



Electrical Safety for Electricians

Daniel Friedman

InspectApedia.com

danjoefriedman@gmail.com

Dallas TX – 25 March 2010

For a related fulltext article see

https://inspectapedia.com/electric/Electrical_Inspector_Safety.php

Deaths/Injuries



- Death from fall – impact on Standards
- Experience can lead to carelessness

Other reports: falls, attic stair collapses, crawl space inspector shocks, client shocks, one murder attempt

How much electrical energy would it take to kill an Electrician?

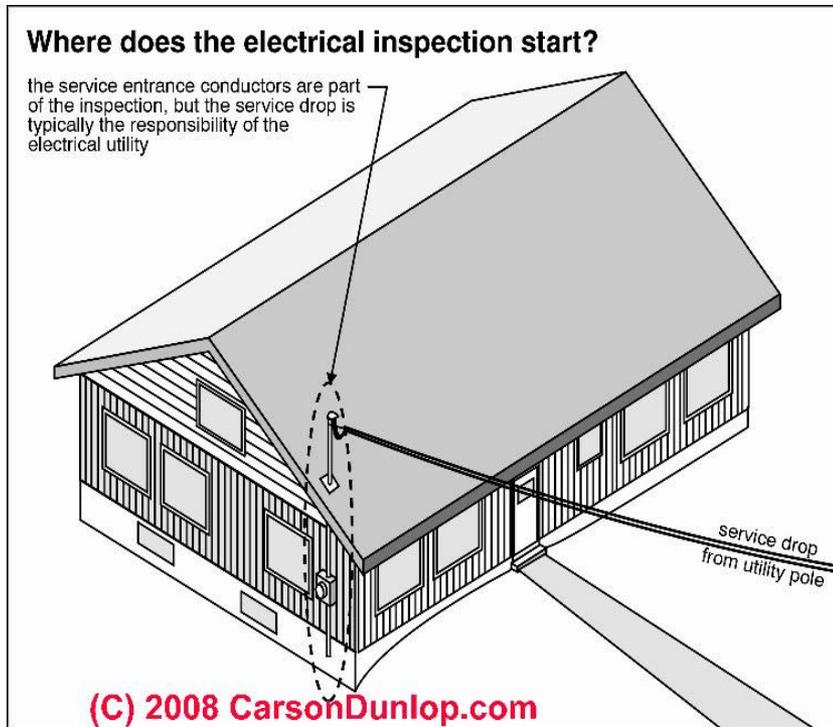
- Wet skin (sweaty or standing in water) – 1000 ohms resistance
- At 100 Volts – 0.1 to 0.3 Amps
- Potentially fatal ventricular fibrillation

Standards Require Dangerous Activities

Such as opening the electrical panel



“Observe”



- **Electrical Inspection Starts Outside**

- **Observe the amperage & voltage ratings of the service**

Abandoned SEC's

- Observe does not mean *touch*
- Don't assume old wires are “dead”
- Anecdote:





Panel inspection for water & rust begins outside

[Inspectapedia.com/electric/ElectricMeters.htm](https://www.inspectapedia.com/electric/ElectricMeters.htm) – how to inspect meters



- **Don't assume the local grounding electrode is real – kick it**
- **Don't assume the utility company ground is working**
- **Don't assume the water pipes form a ground**
- **Don't assume visible connections are good**

inspect-ny.com/electric/Electrical_Ground_Inspection.htm – how-to

inspect-ny.com/electric/Electrical_Ground_Lost.htm - case study

Opening the Electrical Panel is Dangerous

Atlanta GA: a licensed electrician was opening the panel for inspection.

When the cover was removed the spring-loaded bus assembly moved, an arc caused an electrical explosion, killing the inspector.

Statistically you are more likely to fall down the stairs or off of a roof (and live).

Removing the Panel Cover

- **Distance:** Warn clients to keep back
- **Assistance:** Only you touch the panel
- **Blocking:** Stand so as to block your client
- **Touching:** Do not permit client to touch
- **Grounding:** Check visually (& electrically ?)

My client asked, "What's this?" as he reached over my shoulder & stuck his finger straight into an open fuse socket

Before Opening the Panel

- Look for wet floors or other water
- Look for burning, arcing, other damage
- Look for sheet metal screws in the cover
- Look for rust, water tracking on the panel
- Look for an escape path – can you step back?



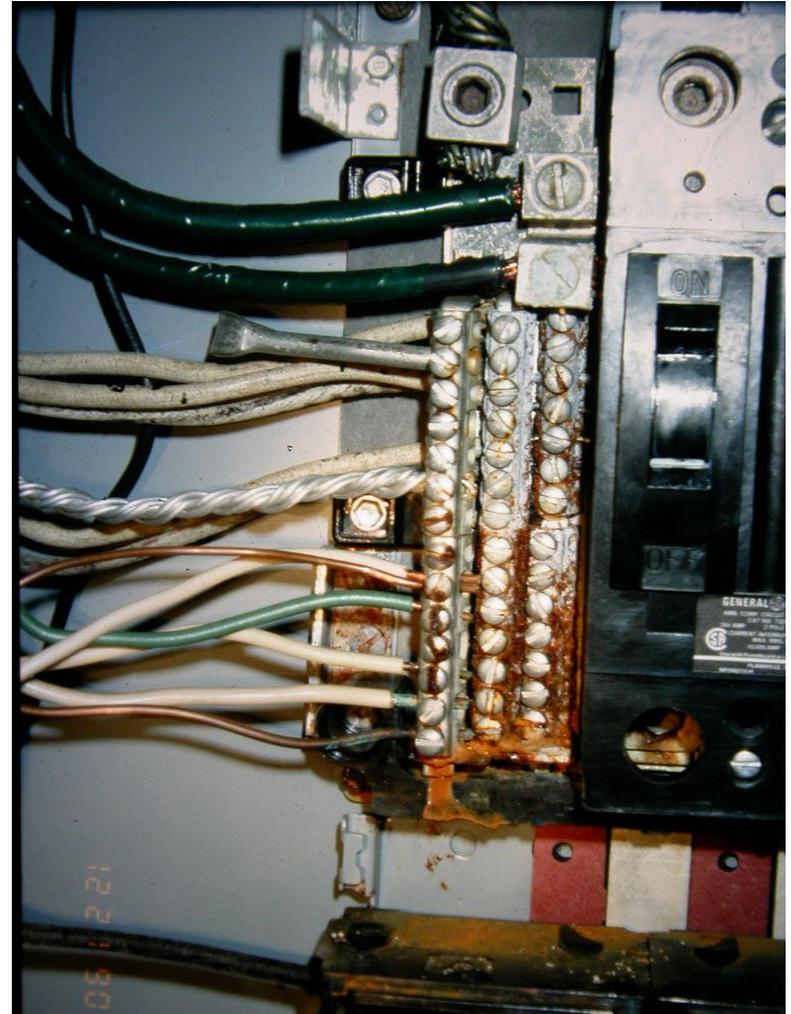
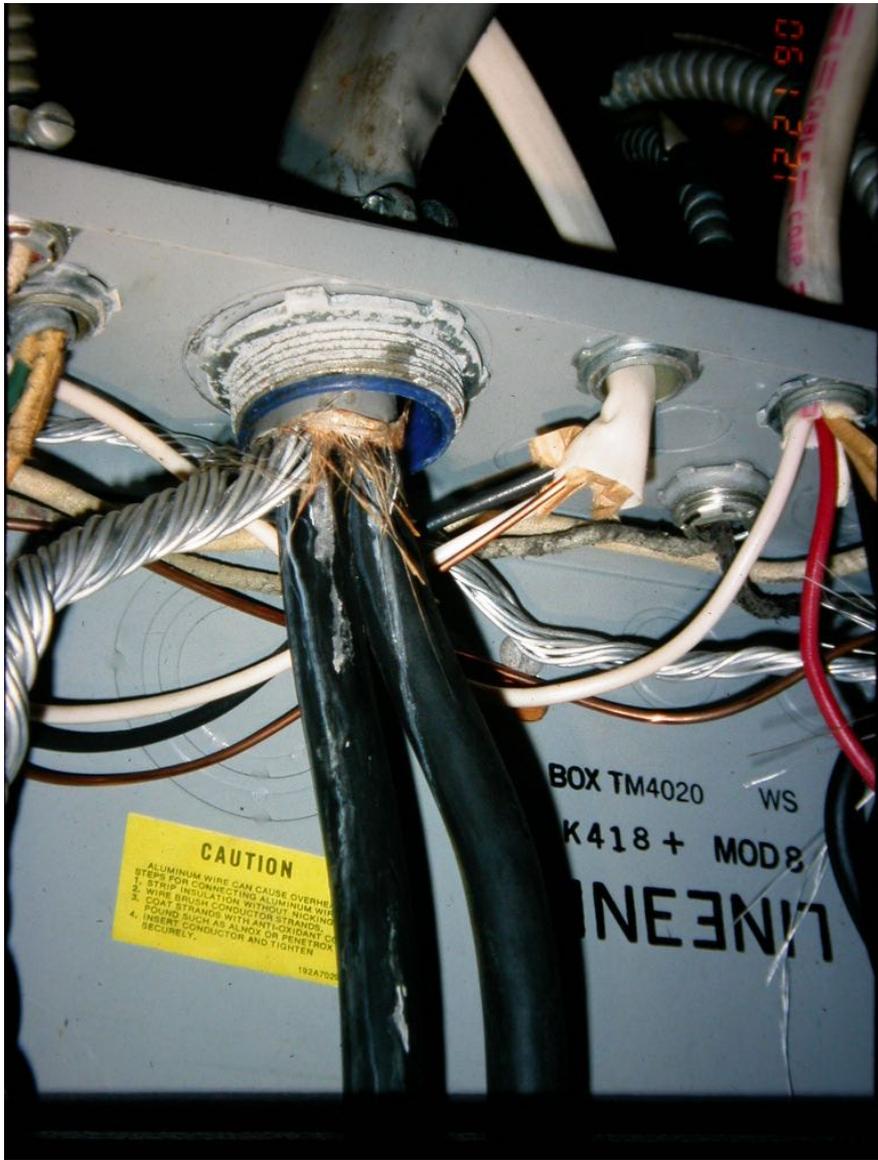
External signs of
internal rust and
water hazards

Notice the water
pipe?

External clues of internal hazards



Water damage inside the electrical panel



Electrical Screws & Screwing Around



SMS pierced
Power feed

Panel Cover Screw Arc Flashover



(C) 2008 InspectAPedia.com

Plastic pen may be a safer pointer



(C) 2008 InspectAPedia.com

Observe branch circuit conductors, overcurrent devices, compatibility of ampacities, voltages

(FPE, Zinsco, Aluminum Wiring, Amateur Workmanship)



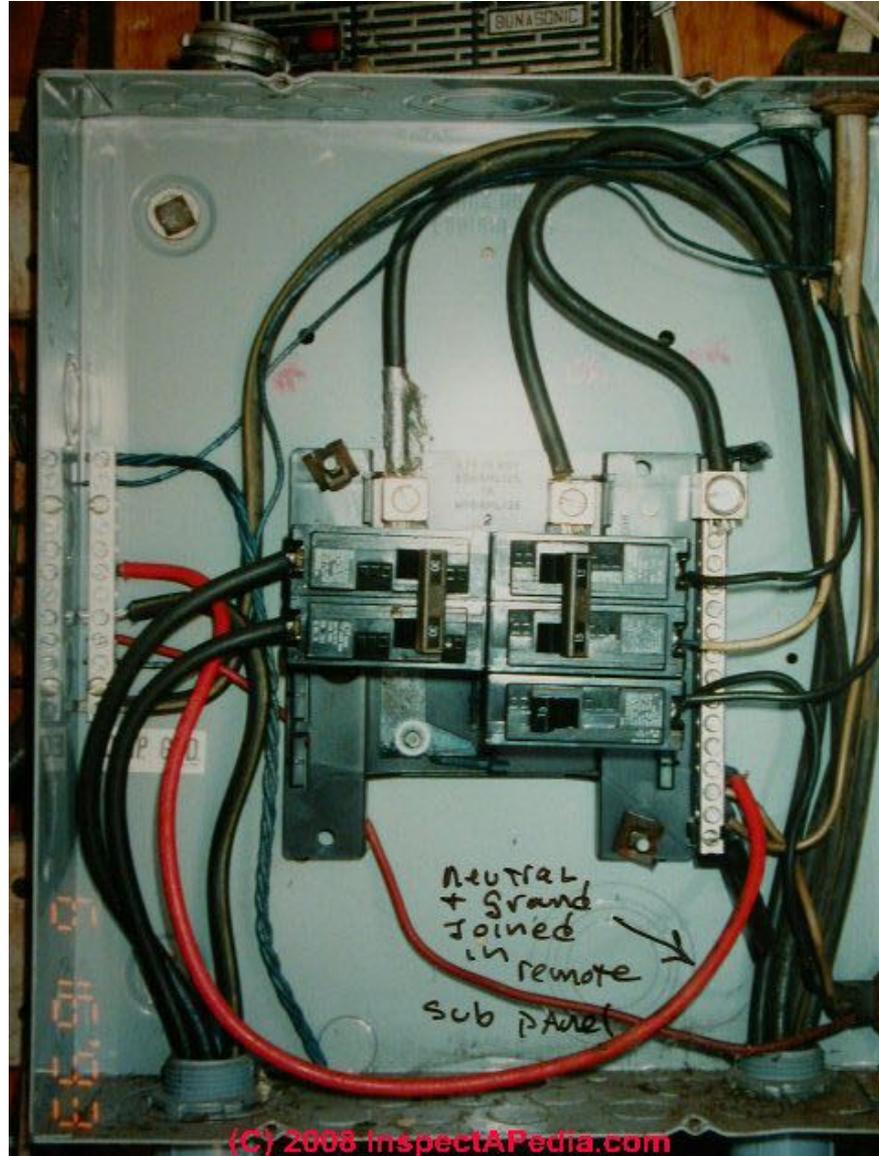
...

I continued to put my arm behind my back and close the breaker with my left hand with my head turned to the left. BAM, a light as bright as the sun and an explosion.

*This knocked us down and blinded us. We were rushed to the hospital. I spent the night in the ER with an ICU nurse and was off of work for 3 weeks and have had to have a stronger prescription. **These FPE panels are all over the building***

InspectAPedia.com/fpe/fpepanel.htm

Binding Steel Screw in AL Bus



Electrical Panel Accessibility



Remain calm,
watch *what*
you say –

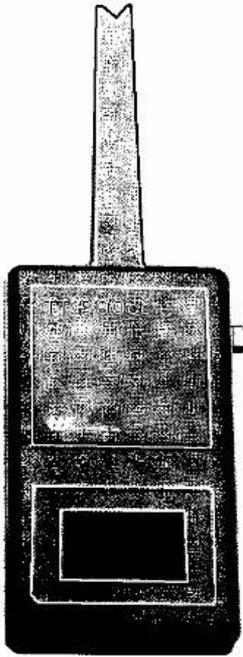
A mumbled
Rats Nest
comment
led to fleeing
client

Touching Electrical Equipment During an Inspection

- **Never touch metal plumbing or gas system pipes**
- **Never touch electrical equipment while standing on a damp or wet surface**
- **Al Alk was a Knuckle Licker**
- **Homeowner was a Knuckle Licker**
- **YOU are the professional: use visual inspection + instruments**

Using Test Equipment

- Tic Tracer, neon tester, outlet tester, VOM, DMM



How to use a DMM

- Set the VOM/DMM in the highest AC-voltage range to start
- One probe is used to contact the surface of the electric panel (or any component to be examined)
- The other probe is touched to a reliable ground source, or in the example shown, to the neutral side of the circuit.
- More than 1 or 2 volts between a service panel cover and ground = a safety problem

inspect-ny.com/electric/ElecSafetyDMMs.htm

Pulling Fuse Blocks

- I Pulled the main fuse block: the pullout block disintegrated in my hand
- Leaving one fuse in place & one half out of the panel
- **"What did you just do to the panel?"** asked the client
- **"I destroyed it."**



Shut Down Unsafe Equipment?

- **You are responsible** whether you touch or not
 - Liable for *failing* to act, detect, warn
 - “Not inspected” disclaimers are inadequate
 - Report why, the hazard, what to do
- **Last Person In rule:** you were there, you are responsible
- **What to tell the Judge** – no heat, frozen pipes, vs. dead people

Whom do you Notify of Dangers?

- Client – all findings
- Owners/Occupants – immediate major safety hazards
- Anecdote: hot AL heating circuit; notified, owner scoffed, house burned down
- Professionals have a duty that extends beyond the client when immediate major hazards are observed
- Orally and in writing

Observe Branch Circuit Conductors

- Aluminum wiring
- Damaged, not supported, rusty BX, overheated, etc.
- Knob and Tube?

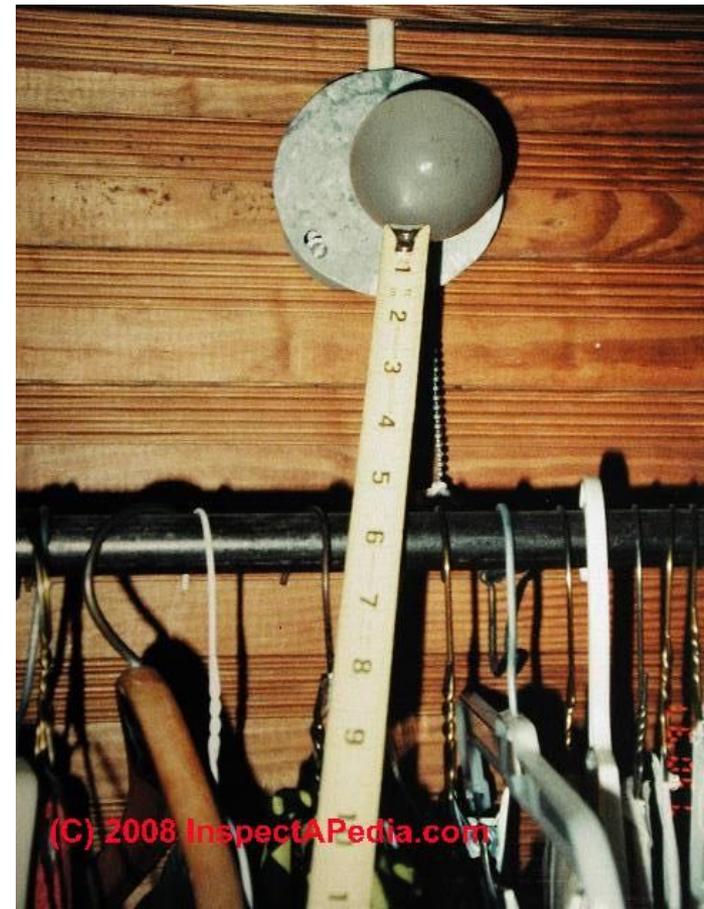


InspectAPedia.com/aluminum/aluminum.htm

InspectAPedia.com/electric/Knob_and_Tube_Wiring.htm

Observe Operate # of Lights, Switches, Receptacles in House, Garage, Exterior

- Look before touching
- Missing, broken covers
- Metal cover plates?
- Do we turn ON circuits that are SHUT OFF?
- Do we turn OFF Circuits?



Testing GFCIs

- Observe polarity & grounding
- Test GFCIs
 - Internal test
 - External test
 - On Knob & Tube?
- Test AFCIs
 - Internal test ONLY



Examples of Unsafe Crawl Space Conditions

- Standing water or wet surfaces
- Exposed wires, connections
- Chemical odors
- Rodents, snakes, insects, other pests
- Inaccessibility (confined space rules)
- Fiberglass insulation = high risk of mold contamination in damp or wet areas
- Unsafe structure – collapse risk

Crawlspace Suggestions

- Do not work alone
- Carry a second flashlight
- Wear a respirator, coveralls, gloves, knee pads, shoe-covers as needed
- Carry a cell phone
- Use a camera and/or recorder to document conditions rather than notepad

Safety Suggestions

- **Pay attention, look carefully, move slowly - Do not assume anything**
- **Do not assume that electrical power is "off"**
- **Do not assume that system grounding is complete**
- **Do not assume that all circuit breakers work**
- **Do not assume that bystanders or clients won't move suddenly**
- **Do not touch live wires or connections**
- **Eye protection:** electrical panels can explode upon opening.
- **Insulating gloves:** panels can become hot as a screw falls when cover is removed.
- **Look before touching:** Don't approach the panel until you give an overall look of the surrounding area to see if anything looks wrong--such as water on the floor under the panel.
- **Avoid Shock Pathways:** Don't have any part of your body touching adjacent items
- **Insulating floor pad:** On a concrete or dirt floor, & rubber soled shoes
- **Insulating tools:** Use insulated handle tools
- **Panel Door & Screws:** Once door is open, set door aside and don't lose the screws





Aluminum Wire Repair, Inc© 2004

