

Morenci Safe Production Standard	Standard 1.7.4	
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	Document Owner	Branch Electrical Safety Steering Team
Approvals:		
<i>Senior VP Morenci Operations: August 31st, 2012</i>	<i>Safety Steering Committee: August 31st, 2012</i>	

1.0 PURPOSE:

Improperly bonded or grounded welding generators can result in a buildup and uncontrolled release of stored electrical energy. This standard establishes the requirements for properly bonding and grounding generators (i.e. welding generators) that are used in a portable or temporary setting.

2.0 SCOPE:

Within Freeport-McMoRan Morenci Operations this standard affects all employees and contractors that install, use, maintain or could otherwise be affected by portable welding generators.

3.0 TERMS, DEFINITIONS AND ABBREVIATIONS

- 3.1 **Bonding:** The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.
- 3.2 **Ground:** The electrical potential of the earth’s surface; a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.
- 3.3 **Ground Connection:** An electrical connection of the welding machine frame to the earth for safety.
- 3.4 **Grounded, effectively:** Intentionally connected to earth through a ground connection of sufficiently low resistance and with adequate current-carrying capacity to prevent the buildup of voltage that may be hazardous to connected equipment or to persons.
- 3.5 **Grounding Conductor:** A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes ground rod(s) or metal water pipe.
- 3.6 **Ground Rod:** A metal rod, typically copper, not less than eight feet in length and 1/2 inch in diameter, driven into the earth such that at least eight feet of length is in contact with the soil, to function as a suitable connection point to earth. NOTE: Since different diameters are required for different rod materials and the driven length and number of rods used depends on the special soil conditions and applications, consult the NEC for the specific data for the correct ground rod and method of use for each particular situation.
- 3.7 **Hard Wired:** Connected by separate conductors to a junction point or box—not to receptacles.
- 3.8 **Portable:** Capable of being carried or moved about; designed for ready movement and use in field locations.
- 3.9 **Separately Derived System (Premises Wiring System):** A premises wiring system whose power is derived from a battery, a solar photovoltaic system, or from a generator, transformer, or converter

windings, and that has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

3.10 **Vehicle Mounted:** Equipment installed in a truck, trailer, or similar wheeled vehicle.

4.0 RESPONSIBILITIES:

- 4.1 **Division Management:** Provide the resources necessary for employees and contractors to comply with the standard.
- 4.2 **Employees:** Employees will comply with this standard and the requirements of equipment manufacturers. If conditions arise that do not comply with this standard employees shall inform their direct supervisor, stop work and the unsafe condition corrected.
- 4.3 **Supervisors:** Supervisors will understand this standard and ensure employees and contractors under their responsibility comply with the standard. When needed supervision shall coordinate with qualified electrical personnel to review grounding requirements and initiate installation.
- 4.4 **Electrical Personnel:** are responsible for installing and testing grounding systems in compliance with this standard and the National Electric Code. The Branch Electrical Steering Team is responsible for providing guidance to the workforce regarding grounding systems and for reviewing the standard when necessary or as applicable codes change.

5.0 GENERAL SAFE WORK PRACTICES

- 5.1 All portable welding generators shall be installed and maintained in accordance with manufacturer's specifications and safety instructions. Equipment manuals shall be retained and made available for review by the workforce. Deviations from conforming to manufacturer installation and use instructions are only authorized if written permission is received from:
 - 1. The Equipment Manufacturer, or
 - 2. The Branch Electrical Safety Steering Team
- 5.2 When feasible auxiliary equipment shall be plugged into outlets provided by the manufacturer directly into the generator, using the manufacturers supplied cords. Auxiliary power cords connected to welding generators shall be:
 - 1. Rated for outdoor use
 - 2. Contain a grounding conductor (3-wire flexible cord and 3-pronged cord connectors) or be double insulated
 - 3. Appropriately rated for the voltage and amperage level which will be applied
 - 4. Inspected and tested in accordance with the FMMO Continuity and Resistance Testing Standard.
- 5.3 Ground-fault circuit interrupters (GFCIs) shall be used when portable welding generators supply power to auxiliary equipment operating near wet or damp areas. If generator mounted outlets are not equipped with GFCI protection a UL approved inline GFCI device shall be used.
- 5.4 Generators shall not be connected to a structure unless the generator has a properly installed transfer switch. The transfer switch must be approved for the use and installed in accordance with the manufacturer's installation instructions by a qualified electrician.

- 5.5 All installations which require hard wiring or grounding must be done by a qualified electrician. In addition, if electrical panel covers must be by-passed or electrical troubleshooting is required a qualified electrician must be contacted to conduct the work.
- 5.6 All equipment shall be visually inspected before use. If defective equipment is discovered it shall be removed from service and either destroyed or tagged to indicate it is unsafe for use.

6.0 SPECIFIC GROUNDING REQUIREMENTS

- 6.1 Welding machine ground leads are not considered an effective means of grounding when auxiliary power sources are connected to the generator.
- 6.2 When **ALL** of the following conditions are met (and none in section 6.3) earth grounding of portable generators is not required:
 - 1. The welding generator is mounted to a truck or trailer;
 - 2. The auxiliary power is taken from receptacles on the generator using a cord and plug arrangement;
 - 3. The receptacles have a grounding pin;
 - 4. The frame of the generator is bonded or electrically connected to the truck or trailer frame
- 6.3 When **ANY** of these conditions are met, then the portable generator must have the frame grounded:
 - 1. The generator is connected to a premises wiring system (for example to provide standby power to facilities or shops during a power outage)
 - 2. The auxiliary power output is greater than or equal to 220 volts AC
 - 3. The auxiliary power is hard wired into the generator without the use of cords and plugs
 - 4. The manufacturer requires the generator to be grounded (manual, placard, label)
- 6.4 Mobile equipment equipped with a functioning neutral ground resistor is considered intrinsically safe and external grounding is not required while the equipment is traveling.
- 6.5 If a ground is installed the qualified individual shall measure the resistance immediately after installation. The resistance measured shall be documented and retained for the duration of the installation. If a ground rod is installed the qualified individual shall measure the resistance immediately after installation through the use of a fall of potential ground tester or a clamp on ground resistance tester.
 - 1. If resistance to earth is 25 ohms or less a supplemental electrode shall not be required.
 - 2. If resistance to earth is greater than 25 ohms a properly bonded supplemental electrode is required. Supplemental electrode shall not be less than 6 feet apart No more than 2 electrodes are required

7.0 RECORDS

Name of the Document	Responsible for Control	Records Retention
This Standard	Health & Safety Department	Permanent
Ground and Continuity Records	Division/Area	10 Years

Original Equipment Manufacturer Manuals	Division/Area	Life of Equipment
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8.0 APPENDICES

None

9.0 REFERENCES

- 9.1 OSHA Fact Sheet: Grounding Requirements for Portable Generators, retrieved 3/8/2012 from http://www.osha.gov/OshDoc/data_Hurricane_Facts/grounding_port_generator.pdf
- 9.2 National electrical Code Part 250
- 9.3 American Welding Society AWS: Safety and Health Fact Sheet Number 29 (July 2004)

10.0 REVIEW AND CHANGE

All changes, modifications and/or revisions must be documented on the table below:

<i>Description of Changes to this Document</i>
<i>Fixed title information prior to initial release of approved document – S. Elias Rev. 00</i>
<i>Updated Records Table – S. Elias 06/11/2013</i>
<i>At the discretion of the Health and Safety Manager, Edward Lopez, item #5 was removed from Section 6.2 “The generator output is less than 220 volts” as it was counterproductive to the intent of the Standard. S. Elias 03/09/2016</i>