

GLOBAL PROPERTY INSPECTIONS TECHNICAL BULLETIN July- 2001

TOPIC: GFCI'S, Reversed Polarity, and Proper Grounding for Electrical Outlets

GFCI – Ground Fault Circuit Interrupter.

GFCI protection devices were introduced in residential construction application in 1971. They were first installed in the main panel and individual devices in bathroom locations near the sink. Within several years they were required to be installed in not only bathrooms, but also kitchen applications. In the kitchen, any outlet that was within six feet of a water source had to be GFCI protected. Over the years the location of installation and requirements for location of installations have changed to what they currently are for present day. According to the 1999 Edition of the National Electrical Code Handbook, (NEC), the present location for GFCI devices are as follows: bathrooms, all counter top locations in kitchens, unfinished basements that would be considered for storage, crawl spaces if they are at grade or below grade level; this is only if an electrical source is present, garages and outside storage sheds; again if an electrical source is present, and all outside receptacles of the home. According to the NEC the devices work as follows: "As long as the current in each conductor remains equal, the device remains in a closed position. If one of the conductors comes in contact with a grounded object, either directly or through a person's body, some of the current returns by an alternate path, resulting in an unbalanced current. The toroidal coil (the actual part of the device that senses the over-current) senses the unbalanced current and a current is established to the shunt-trip mechanism that reacts and opens the current to provide the safety feature."



GFCI's can be installed in older un-grounded two-wire circuit systems where no ground wire is present. Provided they are installed at the lead connection of a branch circuit and wired correctly, they can provide ground fault protection for an individual series of receptacles.

Reversed Polarity

According to the 1999 revision of the NEC handbook-"No grounded conductor shall be attached to any terminal or lead so as to reverse the designated polarity." Polarity is the technical definition for proper wiring to outlets and receptacles of the home. In order for a circuit to be wired correctly, the properly color coded wire must be attached to the appropriate connection of not only the fuse or breaker in the panel but the receptacle as well, whether it is a two-wire circuit or three wire circuit. Below is an example.



The diagram shows the proper method of connecting the proper colored wire and connections. There are examples of how home appliances and electrical devices will still work under these conditions, however, we are talking safety. True, the device will work, but for example if there is an outlet that the polarity has been reversed and say a table lamp is plugged in and the switch for the lamp is off, one goes to change a bad light bulb and accidentally sticks their finger in the socket, there is a potential to be electrocuted from the reverse polarity at the receptacle that has been wired incorrectly. Most devices are wired to have the hot side of the circuit controlled on and off by the switch. If the hot/ neutral becomes reversed, the supposed neutral side still remains hot resulting in the possibility for electrocution. Notice in the diagram that one side of the plug has a wider blade. If the outlet is wired correctly, this will ensure that the device will function correctly because the plug can only be inserted one way.

Grounding of Branch Circuits

According to today's standards all electrical panels and branch circuits should have a grounding system. Often times when inspecting homes two-pronged outlets and ungrounded three pronged receptacles are discovered. Part of this has to do either improper wiring or the age of the home. Below is a diagram that gives a good understanding about wiring in general with older and current standards for wiring.



Most homes built prior to 1960 did not have a ground wire present. This included the older style knob and tube wiring systems as well as the newer two-wire cloth wrapped Romex Brand wiring through 1965. Often times through inspection it will be discovered that someone has installed a three-pronged outlet in place of the two-pronged. This is a safety defect, which gives a false sense of security that the outlet is grounded. In order to correct the problem the home must either be rewired or the outlet must be replaced with the correct two-pronged receptacle. If an older home is wired correctly with two-pronged outlets, it is not defective but should be brought to the clients attention that the system is not grounded from a safety standpoint. All homes post 1965 should have a three-wire grounded system.

In this technical bulletin the word CODE has been used. We DO NOT do CODE inspections. When it comes to safety in regards to proper location of GFCI's, reversed polarity and properly grounded outlets, we can refer to what the codes say in relation to the age of the home.

This Technical Bulletin is been drafted to be general in nature and not technically exhaustive.