

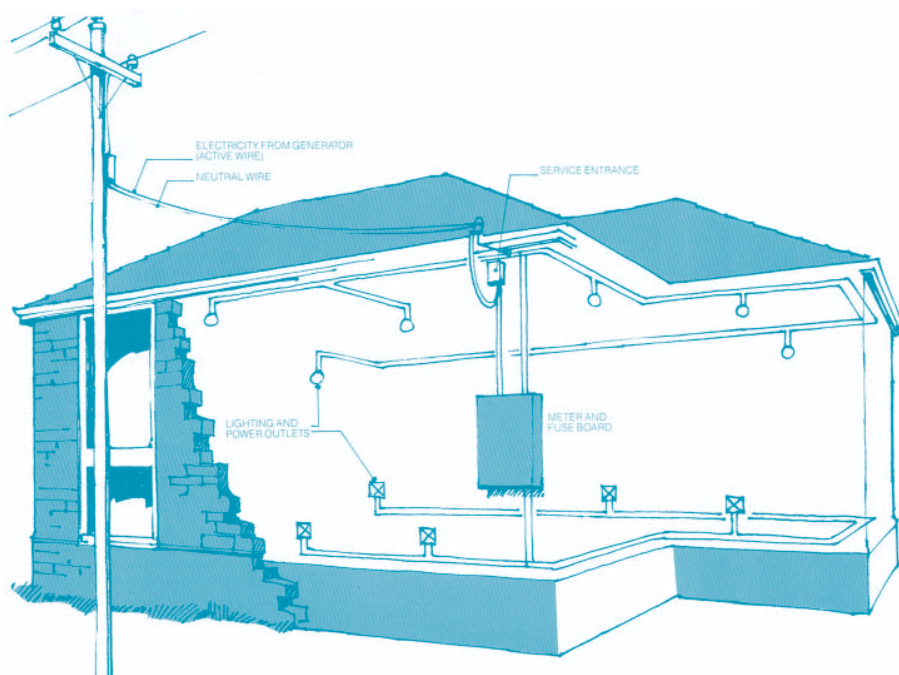
The discovery of Electricity

Electricity in the home



Electrical energy is distributed to the home at 230 volts. This is a standard voltage for electrical appliances in Australia. In some overseas countries, a 110-120 volts supply is used.

Electricity flows from the pole via conductors to the service point where the home wiring system begins. From the service point the power flows to the meter box where normally the measuring meters, fuses and relays are mounted.



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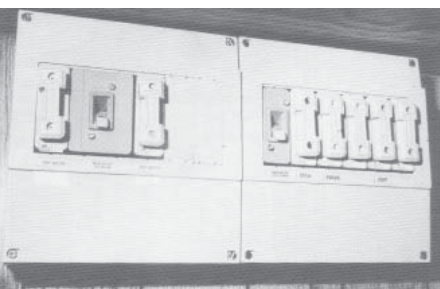


The discovery of Electricity

2



Meter



Fuse board



The meter box

When the electricity comes into a house, it first of all goes through a meter to measure how many 'units' (kWh) of electrical energy are used. After the meter, the electricity goes through the main switch, which can be used to cut off the electricity supply altogether if, for instance, repairs and changes have to be made to the wiring.

Circuits

For electricity to flow to a light or an appliance, a path must be provided for it to return to the generator in order to complete the <circuit>. Therefore, one wire (the active) carries electricity from the generator, the other wire (the neutral) returns electricity to the generator. Thus, there are at least two wires to each appliance.

If a house is correctly wired, a large number of electrical outlets (power points) are installed. This reduces the risk of overloading and eliminates the excessive use of extension cords and double adaptors.

When the electricity enters the house and flows through the meter, it is carried to a fuse board. From there a number of smaller wires or branch circuits carry the electricity throughout the house.

The fuse board

There is a fuse installed for each circuit and these are normally labelled. For example, your home may have one fuse for the electric hot water system, two for the power outlets, and two for the lights with another for the stove.

Fuses act as safety valves to protect the wiring and the people in the house. Wires can carry only a certain amount of electricity efficiently and safely, depending on their size and length. The more appliances connected to a circuit, the heavier the demand for electricity.

If more load is placed on the circuit than it was designed to carry, it would become overheated and a fire risk could occur. The fuse is a safety device which permits only a certain amount of electricity to flow. If too many appliances are used at once, the wire in the fuse will melt, "blowing" the fuse, disconnecting supply to that circuit.

Similarly, if an appliance becomes faulty in a dangerous manner, the circuit would be overloaded and the fuse would operate to protect the person. Many houses are equipped with <circuit breakers>, and the basic principle is the same.

<Map the power
Activity>



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The diScoveRy of Electricity

“Short circuits”

The most spectacular type of overloading occurs in a “short circuit”. A “short circuit” can occur, for example, when the insulation of two wires (active and neutral) in a cord wears through and the two bare wires touch each other. Alternatively, a bare active wire may touch a metal component on an appliance, which is earthed, and hence cause a “short circuit”. Many appliances have the two wires providing the circuit and a green-yellow “earth wire”. One end of the earth wire is connected to the body of an appliance and the other to an earth stake, and in some cases the water pipe. A short circuit to earth causes an increase in current which in turn melts the fuse or trips the circuit breaker, disconnecting supply from that circuit.

In Victoria, it is mandatory that safety switches are installed in all new premises and in premises where major renovations are undertaken. A safety switch monitors the flow of electricity through a circuit, detects a problem as soon as the current leaves the circuit (i.e. when the current in the active does not equal the current in neutral) and turns the power off within 0.03 of a second. That’s quick enough to *<help save your life and help prevent costly fires or damage to property.>*

If you accidentally touch a wire connected to the power supply the current can pass through your body to earth and the result can be fatal.

Accidents can be prevented by careful and regular attention to all electrical appliances and leads. It is essential that worn cords are replaced, that earth wires are properly connected and that care is taken at all times.



Safety Switch

<Simple circuits Activity>

<Simple safety> rules

- 1 Do not attempt repairs unless qualified.
- 2 Never use electricity in a wet or damp situation, as water is a good conductor.
- 3 Replace all defective appliances and frayed cords.
- 4 Keep clear of power lines.
- 5 Do not meddle with switched on appliances.
- 6 Have a sound knowledge of first-aid procedures.

Further information

Circuits

www.energyquest.ca.gov/story/chapter04.html



Activity Map the power

Investigate

Draw a plan of your home identifying all the power points and light-fittings (sockets for light-globes – usually in the ceiling). Make sure you include the location of the fuse-box.

Fill in the table below as you draw your plan.

Warning!

Always have an adult with you when you look at the fuse and meter box. Never touch any of the fuses or wires inside the meter box.

Room	How many power points?	How many light fittings?	Electrical Appliances in the room/area
Bedroom 1			
Bedroom 2			
Bedroom 3			
Kitchen			
Bathroom			
Laundry			
Living Room			
Dining Room			
Outside			

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1. How many fuses does your meter box have?
2. What are the fuses for? (Look at the labels on the fuses)
3. Why do you think there are separate fuses for different functions?
4. Do you have any rooms with too many appliances for the number of power-points?
5. Use the internet to find out how fuses work.

Simple circuits Activity

There are two types of circuits used for wiring up houses and electrical appliances. Series circuits have all the components in a line, with current flowing through all the appliances one after the other. In parallel circuits, the current splits up and flows through separate paths through each component.

You will need:

Crocodile clips
and leads

Small light globes

6 V battery or
powerpack

Switches

Ammeter/Voltmeter

Check it out

Before you start, check out these websites for information on circuits and components:

- A Rough guide to electronics:
<<http://www.madlab.org/electrnx/electrnx.html#contents>>
- All about Circuits: <<http://www.allaboutcircuits.com/>>
- Hyperphysics: All about electricity and magnetism:
<<http://hyperphysics.phy-astr.gsu.edu/hbase/emcon.html#emcon>>

To do:

1. Choose one room in your house plan and design a series circuit and a parallel circuit to power all the light globes and power points in the room. Use switches to represent the power-points and small light-globes for the light fixtures.
2. Draw your circuits using conventional symbols.
3. Build your circuits and then test them out:
 - What would happen in your room (circuit) if one light globe wasn't working?
 - Could you still use the other power points if one wasn't switched on?
 - Measure the voltage and current going across each component in each circuit.

Warning!

Don't touch or use any electricity that plugs into the wall or a socket. Build and test your circuit using batteries only.

Questions

1. Which circuit would work best for your room – the series circuit or the parallel circuit? Use your investigations to give reasons for your answer.
2. Which type of circuit would be used for wiring up your house?
3. In cheap Christmas tree lights, when one globe blows, the rest of the lights go out as well. Are the lights in series or parallel? Explain your answer.

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Activity written by Michaela Patel
on behalf of STAV Publishing.



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