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Moderator: Teresa Campbell

Don't get 'Zapped' by OSHA for Electrical Violations

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SUMMERS ELECTRIC
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Why print companies need to understand basic electrical safety requirements

- OSHA inspections at print companies are on the rise.
- Citations per item are significantly higher.
- Most OSHA visits result in citations for electrical violations.

Stats on Electrical Shock Injuries

- **On average, there is 1 electrocution death per day on the job in the US.**

- 10-15 electrical burns/day
- 4000 non disabling injuries/yr
- 3600 disabling injuries/yr
- If include on & off work, close to 1000 deaths/yr
- (Does not include near misses or injury from arch flash)
- 80% of electrical incidents for people who are un-qualified to work on electrical items are due to electrical shock

Arc Flash Injuries

- **1-2 persons are killed per day from arch flash incidents.**

- 7000 burned every year
- 2000 severe burns
- 5-10 arc explosion/day
- 80% of electrical injuries amongst persons Qualified to work on electrical are from arc

Agenda Part 1:
Things we need the Electrician to get right with installations

- Introduction (presenter info, injury stats, references, who can do work)
- Electrical basics (design)
- Components for intended use (example: outlet type with portable cords)
- Preventing exposure to conductors (cover plates, breaker slots, knockouts, conduit/wiring runs)
- Protecting circuit conductors/wiring (strain, transitions, walls, drop ceilings)
- Hardware included to allow for lockout/tagout
- Labeling electrical

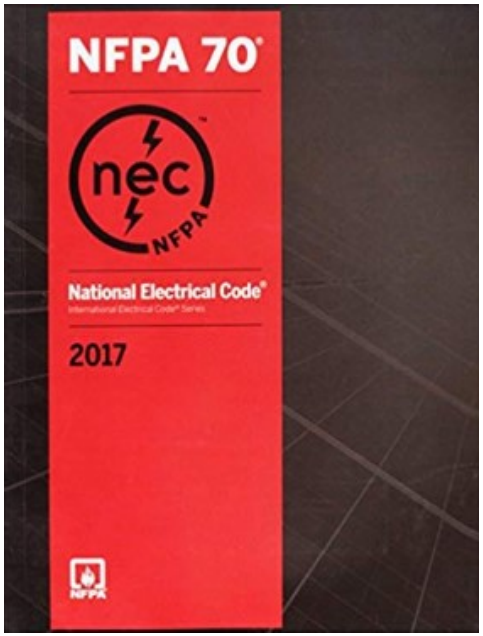
Agenda Part 2:
Things the print company needs to do to maintain compliance

- Notice and repair damaged electrical items (damaged cords, ground prong, damaged/strained conduit, switches/interlocks, cover plates, knockouts)

- Workers trained and reinforced in their role in electrical safety (trip hazards, clearance requirements, panel covers &machine electrical door requirements, culture of reporting issues)

- Extension cords (for permanent uses, trip hazard, damaged, double-jacking)
- Management presence (Otherwise, Bubba does his thing, bad design, doing electrical work without lockout/tagout)

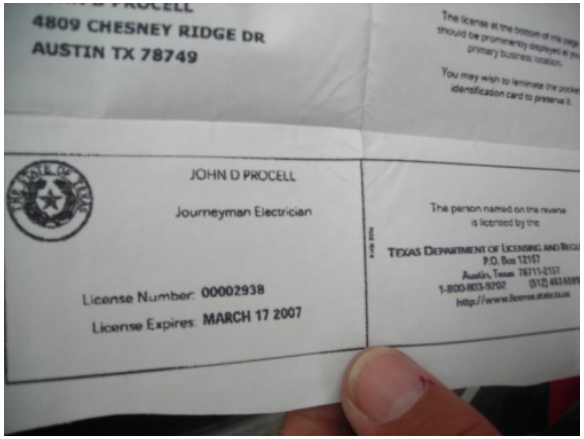
References on Electrical Requirements



1910 Subpart S, .301 - .399 general industry

1926 Subpart K, .400 -.449 construction

Who can do electrical work?



- All electrical designs and component selection to be executed by qualified electrician or electrical engineer.
- All installation of electrical wiring and components to be performed by qualified personnel (such as licensed apprentice working under a licensed journeyman electrician).

Can a plant maintenance person do basic electrical work?

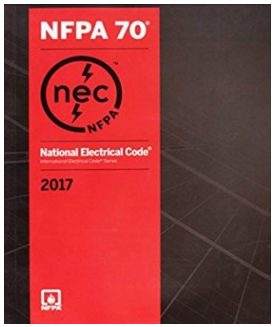
- if certified electrician –Yes.
- If not certified electrician - Maybe:
  - If a maintenance person has experience and/or formal training in electrical work.
  - Simple repairs (replacing with same new component while under full lockout/tagout)
  - Note: the plant is required to document the employee's training & experience and give guidelines on what they can and cannot do.

Part 1:

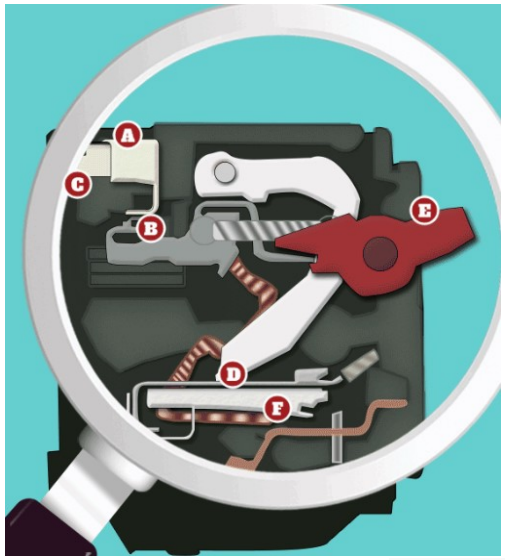
What Electricians need to get right

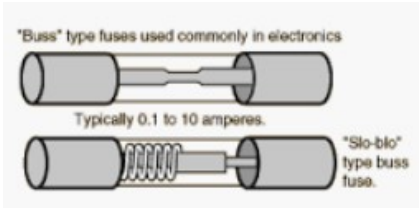
Electrical Design Basics

- Electrical plans and installations to comply with electrical code (NFPA 70).
- Electrical components are to only be used as intended by the manufacturer/supplier (as in UL listing).
- Components must be rated to handle the voltage and amperage for the application/system they will be installed in.



Electrical Design Basics





- Fuses or circuit breakers will be utilized to <u>interrupt current automatically</u> if current exceeds circuit limits.

Electrical Design Basics

- <u>GFCI</u> will be used as appropriate to protect users from ground faults (including with electrical outlets within 6 feet of <u>water outlets</u> & all outlets outside)

Electrical Design Basics

- Extension cords will not be used to power stationary (permanent) equipment.
- Power outlet strips can be used long term, but they must be rated to handle the load they operate.

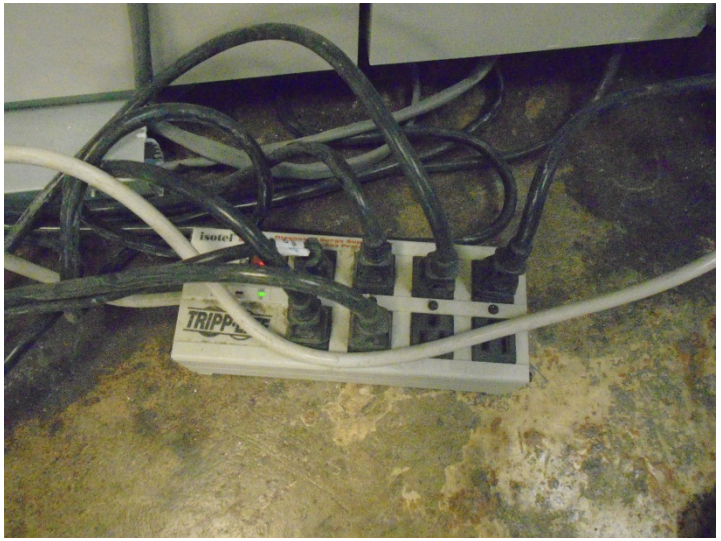
Locating Electrical Gear / Clearance

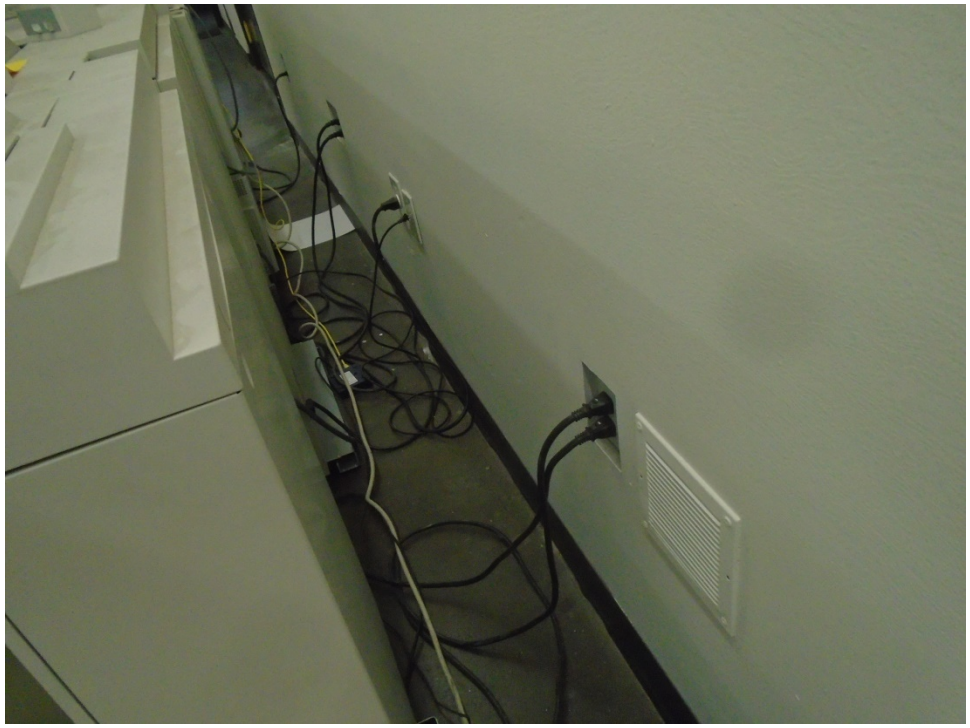
- The electrical contractor and manufacturing company need to communicate/coordinate plans for locating production equipment and electrical equipment to ensure there will be proper clearance and access for electrical equipment.
- (Need 3 ft clearance in front of panels, disconnect boxes, transformers, etc and there must be room for all panel doors to open 90 degrees).

Preventing Electrical Trip Hazards

- Electrical cords/conduit will <u>not be installed on or run across the floor in personnel walkways</u> (or areas operators will need to walk through on a daily basis). In these areas, electrical wiring will be run overhead (or in occasional circumstances an in-floor cable trough). (However, if you already have this situation in a walkway with minimal traffic, you can normally get by with safety covers, as shown)

Is this OK on floor behind a machine?

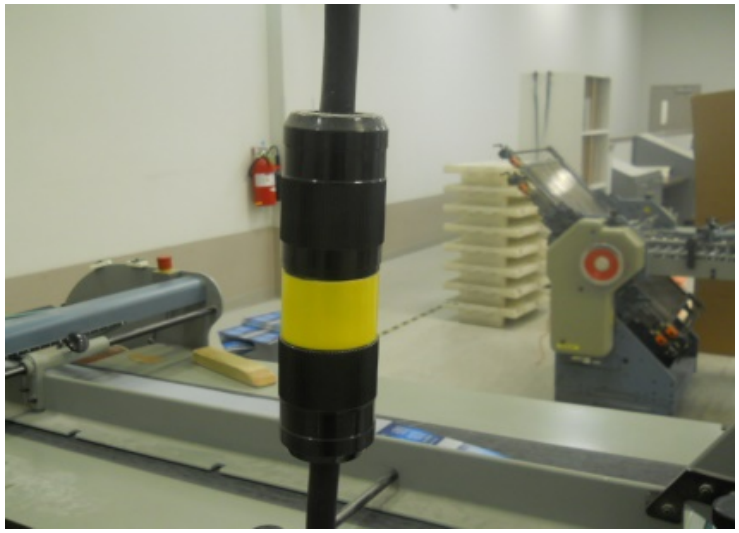




We can have cords on the floor behind a machine where the machine is within 4 ft of the wall and there is no traffic. However, if a person goes back there a couple of times a week, must make things neater to minimize trip hazards.

Using Components only for Intended Purpose

Unmounted Outlet Style

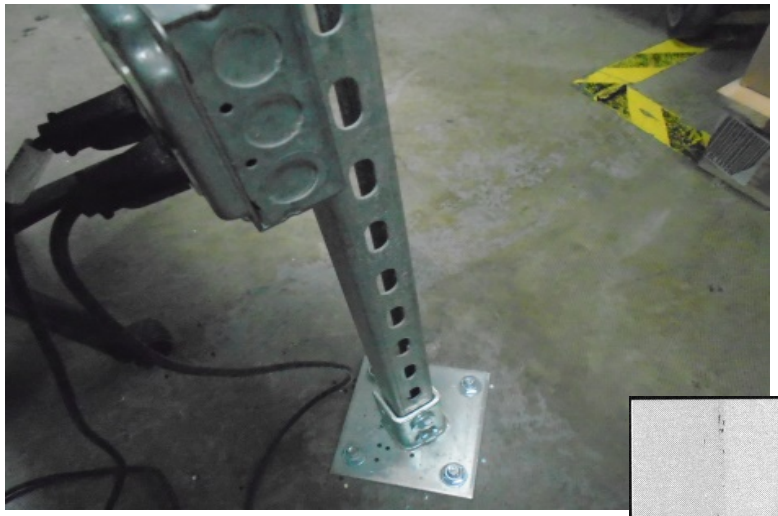


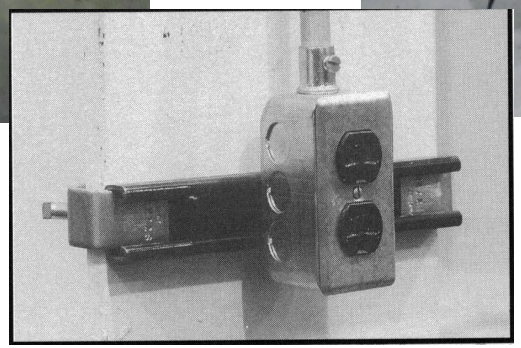
- All loose or hanging outlets attached to portable cords will be (cylinder shaped plastic) female cord caps. Note: These have strain relief built in them.

Are these OK?

- Not allowed. The UL listing for these metal outlets says they are designed to be mounted.

Mounting Metal Rectangular Outlets

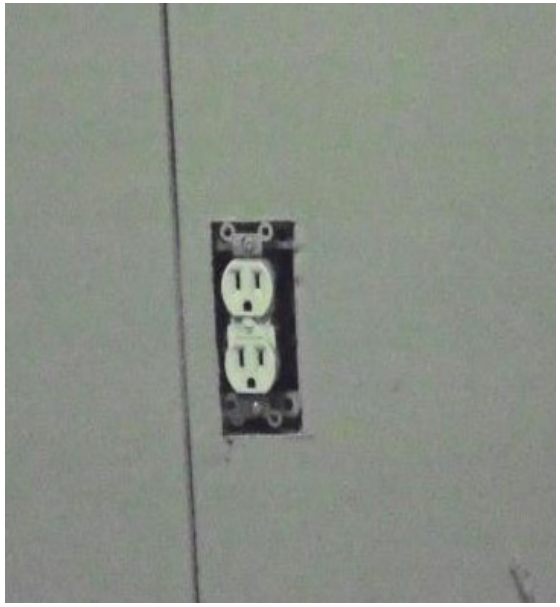




- Electrical receptacles /outlets and switches that are designed to be mounted will be <u>securely mounted.</u>

Preventing Exposure to Conductors

Cover Plates



Commercial Electric 1-Gang Decorator Plastic Wall Plate, White Smooth

Model# PPCW-R

★★★★★ (33)

$2.25 /bag

- Proper <u>cover plates</u> to be on switches and outlets.

Cover Plates

- Proper <u>cover plates</u> to be on switchgear, electrical panels, cable trays, etc.

Breaker Slots in Electrical Panels

Blank filler plate

- All <u>breaker slots</u> to have either circuit breakers or appropriate plastic slot covers in place.

Round Hole Openings

$24.28
Halex 1/2 in. Knock Out Seal (100-Pack)
Home Depot

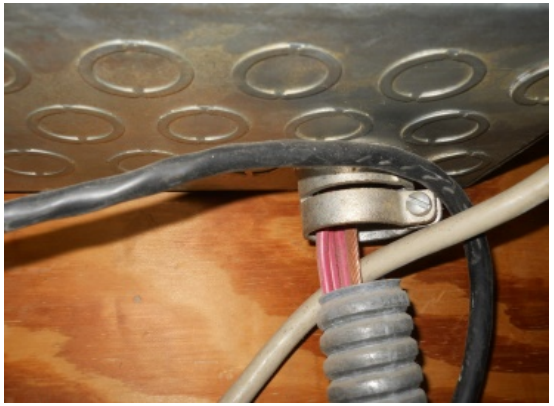
$10.99
Hoffman Steel Conduit Hole Seal,...
Grainger Industrial S...

- All knocked-out hole openings in electrical enclosures (such as round hole openings) must have proper covers (such as basic KO cover or Hoffman plug).

Containing Wiring Runs

- Insulated conductors <u>(wire) to be contained in appropriate wire way</u> (such as conduit, square wiring trough, or other wiring enclosure).

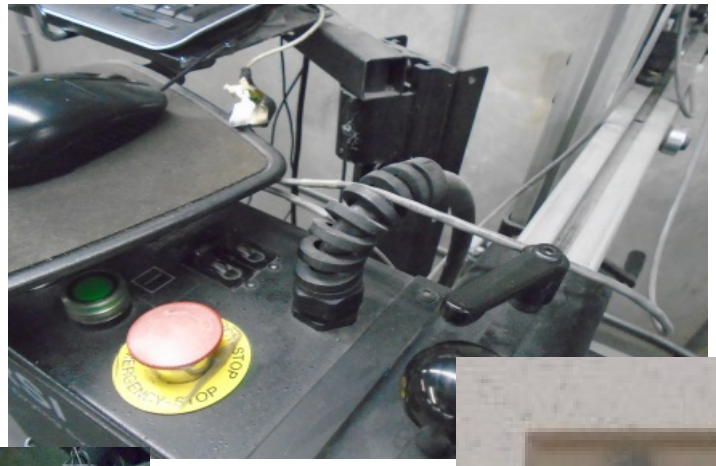
Exposed Wiring



- Wiring should not be visible when machine panel doors are closed.

Protecting Circuit Conductors

Strain Relief



- Portable cords (flexible cords such as 400V SO or 600V SJ types) will have appropriate strain relief (such as strain relief bushing with Chinese finger mesh).

Wire Protection at Transitions

Plastic EMT Insulating Bushin...
garvinindustries.com

Bushing - Electrical - The Home De..

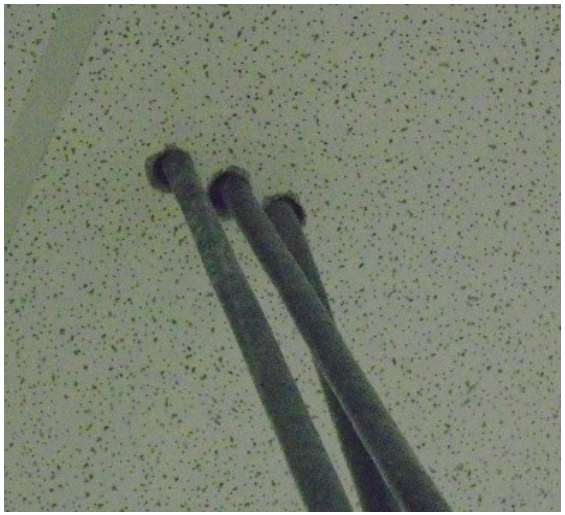
Plastic Knockout Insulating Bushi.

- Electrical insulated conductors (wire) to have <u>insulated bushing at the transition</u> into/out of enclosures & conduit.

Run it through the wall?

- Portable cords will <u>not be run through walls or doors</u>.

Suspended Ceilings



✓

- In general, <u>portable cords cannot not be run through ceiling tile in drop ceilings</u>.

Suspended Ceilings

Power Pole

- A possible exception might be where there is <u>transition hardware, that attaches to proper support from above</u> (such as all thread rods), if the design can be proven to meet code.

Suspended Ceilings






- A possible exception might be where there is <u>transition hardware underneath, that attaches to proper support from above</u> (such as all thread rods), if the design can be proven to meet code.

Ability to Lockout/Tagout Locally

Ability to Lockout/Tagout Machine

- <u>Have a fixture to lockout/tagout each machine locally (near the machine)</u>. This may be a lockable switch built into the machine, electrical disconnect mounted to the machine or wall nearby, or an electrical plug.

Ability to Lockout/Tagout Machine

- Have a fixture to lockout/tagout each machine locally (near the machine). This may be a lockable switch built into the machine, electrical disconnect mounted to the machine or wall nearby, or an electrical plug.

Ability to Lockout/Tagout Machine

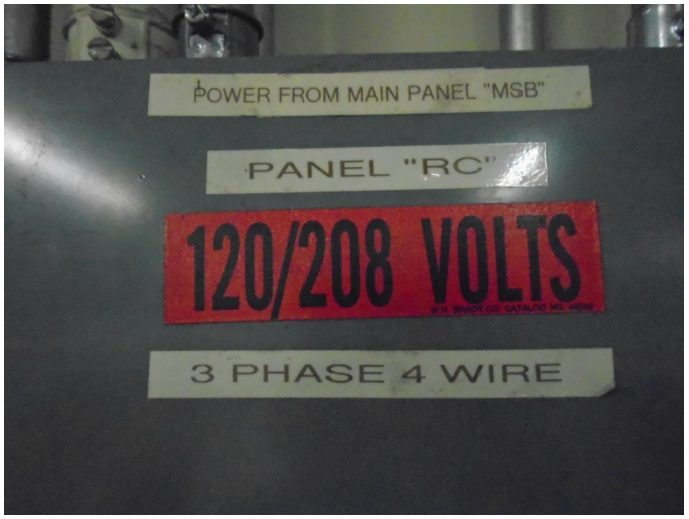
- We prefer to have lockable switches that do not require “gizmos” for lockout/tagout.

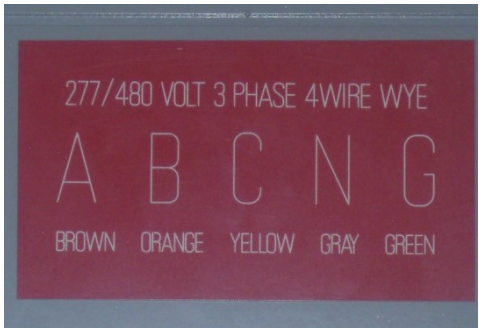
Ability to Lockout/Tagout Machine

- Local electrical disconnect for use in lockout/tagout by operators to be mounted in a place that is accessible from the floor or machine deck (without use of a ladder or stepstool).

Labeling Electrical

Labeling Power Panel ID

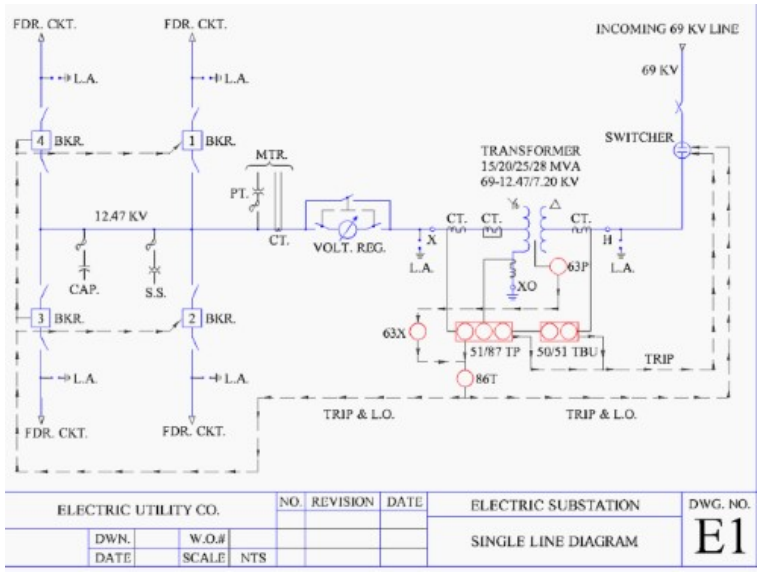




- Switchgear enclosures and electrical panel fronts with doors to have identification labeling (usually code number, such as E05).

Facility Electrical Diagram

Usually Original Facility blueprint

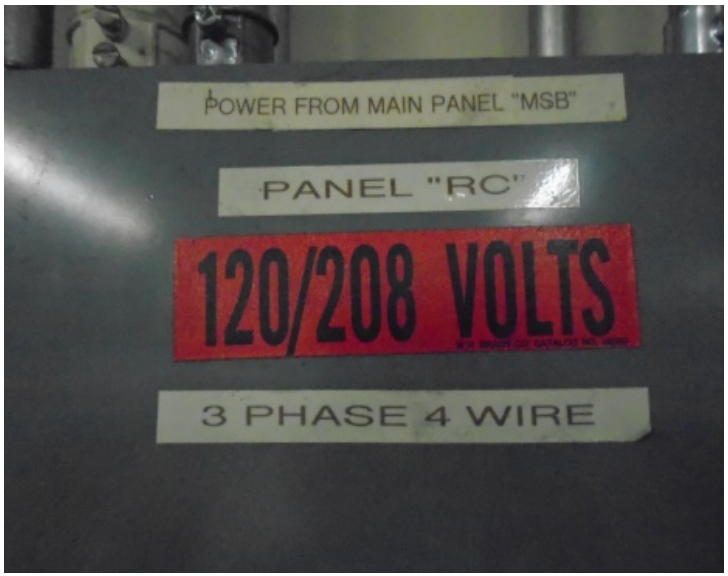


- The facility should keep a <u>layout diagram showing all power panels with IDs</u>. Should have a layers showing main wiring runs. Shows location of power to building.

Labeling Wall Disconnects

- A mounted electrical disconnect that is not near the machine it feeds will have <u>labeling identifying the machine or system it powers</u> (such as Machine XYZ, fed by upstream breaker 22,24,26 in panel H11) .

Labeling Voltage

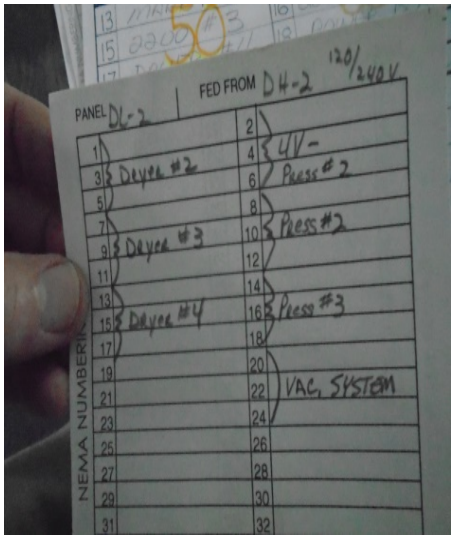


- Switchgear enclosures and electrical panel fronts with doors to have labeling <u>describing voltage, phase and amperage</u>.

Where is it fed from?

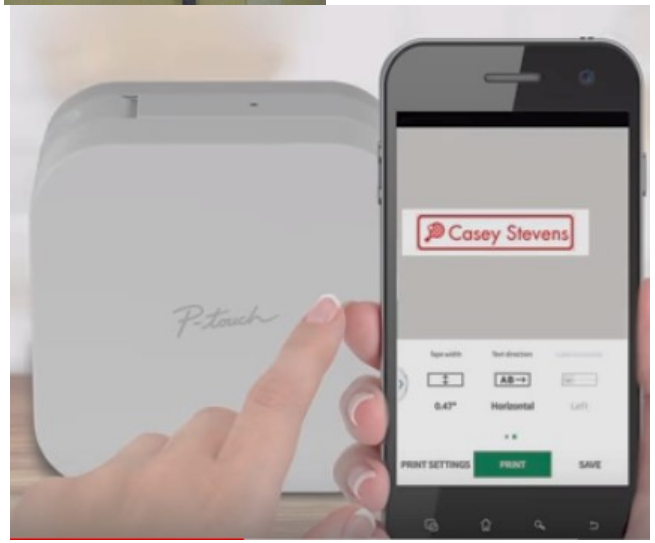
- Electrical disconnects, machine power mains, and receptacles / outlets for plugs to have labeling identifying the name of the upstream breaker panel or disconnect.

Electrical Panels with Doors



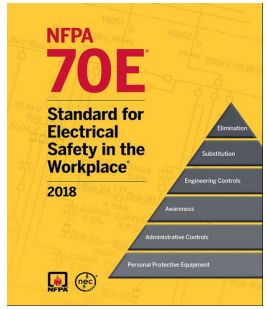
- Each electrical panel with doors will have a <u>panel schedule card in a clear sleeve mounted on the inside of the door</u>. The schedule to be updated and accurate. The schedule to be legible and show breaker position numbers with respective name of equipment the breaker goes to).

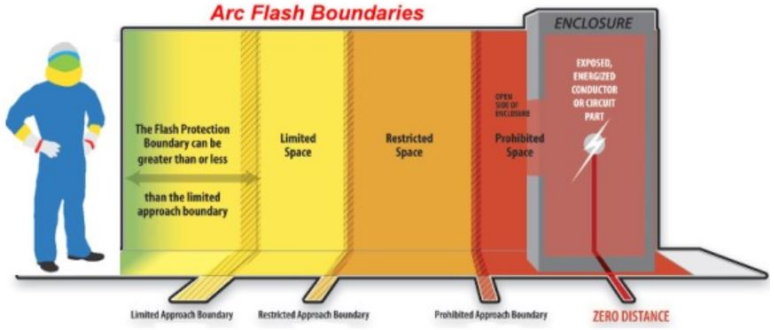
Marker vs Plastic Labeling



- Don't put magic marker IDs next to individual breakers (on open switchgear panels or panels with doors). <u>When individual breakers are labeled, use plastic labels</u> (since they can be removed when the slot is repositioned in the future).

Arc flash study



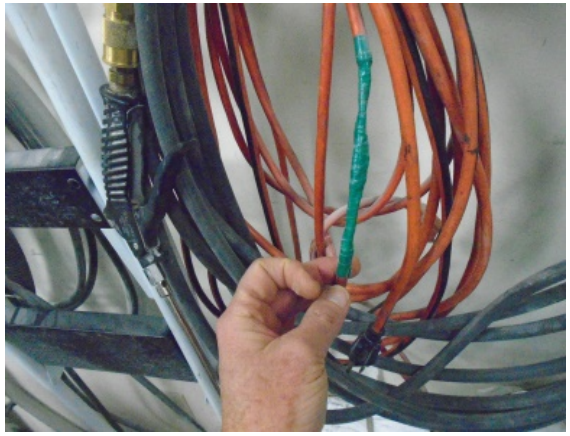


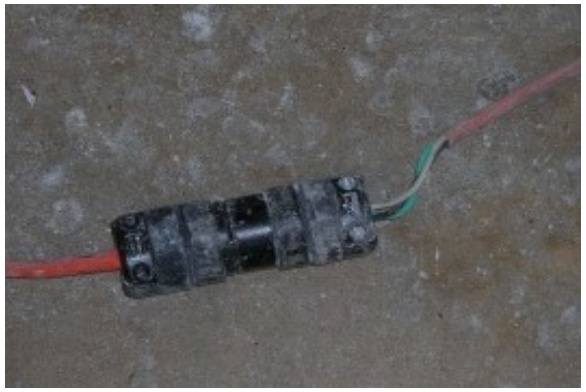
- For working in a cabinet/component that is not fully locked out, must have a reason, and must perform an arch flash assessment. Determine <u>arch flash boundary distance and electrical worker's PPE level.</u>

Part 2:

What the Plant needs to get right

Damaged Cords



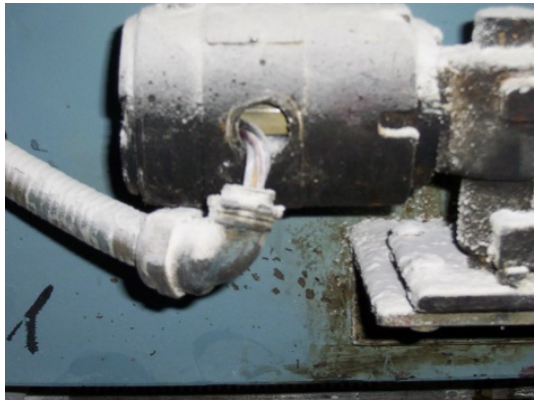


- Dispose of or repair <u>damaged extension cords</u> (no splices allowed).

Ground Prongs

- Replace any plugs with broken ground prongs. Repair any loose grounding cables.

Exposed Wiring Stress

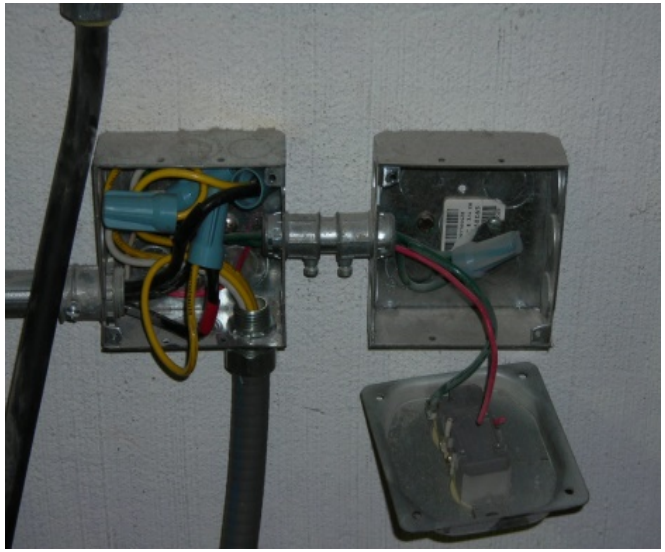


- Repair <u>wiring that gets exposed</u> (or shorted) from stress, strain, movement of machines…

Broken switches and safety interlocks

- Replace broken switches.
- Repair or replace broken or bypassed safety interlocks, and stop-safe buttons.

Cover Plates

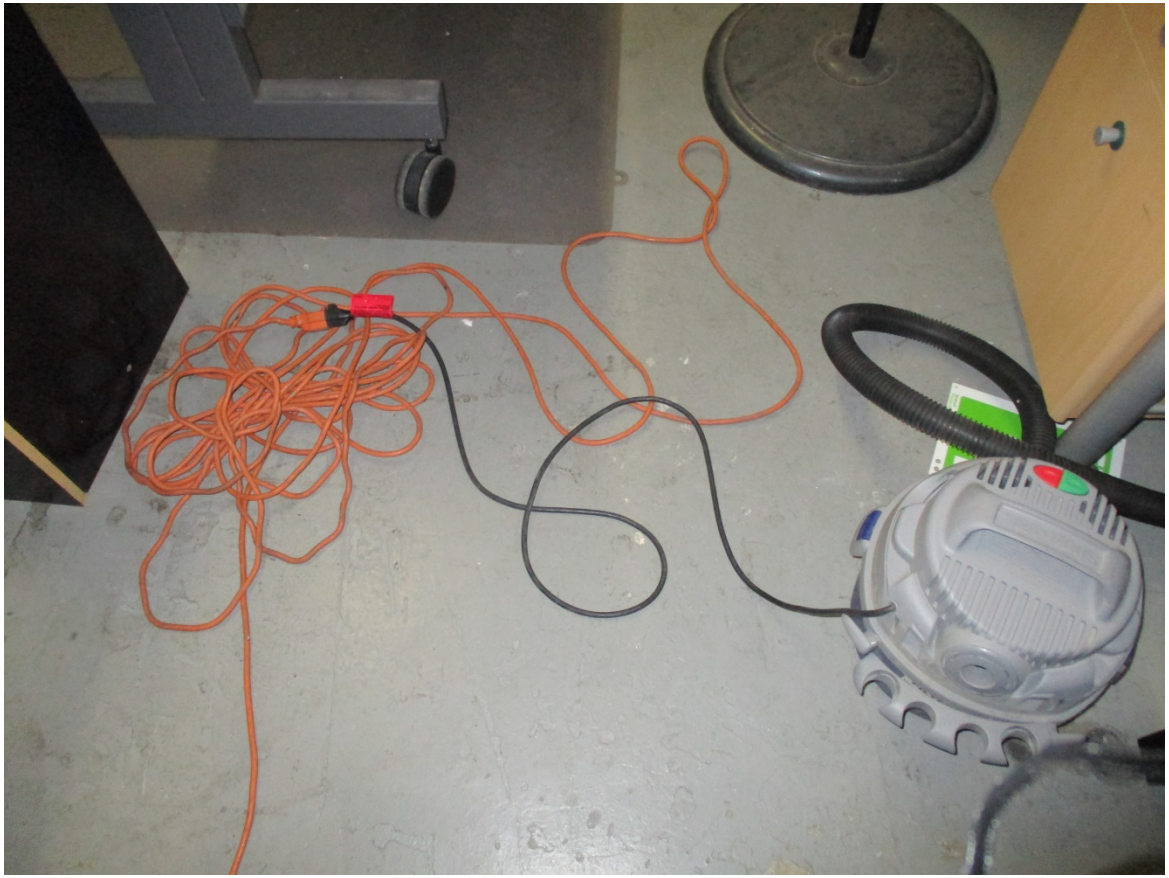


- Replace missing and damaged <u>cover plates</u>.

Daily: Clearance

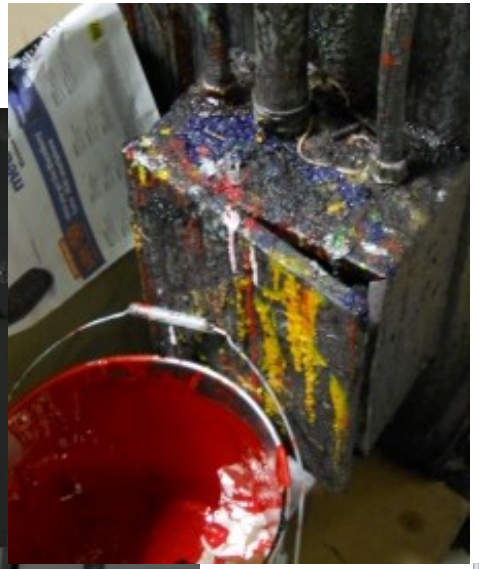
- Maintain electrical <u>clearance</u>
  (3 ft on front, 1 ft on sides)

Daily: Unused extension cords



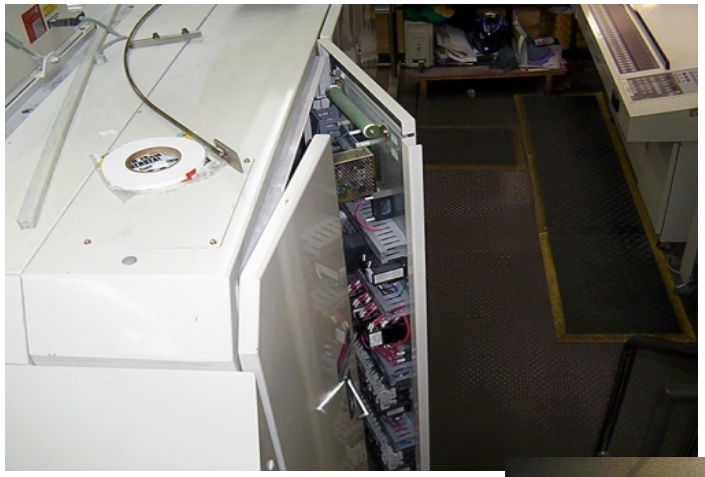
- Keep <u>extension cords off the floor when not in use.</u>

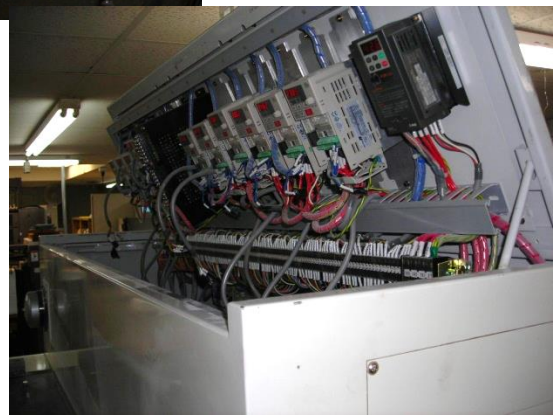
Daily: Panel doors and plates

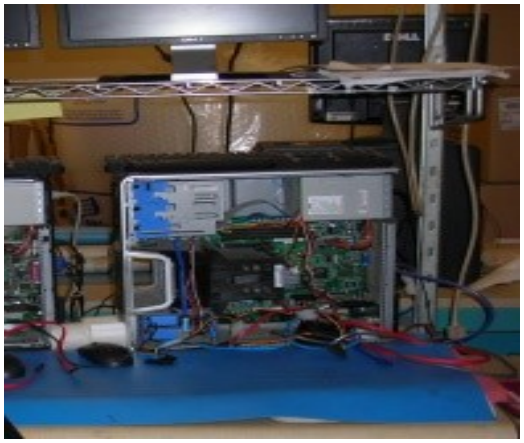


- Keep electrical panel doors closed.
- Keep panel cover frames attached properly.

Daily: Electrical doors on machines

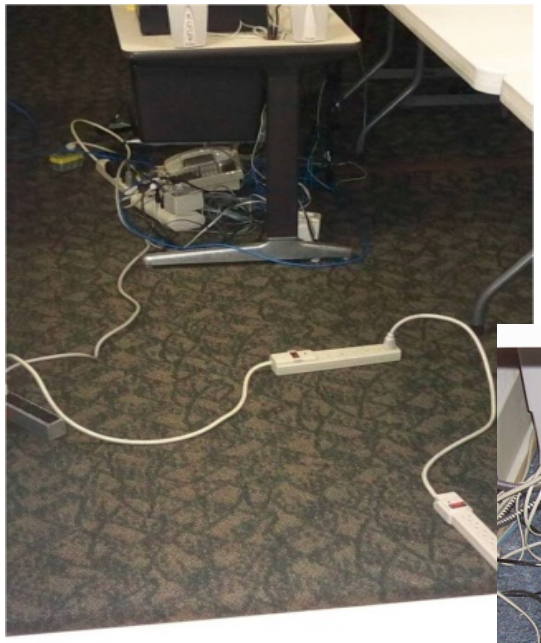


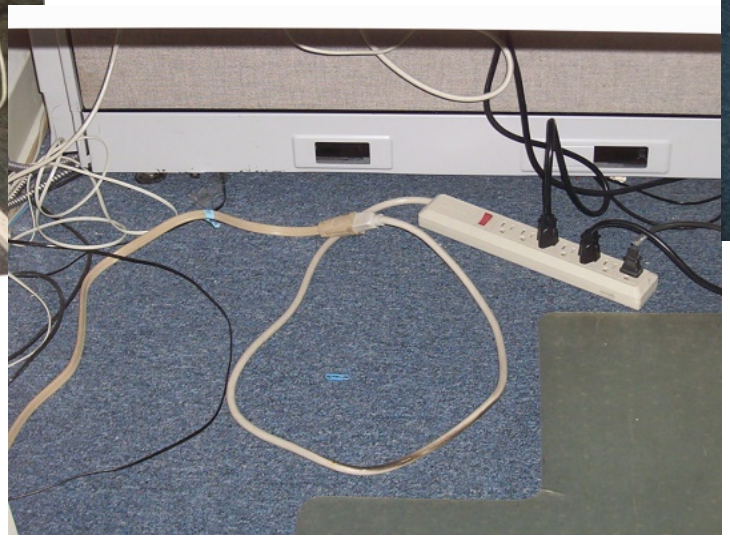


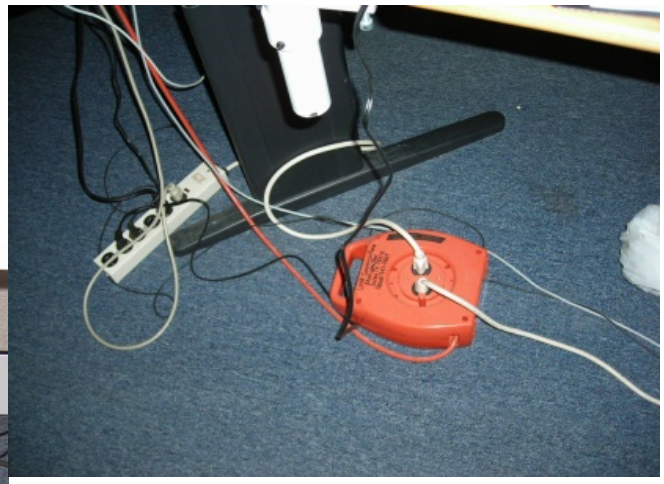


- Keep <u>electrical doors on machines closed</u>. If there is an over-heating problem….

Daily: Double-Jacking

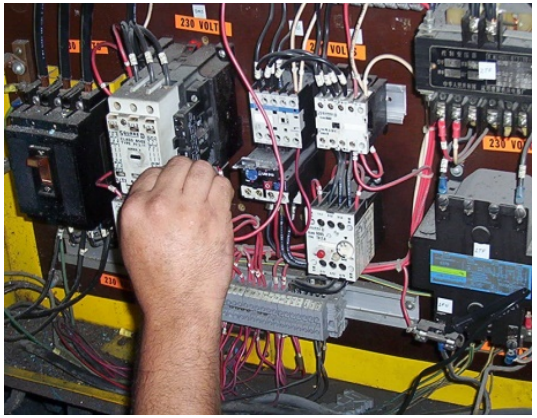






- Don’t <u>double-jack</u> extension cords and/or outlet strips.

Daily: Who's doing electrical work?



- Don't let people with no knowledge of electrical requirements perform repairs.
- Document authorized person's experience and scope of work allowed.

Absence of management observation

- You need to stop and lockout that machine now.
- Is our lockout procedure book current?

- <u>Pay attention to electrical safety in the plant, ask questions, take corrective action</u>.

Don’t allow unmanaged in-experienced folk do electrical work…

Don't get 'Zapped' by OSHA for Electrical Violations

Questions?

On-line now:
Teresa Campbell – PIA Midamerica
Joe Eudy –Impact Safety
Bert Summers – Summers Electric

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