

OSHA Region 1 Cooperative and State Programs

Electrical Training/Inspection “Roll Up”

Extension Cords

GFCIs

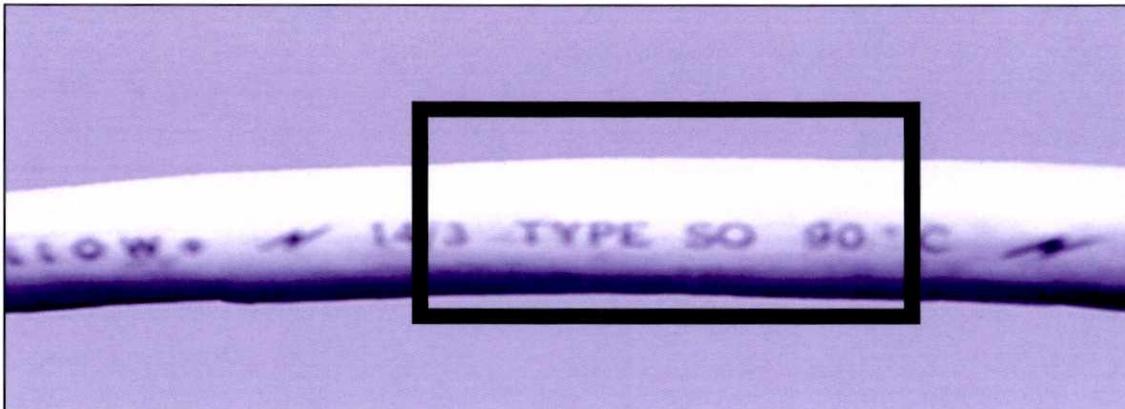
Power tools

Electrical Training/Inspection

- *Electrical equipment, cords and power tools are used in all industry settings*
- *Improper use can result in serious injury or death*
- *Estimated 4,000 injuries associated with extension cords (CPSC)*
- *In most cases*
 - *GFCIs were not used*
 - *Ungrounded cords were used*
 - *Improperly repaired or modified cords used*

Use the Correct Wire

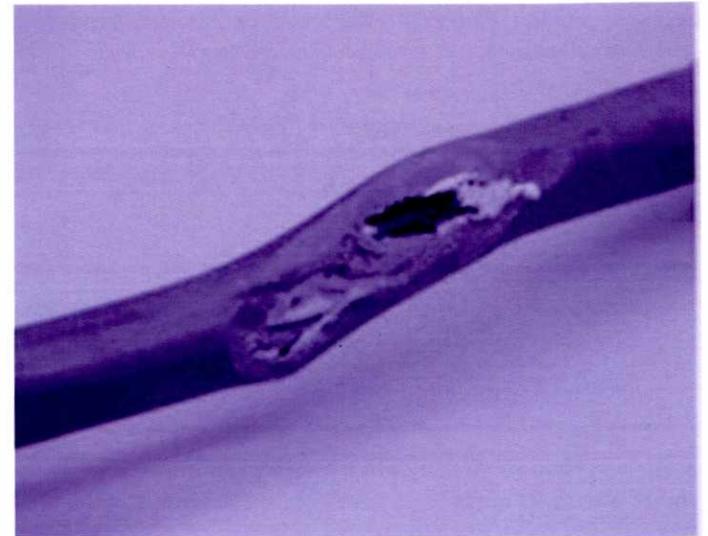
- & **Wire used depends on operation, building materials, electrical load, and environmental factors**
- & **Use the correct extension cord**



Must be 3-wire type and designed for hard or extra-hard use

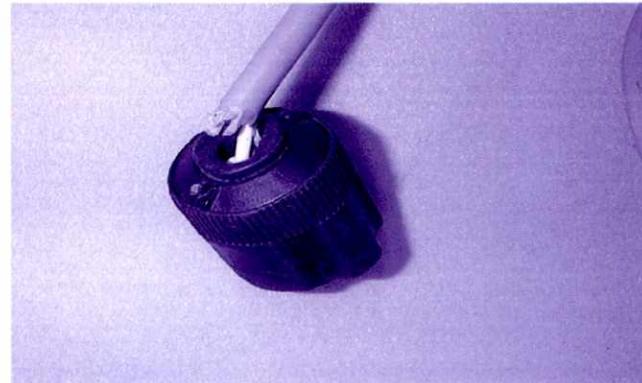
Clues that Electrical Hazards Exist

- ↳ **Tripped circuit breakers or blown fuses**
- ↳ **Warm tools, wires, cords, connections, or junction boxes**
- ↳ **GFCI that shuts off a circuit**
- ↳ **Worn or frayed insulation around wire or connection**



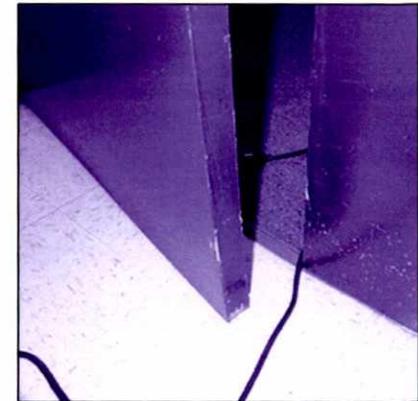
Defective Cords & Wires

- & **Plastic or rubber covering is missing from caps**
- & **Open wiring used as extension cord**
- & **Damaged extension cords & tools**



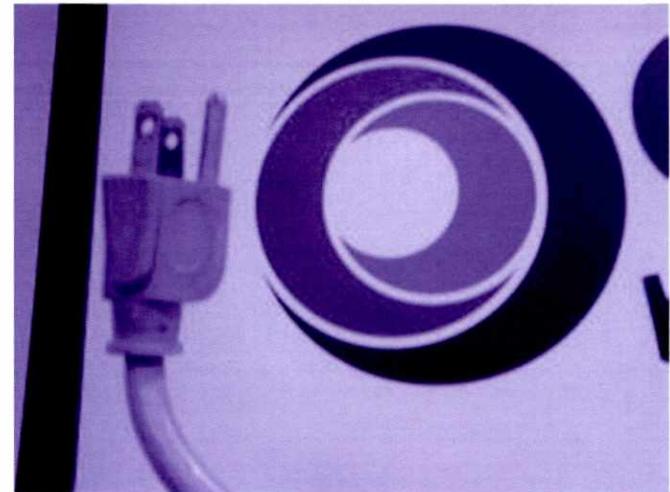
Damaged Cords

- ⌘ *Cords can be damaged by:*
 - ⌘ *Aging*
 - ⌘ *Door or window edges*
 - ⌘ *Staples or fastenings*
 - ⌘ *Abrasion from adjacent materials*
 - ⌘ *Activity in the area*
- ⌘ *Improper use can cause shocks, burns or fire*



Improper Grounding

- ⌘ **Tools plugged into improperly grounded circuits may become energized**
- ⌘ **Broken wire or plug on extension cord**
- ⌘ **Some of the most frequently violated OSHA standards**



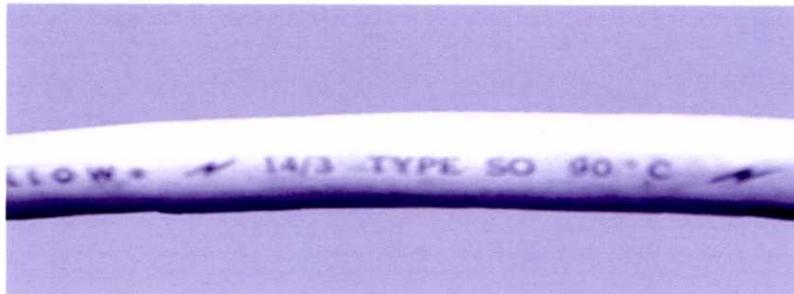
Wiring methods, components, and equipment for general use.

⌘ *Flexible cords protected from damage*

⌘ *Avoid sharp corners*

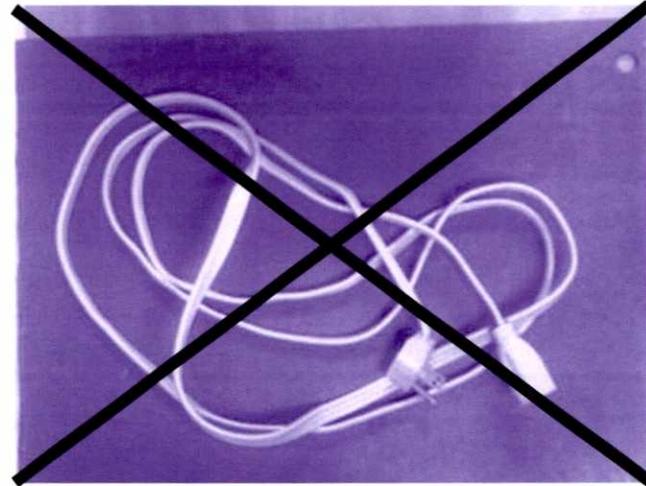
⌘ *Extension cords 3-wire type*

⌘ *Rated Hard or extra-hard duty*

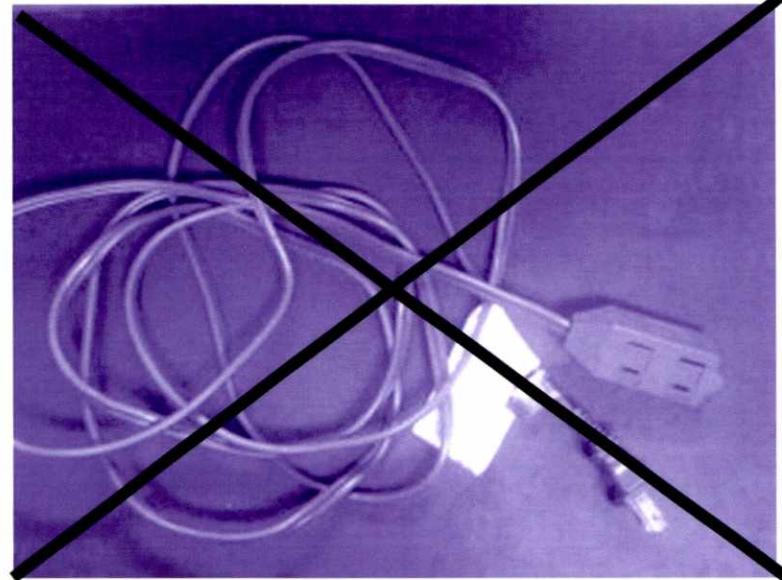


Wiring methods, components, and equipment for general use.

Most flat type extension cords are molded and not rated for hard or extra-hard use and can not be used at work.

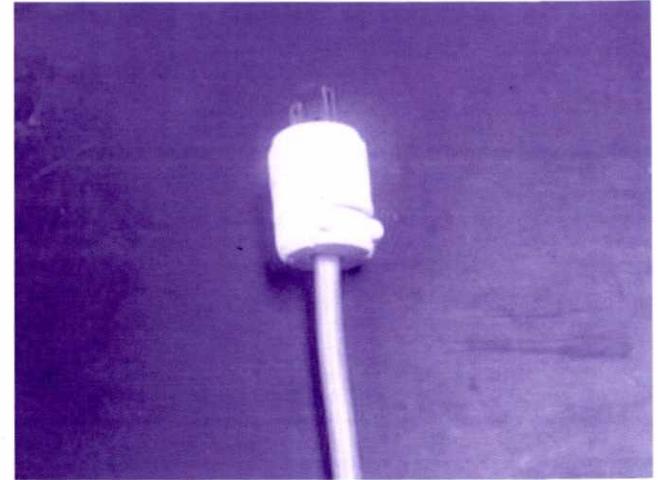


Even if it has a UL label - this flat, molded and ungrounded cord can not be used at work.

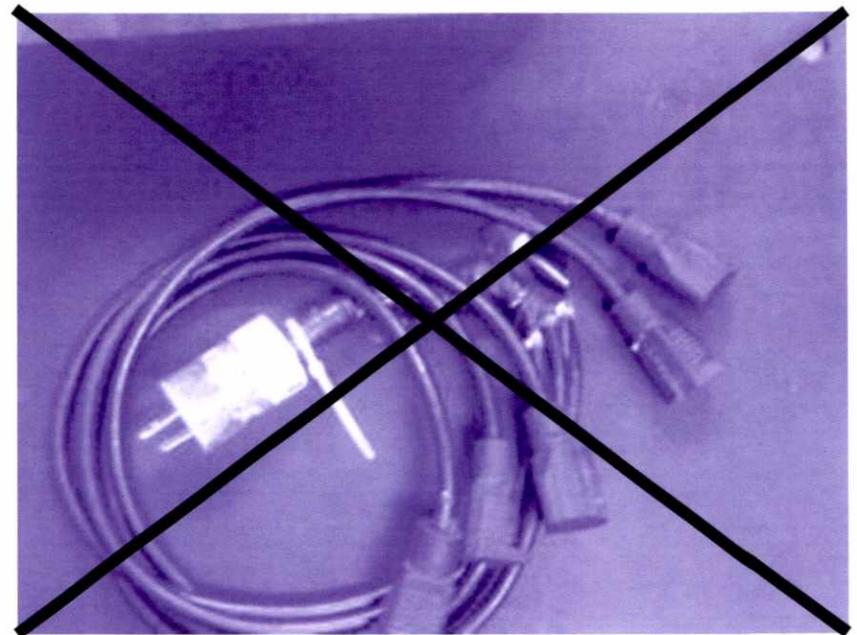


Flexible cords

*Flexible cords shall be connected to devices and fittings so that strain relief is provided.
(Caps may be replaced if damaged)*

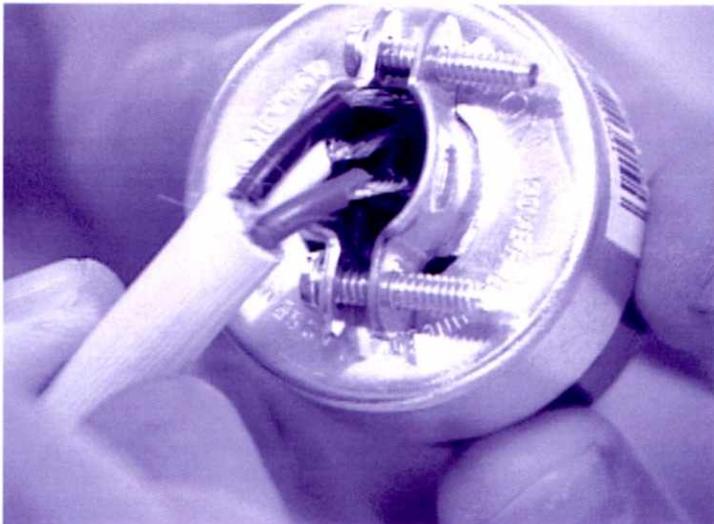


Even though proper ratings of the cord and caps are used flexible cords can not be spliced in this manner.



Wiring Design and Protection

- ⌘ *All conductors singularly identifiable*
- ⌘ *No reversing polarity on conductors*



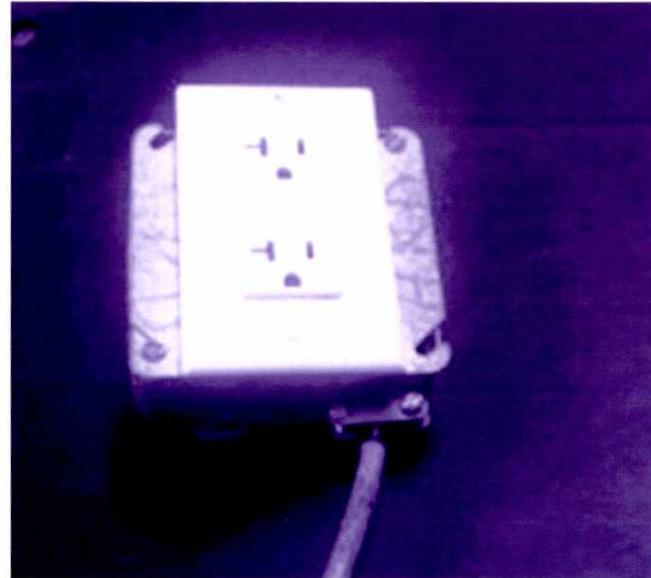
- *Reversed polarity is a condition when the grounded conductor (neutral) is incorrectly connected to the ungrounded (hot) terminal of a plug, receptacle, or other type of conductor.*

Environmental deterioration of equipment.

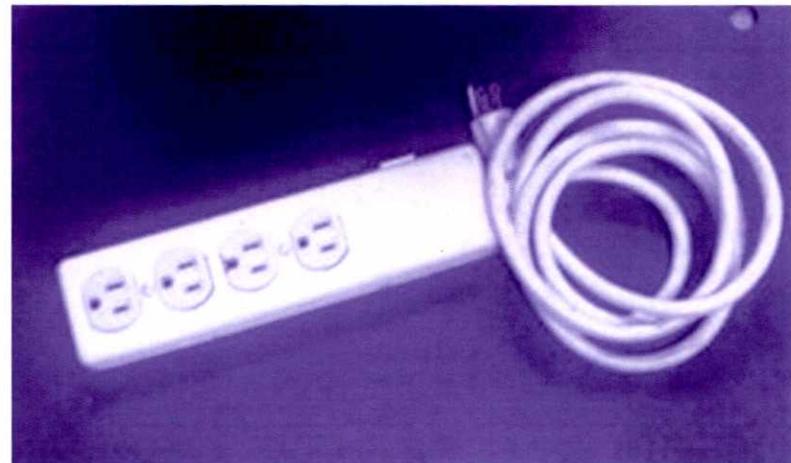
- ↳ *Unless listed or identified for use no conductors or equipment located in:*
 - ⌘ *Damp or wet locations*
 - ⌘ *Harmful chemicals, fumes or vapors*
 - ⌘ *Excessive temperatures*

Listed, labeled or certified equipment shall be installed and used in accordance with their instructions.

Knockout type boxes are not listed/labeled to be used as extension cords or pendants.



Multi tap outlets need to be approved for their use. This one can not be used on construction sites.



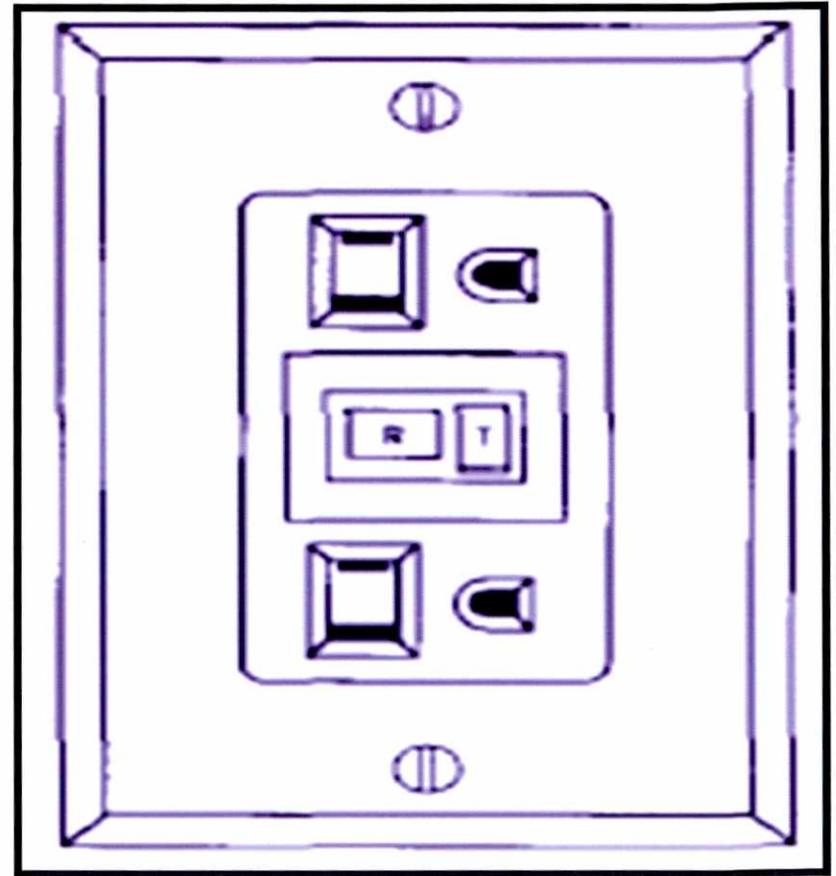
Extension cords can be abused

Damage to insulation and conductors can occur if the cord is improperly wound.

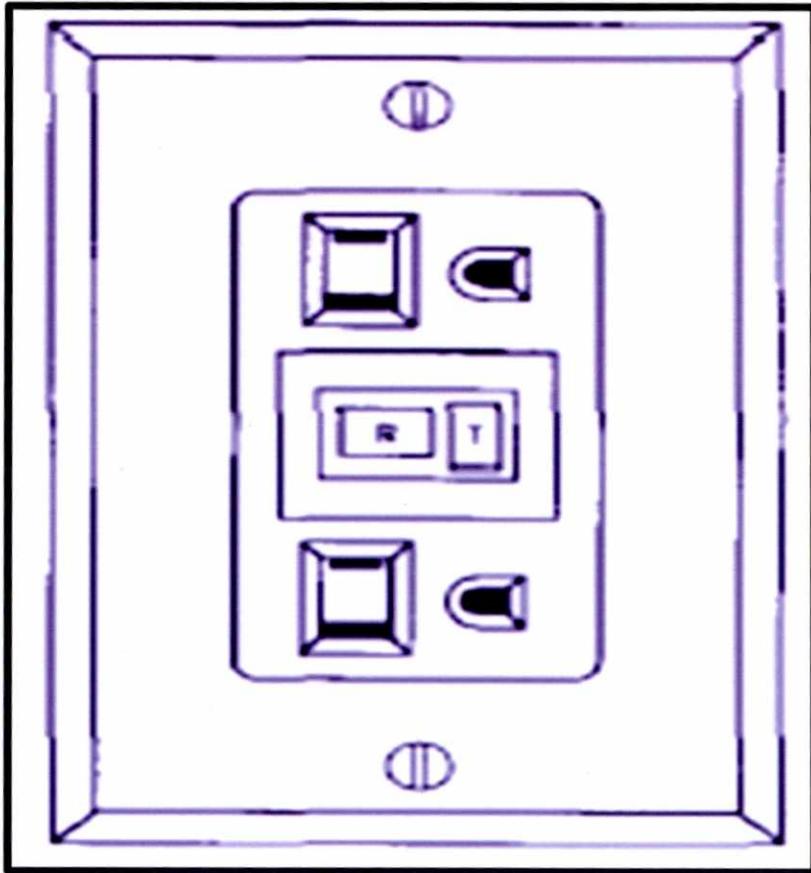


Ground fault circuit interrupters (GFCI's)

- ⌘ A GFCI is **not** an overcurrent device like a fuse or circuit breaker.
- ⌘ GFCI's are designed to sense an imbalance in current flow over the normal path.



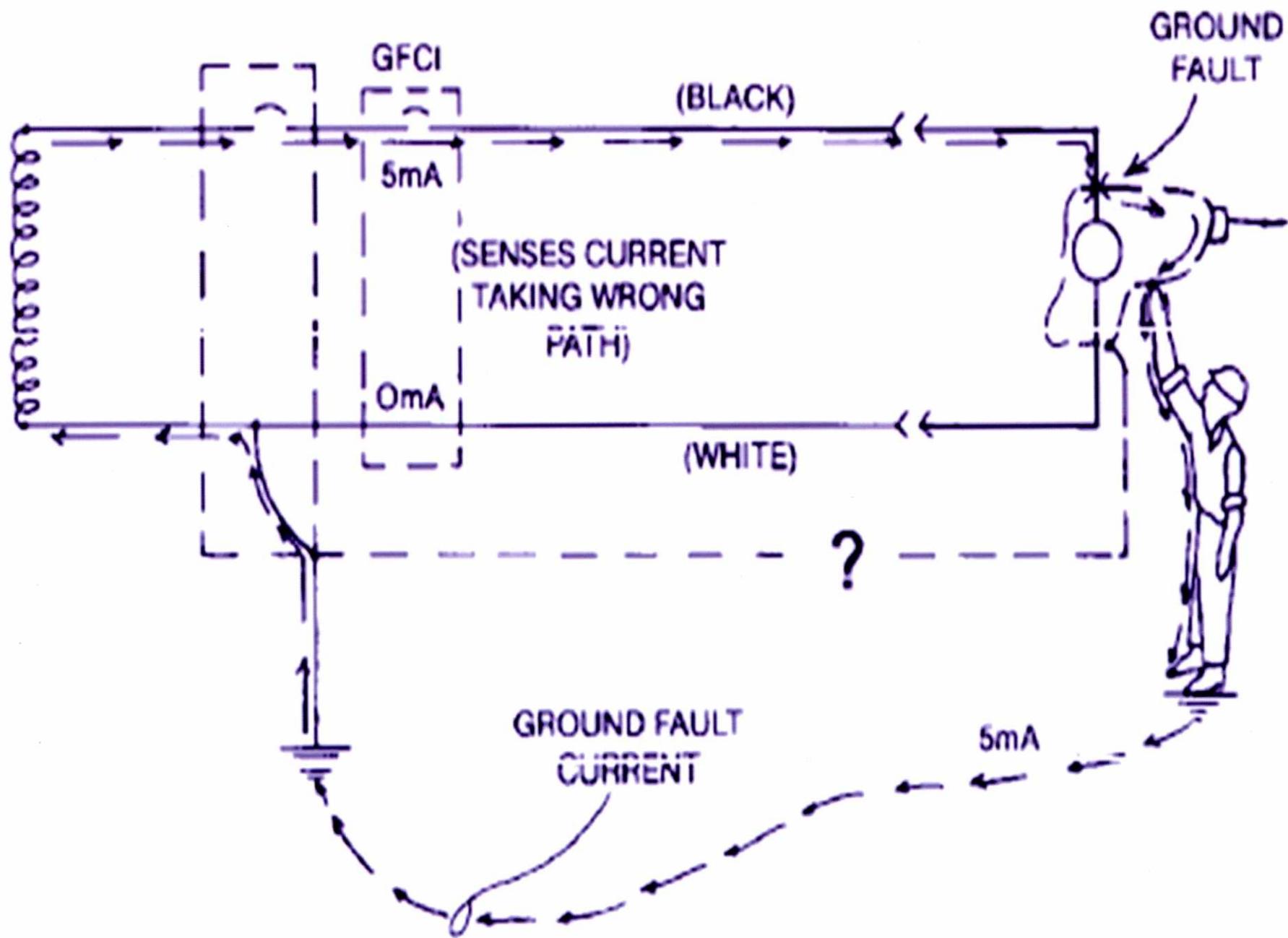
Ground fault circuit interrupters (GFCI's)



- & GFCI contains a special sensor that monitors the strength of the magnetic field around each wire in the circuit when current is flowing.
- & The field is proportional to the amount of current flow.

Ground fault circuit interrupters (GFCI's)

- ⌘ *If the current flowing in the black (ungrounded) wire is within 5 milliampers of the current flowing in the white (grounded) all the current will flow in the normal path.*
- ⌘ *If the current flow differs by more than 5mA, the GFCI will quickly open the circuit.*



Types of GFCI's

↳ **Circuit Breaker type:**

- ↳ *Includes the functions of a standard circuit breaker with the additional function of a GFCI.*
- ↳ *Installed in a panelboard and can protect an entire branch circuit with multiple outlets.*
- ↳ *A direct replacement for a standard circuit breaker of the same rating.*

Types of GFCI's

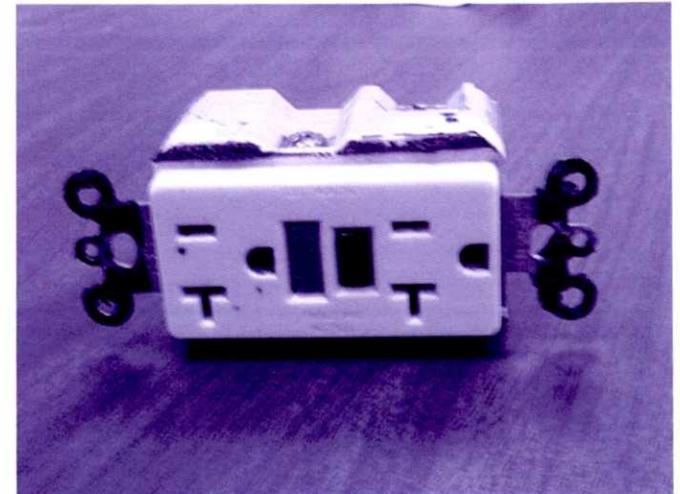
- ⌘ **Receptacle type:**

- ⌘ *Incorporates within one device one or more receptacle outlets, protected by the GFCI.*

- ⌘ *Popular and inexpensive.*

- ⌘ *Most are of duplex type*

- ⌘ *Can protect additional non-GFCI type receptacles connected "downstream".*



Types of GFCI's

- ⌘ **Permanently Mounted type:**
- ⌘ *Mounted in an enclosure and designed to be permanently wired to the supply.*
- ⌘ *Frequently used around commercial swimming pools or similar wet locations.*

Types of GFCI's

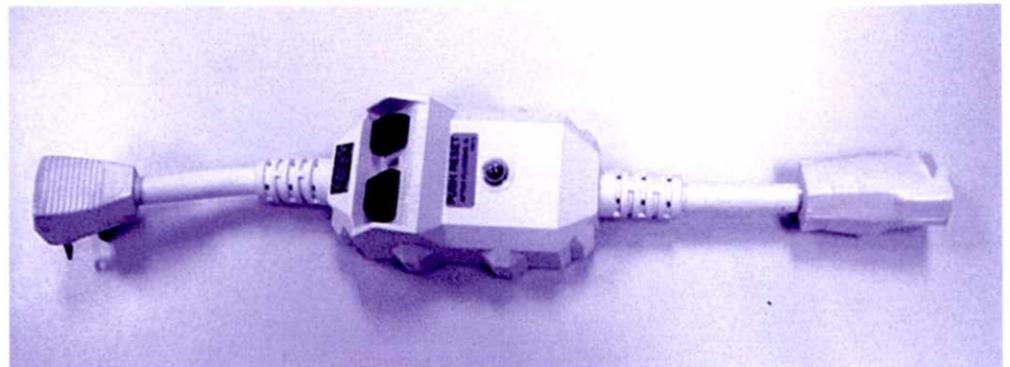
↳ **Portable type:**

- ↳ *Some plug directly into non-GFCI outlets.*
- ↳ *Incorporate no-voltage release device which will disconnect power to the outlets if any supply conductor is open.*
- ↳ *Units for outdoor use will be in suitable enclosure.*
- ↳ *Will be listed if for rain use.*

Types of GFCI's

↳ **Cord Connected type:**

- ↳ *Attachment plug incorporates the GFCI module.*
- ↳ *Protects the cord, and any equipment attached to the cord.*
- ↳ *Attachment has non-standard appearance*
- ↳ *Equipped with test and reset buttons.*
- ↳ *No-voltage release feature*



Testing GFCI's

- ⌘ *GFCI's are complex mechanisms, they must be tested on a regular basis.*
- ⌘ *For permanently mounted types, once a month testing is recommended.*
- ⌘ *Portable GFCI's should be **tested before each use.***
- ⌘ *GFCI's have a test-circuit which imposes an artificial ground fault when the test button is pushed.*

Testing GFCI's

*Push test button and make sure
the GFCI trips.
(A click will be heard)*



*Push reset button and make sure
the GFCI is activated.
A click will be heard*



Power Tools - Precautions

- *Disconnect tools when not in use, before servicing and cleaning, and when changing accessories*
- *Keep people not involved with the work away from the work*
- *Secure work with clamps or a vise, freeing both hands to operate the tool*
- *Don't hold the switch button while carrying a plugged-in tool*
- *Remove damaged electric tools & tag them: "Do Not Use"*

Power Tools - Precautions

- & Consider what you wear – loose clothing and jewelry can get caught in moving parts*
- & Keep tools sharp and clean*
- & Use PPE, such as safety glasses, goggles, face shield, gloves, hearing protection, respirator, hard hat*

Power Tools – Precautions

Electric Cords

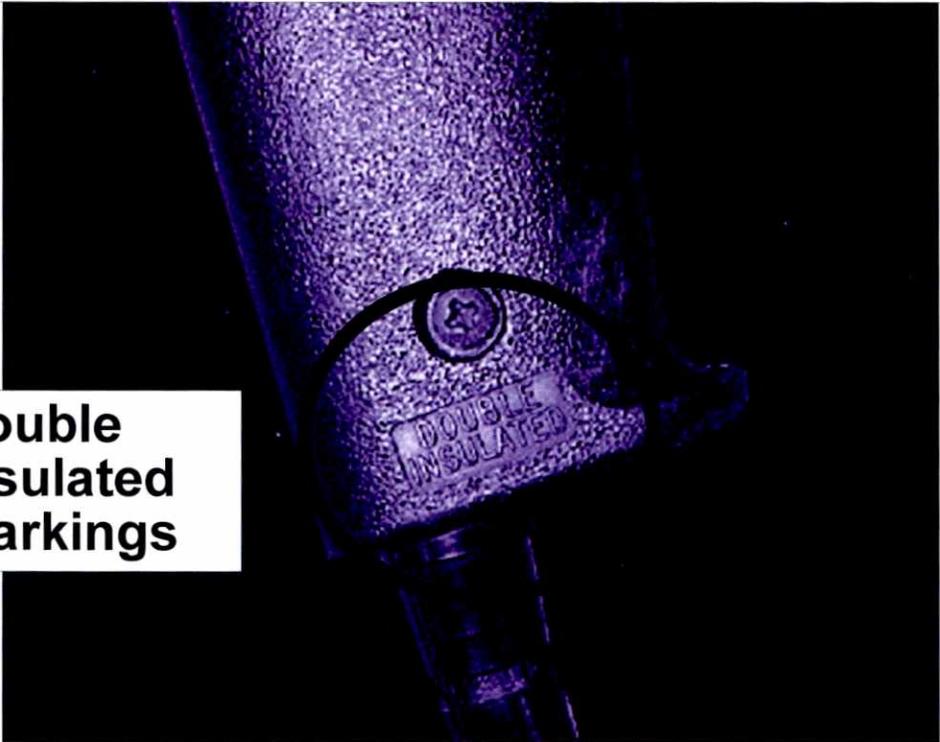


- ⌘ *Don't carry portable tools by the cord*
- ⌘ *Don't use electric cords to hoist or lower tools*
- ⌘ *Don't yank cord or hose to disconnect it*
- ⌘ *Keep cords and hoses away from heat, oil, and sharp edges*

Electric Power Tools

To protect a worker from shock, these tools must:

- have a 3-wire cord plugged into a grounded receptacle
- be double insulated, or
- be powered by a low-voltage isolation transformer



Double
insulated
markings



Plug with a
grounding
pin

Grounding

- ⌘ **Grounding creates a low-resistance path from a tool to the earth to disperse unwanted current.**
- ⌘ **When a short or lightning occurs, energy flows to the ground, protecting you from electrical shock, injury and death.**



Ground Tools & Equipment

- & Ground power supply systems, electrical circuits, and electrical equipment*
- & Frequently inspect electrical systems to ensure path to ground is continuous*
- & Inspect electrical equipment before use*
- & Don't remove ground prongs from tools or extension cords*
- & Ground exposed metal parts of equipment*



Tool Safety Tips

- ⌘ *Don't carry a tool by the cord*
- ⌘ *Don't yank the cord to disconnect it*
- ⌘ *Keep cords away from heat, oil, &*
⌘ *sharp edges*
- ⌘ *Disconnect when not in use and when changing*
⌘ *accessories such as blades & bits*
- ⌘ *Remove damaged tools from use*



Summary

Hazards are usually the result of improper tool use or not following one or more of these protection techniques:

- *Inspecting the tool before use*
- *loose clothing and jewelry can get caught in moving parts*
- *Use PPE, such as safety glasses, goggles and gloves*
- *Using guards*
- *Properly storing the tool*
- *Using safe handling techniques*