 <b>THOMPSON RIVERS UNIVERSITY</b> Occupational Health & Safety	<b>Number:</b> OH&S 18.11.1
	<b>Revision Date:</b> 09/15/2014
	<b>TRU Electrical Safety</b>

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**1. PURPOSE**



1.1. The purpose of these guidelines is to provide the framework for controlling the risks associated with electricity to University staff, students, visitors and contractors

**2. SCOPE**




2.1. These guidelines outline the University’s electrical safety program, aimed at reducing the risk of exposure electrical hazards to staff, students, visitors and contractors. These guidelines are applicable to all areas within the University in which work, teaching or research is performed.



**3. PRECAUTIONS**

**POTENTIAL HEALTH & SAFETY HAZARDS**

HAZARD		TO PROTECT YOURSELF
<b>ELECTRICAL HAZARD</b>		Do not attempt to service electrical wires. Consult TRU Facilities Department.
<b>EXPLOSIVE</b>		Make sure volatile chemicals are stored and handled correctly. Proper grounding must be used for all containers.

**4. PERSONAL PROTECTIVE EQUIPMENT**

	Safety glasses must be worn at all times in work area!
	Work Boots must be worn at all times when working in an area where there is risk of serious foot injury due materials falling onto the foot.
	Work Gloves should be worn when there is a risk of hand injury during the course of work tasks.

	<p>Hard hats must be worn when working in an environment where there is a risk of objects falling from above or where there is a high risk of striking your head on objects.</p>
	<p>Close fitting clothing or protective clothing must be worn.</p>

## 5. REFERENCE

- [CSA Standard C22.2 No. 160-M1985 \(Reaffirmed 1992\), Voltage and Polarity Testers](#)
- [CSA Standard CAN/CSA-C22.2 No. 231 Series-M89, CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment](#)
- Work Safe BC Regulation 19 (9.1 to 19.43)
- CSA Z462-12-Workplace electrical safety

## 6. DEFINITIONS

For the purpose of this procedure, the following definitions apply:

- **“approved”** as applied to electrical equipment, means that the equipment meets the requirements of the Electrical Safety Regulations;
- **"conductor"** means a wire, cable or other metal component installed for the purpose of conveying electric current from one piece of equipment to another or to ground;
- **"control system"** means a manual, remote, automatic or partially automatic system for controlling the operation of equipment;
- **"damp location"** means an exterior or interior location that is subject to condensation of moisture in, on or adjacent to portable electrical equipment;
- **"electrical equipment"** includes machinery, plant, works, wires, pipes, poles, conduits, apparatus, appliances and equipment, designed or used, or intended for use, for or in connection with generation, transmission, supply, distribution or use of electrical energy for any purpose;
- **"electrical worker"** means a person who meets the requirements of the Electrical Safety Regulation for installing, altering or maintaining electrical equipment;

- **"electrofishing"** means the capture or control of fish by the use of electrical equipment;
- **"exposed"**, as applied to electrical equipment or conductors, means that the conductor or a part of the equipment is
  - (a) Electrically connected to a source of voltage difference or electrically charged to have a voltage different from that of earth,
  - (b) Not guarded or insulated in an approved manner, and
  - (c) In a location where a person or any tool, equipment or material the person is touching or using might come closer than a safe distance away from the conductor or part;
- **"hardwired"** means the electrical connection of components within a system by means of electrical conductors so that the only way the system can be modified is by changing the connections;
- **"high voltage"** means a potential difference (voltage) of more than 750 volts between conductors or between a conductor and ground;
- **"isolated"** means that normal sources of energy have been disconnected by opening and securing all associated switches, and that mechanical equipment has been rendered and secured non-operative by disconnecting, stopping, depressurizing, draining, venting or other effective means;
- **"low voltage"** means a potential difference (voltage) from 31 to 750 volts inclusive, between conductors or between a conductor and ground;
- **"mimic display"** means a symbolic representation of the configuration and status of all or part of a power system, complete with device designations;
- **"power system"** means all plant and equipment essential to the generation, transmission or distribution of electricity, including any plant or equipment that is out of service, being constructed or being installed;
- **"safety protection guarantee"** means an assurance that a power system or part of the power system is isolated and will remain isolated;
- **"safety watcher"** means a qualified person whose sole task is to observe the activity when equipment, vegetation or material will be moved relative to energized electrical equipment or conductors, and signal in a clear and predetermined manner to stop the movement whenever contact with electrical equipment, conductors or guarding appears probable, or whenever conditions prevent the watcher from having a clear view of the movement relative to the electrical equipment;
- **"service room"** means a room or space in a building provided to accommodate building service equipment, and meeting the requirements of the BC Building Code or other applicable legislation;

- **"vault"** means an isolated enclosure, either above or below ground, with fire-resisting walls, ceilings and floors for the purpose of housing transformers and other electrical equipment;
- **"Wet location"** means an exterior or interior location in which uncontrolled liquid may drip, splash or flow on or against portable electrical equipment.

## 7. RESPONSIBILITIES

**Deans, Directors, Heads of Departments** are to ensure that:

- The Electrical Safety Guidelines are implemented which includes the appointment of testing personnel to perform the testing requirements.

**Testers of Electrical Equipment** are to ensure that:

- All plug-in type and fixed electrical equipment within the work area under their control is inspected, tested, tagged and recorded in accordance with this policy and procedure.
- Any faulty electrical equipment is decommissioned and tagged appropriately from service until it satisfies the testing requirements.

**Staff and Students** are to ensure:

- Any electrical equipment that has been tagged with a Danger/Out of Service Tag must not be used and must be removed from service until an appropriately licensed person has completed repairs.
- All privately owned electrical equipment of the plug-in type is presented for inspection, testing and tagging prior to use.

**All users of electrical equipment** should:

- Visually inspect all electrical equipment prior to use to check:
  - There is no obvious external damage, particularly to plugs, sockets, cords or other connectors.
  - The flexible supply cord is free of damage, anchored correctly and no inner core insulation is visible.
  - Covers and guards are correctly secured.
  - Ventilation inlets or exhaust are not obstructed.
- Ensure the appropriate department supervisor is notified of any faults and when equipment is out of service for maintenance or repair.

- Use the correct appliance for the specific task.
- Ensure that electrical appliances are dry and clean.
- Not use double adaptors or “piggy-back” plugs (an appropriate power board may be used where more than one appliance is required to be connected to a single GPO).
- Not withdraw a plug from a socket by pulling the cable.

**Workplace Advisory Committees shall:**

- Monitor and review the progress of the electrical safety program in their area(s) of responsibility.

**8 MANAGEMENT OF ELECTRICAL HAZARDS**

The general principles of risk management (identification, assessment, control, and review) will be applied to electrical hazards. These guidelines outline the controls specific to certain hazards concerned with electricity safety.

**9. ACCESS TO ELECTRICAL SWITCHBOARDS**

Access to University switchboards and resetting of circuit breakers is restricted to Facilities buildings staff and approved contractors only.

Reports of tripped circuits and requests for resetting tripped circuits must be directed to Facilities.

**10. TESTING OF ELECTRICAL EQUIPMENT**

(1) Electrical testing equipment may be used if it meets the requirements of

(a) CSA Standard C22.2 No. 160-M1985 (Reaffirmed 1992), Voltage and Polarity Testers

(b) CSA Standard CAN/CSA-C22.2 No. 231 Series-M89, CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment.

(2) Electrical testing equipment not meeting a standard specified in subsection (1) may be used if it has:

(a) Fusing or circuitry designed to protect the operator in the event of a fault resulting from inadvertent misuse of the meter, or a fault on the circuit being tested,

(b) Clearly and unambiguously marked measurement ranges,

(c) Lead wire insulation rated to the maximum voltage reading of the meter,

(d) Lead wires that are not cracked or broken, and having a current carrying capacity that meets or exceeds the maximum current measurement of the meter, and

(e) A minimum exposure of metal on lead wire probes.

(3) Appropriate safe work procedures must be established and followed for testing electrical equipment and circuits.

**8.1 TYPES OF ELECTRICAL EQUIPMENT TO BE TESTED**

**8.1.1 Electrical equipment which requires testing and tagging**

Utilizing a risk management approach, not all electrical equipment is required to be tested. In some situations electrical equipment does not present a risk to the operator, due to:

- the permanent nature of their location;
- the way the equipment is used;
- the working environment in which the equipment is used.

A risk assessment is to be carried out by a ‘competent person’ in accordance with the risk management and consultation provisions of the Regulation. The risk assessment will determine whether the electrical equipment requires testing and tagging as recommended in Table 1 : Examples of Equipment that do require Inspection and Testing and Table 2 : TRU Inspection and Testing of Electrical Equipment Intervals (Modified from AS3760).

Examples of equipment where electrical testing and tagging may not be required due to no cord flexion or connection activity include:

- Desktop computers and monitors
- Scanners
- Photocopiers
- Lamps
- Radios
- Fridges
- Freezers

Table 1: Examples of Electrical Equipment That Requires Inspection and Testing

Category of equipment	Examples of Electrical Equipment
Hand held electrical equipment	<ul style="list-style-type: none"> <li>• Hand held power tools,</li> <li>• Hairdryers,</li> <li>• Kitchen appliances,</li> <li>• Laboratory equipment</li> </ul>
Portable electrical equipment moved while in operation	<ul style="list-style-type: none"> <li>• Floor polishers,</li> <li>• Vacuum cleaners,</li> <li>• Portable lighting equipment</li> </ul>

<p>Electrical equipment that is moved between operations in such a manner that could damage the flexible supply lead</p>	<ul style="list-style-type: none"> <li>• Portable electronic whiteboards,</li> <li>• Overhead projectors,</li> <li>• Laptop computers,</li> <li>• Electrical plant used in factory type environments,</li> <li>• Welding machines,</li> <li>• Extension cords,</li> <li>• Power boards</li> </ul>
<p>Electrical equipment that is used in a <b>hostile working environment</b> where damage to the equipment or the electricity supply to that equipment could occur such as in wet or dusty conditions.</p>	<ul style="list-style-type: none"> <li>• Electrical equipment used in wet or dusty areas,</li> <li>• Electrical equipment used outdoors,</li> <li>• In kitchens,</li> <li>• Laboratories (chemical damage),</li> <li>• Certain factory-type environments</li> </ul>

Where the equipment is new the supplier shall be deemed responsible for the initial electrical safety of the new equipment. New equipment should be tagged to determine the initial test date and noted in the departments asset register. If however, new equipment is identified as a potential hazard, electrical testing should occur to ensure the article is safe.

Electrical inspection and testing of personal equipment is required to be tested as per **Table 2**. Use of personal equipment at the University is to be approved by the applicable Head of Department. Cost for the inspection and testing of approved personal equipment is the responsibility the Department.

Personal equipment which is not approved by the Head of Department is prohibited from use at the University.

**Table 2 – TRU Inspection and Testing of Electrical Equipment Intervals (Modified from AS3760)**

Type of environment and or equipment	Risk Factors			
	High level of cord flexion AND/OR frequency of connection	Low Level of cord flexion AND/OR frequency of connection	Wet or corrosive area or uses water or a corrosive substance in its operation	No cord flexion, no frequency of connection, fixed or stationary equipment
1. Workshops, places of work or repair, manufacturing, assembly, maintenance or fabrication.	6 months	12 months	6 months	Not Required
2. Laboratories, health care & educational establishments.	12 months	2 years	12 months	Not Required
3. Office environment.	12 months	5 years	12 months	Not Required
4. Hire equipment.	Visually inspect before each hire. Test every 3 months.			
5. Repaired/service d/second hand equipment.	After repair or service which could affect electrical health and safety, or on re-introduction to service			
6. Equipment used for commercial cleaning.	6 months	12 months	6 months	Not Required
7. Accommodation houses.	12 months	2 years	12 months	Not Required
8. Theatre environment NOTE: for theatre hire equipment refer to section 4 in this table.	6 months	5 years	12 months	Not Required

\* Intervals marked in red, indicate periods differing to AS3760.

## 8.2 TESTING INTERVALS FOR ELECTRICAL EQUIPMENT



Intervals for testing and inspection of electrical appliances, as applicable in 8.1, shall not exceed those specified in **Table 2**. This table has been derived from AS3760, however it incorporates a risk management approach. Factors considered in determining appropriate inspection and test intervals include mobility of equipment, flexion of cord and the environment the equipment is used to evaluate risk to health and safety.

The intervals in Table 2 are the minimum requirements for testing at the University. Additional tests may be undertaken to determine the safety of electrical equipment if it is felt necessary. This is at the discretion of the relevant supervisor in consultation with staff members.

### **8.3 TRAINING REQUIREMENTS FOR TESTING PERSONNEL**

Work Safe BC Regulations states the inspection and testing of electrical equipment should be carried out by a competent person. For this reason electrical testing will only be carried out by a qualified electrical or electronic tradesperson or any person trained to use a portable appliance tester (PAT).

Training in portable appliance testers is available through the University's Career Development Unit.

### **8.4 INSPECTION AND TEST PROCEDURES**

Inspection and testing of electrical appliances is to be in accordance with CSA Standard CAN/CSA-C22.2 No.231 Series-M89

### **8.5 COMPLIANT ELECTRICAL EQUIPMENT**

Electrical equipment which is compliant with the inspection and testing procedure are to be fitted with an appropriate tag. The tag must include the asset identification number, the identity of the person carrying out the testing, the date tested and the date due for retest.

### **8.6 NON-COMPLIANT ELECTRICAL APPLIANCES**

Electrical appliances which are non-compliant with the inspection and testing procedure are to be fitted with a danger tag warning persons of a potential hazard.

The item is to be withdrawn from service and quarantined to ensure that it cannot be used. Removal of the plug may be applicable to ensure that equipment cannot be used. This should only be completed when the equipment is unplugged from the power point and is safe to do so.

Repair of equipment shall only be completed by authorised repair agents or suitably qualified electrical personnel. Personal equipment is to be repaired at the owner's expense.

The equipment must be re-tested for compliance and then tagged accordingly prior to re-introduction to service.

### **8.7 RECORD KEEPING**

Records of inspection and testing of electrical equipment is required as detailed in the OH&S Regulation 2001. The University recommends the use of PAT testing equipment compatible with *PatGuard Plus* (electric testing records database) to aid in the maintenance of testing records.

Records of maintenance should be kept throughout the working life of the equipment. Copies are to be retained by the department.

Records are to include at minimum:

- The date of inspection and test
- Clear identification of the equipment tested
- The results of the test (whether the equipment passed or failed)
- The identification of the person carrying out the testing and
- The date retest is due

Form 1 – Record of Maintenance

Form 2 – Register of Failed Equipment, is an example of how records should be maintained

**9. REPORTING OF ELECTRICAL INCIDENTS**

All electrical incidents are required to be reported to TRU Safety & Emergency Management Department (S&EM) Hence, any injury or incident involving electricity on the university campus must be reported to the S&EM immediately or as soon as possible after the event. This can be achieved by contacting S&EM during normal business hours or, if after hours, telephoning Security. As soon as practicable, a Hazard and Incident Report Form is to be completed and forwarded to the S&EM Department.

On receipt of a report the Safety department will investigate immediately to ensure all corrective actions have been taken to prevent further injury.

It is also important that any person, who has suffered an electric shock, seeks medical treatment as soon as possible after the event, as effects from electricity may have a delayed effect.

Whenever an electrical incident has occurred, Facilities electrical personnel are to be contacted to inspect the electrical outlet and appliance. Any equipment which causes an electric shock or is faulty is to be inspected and tested prior to re-use.

**10. ASSOCIATED DOCUMENTATION**

<u>Doc. Number</u>	<u>Doc. Title</u>
	Record of electrical maintenance
	Record of failed equipment
	TRU Hazard Incident Form

**11. RECORDS/VERIFICATION OF UNDERSTANDING**

a. Records

- i. All training records will be held with the workers Supervisor.

**10. SUMMARY OF CHANGES**

Revision #	Date	Change (include section #)	Issued By
1	09/15/2014	NEW	OHS Officer

**Form 1 – Record of Maintenance**

**Date of Inspection:**

**Location:**

**Tested By:**

<b>Equipment Description</b>	<b>P.E</b>	<b>Building &amp; Room No.</b>	<b>Tag Applied</b>	<b>Visual Inspection</b>	<b>Machine Test</b>	<b>Compliant/ Non-Compliant</b>

**Next Inspection Due By:**

**Signature of Inspector:**

### Form 2 – Register of Failed Equipment in Building

Room Number	Equipment Description	P.E	Danger Tag Applied	Comments	Action		Re-test
					Repair	Disposal	Compliant/ Non-Compliant

**Date of Inspection:**

**Signature of Inspector**