Electrical Safety

Equipment Grounding Circuits, Double Insulation, and GFCI’s
This presentation provides information to help individuals obtain a basic understanding of ground faults, and equipment grounding and its importance. This presentation also helps individuals become familiar with the term “double insulation”.

Ground fault circuit interrupters (GFCI) are also introduced.
A ground fault occurs when electricity leaks from a current carrying conductor to the enclosure of a piece of equipment.

**Dangerous Condition**

**Normal Condition**

Presentation diagrams have been adapted from an OSHA Training Institute 203 Electrical Standards volume 2 manual.
Means of Protection

There are two different ways to protect against a ground fault:

1. Grounding; and
2. Double insulating equipment, appliances, machines, power tools, etc. (referred to collectively as just equipment throughout the remainder of this presentation)

An added measure of protection can be afforded by using ground fault circuit interrupters (GFCI).
The circuit that helps ground a piece of equipment is known as a grounding circuit. This circuit helps protect people and property by providing an alternate path for current to flow from the enclosure back to the service entrance if a ground fault occurs. A grounding circuit is not normally energized.
A grounding circuit must be complete, and designed and installed properly to perform the following functions:

1. Prevent people or other objects from being energized; and

2. Provide a path for large amounts of current to flow back to its source, thus blowing the fuse or tripping the circuit breaker.

- Protects People
- Protects Property
If the grounding circuit is improperly designed or installed, or even perhaps damaged, then a sufficiently large amount of current will not be able to flow back to the source, which could result in an electrocution.

The grounding circuit must be continuous so that it is not interrupted from the equipment back to the electrical service.
Conduit can be used as part of a grounding circuit.

If you see damaged conduit, or conduit that is not connected together then have the damage corrected before using the associated circuit.
Don't Use Equipment if the Ground Prong is Missing from the Cord

The grounding circuit won't work if it is incomplete.
Double Insulated

Some pieces of equipment include double layers of insulating material or reinforced insulation to protect live parts from energizing their enclosure. These products aren’t grounded and should never be grounded.

Double insulated products are labeled "Class II", "Double Insulated" and/or bear the double insulation symbol.

Double insulated products have plugs that are manufactured without a ground prong.
A ground fault circuit interrupter (GFCI) monitors the current leaving it and compares it with the current returning to it. If the current differs more than a set amount (e.g. 5 mA) then the GFCI opens the circuit and stops the flow of current.

Time of exposure and the amount of current flow affect the severity of an electric shock. A GFCI is designed to open very quickly once it detects stray current.

GFCI's should always be used in wet locations.
GFCI’s need to be used when work will be performed in wet or damp locations, outdoors, or when receptacles are being used that are near sources of water.

GFCI outlets, breakers, and cords that incorporate a GFCI are available.