



Weekly Safety Meeting

Your Safety Is Our Business®

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Bonding and Grounding

When transferring flammable liquids, it is important that the containers involved are bonded and grounded in order to prevent static electricity from igniting the vapors. Static electricity results from the interaction of dissimilar materials.

This can occur when materials are rubbed together, such as walking across carpet while wearing wool socks. Static charges can develop when a liquid passes through a pipe or through an opening into a tank or drum. A static spark is a discharge of electricity across a gap between two points not in contact, resulting from the difference in electrical potential.

The spark produced from this discharge usually contains enough energy to ignite flammable vapors if they are in concentrations that will sustain combustion. While static electricity cannot be eliminated, the potential for static charge buildup can be reduced through bonding and grounding.

Bonding is the process of eliminating electrical potential differences between two or more objects. This can be accomplished by attaching a conductive wire between the objects. The attachment point on both objects must be solid and secure and should be made on a bare metal surface. Using a pressure clamp (screw-on or spring-loaded) is a good way to ensure a positive connection. The connection must be made prior to beginning the transfer of material between containers. Bonding will not eliminate a potential charge difference between the objects and the earth.

Grounding is the process of eliminating that potential difference between an object and the earth. To ensure a static spark is not created by the difference, a conductive path must be provided to the earth. An underground water main is a good grounding point, or a metal grounding rod can be driven into the earth.

Bonding and grounding are only effective on electrical charge conducting materials such as metal. Plastic drums and buckets cannot be grounded or bonded. When transferring flammable liquids to or from a plastic container, extreme caution should be exercised.

When filling a plastic container, use a grounded discharge nozzle and hose and fill the container from the bottom up. Decreasing the flow rate of the flammable liquid will decrease the potential for a static spark as will minimizing the sloshing of liquid in the container.

Grounded flash guards through which the liquid must flow can also reduce static potential. Ideally, flammable liquids are not stored in plastic drums.

Typical problems:

Frequently noted problems with bonding and grounding systems for flammable liquid containers and piping include:

- Inappropriate choice of what is used as a pathway to ground;
- Poor connections of bonding and/or grounding conductors to flammable liquid system components;
- Damaged conductors;
- Multiple containers in series.



Good practice principles:

Whether the situation consists of multiple pressurized spray containers at a spray booth, a series of drums connected to a dispensing system in a paint locker, or just a single container of flammable liquid or contaminated rags, the same principles of bonding and grounding apply.

- **Confirm the ground:** Confirm that whatever the grounding conductor will be attached to actually is grounded (preferably tied into the building grounding electrode system).
- **Create a reliable electrical connection:** Attach the grounding conductor to the source of ground permanently with a reliable means that will ensure continued metal-to-metal contact (e.g., mechanical, bare-metal connection via bolt and nut, welded connection, etc.).
- **Chisel-point clamps:** If the grounding conductor will be used to connect a single item to ground, ensure that the connecting end of the conductor is equipped with the type of clamp that has a chisel-point bolt and requires tightening with a wrench. This type of clamp will break through the paint on drums and other items that may need to be grounded. Do not use weak spring-loaded clips and clamps.
- **Conductor wire:** Use a conductor that is sufficient for the application such as No.4 copper wire for grounding and No.6 copper wire for bonding.
- **Clamp to conductor connection:** Make sure the clamp at the end of the grounding conductor is attached to the conductor in a reliable fashion that will ensure continued metal-to-metal contact (e.g., compression fitting, welded connection, etc.).
- **Grounding multiple items at one location:** If multiple items need to be grounded at one location, install a main grounding conductor with lateral conductors attached to it. In most cases, the main conductor will be run horizontally next to the items that need to be grounded. The laterals should be attached to the main conductor at locations nearest the respective items to be connected. Install the main conductor so that it is solid and taut. Keep the lateral conductors as short as feasible.
- **Bonding straps:** When constructing a bonding strap, use a suitable conductor (e.g., No.6 copper wire) and two chisel-point clamps that require tightening with a wrench. Make sure the clamps are attached to the ends of the conductor in a fashion that will ensure continued metal-to-metal contact (e.g., compression fitting, welded connection, etc.).
- **Paint and other coatings:** When applying bonding or grounding straps to containers or other items, make sure the chisel-point clamps are tightened sufficiently to break through any layers of paint or other coatings so a metal-to-metal connection is achieved.

Working safely may get old...but so do those who practice it!!

