

Homeowner Electrical Safety

Fuses, Circuit breakers, GFCI, AFCI, Ting, Whole House Surge Suppressors, EV chargers, Smoke/CO Detectors, Water Detectors

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Topics

- Disclaimer
- Fuses
- Circuit breakers
 - Failure modes
 - Federal Pacific circuit breakers
 - Ground Fault Circuit Interrupter (GFCI)
 - Arc Fault Circuit Interrupter (AFCI)
- Ting
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- Smoke/CO detectors
- Water detectors
- Q and A

Disclaimer



COLORADO

Department of
Regulatory Agencies

- In Colorado, Electricians are licensed by the Department of Regulatory Agencies (DORA)
- To verify if someone is licensed, visit <https://dpo.colorado.gov/Electrical>
- I am not a licensed electrician
- Hobbyist since 1960
- Please confirm any information I provide with a licensed professional before proceeding with any project

Fuses

- A device that disconnects a circuit when a certain current level is reached or exceeded
- They were once used to protect homes
 - May still be found in older homes
- Now we see them in electronic devices, vehicles, furnace equipment, A/C compressors
- Often a small diameter wire of a special alloy designed to melt when the critical current is reached or exceeded
- Single use
- Their purpose is to protect the equipment, NOT YOU

Circuit breakers

- A device that automatically switches off when a certain current level is reached or exceeded
- Found in all homes in Stoney Brook
- Can be reset after tripping
 - Overcomes the single-use problem of fuses
- Again, its purpose is to protect the house, NOT YOU
 - A typical size circuit breaker is 15 amperes (the measure of electrical current). This is about 100 times more than the normal lethal current.

Unsafe (uninsurable?) circuit breakers

- Federal Pacific Electric (FPE): Commonly found with "Stab-Lok" breakers, known for high failure rates (up to 25%) and notorious for failing to trip when overloaded, leading to insurer blacklisting.
- Zinsco/GTE-Sylvania: Known for **bus bars** that corrode and breakers that melt, preventing them from shutting off power. These often feature bright red, blue, or yellow colored breakers.
- Challenger: Often labeled as Challenger, GTE-Sylvania, or Zinsco, these are flagged for overheating at the bus bar connection.
- Pushmatic: Older panels known for issues with breakers that fail to trip correctly

What is a bus bar?

Source: Mario Castillo Electric

Federal Pacific Circuit Breakers

- Commonly used 1950s to 1980s, Stab-Lok
- Have been known to fail catastrophically
 - The breaker does not trip when the critical current is reached
 - A serious fire hazard
 - It hasn't happened yet, but the insurance industry is leaning toward not covering homes with Federal Pacific and other similar breakers.

Federal Pacific Circuit Breakers

- Some were present at Stoney Brook
 - Many have been replaced
 - Do we have any left?
- FAQs
 - Can't I wait until I experience any problems?
 - Because of the way they can fail, this is extremely risky.
 - Can't I just replace the breakers?
 - Not always feasible. Breaker boxes are designed for a specific type of breaker.

Failure modes

- All kinds of products fail in service every day.
- There are several types of failures
 - Safe failure
 - The device did exactly what it was supposed to do.
 - Example: An airbag deploys when a car crashes.
 - Nuisance failure
 - The device deploys, but there was no fault.
 - Example: a smoke detector alarms for no obvious reason
 - Catastrophic failure
 - The device should have deployed, but didn't
 - Example: A 15-ampere circuit breaker does not trip when it should



Indiana State Fair Grandstand, August 13, 2011



Indiana State Fair Grandstand, August 13, 2011



Seven people died
in this accident, 58
were injured.

Ground Fault Circuit Interrupter (GFCI)

- A circuit breaker, receptacle, or extension cord that can detect a tiny current flowing to the ground (likely during a shock) and quickly disconnects the circuit.
- GFCIs are now required in kitchens, bathrooms, garages, basements, outdoor receptacles and any place where electrical devices can come in contact with water.
 - Do you have a wet bar?
- The GFCI protects the user from potentially dangerous electrical shocks.
 - Finally, a device that protects the user!

Arc Fault Circuit Interrupter (AFCI)

- A newer safety device
- Interrupts the circuit when there is an arc
 - A current jumping through the air
- Often happens due to worn or damaged wiring in the wall or lamp cord
- Extreme fire hazard
- Required in nearly all living areas in new construction
- Can often be easily retrofitted by just changing a breaker
- Not all electricians are embracing this technology
 - Early versions were not so reliable
 - Electricians don't like call backs

Ting

- A plug-in device that detects arc faults in the entire house
- Externally monitored
- You will be notified if there is a fault, and an electrician will be dispatched to repair it
- www.tingfire.com
- Free for the asking if you have State Farm homeowner's insurance
 - I think State Farm figured it was better to buy many of these devices compared to paying a house fire claim
 - <https://www.tingfire.com/free-through-insurance/>
- Available from [Amazon](#) for \$99

Whole House Surge Suppressor

- Placed in the breaker box, occupies two spaces
- Protects the entire house from power surges and lightning strikes
- Usually comes with a guarantee
- Not foolproof but excellent protection
- Important as we add more electronic devices in our homes
- Cheap insurance, \$71.36 @ Home Depot, 3-year, \$10,000 warranty



Photo source: Home Depot

EV Chargers

EV Chargers			
Level	Voltage	Range Increase	Comments
1	120 V	Adds 3 to 5 miles of range per hour of charge	Good for overnight charging, plugin hybrids and low mileage drivers
2	240 V	Adds 25 to 45 miles of range per hour of charge	Good for daily drivers, long commuters, multiple EV's
3	240 V	Not for home use	

Depending on how they are set up, a Level 1 charger may draw up to 16 Amperes. Consequently, a **dedicated** 20 Ampere circuit may be prudent.

Level 2 EV Chargers

Don't use this one. They can become very hot. Possibly ignite.



Leviton 30 Ampere
NEMA 14-30
\$10.98 @ Home Depot

Use one of these



Leviton 50 Ampere
NEMA 14-50R
\$39.98 @ Home Depot



Hubbell 9450R
Commercial grade
\$99.00

Electrical Red Flags

- Too many extension cords
- Dimming or flickering lights
- Funny odors
- Sparking
- Hot outlets or switch plates
- Frequently tripped breakers or blown fuses
- Buzzing
- No GFCI protection: kitchen, bathroom, garage, basement, wet bar, outdoor
- Have these conditions checked and addressed by a professional ASAP

Source: Underwriters Laboratory (UL)

When an Electrician visits your home

- Have him or her check all your GFCI and AFCI circuits for proper operation. If you don't have GFCI protection in the key locations, add it: kitchen, outside, bathroom, garage, and basement.
- If you don't have one already, have them install a whole-house surge suppressor. If you have one, have it checked for proper operation.
- Have them tighten all the electrical connections inside your circuit breaker box. This helps prevent flickering lights and arcing
- Have them identify and correct any other potentially dangerous situations.

Smoke and CO Detectors

- Smoke detectors are meant to give an early warning, since many fires smolder before fully igniting. This time can save your life!
 - There are two detection methods
 - Ionization
 - Photoelectric
 - Since not all smoke is the same, it is wise to use at least one of each type of detector
 - Detectors are designed to work for 10 years
- CO means carbon monoxide, found in auto exhaust and combustion products
 - Combination CO and smoke detectors are available
 - CO detectors seem to have a shorter lifetime, about 5 years

Locations

- At least one on every level of the home
- *New* → Inside every bedroom, especially if people sleep with the door partially or fully closed

Locations

RECOMMENDED PLACEMENT:



Smoke Alarm
One on every level and
in every bedroom



Carbon Monoxide Alarm
One on every level and
in every bedroom



Fire Extinguisher
One on every level, plus
kitchen and garage



IMPORTANT!

Specific requirements for smoke alarm installation vary from state to state and from region to region. Check with your local Fire Department for current requirements in your area. **It is recommended AC or AC/DC units be interconnected for added protection.**

Photo source: First Alert

Two helpful hints

- Print out the beep and chirp information for your smoke detectors and keep it near where you sleep. You'll be thankful one morning at 3 AM.

First Alert	
SMICO100-AC	
# of Beeps	Fault/Alarm
3	Smoke
4	CO
# of Chirps	
1	Low Battery
3	Malfunction
5	End of Life

- Don't change all your detectors at once, unless absolutely necessary. You run the risk of having them all fail at roughly the same time. Spread out the replacement over time, if possible.

Water Leak Detectors

- Placed under the sink, toilet, water heater to sound an alarm when there is a leak or freezing conditions
- Usually connected via home network
- Fancier models can turn off main water valve

[Kidde Water Leak Video](#)

Conclusions

- Electrical safety is important for the safety of your home, its occupants and neighbors.
- See what kind of circuit breakers you have
 - If you have Federal Pacific breakers, or other dangerous breakers, please consider replacing them ASAP
- Do you have GFCI breakers or receptacles where required? If you don't have them, please consider adding them ASAP.
- Please consider upgrades to your electric system any time you do a major remodel, or sooner if you experience any difficulties.

Q and A