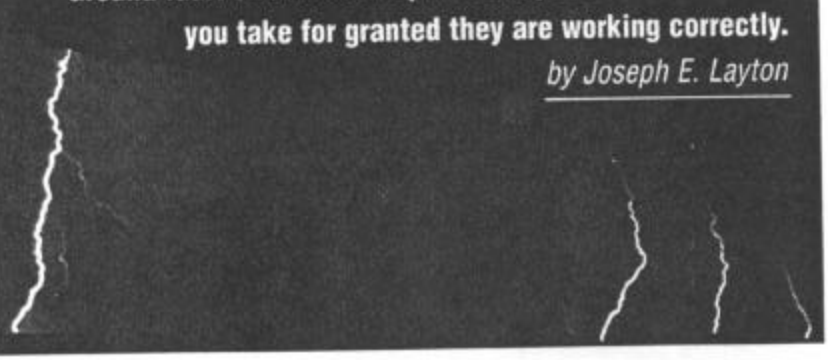
Why GFCIs Fail

Ground fault circuit interrupters can pose serious risks if you take for granted they are working correctly.

by Joseph E. Layton



Electricity has been around since the beginning of time in the forms of lightning and static electricity. In 600 BC in Greece, it was observed that amber rubbed with wool would attract light objects such as straw, feathers, and bits of wood. Around 1570, William Gilbert, the man who is credited with coining the word "electricity," discovered electrical properties in items other than amber. The electric light bulb was invented in 1802, and Thomas Edison was the first person to successfully market an incandescent lamp, in 1879.

With the ever-expanding use of electricity, the need was recognized for a national standard to regulate electrical installations nationwide. The National Electrical Code came into being in 1897. Through the National Fire Protection Association it became NFPA 70 and remains the same today. It is the electrical standard for the United States and other foreign countries, including Mexico. The code is not a training manual; rather, it is a uniform standard used by inspection agencies, designers, insurance companies, and others who are responsible for electrical installations. The code is a minimum requirement for safe installations, and parts of the code became Subpart S and Subpart K of OSHA's standards.

Grounding

When electricity became part of our lives, whether in the workplace or at home, effective grounding became our means of protection. Grounding is still a required method of protection from shock in the event of an electrical fault. This is the separate wire that is run with the circuit conductors and connected to the non-current-carrying metal parts of equipment that could become energized because of a fault.

A grounding conductor is also required in cords that are connected to tools, equipment, and appliances. The only exception is if the tool is supplied through an isolation transformer with an ungrounded secondary of not over 50 volts, or uses a system of approved double insulation. The grounding conductor gives a direct path back to the grounding electrode (ground rod, structural steel, etc.) if a fault occurs.

When the transistor was invented, we entered into a new era. Suddenly, we were faced with items such as transistor radios, which operated on batteries or regular household current. In the mid to late 1960s, one could hardly read a newspaper or watch the evening news without reading or hearing about someone being electrocuted. Typically they would be sitting in the bathtub when their radio (plugged into household current) fell into the tub and electrocuted them.

Hairstyles were changing during this period, and the hand-held hair dryer became a part of practically every household. They posed a problem because they were primarily used in the bathroom, near the lavatory. This presented additional hazards because the water piping system was grounded, and a fault in the hair dryer along with someone coming in contact with the faucets could result in serious electrical shock or electrocution.

These factors led to the introduction of Ground Fault Circuit Interrupters.

Understanding GFCIs

One of the items covered in the National Electrical Code is Ground Fault Circuit Interrupters, or GFCIs. The GFCI is probably the most significant life-saving device ever invented for protection against serious injury or death caused by an electrical shock.

The GFCI is designed for "personal" protection, not to protect equipment or the conductors of a circuit. While grounding is required and a vital part of safety of both people and equipment, the *grounding con-*