Ground Fault Circuit Interrupters (GFCI) Basics

Week Number 17 (April 26 - 29) 2017 Edition

OBJECTIVES

Upon completion of this safety talk, participants will be able to:

- Explain the limits of the protection provided by a GFCI
- Identify when GFCI protection is needed

A Ground Fault Circuit Interrupter (GFCI) is a fast-acting circuit breaker designed to shut off electric power when there is a difference in the current going to and returning from equipment. Shut off occurs in as little as 1/40 of a second when the difference in current changes by about 4 to 6 milliamps. If the GFCI is properly in- stalled, it will trip as soon as a faulty tool is plugged in. If the grounding conductor is not intact or of low-impedance, it may not trip until you touch it and provide a path. If this occurs, you will receive a shock, but should not be harmed because of the speed at which the GFCI trips.

GFCIs can be panel mount breakers, receptacles or built in to portable cords. They are required by NEC and NFPA 70E. 70E calls for GFCIs wherever national, state or local code mandates it. According to OSHA regulations they are needed on all 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites which are not part of the permanent wiring of the building or structure. This concept applies even when per- forming remodeling or maintenance work that is similar in nature to construction activity. GFCIs also need to be installed as part of permanent wiring when used in wet locations, such as rooftops, bathrooms, and kitchens. They are not needed for receptacles on a two-wire, single-phase portable or vehicle-mounted generators rated not more than 5kW, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces.

GFCIs do not protect against all shock. They will not provide protection against phase to phase or hot to ground shocks. If you touch two “hot” wires, a hot and a neutral wire in each hand, or contact an overhead power line, the GFCI is useless. It is also useless if it is broken. Power transients like lightning or utility com- pany switching can cause repeated surges. GFCIs have a metal oxide varistor (MOV) which serves as a surge suppressor. The MOV absorbs the voltage surge and converts it into heat. The repeated surges break down the MOV. Once broken down it will allow current to flow without providing the protection required. To make sure a GFCI is working properly you must test it. Permanently wired devices need to be tested monthly. Test portable GFCIs before each use. All GFCIs have a built-in test circuit, with test and reset but- tons that triggers an artificial ground-fault to verify protection. When the GFCI trips, reset and then trip it using either a GFCI tester or test buttons on the device. Verify that the current stops using a lamp or other device. Reset and use the circuit. Since each GFCI is required by UL to undergo an end-of-line calibration test to as- sure that the GFCI is tripping at the proper variation amounts (4mA to 6mA) and clearing time, you do not need to check calibration in the field. However, there are testers that you can plug in to the outlet and can ramp up the leakage current in 1 mA increments to verify the trip point. If one of these is used, be sure to follow the manufacturer’s instructions exactly and that it is UL listed. Failure can provide false readings and possible shock.

DISCUSSION QUESTIONS

- Why is it important to test GFCIs regularly?
- Why is GFCI protection needed if a circuit is grounded?
- How can GFCI still work when using a tool that is only two-wire?
- What are some causes for GFCI failure?