

Propane Training for Specialist Employees B Operations – Study Guide

Fill in the blanks and take notes as you view the course. You may use this study guide during the Knowledge Checks at the end of each lesson and on the Final Assessment at the end of the training.

Lesson 1 - Applying the Physical and Chemical Properties of Propane to Risk Assessment

Objectives:

- Explain the significance of the physical properties of propane in the risk assessment process at a propane incident.
- Predict the behavior of propane stored in a closed container.
- Explain the significance of the chemical properties of propane in the risk assessment process at a propane incident.
- Determine appropriate actions in a situation involving the incomplete combustion of propane.

Awareness Level Personnel: _____

Operation Level Responders: _____

Hazardous Materials Technician: _____

Importance of Risk Assessment: _____

Physical properties of Liquefied Compressed Gas:

1.
2.
3.
4.
5.

Specific Gravity

The specific gravity of a liquid is: _____

Propane is about: _____

During filling operations, the specific gravity is used to: _____

Vapor Density

Vapor density is the: _____

Propane is about _____ heavier than air.

Propane readily dissipates if a leak develops in a gas line or container. However, under the right conditions, propane gas may settle in: _____

Boiling Point

The boiling point of a liquid is: _____

The boiling point for propane is: _____

As soon as propane liquid is pumped into a cylinder, it begins to: _____

Expansion Ratio

The expansion ratio is: _____

The expansion ratio for propane is: _____

Vapor Pressure

Vapor pressure is:

Vapor pressure keypoint #1:

Vapor pressure keypoint #2:

Vapor pressure keypoint #3:

Chemical Properties of Propane

Chemical Properties	Notes
1. Flammable Limits	UFL: LFL:
2. Combustion Characteristics	Complete Combustion: Incomplete Combustion:
3. Ignition Temperature	Common sources of ignition for propane:

Chemical Properties Impact on Risk Assessment

Flammable Limits: _____

Combustion Characteristics: _____

Ignition Temperature: _____

Tips to Keep in Mind When Using Gas Monitors

Tip #1:	
Tip #2:	
Tip #3:	
Tip #4:	

Behavior of Propane in a Closed Container

Weather Impact: _____

Heat Impact: _____

Boiling Point Impact: _____

Hazards of Incomplete Combustion

Carbon Monoxide: _____

Sulfuric Acid: _____

Aldehydes: _____

When incomplete combustion is suspected, or individuals involved in an emergency situation are exhibiting symptoms of carbon monoxide poisoning: _____

Additional Lesson Notes

Notes:

Lesson 2 – Hazard Assessment and Risk Mitigation

Objectives:

- Explain the fundamental concepts that are part of a framework for systematically resolving a propane incident.
- Recognize key players who may provide support in a propane incident.
- Differentiate between technical decontamination and emergency decontamination.
- Evaluate the strategies and tactics for managing a propane incident.
- Describe the capabilities and limitations of PPE for various hazards.

Tactical Procedures Based on The Eight Step Process©

Steps	Checklist Items	Notes
Step #1: Site Management and Control	<ul style="list-style-type: none"> • Assess the area • Establish an Incident Command Post (ICP) • Establish additional areas of control • Initiate public protective actions (PPA) 	
Step #2: Identify the Problem	<ul style="list-style-type: none"> • Survey the incident and identify the nature and severity of the problem • Determine if LP-Gas is involved • Assess the type of container involved • Conduct offensive or defensive reconnaissance 	
Step #3: Evaluate the Hazards and Risks	<ul style="list-style-type: none"> • Assess the hazards • Collect and prioritize hazard data • Utilize Primary Technical Information Centers as needed • Determine tactics • Develop your Incident Action Plan (IAP) 	

<p>Step #4: Select the Proper Protective Equipment (PPE)</p>	<ul style="list-style-type: none"> • Select PPE based on hazards and objectives • Order additional personnel, equipment, and expertise early • Ensure ALL personnel are using the proper PPE 	
<p>Three types of PPE typically utilized by emergency responders are:</p> <ol style="list-style-type: none"> 1. 2. 3. 		
<p>Step #5: Information Management and Resource Coordination</p>	<ul style="list-style-type: none"> • Confirm a unified command is in place • Ensure all internal and external notifications have been made • Expand the ICS and create additional branches, divisions, or groups as necessary 	
<p>Duties of a Liaison Officer include:</p> <ol style="list-style-type: none"> 1. 2. 3. 		
<p>Step #6: Implement Response Objectives</p>	<ul style="list-style-type: none"> • Prioritize and protect exposures • Implement response objectives • Implement firefighting operations • Ensure entry teams have been briefed before entering the hot zone 	
<p>Step #7: Decontamination and Clean-Up Operations</p>	<ul style="list-style-type: none"> • Coordinate decon with tactical operations • Ensure proper decon of all personnel before they leave the scene • Dispose of contaminated supplies and equipment 	
<p>Types of Decontamination:</p> <ol style="list-style-type: none"> 1. 2. 3. 		

Step #8: Terminate the Incident	<ul style="list-style-type: none">• Account for all personnel before securing operations• Transfer command• Document important information• Conduct a critique• Importance of documentation	
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Additional Lesson Notes

Notes:

Lesson 3 – Responding to and Mitigating Propane Incidents

Objectives:

- Determine appropriate intervention actions when propane is stored in a closed container.
- Determine appropriate actions based on design and construction features of propane cylinders.
- Determine appropriate actions based on the design and construction features of the MC-331 cargo tank truck.
- Determine appropriate actions based on design and construction of a propane railroad tank car (DOT-105, DOT-112, DOT 114).
- Determine appropriate actions based on design and construction of a bulk plant.
- Determine appropriate actions based on design and construction of a bulk propane container.
- Determine appropriate actions based on design and construction of a bulk transport cargo tank truck.
- Determine appropriate actions based on design and construction of the IMO Type 5 / DOT Spec 51 propane tank container.

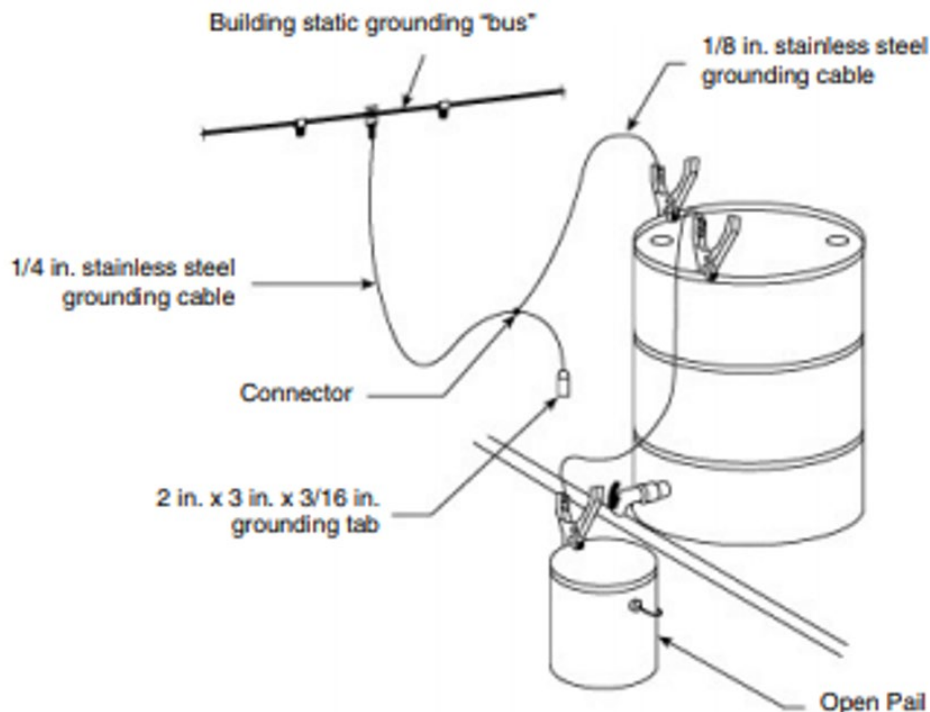
Propane Incident Safety Measures

_____ and _____ are imperative to create a safe environment when transferring liquid propane.

Bonding and grounding wire and accessories help prevent: _____

The decision whether to bond and ground a damaged cargo tank truck or rail car should be made on a case-by-case basis by the: _____

Effective Bonding and Grounding



For bonding and grounding to be effective, a: _____

_____ and _____ are the two types of bonding and grounding connections.

Uninsulated wires are recommended for bonding and ground because: _____

Review of Key Concepts

1. Liquid propane has a boiling point of _____, meaning it will become gas when exposed to temperatures above that point.
2. Propane can be stored as a liquid under pressure when placed in a pressure-tight container. All closed containers have safety valves designed to allow the: _____

3. Proper PPE is necessary when responding to propane incidents to protect the responder from _____, _____, and _____ hazards. Liquid propane can cause freeze burns to exposed skin.
4. Propane vapor density is _____ at _____ °F. This makes it roughly _____ times heavier than air, and it may gather in low-lying areas.
5. Propane has an expansion ratio of _____ which means one volume of liquid propane will increase to _____ times the original volume leading to a large hazard area.
6. Heat applied to a closed container will impact the _____ and _____ of the container.
7. Propane gas is flammable when within the upper and lower flammable limits. The UFL is _____% and the LFL is _____%. Propane gas will ignite when exposed to an ignition source, such as a spark as low as _____ °F.
8. Incomplete combustion of propane causes harmful by-products, including _____, _____, and _____ are produced. _____ is an odorless, colorless and tasteless gas that cannot be detected by the body. Exposure to _____ at high enough concentrations will cause death.

Scenarios

Scenario #1: Overturned MC-331 Cargo Tank Truck

While driving down a major interstate highway in a metropolitan area, an MC- 331 cargo tank truck was cut off by an automobile making a quick lane change causing the tank truck driver to swerve sharply and lose control of the vehicle. The cargo tank truck overturned onto its left side, sliding along the concrete highway until it came to rest against a guardrail.

Upon arrival at the scene, the Incident Commander (IC) sizes up the situation. The driver has already extricated himself from the tractor, and an EMS unit has arrived on-scene and has begun treatment of the injured driver. There are no visible leaks or spills from the cargo tank.

What Are The Next Steps?	
Step Title	Notes
Step 1: Site Management and Control	
Step 2: Identify the Problem	
Step 3: Evaluate the Hazards and Risks	
Step 4: Select the Proper Protective Equipment	

<p>Step 5: Information Management and Resource Coordination</p>	
<p>Step 6: Implement Response Objectives</p>	
<p>Step 7: Decontamination and Clean-Up Operations</p>	
<p>Step 8: Terminate the Incident</p>	

Scenario #2: Overturned Railroad Tank Car with Fire

A DOT-112 railroad tank car transporting propane has been involved in a high-speed derailment in a remote rural area approximately 500 feet from a two-lane road. The rail car is overturned on its right side and the car's topside relief valve is below the liquid level in the tank.

An adjacent rail car of acetone has been breached and is on fire. A running pool fire of burning acetone is exposing the propane rail car to intense heat. The propane rail car's relief valve is functioning due to the increased internal pressure in the car.

Since the relief valve is below the liquid level, liquid propane is being forced out of the relief valve and is exposing the upper half (right side) of the car to heavy fire.

What Are The Next Steps?

Step Title	Notes
Step 1: Site Management and Control	
Step 2: Identify the Problem	
Step 3: Evaluate the Hazards and Risks	
Step 4: Select the Proper Protective Equipment	
Step 5: Information Management and Resource Coordination	

<p>Step 6: Implement Response Objectives</p>	
<p>Step 7: Decontamination and Clean-Up Operations</p>	
<p>Step 8: Terminate the Incident</p>	

Scenario #3: Emergency Planning for a Propane Bulk Plant

On June 5, 1996, the National Response Team (NRT) issued a good planning aid for industrial facilities that want to plan for emergencies. This document is called the Integrated Contingency Planning Guidelines (ICP).

The ICP allows facilities to create new plans or revise their existing emergency plans to address the many different regulatory requirements of various federal agencies in one single plan.

If the ICP guidelines are followed in preparing your plan, the document will help you deal with any type of emergency including a propane release, fire, tornado, hurricane, or any contingency that may require emergency actions.

The concept of having "One Plan" instead of several different plans for various types of emergencies helps minimize duplication and makes emergency planning cost-effective. It also helps keep the plan up to date easier.

Integrated Contingency Plan

The three primary sections of an ICP are:

- 1.
- 2.
- 3.

Additional Notes on Each Section:

Scenario #4: Underground Propane Tank Fire

A lawn service is cutting the grass in the yard of a new home using a riding lawn mower. The grass is high and the gardener fails to notice the exposed riser of a 500-gallon underground propane tank. The lawn mower runs over the riser and gets hung up on top of the shroud protecting the multi-valve.

The impact of the mower against the riser causes a crack to develop in the pipe at the point where it enters the underground tank two feet below grade. Propane gas is released through the crack in the pipe and escapes into the shroud surrounding the pipe. The leaking propane is ignited by the lawn mower.

The gardener was able to escape the area without injury and called the fire department.

The gardener explains that he hit something with the lawn mower and then smelled gas. This is his first time cutting the lawn at this location and he was unaware that there was a propane tank buried in the yard. The owner is not at home.

What Are The Next Steps?	
Step Title	Notes
Step 1: Site Management and Control	
Step 2: Identify the Problem	
Step 3: Evaluate the Hazards and Risks	
Step 4: Select the Proper Protective Equipment	

Step 5: Information Management and Resource Coordination	
Step 6: Implement Response Objectives	
Step 7: Decontamination and Clean-Up Operations	
Step 8: Terminate the Incident	

Scenario #5: Fire Involving Bobtail Delivery Truck

A bobtail propane delivery truck has been involved in an accident on a two-lane highway. The bobtail stopped at an intersection for a red light and was struck from the rear by a cargo truck.

The severe impact produced a liquid propane leak at the rear of the bobtail truck. The propane gas has ignited and flames are impinging on the back of the tank. Two pressure relief valves (PRVs) are intermittently opening and gradually closing down.

Upon arrival at the scene, the Incident Commander (IC) sizes up the situation.

The driver of the cargo truck is still in the cab, slumped down over the steering wheel.

The driver of the bobtail truck is not injured and has offered to shut a valve that will extinguish the propane fire.

What Are The Next Steps?

Step Title	Notes
Step 1: Site Management and Control	
Step 2: Identify the Problem	
Step 3: Evaluate the Hazards and Risks	
Step 4: Select the Proper Protective Equipment	

Step 5: Information Management and Resource Coordination	
Step 6: Implement Response Objectives	
Step 7: Decontamination and Clean-Up Operations	
Step 8: Terminate the Incident	

Scenario #6: Leak on Intermodal Pressure Tank Container

Your fire department responds to a marine terminal for a report of a gas leak involving an intermodal tank in a container yard.

Upon arrival at the marine terminal, the Port Authority Police escorts you to the scene of the incident.

The senior police officer at the scene tells you that the container was offloaded from a container ship about one hour ago. Dock workers smelled a strong odor of gas in the area of the tank and called the Port Police.

What Are The Next Steps?

Step Title	Notes
Step 1: Site Management and Control	
Step 2: Identify the Problem	
Step 3: Evaluate the Hazards and Risks	
Step 4: Select the Proper Protective Equipment	
Step 5: Information Management and Resource Coordination	

Step 6: Implement Response Objectives	
Step 7: Decontamination and Clean-Up Operations	
Step 8: Terminate the Incident	