Arc Fault Circuit Interrupters (AFCIs)

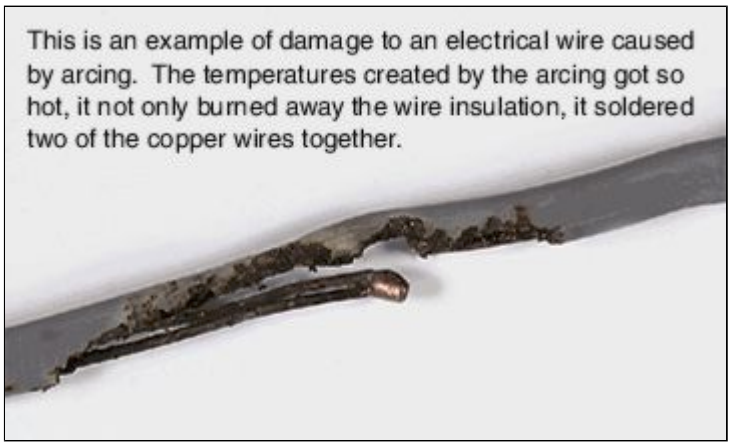
Understanding the Problem of Arc Faults and House Fires

According to the Consumer Products Safety Commission (CPSC), approximately 40,000 fires are caused annually by problems with home electrical wiring. For the last five years, electrical wiring systems have been one of the leading causes of fire deaths, claiming between 260 and 380 lives per year and costing more than $650 million annually.

In 1998, according to the latest statistics released by the CPSC, fire originating in the electrical distribution system accounted for more than 10 percent of all home fires.[1]

What is an Arc Fault?

Many times the culprit is an arc fault. An arc is a discharge of electric current across a gap. Many of us have seen an arc such as from an arc welder or sparks from a downed power line. An arc fault is an unintended arc flowing through an unintentional path.

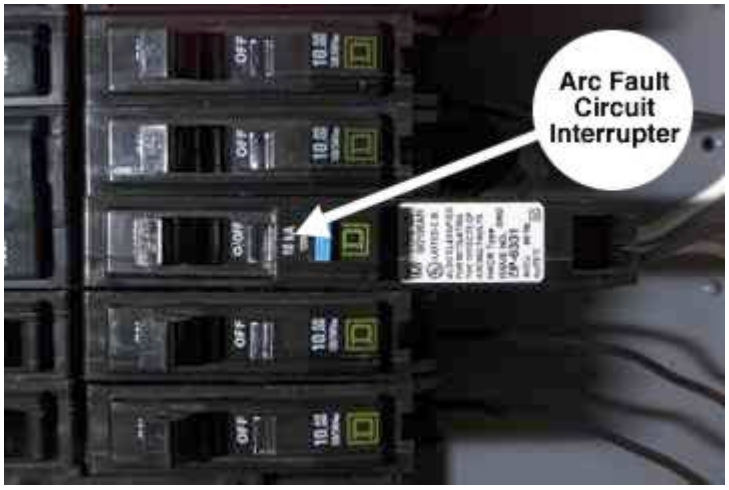


This is an example of damage to an electrical wire caused by arcing. The temperatures created by the arcing got so hot, it not only burned away the wire insulation, it soldered two of the copper wires together.

Common causes for arc faults in a house are:

- Loose or improper connections, such as electrical wires to outlets or switches
- Frayed or ruptured appliance or extension cords
- Pinched or pierced wire insulation, such as a wire inside a wall nipped by a nail or screw or a chair leg setting on an extension cord
- Cracked wire insulation stemming from age, heat, corrosion or bending stress
- Overheated wire or cords
- Damaged electrical appliances
- Wires or cords touching vibrating metal
- Electrical wire insulation chewed by rodents

When an arc fault occurs inside the walls or ceiling, or inside an electrical appliance, temperatures can exceed 10,000° F. Nearby combustibles like wood studs or insulation can be ignited by an electrical arc.



Fortunately, companies have developed arc fault circuit interrupters (AFCI) to help avoid fires caused by arc faults. They look and work just like conventional circuit breakers and fit into electrical panels in the same way. But they provide additional protection against arc faults.

Conventional circuit breakers "trip" if an overload or short circuit is detected, which shuts off the electrical power. They protect against overloads and short circuits with thermal and magnetic protection, respectively. AFCIs, however, not only protect against overloads and short circuits, they can also electronically sense arcing and "trip."

- **Code Requirements**
  This breakthrough technology, first developed by electric utility companies to deal with downed power lines, prompted the National Electrical Code (NEC) to require that AFCIs be used on home bedroom circuits by 2002. In fact, industry experts believe AFCIs will eventually be required on all home circuits. The NEC elected to require them on bedroom circuits first because a CPSC study showed many home fire deaths were related to bedroom circuits.

  However, some code jurisdictions may choose not to adopt the section of the NEC (Section 210.12) requiring the installation of AFCIs. Check with local code officials if you have questions.

- **Costs**
  Initially, the cost for AFCIs was relatively high … between $75 and $160 as compared to $10 to $20 for each conventional circuit breaker. The cost has dropped to around $40 to $50 each.

- **Assessing Your Situation**
  Many in the construction industry may not be aware of the technology or its use because AFCIs have only recently become code required. Electrical panel manufacturers can assist in getting information about AFCIs.

  It is difficult, if not impossible, to know whether your house has an arc fault problem or the potential for one. One study has suggested that nearly 80 percent of all residential electrical fires occur in homes that are more than 20 years old.[2] AFCIs may be important to use in older houses that may have aged or damaged electrical wire insulation. Newly constructed houses also may have electrical wires nicked by nails and screws that are concealed inside walls and ceilings.

  An AFCI should not be confused with a Ground Fault Circuit Interrupter (GFCI). They are completely different and serve two totally different purposes. See the article on Ground Fault Circuit Interrupters for more information.

- **How to Proceed**
  Installing AFCIs in your home requires a qualified electrician. The AFCIs snap into the electrical panels similar to conventional circuit breakers. It is typical that electrical panel manufacturers also make the circuit breakers that fit into their panels. Circuit breakers are (generally) not interchangeable in other manufacturers' electrical panels. There is one manufacturer that is developing a circuit breaker series, including AFCIs, that can be installed in any manufacturer's electrical panel.

  And at this time, most electrical panel manufacturers make AFCI circuit breakers. It is possible, however, that existing electrical panels in older homes may have to be replaced if the panel manufacturer does not have an AFCI available.

  Currently, AFCIs are available in circuit breaker form only. Some electrical product manufacturers are developing electrical outlets that will have AFCI protection.

  Sources of information about AFCIs can be obtained from the CPSC, the National Fire Protection Association, Underwriters Laboratories (UL), your local fire department, an experienced electrical contractor, or electrical supply store.

  State Farm believes the information contained in the The Disaster Survival House is reliable and accurate. We cannot, however, guarantee the performance of all items demonstrated or described in all situations. Always consult an experienced contractor or other expert to determine the best application of these ideas or products in your home.

[1] 1998 Residential Fire Loss Estimates (U.S. National Estimates of Fires, Deaths, Injuries and Property Losses from Non-Incendiary, Non-Suspicious Fires); U.S. Consumer Product Safety Commission; Division of Hazard Analysis.

[2] Smith, Linda & McCoskrie, Dennis, "What Causes Wiring in Residences" Fire Journal Jan/Feb 1990; 19-24,69

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