TRIPR

TRANSPORTATION RAIL INCIDENT PREPAREDNESS AND RESPONSE

INTRODUCTION

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

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INTRODUCTION

COLLABORATING ORGANIZATIONS

United States Coast Guard
Semper Paratus
1790

TRANSCAER
Emergency Response ★ Transportation ★ Community Awareness ®

ASLRRA

U.S. Department of Transportation
Federal Railroad Administration

Association of American Railroads

RFA
Renewable Fuels Association

U.S. Fire Administration

FEMA

EPA
United States Environmental Protection Agency

"Out of Many, One" — Interagency Board — Interoperability and Standardization — Local, State, and Federal

API
American Petroleum Institute

COURSE OUTLINE

0.0 Introduction

1.0 Pre-Incident Planning and Preparedness

2.0 Incident Management Principles

3.0 Hazard Assessment and Risk Evaluation

4.0 Select and Implement Response Objectives

5.0 Scenarios

OBJECTIVES

- Outline planning and response considerations for a risk-based approach related to rail incidents involving hazardous materials
- Identify the key considerations associated with planning for and responding to incidents involving the transportation of hazardous materials by rail.
- Describe the basic safety procedures to use when working in a railroad environment.
- Identify general tank car types used for HazMat via rail

PROGRAM OVERVIEW

Mission

- Communicate critical information on best practices related to preparedness and response to rail incidents

Intent

- U.S. DOT PHMSA led collaborative efforts to expand awareness
- Flexible approach to providing information resources to the nation's first response community

TARGET AUDIENCE

- Hazmat Response Community
- HazMat First Responders/ Operations Level

COMMODITY REFERENCE SHEETS

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

COMMODITY PREPAREDNESS AND INCIDENT MANAGEMENT REFERENCE SHEET

PETROLEUM CRUDE OIL

CAS NO. 8002-05-9
UN 1267
DOT Hazard Class: 3
FLAMMABLE LIQUID
ERG Guide No. 128

HAZARD RATING = HIGH

DOT Hazard Classification and NFPA 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response

TRANSPORTATION AND PLANNING CONSIDERATIONS

- With the increased production of oil from shale reserves in states such as North Dakota and Texas, there has been a dramatic increase in the transportation of crude oil by rail. Rail shipments of crude oil from these regions are typically made using unit trains. Unit trains of crude oil are single commodity trains that generally consist of over 100 tank cars, each carrying approximately 30,000 gallons of crude oil.
- Unit trains typically move from one location (e.g., shipper's production facility or transloading facility) to a single destination (e.g., petroleum refinery). 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.
- In the event of an incident that may involve the release of thousands of gallons of product and ignition of tank cars of crude oil in a unit train, most emergency response organizations will not have the available resources, capabilities or trained personnel to safely and effectively extinguish a fire or contain a spill of this magnitude (e.g., sufficient firefighting foam concentrate, appliances, equipment, water supplies).
- Responses to unit train derailments of crude oil will require specialized outside resources that may not arrive at the scene for hours; therefore it is critical that responders coordinate their activities with the involved railroad and initiate requests for specialized resources as soon as possible.
- These derailments will likely require mutual aid and a more robust on-scene *Incident Management System* than responders may normally use. Therefore, pre-incident planning, preparedness and coordination of response strategies should be considered and made part of response plans, drills and exercises that include the shippers and rail carriers of this commodity.

TRANSPORTATION RAIL INCIDENT PREPAREDNESS & RESPONSE:

HIGH HAZARD FLAMMABLE LIQUID UNIT TRAIN (HHFT) EMERGENCY RESPONSE SUPPLEMENTAL INFORMATION (V 9.3)

SECTION I - INTRODUCTION

Changes in the North American energy sector have brought new challenges to the emergency response community, especially in many geographic areas where there has not historically been a large energy sector footprint. These changes have involved oil and gas exploration, production and manufacturing facilities, as well as the expansion of transportation modes, corridors and operations to meet the needs of the emerging marketplace.

This background paper will focus on flammable liquid unit trains, primarily those transporting crude oil and ethanol. The U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (DOT / PHMSA) defines High Hazard Flammable Liquid Trains (HHFT) as trains that have a continuous block of twenty (20) or more tank cars loaded with a flammable liquid or thirty-five (35) or more cars loaded with a flammable liquid dispersed through a train.

The objectives of this paper are to assist emergency planning and response personnel in preparing for HHFT incident scenarios. The information is based upon an analysis of previous HHFT incidents that have occurred, the lessons learned, and the input and experiences of emergency response peers representing the railroad and petroleum industries, emergency response contractors, and the public safety emergency response community. This paper was originally developed in 2016 and is viewed as a "living document" that will be updated as needed. See the Appendix D for the list of emergency response peers who have participated in this process.

The information provided in this paper is intended to supplement HHFT planning and training information already being used within the emergency response community. It is not meant to establish a standard of operations for any emergency response organization. The issues outlined in this paper focus upon "What do we know about HHFT emergency response and incident management operations that is considered to be either factual or has been validated through science or engineering?" and "What have we repeatedly observed at HHFT scenarios but has not yet been validated by either science or testing?"

A. Risk-Based Response

The application and use of a risk-based response (RBR) methodology is critical for incidents involving HHFT's. As background, RBR is defined by *NFPA 472 – Standard for the Competence of Responders to HM/WMD Incidents* as a systematic process by which responders analyze a problem involving hazardous materials, assess the hazards, evaluate the potential consequences, and determine appropriate response actions based upon *facts*, *science*, and the *circumstances* of the incident. Knowledge of the behavior of both the container involved and its contents are critical elements in determining whether responders should and can intervene.

Most fire departments have a fundamental understanding and familiarity with flammable and combustible liquids, as they represent the most common class of hazardous materials encountered. The size, scope and complexity of the problems posed by a HHFT incident will challenge virtually all emergency response organizations, and have a direct influence upon the possible strategies and tactics that may be employed by the Incident Commander and

RISK-BASED RESPONSE PROCESS

Systematic process by which responders:

Analyze a problem involving HazMat → Assess the hazards → Evaluate the potential risks → Determine appropriate response actions

RISK BASED RESPONSE – WHAT WE KNOW

- Every incident will arrive at some outcome, whether responders intervene (offensive) or not
- Responders 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

CONTAINER BEHAVIOR – WHAT WE KNOW (FIRE)

- Tank cars have failed as quickly as 20 minutes after initial derailment or more than 24 hours later.
- Heat induced tears will differ from BLEVE scenarios
- Fire growth curve vs. state of “Equilibrium”

CONTAINER BEHAVIOR – WHAT WE KNOW (NON-FIRE)

Non-fire tank breach scenarios:

- Boiling Liquid Expanding Vapor Explosion (BLEVE)
- Polymerization / reactive chemical event
- Toxic gas release from a venting tank car
- Overheating exothermic reaction
- Leak involving a non-flammable toxic chemical

PLANNING CONSIDERATIONS

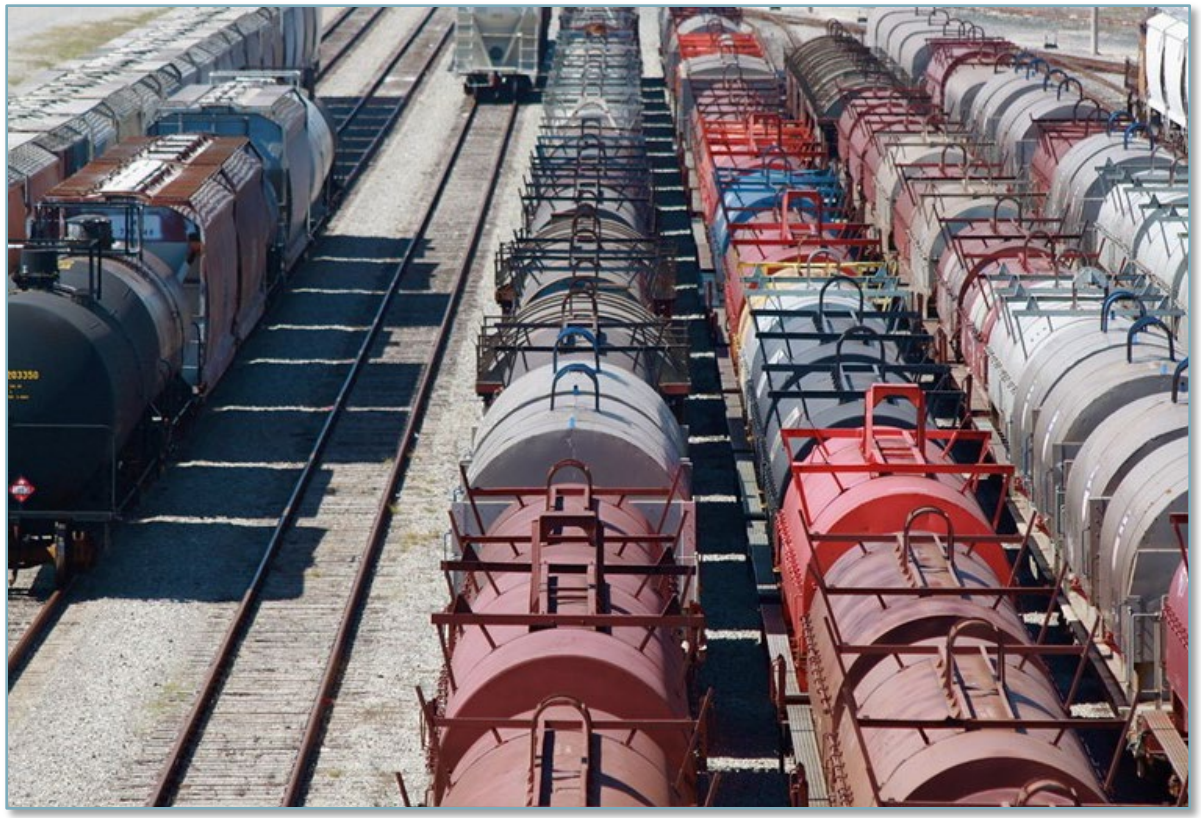
- Hazardous material derailments will likely require mutual aid and a more robust on-scene Incident Management System than responders normally use.
- Get involved with LEPCs and other agencies supporting responders
- Include producers, shippers, and rail carriers in your pre-incident planning, preparedness, and coordination of response strategies.

RESPONSE CONSIDERATIONS

- Contact the railroad as soon as possible.
- It may be a challenge to obtain necessary resources to safely and effectively extinguish a fire, control a spill, or ensure public protection.
- Tank car jackets may make cooling streams ineffective
- Applying water to most commodities should be done with technical knowledge of the commodity
- Response to these scenarios may require specialized outside resources that may not arrive at the scene for hours.

SAFE RAIL TRANSPORTATION

- Rail transportation has never been safer.
- Most hazardous materials transported by rail reach their destination safely.
- In the unlikely event that an incident occurs, response partners need to be prepared and informed.



BASIC RAILROAD SAFETY

RULE #1: Expect a train or rail equipment to move on any track from either direction at any time.

RULE #2: Contact the railroads if an incident occurs.

RULE #3: Make sure the track is secured by railroad personnel.

BASIC RAILROAD SAFETY

- Never step on a rail
- Never stand, walk or sit on railway tracks, between the rails or on the ends of ties
- Never put your feet on movable parts
- Stand a minimum of 25 feet away from the tracks if possible
- Do not occupy the area between adjacent tracks when a train approaches

BASIC RAILROAD SAFETY

- 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 ladder rung, DO NOT JUMP.
- A good plan is to use your own ladders. Block the feet and tie off all ladders at the top.

BASIC RAILROAD SAFETY

- At a derailment scene beware of tipped, jagged, and leaning equipment, or distorted/stressed tracks.
- Stressed rail ties and tracks can snap back
- Be aware of the location of structures or obstructions where clearances are close.
- Avoid using a cell phone within 25 feet of live tracks.

COMMON CHEMICALS CARRIED

Fuels and Petroleum Products

- **Denatured fuel ethanol:** The highest-volume chemical and renewable fuel moved by rail.
- **Crude oil and gasoline:** Transported in massive quantities as flammable liquids.
- **Liquefied petroleum gases (LPG):** Includes propane and butane for energy and manufacturing.

Industrial and Agricultural Chemicals

- **Anhydrous ammonia:** Widely shipped for use as a nitrogen fertilizer.
- **Sulfuric acid and hydrochloric acid:** Core corrosive components used in refining and manufacturing.
- **Caustic soda (sodium hydroxide) and soda ash:** Essential for paper, textile, and soap production.
- **Plastic materials and synthetic resins:** Account for over a quarter of total rail chemical tonnage.

TANK CAR TYPES

Typical service

- Crude oil
- Ethanol
- Other Class 3 flammable liquids, when authorized

DOT-117J100W

DOT-113A90W

Common services

- Non-flammable gases
- Ethylene
- Hydrogen
- Additional approved cryogenic liquids

Typical service

- Anhydrous ammonia
- Other compressed gas products

DOT-105J500W (Chlorine)

DOT-111A100W1

Typical service

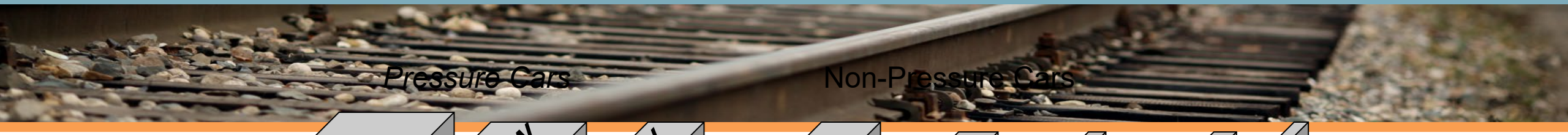
- Industrial chemicals
- Food-grade liquids
- Petroleum products
- Other non-cryogenic liquids, when authorized

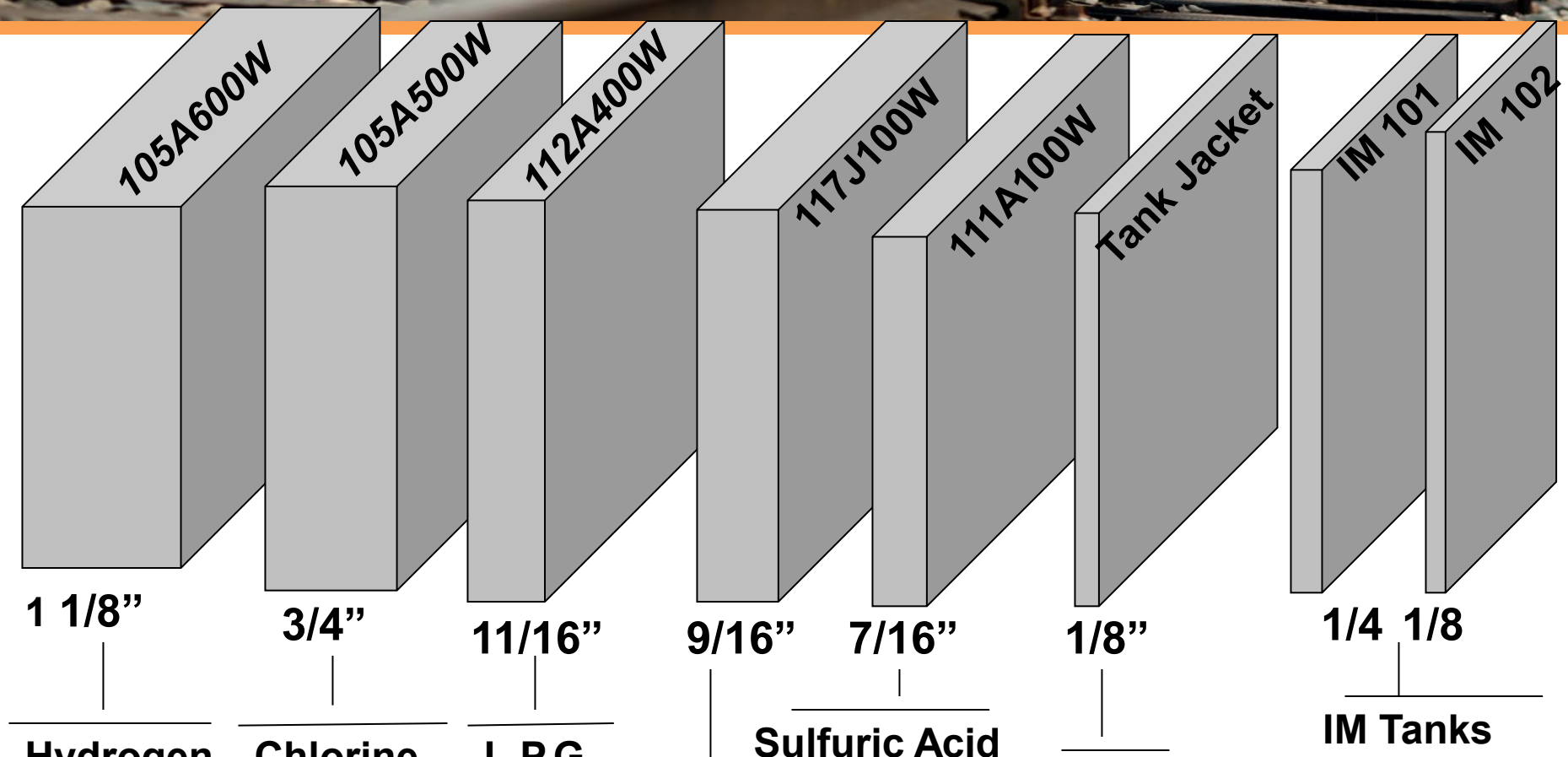
TANK CAR CONSTRUCTION

Tank Car Features

- Double Shelf Couplers
- Head Shields
- Pressure Relief Device (PRD) – either a value or a vent

TANK CAR THICKNESS

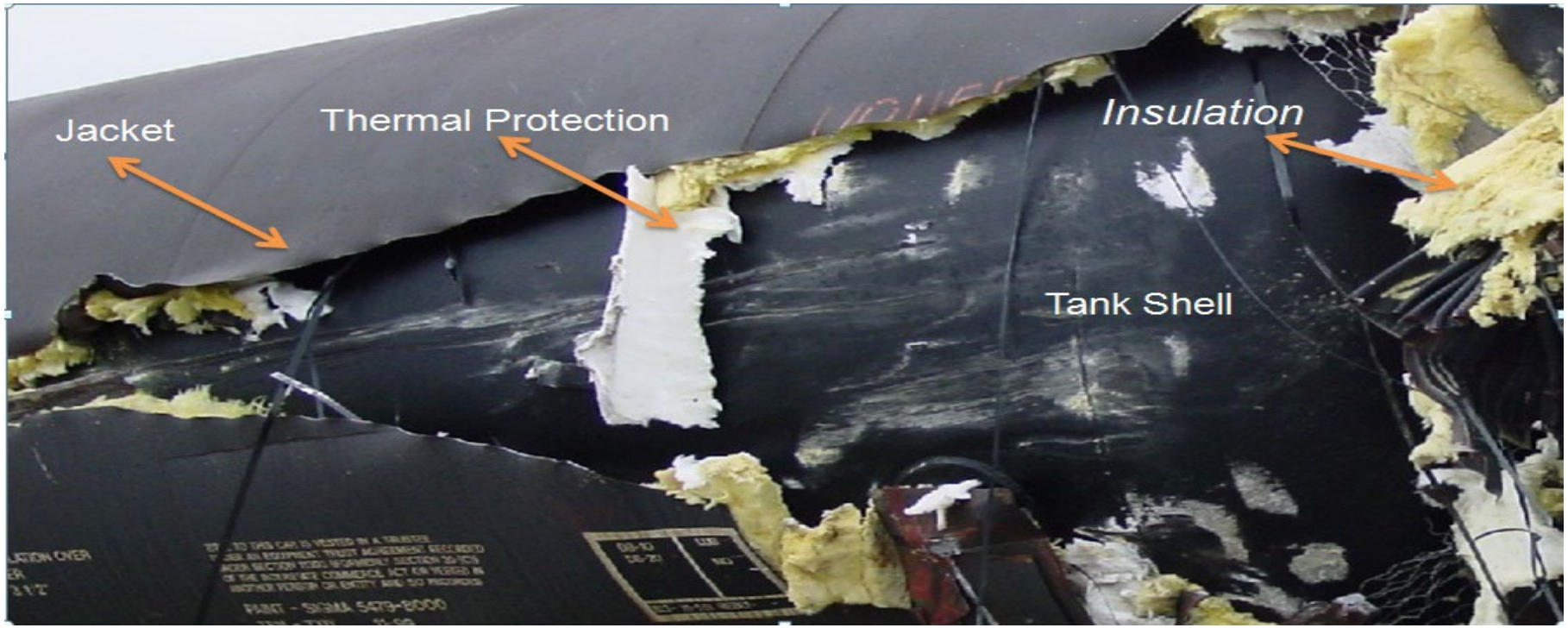




Pressure and Non-Pressure Tank Cars may have insulation and thermal protection

TANK CAR CONSTRUCTION

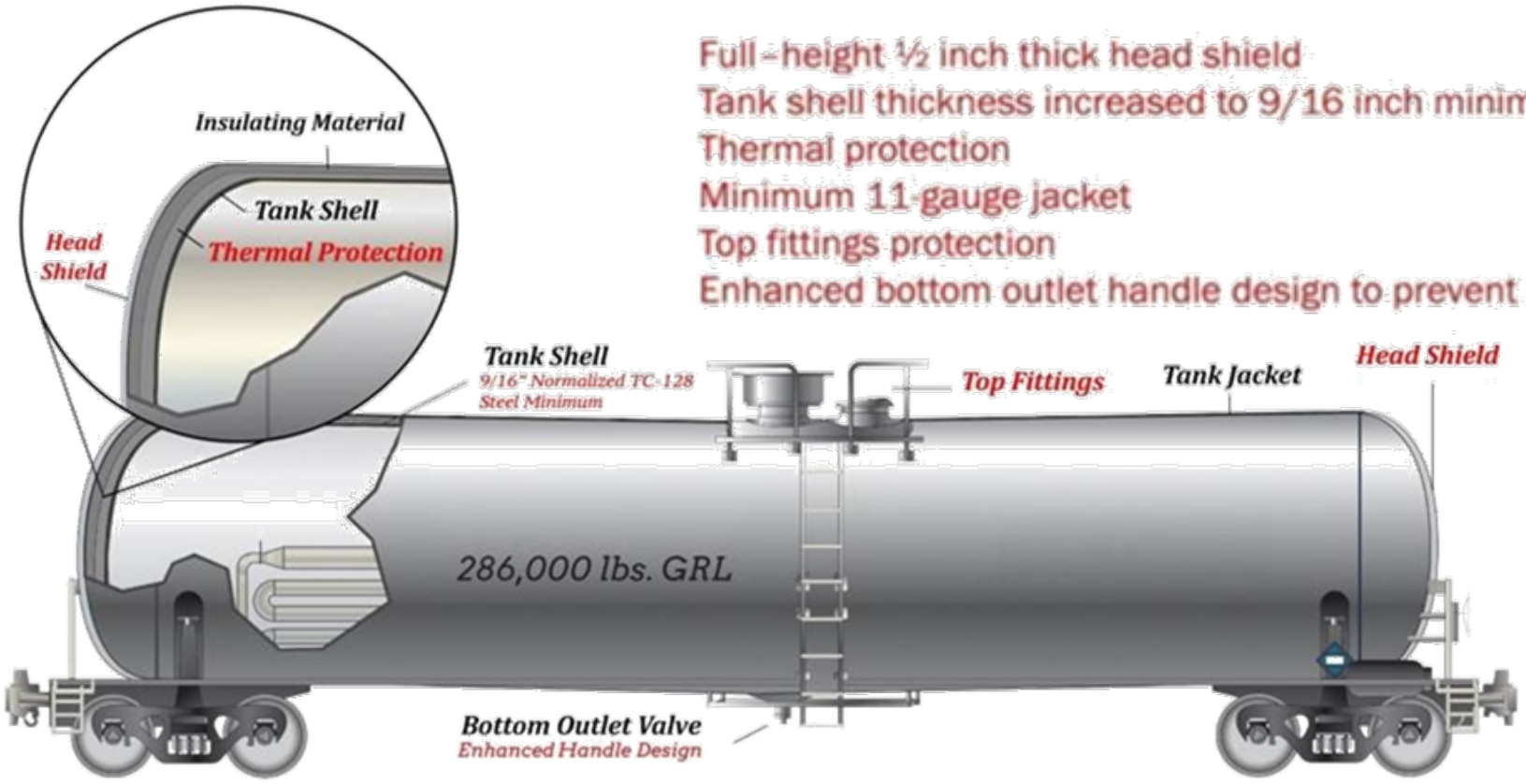
Pressure and Non-Pressure Tank Cars may have insulation, thermal protection or both if jacketed.



DOT 117 SPECIFICATION CAR

Safety enhancements of DOT Specification 117 Tank 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



SUMMARY

In this module we presented the following information:

- Planning and response considerations related to rail incidents involving hazardous materials.
- Key considerations associated with planning for and responding to incidents involving the transportation of hazardous materials by rail.
- Basic safety procedures to use when working in a railroad environment.
- Basic rail car types