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SAFETY COMMITTEE NEWS BULLETIN IN PARTNERSHIP WITH CONSTRUCTION SAFETY COUNCIL

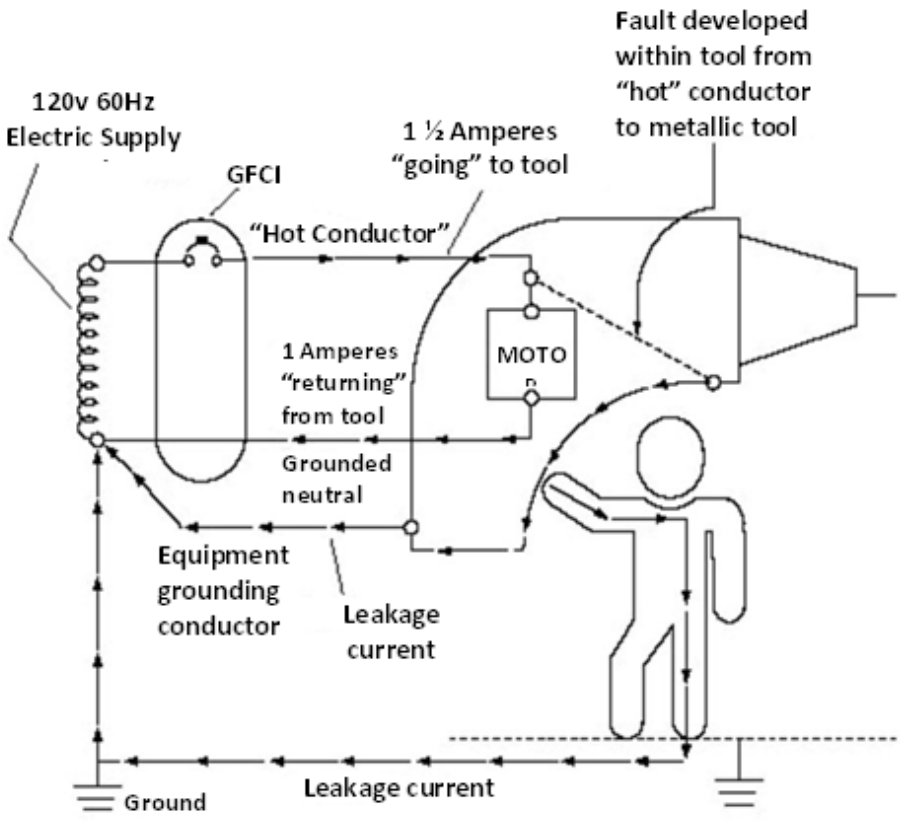
Using GFCI's or an Assured Equipment Grounding Conductor Program

By: Timothy Janis, Construction Safety Council

Due to the dynamic, rugged nature of construction work, normal use of electrical equipment at a jobsite causes wear and tear on tools and cords that results in insulation breaks, short-circuits, and exposed wires. If there is no ground fault protection, then misuse of flexible cords and power tools can cause a ground fault that sends electrical current through the worker's body, resulting in burns, explosions, fire, or death. In OSHA's Construction Standards, under paragraph 1926.404(b)(1)(i), the employer is required to provide ground fault protection -- either using ground fault circuit interrupters (GFCIs) or using an assured equipment grounding conductor program.

What is a GFCI?

A ground fault circuit interrupter (GFCI) is a fast-acting circuit breaker that 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. If the amount "going" differs from the amount "returning" by approximately 5 milliamps, then the GFCI interrupts the electric power within as little as 1/40 of a second. (See diagram.)



The GFCI, however, does not protect from line-to-line contact hazards—such as a worker holding two "hot" wires or a hot and a neutral wire in each hand. It protects against the most ordinary form of electrical shock hazard—the ground fault, and protects against fires, overheating, and destruction of insulation on wiring.

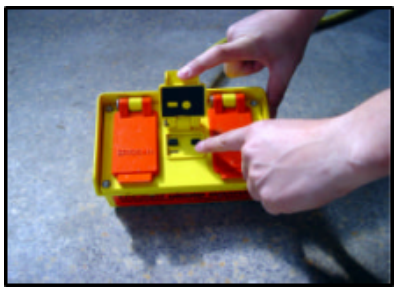
GFCIs can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCIs—interrupting current flow—is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using water-tight or sealable connectors.

Providing more GFCIs or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits.

<u>OSHA Policy on Testing Ground-Fault on Job Sites</u>

Ground fault protection is required on all 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites where the outlets are not a part of the permanent wiring of the building or structure, and which are in use by construction employees. To ensure that the proper protection is in place, perform the following visual and manual tests:

- Determine if the branch circuit is equipped with a GFCI device. If there is no outlet-type GFCI (the type that is installed in the outlet box) or cord-connected GFCI visible, then there may be a GFCI installed further up the circuit. Use an approved external GFCI tester at the outlet to see if there is a positive reading (indicating that the circuit is GFCI protected).



GFCI "TEST" BUTTON

- If a negative reading (a reading that indicates that the circuit is not GFCI protected) is obtained, then further investigation is required to determine whether the circuit is protected. Reliance must not be placed solely on a negative external GFCI tester reading to establish a violation of the standard. This is because there are some circumstances where a negative reading on an external tester can result even though there is a functioning GFCI protecting the circuit. Consult a qualified electrical worker.

Approved External GFCI Tester

Assured Equipment Grounding Conductor Program

If a contractor chooses not to use a ground fault circuit interrupter, then the alternative is to implement an “assured equipment grounding conductor program.”

OSHA requires that a written description of the employer's assured equipment grounding conductor program, including the specific procedures adopted, be kept at the job site. This program should outline the employer's specific procedures for the required equipment 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 available at the jobsite and to OSHA and to any affected employee upon request. The employer is required to designate one or more competent persons to implement the program.

Electrical equipment noted in the assured equipment grounding conductor program must be visually inspected for damage or defects before each day's use. If there is evidence of damage or defect, then the equipment must not be used.

OSHA requires the following two tests as part of an assured equipment grounding conductor program:

- A continuity test to ensure that the equipment-grounding conductor is electrically continuous. This test must be performed on all cord sets and receptacles that are not part of the permanent wiring of the building or structure, and on cord- and plug-connected equipment that 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.

- A polarity test 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 continuity test.

Double-Insulated Tools

Hand-held tools manufactured with non-metallic cases are called double-insulated. If approved, they do not require grounding under the National Electrical Code. Although this design method reduces the risk of grounding deficiencies, a shock hazard can still exist.

Such tools are often used in areas where there is considerable moisture or wetness. Although the user is insulated from the electrical wiring components, water can still enter the tool's housing. Ordinary water is a conductor of electricity. If water contacts the energized parts inside the housing, it provides a path to the outside, bypassing the double insulation. When a person holding a hand tool under these conditions contacts another conductive surface, then an electric shock occurs.

- If a power tool, even when double-insulated, is dropped into water, do not reach for or retrieve the tool without first disconnecting the power source.

Symbol for Double Insulated Tool

In Summary

Implementing the use of GFCI's on a construction project provides protection from electrocution to workers. With the GFCI measuring the amperage flowing away from the electrical source, the amperage should be the same returning to the source. If the GFCI senses an imbalance or difference along the electric circuit greater than 5 milliamps (0.005 amps), it will shut off the current flowing to the tool or equipment drawing the power within 1/40 of a second. Along with using the GFCI, it is also recommended that a visual inspection of tools, extension cords, and equipment be conducted daily for insulation damage or loose components (loose or missing pins). The type of GFCI can be the receptacle type (at the outlet), a circuit breaker type (built within the circuit breaker), or a portable type, which is oftentimes referred to as a "pig tail" or "GFCI whip").

When a GFCI cannot be used due to design or because it creates a greater hazard for temporary wiring methods or extension cords providing power to portable electric tools, then an assured equipment grounding conductor program for tools, extension cords, and equipment ensures inspection each day before use. Periodic testing (with documentation) must be conducted every three months (at a minimum) on each cord, receptacle, or piece of equipment in order to ensure that the grounding conductor is connected to the correct terminal so that faults do not occur. This method of protection relies upon the circuit breaker's capacity for each branch circuit to activate when amperage being drawn exceeds the rated capacity of the individual circuit breaker. The circuit breaker prevents "overloading" when too many tools and/or pieces of equipment are plugged into one outlet and drawing power at the same time.

PowerForward DuPage and the Construction Safety Council are pleased to partner in support of this continued effort to ensure that IBEW contractors and members Work Smart, Build Safe.

Timothy Janis is a Safety Training Specialist at the Construction Safety Council located in Hillside, Illinois. For more than 30 years, the Council has delivered programs and services in support of its mission to improve human safety performance through education and training. Learn more at www.buildsafe.org.