

FACILITIES SERVICES

Acquisition & Use of Electrical Test Equipment

Responsibilities

Manager	<p>Provide for the purchase, maintenance, and repair of the properly rated electrical test equipment for the work of the unit.</p> <p>Assure that all employees are complying with the Acquisition & Use of Electrical Test Equipment Safety Practice.</p>
Supervisor/Lead	<p>Review the Acquisition & Use of Electrical Test Equipment information with all affected employees.</p> <p>Assure that employees have electrical test equipment with the correct category rating for the work they are conducting, and are knowledgeable about the contents of the manual, particularly the safe use, maintenance, and repair sections.</p> <p>Assure employees use only University of Washington owned and maintained tools and equipment.</p>
Employee	<p>Select and use electrical test equipment AND accessories (clamps, test leads, etc) with the proper category rating.</p> <p>Read, and be familiar with, the equipment manufacturer's information/recommendations for the test equipment, particularly safe use, maintenance, and repair.</p> <p>Inspect electrical test equipment before each use.</p> <p>Know the maximum voltage to be tested.</p> <p>Use only University of Washington owned and maintained tools and equipment.</p>

Purpose

To establish minimum standards for the selection, purchase, maintenance, and use of electrical test equipment. Equipment covered by this statement includes, but is not limited to; VOM (multimeters), voltmeters, oscilloscopes, power monitors, ammeters, tic tracers, neon tracers, high voltage phase testers, megohm-meters, and light sticks.

Practice

To protect themselves and others, employees must follow, as a minimum, the safety practices described below whenever they purchase and/or use electrical test equipment.

Employees must review the International Electrotechnical Commission (IEC) category specifications to determine which category the work belongs in. The electrical test equipment and attachments purchased/used for the work must be rated for that category, or higher.

Employees must be familiar with the contents of the equipment manual for all pieces of electrical test equipment they use, particularly those sections regarding safe use, maintenance, and repair.

When purchasing, or before first use:

- Look for the symbol for an independent testing lab such as UL, CSA, TUV or other nationally recognized testing organization (see <http://www.osha.gov/dts/otpca/nrtl/nrtllist.html>). The CE mark is NOT a guarantee of independent testing. Don't use equipment with wording such as "designed to meet specification..." this is not the same as an independent test.
- Look for the CAT rating (see IEC Category Specifications) and make sure it meets or exceeds the category your work falls into.
- Look for the double insulated symbol on the back (a square within a square).

If the equipment doesn't meet these standards, don't buy or use it. If the equipment is already in service, notify your supervisor and turn it in to the tool room for disposal.

Before use:

- Check for a broken or cracked case, or faded display.
- Inspect for worn test leads, broken or frayed wires.
- Make sure test leads have shrouded connectors, finger guards, CAT ratings that meet or exceed the meter rating, are double insulated, and have minimal exposed metal on the probe tips.
- If applicable to test equipment being used, check for internal breaks using continuity test function (see equipment manual).
- Check the manual to verify the ohms and continuity circuits are protected to the same level as the voltage test circuit.
- Assure the amperage and voltage of meter fuses meets specifications. The fuse voltage must be as high, or higher, than the equipments voltage rating. Test the fuse(s) (see equipment manual).

IEC Category Specifications

The International Electrotechnical Commission (IEC) develops and publishes international standards which serve as a basis for national standardization. In 2001 the IEC updated standard IEC-61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, which was used as the basis for the ANSI/ISA S82.01, .02, and .03 Safety Standard for Electrical and Electronic Test, Measuring, Controlling and Related Equipment.

Use the tables below to determine the category of the work. Use test equipment rated for that category or higher.

Transient Test Values for Overvoltage Installation Categories for Electrical Test Equipment

Overvoltage Category	Working Voltage (dc or ac-RMS to ground)	Peak Impulse Transient (20 repetitions)	Test Source ($\Omega = V/A$)
CAT I	600 V	2500V	30 Ohm source
CAT I	1000 V	4000 V	30 Ohm source
CAT II	600 V	4000 V	12 Ohm source
CAT II	1000 V	6000 V	12 Ohm source
CAT III	600 V	6000 V	2 Ohm source
CAT III	1000 V	8000 V	2 Ohm source
CAT IV	600 V	8000 V	2 Ohm source

Higher categories are closer to the power source and require greater protection.

Overvoltage Category	In Brief	Examples
CAT IV	Three-phase at utility connection, any outdoor conductors	<ul style="list-style-type: none"> • Refers to the “origin of installation”; i.e., where low-voltage connection is made to utility power. • 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, including single-phase commercial lighting	<ul style="list-style-type: none"> • Equipment in fixed installations, such as switchgear and polyphase motors. • Bus and feeder in industrial plants. • Feeders and short branch circuits, distribution panel devices. • Lighting systems in larger buildings. • Appliance outlets with short connections to service entrance.
CAT II	Single-phase receptacle connected loads	<ul style="list-style-type: none"> • Appliance, portable tools, and other household and similar loads. • Outlet and long branch circuits. • Outlets at more than 10 meters (30 feet) from CAT III source. • Outlets at more than 20 meters (60 feet) from CAT IV source.
CAT I	Electronic	<ul style="list-style-type: none"> • Protected electronic equipment. • Equipment connected to (source) circuits in which measures are 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.

Table 1. Overvoltage installation categories. IEC 1010 applies to *low-voltage* (<1000 V) test equipment. (From Fluke Corporation “ABC’s of Multimeter Safety”)