Q I have noticed that arc-fault circuit-interrupter (AFCI) circuit breakers tend to be warmer to the touch than regular circuit breakers. Now that the 2008 *NEC* requires most circuits in a dwelling to be protected by a combination-type AFCI circuit breaker, and there will be more AFCIs stacked into a panel, will the added heat affect the operation of the circuit breakers in the panelboard or create a hazard?

A The short answer is no; the additional stacked AFCI circuit breakers do not produce enough heat to adversely affect the operation of the circuit breakers in the panelboard or to introduce a hazard.

In order to address possible heating concerns with the expanded use of AFCIs in dwelling unit panelboards as required by the 2008 *NEC*, UL conducted a research project. This project confirmed that the expanded use of AFCIs in panelboards does not result in temperatures in excess of those permitted in the Standard for Safety for Panelboards, UL 67, and the Standard for Safety for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489.

UL worked with AFCI manufacturers to conduct this testing by evaluating several different circuit breaker configurations as specified in UL 67, as well as a "typical residential" loading configuration.

In order to set up a more severe scenario, the temperature tests out of UL 67 included populating a 200-A, 42-circuit main lug only panelboard, fully loaded to 200 A per phase, with all AFCI circuit breakers (with the exception of the larger ampere breakers, which are not available with AFCI protection). Normally, AFCI breakers would represent half or fewer of the branch-circuit breakers.

The "typical residential" configuration consisted of a 200-A main breaker panelboard populated with circuit breakers to represent a configuration likely to be found in a typical residential panelboard and loaded to 80 percent of the current rating (corresponding to the maximum continuous load permitted by the *NEC*). During each of these tests, the UL 67 and UL 489 temperature limits were not exceeded.

Since the "typical" loading resulted in lower temperatures than the UL 67 testing, these results suggest that code-compliant installations of additional AFCI circuit breakers in panelboards will not cause a safety concern due to their thermal characteristics.

Q I understand UL conducted research on old homes to determine the effects of aging on residential electrical wiring systems. Is that research project complete, and where can I get the report and any recommendations from the research?

A UL partnered with several other organizations to help sponsor the Fire Protection Research Foundation's (FPRF) Residential Electrical System Aging Research Project. The research project was completed in 2008, and the report issued in July 2008.

The goal of this project was to characterize the condition of various age groups of residential electrical systems, by surveying a representative sampling of actual installed systems from homes across the country, and then documenting how aging and installation may relate to residential electrical fire causes. In all, 30 houses were studied.

Electricity has been a permanent feature in residential occupancies for over 100 years, and it was known to be a cause of fires since the earliest days of its use. Recent studies have shown that the frequency of fires in residential electrical systems is disproportionately higher in older homes. Three factors that could influence most the likelihood of a residential electrical fire are: (1) the effects of natural aging over time on the electrical system wiring and equipment, (2) misuse or abuse of the electrical system components in the home by the occupants, and (3) non-code-compliant installations, upgrades, or repairs. The findings of this project seemed to confirm these suspicions.

For more information on the research project and to download a copy of the report, please see the Fire Protection Research Foundations (FPRF) section of NFPA's website at www.nfpa.org/agedwiring.

If you would like to see a presentation on the project and results at your local IAEI chapter meeting, please contact your section's UL Regulatory Services representative. Northwestern Section, Bob Eugene; Southwestern Section, Rich Berman; Western Section, Tom Lichtenstein; Eastern Section, John Cangemi; Southern Section, Jeff Fecteau. They can be reached at (800) 595-9844.