

ELECTRICAL SAFETY LOCKOUT/TAGOUT



1910.Sub Part S - Electrical

- 331 - Scope of the Requirements
- 332 - Training Requirements
- 333 - Selection/Use of Work Practices
- 334 - Use of Equipment
- 335 - Safeguards for Personnel



OTHER REG'S

- ANSI - C2-81 National Electrical Safety Code
- NFPA - 70-78 National Electrical Code
 - 70E Electrical Safety in Workplaces



What is Electricity?

- Static - stationary
- Dynamic - moving, flow
- Free electrons = electricity when given flow
- Conductor



Definitions

- Voltage
- Current
- Power
- Resistance



Hazards of Electricity

- Shock
- Burns
- Arc-blast
- Explosions
- Fires



Maximum Amperage

- OSHA determined
 - 10 mA no let go level
 - 30 mA electrocution level
 - Resistance of dry skin = 100,000 ohms
 - Resistance of wet skin = 1,000 ohms

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Effects on the body

- Aggravation of pre-existing condition
- Emotional or psychological
- Extensive tissue damage
- Internal hemorrhaging

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Effects cont.

- Respiratory failure
- Ventricular fibrillation
- Heart stops during shock & starts again
- Unconscious or death

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Electrical Safety Program

- All Employers Must:
 - ☑ Safeguard Electrical Sources
 - ☑ Review Job Specific Hazards
 - ☑ Implement Corrective Actions
 - ☑ Conduct Hazard Assessments

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Electrical Safety Program cont.

- ☑ Conduct Accident Investigations
- ☑ Provide Training to All Required Employees
- ☑ Control Workplace Hazards Using PPE As a Last Resort

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Training for Qualified Persons

- Training must be provided:
 - Safety related work practices
 - Prior to job assignment
 - Explain specific regs that apply
 - Explain hazards assoc. w/electricity

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Qualified Persons cont.

- Determine nominal voltage of live parts
- Determine clearance distances of live parts
- Teach them to distinguish between live & other parts

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Retraining Requirements

- ☑ **New Electrical Hazard**
- ☑ **Program Related Injury**
- ☑ **Change in Job Assignment**
- ☑ **New Equipment Introduced**
- ☑ **New Hazard Control Methods**
- ☑ **Failure in the Safety Work Practices**
- ☑ **Reason to Doubt Employee Proficiency**

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Reversed Polarity

- Reverse wiring
- Can cause mechanical hazards
- Accidental startup

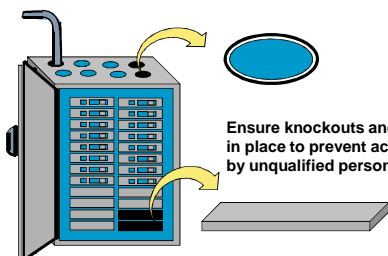
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Equipment - power lines

- Vehicles or mechanical equipment capable of having elevated parts near energized overhead lines must be operated so that a clearance of **10 ft.** (305 cm) is maintained.
- If the voltage is higher than 50kV, the clearance must be increased 4 in. (10 cm) for every 10kV over that voltage.



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Electrical Inspection Checklist

- 1. What is the purpose of the inspection?
 - Grounding
 - Wire size
 - Polarity
 - GFCI's
 - Etc

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2. Codes & Regulations

- 1910 Subpart S
- 1926 Subpart K
- NEC
- NEC handbook
- Various NFPA standards
- UL codes

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3. Special Equipment

- Volt pens
- Tick tracer (voltage)
- Voltmeter
- Circuit tester
- Measuring tape or ruler
- Cutting tool
- NEVER unplug without asking first!!

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4. Analysis of Equipment

- Grounds (1910.304)
 - continuous
 - ground pin
 - conduits
 - cheater plug (adapter)
- General wiring
 - Extension cords
 - flat or round – must be round
 - using temporary or permanent
 - conduit
 - tape – splices
 - GFCI or assured grounding

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Analysis cont.

- Temporary lighting
 - 90 day rule
 - changing cords
 - temporary lights

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5. Panels & boxes

- Nameplate
- Clearance
- Openings
- Labeling breakers
- LO/TO

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Panels & boxes cont.

- Exposed live parts
- Breakers cannot be taped shut/open
- Cannot be locked shut or painted shut (1910.303(g)(1))

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6. Evidence of LO/TO

- Written program
- Sufficient training
- Make sure information is being applied



7. Hazardous Locations

- Box rated for hazard
- No missing screws, gaskets, or other items
- Romex can only go through seal tight locations



Haz. Locations cont.

- Permanent fixtures must have hazard products
 - Division I (use or mix)
 - Division II (where you store it)



Inspection Final Points

- Wet and damp locations
- Double insulated tools
- Metal ladders & conductive tools
- Property inspection
- CPR training



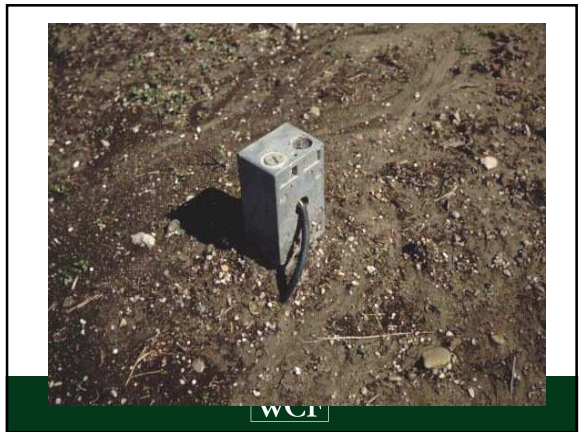
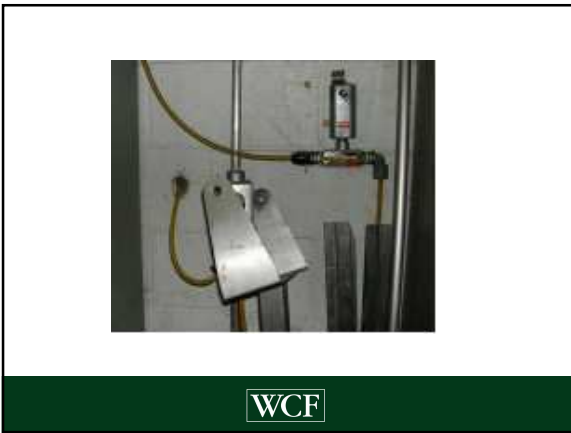
Inspection Final Points

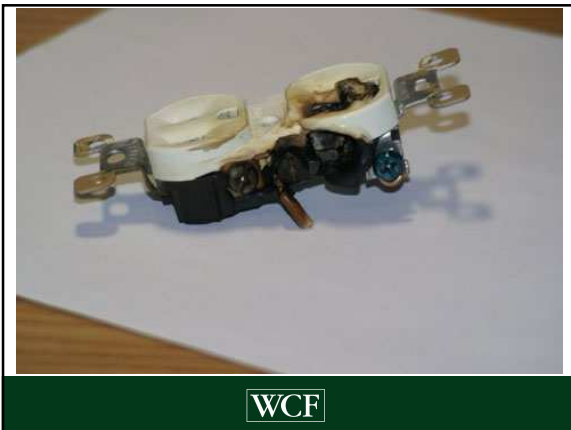
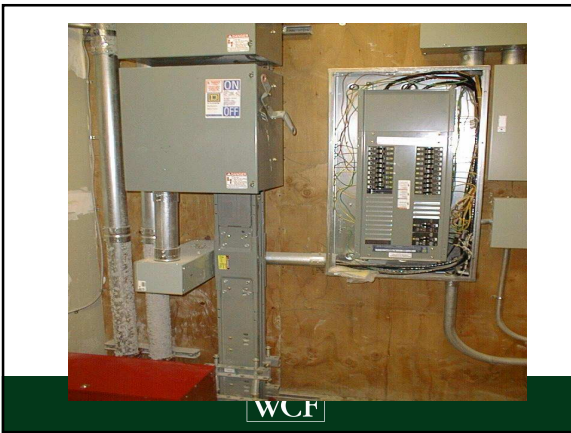
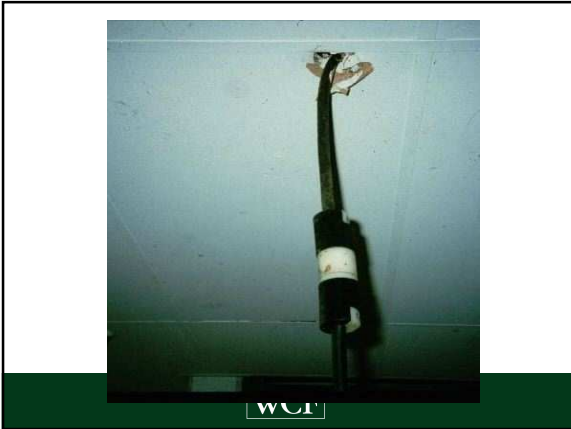
- Education & training
1910.332 & .333 evidence of training
- Periodic Review of electrical safety program



VIRTUAL TOUR









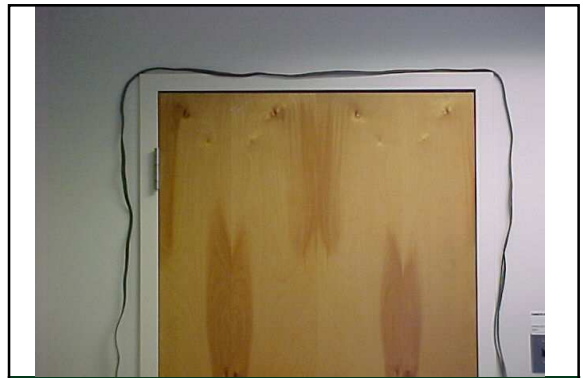
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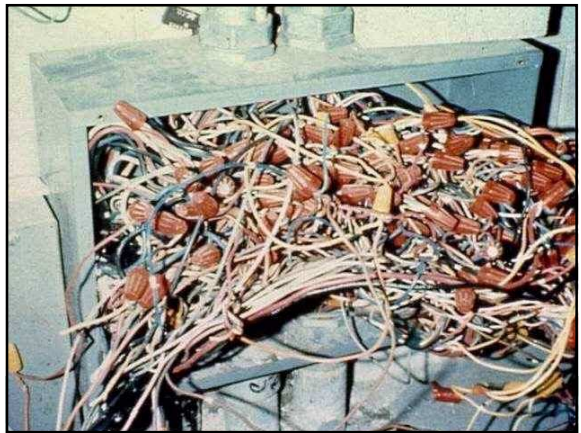
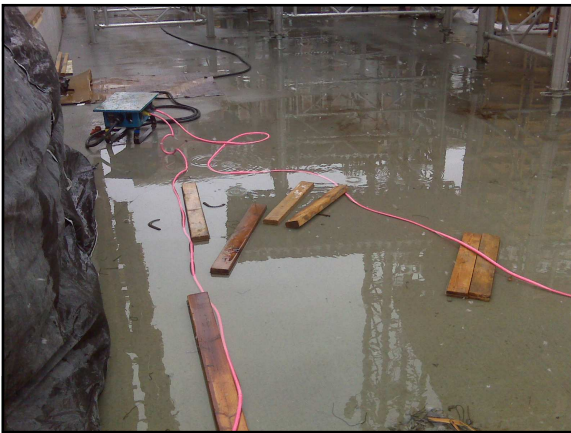
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LOCKOUT/TAGOUT
1910.147



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Lockout/Tagout

- Standard was created to prevent 120 deaths per year and 60,000 injuries per year
- Covers servicing & maintenance when UNEXPECTED start-up or release of stored energy occurs (1910.147 (a)(1)(i))



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Exclusions

- Construction
- Agriculture
- Maritime
- Installation under control of electric utilities
- Work on, near, or with conductors or equip. in electric utilization installations (Subpart S)
- Oil & gas drilling & servicing

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Normal Production Operations

- *Minor* tool changes & adjustments, & other *minor* servicing activities, which take place during *normal production operations* are NOT covered by this standard if they are *routine, repetitive, & integral to the use of the equipment for production*, provided that the work is performed using alternative measures which provide effective protection.

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Capable of Being Locked Out

- Designed with hasp or attachment to which the lock can be affixed
- Has locking mechanism built in
- Lockout can be achieved w/o need to dismantle, rebuild, replace or permanently alter
- 1910.147 (b)



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LO/TO INJURIES

- Injured by moving machinery part
- Contact with energized part
- Injured by physical hazard
- Injured by falling machine part

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Circumstances of Injury

- Un-jamming object(s) from equip.
- Cleaning equipment
- Repairing equipment
- Performing routine maintenance
- Installing equipment

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Circumstances cont.

- Adjusting equipment
- Doing set-up work
- Performing electrical work
- Inspecting equipment
- Testing equipment

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Equipment Not Shut Off

- Afraid of slow down in production
- Afraid it would take too long
- Not req'd by comp. procedure
- Didn't know power was on

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Not Shut Off cont.

- Didn't know how to turn off
- Didn't think it was necessary
- Live work req'd

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Equipment Turned On

- Accidentally by employee injured
- Co-worker acc. turned on
- Equip. moved when jam cleared
- Equip. unexpectedly "cycled"
- Parts still in motion (coasting)

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Cord & Plug Connected Equipment

- Exclusions to LO/TO
 - Physically in possession
 - Within arms reach & in line of sight
 - LO/TO device is attached
- 1910.147 (c)(4)

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Energy Control Program

- Control procedures
- Employee training
- Periodic inspections
- Ensures machine is inoperable before working
- 1910.147 (c)(1)



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Program Requirements

- Procedures inspected annually
- Inspections by auth. employees
- LO reviewed authorized emps
- TO reviewed by auth. & affected

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Written Procedures

- Scope
- Purpose
- Authorization
- Rules
- Techniques to be utilized
- Means to enforce compliance



Procedures

- Must be MACHINE SPECIFIC
- State intended use
- Steps for shut down & energy control



New/Modified Equipment

- Must be capable of being locked out
- If you have an accident you will be cited
- 1910.147 (c)(2)(iii)



Using Tags

- If capable of lockout - additional means must be used
- Removal of an isolating circuit
- Blocking of a control switch
- Opening an extra disconnect
- Removal of a valve handle



Tagout Requirements

- Only a warning device
- Only removed by responsible person
- Do not provide physical restraint
- Never to be defeated or ignored



Tagout Req's cont.

- Must be legible & understandable
- Withstand environmental conditions
- May evoke false sense of security
- Must be securely attached



Rules for Tag Use

- List warnings on tag
 - Do not start
 - Do not open
 - Do not close
 - Do not energize
 - Do not operate
- Personalize w/name & picture



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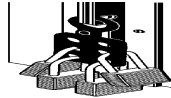
Lock Construction

- Requires excessive force to remove (Bolt Cutters)
- Don't use breakaway shackles (Removable with a hammer)
- Must indicate identity of authorized person applying device

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Rules for Lock Use

- One person per lock
- One key for each lock
- Some have spare key in a locked box
- Spare key compromises personal protection



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Locks & Tags

- Provided by employer
- Singularly identified
- Only devices used
- Durable
- Standardized
- Substantial



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Annual Inspection

- Date of inspection
- Identification of machine or equipment
- Emps included in inspection
- Name of inspector

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Employee Training

- Authorized 1910.147 (b)
- Affected 1910.147 (b)
- Other 1910.147 (c)(7)(ii)(c)
- Maintenance with guarding in place need only be trained as affected employees



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Training cont.

- Employer must provide:
 - Effective initial training
 - Effective retraining as needed
 - Certification of training, emps name & dates of training
- 1910.147 (c)(7)(iv)

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Authorized Employee Training

- Recognition of hazardous energy sources
- Type & magnitude of energy in workplace
- Methods for energy isolation/control

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Affected & Other Employee Training

- Affected
 - Purpose/use of energy control procedure
- Other employees
 - Procedure
 - Prohibition on restarting machines or equipment

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Retraining Requirements

- Change in job assignments
- Change in machines, equipment or processes that present new hazards
- Change in energy control procedures
- Inspection reveals deviations in employee knowledge of procedures
- 1910.147 (c)(7)(iii)

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Training on Tag Limitations

- Warning devices only
- Must not be removed/bypassed/ignored
- Must be legible
- Withstand environmental conditions
- May evoke a false sense of security
- Must be securely attached

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LO/TO Procedure

- Name of company
- Type(s)/Magnitude(s) of energy/hazards
- Name(s) and/or job title(s) of emps authorized
- Names(s) and/or job title(s) of affected emps & how to notify
- Type(s)/Location of energy isolating devices

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LO/TO Procedure cont.

- Type(s) of stored energy - methods to dissipate or restrain
- Method(s) selected (Locks, tags, safety measures, etc.)
- Type(s) of equipment checked to ensure disconnections
- Name(s) and/or job title(s) of emps authorized for group lo/to



OSHA's Website

- <http://www.osha.gov/SLTC/controlhazardousenergy/index.html>
- <http://www.osha.gov/SLTC/electrical/index.html>



Thank You!

