The competing requirements of safety and economy have manifested themselves again in a relatively new NEC requirement for arc fault circuit interrupters (AFCIs). These are a new type of protection device that detects hazards in frayed extension cords, for example, before a fire begins. The operating principle has been used in the protection of areas near fallen utility lines for many years but was scaled down and presented to the technical committees of the National Electric Code. AFCI in dwelling unit bedrooms became mandatory in Section 210-12 on January 1, 2002. I know that facility managers look forward to changes in the NEC as much as we all look forward to changes in the tax code.

The requirement for the application of AFCIs in the bedrooms of all dwelling units presents our industry with application decisions with respect to dormitory design. It makes sense that NEC code writers selected bedrooms as the first application point for AFCI; bedrooms are, after all, where most people spend one-third of their lives. Sleep-deprived students, making up a week's worth of lost sleep, can be rendered unable to respond to fire alarms or even a cold steady flow of water from a sprinkler head. The ratio of the bedroom space to the total area of living space is relatively large as compared to the ratio of the number of bedroom circuits to the total number of circuits. Thus, you get the most protection for the cost.

The crux of the application problem for higher education lies in how the NEC defines “dwelling unit.” Article 100 of the NEC defines a dwelling unit as an occupancy with permanent cooking facilities. Arguably, any dormitory room that does not have permanent cooking facilities is not required to have AFCIs. Knowledgeable facility executives know, however, that dormitory rooms are filled with surprises. The safest thing to do is make arc fault circuit interrupters mandatory in all dormitory sleeping quarters whether or not there is a defined kitchenette in the dormitory. For all practical purposes, any space within a dormitory room can turn into a kitchenette with a refrigerator, a hot plate, a coffee-maker, a popcorn popper, and a microwave.

Arc fault circuit protection is not cheap; at least not yet. While the cost of a standard circuit breaker may be $10 or less, the cost of arc fault protection is about five times this amount—depending upon the market and the manufacturer. Economies of scale are rapidly bringing the per unit cost down. The larger cost impact of AFCIs has to do with the implications it has for:

- The electrical design of the power system within the dormitory room
- Maintenance and operation cost to reset AFCI circuit breakers after they have opened.

Unlike ground fault circuit interrupters (GFCIs), arc fault protection

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In the design of new dormitories it should make sure that all AFCI-pro-

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As above $10 per outlet Available

Note: An AFCI does offer some ground fault protection. One of the more common wiring mistakes when installing an AFCI in a new or retrofit installation is a “shared neutral” condition (two black wires feeding circuits with a common white wire return). Two-pole AFCIs are available for this condition.

applys to the entire branch circuit. To use housing construction funding wisely, your electrical designers should make sure that all AFCI-pro-

cuits that feed residential living areas; not just bedrooms. The city of Atlanta, Georgia, now requires AFCIs for all retrofit/remodels. You should track AFCI-adoption programs with the authority having jurisdiction; typically the chief state electrical inspector or fire marshal.

Like the ground fault circuit protection that preceded it, AFCIs have experienced growing pains. They have frequently worked too well; sometimes not at all. Dimmable lighting circuits within bedrooms may trip when used with arc fault circuit interrupters. This nuisance tripping is dependent on the load wattage and the number of high wattage lamps on each AFCI. Within the past three years, one manufacturer had to recall some AFCIs and the problem was quickly resolved.

Some antagonists of the safety community assert that mandatory application of AFCIs is overzealous and too early; that the technology is still buggy. Starting from the late 1960s, it took ten years to get GFCIs to a point where they were not nuis-

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Circuit breaker graphic from SQ-D

Note the similarity in size with a conventional 15A-20A circuit breaker. The microelectronics within these devices do generate more heat than conventional breakers, however. Until the recent development of the AFCI for residential occupancies, there was no way to protect against hazards that occurred at current levels below those at which circuit breakers were designed to operate. The AFCI senses the existence of a small plasma called an arc and will open an entire circuit. An arcing hazard happens between phases and/or neutral. (Note the white, coiled wire, identifying the neutral.) An AFCI is unlike the GFCI. A GFCI, which is applied near water, senses hazards between phase/neutral or ground. The coiled wire that accompanies a GFCI unit is green. A GFCI can be tested at the outlet within a given room. An AFCI outlet, however, must be tested back at the circuit breaker panel. This difference has policy and cost implications for student housing, security, maintenance, and operations.