

ELECTRICAL GROUNDING SAFETY PROGRAM

PURPOSE / SCOPE

The purpose of this program is to ensure the proper installation, maintenance, inspection, and testing of equipment grounding conductors on construction sites, in order to minimize injuries due to electrical ground faults.

The OSHA regulations for ground fault protection allows employers to choose between the use of Ground Fault Circuit Interrupters (GFCI) or an Assured Equipment Grounding Conductor Program. These equipment grounding requirements, which have been in the National Electrical Code for many years, are intended to provide for protection from electrocution.

Winger Companies, herein referred to as Winger, has chosen the GFCI Electrical Safety Program as the company electrical grounding safety program. However, when our crews are on jobsites that the GFCI Program is not allowed, we will use the Assured Grounding Conductor Program.

Ground Fault Circuit Interrupters (GFCI) are designed to interrupt the circuit in the event of a ground fault. The circuit trips within as little as 1/40 of a second to prevent electrocution. The Assured Equipment Grounding Conductor Program requires periodic inspection and testing of the ground circuits. Regardless of which of these two options is chosen, the grounding requirements of the National Electrical Code still apply.

GROUND FAULT CIRCUIT INTERRUPTERS (GFCI)

All 120-volt, single-phase, 15 and 20 ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground fault circuit interrupters for personnel protection.

Receptacles on a two-wire, single-phase portable or vehicle-mounted generator rated not more than 5kW, where the circuit conductors of the generator are insulated from the generator frame and other grounded surfaces, need not be protected with ground fault circuit interrupters.

The OSHA regulations require GFCI protection at the receptacle only when the receptacle is being used by employees for cord set and plug-connected equipment that must be grounded.

How A GFCI Works

A Ground Fault Circuit Interrupter (GFCI) is a piece of equipment that senses a leak to ground electrical charge and then "interrupts" the circuit by cutting the power. An unintentional electric path between a source of current and a grounded surface is referred to as a "ground-fault". A potentially dangerous ground fault is any amount of current above the level that may deliver a dangerous shock. Any current over 8mA is considered potentially dangerous depending on the path the current takes, the amount of time exposed to the shock, and the physical condition of the person receiving the shock. A fault current as low as 4 mA to 6 mA activates the GFCI and interrupts the circuit. Once activated, the fault condition is cleared and the GFCI must be manually reset before power may be restored to the circuit. GFCI's must be used when an Assured Grounding program is not in effect. The GFCI's are to be plugged in at the earliest source of electricity available.



3 TYPES OF GROUND FAULT CIRCUIT INTERRUPTERS



RECEPTACLE TYPE:

This type of GFCI is used in place of the standard duplex receptacle found throughout a house or building structure. If fits into the standard outlet box and protects you against "ground faults" whenever an electrical product is plugged into the outlet MOST receptacle-type GFCI's can be installed so that they also protect other electrical outlets further down stream in the branch circuit.

CIRCUIT BREAKER TYPE:

In places equipped with circuit breakers rather than fuses, a circuit breaker GFCI may be installed in a panel box to give protection to selected circuits. The circuit breaker GFCI serves a dual purpose- not only will it shut off electricity in the event of a 'ground-fault', but it will also trip when a short circuit or an over-load occurs Protection covers the wiring and each outlet, lighting fixture, heater, etc. served by the branch circuit protected by the GFCI in the panel box.





PORTABLE TYPE: "PIG TAILS"

Where permanent GFCI's are not practical, portable GFCI's may be used. One type contains the GFCI circuitry in a plastic enclosure with plug blades in the back and receptacle slots in the front. It can be plugged into a receptacle, then; the electrical product is plugged into the GFCI. Another type of portable GFCI is an extension cord combined with a GFCI. It adds flexibility in using receptacles that are not protected by GFCI's.

GROUND FAULT CIRCUIT INTERRUPTER USE

- ✚ Remember that these Ground Fault Circuit Interrupters (GFCI's) have been provided for your protection. Use them at all times.
- ✚ Always test the Ground Fault Circuit Interrupter (GFCI) before each use.
- ✚ Follow these steps when using a Ground Fault Circuit Interrupter (GFCI).
 - When using a power tool without an extension cord:
 - Plug GFCI into receptacle.
 - Then plug the power tool into the GFCI.
- ✚ When using a power tool with an extension cord:
 - Plug GFCI into receptacle.
 - Plug the extension cord into the GFCI.
 - Then plug power tool into the extension cord.

ASSURED EQUIPMENT GROUNDING CONDUCTOR PROGRAM

The employer shall establish and implement an assured equipment grounding conductor program on construction sites covering all cord sets, receptacles which are not part of the permanent wiring of the building or structure, and equipment connected by cord and plug which are available for use or used by employees.

GENERAL REQUIREMENTS

- ✚ If the assured equipment grounding conductor program option is elected, a written description of the program shall be available on the jobsite although it does not have to be posted.
- ✚ The employer shall designate one or more competent persons to implement the assured equipment grounding program. A competent person is capable of identifying existing and predictable hazards in the surroundings, as well as working conditions which are unsanitary, hazardous or dangerous to employees, and is authorized to take prompt corrective measures to eliminate them. The competent person does not necessarily have to be on the jobsite at all times.
- ✚ Daily visual inspection is made only on the days the equipment is actually used and may be made by the person using the cord set and plug-connected equipment.
- ✚ Double insulated tools are not required to be grounded and therefore cannot, and do not, have to be tested as required by the regulation.
- ✚ It is not required that all tests be performed at the jobsite.
- ✚ The requirements of this standard also apply to any tools and cord sets owned by employees that are used at the jobsite.

PROCEDURE

Equipment grounding conductors shall be installed and maintained in accordance with the procedure outlined below.

INSTALLATION REQUIREMENTS

- ✦ All 120 volt, single-phase, 15 and 20 ampere receptacles shall be of the grounding type and their contacts shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacles in accordance with the applicable requirements of the National Electric Code (Sections 210-7(c)) and 305-2(d).
- ✦ All 120 volt flexible cord sets (extension cords) shall be of the 3-wire type with an equipment-grounding conductor, which shall be connected to the grounding contacts of the connectors on each end of the cord.
- ✦ The exposed non-current carrying metal parts of the 120 volt cord-and-plug connected tools and equipment that are likely to become energized shall be grounded by the use of a grounding conductor in the supply cord and shall be connected to the grounding contact in the attachment plug, in accordance with the applicable requirements of the National Electrical Code (Sections 250-45 and 250-59).
- ✦ All other receptacles of higher voltage shall be grounded in accordance with the applicable requirements of the National Electrical Code.

VISUAL INSPECTION REQUIREMENTS

- ✦ Instruct employees to visually inspect, before each day's use, receptacles, flexible cord sets (extension cords), and any equipment connected by cord and plug, except those that are fixed and not exposed to damage.
- ✦ Check for external defects, such as deformed or missing pins, for insulation damage, and for any indication of possible internal damage.
- ✦ Immediately tag and remove from service any item found with evidence of damage. Such items will remain out of service until tests and any required repairs have been made.

TESTING REQUIREMENTS

- ✦ All 120 volt single phase, 15 and 20 ampere receptacles, 120 volt flexible cord sets, and 120 volt cord-and-plug connected equipment which is not a part of the permanent wiring of the building or structure shall be tested to ensure that electrical continuity is maintained through all required equipment grounding conductors and their connectors.
- ✦ All equipment grounding conductors shall be tested for ground wire continuity and shall be electrically continuous. Use either a continuity tester or a volt-OHM meter when conducting this test.
- ✦ All receptacles, attachment caps, and plug and receptacle of cords sets shall be tested for correct attachment of the equipment-grounding conductor. The equipment-grounding conductor shall be connected to its proper terminal. Use either a receptacle tester or volt-OHM meter when conducting this test.
- ✦ Do not make available or permit any employee to use equipment that has failed to pass the required tests.





EQUIPMENT IN SERVICE

A more thorough way to test electrical outlets involves the use of an outlet tester. This device will not only indicate if the outlet has power, it will also indicate if the outlet is grounded and whether the hot and common wires are reversed.

TEST SCHEDULING REQUIREMENTS

- ✚ Before first use.
- ✚ Before equipment is returned to service following any repairs.
- ✚ Before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over).
- ✚ At intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

TEST VERIFICATION REQUIREMENTS

Tag the item tested with either numeric or color-coded marking tape in accordance with the 5.0 coding scheme, indicating the date (month or quarter) it passed the test.

TEST DOCUMENTATION REQUIREMENTS

- ✚ Fully document each test; always include the following information.
 - Location of jobsite.
 - Name of construction site employer complying with this program.
 - Name of competent person designated to implement this program.
- ✚ Keep records at the jobsites.

CODING SCHEMES FOR ASSURED EQUIPMENT GROUNDING CONDUCTOR TEST RECORDS			
Month or Quarter	Color Coding Scheme		Numeric Coding Scheme
	Quarterly	Monthly	Monthly
January	White	White	1
February		White & Yellow	2
March		White & Blue	3
April	Green	Green	4
May		Green & Yellow	5

June		Green & Blue	6
July		Red	7
August	Red	Red & Yellow	8
September		Red & Blue	9
October		Orange	10
November	Orange	Orange & Yellow	11
December		Orange & Blue	12
Repair or Incident	Brown	Brown	0

GENERAL SAFETY PRECAUTIONS

- ✚ All employees shall follow OSHA Construction Industry Standards, Subpart K – Electrical 1926.400 through 1926.441.
- ✚ Visually inspect each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage.
- ✚ For extension cords:
 - Make sure the cord is unplugged from any electrical power source before inspection.
 - Make sure the grounding prong is present in the plug.
 - Make sure the plug and receptacle are not damaged.
 - Wipe the cord clean and examine for cuts, breaks, abrasions, and defects in the insulation.
- ✚ Coil or hang the cord for storage. Do not use any other methods. Coiling or hanging is the best way to avoid tight kinks, cuts, and scrapes that can damage insulation or conductors.
- ✚ If any electrical equipment needs to be repaired, notify your supervisor immediately, tag it and take it out of service. Do not put it back in the gang box or work truck for someone else to pick up and use.
- ✚ To prevent possible electrical shock be sure that portable electric tools and appliances you use are properly grounded...this is to include three wire receptacles and plugs with the third wire system properly grounded.
- ✚ Clearly mark all double insulated tools; these require only two-pronged plugs. If there is any noticeable damage to the double-insulated tool, return it immediately to the tool crib or your supervisor.
- ✚ Do not lay electrical and extension cords or cables on floors, in walkways, etc., unless it is impractical to do otherwise. They should be suspended or secured in such a way as not to block or hang in walkways, doorways, or work areas. If possible, hang all extension cords above the floor to prevent damage and trip hazards.
- ✚ Do not drive mobile equipment over extension cords such as aerial lifts or forklift.
- ✚ No cable or cord shall be fastened with staples, hung with nails, or suspended with wire.
- ✚ Never climb onto, walk on, or tie equipment to electrical conduits.
- ✚ Do not use temporary light strings as extension cords.
- ✚ Do not support temporary light strings by their electric cords unless cords and lights are designed for this type of usage.
- ✚ Equip all temporary lights with guards to prevent contact with the bulb.
- ✚ Do not use knockout boxes as a receptacle on the end of extension cords unless unused openings are closed or unless boxes have covers installed.
- ✚ Do not attach a grounded conductor to any terminal or lead as to reverse designated polarity.
- ✚ Use splices only for #12 and heavier gauge conductors; insulation must be equal to that of the cable.
- ✚ Ensure that only qualified electricians perform any type of electrical work.

- ✚ When plugging in an extension cord to a piece of heavy equipment or a truck, plug the extension cord into the machine first before plugging the cord into the electrical source.
- ✚ When unplugging an extension cord from your machine or truck, unplug the extension cord from the electrical source first. If this is not done, this will create arcing which could damage both the extension cord and the plug-in on the piece of equipment.
- ✚ All extension cords not essential to plant operations must be unplugged when not in use.
- ✚ All cords should be wrapped and stored properly when not in use. Do not leave them lying around.
- ✚ All plates and covers on electrical equipment must be closed and secured at all times unless necessary to open for repairs.
- ✚ Ground wires must be kept intact. Loose conduit and ground wires should be reported to the supervisor immediately.
- ✚ Repairs made to 110 volt cords, 240/480 cords, welding leads, or any other electrical cords, are permitted using the following guidelines.
 - Only appropriate shrink-wrap material will be used to repair cords.
 - Only 1 repair in 10' of cord is allowed.
 - No more than 3 repairs within 50' of cord will be allowed.
- ✚ Never plug in cords that are wet or touch electrical equipment with wet hands.
- ✚ Grasp the plug to remove it from a socket – never pull on the electrical cord.
- ✚ Maintain a three-foot clearance around electrical panels.
- ✚ Remove all rings, key chains or other metal objects when working around electricity.
- ✚ Always follow lockout/tagout procedures when working on electrical equipment and wear appropriate Personal Protective Equipment (PPE) such as safety glasses, rated rubber gloves, rated rubber sleeves, insulated boots, or face shield.
- ✚ Guard all live parts operating at 50 volts or more against accidental contact by enclosing them in cabinets or other forms of enclosure.
- ✚ Always maintain a minimum distance of 12 feet between electrical power lines and any part of a crane or piece of equipment. A very serious hazard in crane operation is contact with electrical power lines. If possible, have all interfering lines relocated during construction, or if not possible and work must be done with line intact, call the utility company to have the power turned off.

TRAINING

- ✚ Employees must be trained in safety-related work practices who face a risk of electric shock that is not reduced to a safe level.
- ✚ Employees fall into two categories:
 - ✚ Qualified – those who have training in avoiding the electrical hazards of working on or near exposed energized parts.
 - ✚ Unqualified – those with little or no such training.
- ✚ Training shall be of the classroom and on-the-job type.
- ✚ Retraining will be performed whenever work site inspections indicate that an employee does not have the necessary knowledge or skills to safely work in or around electrical systems. Retraining will also be performed when policies or procedures change, and/or new equipment or systems are introduced into the work area.
- ✚ Training records will be maintained by the safety department.

SOURCE CREDITS

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DOCUMENT CONTROL

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