Safety in the Workplace

Grounding
GROUNDING AND BONDING
Proper *grounding practices* protect people from the hazards of electric shock and ensure the correct operation of overcurrent protection devices.
Grounding is the intentional connection of a current-carrying conductor to the earth in order to:

- limit the voltage surges caused by lightning, utility system operations, or accidental contact with higher-voltage lines.
- provide a ground reference that stabilizes the voltage under normal operating conditions.
- facilitate the operation of overcurrent devices such as circuit breakers, fuses, and relays under ground-fault conditions.
Bonding is the permanent joining together of metal parts that aren’t intended to carry current during normal operation in order to:

- establish an effective path for fault current that facilitates the operation of overcurrent protective devices.
- minimize shock hazard to people by providing a low-impedance path to ground.

Bonding limits the touch voltage when non-current-carrying metal parts are inadvertently energized by a ground fault.
The National Electrical Code requires all metal used in the construction of a wiring system to be bonded to, or connected to the ground system. The intent is to provide a low-impedance path back to the utility transformer in order to quickly clear faults.
The earth is not considered as an effective ground-fault current path. The resistance of earth is so high that very little fault current returns to the electrical supply source through the earth.
Grounding is accomplished by connecting the circuit to a metal underground water pipe, the metal frame of a building, a concrete-encased electrode, or a ground ring.
A grounding system has two distinct parts: system grounding and equipment grounding.

**System grounding** is the electrical connection of one of the current carrying conductors of the electrical system to the ground.

**Equipment grounding** is the electrical connection of all the metal parts that do not carry current of all electrical equipment to the ground.
**Equipment Grounding Conductor (EGC)** provides a low-impedance ground path between electrical equipment and enclosures within the distribution system.
A *ground fault* is an unintentional, electrically conducting connection between an ungrounded conductor of an electric circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

The *Ground-Fault Circuit Interrupter (GFCI)* is a device that can sense small ground fault currents. The GFCI is fast acting; the unit will shut off the current or interrupt the circuit within 1/40 second after its sensor detects a leakage as small as 5 mA.
The GFCI receptacle compares the amount of current in the ungrounded (hot) conductor with the amount of current in the grounded (neutral) conductor. Under normal operating conditions the two will be equal in value.