

Author	Status	Effective Date
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1.0 Purpose

This procedure is intended to ensure that appropriate grounding and bonding connections are in place whenever materials are being mixed, poured, filled, or otherwise transferred from one container/vessel to another. Static electricity is generated when liquids move in contact with other materials. This is a common occurrence when liquid is being moved through pipes, mixed, poured, pumped, filtered, or otherwise agitated. Other causative processes include the settling of solids or immiscible liquid through a liquid, the ejection of particles or droplets through a nozzle, and the splashing of a liquid against a solid surface. NFPA 77 states that "under certain conditions, particularly with liquid hydrocarbons, static may accumulate in the liquid", with the danger of subsequent sparking in a flammable vapor-air mixture. Static charge hazards in the classified areas are minimized by proper use and maintenance of bonding and grounding equipment and containers. These standard operating procedures are guidelines intended to meet and comply with Gemini Industries' Static Control Program.

2.0 Scope

This document covers the standard procedures to be followed for all employees that engage in handling, mixing, or transferring liquids for Gemini. By following the instructions, the workload will be completed accurately, consistently, and safely. Static electricity has long been known as a hazard associated with handling and mixing of flammable products. Proper grounding and bonding is paramount to the proper safe operations required by Gemini Management and Gemini's Static Control Program.

3.0 Safety



***Absolutely NO Electronic Devices in the Hazardous Environments. (Production, Fill-Off, TWP Room)**

***Absolutely NO use of headphones, ear buds, etc. inside the Warehouse and/or Hazardous Environments.**

4.0 Proper Grounding & Bonding Procedures/Static Electricity Information

4.1 Definitions

- 4.1.1 **STATIC ELECTRICITY**- is electricity at rest or the accumulation of electric charge, as opposed to an electric current, which is the movement of electricity. The flow or movement of people and/or materials in and through the environment causes separation and therefore static electricity. A familiar example of static electricity is when a person walks across a carpeted floor. Static electricity/electrostatic charge is generated simply by the contact and separation of the soles of that individual's shoes from the carpeted floor.
- 4.1.2 **ELECTROSTATIC DISCHARGE (ESD)**- occurs when the electrostatic charge is transferred from a material that carries the charge to an electrostatic sensitive device. In the example above, this electrostatic discharge is the "shock" felt after walking across the carpeted floor and then touching a doorknob. It is this electrostatic discharge, which comes in varying degrees that can be most damaging to electrical devices and other industrial, commercial, and consumer products.
- 4.1.3 **INSULATIVE** - An insulative material does not allow for the flow of electrons across or through its bulk. In this case, the material has a high electrical resistance. (Examples include plastic and rubber)
- 4.1.4 **STATIC DISSIPATIVE**- Although static electricity can be generated on this type of material, this material allows the transfer of electrons to ground or other conductive objects. This material has a lower electrical resistance than an Insulative material. (Examples include medium conductive resin loads and topical anti-stats)
- 4.1.5 **CONDUCTIVE** - Conductive material allows a charge to flow across the surface or through its volume easily. Thus, conductive materials have a low electrical resistance. (Examples include shielded bags, foils, metal, grounding clamps)
- 4.1.6 **BOND** - To "**bond**" means to have contact between the metal drum and the metal container or equipment that operational activities are being performed with (e.g. pouring, mixing, tinting, filling, etc). **Bonding** eliminates the electrical potential between two containers therefore eliminating the likelihood of sparks.



Figure 1: Bonding wires between drums

- 4.1.7 **GROUND** - To "**ground**" means to have a physical connection between the drum or container and the grounding source (earth ground). Containers holding ignitable liquid wastes shall be grounded when adding or removing waste from the container or any mixing, tinting, pouring, or filling operations are conducted. **Grounding** eliminates the difference in static potential charge between the conductive object and ground. Grounding is accomplished by connecting the conductive object directly to the earth.

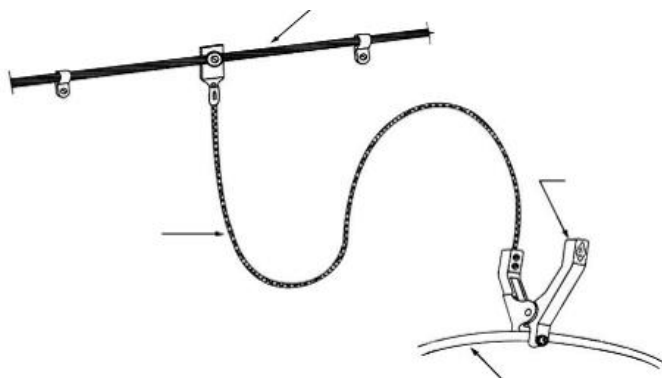


Figure 2: Building static grounding "Bus" (Mounted on wall)

4.2 Nature of Static Electricity

- 4.2.1 Static charges are constantly being "generated." The real problem occurs when these charges accumulate on a particular material. Static charges seek equilibrium (an equalizing of charge). Equilibrium may be reached through the dissipation of a charge to electrical ground, or through the sudden recombination with an unlike charge resulting in ESD (electrostatic discharge). An ESD event

may create sufficient energy to provide ignition in a flammable mixture. When an electrostatic charge is generated, it will either accumulate or dissipate depending on the conductivity of the materials involved and the possible conduction path to the ground. Most polymers on the other hand may retain electrostatic charge for many minutes or even hours. Glass can exhibit wide variations in conductivity. Electrostatic charge can accumulate on insulating surfaces such as plastics and also on ungrounded conductors (for example an ungrounded metal solvent drum on an epoxy floor).

4.3 Grounding Equipment

4.3.1 Bonding Clamps



4.3.2 Ground Reels



4.4 General Requirements

- 4.4.1 No Plastic Containers or Equipment shall be used within 10 feet of any tinting, mixing, or filling operation.
- 4.4.2 Containers must be both grounded and bonded when transferring liquids from one container to another, no matter the transferring method.
- 4.4.3 An Ohm meter will be used weekly to verify sufficient grounds are maintained on all mixing equipment, filling equipment, tinting equipment, or any other like

equipment.

4.4.4 A fire extinguisher must be within close proximity to the area that the operations are being performed (<5feet).

4.4.5 Forklifts must not be used to move open fill containers or come within 10 feet of any area where operations are being conducted, unless an EE rated forklift is used.

4.4.6 The area of operations should be 10 feet away from all electrical outlets and other non-intrinsically safe pieces of equipment.

4.4.7 Ventilation system should be turned on prior to operations.

4.4.8 NO non-intrinsically safe lights may be used within 10 feet of the area where the operations are being done.

4.4.9 Only approved clothing will be permitted in the operations area (cotton or natural fiber clothes)- No polyester, nylon, or static producing clothing.

4.4.10 Use only spark proof equipment.

4.5 Procedures For Mixing

4.5.1 Secure tub to the mixer using attached chain and tightening with the tensioner.

4.5.2 Ground the tub to the Multi-Point ground system using the mixers interlocked ground device. When ground is connected, the Multi-Point display will flash a green light next to the identified mixer. Mixer will not operate without and being connected to this ground.

4.5.3 When adding raw materials to the tub, bond clamps must be connected between the tub and container prior to pouring.

4.5.4 When not actively pouring, a cardboard lid must be formed to the top of the tub.

4.5.5 When the batch is complete and before releasing the tub from the chain, you must disconnect the ground.

4.6 Procedures For Filling

4.6.1 Verify that the fill tub is connected to the earth ground by grounding clamps or another approved device.

4.6.2 Connect agitator to the fill tub using the attached bond clamp.

4.6.3 Connect the fill tub to the fill pump with bond clamps, ensuring that the clip is

attached "metal to metal" to maintain a proper connection.

- 4.6.4 Connect the pump to the holding tub with bond clamp that will be used to fill the final container from.
- 4.6.5 Connect the fill tub to the ground plate that the 1-gallon or 5-gallon container will rest on when filling. Ground plate must be clean. Buildup of paint can restrict metal to metal contact and sufficient connection will not be achieved.
- 4.6.6 Inspect area to verify that there are no pieces of equipment within 10 feet that are not intrinsically safe.
- 4.6.7 Fill material to the desired level and immediately secure the lid on the 5- or 1-gallon filling container to reduce potential vapor concentration.
- 4.6.8 ** Fill machines remain stationary and will always remain grounded and bonded. Equipment will be verified weekly by using an OHM meter to test connections.

5.0 References

Reference	Title
1	None