

Innovations



PRODUCT FEATURE

AFCIs to the Rescue

Electrical fires can cause misery and damage. The technology of arc-fault circuit interrupters combined with proper wiring and maintenance techniques may help prevent residential fires.

There are few things more devastating to a homeowner than a fire. Despite best efforts from manufacturers, installers and inspectors, home electrical problems cause an estimated 67,800 home fires and \$868 million in property losses annually, according to the most recent data from the U.S. Fire Administration.

But there are steps builders can take to prevent electrical fires, which lead to an estimated 485 deaths and 2,300 injuries annually, according to the USFA.

That includes using arc-fault circuit interrupters (AFCIs), which the U.S. Department of Housing and Urban Development listed as one of the many devices that can be used to prevent residential electrical fires.

Whereas conventional circuit breakers only respond to overloads and short circuits, they don't prevent arcing conditions that produce an erratic current flow. According to the National Electrical Manufacturers Association, arcs naturally occur in the operation of electrical

devices such as motors and switches. An arc fault occurs when wiring insulation damages the arc. These can produce extreme heat and lead to fires.

"Arc faults can occur in two ways: a series arc would be a broken current-carrying path in a single conductor, while a parallel arc would be an arc between two conductors or between a conductor and ground. Parallel arcs generally involve more energy," says Gerard Winstanley, program manager for NEMA. "An AFCI utilizes advanced electronic technol-

>> BY NICK BAJZEK, PRODUCTS EDITOR



ABOVE: Some examples of typical AFCI units from several manufacturers. Right: Arc faults can occur in improperly sheathed or worn wiring. PHOTOS COURTESY OF NEMA



ogy to monitor the circuit for the presence of normal and dangerous arcing conditions. It will analyze ... an arcing event and determine if it is hazardous, in which case it will interrupt power to the line."

According to NEMA, the 2008 National Electrical Code is expanding requirements for AFCIs. NEMA estimates AFCI protection in circuit breakers could prevent 50 percent or more of the fires caused by problems in the electrical system. The 2008 edition of the code also takes safety a step further by requiring that all new home construction builders install combination AFCIs to all 15-amp and 20-amp branch circuits not only in bedrooms, but in additional living areas in new dwellings and in the lighting system.

It is important to note that AFCIs are not a panacea; it is possible for a high-voltage surge to damage the arc-detecting circuits of an AFCI. "This is a very rare occurrence, and in this case, the device



ABOVE: An example of how a typical arc-fault occurs in appliances and other household electrical equipment. PHOTOS COURTESY OF NEMA

may still function as a circuit breaker. The test button on the AFCI will confirm whether the arc detecting circuitry is still functioning," says Winstanley. "We recommend that the operation of all AFCIs is checked on a monthly basis."

AFCIs may also be tripped inadvertently, though this too is rare. According to NEMA, the majority of the "nuisance trip" issues are related to installation problems. Specific examples include reversing neutral to ground wires, shared neutral wiring on single pole cir-

THE PRICE OF SAFETY

Electrical Wholesaling Magazine breaks down the cost of using AFCIs using a 2,500-square-foot home costing \$192,846. As per the Consumer Product Safety Commission, the average professionally installed cost differential between an AFCI and a standard circuit breaker is between \$15 and \$20. With the average number of circuits requiring AFCIs being 12, this equates to an approximate cost increase of \$180 to the builder.

cuits, and ground wires touching neutral wires. These are arcs that a standard circuit breaker would not detect, but an AFCI would and then shut the circuit down immediately. "As contractors become more familiar with the installation and operation of AFCIs, these wiring errors, reports of nuisance tripping will decline," says Winstanley.

"AFCIs are a relatively new technology and manufacturers are investing great effort in their development. It is very likely we will see further developments in these products. The key issue is safety. There are many home safety options, but AFCIs are a technological leap forward that provides immediate preventative protection to the home's electrical system," says Winstanley.

He believes the expanded NEC requirement will have a significant impact on home safety and decrease the number of lives lost and injuries that occur in residential fires. "Homeowners deserve the safest home possible. This is especially important with new home construction, where safety needs to be the number one priority in the home building processes." **PB**

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PROFESSIONAL BUILDER 12.2007 WWW.PROBUILDER.COM