

Static electricity hazards

By Arne Larson

Before you begin

Survey your facility to identify activities that have potential to create static electricity sparking. Review safety procedures at your company designed to prevent hazards caused by static electricity. If available, bring examples of bonding and grounding devices to demonstrate their use.



Under certain conditions, liquids, solid objects and people can become charged with static electricity. If these charges cannot move or flow to ground, the static charges continue to accumulate, and will eventually develop enough energy to jump as a spark to another nearby object. If flammable gas or vapor is present when this occurs, this spark can ignite a fire or cause an explosion.

Everyone has probably experienced a static electricity spark (and shock) at one time or another. This usually happens in the winter when there is not much moisture in the air (humidity is low), but can occur any time of year.

Review the sources of static electricity with the group. Write these terms on a white board or flip-chart for later reference.

- Triboelectrification occurs when two different materials make contact and then separate (walking across a carpet).
- Liquid shear charging is created by the flow of liquids through a pipe, hose or vessel (filling a tank truck through a loading pipe). Free falling liquids through air can also generate static charge.

- Induction charging occurs when a neutral ungrounded object moves into the electric field that surrounds a highly charged object (walking on a wood floor and touching a charged object).
- Corona charging is caused when a nonconductive object is sprayed with a stream of material that is electrically charged (electrostatic paint spraying).

Methods to prevent static electricity discharge

Discuss with the group each of these seven ways to reduce or eliminate static electricity. Ask them to identify locations in the facility where examples may be found.

- Bond – connect two or more conductive objects together with a conductor (like a wire) to equalize the potential charge between them.
- Ground – connect one or more conductive objects directly to the earth with a conductor (like a wire or steel rod).
- Humidification – moisture in the air (humidity above 60 percent) can help dissipate static charges on objects.

- Additives – certain fuel additives can increase the conductivity of the liquid.
- Static collectors – highly conductive devices that collect static charges from non-conductive sources and safely channel it to ground.
- Materials – conductive flooring and shoe soles can help dissipate static charges away from the person.
- Minimize splash filling and free-fall of low conductivity flammable liquids.

Types of static discharges

Ask the group to identify situations at your facility where static discharges may occur.

- Capacitive discharge – sparks that occur between conductive objects, such as a metal drum and a metal container.
- Brush discharge – may occur when a grounded conductor comes close to a charged non-conductive object. For example, removing a sweater and putting it on a metal hanger rod.
- Note: there are other types of discharges associated with powders and powder coating operations. See reference materials for more information.

Preventing fires and explosions

Discuss with the group the safety precautions listed below for working with flammable liquids, gases, vapors and dusts to minimize generation of static electricity. Ask if they can think of any other ways to prevent static sparking.

- Bond and ground all metallic equipment.
- Bonding and grounding are both required when handling flammable liquids.
- Non-metallic piping and containers cannot be bonded and grounded. If possible, these materials should not be used to handle flammable liquids.
- Special care is required when dispensing flammable liquids.
 - Minimize splash filling and free fall as much as possible.
 - Reduce the flow rate of the liquid. A slower liquid velocity helps minimize agitation and turbulence.

- Increase conductivity of a liquid by using anti-static additives, or mixing in other more conductive liquids (for example, ethanol, acetone).
- In-line microfilters can cause rapid charging of low conductivity liquids.
- Enclose filters in a grounded metal enclosure.
- Plastic bags and drum liners can generate static charges when pulled apart or across other materials.
- Static-dissipating soles on shoes and treated or cotton clothing can help reduce static buildup.
- Inspect and repair grounding wires, straps, connections, clamps, etc. to ensure a good path to ground is maintained.

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We always strive to improve the *Safety Leader's Discussion Guide*. Your feedback can help. Please send your comments via e-mail to Safety@ohiobwc.com.

References

Web sites

- Static Electricity (Industrial Accident Prevention Association, Ontario, Canada): www.iapa.ca/Main/documents/pdf/2004_feb_Static%20Electricity.pdf
- Static Protection through Bonding and Grounding (IAEI Magazine): www.iaei.org/magazine/2004/05/static-protection-through-bonding-and-grounding/
- Stop Static (Petroleum Equipment Institute): www.pei.org/PublicationsResources/SafetyResources/StopStaticCampaign.aspx

Publication

- Recommended Practice on Static Electricity, NFPA 77, National Fire Protection Association.