SEGURIDAD ELECTRICA

Esta hoja contiene información complementaria a la disponible en internet

Factores primarios que causan daño biológico

1) Cantidad de corriente que fluye a través del cuerpo (la unidad apropiada es mA).
2) La trayectoria dentro del cuerpo, desde el punto de entrada al de salida.
3) El tiempo durante el cual el cuerpo humano es parte del circuito (la unidad apropiada es ms).

Factores secundarios

1) Edad
2) Sexo
3) Tamaño y estatura
4) Condición física general
5) Frecuencia de la corriente
6) Piel mojada o transpirada

Tablas y páginas útiles obtenidas de la referencia indicada al final

Murphy's law—"if something *can* go wrong, it *will* go wrong"—should be kept in mind in any electrical or electronic installation, operation, test, or maintenance procedure. It is equally important never to assume anything about any electric circuit except perhaps that it can kill you if you don't take the proper precautions.

A few of the more obvious shock hazards are listed in Table 2-3. Table 2-4 lists some shock hazards that are not so obvious—in fact they may be

TABLE 2-3 *Obvious electric shock hazards*

Testing a circuit with a wet finger to see if it's "live"
Working on circuits assumed to be "dead" before checking that they *are* dead, and failing to prevent such circuits from being energized by others
Any electrical device that gives you a "tingle" when you touch it
Spliced, broken, frayed, and cracked cords and plugs
Ungrounded tools (drills, etc.), unless they are protected by double insulation
Transformer-less sets that may have hot chassis
Electric cords in floors where they may be worn or broken by people walking over them
Overloaded receptacles and circuits
Using metal ladders where they may brush or fall against power lines
Drilling into wall or floor without knowing what's on other side—it could be a hot electrical circuit

TABLE 2-4 *Subtle electric shock hazards*

Equipment bearing the UL label may become dangerous later because of environment or misuse
Equipment may be hot even though turned OFF
Unfamiliar circuits, unpredictable types of component breakdown
Hot cabinets—a result of failure to replace insulating spacers between chassis and cabinet
Replacing push-on knobs with knobs having metal setscrews which can become hot
Exposed metal screws and control shafts on equipment with plastic cases may be hot
Fallen power line that does not crackle or pop can be harmless one minute and lethal the next
Interlocks and bleeder resistors may fail
Capacitors that can discharge more than 50 joules

A component failure in one equipment rack, for instance, may create a hazard in the rack next to it. New equipment with unfamiliar circuits may trap the unsuspecting technician. The previous owner or user of a device may forget to warn you of the dangers. Instruction manuals may have been lost. And of course there's always the problem of: "Familiarity breeds contempt."

In research laboratories particularly, the nationally recognized and local electrical codes and standards may not provide satisfactory safety. The Atomic Energy Commission points out that the element of the unknown is inherent in all research, and therein lies the possibility of direct and indirect electrical hazards for which there can be no previous record or experience. Thus, there must be special efforts in such labs to recognize and control shock hazards.

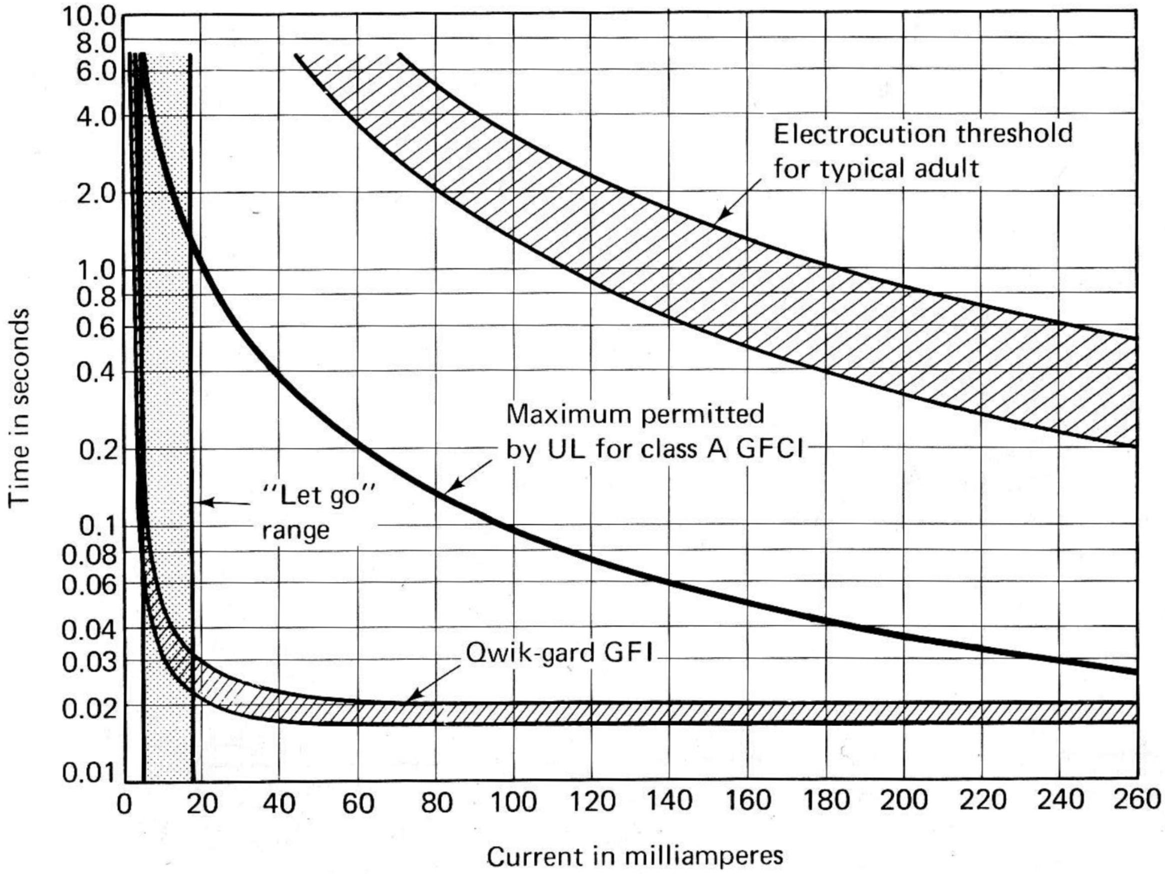

Figure 2-17. Action of ground fault interrupter. (Courtesy of Square D Company.)

Personal Operating Safety Precautions

Proper insulation, grounding, isolation, and lockouts, plus the use of low voltage and ground fault interrupters can make your shop, laboratory, or transmitter room a much safer place in which to work. However, these precautions may be inadequate to keep you from being shocked, if you have poor or careless work procedures.

Here are some basic procedures to follow in the shop or lab:

1. Keep one hand in your pocket when working on energized circuits.
2. If you can't keep your hand in your pocket, do not touch any metal object with your free hand while holding an electrical tool in the other hand.
3. Don't depend on switches to kill a circuit; pull the plug from the outlet.
4. If you are working on high-voltage circuits, have a buddy standing by to help you in case of shock. Just anybody will not do; your observer must know how to kill the circuit to get you loose and how to give you mouth-to-mouth resuscitation and closed-chest heart massage.
5. Do not wear loose clothing, metallic frame eyeglasses, rings, watches, or other jewelry if you are near energized circuits.
6. Do not use an ordinary lamp as an extension trouble light.
7. If directions or instructions are available, follow them. The guy who wrote the book may know more about the hazards involved than you.
8. When you're mentally or physically fatigued, avoid work on energized circuits.
9. To measure high voltages, deenergize the equipment, discharge appropriate capacitors, attach the meter leads, step back, energize the equipment, and make your readings. Don't go probing with a test lead in your hand.
10. Try to make safety protection equipment fail-safe.
11. Never assume that a circuit is dead. Check it first.
12. Do not rely solely on interlocks unless you are certain that they have disconnected the circuit.

13. Have sufficient illumination to see the smallest parts of the equipment you're working on.
14. Discharge all items that can retain a charge.
15. Short out interlocks at your own risk!
16. Study equipment schematic and instruction manual before you start work.
17. If there is any possibility that the equipment chassis may be hot, connect it to an isolation transformer instead of the usual power outlet.
18. Do not draw arcs either intentionally or accidentally. Technicians on missile work have been nearly blinded by low voltage, high current arcs caused by accidental shorts. Such arcs can also be hazardous in flammable atmospheres:

Ref. Edward A. Lacy, Handbook of eeelectronic safety procedures, Prentice Hall, NJ (1977)