Electrical Equipment and Terminology

Description
Understand the language of the electrical trade and knowing what electrical equipment is named and its purpose are very important. Anyone who is exposed to a new job must not only learn how to perform the tasks that come with the job, but must also understand specific information that is unique to the job. In electrical construction, knowing the terminology and being able to identify components and equipment are important skills to learn, especially for new workers. Electrical workers will be continually challenged to learn about innovations with equipment, tools, and processes involved with the trade.

Lesson Outcomes
The student will be able to:
- Identify basic electrical components and equipment
- Understand key electrical terms

Assumptions
The student:
- Understands basic electrical theory and safety.
- Knows the working conditions and duties of an electrician.

Terminology
Ampere (Amp): the unit for the rate of flow of electrons in an electrical circuit. One ampere is the amount of current that will flow through a resistance of 1 ohm under pressure of 1 volt.

Arc-fault circuit interrupter (AFCI): a circuit breaker designed to prevent fires by detecting electrical arcs and disconnecting power before the arc starts a fire, required for all bedroom outlets in new homes.

Bonding: a low-resistance path created by joining together non-current-carrying metal parts so all have the same electrical potential.

Branch circuits: the portion of wiring from the final circuit breaker to the outlet.

Circuit: a path between two or more points along which an electrical current can be carried.
**Circuit breaker**: a device designed to open a circuit under an excessive amount of current flow, either an overload or a short circuit.

![Circuit breaker diagram](image)

**Figure 1**—Circuit breaker

**Circuit loading**: criteria that does not allow you to exceed the designated number of receptacles on a circuit, gauge of wire, or amperage of the circuit breaker.

**Conductor**: a material that allows an electric current to pass through it easily (e.g., copper, aluminum).

**De-energized circuit**: a circuit that has no voltage applied to it.

**Electrical load**: the part of the electrical system that controls the current and actually uses the energy or does the work required.

**Electrical equipment**: common electrical equipment terms include *circuit breaker, electrical meter and meter base, electrical panel, exhaust fan, light fixture, non-metallic sheathed cable (NMSC), receptacle, single pole switch, and three-way switch*.

**Electric arc**: a luminous discharge of current that jumps a gap in a circuit, caused by a high voltage.

**Electrical meter and meterbase**: a device that measures how much energy a household or business uses so the electric company knows how much to charge is also known simply as an *electrical meter*. 
**Figure 2**—Kilowatt-hour meter

**Electrical panel**: an insulated panel on which electrical wires are connected to circuit breakers. The panel supplies the branch circuits.

**Figure 3**—Electrical panel

**Electrical safety**: recognizing hazards associated with the use of electrical energy and taking precautions so that hazards do not cause injury or death.

**Electric hazard**: a dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.
Exhaust fan: a fan for ventilating an interior space by drawing air from the interior and expelling it outside.

![Exhaust fan](image)

Figure 4—Exhaust fan

Fuse: a device that interrupts excessive current so that overheating or fire does not cause further damage.

Ground fault circuit interrupter (GFCI): a device that stops the flow of electricity by opening or breaking the circuit when a small flow of current to ground is detected. GFCI protection is required for electrical outlets near water sources like sinks and laundry appliances and for bathroom and outdoor outlets.

Grounding: the process of connecting equipment to a common ground, or “earth.” This is done as a safety mechanism in order to prevent equipment from becoming unsafely energized.

High-resistance fault: a fault in an electrical circuit that overheats due to current flowing through a faulty connection.

![High-resistance fault](image)

Figure 5—Result of a high-resistance fault.
Loose wire connections create a high resistance point within the electrical system, which can lead to a breakdown in insulation or even a fire.
Figure 6—Circuit with high-resistance fault. In this example there is a high-resistance fault between the 2nd and 3rd receptacle. The voltage drop increased from the 2nd to the 3rd. The high resistance was identified as a poor connection between the two devices.

Light fixture (light fitting): an electrical device used to create artificial light and/or illumination.

Figure 7—Light fixture

Live conductors: conductors (wires) that have voltage applied to them. The term hot is often used to describe a wire that has voltage on it.

Neutral conductor: the conductor connected to ground in circuit wiring.
Non-metallic sheathed cable NMSC: a common plastic-sheathed cable used for wiring wood frame construction buildings. Also known by trade names Romex (USA) and Loomex (Canada). The most common cable type used in residential wiring is non-metallic dry (NMD) 90 cable. “Dry” refers to the cable’s use in dry areas.

14/2 NMD 90

12/3 NMD 90

Figure 8—Non-metallic dry (NMD) cable

Ohm: the unit of measure for electrical resistance. An ohm is the amount of resistance that will allow 1 ampere to flow under a pressure of 1 volt. Symbol is the omega (Ω).

Ohm's law: the relationship between voltage, current, and resistance, expressed by the equation V (also expressed as E) = IR, where:

- V(E) is the voltage in volts
- I is the current in amperes
- R is the resistance in ohms

Open circuit: an electric circuit in which the normal path of current has been interrupted.

Overcurrent: a condition that exists on an electrical circuit when the normal load current is exceeded. Overcurrents take on two separate characteristics: overloads and short circuits.
**Overload:** an overcurrent that exceeds the normal current rating of a circuit. This type of overcurrent generally does not leave the normal current-carrying path of the circuit.

![Figure 9—Result of overload in an electrical panel](image)

**Receptacle:** a contact device, usually installed in an outlet box, that provides the socket for the attachment of a plug to supply electric current to portable power equipment, appliances, and other electrically operated devices. Also known as an *electrical outlet, duplex receptacle,* or *plug.*

![Figure 10—Residential grade 120V/15-20R receptacle](image)
**Service equipment**: circuit breakers, fuses, electric meter, conduit, and wire associated with the wiring from BC Hydro to the main electric panel.

![Schematic depicting household wiring dispersion](image)

**Short circuit**: an overcurrent that exceeds the normal current rating of a circuit by a factor of many tens, hundreds, or thousands of times.

**Single-pole switch**: a standard on/off wall switch that has two terminals and controls one or more light fixtures from a single location.

**Three-way switch**: an on/off wall switch that has three terminals. Used to control one or more lights from two different locations.

![Single-pole toggle switch](image)  ![Three-way switch](image)

**Volt**: the Standard International (SI) unit of electric potential or electromotive force. **Electrical pressure** applied to electrons in a circuit. Symbol is V.
**Estimated Time**

2 hours

**Recommended Number of Students**

20, based on *BC Technology Educators’ Best Practice Guide*

**Facilities**

Classroom or computer lab, or shop with access to computer with Internet and projector

**Tools**

Markers for poster paper, or white board

**Materials**

Masking tape, pictures printed from electrical equipment sheet, definitions and headings from terminology sheet

**Optional**

This would be a great opportunity for a field trip to a job site in progress to show students electrical equipment and question their knowledge of some of the terminology. A field trip could be done to add to the activity, and/or add to other activities. It is also an opportunity for an electrician to come in as a guest speaker and bring some electrical equipment to show students, and to help explain some of the terminology.

If none of these options are available, the teacher could lead students on a tour around the school and show them electrical equipment. The teacher could show students the main electrical room. This would allow students to see the main electrical service and help to explain the operation of a working electrical installation.

**Resources**

All photos used in activity
Activity

1. Teacher should photocopy a sheet with all definitions and pictures for each group of students.
2. Teacher should view terminology with students and explain and discuss.
3. Teacher should view electrical equipment with students and explain and discuss.
4. Students break into groups of four or five.
5. Each group receives all terminology words and definitions separately and matches them up taped to a board, wall, chart, or poster paper. If samples are available students could attach the definitions to them.
6. Have each group present their definitions to the class when complete.
7. Teacher may post the electrical equipment photos and have students identify what they are and their use.

Evaluation Guidelines

The student:

• Correctly identifies terminology and definitions
• Participates in discussion and presentation of terminology and definitions
• Contributes to group work
• Can identify and explain electrical equipment

Extension Activity

Have students use the web to research:

• additional electrical terminology and definitions
• various types of electrical equipment, explaining what the equipment does and providing a picture of the equipment

Once students have retrieved this information, they can present and explain their findings to the class.