Electrical Hazards

- Practically the entire workforce are exposed to potential electrical hazards during the performance of their work.
- Many workers are unaware of these hazards.
- Electrical injuries can consist of:
  - Electrocution (fatal)
  - Electric shock
  - Burns
  - Falls caused as a result of contact with electrical energy
  - Broken bones (reflex action)
- Severe injuries such as deep internal burns.
Electrical Shock

• Severity of Shock Depends on:
  – Path of current through the body
  – Amount of current flowing through the body (amps)
  – Duration of the shocking current through the body

• Electricity needs a complete path, or circuit in order to flow

• The heart and brain are most susceptible to shock. Heart rhythm is affected.
<table>
<thead>
<tr>
<th>Current</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 milliamp</td>
<td>Threshold of sensation. Faint tingle.</td>
</tr>
<tr>
<td>5 milliamps</td>
<td>Slight shock felt. Disturbing, but not painful.</td>
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<tr>
<td>6-30 milliamps</td>
<td>Painful shock. Muscular control is lost.</td>
</tr>
<tr>
<td>50-150 milliamps</td>
<td>Extremely painful shock. Respiratory arrest.</td>
</tr>
<tr>
<td>1- 4.3 amps</td>
<td>Ventricular fibrillation. Death is likely.</td>
</tr>
<tr>
<td>10 amps</td>
<td>Cardiac arrest and severe burns. Death probable.</td>
</tr>
<tr>
<td>15 amps</td>
<td>Lowest over-current at which a fuse or circuit breaker opens a circuit!</td>
</tr>
</tbody>
</table>
Current Through Skin

- **Dry Skin**
  - 50 Volts/250,000 ohms = 0.20 milliamps
  - 120 volts/250,000 ohms = 0.48 milliamps

- **Conductive Skin**
  - 50 volts/1,000 ohms = 50 milliamps
  - 120 volts/1,000 ohms = 120 milliamps

- 50-150 milliamps = Respiratory arrest, severe muscle contractions. Death is possible.

- You must treat >50V as potentially lethal!
Office Electrical Hazards

• Electrical equipment used in office areas is potentially hazardous and can cause electrical shock or fires if improperly maintained.
• Take a few minutes to inspect your office area using the electrical safety check list provided.
• Office area electrical safety check sheet
Office Electrical Safety Self-Assessment Form

Office Number:
Assessor Name:
EETD Department:
Date:

<table>
<thead>
<tr>
<th>Safety Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are electrical cords and plugs in good condition? Answer “No” if outer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>jacket of cord damaged, frayed or exposed wire.</td>
<td></td>
<td></td>
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<tr>
<td>2. Are none of the power strips “daisy chained” together? Answer “No” if</td>
<td></td>
<td></td>
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<tr>
<td>one power strip plugged into another power strip.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Are electrical cords properly placed such that they cannot be damaged?</td>
<td></td>
<td></td>
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<tr>
<td>Answer “No” if cords under carpets, severe bending at plug, use of nails.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Are there enough outlets to avoid use of extension cords for permanent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>applications? Answer “No” if extension cords are in permanent use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Are electrical outlets free of overloading? Answer “No” if use of adapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>to increase the number of plugs, over-heating of plugs, tripping of breakers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Is all electrical equipment &gt;50 vols approved by a National Testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory? Answer “No” if no UL, ETL, IEC, UL listed equipment.</td>
<td></td>
<td></td>
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<tr>
<td>7. Is all electrical equipment in good condition? Answer “No” if missing</td>
<td></td>
<td></td>
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<tr>
<td>panels, missing wall plates, imperable switches, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Is all electrical equipment (including computers) turned off when not in</td>
<td></td>
<td></td>
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<tr>
<td>use after regular office hours? If “No” indicate equipment type in comments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Is the office temperature comfortable without the use of portable heats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ers or air conditioners? Answer “No” if portable heaters are in use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Are area lighting motion sensors functioning properly? If “No” indicate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>type of problem in comments.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments/Areas for Improvement

Rev A, 8/17/13, S. Schick
Are Cords and Plugs in Good Condition?

• Inspect cords regularly to ensure they are not damaged.

• Cord damage includes: cuts/tears of insulation, fraying, and exposed wiring.

• Adapters should not be used to convert a three-prong plug into a two prong.
Are Power Strips "Daisy Chained"?

• One power strip should not be plugged into another power strip. This is called “daisy chaining”.
• Daisy chaining can result in too many items plugged into an outlet causing an overloaded circuit.
Are Cords Properly Placed to Prevent Damage?

- Electrical cords should not be placed under floor mats or carpets.
- Do not use staples, tacks or nails to secure electrical cords.
- Electrical cords should not undergo severe bending, pressure or crimping.
- Do not place cords in aisles where they can become a trip hazard.
Are There Enough Electrical Outlets?

- Extension cords are permitted only for temporary uses.
- Extension cords should not be used as a means of reaching a far away outlet.
- If additional outlets are needed in an area, contact the Building Manager. An electrician will properly install needed outlets.
Are Electrical Outlets Free of Overloading?

• Use of adapters to add plugs into an outlet should be avoided.
• Too many items plugged into a single circuit can cause circuit overload and tripping of the main breakers.
• In some instances, an overloaded circuit can overheat and cause a fire.
Do Your GFCI’s Work Properly?
Ground-Fault Circuit-Interrupters (GFCI’s)

- GFCI’s are to be used when using electrical equipment in a wet environment
- GFCI’s are designed to detect any leakage of current in an electrical circuit before it can harm you
- GFCI’s turn off or “trip” the circuit whenever the leakage is greater than 5/1000 of an ampere
- Test monthly using test button. Have something plugged into the circuit when testing.
Is All Equipment >50 Volts NRTL Approved?

- All electrical equipment greater than 50 volts must be approved by a Nationally Recognized Testing Laboratory (NRTL).
- This includes power strips and electrical cords.
- If NRTL approved equipment is not available, it must be inspected by an electrician prior to use.
- Typical NRTL logos to look for:
**Is All Electrical Equipment in Good Condition?**

- Electrical equipment must be maintained in good operating condition.
- Equipment must have all panels and covers securely affixed.
- Wall outlets must have the wall plate affixed.
- Look for signs of damage or overheating.
- If equipment is defective, take it out of service immediately!
Is a Portable Space Heater in Use?

- Space heaters should be limited to small personal office areas only.
- If possible, have Facilities make temperature adjustments to your area.
- If a portable space heater is used, it must have:
  - A grounded (three prong) plug.
  - A maximum rating of 1500 watts or 13 amps.
  - Auto tip-over shut-off feature.
  - 36” clearance in front and 18” on sides and back.
- Do not plug heaters into extension cords or power strips. They must be plugged directly into a wall outlet.
Is Equipment Turned Off After Hours?

- Where possible, electrical equipment should be turned off during non-business hours.
- Area motion sensors should be used when feasible to prevent lights being left on at night.
- Use equipment with the EPA “Energy Star” logo affixed.
Lock-Out/Tag-Out

• De-energize equipment prior to maintenance or repair
• “Cord and Plug”
• LOTO
  – Identify Energy Sources
  – Shutdown Equipment
  – Isolate Energy Sources
  – Verify Proper Isolation
Arc Flash
Switch Gear Explosion
Thank You!

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- https://eta-safety.lbl.gov
Electrical Safety Slide Show

• Various Electrical Safety Photos
• Can You Spot Any Issues?