PAGODA
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Assured Equipment Grounding Program and GFCI

Policy:

This Company assured equipment grounding conductor program covers all cord sets, receptacles which are not a 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. The requirements which the program must meet are stated in 29 CFR 1926.404(b)(1)(iii), but employers may provide additional tests or procedures. (See Appendix.)

OSHA requires that this written description of Pagoda Electrical, Inc.'s assured equipment grounding conductor program, including the specific procedures adopted, be kept at the jobsite and be available for inspection and copying by the Assistant Secretary and any affected and interested employee. This program shall outline Pagoda Electrical, Inc.'s specific procedures for the required equipment inspections, tests, and test schedule.

Background:

Insulation and grounding are two recognized means of preventing injury during electrical equipment operation. Conductor insulation may be provided by placing nonconductive material such as plastic around the conductor. Grounding may be achieved through the use of a direct connection to a known ground such as a metal cold water pipe.

Consider, for example, the metal housing or enclosure around a motor or the metal box in which electrical switches, circuit breakers, and controls are placed. Such enclosures protect the equipment from dirt and moisture and prevent accidental contact with exposed wiring. However, there is a hazard associated with housings and enclosures. A malfunction within the equipment—such as deteriorated insulation—may create an electrical shock hazard. Many metal enclosures are connected to a ground to eliminate the hazard. If a "hot" wire contacts a grounded enclosure, a ground fault results which normally will trip a circuit breaker or blow a fuse. Metal enclosures and containers are usually grounded by connecting them with a wire going to ground. This wire is called an equipment grounding conductor. Most portable electric tools and appliances are grounded by this means. There is one disadvantage to grounding: a break in the grounding system may occur without the user's knowledge.

Insulation may be damaged by hard usage on the job or simply by aging. If this damage causes the conductors to become exposed, the hazards of shocks, burns, and fire will exist. Double insulation may be used as additional protection on the

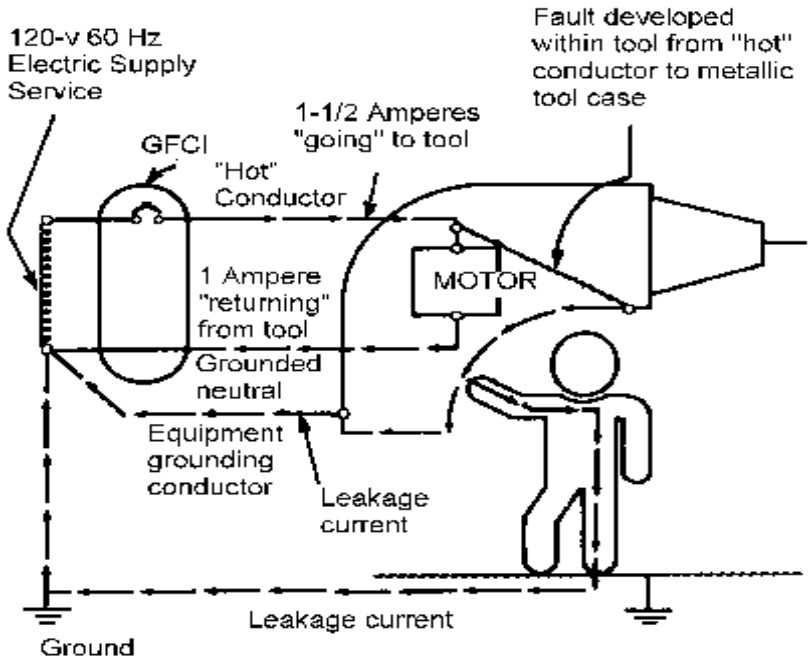
live parts of a tool, but double insulation does not provide protection against defective cords and plugs or against heavy moisture conditions.

The use of a ground-fault circuit interrupter (GFCI) is one method used to overcome grounding and insulation deficiencies.

What is a GFCI?

The ground-fault circuit interrupter (GFCI) is a fast-acting circuit breaker which senses small imbalances in the circuit caused by current leakage to ground and, in a fraction of a second, shuts off the electricity. The GFCI continually matches the amount of current going to an electrical device against the amount of current returning from the device along the electrical path. Whenever the amount "going" differs from the amount "returning" by approximately 5 milliamps, the GFCI interrupts the electric power within as little as 1/40 of a second. (See diagram.)

Ground-Fault Circuit Interrupter



GFCI monitors the difference in current flowing into the "hot" and out to the grounded neutral conductors. The difference (1/2 ampere in this case) will flow back through any available path, such as the equipment grounding conductor, and through a person holding the tool, if the person is in contact with a grounded object.

However, the GFCI will not protect the employee from line-to-line contact hazards (such as a person holding two "hot" wires or a hot and a neutral wire in each hand). It does provide protection against the most common form of electrical shock hazard--the ground fault. It also provides protection against fires, overheating, and destruction of insulation on wiring.

What are the hazards?:

With the wide use of portable tools on construction sites, the use of flexible cords often becomes necessary. Hazards are created when cords, cord connectors, receptacles, and cord- and plug-connected equipment are improperly used and maintained.

Generally, flexible cords are more vulnerable to damage than is fixed wiring. Flexible cords must be connected to devices and to fittings so as to prevent tension at joints and terminal screws. Because a cord is exposed, flexible, and unsecured, joints and terminals become more vulnerable. Flexible cord conductors are finely stranded for flexibility, but the strands of one conductor may loosen from under terminal screws and touch another conductor, especially if the cord is subjected to stress or strain.

A flexible cord may be damaged by activities on the job, by door or window edges, by staples or fastenings, by abrasion from adjacent materials, or simply by aging. If the electrical conductors become exposed, there is a danger of shocks, burns, or fire. A frequent hazard on a construction site is a cord assembly with improperly connected terminals.

When a cord connector is wet, hazardous leakage can occur to the equipment grounding conductor and to humans who pick up that connector if they also provide a path to ground. Such leakage is not limited to the face of the connector but also develops at any wetted portion of it.

When the leakage current of tools is below 1 ampere, and the grounding conductor has a low resistance, no shock should be perceived. However, should the resistance of the equipment grounding conductor increase, the current through the body also will increase. Thus, if the resistance of the equipment grounding conductor is significantly greater than 1 ohm, tools with even small leakages become hazardous.

Preventing and eliminating hazards:

GFCIs can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCIs—interruption of current flow—is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCIs or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits.

Ground-Fault Circuit Interrupters:

Pagoda Electrical, Inc. will provide approved ground-fault circuit interrupters for 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. Receptacles on the ends of extension cords are not part of the permanent wiring and, therefore, must be protected by GFCIs whether or not the extension cord is plugged into permanent wiring. These GFCIs monitor the current-to-the-load for leakage to ground. When this leakage exceeds 5 mA ± 1 mA, the GFCI interrupts the current. They are rated to trip quickly enough to prevent electrocution. This protection is required in addition to, not as a substitute for, the grounding requirements of OSHA safety and health rules and regulations, 29 CFR 1926. The requirements which employers must meet, if they choose the GFCI option, are stated in 29 CFR 1926.404(b)(1)(ii).

Assured Equipment Grounding Conductor Program Inspections, Tests, and Test Schedule:

The required tests must be recorded, and the record maintained until replaced by a more current record. The written program description and the recorded tests must be made available, at the jobsite, to OSHA and to any affected employee upon request. Pagoda Electrical, Inc. is required to designate one or more **competent persons** to implement the program. The Safety and Health Manager is that competent person.

Electrical equipment noted in the assured equipment grounding conductor program must be visually inspected for damage or defects before each day's use. Any damaged or defective equipment must not be used by the employee until repaired.

Two tests are required by OSHA. One is a continuity test to ensure that the equipment grounding conductor is electrically continuous. It must be performed on all cord sets, receptacles which are not part of the permanent wiring of the building

or structure, and on cord- and plug-connected equipment which is required to be grounded. This test may be performed using a simple continuity tester, such as a lamp and battery, a bell and battery, an ohmmeter, or a receptacle tester.

The other test must be performed on receptacles and plugs to ensure that the equipment grounding conductor is connected to its proper terminal. This test can be performed with the same equipment used in the first test.

These tests are required before first use, after any repairs, after damage is suspected to have occurred, and at 3-month intervals. Cord sets and receptacles which are essentially fixed and not exposed to damage must be tested at regular intervals not to exceed 6 months. Any equipment which fails to pass the required tests shall not be made available or used by employees.

Pagoda Electrical, Inc. Responsibility:

OSHA ground-fault protection rules and regulations have been determined necessary and appropriate for employee safety and health. Therefore, it is Pagoda Electrical, Inc.'s responsibility to provide either: (a) ground-fault circuit interrupters on construction sites for receptacle outlets in use and not part of the permanent wiring of the building or structure; or (b) a scheduled and recorded 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.

The Safety and Health Manager is solely responsible for all facets of this program and has full authority to make necessary decisions to ensure success of the program. The Safety and Health Manager is the sole person authorized to amend these instructions and is authorized to halt any operation of Pagoda Electrical, Inc. where there is danger of serious personal injury.

Written Program:

Pagoda Electrical, Inc. will review and evaluate this chapter/document and practice instruction on an annual basis, or when changes occur to 29 CFR 1926.404, that prompt revision of this document, or when facility operational changes occur that require a revision of this document. Effective implementation requires a written program for job safety, health, that is endorsed and advocated by the highest level of management within this company and that outlines our goals and plans. This written

program will be communicated to all required personnel. It is designed to establish clear goals, and objectives.

General Requirements:

Pagoda Electrical, Inc. shall be responsible for the safe condition of electrical tools and equipment used its employees, including tools and equipment which may be furnished by employees. Pagoda Electrical, Inc. will develop assured grounding operational procedures through the use of this document. After tool and equipment selection and evaluation, equipment will be used and maintained in a safe condition. Supervisors will ensure that equipment utilized at each job site is maintained in a safe condition.

Power Tool and Accessories Selection, Evaluation and Condition:

The greatest hazards posed by power tools usually results from misuse and or improper maintenance. Tool selection sometimes is not considered a priority when arrangements are made to begin work.

All employees will consider the following when selecting tools:

- Is the tool correct for the type work to be performed?
- Are grounding methods sufficient when working in wet conditions?
- Is the grounding terminal present on the plug?
- Is the polarity of connections correct? No grounded conductor can be attached to any terminal or lead which results in a reversed designated polarity.
- Are grounding terminals or grounding-type devices on receptacles, cord connectors, or attachment plugs used for the intended purpose?
- Are grounding terminals or grounding-type devices on receptacles, cord connectors, or attachment plugs defeated in any way?
- Are all receptacles and attachment caps or plugs tested for correct attachment of the equipment grounding conductor? The equipment grounding conductor must be connected to its proper terminal.
- Are grounding terminals or grounding-type devices on receptacles, cord connectors, or attachment plugs defeated in any way?
- Are all 12 volt, singlephase 15 and 20 ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the

building or structure equipped with approved ground fault circuit interrupters for personnel protection?

Are conductors used as a grounded conductor identifiable and distinguishable from all other conductors?

- Each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. Adopted equipment found damaged or defective shall not be used until repaired. (Exception cord sets and receptacles which are fixed and not exposed to damage).
- Is equipment found damaged or defective removed from service until repaired or replaced?
- Are guards installed properly and in good condition?
- The following tests shall be performed on all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded:
    - All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.
    - Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.

- All required tests shall be performed:
    - 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); and
    - 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.
- Tests performed as required in this paragraph shall be recorded and include the following:
    - The identity of each receptacle, cord set, and cord- and plug-connected equipment that passed the test
    - The last date it was tested or the interval for which it was tested.

  - This record shall be kept by means of logs, color coding, or other effective means, and
  - Shall be maintained until replaced by a more current record.
  - The record shall be made available on the jobsite for inspection by the Assistant Secretary and any affected employee.
- Does the tool create sparks or heat? Has this been considered when working around flammable substances?
- Are cutting tools sharp? Dull tools are more hazardous than sharp ones.
- Is the tool used on the proper working surface? Tools used on dirty or wet working surfaces can create a multitude of hazards.
- Are tools stored properly when not being used? Saw blades, and like sharp tools should be stored so that sharp edges are directed away from aisles and coworkers.

Power Tool Precautions:

Power tools can be hazardous when improperly used. The following precautions will be taken by employees to prevent injury:

- Power tools will always be operated within their design limitations.
- Eye protection, gloves and safety footwear are recommended during operation.
- Tools will be stored in an appropriate dry location when not in use.
- Tool work will only be conducted in well illuminated locations.
- Tools will not be carried by the cord or hose.
- Cords or hoses will not be yanked to disconnect it from the receptacle.
- Cords and hoses will be kept away from heat, oils, and sharp edges or any other source that could result in damage.
- Tools will be disconnected when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- Observers will be kept at a safe distance at all times from the work area.
- Work will be secured with clamps or a vice where possible to free both hands to operate tools.

Power tools can be hazardous when improperly used. The following precautions will be taken by employees to prevent injury: (continued)

- To prevent accidental starting, employees should be continually aware not to hold the start button while carrying a plugged in tool.
- Tools will be maintained in a clean manner, and properly maintained in accordance with the manufacturer’s guidelines.
- Ensure that proper shoes are worn and that the work area is kept clean to maintain proper footing and good balance.

- Ensure that proper apparel is worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- Tools that are damaged will be removed from service immediately and tagged "Do Not Use". They will be reported and turned over to the site foreman for repair or replacement. Defective equipment will be disposed of or returned to the parts clerk for evaluation.
- Cracked saws. All cracked saws will be removed from service.

Pagoda Electrical, Inc. shall not make available or permit the use by employees of any equipment which has not met the requirements of the Power Tool and Accessories Selection, Evaluation and Condition section and Power Tool Precautions section, previous two pages. Damaged items and equipment shall not be used until repaired.

Methods of Guarding:

One or more methods of guarding shall be provided where required to protect the operator and other employees in the area from hazards such as those created by point of operation, in running nip points, rotating parts, flying chips and sparks. Examples of guarding methods are; barrier guards, two-hand tripping devices, electronic safety devices, etc.

The guard shall be such that it does not offer an accident hazard in itself. Employee's will:

- Inspect tools without guards for signs of guard removal. If it is evident that a guard is required. Tagout the tool and obtain a replacement. Tools will not be energized during inspection.
- Inspect tools having guards for proper operation and maintenance prior to use. Tools will not be energized during inspection.
- Never remove a guard during use.

Initial Training:

Training shall be conducted prior to job assignment. Pagoda Electrical, Inc. shall provide training to ensure that the grounding requirements, purpose, function, and proper use of tools to be used in the normal function of their jobs is understood by employees and that the knowledge and skills required for the safe application, and usage is acquired by employees.

This standard practice instruction shall be provided to, and read by all employees receiving
training. The training shall include, as a minimum the following:

- Grounding requirements for tools and associated site electrical equipment.
- Types of tools appropriate for use.
- Recognition of applicable electrical hazards associated with work to be completed.
- Tool selection requirements.
- Procedures for removal of an electrical tool/accessory from service.
- All other employees whose work operations are or may be in an area where tools which could present a hazard to other than the user, will be instructed to an awareness level concerning hazards.
- Tools identification. Tools having identification numbers will be checked for legibility.
- Certification. Pagoda Electrical, Inc. shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.
- Tool trainers. The following employees or position titles will receive training and as required, serve as tool trainers. Pagoda Electrical, Inc. qualified trainers will consist of the following:

ASSURED GROUNDING PROGRAM TRAINERS

Parts Clerk(s)
Safety and Health Manager
Job Site Foreman

Refresher Training:

This standard practice instruction shall be provided to, and read by all employees receiving refresher training. The training content shall be identical to initial training.

Refresher training will be conducted on as required basis or when the following conditions are met, which ever event occurs sooner:

- Retraining shall be provided for all authorized and affected employees whenever (and prior to) there being a change in their job assignments, a change in the type of tools used, or when a known hazard is added to the work environment.
- Additional retraining shall also be conducted whenever a periodic inspection reveals, or whenever Pagoda Electrical, Inc. has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of tools.

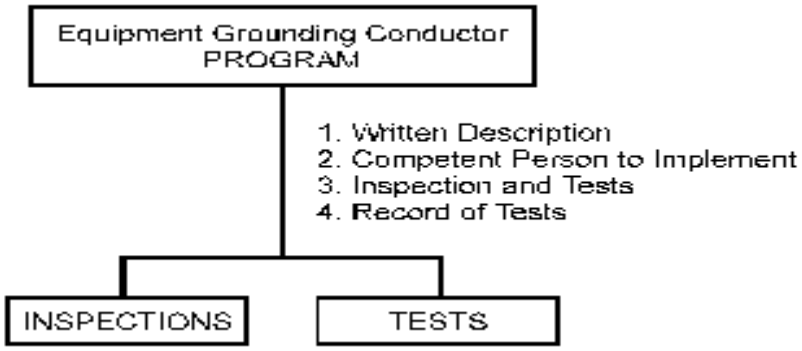
- The retraining shall reestablish employee proficiency and introduce new or revised methods and procedures, as necessary.
- Certification. Pagoda Electrical, Inc. shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

SUMMARY

This discussion provides information to help guide Pagoda Electrical, Inc. and employees in protecting themselves against 120-volt electrical hazards on the construction site, through the use of ground-fault circuit interrupters or through an assured equipment grounding conductor program.

When planning your program, Pagoda Electrical, Inc. will remember to use the OSHA rules and regulations as a guide to ensure employee safety and health. Following these rules and regulations will help reduce the number of injuries and accidents from electrical hazards. Work disruptions should be minor, and the necessary inspections and maintenance should require little time.

An effective safety and health program requires the cooperation of both Pagoda Electrical, Inc. and employees.



Visual inspection of following:

1. cord sets
2. cap, plug and receptacle of cord sets
3. equipment connected by cord and plug

Exceptions:

- receptacles and cord sets which are fixed and not exposed to damage

Frequency of Inspections:

- before each day's use

Conduct tests for:

1. continuity of equipment grounding conductor
2. proper terminal connection of equipment grounding conductor

Frequency of Tests:

- before first use
- after repair, and before placing back in service
- before use, after suspected damage
- every 3 months, except that cord sets and receptacles that are fixed and not exposed to damage must be tested at regular intervals not to exceed 6 months.