

Technical Reference

How a Ground Fault Circuit Interrupter Works

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As explained in OSHA Regulation 1926.404, an option for safe compliance in temporary power set-ups is the use of a Ground Fault Circuit Interrupter (GFCI). The 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. A GFCI continually monitors the amount of current returning from the device along the normal electrical path. Whenever the amount "returning" differs from the amount "going" by more than $5 \text{ mA} \pm 1 \text{ mA}$, the GFCI interrupts the current - preventing electrocution.

Beware of "open neutrals" and "reverse phasing"

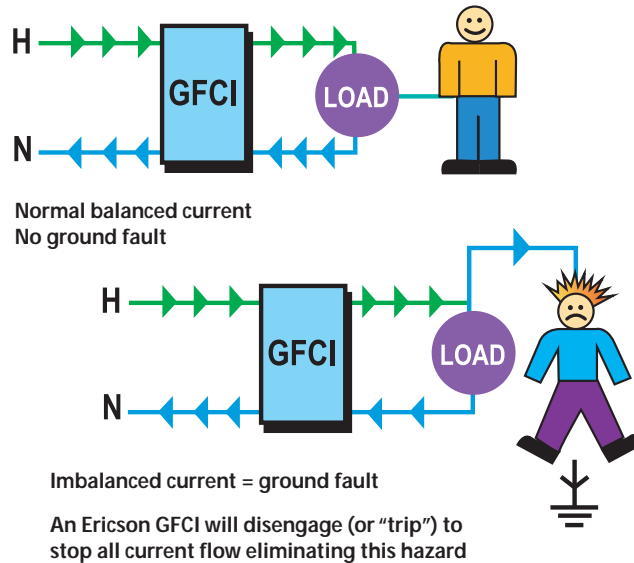
Normally, GFCI receptacles (like those found in your bathroom) can sense ground-fault circuits. However, if the line-side neutral conductor is opened or lifted at a panel, the circuitry in the GFCI receptacles will not have the necessary 125V power from which to operate. That means that GFCI is no longer capable of sensing and disengaging. This is called an "open neutral."

Anyone using the receptacles protected by the disabled GFCI will not have GFCI protection. And if a faulted tool is connected to the now-unprotected receptacle, the user will be exposed to a shock or electrocution hazard.

This is why jobsite GFCIs must provide open neutral protection.

The portable type GFCI provides open neutral protection to the user by disconnecting both output wires whenever either of the input wires are broken or disconnected. This protection is required for all portable GFCI units by UL Standard 943. GFCIs intended for fixed installation, such as receptacle GFCIs, are not required to provide this protection.

Temporary wiring installations are more likely to be improper than fixed installations. Because of this, portable GFCIs are required by UL Standard 943 to work properly when the supply side wires are reversed, or reverse-phased.



SAFE CURRENT VALUES	
Milliamperes	Effect on Average Human
1 or less	Causes no sensation - not felt, is at threshold of perception.
1 to 8	Sensation of shock. Not painful. Individual can let go at will, as muscular control is not lost. (5mA is accepted as maximum harmless current intensity.)
UNSAFE CURRENT VALUES	
Milliamperes	Effect on Average Human
8 to 15	Painful shock. Individual can let go at will, as muscular control is not lost.
16 to 20	Painful shock. Muscular control of adjacent muscles lost. Cannot let go.
21 to 99	Painful. Severe muscular contractions. Breathing is difficult.
100 to 200	Ventricular fibrillation. (A heart condition that may result) Disrupts or changes rhythm of the heart.
200 & over	Severe burns. Severe muscular contractions - so severe that chest muscles clamp heart and stop it during duration of shock. (This prevents ventricular fibrillation.)

Flexible Cords = Portable Danger

With the ever increasing presence of portable tools at jobsites, the use of flexible cords is a necessity. Flexible, exposed cords are more vulnerable to damage than fixed wiring. Hazards are often created when flexible cords, cord connectors, receptacles, cord-connected equipment or plug-connected equipment are improperly used or maintained.

Also, on-site routine objects, like door or window edges, staples or fasteners or abrasive materials can damage cords. Another frequent hazard on a construction site, is a cord assembly, with improperly connected terminals.

Moisture is a problem, too. When a cord connector is wet at any point, potentially fatal leakage can pass through an individual coming in contact at the point of leakage - electrocution can result.

That's why the Occupational Safety and Health Administration (OSHA) and the National Fire Protection Association have created ground fault protection standards for added electrical safety on the job.