

We Interrupt This Circuit

New rules promoting the use of arc-fault circuit interrupters in the latest National Electrical Code give distributors added opportunities for promoting safety and doing good business.

In an effort to further reduce the risk of fire caused by electrical sources, the industry's standards bodies have been promoting use of arc-fault circuit interrupters (AFCIs) by adding them to codes and standards and by mobilizing their public relations organizations to get the word out.

NEMA this summer launched a website devoted to the subject: www.AFCISafety.org. The 2008 edition of the National Electrical Code (NEC) requires that AFCIs be used on a much broader range of branch circuits than previous editions. Instead of just the bedrooms, they now apply to essentially the whole house.

Arc faults come in two types: parallel arcs (line-to-line, line-to-neutral and line-to-ground) such as when a metal object penetrates a lamp cord and shorts the hot wire to neutral or ground; and series arcs (arcing in series with one of the conductors) such as when a power cord is broken and the electricity arcs across the two broken ends of single conductor. Both can heat up surrounding materials and start a fire.

NEMA and other standards bodies encountered some initial resistance to the AFCI requirement, primarily based on the added cost and the potential for nuisance tripping.

The added cost is actually very small, compared to the potential loss of life and property they protect against, says Gerard Winstanley, technical program manager for NEMA's Low Voltage Distribution Equipment Section. "People were saying, 'This is not a good time to be adding to the cost of housing.' But AFCIs typically add \$15 to \$20 to the cost of a standard circuit breaker, so you can protect an average home for around \$200. That's not much when compared with the improvements in safety," Winstanley says.

Nuisance tripping was a more frequent complaint when AFCIs were introduced in the late 1990s, but the technology has improved quite a bit since then. Unlike a standard circuit breaker detecting overloads and short circuits, an AFCI uses electronics to identify different arcing conditions. The nuisance tripping problem comes from the difficulties in distinguishing a dangerous arc fault caused by a broken power cord or deteriorating device connection from the normal arcing that happens sometimes when a switch is turned off or the inrush

currents that occur when turning on a tungsten incandescent lamp. Without fairly sophisticated detection, an AFCI could trip anytime a compressor goes on. To address this concern, UL sets minimum product standards for AFCIs covering four varieties of tests to avoid unwanted tripping: inrush current, normal arcing, nonsinusoidal waveforms and cross talk.

The 2008 edition of the NEC upgrades the requirements to include protection on outlets in many other parts of the house:

(B) Dwelling Units. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by a listed arc-fault circuit interrupter, combination-type, installed to provide protection of the branch circuit.

The "combination-type" specified in the N.E. Code refers to AFCIs that meet the requirements for both branch/feeder and outlet circuit protection. "It is intended to protect downstream branch circuit wiring and cord sets and power-supply cords," says the Underwriters Laboratories' (UL) Web site.

Distributors can help their contractor customers by suggesting that they explain to their end-user customers the difference between AFCI and GFCI, and why both are needed in some situations. An AFCI-protected circuit will not provide the same protection in the event of a ground fault as a GFCI will. Most AFCIs have integral GFCI protection, but they typically interrupt at 30 mA rather than the 5 mA protection of a standard GFCI. According to the Occupational Safety and Health Administration, 30 mA is above the level of current where most people will feel a painful shock and be unable to let go of the source, called the "freezing current" or "let-go threshold" (9-10 mA for women and 15-20 mA for men) but below the level considered likely to be fatal.

Some manufacturers have developed "dual-purpose" AFCIs that provide 5 mA ground-fault protection integrated into the circuit breaker, so distributors should ask their circuit-breaker suppliers about them. ■

By Doug Chandler, Executive Editor