



Training Solutions, Delivered!

Bonding and Grounding of Flammable Liquids

Concise Version

**Leader's Guide, Fact Sheet
& Quiz**

Item Number: 5369

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This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation.

PREPARING FOR THE MEETING

Here are a few suggestions for using this program:

- a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.
- b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.
- c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.
- d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes before the quiz itself, which is on the final page.

CONDUCTING THE PRESENTATION

- a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.
- b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.
- c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.
- d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

5369 Bonding and Grounding of Flammable Liquids - Concise FACT SHEET

LENGTH: 7 MINUTES

Production Year: 2024

PROGRAM SYNOPSIS:

Every day, flammable liquids are safely used, transported, and transferred in a wide variety of industries, vehicles, and applications. In order to do so, all personnel involved in flammable liquid operations must be aware of the potential hazards presented by flammable liquids and understand the safe work practices that must be followed to prevent fires or explosions. This program demonstrates how to prevent electrostatic discharge while transferring flammable liquids by using proper bonding and grounding methods.

PROGRAM OBJECTIVES:

After watching the program, the participant should be able to explain the following:

- What is static electricity;
- Why it is important to know the flashpoint of a flammable liquid;
- How bonding and grounding works.

PROGRAM OUTLINE:

INTRODUCTION

- Every day, flammable liquids are safely used, transported, and transferred in a wide variety of industries, vehicles, and applications.
- In order to do so, all personnel involved in flammable liquid operations must be aware of the potential hazards presented by flammable liquids and understand the safe work practices that must be followed to prevent fires or explosions.
- During this program, you will learn how to prevent electrostatic discharge while transferring flammable liquids. But first, we need to have a good understanding of static electricity.

STATIC ELECTRICITY

- All matter is made up of atoms. Atoms are often called “the building blocks of matter.” Anything that has mass or takes up space is made up of atoms. This includes all solids, liquids, and gasses.
- Atoms consist of other small particles: protons, neutrons, and the smallest of particles – electrons. The nucleus, or center, of an atom consists of some combination of protons and neutrons while the smaller electrons orbit around the nucleus.
- It is these electrons that we are concerned about when it comes to flammable liquid safety because each electron carries a small, negative electrical charge.
- It is the imbalance of negatively charged particles that creates static electricity.
- The risk of creating a build-up of static electricity increases when flammable liquids are transferred from one container to another. This is because liquid moving through a pipe or hose, or even being poured from one container to another, is forcibly moving electrons from one place to another.
- This transfer of electrons via the flowing liquid can create a charge imbalance in the various items or materials involved in the transfer. Drums, containers, vehicles, tanks, vessels, even airplanes can become negatively or positively charged relative to other objects.
- And when materials with this type of a charge imbalance are brought close together, touch, or are connected by a conductive object, an electrostatic discharge can occur and potentially ignite any nearby vapors from flammable liquids.

FLASHPOINT

- By definition, a flammable liquid is any liquid with a flashpoint equal to or below 93 degrees Celsius or 199.4 degrees Fahrenheit. The term “flashpoint” refers to the minimum temperature at which a liquid gives off vapor within a vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. This is an important concept to understand because it is the **vapor** that ignites, not the **liquid**.

- In general, flammable liquids with a lower flashpoint are **more** volatile, meaning they present a greater fire hazard, than flammable liquids with a higher flashpoint.

BONDING AND GROUNDING

- Due to their volatility, both OSHA and the NFPA have bonding and grounding requirements when transferring flammable liquids. Bonding and grounding is used to prevent the build-up of static electricity and help prevent the occurrence of a spark due to electrostatic discharge.
- This is why all containers of flammable liquids with a flashpoint of 100 degrees Fahrenheit or less must be bonded and grounded during the dispensing of the flammable liquid.
- The process of bonding and grounding can be defined as providing an electrically conductive pathway between a dispensing container, a receiving container, and an earth ground.
- Most modern plastic containers may have an embedded ground wire so it can be grounded and bonded as needed.
- Also, a pump with a metal draw tube can be used to ensure contact with the liquid. In laboratory settings, a copper tube is often inserted into a glass beaker for this purpose.
- By establishing this conductive pathway **before** the transfer of flammable liquid begins, any potential build-up of static electricity will safely dissipate into the ground and there will be no charge imbalance created between the containers, thus reducing the possibility of sparks from electrostatic discharge.
- Next, let's briefly explain the difference between bonding and grounding.
- When two items are **bonded** together with a conductive material, any charge imbalance between the items (also known as "electrical potential") is eliminated because excess electrons can easily move or "flow" through the bonding conductor as needed to correct any charge imbalance.
- In other words, bonding completes the "circuit" between two objects and places them at the same electrical potential.
- However, there is another large object that must also be considered, the Earth.
- Bonding the drum to a smaller container merely creates a bonded system that may also have a charge imbalance relative to the Earth. And any person or object in contact with the Earth may cause an electrostatic discharge (or spark) when contacting the bonded drum or small container.
- The solution to this problem is grounding.
- Grounding begins by driving a conductive grounding rod deep into the Earth and then attaching a conductive grounding wire to the grounding rod. This grounded connection can then be routed via other conductive objects and attached to the item being grounded.
- In addition to grounding wires and bus bars, conductive plumbing pipes are often used to provide a grounded connection to other points in a facility.
- Once an object is grounded in this manner, any build-up of static electricity in the grounded item or any item bonded to it will dissipate into the Earth.
- For bonding and grounding to be effective, each bonding and grounding cable must be in good condition and all connectors must be in solid contact with a conductive surface and free from excessive corrosion. This requires periodic inspection and testing by qualified personnel to ensure that a complete low-resistance circuit exists.

USE CORRECT PPE

- Any time you're transferring flammable liquids, you should always be aware of your personal safety. Make sure to wear the proper personal protective equipment.

BONDING AND GROUNDING OF FLAMMABLE LIQUIDS - CONCISE

ANSWERS TO THE REVIEW QUIZ

1. a

2. a

3. b

4. a

5. a

6. a

BONDING AND GROUNDING OF FLAMMABLE LIQUIDS - CONCISE REVIEW QUIZ

Name _____ Date _____

The following questions are provided to determine how well you understand the information presented in this program.

1. The risk of creating a build-up of static electricity increases when flammable liquids are transferred from one container to another.
 - a. True
 - b. False

2. The term "flashpoint" refers to the minimum temperature at which a liquid gives off vapor within a vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.
 - a. True
 - b. False

3. Flammable liquids with a higher flashpoint are **more** volatile than flammable liquids with a lower flashpoint.
 - a. True
 - b. False

4. All containers of flammable liquids with a flashpoint of 100 degrees Fahrenheit or less must be bonded and grounded during the dispensing of the flammable liquid.
 - a. True
 - b. False

5. Bonding completes the "circuit" between two objects and places them at the same electrical potential.
 - a. True
 - b. False

6. Grounding begins by driving a conductive grounding rod deep into the Earth and then attaching a conductive grounding wire to the grounding rod.
 - a. True
 - b. False