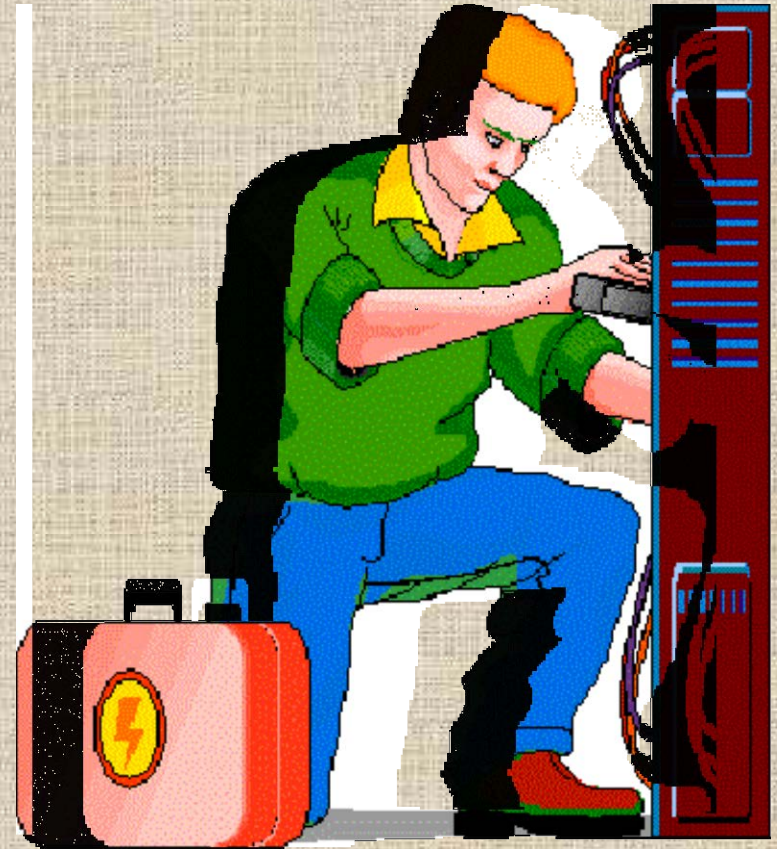


Electrical Safety Related Work Practices



Objectives:

Demonstrate an ability to:

1. Recite Hazards of Electricity
2. Identify Isolating Circuits
3. Perform Lock Out Procedure
4. Describe Procedure for Testing of Circuits
5. Work on Energized Equipment Safely

Objectives Continued:

6. Inspect and Safety Use Portable Electrical Tools
7. Inspect and Describe When to Use Electrical PPE
8. Identify Work Area Safety Items
9. Recite Special Procedures for Electrical Systems

Electrical Safety

- **Special Training is required for work on electrical equipment**
- **Only Qualified Persons may conduct electrical work**

Qualified Persons

Qualified persons are those who have been trained in avoiding the electrical hazards of working on or near exposed energized parts.

Unqualified Persons

Unqualified persons are those with little or no training in avoiding the electrical hazards of working on or near exposed energized parts.

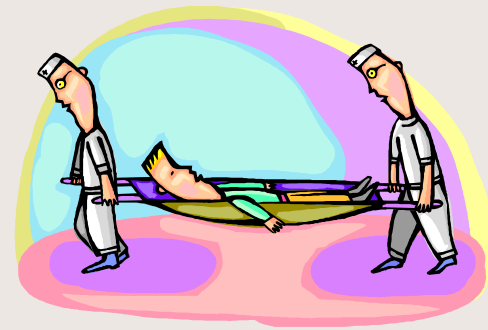
Special Training

This Training for Qualified Employees covers:

- Safe Work Practices
- Isolation of Electrical Sources
- Test Equipment
- Tools & PPE

First Objective: Recite Hazards of Electricity

- **Electrical Hazards Include**
 - Electrical Shock**
 - Electrical Explosions**
 - Electrical Burns**



These can result in severe injury or death

Second Objective: Identify Isolating Circuits

Before starting work...

- De-energize, Lock, Tag and Test all circuits
- De-energize all Power Sources
- Disconnect from all electric energy sources

Control circuit devices such as...

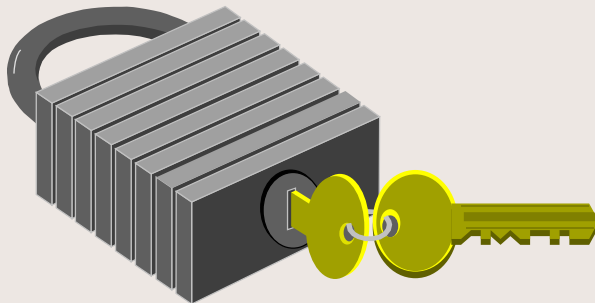
- push buttons
- selector switches
- interlocks

...may not be used as the sole means for de-energizing circuits or equipment.

Third Objective: Perform Lock, Tag Procedure

Lock & Tag all Sources

- Place Lock & Tag on each disconnecting means used to de-energize circuits
- Attach Lock so as to prevent operating the disconnecting means
- Place Tag with Each Lock



DANGER

Do
Not
OPERATE

This lock/tag may
only be removed by

Name _____
Dept. _____
Expected Completion _____

W.H. Brady Co. Cat. No. 65520

DANGER

This energy source
has been LOCKED
OUT.

Unauthorized removal
of this lock / tag may
result in immediate
discharge.
Remarks: _____

If a Lock cannot be applied...

A tag used without a lock must be supplemented by at least one additional safety measure that provides a level of safety equal to that of a lock.

Examples:

- Removal of an isolating circuit element such as a fuse
- Blocking of a controlling switch
- Opening of an extra disconnecting device.

Release Stored Energy...

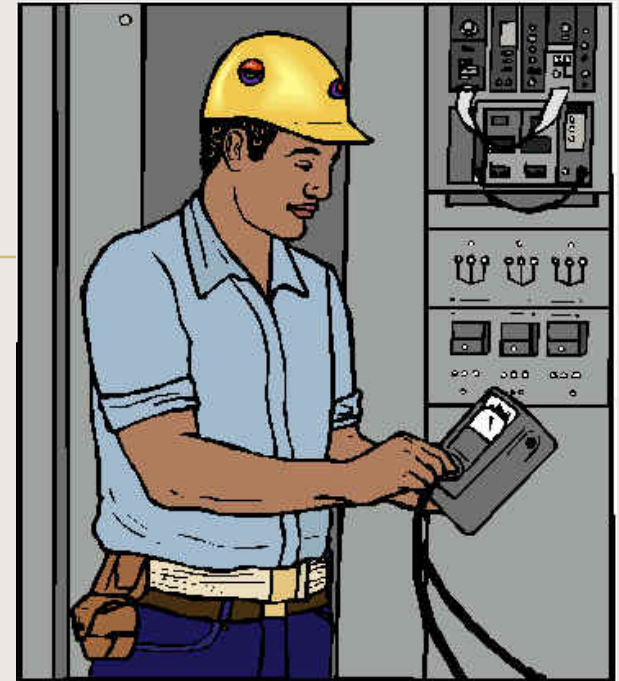
Stored electric energy must be released before starting work.

- Discharge all Capacitors &
- Short-Circuit & Ground all high capacitance elements

Is it “Dead”?...

Verify System is De-energized

- ❑ Operate the equipment controls to check that equipment cannot be restarted.
- ❑ Use test equipment to test the circuits & electrical parts for voltage & current



Fourth Objective:

Describe Procedure Testing Circuits

Check test equipment (Volt-Ohm Meter) on a known live source of same rating to ensure it works before and after checking the circuit on which you will be working.

Lock Out Cont.

Re-energizing Equipment...

- Conduct tests and visual inspections to ensure all tools, electrical jumpers, shorts, grounds, and other such devices have been removed
- Warn others to stay clear of circuits and equipment.
- Each lock and tag must be removed by the person who applied it
- Visually check that all employees are clear of the circuits and equipment.

Fifth Objective:

Work on Energized Equipment Safely

Working on or Near Exposed Energized Parts

In the rare situation when energized equipment (or working in near proximity to energized equipment) can not be de-energized, the following work practices must be used to provide protection

- Obtain permission from Manager to work on or near energized electrical circuits.
- Lock out and Tag out all circuits possible.
- Treat all circuits as energized.

Working on energized circuits Cont.

When working on energized circuits

- Isolate the area from all traffic
- Remove all conductive clothing and jewelry (rings, watches, wrist/neck chains, metal buttons, metal writing instruments, etc.)
- Use proper protective equipment, shields and/or barriers to provide effective electrical insulation from energized circuits. This may include electrically rated insulated gloves, aprons, rubber soled shoes, insulated shields, insulated tools, etc.

Working on energized circuits

Cont.

When working on energized circuits

- Provide adequate lighting. Do not enter areas with exposed energized parts unless illumination is provided so that you may work safely. Do not reach around obstructions of view or lighting (blindly) into areas where exposed energized parts are located.
- When entering a confined space with exposed energized parts, you must use protective barriers, shields, or equipment or insulated materials rated at or above the present voltage to avoid contact.

Working on energized circuits Cont.

When working on energized circuits

- Doors or other hinged panels shall be constructed and secured to prevent them from swinging into an Employee and causing contact with exposed energized parts.

A decorative graphic on the left side of the slide, resembling the spiral binding of a notebook. It features a vertical line of dark, circular rings on a light background, with a dark vertical bar to its left.

Conductive Materials

Conductive materials and equipment must be handled so as to prevent them from contacting exposed energized conductors or circuit parts

Conductive Apparel

Remove all conductive articles of jewelry and clothing, such as watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear.

Sixth Objective:

Safe Use Portable Electric Tools

- Portable equipment shall be handled in a manner which will not cause damage.
- Flexible electric cords connected to equipment may not be used for raising or lowering the equipment.
- Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.

Visually Inspect...

Portable cord and plug connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects:

- Loose parts
- Deformed or missing pins
- Damage to outer jacket or insulation
- Evidence of possible internal damage

Remove from Service...

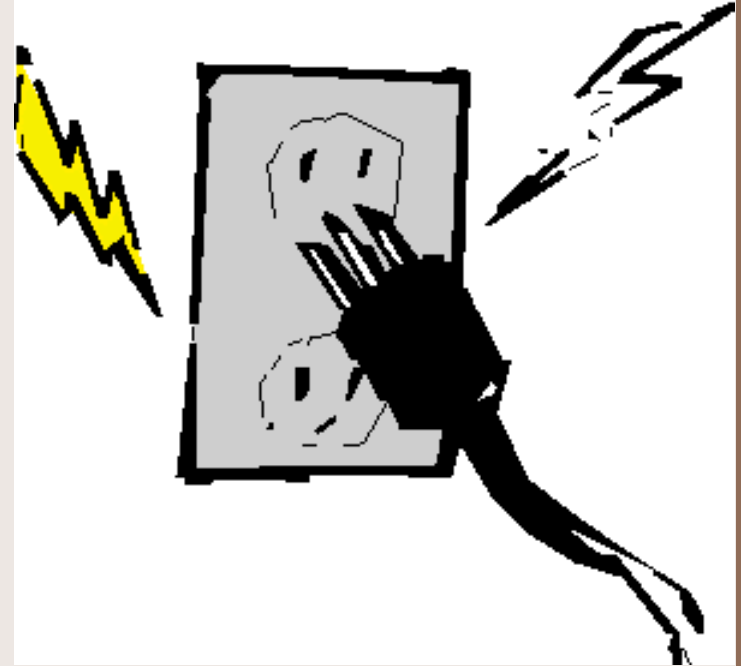
If there is a defect or evidence of damage to any electrical tools or equipment...

- Immediately notify your supervisor
- Remove the item from service
- Tell your co-workers

Attachment Plugs...

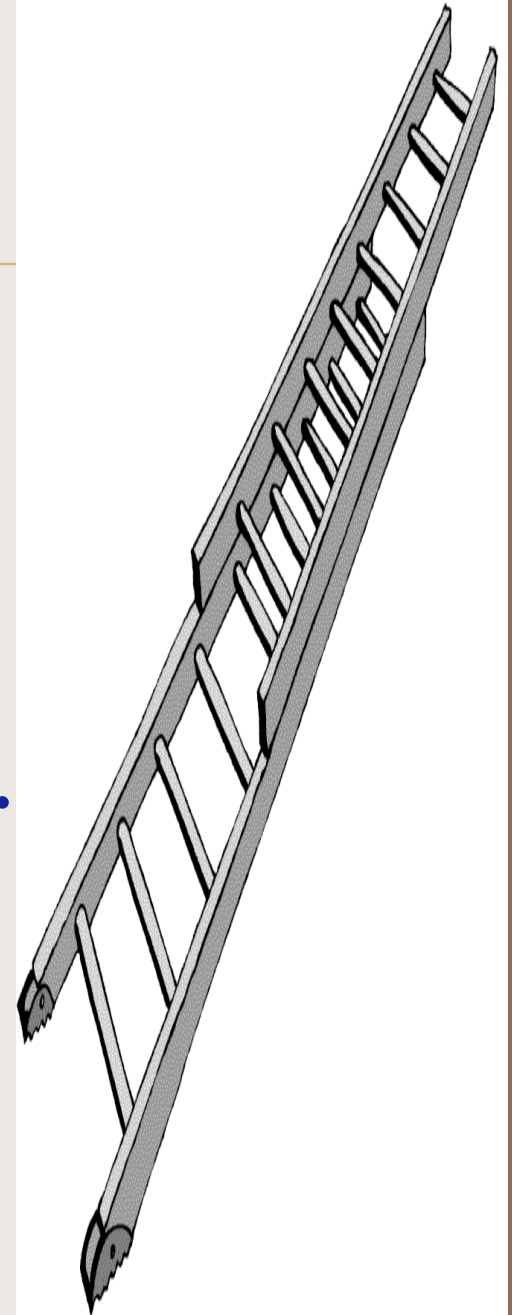
Connecting Attachment Plugs

- ❑ Ensure hand, cords and receptacles are dry when plugging and unplugging flexible cords and cord and plug connected equipment, if energized equipment is involved.



Ladders....

- ❑ Portable ladders must have **Non-conductive side rails** if they are used where a workers or the ladder could contact exposed energized parts.
- ❑ Keep all ladder parts at least **10 feet** away from **Overhead power lines**



Test Instruments..

- Test instruments, equipment & test leads, cables, power cords, probes, and connectors must be visually inspected for external defects and damage before the equipment is used.
- Remove any defective items from service

Instrument Ratings...

Test instruments and equipment & accessories must be:

- Rated for the circuits and equipment to which they will be connected
- Designed for the environment in which they will be used

A decorative graphic on the left side of the slide, resembling the spiral binding of a notebook. It features a vertical line of dark, circular rings on a light background, with a dark vertical bar to its left. The rings are arranged in a slightly irregular pattern, giving it a hand-drawn or artistic feel.

Seventh Objective: Using Personal Protective Equipment

Employees working in areas where there are potential electrical hazards must use electrical protective equipment that is appropriate for the work to be performed.

More on PPE..

- Use, store & maintain your Electrical PPE in a safe, reliable condition
- Wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.
- Wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.

PPE Inspection...

Electrical PPE with any of the following defects may not be used

- A hole, tear, puncture, or cut**
- Ozone cutting or ozone checking (the cutting action produced by ozone on rubber under mechanical stress into a series of interlacing cracks)**

AND....

- Any of the following texture changes: swelling, softening, hardening, or becoming sticky or inelastic.
- An embedded foreign object
- Any other defect that damages the insulating properties

Don't use defective Electrical PPE!

PPE Testing

Rubber insulating line hose

- Upon indication that insulating value is suspect.

Rubber insulating covers

- Upon indication that insulating value is suspect.

Rubber insulating blankets

- Before first issue and every 12 months

Rubber insulating gloves

- Before first issue and every 6 months

Rubber insulating sleeves

- Before first issue and every 12 months

Tools & Equipment

- Use insulated tools or handling equipment when working near exposed energized conductors or circuit parts.
- Use fuse handling equipment to remove or install fuses when the fuse terminals are energized.
- Ropes and handlines used near exposed energized parts must be nonconductive.

Eighth Objective: Work Area Safety...

You must be able to see what you are doing when working on energized equipment

- Do not work on energized electrical parts
 - **without adequate illumination**
 - **if there is an obstruction that prevents seeing your work area**
 - **if you must reach blindly into areas which may contain energized parts**



Alerting others...

- ❖ Use safety signs, safety symbols, or accident prevention tags to warn others about electrical hazards which may endanger them.
- ❖ Use barricades to prevent or limit access to work areas with un-insulated energized conductors or circuit parts
- ❖ If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees

Conductive Work Locations...

Portable electric equipment & flexible cords used in highly conductive work locations where employees are likely to contact water or conductive liquids, must be rated for the wet environment

Ninth Objective:

Recite Special Procedures for Electrical Systems

Interlocks

Only a qualified person may defeat an electrical safety interlock, and then only temporarily while he or she is working on the equipment. The interlock system shall be returned to its operable condition when this work is completed.

Electrical Systems Cont.

Re-closing circuits after protective device operation

After a circuit is de-energized by a circuit protective device, the circuit protective device may not be manually reenergized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual re-closing of circuit breakers or reenergizing circuits through replaced fuses is prohibited.

Over-Current Protection...

Overcurrent Protection Modification

Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis

System Markings..

Electrical equipment may not be used unless the manufacturer's name, trademark, or other descriptive marking is placed on the equipment.

Other markings shall be provided giving voltage, current, wattage, or other ratings as necessary.

Circuit ID...

Identification of disconnecting means and circuits

- Each disconnecting means for motors and appliances shall be legibly marked to indicate its purpose.
- Each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, must be legibly marked to indicate its purpose

Its Your Job....

- ✓ Know the hazards of electricity
- ✓ Know the equipment
- ✓ Use Safe Work Practices
- ✓ Inspect your PPE before each use
- ✓ Don't work on energized circuits without permission