

**Objectives**

1. Describe the key points in identifying and managing resources at a high hazard flammable train scenario consistent with the basic principles of NIMS.
2. Explain the need for resource management in the early stages of a rail incident involving Hazard Class 3 flammable liquids such as crude oil and ethanol.

**Lesson**

*Expedite Resources as Soon as Possible*

Order equipment and technical resources early. Call for additional resources and activate mutual aid as soon as possible. Establish a Logistics Section early and identify needs and manage resources using NIMS. If unsure of the initial resource requirements, always call for the highest level of assistance available.

*Logistics and Resource Management*

The Logistics Section ensures that all other sections are supported for the duration of the incident. Any personnel, equipment, supplies or services required by the other sections will be ordered through the Logistics Section. The size, scope, and resources needed to successfully manage a Hazard Class 3 flammable liquid rail transportation incident may overwhelm the capability of many emergency response agencies. Emergency planning and response agencies must identify their logistical needs, identify agencies or organizations that can meet those requirements, and effectively manage the resources available from those identified sources.

*Railroad Responsibilities*

The railroads will be the primary providers of logistical support and resources. They will provide emergency response resources, air monitoring, and environmental management capabilities. The railroads can also provide technical specialists and contractors to safely manage the consequences of a train derailment.

*Emergency Response Notifications*

Railroads and/or emergency responders may reach out to:

- National Response Center (NRC) serves as EPA Hazardous Materials and USCG Oil Spill Hotline
  - (800) 424-8802
- CHEMTREC®
  - (800) 424-9300
- Chemtel, Inc.
  - (888) 255-3924
Time Required for Asset Arrival

Be aware of and consider the footprint needed for staging areas, logistical delays for assets to arrive, as well as potential barriers that may prevent assets from reaching the event scene. There may be a need for escorts to facilitate assets to access the event scene. The time required for assets to arrive on scene and initiate operations must be taken into account since long delays can diminish operational effectiveness.

Reference Sheet and Lessons Learned

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about logistics and resource management?

- Order specialized equipment and technical resources early in the incident. If you are unsure of your initial resource requirements, always call for the highest level of assistance available. Do not wait to call for additional resources or activate mutual aid agreements.
- Establishing a Logistics Section early in the incident will be critical in providing the necessary support, resources and services to meet operational objectives. The size, scope and resources needed to successfully manage a Hazard Class 3 flammable liquid rail transportation incident may overwhelm the capability of most emergency response agencies.
- Emergency planning and response agencies must identify their logistical needs, identify agencies or organizations that can meet those requirements, and effectively manage the resources available from those identified sources within the NIMS framework.
- The railroads will be the primary providers of logistical support and resources. Rail carriers can provide emergency response resources, air monitoring and environmental management capabilities, technical specialists and contractors to safely manage the consequences of a crude oil train derailment. For example, rail carriers may use the services of private contractors to provide air monitoring and toxicology assessments.
- The time required for assets to arrive on scene and initiate operations must be taken into account since long delays can diminish operational effectiveness. Logistics for access, positioning, and movement of these resources should be considered, including the need for escorts to facilitate prompt access to the scene.
- Technical specialists and contractor support can also be made available from the shipper and can be obtained by contacting the 24-hour emergency telephone number provided on shipping papers or by contacting CHEMTREC® at 1-800-424-9300.
Emergency responders may also obtain assistance from the NRC by calling 1-800-424-8802. For example, the NRC can provide 24-hour access to federal government agency resources and technical assistance. The NRC also serves as the EPA’s Hazardous Materials Hotline and the USCG Oil Spill Hotline.

Summary

In this lesson we presented the following information:

- Key points in identifying and managing resources consistent with NIMS
- The need for resource management in the early stages of a rail incident
- Issues to consider regarding resource arrival

Resources and References

7.0 Select and Implement Response Objectives

Objectives

1. Outline incident management principles and critical size-up questions responders will need to consider when identifying response objectives for a rail incident involving Hazard Class 3 flammable liquids such as ethanol and crude oil.

2. Review considerations in determining the response strategies and modes of operation (i.e., offensive, defensive or non-intervention) for rail incidents involving hazard class 3 flammable liquids such as ethanol and crude oil.

3. List the potential response scenarios involving high hazard flammable trains that may be encountered by emergency responders.

Lesson

Initial Response Objectives

Incidents may likely be complex events so incident management will be crucial. Use the ERG for initial response guidance. Approach and manage the scene as a hazardous materials problem. Notify and request outside technical assistance and support early. Be sure to coordinate response operations with the railroad and shipper or consignee as well as EPA, USCG, and State personnel. Utilize Railroad Technical Specialists to assist with the size-up and damage assessment process. They have been specifically trained to respond to railroad emergencies and derailments. State and Federal response officials may also provide technical assistance prior to arrival on the scene.

It is critical to involve the railroads early to have them assist in response operations. Use the railroad’s emergency telephone number to establish communication with the railroad and stay in constant communication with the railroad. If the train crew is disabled or unavailable, the train consist is available from the Railroad Emergency Telephone Number point-of-contact and can be sent to the scene via e-mail or fax.

Incident Management Principles

Establish site management and control. Assume command and establish an Incident Command Post (ICP), establish an initial isolation perimeter, and establish initial hazard control zones (i.e., hot, warm, cold zones). Identify and verify the materials involved, size-up the problem, implement the local Emergency Operations Plan, establish a unified command organization, and expand the ICS organization based upon the nature of the problem and amount and type of resources on-scene.
**Critical Factors and Considerations**

Critical factor questions to address at a scene are:

- Are there any life safety exposures in danger that responders must address right now?
- Can responders safely approach the incident?
- Do responders fully understand the nature and scope of the problem?

Determine what is happening:

- Has product been released?
- Is there fire involved? What type?
- Is the fire impinging on other tank cars?
- Is it a pressure fed fire?
- Are there breached tank cars with product burning inside of the container?

Fire Scenarios:

- Do responders have immediate access to sufficient water supplies for cooling?
- Do responders have access to Class B foams and agents for effective vapor suppression or fire control operations?
- Can cooling water be effectively applied to any tank cars impacted by direct flame impingement?
- Can fire suppression agents be effectively applied to the tank car(s) and spill involved?
- Will extinguishment improve or worsen the incident? What is the environmental impact of doing so?

Spill Scenarios:

- What is spilled and how much?
- Where is it going?
- How fast is it moving?
- What will it impact and when?
- What can we do about it?

Determine if there is spill control equipment readily available to:

- Protect the safety and the health of people by securing the perimeter, eliminate ignition sources, and establish air monitoring.
- Stop the source of a spill as quickly as possible.
- Minimize environmental and community impact by limiting the amount spilled and limiting the spread the spill.
Incident Timeline

This is a training tool only – designed to show the relationship between:

- Behavior of the tank car(s) and their contents
- Key incident management benchmarks
- Strategic response options

Specific response timeline elements will vary based upon local response timelines and operational capabilities. Train speed and energy will directly influence container breach and the size/scope of the incident. Container breaches have occurred as soon as 20 minutes and as long as 8 hours.

Problem vs. Response Timeline

Risk Based Response
- Analyze Problem
- Assess Hazards
- Evaluate Consequences
- Available Resources
- Appropriate Response
Chapter 7: Select & Implement Response Objectives

Operational Modes of Response

There are three types of operational modes of response: offensive, defensive and non-intervention. The selected operational mode of response is based upon the level of available resources, level of emergency responder training, and operational capabilities and potential harm created by the incident.

In the offensive response mode actions are conducted to ensure the incident does not spread, causing additional property damage or threat to the public. All available resources are committed to fire control objectives to control and extinguish the fire. This response mode increases risk to responders. It relies on having sufficient water, Class B foam concentrate and foam appliances available.

Some offensive response mode considerations include the following:

- Derailment scenarios involving spill fires can be different and challenge the ability to achieve fire control.
- Do you have sufficient quantities of Class B foam concentrate, water, and application devices?
- Do you have trained personnel capable of initiating and sustaining Class B foam operations?
- Once the fire is extinguished, can you maintain the integrity of the foam blanket?
- How will the remaining spill be cleaned up?

If the answer is no, defensive or non-intervention strategies should be pursued.

In the defensive response mode, response resources are committed to less aggressive response objectives to limit the overall size or spread of the problem. The purpose is to protect exposures and ensure the incident does not spread, causing additional property damage or threats to the public. This approach exposes responders to less risk than offensive operations.

Some defensive response mode considerations include the following:

- Are there any life safety exposures in danger?
- Do responders have immediate access to sufficient foam and water supplies for effective fire control/suppression operations?
- What are the impacts to the environment?

The final possible mode of operation is non-intervention response. During the non-intervention response mode, no action is taken other than isolating the area. Fire size and the potential for tank car explosions will not allow responders to safely approach the problem. It allows flammable liquids to burn until the bulk of the product has been consumed by the fire. Railroad responders and firefighting contractors can determine when to extinguish the remaining fires.

Some non-intervention response mode considerations include the following:

- Are there critical exposures near-by?
- Do you have the resources to extinguish or control the fire?
- Will extinguishing the fire improve or worsen the incident?
- Can responders safely approach the incident?
- Do responders fully understand the nature and scope of the problem?

**Reference Sheet and Lessons Learned**

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about selecting and implementing response objectives?

- The initial stage of an incident involving crude oil should include an analysis of appropriate site specific response procedures and potential effects that an incident would have on nearby life, property, critical systems and the environment.
- The ERG should be used by all emergency responders to obtain initial response guidance for crude oil incidents.
- **Traditional firefighting strategies and tactics may not be effective in these situations.** These incidents also need to be approached and managed as a hazardous materials problem to ensure that proper and appropriate technical assistance and the support of outside resources are notified and requested as soon as possible.
- Use the railroad’s emergency telephone number to establish communication with the railroad and stay in constant communication with the railroad. If the train crew is disabled or unavailable, the train consist is available from the Railroad Emergency Telephone Number point-of-contact and can be sent to the scene via e-mail or fax.
- Confirm your location with the Railroad Emergency Telephone Number point-of-contact by observing mile posts or the individual grade crossing identification numbers at or near the scene.
- Coordinate operations with the railroad, chemical shippers and manufacturers, CHEMTREC® and/or the shipper’s 24-hour emergency contact to ensure that you have access to all the information available concerning the commodity and tank car(s) involved in the accident.
- Utilize the railroads’ hazardous materials personnel when they arrive on scene. They can assist with size-up and damage assessment. These personnel have been specifically trained to respond to railroad emergencies and derailments.
- **Based on the collection, evaluation and verification of response information, emergency responders need to determine whether the incident should be handled offensively, defensively or by non-intervention.** Remember that offensive tactics significantly increase the risks to emergency responders.

**LESSON LEARNED & RESPONDER TIPS**

- The goal of every responder should be to favorably change or influence the outcome of the incident. If you can’t change the outcome safely then consider nonintervention.
- Air monitoring is an integral part of site safety operations and a cornerstone of a risk-based response philosophy.
Summary

In this lesson we presented the following information:

- Incident management principles and critical size-up questions responders will need to consider when identifying response objectives for a rail incident involving hazard class 3 flammable liquids such as ethanol and crude oil
- Considerations in determining the response strategies and modes of operation (i.e., offensive, defensive or non-intervention) for rail incidents involving hazard class 3 flammable liquids such as ethanol and crude oil
- The potential response scenarios involving high hazard flammable trains that may be encountered by emergency responders

Resources and References

8.0 Clean-up and Post-Emergency Operations

Objectives

1. Identify the key factors that should be considered as part of the decontamination, clean-up, and incident termination process.
2. Describe the process for transitioning from emergency phase to post-emergency response operations (PERO).

Lesson

Operational Considerations

State and Federal environmental agencies will assume key roles, especially with spill control, remediation, and public health monitoring. Response objectives will change as the incident moves from response to PERO. Containment and recovery will be conducted in coordination under the direction of Unified Command.

The railroads are responsible for incident remediation and clean-up. Following factors are considered in their response:

- Determine and implement appropriate decontamination processes and procedures to minimize secondary contamination.
- Determine an effective means to contain all decontamination/gray water runoff.
- Ensure re-entry air monitoring for evacuees.
- Implement product transfer and remediation measures to minimize further contamination.
- Transition from emergency phase to post-emergency response operations.

Determine Appropriate Decontamination

For both ethanol and petroleum crude oil the recommended decontamination method is large amounts of water. For skin contact use both soap and water.

Considerations

Establish the decontamination line outside of the exclusion/hot zone and downwind and downhill from the cold zone/occupied areas. Containment of runoff/gray water is important. Construct a lagoon or pool using existing terrain features, while bladders or portable tanks can provide containment. Plan daily service for treatment and/or removal. Significant amounts of gray water will be generated so plan on a very large containment operation, and ensure re-entry is conducted on evacuees.
**Transition to Post-Emergency Operations**

When transitioning to post-emergency operations, follow the Emergency Response Plan. Ensure a complete handoff briefing. Be sure to conduct a thorough After Action Review (AAR) and address what worked, what did not work, lessons learned, and changes to the plan.

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### Reference Sheet Recap

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about clean-up and post-emergency operations:

- ✅ Establish a decontamination corridor in the warm zone away from the contaminated area. Ensure that all protective clothing and equipment is isolated for proper disposal and/or cleaning.
- ✅ Ensure proper decontamination of emergency personnel before they leave the scene. Crude oil vapors can saturate protective clothing and be carried off-site. Personnel should monitor for hazardous vapors before removing PPE.
- ✅ Use a massive water rinse on the outer shell of protective clothing. Maintain appropriate respiratory protection throughout the decontamination process.
- ✅ Contain all runoff since it may contain harmful contaminants. Properly dispose of in accordance with applicable federal, state and local environmental regulations.
- ✅ Conduct a post-incident analysis to properly document the incident and identify follow-up activities.

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### Summary

In this lesson we presented the following information:

- Key factors that should be considered as part of the decontamination, clean-up, and incident termination process
- The process for transitioning from emergency phase to post-emergency phase

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### Resources and References

1. ConocoPhillips. *Safety Data Sheet (SDS) 825378, for UN1267 Petroleum Crude Oil (Section 4, First Aid Measures).* May 19, 2014.
9.a Scenario A – Derailment with No Release or Fire

Objectives

1. Demonstrate the ability to establish a NIMS-based ICS organization and establish incident scene control procedure including hazard control zones, unified command, and integrated communications.
2. Describe the general hazard and risks that must be evaluated when responding to a rail accident involving bulk hazardous materials with flammable qualities.
3. Determine the most appropriate response strategies and modes of response operation.
4. Identify the appropriate local and regional government and industry resources available to support response operations for railroad unit train accidents involving bulk hazardous materials such as crude oil.

What You Will Need

- PowerPoint 9.a Scenario A
- Student Workbook
- Instructor Lesson Plan
- 30 minutes

Introduction

This section reviews one of three rail incident scenarios that are based on the guidance provided in Section 7 of the Commodity Preparedness and Incident Management Reference Sheet. The scenarios are accompanied by a PowerPoint presentation, instructor lesson plan, and videos that will help you and your instructor to discuss the best approach to the simulated incident information provided. Each scenario will follow a similar format. First we will present the introduction, initial conditions, and objectives. Then your instructor will show you some videos depicting the accident scene with animation. After each video you will be guided through a set of questions. These questions can be modified to suit your instructor’s needs. You will also be provided with a summary of actions taken and some background information for reference inside this Student Workbook. All of these materials are meant to guide discussions using the incident management practices discussed in the Transportation Rail Incident Preparedness & Response training resources and the PHMSA Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil. In this scenario you will be given an opportunity to discuss the response to a rail accident that results in a derailment of a unit train containing crude oil with no fire or release.

Initial Conditions

In this scenario a crude oil HHFT is transporting crude oil when it derails in an urban environment on a bridge crossing a critical waterway. Three tank cars are off the tracks. Although the tank cars have been subject to mechanical stress, there is no apparent release.
The Railroad Bridge and corridor are in close proximity to a number of significant exposures. These include the waterway and several large institutions to include a hospital and three universities. The rail bridge and rail corridor also run parallel to a heavily-traveled Expressway with multiple power lines surrounding it. Again, initial assessment reports of the scene indicate no loss of the train’s contents.

Initial Conditions:
- 100 Car Unit Train Bridge Derailment
- No Apparent Release
- Highly Populated Urban Area
- Critical Waterway Below
- Highways, Hospitals, and Universities Nearby

Tabletop Discussions

Identifying the Problem
Based Upon the conditions, verify what Hazmat is present:

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**Priorities and Objectives**
What would the initial priorities and objectives be for this event? Identify your priorities and objectives in the space below:

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**Initial Hour of Response**
What would your primary tasks be during your initial hour of response?

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**Support Resources (Within the hour)**

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**ICS and Tactical Considerations for the Initial Operational Period**
Identify what your ICS and Tactical Considerations would be for the first 12 hours:

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**Applying ICS**

When considering how to apply ICS to this event discuss the following questions:

- What agencies and organizations would be part of the unified command?
- What elements of the ICS command and general staff would be initially staffed?
- How would railroad personnel and operations be integrated into the ICS organization?

---

**Identify the Problem**

Based upon conditions, verify what Hazmat is present:

- Basic recognition & identification clues.
- Notify the railroad via their Emergency Contact Number.
- Locate the train crew to acquire the shipping papers.
- Identify the products being transported.
**Hands-on Classroom Activity**

A map of the area is below:

![Map of the surrounding area.](image)

Use the map and the ERG to identify:

- Evacuation zone
- Isolation zone
- Public Protective Actions Recommendations

Consider the following questions:

- Where would you start to shelter in place?
- Where would you place the ICP?
Reference Sheet Recap

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about a scenario like this one? Let’s review the identified considerations which are related to this type of scenario.

**Example A: Derailment No Fire**

- Implement emergency response plan.
- Ensure the railroad is notified via their Emergency Contact Number.
- Call the 24-hour emergency contact number for the shipper listed on the shipping papers available from the train crew. If this information is not available from the train crew, contact the Railroad Emergency Contact Number.
- Contact CHEMTREC® at 1-800-424-9300 if there is no emergency contact telephone number listed for the shipper or other technical assistance is needed.
- Conduct a hazard assessment and risk evaluation to determine the scope and magnitude of the problem, resource requirements and response options. Do not overlook obvious physical hazards that may be present such as damaged rail and other equipment that may have sharp/jagged edges.
- Conduct continuous air monitoring as appropriate.
- Confinement operations (i.e., spill control tactics) are a priority to limit the size and spread of the release – damming and diking may be required to limit the potential for the spill to migrate beyond the immediate area and cause extensive environmental damage.
- If foam supplies and equipment are available on-site, foam should be applied for vapor suppression.
- Refer to the ERG for recommended isolation distances.

**Summary**

In this scenario we discussed how to:

- Establish a NIMS-based ICS organization incident scene control and safety procedures
- Estimate and predict the behavior and movement of both the container(s) and any released product
- Apply a risk-based response process to determine the most appropriate response strategies and modes of response operation
- Identify the appropriate local and regional, government, and industry resources available to support response operations

**Lesson Learned & Responder Tips**

- Getting people out of harm’s way is the priority.
- Ask the railroad to immediately provide the train consist and reach out to the shipper emergency contact to request product technical information.
- Make sure you have the correct fax numbers or email addresses at the ICP or Communications Center to send the information.
Resources and References

9.b Scenario B – Derailment with Fire, 1 Car Release with Contained Spill and Fire

Objectives

1. Demonstrate the ability to establish a NIMS-based ICS organization and establish incident scene control and safety procedures including hazard control zones, unified command, and integrated communications.
2. Discuss the application of a risk-based response process to determine whether to initiate offensive, defensive, or non-intervention response strategies.
3. Identify the appropriate local and regional government and industry (e.g., railroad) resources available to support response operations for railroad unit train accidents.
4. Estimate and predict the behavior and movement of both the container and any released product based on current and forecasted incident scene conditions.
5. Determine the appropriate decontamination methods for personnel and equipment.
6. Transfer command of an incident involving bulk hazardous flammable materials such as crude oil to the appropriate agency.

What You Will Need

- PowerPoint 9.b Scenario B
- Student Workbook
- Instructor Lesson Plan
- 45 minutes

Introduction

This section reviews one of three rail incident scenarios that are based on the guidance provided in Section 7 of the Commodity Preparedness and Incident Management Reference Sheet. The scenarios are accompanied by a PowerPoint presentation, instructor lesson plan, and videos that will help you and your instructor to discuss the best approach to the simulated accident information provided. Each scenario will follow a similar format. First we will present the introduction, initial conditions, and objectives. Then your instructor will show you some videos depicting the accident scene with animation. After each video you will be guided through a set of questions. These questions can be modified to suit your instructor’s needs. You will also be provided with a summary of actions taken and some background information for reference inside this Student Workbook. All of these materials are meant to guide discussions using the incident management practices discussed in the Transportation Rail Incident Preparedness & Response materials and the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil. The primary goal of this scenario will be to provide the student with the opportunity to implement response objectives for a release and fire scenario in an urban environment with significant exposures. The rapid escalation of the event and number of exposures will pose challenges to emergency responders, including the level of response.
resources needed. In this scenario the accident escalates from a derailment to one car being involved in a release of crude oil and subsequent fire. Instructors can choose to present this scenario in terms of a spill or as a spill and fire.

**Initial Conditions: Spill**

In this scenario a HHFT transporting crude oil has just crossed the bridge when a derailment occurs. A number of tank cars are off the tracks and several of the tank cars have fallen into the river. At least one of the tank cars has been breached and released an unknown quantity of crude oil into the river. Just downstream from this location are water intakes for the water treatment plant and several industrial facilities. The area of the incident is densely populated with significant exposures.

**Initial Conditions:**
- Unit Train derailed on a bridge
- 3 Cars derailed, one tank damaged
- Spilling Contents into Waterway
- Intakes downstream
- Highly populated urban area
Tabletop Discussion (Spill)

Priorities and Objectives
What would the initial priorities and objectives be for this event? Identify your priorities and objectives in the space below:

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Initial Hour of Response

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Support Resources (Within the hour)

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ICS and Tactical Considerations for the Initial Operational Period
Identify what your ICS and Tactical Considerations would be for the first 12 hours:

__________________________________________________________________________________
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__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

__________________________________________________________________________________
**Applying ICS**

When considering how to apply ICS to this event discuss the following questions:

- What agencies and organizations would be part of the unified command?
- What elements of the ICS command and general staff would be initially staffed?
- How would railroad personnel and operations be integrated into the ICS organization?

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**Hands-on Classroom Activity**

A map of the area is below.

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Review the Guidance in the DOT ERG and discuss:

- Evacuation zone
- Isolation zone
• Public Protective Actions Recommendations

Consider the following questions:

• Where would you start to shelter in place?
• Where would you place the ICP?

Initial Conditions: Spill and Fire

In this scenario a unit train transporting crude oil has just crossed the bridge when a derailment occurs. A number of tank cars are off the tracks and several of the tank cars have fallen into the river. At least one of the tank cars has been breached and has released an unknown quantity of crude oil into the river. Just downstream from this location are water intakes for the water treatment plant and several industrial facilities. The area of the incident is densely populated with significant exposures. At least one of the tank cars ignites and the surrounding tank cars are on fire.

Initial Conditions:

• Unit Train Derailed On a Bridge
• 3 Cars Derailed
• At Least One Tank is Breached
• Crude Oil Being Released into the Waterway
• At Least One Tank Car has Exploded and is on Fire

**Tabletop Discussion (Spill and Fire)**

**Response Strategies (Fire Control)**

How does the addition of fire change your response strategy? Discussion lines of inquiry will review:

• How does the introduction of fire change the response strategy or objectives?
• Do you have sufficient resources to extinguish and cool surrounding tank cars?
• Do you need to re-evaluate the PPE?

__________________________________________________________________________________
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**Priorities and Objectives**

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**Follow-on Discussion**

What are the advantages and limitations of conducting fire control strategies?
Under What conditions would emergency responders consider defensive fire control operations?
Under what conditions would emergency responders consider offensive fire control?
What factors should be considered as part of the size-up process and whether to initiate cooling tactics?
Clean Up and Post Emergency Operations

When considering the Clean Up and Post Emergency Response Operations (PERO):

- Determine appropriate decontamination methodology for personnel and equipment
- Determine optimum placement of a decontamination corridor
- Determine post-incident needs to document response operations and identify issues requiring corrective actions.

Reference Sheet Recap

What does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say about a scenario like this one? Let’s review the considerations identified related to this type of scenario:

EXAMPLE B: DERAILMENT WITH FIRE

- Implement emergency response plan.
- Ensure the railroad is notified via their Emergency Contact Number.
- Call the 24-hour emergency contact number for the shipper listed on the shipping papers available from the train crew. If this information is not available from the train crew, contact the Railroad Emergency Contact Number.
- Contact CHEMTREC® at 1-800-424-9300 if there is no emergency contact telephone number listed for the shipper or other technical assistance is needed.
- Conduct a hazard assessment and risk evaluation to determine the scope and magnitude of the problem, resource requirements and response options. Do not overlook obvious physical hazards that may be present such as damaged rail and other equipment that may have sharp/jagged edges.
- Conduct continuous air monitoring as appropriate.
- Confinement operations (i.e., spill control tactics) are a priority to limit the size and spread of the release – damming and diking may be required to limit the potential for the spill to migrate beyond the immediate area and cause environmental damage.
- If fire suppression strategies are selected, responders will need to refer to the ERG for recommended isolation distances.
- If fire suppression operations are initiated, responders need sufficient foam concentrate supplies, adequate water supply, foam appliances, equipment and properly trained personnel to effectively implement and sustain fire suppression and post-fire suppression operations.

CRITICAL QUESTION: Do you have the ability to extinguish a single tank car containing 30,000 gallons of crude oil? Based on the guidance in NFPA 11, Standard for Low-Medium- and High-Expansion Foam

LESSON LEARNED & RESPONDER TIPS

- Be honest and realistic about your capabilities and what resources you can provide within the first hour of a major derailment and fire scenario.
- Consider an unmanned master stream operation for exposed cars, providing there is no life hazard exposure that requires evacuation.
- Remember - this is a basic flammable liquid scenario. The challenge is the volume and the volume will determine the overall risk.
- If you do not have sufficient water or foam concentrate and the staffing to initiate an operation, then do not attempt any offensive operation.
(2011 edition) -- for a spill scenario greater than one (1) inch in depth, agencies will need a minimum of approximately **216 gallons of 3% foam concentrate** available for the first 15 minutes of the operation based on a spill area of approximately 3,000 sq. ft. In addition, reapplication of foam will normally be necessary to maintain an adequate foam blanket.

*Note: If 1% foam concentrate is available and used, approximately 72 gallons of foam concentrate would be required for the first 15 minutes of the operations.*

If you do not have the capability to safely and effectively implement and sustain this strategy, defensive or non-intervention strategies should be pursued.

**Summary**

In this scenario we discussed how to:

- Establish a NIMS-based ICS organization incident scene control and safety procedures
- Estimate and predict the behavior and movement of both the container(s) and any released product
- Apply a risk-based response process to determine the most appropriate response strategies and modes of response operation
- Identify the appropriate local and regional government and industry resources available to support response operations
- Determine the appropriate technical decontamination processes
- Describe the process for transfer of command and the transition from emergency operations to post-emergency response operations (PERO)

**Resources and References**

1. ConocoPhillips. *Safety Data Sheet (SDS) 825378, for UN1267 Petroleum Crude Oil (Section 4, First Aid Measures).* May 19, 2014.


9.c Scenario C – Derailment, Multiple Car Release with Uncontained Spill and Fire

Objectives

1. Demonstrate the ability to establish a NIMS-based ICS organization and establish incident scene control and safety procedures including hazard control zones, unified command, and integrated communications.
2. Estimate and predict the behavior and movement of both the container(s) and any released product based on current and forecasted incident scene conditions.
3. Apply a risk-based response process to determine the most appropriate response strategies and modes of response operation (i.e., offensive, defensive, or non-intervention).
4. Identify the appropriate local and regional government and industry (e.g., railroad) resources available to support response operations for HHFT accidents involving Hazard Class 3 hazardous materials such as ethanol.
5. Determine the appropriate technical decontamination processes and procedures for personnel and equipment.
6. Describe the process for transfer of command as part of the incident escalation process and the transition from emergency operations to post-emergency response operations (PERO).

What You Will Need

- PowerPoint 9.c Scenario C
- Student Workbook
- Instructor Lesson Plan
- 45 minutes

Introduction

This section reviews one of three rail incident scenarios that are based on the guidance provided in Section 7 of the Commodity Preparedness and Incident Management Reference Sheet for Crude Oil. The scenarios are accompanied by a PowerPoint presentation, student workbook, instructor lesson plan, and videos that will help you and your instructor to discuss the best approach to the simulated accident information provided. Each scenario will follow a similar format. First we will present the introduction, initial conditions, and objectives. Then your instructor will show you some videos depicting the accident scene with animation. After each video you will be guided through a set of questions. These questions can be modified to suit your instructor’s needs. You will also be provided with a summary of actions taken and some background information for reference inside this Student Workbook. All of these materials are meant to guide discussions using the incident management practices discussed in the Transportation Rail Incident Preparedness & Response training resources and the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil. The primary goal of this scenario will be to provide the student with the opportunity to select and implement response.
objectives that best suite an accident with multiple cars involved in a release of contents to include spill and fire. This scenario involves the deralement of a unit train with an immediate spill and fire involving multiple tank cars.

**Initial Conditions**

In this scenario an east bound HHFT has derailed just outside a rural farming community with 500 residents. Multiple cars have derailed and initial 911 phone calls report a large fire. The average response time to this area is a minimum of 15 minutes.

As the first responders roll up to the scene they see and hear some secondary explosions. It is unclear how many tank cars are involved initially and the type of Hazardous Commodity that is on fire.

Initial Conditions:
- 911 calls indicate a HHFT has derailed and is on fire.
- Location of the fire is in a rural area with 500 residents near-by.
- The incident scene is just outside of town.
- Response time to this location is 15 minutes.
- As you roll up on the scene, you hear and see loud explosions.
Tabletop Discussion

Identifying the Problem
Based upon fire conditions, verify the Hazmat present:

__________________________________________________________

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__________________________________________________________

Priorities and Objectives
What would the initial priorities and objectives be for this event? Identify your priorities and objectives in the space below:

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Initial Hour of Response

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Support Resources (Within the hour)

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__________________________________________________________
ICS and Tactical Considerations for the Initial Operational Period

Identify what your ICS and Tactical Considerations would be for the first 12 hours:

Applying ICS

When considering how to apply ICS to this event discuss the following questions:

- What agencies and organizations would be part of the unified command?
- What elements of the ICS command and general staff would be initially staffed?
- How would railroad personnel and operations be integrated into the ICS organization?

Identifying the Problem

Based upon fire conditions, verify what Hazmat are present:

- Basic recognition & identification clues
- Notify the railroad via their Emergency Contact Number
- Locate the train crew to acquire the shipping papers
- Identify the products being transported
Hands-on Classroom Activity

A map of the area is below:

Review the Guidance in the DOT ERG and discuss:

- Evacuation zone
- Isolation zone
- Public Protective Actions Recommendations

Consider the following questions:

- Where would you start to shelter in place?
- Where would you place the ICP?

Refer to the 2012 ERG Guide 127 to discuss.
When considering the Clean Up and Post Emergency Response Operations (PERO):

- Determine and implement appropriate decontamination processes and procedures to minimize secondary contamination.
- Determine an effective means to contain all decontamination/gray water runoff.
- Implement product transfer and remediation measures to minimize further contamination.
- Transition from emergency phase to post-emergency response operations.
Reference Sheet Recap

So what does the Commodity Preparedness and Incident Management Reference Sheet for Petroleum Crude Oil have to say? Let’s review the considerations identified related to this type of scenario:

EXAMPLE C: DERAILMENT WITH FIRE (UNIT TRAIN, MULTIPLE CAR INVOLVEMENT, RELEASE, SPILL, WITH FIRE)

- Implement emergency response plan
- Ensure the railroad is notified via their Emergency Contact Number
- Call the 24-hour emergency contact number for the shipper listed on the shipping papers available from the train crew. If this information is not available from the train crew, contact the Railroad Emergency Contact Number.
- Contact CHEMTREC® at 1-800-424-9300 if there is no emergency contact telephone number listed for the shipper or other technical assistance is needed.
- Conduct a hazard assessment and risk evaluation to determine the scope and magnitude of the problem, resource requirements and response options. Do not overlook obvious physical hazards that may be present such as damaged rail and other equipment that may have sharp/jagged edges.
- Conduct continuous air monitoring as appropriate
- Confinement operations (i.e., spill control tactics) are a priority to limit the size and spread of the release – damming and diking may be required to limit the potential for the spill to migrate beyond the immediate area and cause environmental damage.
- If fire suppression strategies are selected, responders will need to refer to the ERG for recommended isolation distances.
- If fire suppression operations are initiated, responders need sufficient foam concentrate supplies, adequate water supply, foam appliances, equipment and properly trained personnel to effectively implement and sustain operations.
- The resource requirements to safely and effectively respond to an incident of this magnitude will exceed the capabilities of most emergency response organizations. In situations of this nature, the amount of foam concentrate that is required to be available on-site to begin suppression operations per NFPA 11 (2011 edition), -- for a spill scenario greater than one (1) inch in depth, is approximately 26,000 gallons of 3% foam concentrate for the first

LESSON LEARNED & RESPONDER TIPS

- Ethanol fires will require large quantities of alcohol resistant foam concentrate that may not be immediately available.
- As part of the risk evaluation process, are there any other tank cars threatened by the car on fire?
- The IC must keep an open mind when it comes to tactical objectives. The intact cars nearby or close to a burning pool fire may need to be moved away.
- The use of foam and cooling water may result in large quantities of run-off. Also, consider the issue of water solubility when comparing crude oil or hydrocarbon products spills to those involving ethanol or polar solvent spills.
15 minutes of the operation based on a spill area of approximately 360,000 sq. ft. In addition, reapplication of foam will normally be necessary to maintain an adequate foam blanket.

Note: If 1% foam concentrate is available and used, approximately 8,666 gallons of foam concentrate would be required for the first 15 minutes of the operations.

NOTE: THE STRATEGY FOR THIS TYPE OF INCIDENT THAT PROVIDES THE HIGHEST LEVEL OF SAFETY TO RESPONDERS IS DEFENSIVE TO PROTECT EXPOSURES OR NON-INTERVENTION.

Summary

In this scenario we discussed how to:

- Establish a NIMS-based ICS organization incident scene control and safety procedures
- Estimate and predict the behavior and movement of both the container(s) and any released product
- Apply a risk-based response process to determine the most appropriate response strategies and modes of response operation
- Identify the appropriate local and regional government and industry resources available to support response operations
- Determine the appropriate technical decontamination processes
- Describe the process for transfer of command and the transition from emergency operations to post-emergency response operations (PERO)

Resources and References

3. Safety Data Sheets/Material Safety Data Sheets (SDS/MSDS) for Ethanol/UN 1987
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