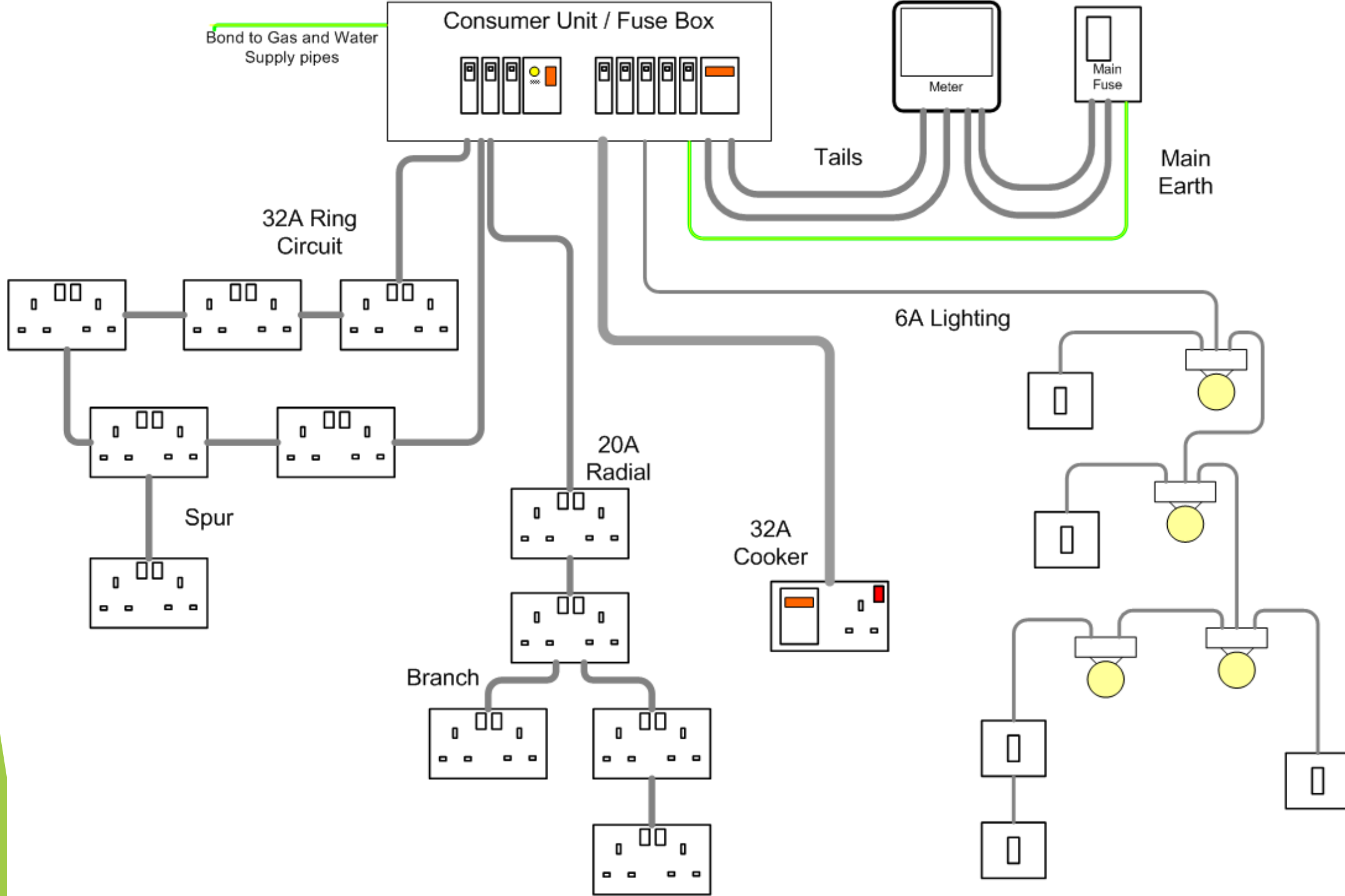


Home Electrics

From changing a light bulb to rewiring a house.

Lets get started

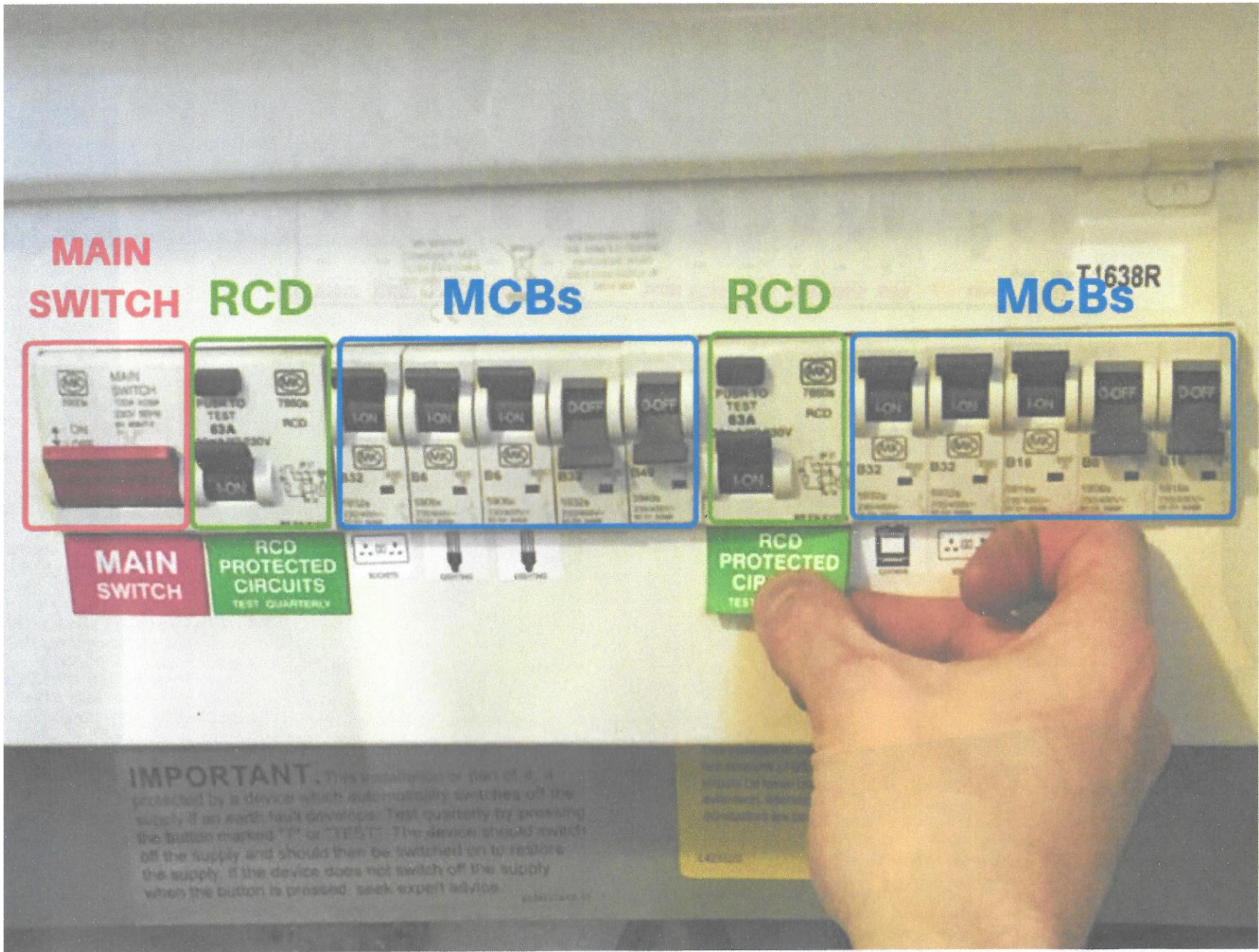
- ▶ Today I hope to give you a quick insight on how your home is wired in the two major sources of electrical power we use in our homes on a daily basis.
- ▶ These are:
 - ▶ The consumer unit fuse box.
 - ▶ The ring main of power sockets.
 - ▶ The lighting circuit.



Consumer box / Fuse box

- ▶ First rule of thumb before doing any work on the electrics is to
‘Turn the power OFF’.
- ▶ This can be done by either using the main switch in the consumer box or switching OFF the circuit you are working on.
- ▶ To turn the circuit off:
 - ▶ In the case of a fuse box pull out the fuse of the circuit you are working on.
 - ▶ In the case of a trip switch box just trip the switch to the off position, usually down.
- ▶ A Live & Neutral phase (supply) is presented at the consumer box via your meter. The case of a fuse box it will have various sizes of fuses ranging from 5 to 60 amps or in the case of a RCD trip switch box it will have trip switches ranging from 6 to 63 amps.
- ▶ **RCD** stands for: **R**esidual **C**urrent **D**evice.
- ▶ A consumer box is really just one big Junction box distributing the electrical circuits throughout the house.





MAIN SWITCH

RCD

MCBs

RCD

MCBs T1638R

MAIN SWITCH

RCD PROTECTED CIRCUITS
TEST QUARTERLY

RCD PROTECTED CIRCUITS
TEST

IMPORTANT. This installation or part of it, is protected by a device which automatically switches off the supply if an earth fault develops. Test quarterly by pressing the button marked "T" or "TEST". The device should switch off the supply and should then be switched on to restore the supply. If the device does not switch off the supply when the button is pressed, seek expert advice.

Colours & Sizes of the Wires

OLD CABLES

LIVE WIRE RED 7029 or 3029
 NEUTRAL WIRE BLACK 7029 or 3029
 EARTH WIRE GREEN WIRE 3029

NEW CABLES

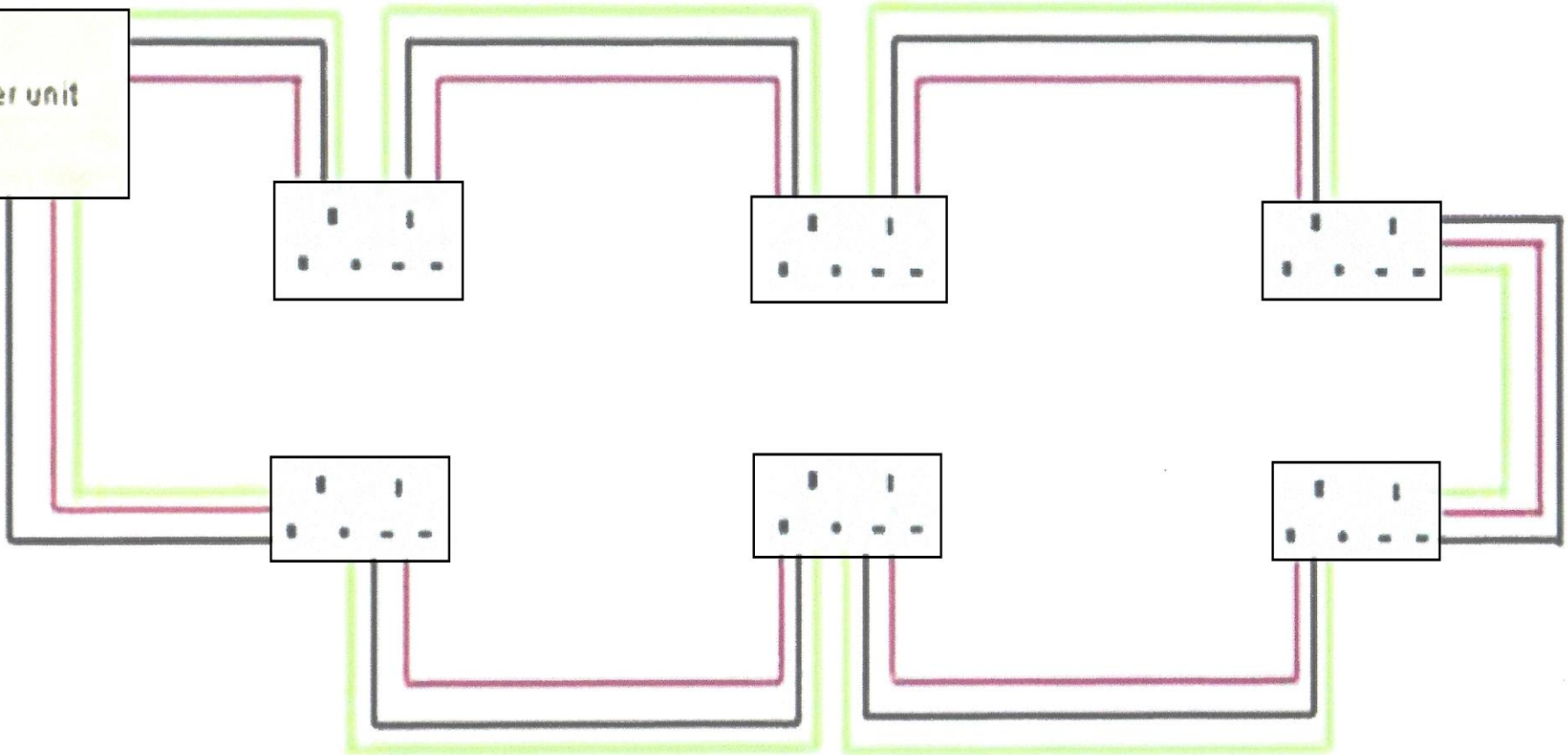
BROWN 2.5mm or 1.5mm
 BLUE 2.5mm or 1.5mm
 GREEN/YELLOW 1.5mm

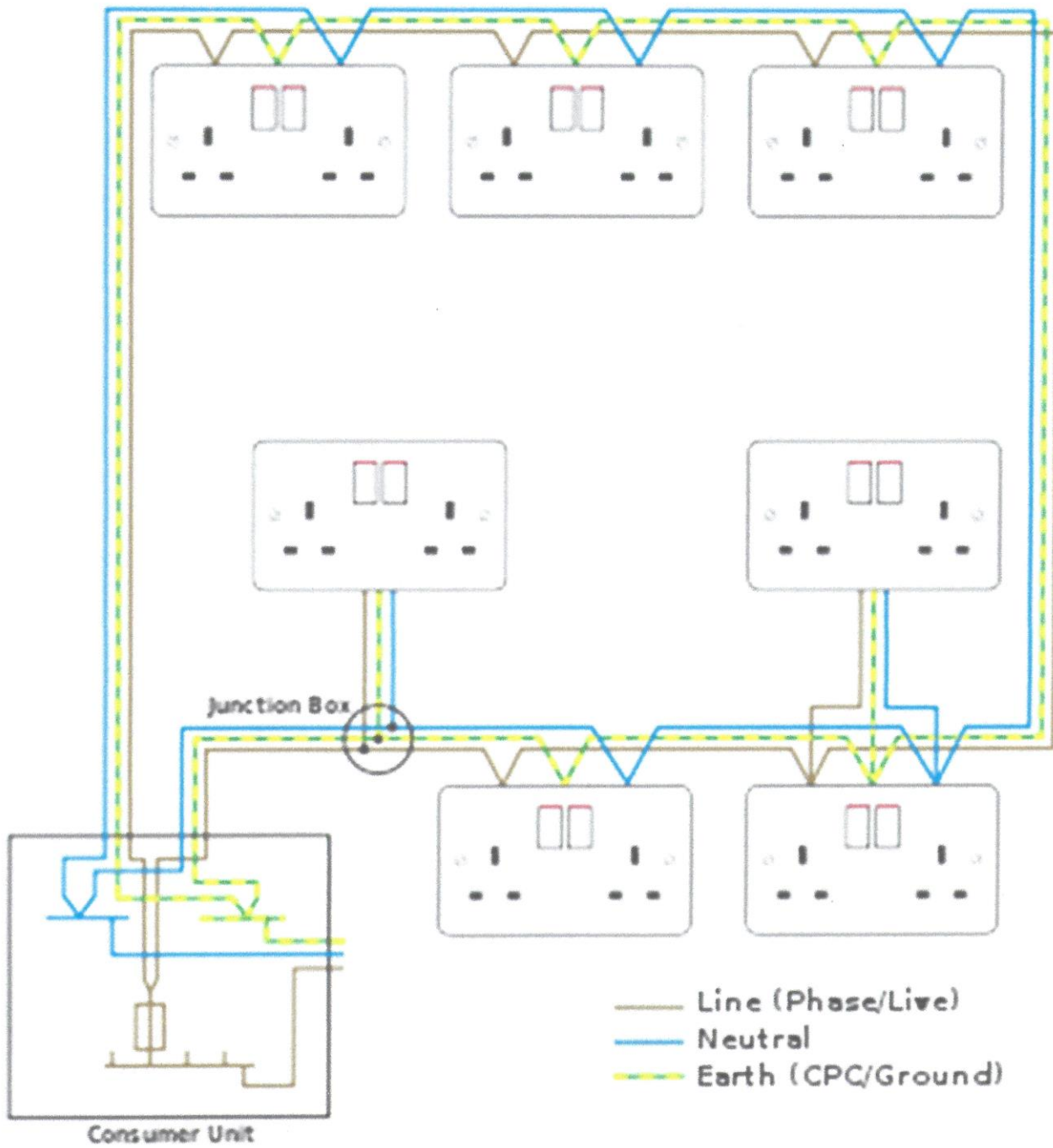
	Pre-1977 IEE	Pre-2004 IEE	Current IEC
Protective earth (PE)			
Neutral (N)			
Single phase: Line (L)			

The Ring Main Circuit

- ▶ A ring main circuit is the main power source to operate all electrical appliances i.e. computers, televisions & cleaning equipment etc and consists of a cable that runs out of the consumer box, connecting all the plug sockets up in the house.
- ▶ Then from the last socket, the cable runs back to the consumer box forming a ring circuit. The connection of the two cables at the consumer box should be connected by a qualified electrician .
- ▶ **Ring main circuits** are wired in 2.5mm cable which has one strand of copper wire conductor in each of the brown, blue & earth wires.
- ▶ However be aware of old cables that have been used mainly wired in older types of properties which have been cabled in **7029** cables which have 7 small strands of wire for the red live wire, 7 small strands of wire for the black neutral wire & 3 small strands of wire for the earth wire.
- ▶ Ring mains circuits are protected either by a 30 amp fuse in the consumer box that has fuses, or a 32 amp circuit breaker in a consumer box that trip switches (RDC).

Consumer unit





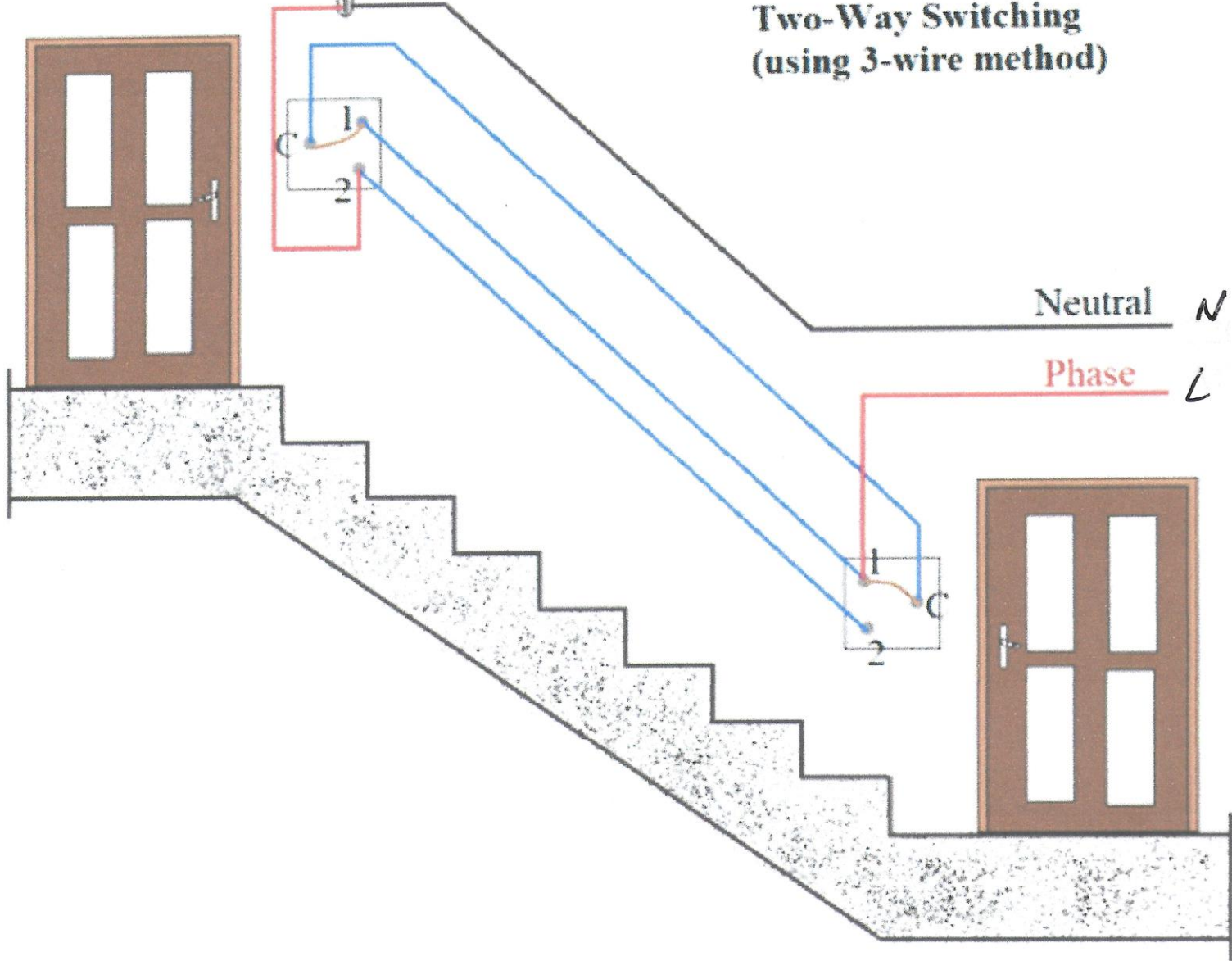
- Line (Phase/Live)
- Neutral
- - - Earth (CPC/Ground)

Consumer Unit





Lighting Circuits

- ▶ The lighting circuits for all the lights in the property have just one cable that runs out from the consumer box connecting all the ceiling roses up in each of the rooms in the house.
- ▶ Unlike the ring main circuit there is no return cable on this circuit back to the consumer box.
- ▶ **The lighting circuit** is wired in 1.5mm cable, although nowadays some of these circuits have been wired in 1mm cable due to the lower wattage of bulbs we now use.
- ▶ This cable also has one strand of copper wire conductor in each of the Brown, blue & earth wires
- ▶ Again be aware of old cables wired in 3029 cables mainly used in older types of properties. This type of cable will have 3 small strands of wire for the red live wire, 3 small strands of wire for the black neutral wire & three small strands of wire for the earth wire.
- ▶ These circuits are protected by either a 5 amp fuse in the consumer box that has fuses, or a 6 amp circuit breaker in the consumer box with trip switches (RDC)
- ▶ The earth wires in all these cables are bare wire within the cable itself and will have to be protected with a green/yellow sleeve when connecting the earth to a socket.

**Two-Way Switching
(using 3-wire method)**



Light bulbs - Lumens vs Watts

BRIGHTNESS IN LUMENS		220+	400+	700+	900+	1300+
 STANDARD	25W	40W	60W	75W	100W	
 HALOGEN	18W	28W	42W	53W	70W	
 CFL	6W	9W	12W	15W	20W	
 LED	4W	6W	10W	13W	18W	

Types of light bulb fitting

B22



B15



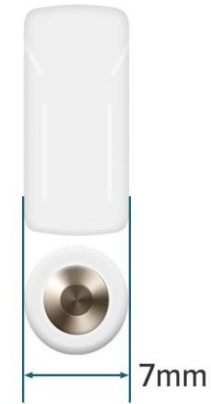
E27



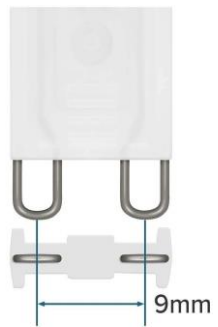
E14



R7



G9



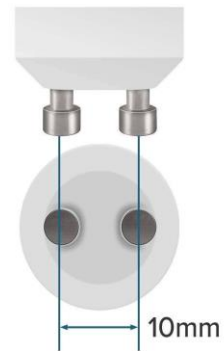
G4



GY6.35



GU10



GU5.3/MR16



Safety first

- ▶ Any property that has 7029 or 3029 cables must be replaced a.s.a.p.
- ▶ In a property with two (or more) floors and requires two (or more) ring mains and two (or more) lighting circuits, the best practice is to split both these circuits across the two (or more) floors.
- ▶ Should one of the circuits go out due to a faulty bulb or faulty appliance, then you are not completely without power or lights on any of the floors.
- ▶ To calculate how much load to have on any one particular wiring circuit, multiply the voltage by the amperage which will give the wattage, this is expressed as:

$$v \times a = w$$

- ▶ For example on a ring main that is protected by a 30 amp fuse in a consumer box = 7,200 watts and on a lighting circuit that is protected by 5 amp fuse = 1,200 watts.
- ▶ On a consumer box that has circuit breaker switches, a ring main that is protected by a 32 amp trip switch (RDC) = 7,680 watts and on a lighting circuit that is protected by 6 amp trip switch (RDC) = 1,440 watts.
- ▶ If the fuse blows or the circuit breaker switch trips out and cuts off the power to that circuit, this has happened in order to protect the wiring from overheating because there could be too many appliances running on the same circuit.

AMPS

- ▶ Amperage is a way to measure the amount of electricity running through a circuit. Amperage is the "rate" that current is flowing through the circuit or the number of electrons moving through the wire.
- ▶ You might come across amps if you look inside your home's consumer box. You'll see [different circuit breakers listed](#) as 6amps 15 amps, and 32 amps. The larger the amperage, the more electricity can flow through the circuit. Again, large appliances like air conditioners, washers and dryers will be connected to 32-amp circuits, while most outlets in a home will be powered by 6-amps or 15-amp circuits.
- ▶ The unit is named after French physicist André-Marie Ampère, one of the fathers of electromagnetism.

VOLTS

- ▶ Voltage is a measurement of the electric potential or "pressure" at which electricity flows through a system. Voltage is also described as the speed of individual electrons as they move through a circuit and is measured in units called volts.
- ▶ Volts are named after the Italian physicist 'Alessandro Volta', who built one of the first batteries in the 1800's.

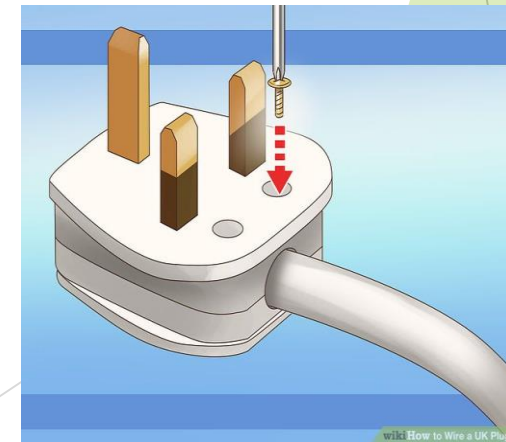
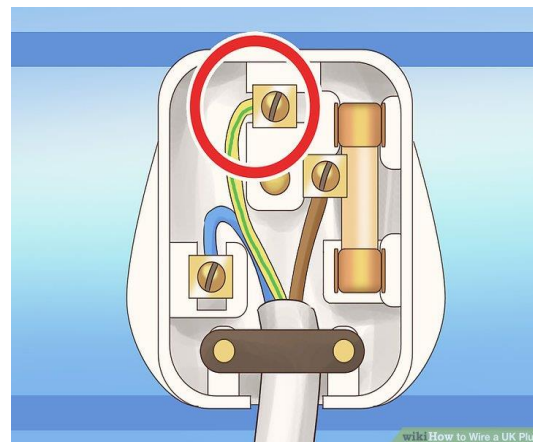
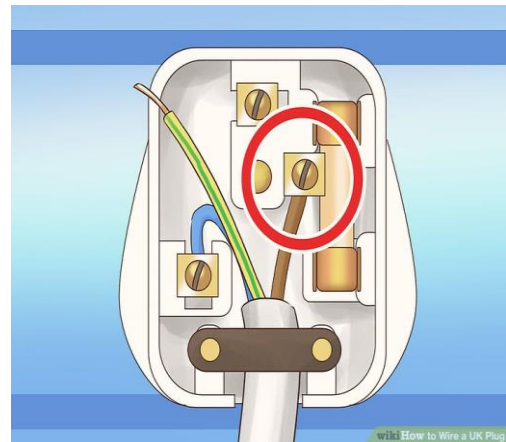
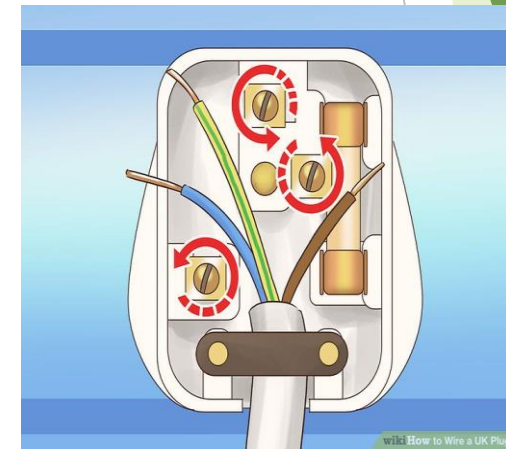
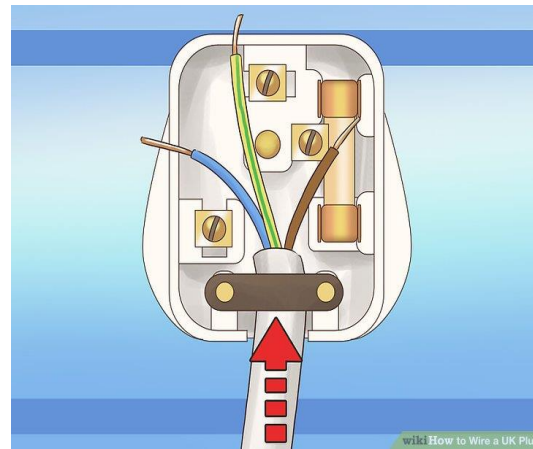
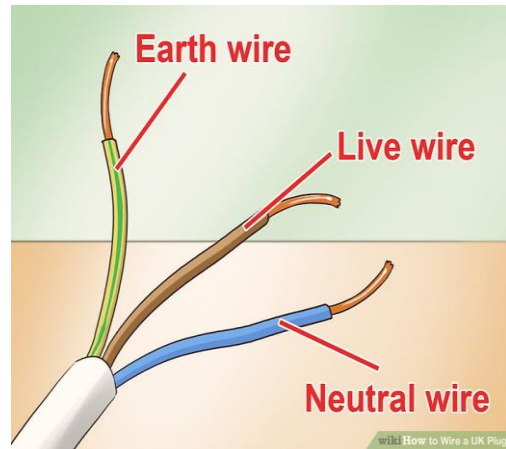
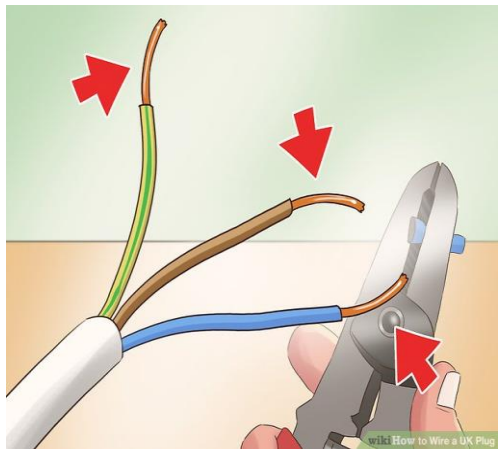
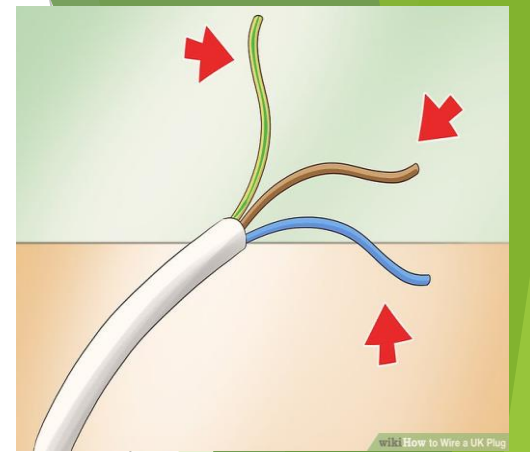
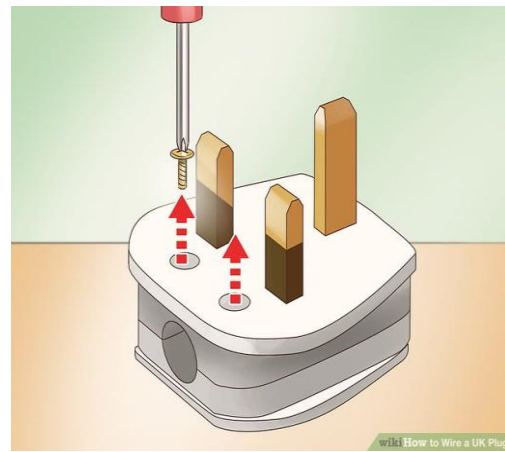
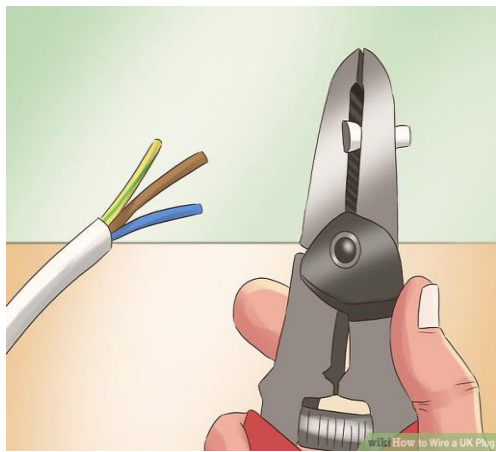
WATTS

- ▶ Of all these different units of electricity, **wattage** is probably the most familiar. For years, you've been buying 40 & 60 watt light bulbs. A light bulb of 60-watt is generally understood is brighter than a 40-watt bulb.
- ▶ Wattage, is the amount of power an electric device consumes. Another way to think about wattage is "electricity at work" – the power it takes to actually do something, whether it's running a vacuum (400 to 900 watts), ringing the doorbell (2 to 4 watts) or illuminating a light bulb (40 to 75 watts).
- ▶ To calculate wattage, you simply multiply voltage (pressure/speed) by amperage (volume), expressed as $V \times A = W$. The faster each electron moves through the circuit and the greater the volume that the circuit can hold, the higher the wattage.
- ▶ Wattage is named after James Watt, the Scottish engineer who popularized the steam engine.

OHMS

- ▶ Circuits are made up of wires and wires are not always perfect conductor's electricity. Most electrical wiring in the home is made of copper and both of those materials have a certain amount of resistance or friction, which slows down the flow of electricity. When electricity passes through electrical devices and appliances, they also apply their own resistance built in these devices and appliances.
- ▶ Therefore this resistance is measured in ohms, which are named after the German physicist and mathematician Georg Simon Ohm.

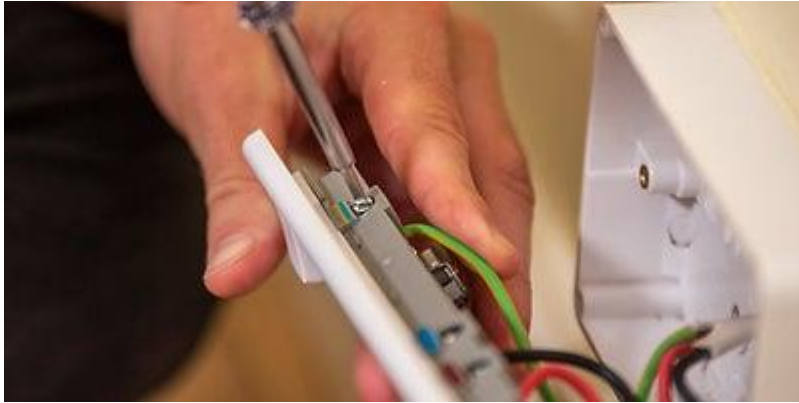
Wiring a plug




Changing a plug Socket



Changing a plug Socket (Cont)




Rewiring a house



**DOES MY HOUSE
NEED
REWIRING?**

Follow our guide to help answer any questions that you may have before you agree for someone else or yourself to alter your electrical wiring.



Rewiring a house has many factors to consider such as cost, how long it will take and how the work will affect your day-to-day life whilst the project is ongoing.

HOW MUCH DOES IT COST?



**2 BED
TERRACE**
£2,200 -
£3,000

PRICE OF A REWIRE DEPENDS ON:

Whether the house is occupied
or vacant

How many bedrooms there are

The overall size of the property

The age of the property

Where you live in the country

Who you hire



3 BED SEMI
£2,800 -
£4,000

4 BED DETACHED
£4,000-£6,000



ALTERNATIVELY, YOU COULD LOOK INTO TRAINING UP AS A DOMESTIC ELECTRICIAN AND COMPLETING THE WORK YOURSELF!

WHAT DOES A REWIRE INVOLVE?

A full rewire means all electrical cable is replaced and a new consumer unit installed



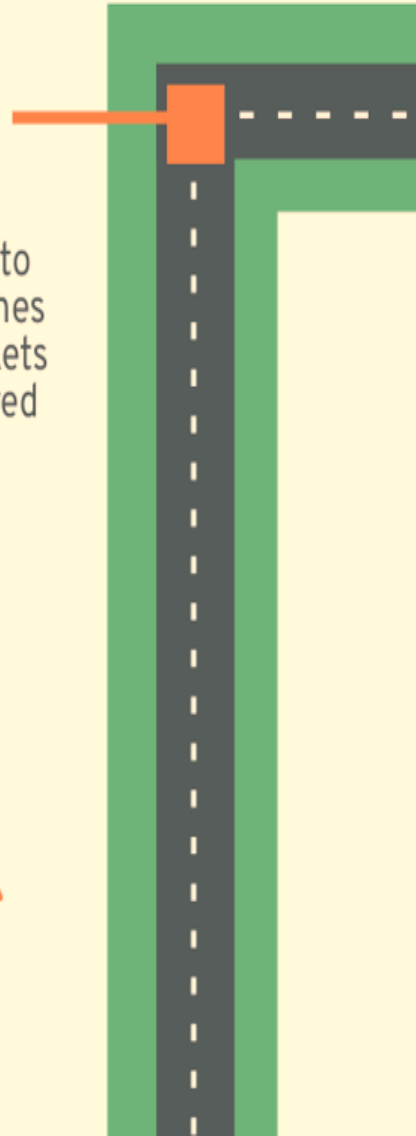
2-4 weeks is the average time to complete



New cabling is fitted underneath the floor and buried in the walls



Access to all switches and sockets is required



The main reason for rewiring a house is due to

OUT OF DATE OR FAULTY WIRING

Faulty wiring can be **VERY DANGEROUS** and each year causes...



750
accidents in the home



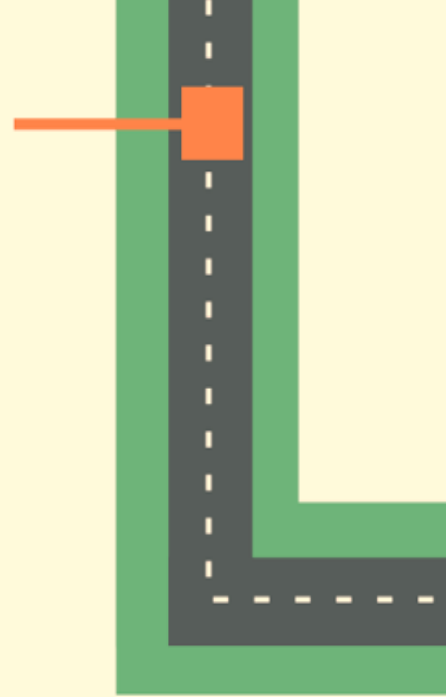
12,500
house fires



more than
30
deaths

WARNING SIGNS YOU NEED A REWIRE

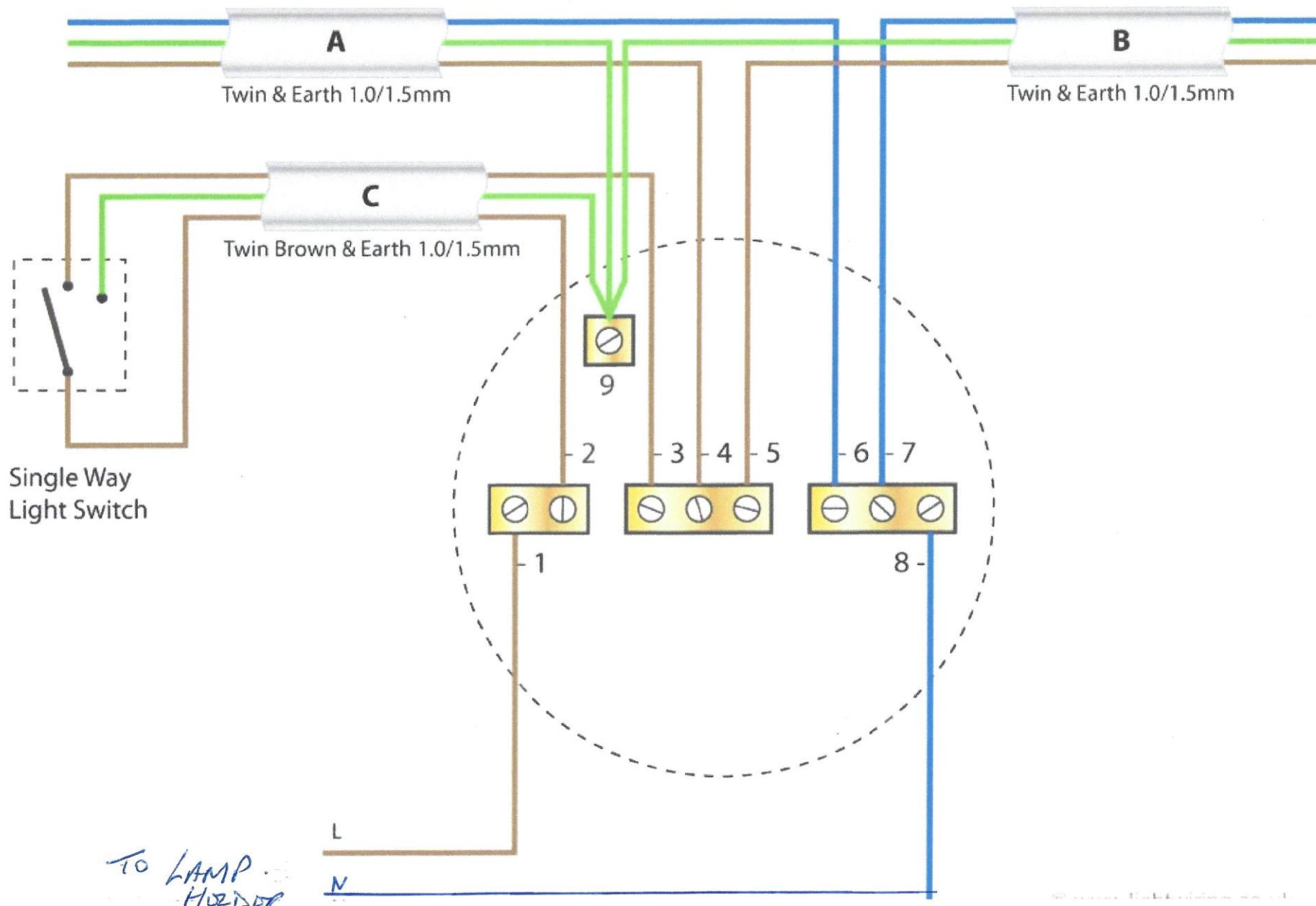
- ✓ A consumer unit with wooden backing, cast iron switches, a black electricity cable or no labeling.
- ✓ Out of date plug sockets: broken or cracked sockets and rounded entries as opposed to 3-pin varieties.
- ✓ Breakers that trip repeatedly.
- ✓ Old cable colours or aluminium wiring present in the home. Check to see if your cables include an earth cable/path.
- ✓ Flickering or dimming lights that need to be changed regularly.

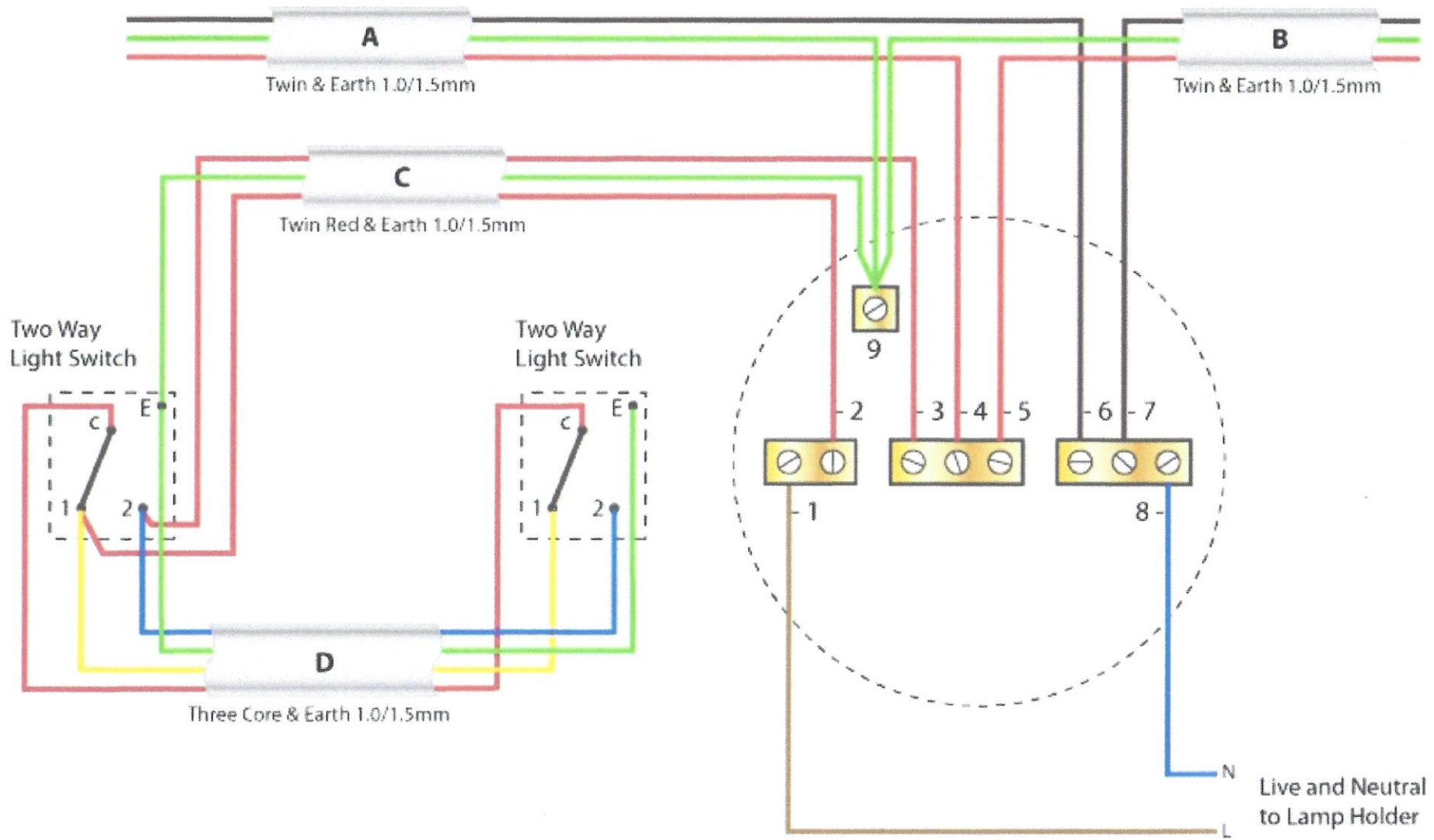


**IF YOUR PROPERTY HAS NOT BEEN REWIRED
WITHIN THE LAST 25 YEARS, IT WILL NEED
UPGRADING!**

Appendix

The background features a complex, abstract design of overlapping, semi-transparent green triangles and polygons. The colors range from light, pale greens to deep, dark forest greens. The shapes are layered, creating a sense of depth and movement. The design is primarily concentrated on the right side of the page, with some elements extending towards the center.





N
L
Live and Neutral
to Lamp Holder