Ground Fault Circuit Interrupters (GFCI)

A “ground-fault” occurs when there is a break in the low-resistance grounding path from a power tool or electrical system. The electrical current may then take an alternative path to the ground through the user (i.e. an employee using an electric drill or impact gun), resulting in serious injuries or death. The ground-fault circuit interrupter, or GFCI, is a fast-acting circuit breaker designed to shut off electric power in the event of a ground-fault within as little as 1/40 of a second. It works by comparing the amount of current *going to* and *returning from* the power tool or equipment along the circuit conductors. When the amount *going* differs from the amount *returning* by approximately 5 milliamperes, the GFCI automatically interrupts the current.

The GFCI is rated to trip quickly enough to prevent an electrical incident. If it is properly installed and maintained, this will happen as soon as the faulty tool is plugged in. If the grounding conductor is not intact or of low-impedance, the GFCI may not trip until a person provides a path. In this case, the person will receive a shock, but the GFCI should trip so quickly that the shock will not be harmful.

The GFCI is not perfect – for example it will *not* protect you from line contact hazards (i.e. a person touching two "hot" wires, a hot and a neutral wire, or contacting an overhead power line). However, a GFCI protects against the most common form of electrical shock hazard, the ground-fault. It also protects against fires, overheating, and destruction of wire insulation.

AMOUNT OF CURRENT NEEDED TO CAUSE INJURY

3 mA will cause a painful shock. Your reaction to the shock may cause further injury to you or others around you.

5 to 10 mA is the range of current it takes to create the “NO-LET-GO” type of muscle contractions. The "let-go" current threshold is defined as the maximum current at which a person is still capable of letting go of the source, i.e. a portable tool.

30 mA can cause temporary lung paralysis.

50 mA can cause possible ventricular fibrillation (heart dysfunction).

100 mA to 4A can cause certain heart failure. If not rescued immediately, death will occur rapidly.

1 mA (milliampere) is equal to 1/1,000 of 1 ampere (A).

As good as they are, GFCI units can nuisance trip, which will cause the user to become annoyed and remove it from the system. Before you do so, check out these possible causes to your problems:

- The generator or welding machine is not operating at a high enough RPM to produce the amount of startup current for the tool. In the amount of time it takes the engine to rev up and produce current per the demand (i.e. squeezing the trigger of the impact gun), the GFCI senses the power differential, and shuts down. Keep the engine at full RPM when using the electric supply.
- Long extension cords may cause a drop in current flow due to their length. If the GFCI is plugged in at the source of power, and a 100-foot cord is used, the GFCI may sense a drop in current

along this long path and again cause it to trip off. Move the power source closer to the work, shorten the power cord, and eliminate the nuisance trip potential.

- The power source may have a bad ground, and current is leaking to it.
- The tool may have a bad ground, cracked housing, or some other internal defect, causing a current leak or excessive resistance.
- The power cord may have a broken ground prong or ground wire. It may have a cut outer covering and current is leaking through an exposed hot wire.
- More than one portable electric tool may be connected to a single GFCI. If both tools are started at the same time, they may draw more current, and cause the GFCI to falsely recognize this a as ground fault.
- The GFCI itself may indeed be the source of the problem. They do not function well when they are contaminated with mud, water, grout, oil, grease, fuel or whatever we may encounter on a jobsite. They are also sensitive to having tools dropped on them in the gang box or rolling around in the back of a pickup truck. Always inspect and test the GFCI before each use.

Some newer portable generators and or welding machines have built in GFCI outlets from the manufacturer – but not all have this option. Be sure to read the operator's manual and the control panel before assuming the outlets are indeed GFCI protected.

Be careful when handling electric tools. Abuse such as dropping the tool in the tool box, or carrying the tool by the power cord, may cause internal wire connections to come loose or break and allow current to flow to the grip or another part of the tool, and ultimately to the user. Therefore, you must inspect your tools and the GFCI each day, *before* the tool is used.

Remember too, when working on any electrical device, you must de-energize the system BEFORE you begin to work on it. This may be something as simple as unplugging the power cord or disconnecting the battery from the grinder before you change the disc, or locking out a switch box, utilizing a lock out / tag out program. This simple precaution will keep you from being injured by the accidental startup of the tool.

Keep your power cords out of the water and muddy conditions. Do not allow equipment such as skid-steers to drive over a cord. Always disconnect the power cord from the source before rolling it up. You could receive a shock while doing so. **Remember the GFCI can only protect you, if it is connected!**