University of Washington
Facilities Services Safety

IEC CATEGORY SPECIFICATIONS FOR ELECTRICAL TEST EQUIPMENT

Higher categories are closer to the power source.

CAT IV- Three-phase at utility connection, any outdoor conductors. Refers to the "origin of installation"; where a low-voltage connection is made to utility power. Includes electricity meters, primary overcurrent protection equipment, outside and service entrance, service drop from pole to building, run between meter and panel, overhead line to detached building, underground line to well pump

CAT III - Three-phase distribution, includes single-phase commercial lighting. Refers to equipment in fixed installations such as switchgear, polyphase motors, bus and feeders in industrial plants, feeders and short branch circuits, distribution panel devices, lighting systems in larger buildings, and appliance outlets with short connections to service entrance.

CAT II - Single-phase receptacle connected loads. Refers to appliances, portable tools, other household and similar loads, outlet and long branch circuits, outlets at more than 10 meters (30 feet) from CAT III sources, and outlets more that 20 meters (60 feet) from CAT IV sources.

CAT I – Electronic. Refers to protected electronic equipment, equipment connected to (source) circuits in which measures have been taken to limit transient overvoltages to an appropriately low level, any high-voltage, low-energy source derived from a highwinding resistance transformer, such as the high-voltage section of a copier.

TIPS TO REDUCE ELECTRICAL HAZARDS:

- ✓ Frequently inspect your workplace for damaged, overheating, or misused electrical equipment (appliances, tools, cords, outlets, wiring, light switches, light sockets etc) and report any problems to your supervisor.
- ✓ Only have qualified, authorized employees work on electrical equipment and systems.
- ✓ Follow safe work practices and wear all the required personal protective equipment when working on or near electrical equipment.
- ✓ Work on de-energized circuits unless a shut-down is not feasible.
- ✓ Store flammable materials away from electrical sources.
- ✓ Follow the recommendations in the *Ground Fault Circuit Interrupters* and *Extension Cords* brochures.
- ✓ Know the maximum voltage you will be testing.
- ✓ Use electrical test equipment with the proper IEC category rating for the work being done.
- ✓ Keep area 36" in front of electrical panels clear of ALL materials.

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University of Washington
Facilities Services

Electrical Hazards

"Better a thousand times careful than once dead"

-Proverb

Electrical Hazards

We use electricity everyday without giving much thought to the hazards it can present. The following information will explain the hazards of electricity and how to reduce or eliminate exposure to electrical hazards.

HAZARDS OF ELECTRICITY

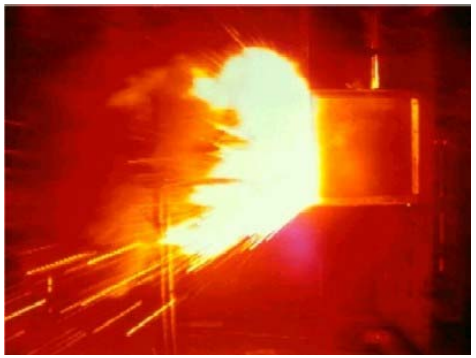
The five primary hazards associated with electricity and its use are;

1. SHOCK Some common causes of electrical shock are contact with bare wire, unsafe equipment, inadequate grounding, damp floors, water, metal ladders, power still on, and lightning strikes. The effects, or damage, produced by an electrical shock depend on the duration, quantity, frequency, and path of the current passing through the body, and the skin's moisture content.

Your nervous system is an electrical network that uses extremely low amperage currents. An electric shock--with even very low current--can disrupt normal functioning of muscles--most significantly, your heart. It may cause the heart to lose its coordination or rhythm. Shock causes muscle contractions that can cause a person working from a ladder to fall, or can cause the person receiving the shock to be unable to "let go". These effects can be caused by currents that produce no noticeable heating of tissue or visible injury.

2. BURNS Although a current may not pass through vital organs or nerve centers, internal electrical burns can still occur.

These burns are the result of heat generated by the current flowing in tissue, and can be either at the skin surface, in deeper tissue layers (muscles, bones, etc.), or both. These types of electrical burns heal slowly.



3. ARC-FLASH Arc-flashes occur from high-amperage currents arcing through air. An arc-blast happens when there is contact between two energized points. This contact can be caused by people, or equipment failure. The primary hazards associated with an arc-flash are:

Thermal Radiation. The radiated thermal energy, or heat, can cause burns. Proper clothing, work distances, and overcurrent protection can reduce the chances of receiving incurable burns.

Pressure Wave. A high- energy arc fault can produce a considerable pressure wave (a person 2 feet from a 25,000 amp arc would experience a force of about 480 lbs). Such a pressure wave can cause ear damage, memory loss (mild concussion); and may throw the victim away from the arc-blast. This would reduce the exposure to the thermal energy, but increase the risk of serious physical injury.

Projectiles. An arc-pressure wave can propel big objects over a considerable distance. A high-energy arc can cause metal equipment components to become molten, then these droplets of molten metal can be thrown through the air, causing burns or igniting clothing up to 10 feet away.

4. EXPLOSIONS Explosions occur when electricity ignites an explosive mixture in the atmosphere. Explosive atmospheres result from the accumulation of flammable vapors or gases from nearby sources and processes. Ignition sources can be overheated conductors or equipment, or normal arcing (sparking) at switch contacts.

5. FIRES Electricity is often the cause of fire both in the home and workplace. Defective or misused electrical equipment, such as old or defective power strips, is a major cause of electrical fires. High resistance connections are one of the primary sources of ignition. High resistance connections occur where wires are improperly spliced or connected to other components such as receptacle outlets and switches.

SELECTING ELECTRICAL TEST EQUIPMENT

Selection of properly rated electrical test equipment can mean the difference between completing a job safely, or sustaining serious injuries. The International Electrotechnical Commission(IEC) has developed specifications to help determine which category of test equipment is needed for a task. The electrical test equipment, and attachments, used for the work must be rated for that category, or higher.

The category rating (CAT) for electrical test equipment can be determined by looking for a label on the equipment, or by reading the equipment manual. If there is no IEC category rating for the test equipment, it should not be used.