Arc Fault

There is new electrical technology that is designed to reduce the number of electrical fires and to save lives. Many electrical fires have been determined that the cause was a short circuit. The term short circuit is used for many types of electrical problems. In many times it is not appropriately used. A circuit breaker is designed to de-energize the circuit upon overloads, ground-faults, and short-circuits. An overload occurs when the circuit has more of a load on it than it is designed for. Such as a 15 amp circuit having more things added to the circuit until it exceeds the rating of the breaker and the circuit breaker trips and de-energizes the circuit. Ground-faults can happen when a hot conductor touches a grounded conductor or object a ground-fault would occur. There are circuit breakers and other devices that would detect a ground-fault and de-energize the circuit before much damage or injury would happen. A short circuit would occur when a hot conductor touches another hot conductor, (a phase to phase short circuit), or when a hot conductor touches a neutral conductor.
Over the years circuit breakers have been designed to protect our homes and families from the electrical hazards above and the fires that they can create. The problems of electrical fires has not been substantially reduced over the years and the Consumer Product Safety Commission's (CPSC) residential fire report in 1996 revealed that in a one year period that there were over 43,000 electrical related fires where over 330 fatalities occurred, along with over 1,800 injuries and over 700 million dollars in property damage. There were further studies related to this report to determine where the electrical fires started and to determine what could be developed to reduce these staggering numbers.

The technology of circuit breakers was unable to detect a phenomenon known as an arc fault. It was believed that the arc fault caused a majority of the electrical fires from the report by CPSC. An arc fault can create temperatures in excess of ten thousand degrees Fahrenheit, which is extremely higher, then the temperature required to ignite combustibles. Some examples of an arcing fault would be insulation on a wire that is damaged, cut, or deteriorated and arcing occurs. An arc fault can last for weeks without being detected in an insulated wall or attic. The arc is not sufficient enough to activate a normal circuit breaker under a short circuit condition. Other examples are a nail in a wall hitting the electrical cable behind the drywall, or a cord that is pinched or chewed into by your dog. Once the insulation breaks down the arcing could occur at any time day or night. Even a loose connection in an electrical outlet can produce an arc fault enough to start a fire, but not enough to trip a normal circuit breaker.

New technology has emerged that will detect an arc fault and de-energize the circuit before a fire can start. The new technology is an "Arc-Fault Circuit Interrupter" (AFCI) circuit breaker. This new device has electronic components in them to analyze the sine wave of an electrical arc and de-energize the circuit. The AFCI breaker still acts as a normal circuit breaker by checking for overloads, short circuits, and ground-faults. This is quite an accomplishment to have a breaker that will analyze an electrical arc and decide if it is a normal arc or an unsafe arc. The AFCI circuit breaker will analyze the sine wave of a vacuum cleaner or a light switch that is being turned off and on and be able to tell that it is a normal arc and not a dangerous arc-fault.

The National Fire Protection Association, NFPA, is responsible for the making of the National Electrical Code, NEC, and in their 1999 edition made a code requirement for the installation of arc-fault circuit interrupters. In the writing stage of the 1999 code these device were to be utilized through out residential dwellings. The printed document reduced that requirement to the bedroom receptacle circuits of dwelling units starting in January of 2002. The State of Vermont has become a leader in the Arc-Fault Circuit requirement by requiring most of the house wiring to be protected with an AFCI and started enforcing this requirement in January 2001. In the reverse direction, the State of Michigan exempted this requirement from their adoption of the 1999 Michigan Electrical Code. The code adoption committee for the 2002 Michigan Electrical Code has approved the requirement for AFCI's in the adoption of the 2002 Michigan Electrical Code. The State of Michigan adopted the 2000 Michigan Residential Code on July 31, 2001 with no code requirements relating to this new technology.
Most electricians and electrical inspectors feel that the arc-fault circuit interrupter is the greatest thing in the electrical industry since ground-fault circuit-interrupter (GFCI) protection. The Arc-Fault Circuit Interrupter will drastically reduce the number of electrical fires and save numerous lives. I feel that

the National Electrical Code and the electrical industry will see the benefits of this device and increase its usage over the next few years.