This presentation is designed to assist trainers conducting OSHA 10-hour General Industry outreach training for workers. Since workers are the target audience, this presentation emphasizes hazard identification, avoidance, and control – not standards. No attempt has been made to treat the topic exhaustively. It is essential that trainers tailor their presentations to the needs and understanding of their audience.

This presentation is not a substitute for any of the provisions of the Occupational Safety and Health Act of 1970 or for any standards issued by the U.S. Department of Labor. Mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. Department of Labor.

Introduction

- The two primary hazards associated with flammable liquids are *explosion* and *fire*
- Safe handling and storage of flammable liquids requires the use of approved equipment and practices per OSHA standards

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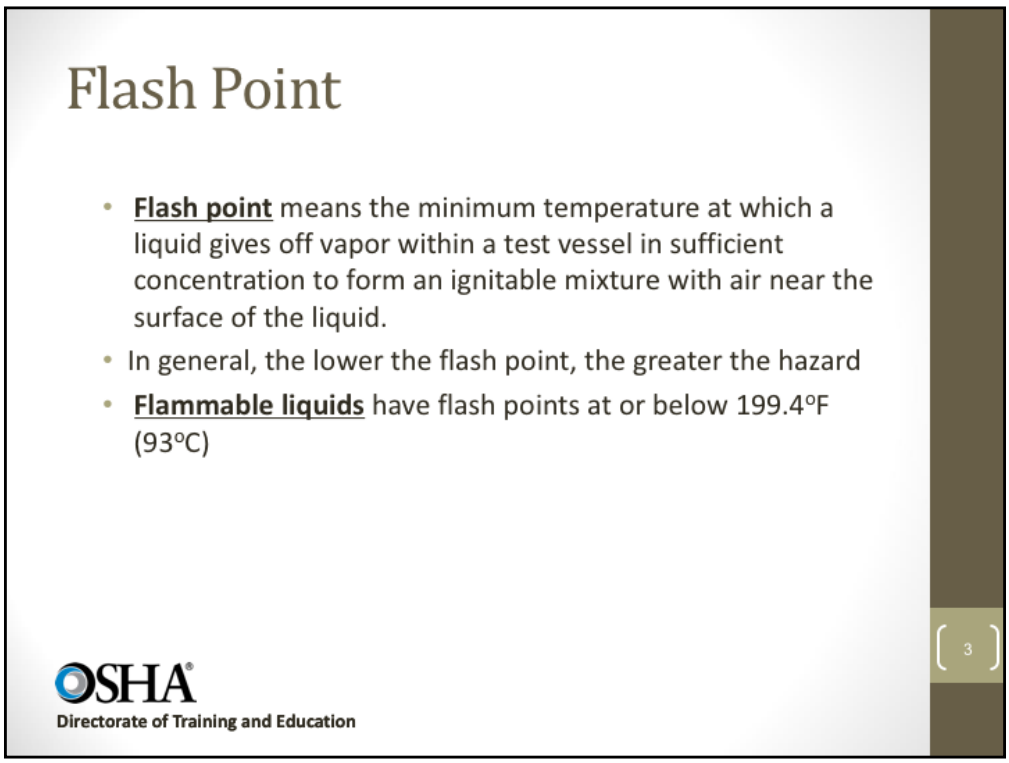
2

29 CFR 1910.106



1910.106(a)(14)

Flash point means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flammable liquids themselves will not burn, but as the liquid evaporates, it gives off vapors that mix with the air to form dangerous gases that can be set off by a small spark. Gasoline, for example, evaporates at temperatures as low as 45 degrees Fahrenheit below zero. As the temperature rises, the rate of evaporation increases and more and more vapors are given off. Flammable vapors are usually heavier than air so they collect in the lowest areas they can reach. Without good ventilation to dissipate them, a small spark can set off a big disaster.

Program Components

A good plan for safe use of flammable liquids contains at least these components:

- Control of ignition sources
- Proper storage
- Fire control
- Safe handling

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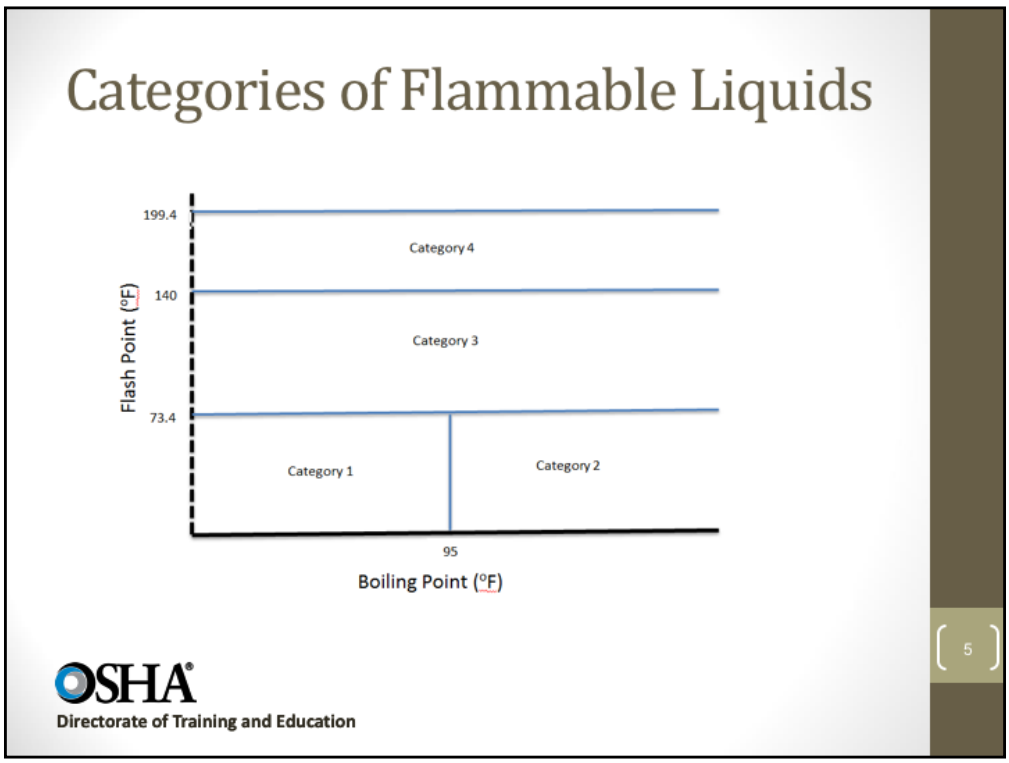


1910.106(a)(19)

Flammable liquids are classified primarily according to their flash point to indicate the danger they pose as a fire hazard. Flash point is directly related to a liquid's ability to generate vapor. Since it is the vapor of a liquid, not the liquid itself, that burns, vapor generation becomes a primary factor in determining the fire hazard.

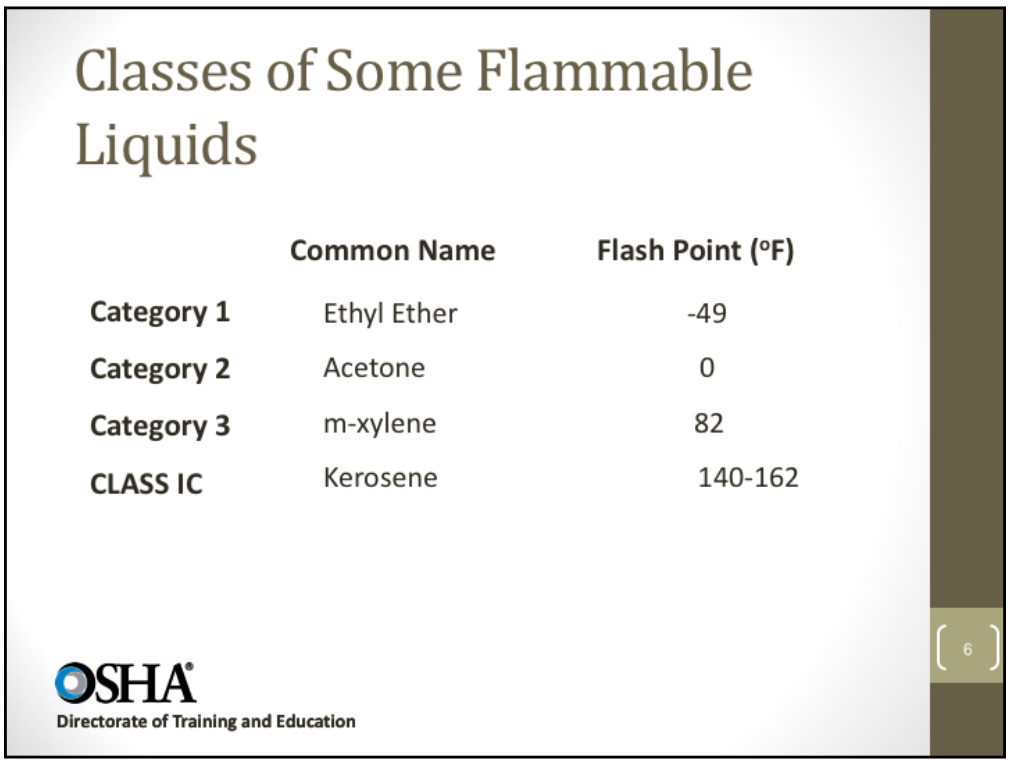
Category 1 shall include liquids having flashpoints below 73.4 °F (23 °C) and having a boiling point at or below 95 °F (35 °C).

Category 2 shall include liquids having flashpoints below 73.4 °F (23 °C) and having a boiling point above 95 °F (35 °C).

Category 3 shall include liquids having flashpoints at or above 73.4 °F (23 °C) and at or below 140 °F (60 °C). When a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C) is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint below 100 °F (37.8 °C).

Category 4 shall include liquids having flashpoints above 140 °F (60 °C) and at or below 199.4 °F (93 °C). When a Category 4 flammable liquid is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C).

When liquid with a flashpoint greater than 199.4 °F (93 °C) is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 4 flammable liquid.



Some kerosenes may have a lower flash point. Kerosene is a mixture of refined petroleum solvents and the content of the mixture can vary with the manufacturer. Check the SDS.

Sources of Ignition

Must take adequate precautions to prevent ignition of flammable vapors. Some sources of ignition include:

- Open flames
- Smoking
- Static electricity
- Cutting and welding
- Hot surfaces
- Electrical and mechanical sparks
- Lightning

7

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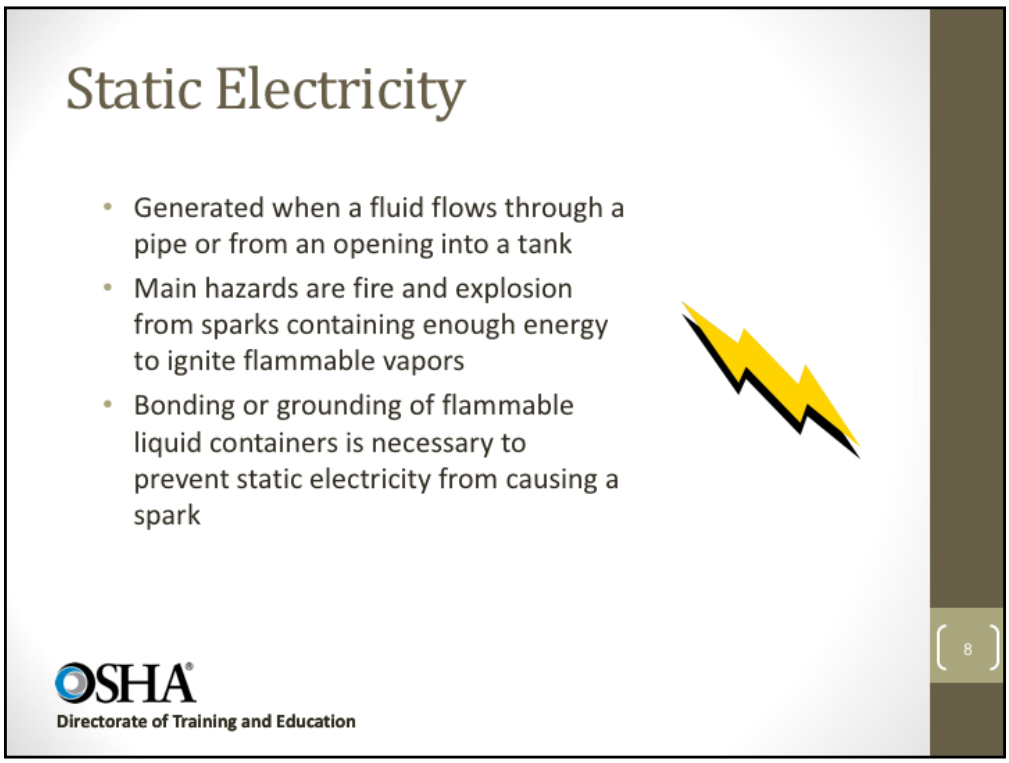
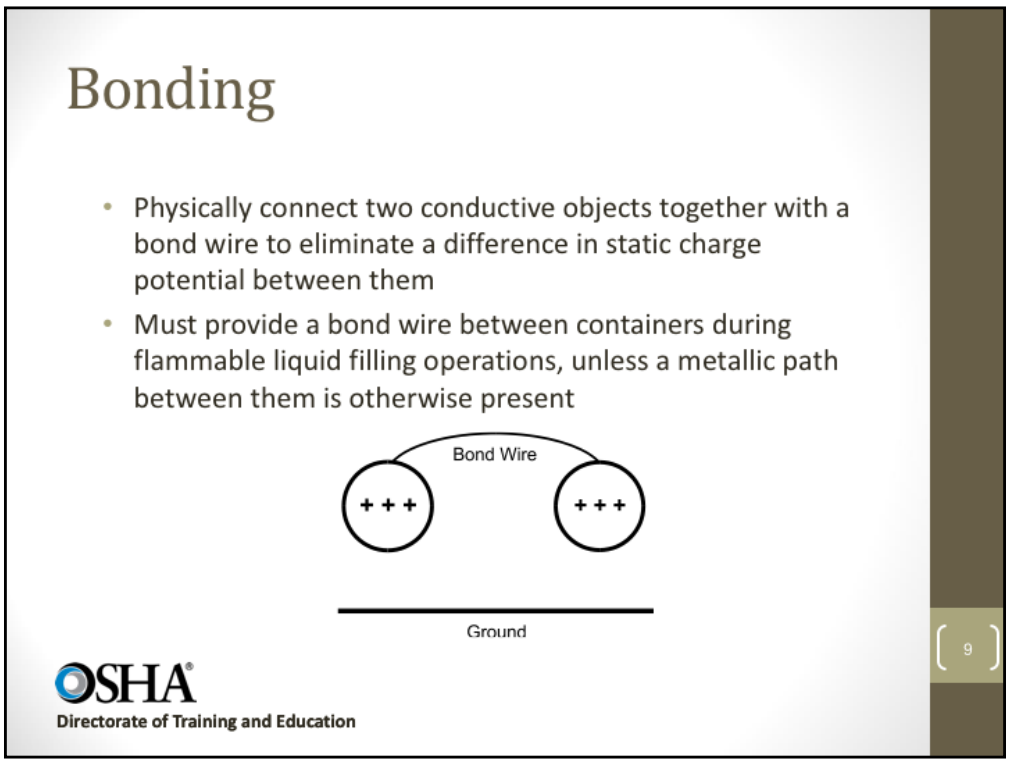
1910.106(e)(6)(i)



Static electricity can be generated by the contact and separation of dissimilar materials. For example: belts and pulleys, tires and the road, fluid flow through a pipe, agitation and mixing of fluids, and splash filling of flammable liquids.

For more information, see NFPA 77, *Static Electricity*.

One of the primary means of reducing the hazard of static electricity when transferring flammable liquids into/from containers is through the use of bonding and grounding, which is discussed in this program.

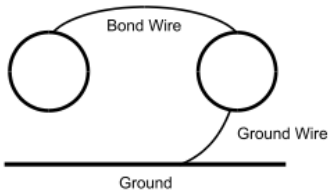


1910.106(e)(6)(ii)

Both objects bonded share the same charge and have no potential difference, BUT there still is a potential difference between the conductive objects and ground. Thus, there is danger of a spark from one of the conductive objects to grounded objects.

Grounding

- Eliminates a difference in static charge potential between conductive objects and ground
- Although bonding will eliminate a difference in potential between objects, it will not eliminate a difference in potential between these objects and earth unless one of the objects is connected to earth with a ground wire



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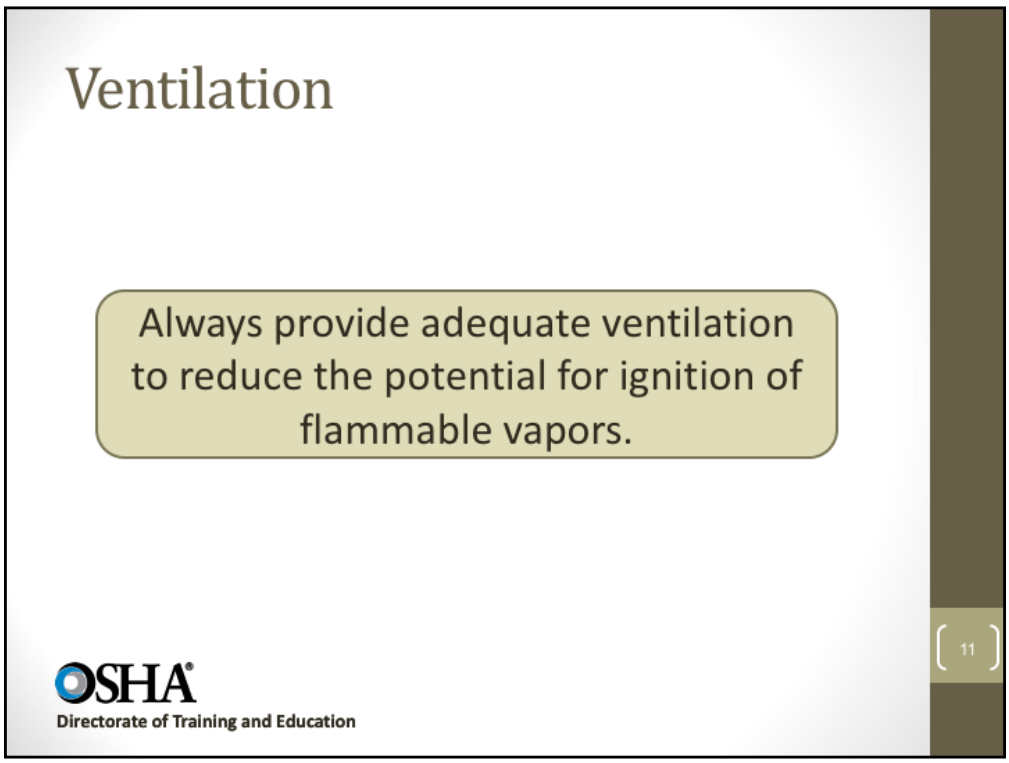
10

1910.106(e)(6)(i)

Both objects bonded and grounded permit charge to flow to ground.



1910.106(a)(31)

Ventilation for the prevention of fire and explosion is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

For additional information on ventilation, see OSHA's web site at:

http://www.osha-slc.gov/SLTC/ventilation/index.html

Storage Fundamentals

- Identify incompatible chemicals – check the Safety Data Sheets
- Isolate and separate incompatible materials
  - Isolate by storing in another area or room
  - Degree of isolation depends on quantities, chemical properties and packaging
  - Separate by storing in same area or room, but apart from each other

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Storage of Flammable Liquids

- Storage must not limit the use of exits, stairways, or areas normally used for the safe egress of people
- In office occupancies:
  - Storage prohibited except that which is required for maintenance and operation of equipment
  - Storage must be in:
    - closed metal containers inside a storage cabinet, or
    - safety cans, or
    - an inside storage room

Inside storage room

13

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1910.106(d)(5)(i) and (iii)

In office occupancies, the inside storage room must not have a door that opens into that portion of the building used by the public.

Safety Cans for Storage and Transfer

- Approved container of not more than 5 gallons capacity
- Spring-closing lid and spout cover
- Safely relieves internal pressure when exposed to fire

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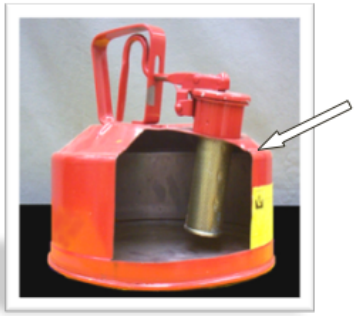
14

1910.106(a)(29)

Flame Arrester Screen

- Prevents fire flashback into can contents
- Double wire-mesh construction
- Large surface area provides rapid dissipation of heat from fire so that vapor temperature inside can remains below ignition point



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15

Storage Cabinets

- Not more than 60 gallons of Category 1, 2, or 3 flammable liquids, nor more than 120 gallons of Category 4 flammable liquids may be stored in a storage cabinet.
- Must be conspicuously labeled, "Flammable - Keep Fire Away"
- Doors on metal cabinets must have a three-point lock (top, side, and bottom), and the door sill must be raised at least 2 inches above the bottom of the cabinet

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16

1910.106(d)(3)(i) and (ii)

Three-point lock on metal cabinet doors prevents buckling, which would expose contents to fire.

A raised door sill will contain a leak.

Fire Control

- Suitable fire control devices, such as small hose or portable fire extinguishers must be available where flammable liquids are stored
- Open flames and smoking must not be permitted in these storage areas
- Materials which react with water must not be stored in the same room with flammable liquids

17

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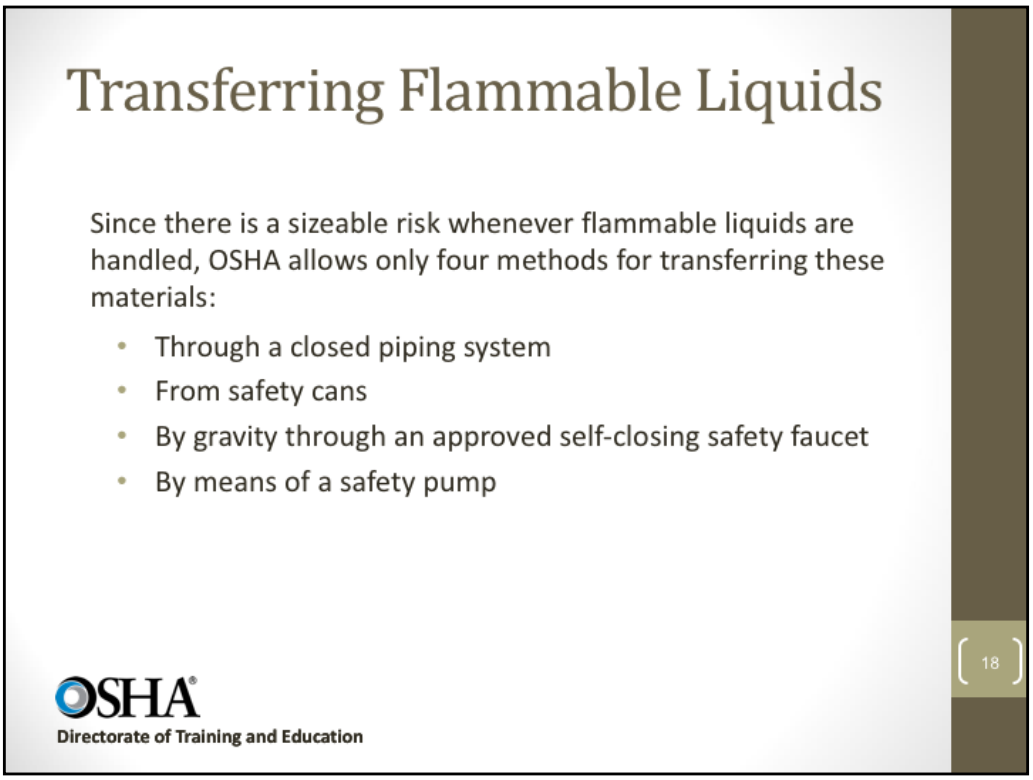
1910.106(d)(7)(i) and (iii) and (iv)



1910.106(e)(2)(iv)(*d*)

Transferring of flammable liquids by means of air pressure on the container or portable tanks is prohibited.

Self-Closing Safety Faucet

- Bonding wire between drum and container
- Grounding wire between drum and ground
- Safety vent in drum22

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19

Safety Pump

- Faster and safer than using a faucet
- Spills less likely
- No separate safety vents in drum required
- Installed directly in drum bung opening
- Some pump hoses have integral bonding wires

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20

Waste and Residue

Flammable waste and residue must be kept to a minimum, stored in covered metal receptacles and disposed of daily.

Waste drum with disposal funnel

Safety disposal can

Oily-waste can (self-closing lid)

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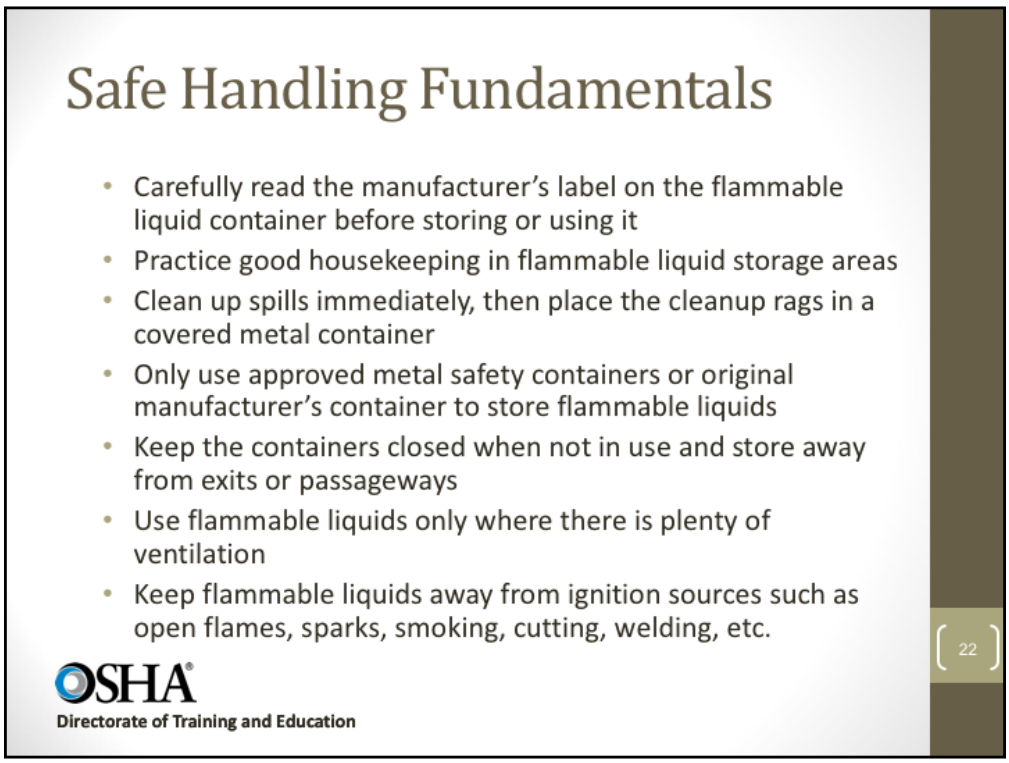
21

1910.106(e)(9)(iii)



Spills or Leaks

First, eliminate all sources of ignition, then

- Stop the leak, if possible
- Contain the material
- Isolate the area
- Avoid direct contact with the material
- Use appropriate fire control procedures

Summary

- The two primary hazards associated with flammable liquids are explosion and fire
- Safe handling and storage of flammable liquids requires the use of approved equipment and practices per OSHA standards
- An excellent reference on this topic is National Fire Protection Association Standard No. 30, *Flammable Liquids and Combustible Code*

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