Unit 19 : Developing Electrical Installation Skills

LEARNING OBJECTIVES

TO DESCRIBE THE DANGERS INVOLVED WHEN WORKING WITH ELECTRICITY.

Key Words

Voltage
PAT
Mandatory

PERSONAL PROTECTIVE EQUIPMENT

When carrying out basic electrical installation processes make sure you are using the correct Personal Protective Equipment (PPE).

Safety gloves

Gloves should be worn to:

- Cut metal conduit with a hacksaw
- Cut large cables with cutters
- Handle any sharp materials

Goggles

Eye protection will need to be worn if you are using equipment that would cause particles to fly off towards your face.

Safety boots

The soles of safety boots are made from an insulating material. This stops an electric current passing through your body to earth and keeps you safe.

Know what PPE you need for the tasks you will be doing.

PPE - INSTALLING A CIRCUIT

Isolate power supply

This is a very important operation. You must ensure that the power is switched off to prevent any electrical shock while you are at work.

Make sure that the power supply is set to off and locked off by your tutor so it cannot be switched on without their intervention.

SAFE MAINTENANCE AND STORAGE OF TOOLS AND EQUIPMENT

You will need to make sure that the tools you are using:

- Have electrical insulation on them
- Work correctly, for example a multimeter
- Are sharp for cutting wires and insulation

Any broken tools will need replacing or maintaining so that they are in good working order.

WORKING RESPONSIBLY WITH OTHERS

Maintain a clean and tidy work environment

Good housekeeping is essential in order to maintain a safe working environment. This means:

- Not leaving any sharp objects on the floor or working surface
- Removing all packaging which is a fire risk
- Cleaning away all wire offcuts and insulation
- Placing all tools and equipment into tool bags and storing after use
- Emptying rubbish bins and disposing of waste safely

WORKING RESPONSIBLY WITH OTHERS

Working responsibly

Working with electricity is dangerous. You must not:

- Switch on any live supply to your board unless a tutor is present
- Leave any exposed copper wiring
- Cut a live wire
- Plug anything into a socket without your tutor present

WORKING WITH ELECTRICITY

According to the Health and Safety Executive, there are approximately 1,000 major electrical related injuries reported each year.

These can involve burns and electrical shocks and of these injuries *around 30 of them are fatal*

WHAT ARE THE HAZARDS

TASK 1

Working in pairs, think of the main hazards of electricity

MAIN HAZARDS

- Contact with live parts causing shock and burns (normal mains voltage)
- Faults which could cause fires
- Fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere, e.g. in a spray paint booth
- Equipment that is unsuitable for its working environment
- Faulty equipment

PREVENTING ELECTRIC SHOCKS

Never:

- Carry electrical equipment by the cable
- Remove plugs by pulling on the lead
- Allow tools to get wet; if they do, get them checked before use.

Always:

- Check equipment, leads and plugs before use
- Keep cables off the ground to avoid damage/trips
- Keep cables away from sharp edges
- Keep equipment locked away and labelled to prevent it being used by accident
- Use cordless tools where possible
- Follow all instructions
- Isolate sockets, equipment etc from power source when working on them

DANGERS OF ELECTRICITY

Electricity is an invisible killer. You can get an electric shock from:

- Working closely to live overhead cables
- Plastering a wall with an electric socket
- Carrying out maintenance work on a floor
- Drilling into a wall

TASK 2

Working in pairs, think of as many ways as you can to reduce the risk of electrocution

DEALING WITH ELECTRIC SHOCKS

- Always disconnect the power supply first before helping someone
- Don’t touch the person until they are clear of the supply
- Call an ambulance immediately
- Check for response and breathing
- Check area is safe and then start resuscitating the victim

HOW CAN THE FOLLOWING REDUCE THE RISK OF ELECTROCUTION?

110 VOLTS

- In the UK, the line voltage is 230 volts and this voltage can be lethal in a wet construction site.
- On site the use of equipment running on 110 volts is now mandatory to meet the requirements of Health & Safety laws.
- The step down transformer used has a centre tapped secondary winding of 55v+ 55v make 110 volts. The centre tap is earthed to the power tool etc, thus making the maximum potential for electric shock at 55 volts - sub lethal.

110V EQUIPMENT

A 13A PLUG-IN RESIDUAL CURRENT DEVICE

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- The safety RCD adapter continuously monitors the power supply to an electrical appliance and cuts off the power within 40 milliseconds if an earth current fault is detected. This is fast enough to prevent a fatal electric shock.
- Electrical appliances can become dangerous if the wiring becomes loose, or their power cords become damaged or if they get wet. Electrocution is also possible if fingers, wet hair or other conductive bodies enter the appliance. In all these cases the safety RCD adapter will instantly cut off the electricity before you or a member of your family receives a potentially fatal electric shock.

- Where might we use a RCD?

- What is an MCB?

https://www.youtube.com/watch?v=ERuwXvOvZhk

PAT TESTING

Make a note of what details are required on the PAT tested sticker.

PAT TESTING

PAT testing (Portable Appliance Testing) is an important part of any health & safety policy and a legal requirement.

- 1. Where appliances are used by employees.
- 2. Where the public may use appliances in establishments such as hospitals, schools, hotels, shops etc.
- 3. Where appliances are supplied or hired.
- 4. Where appliances are repaired or serviced

PAT TESTING

- PAT testing is applicable to both 110 and 230 volt equipment.
- The HSE states that PAT testing power tools on construction sites should be carried out every 3 months.
- **Find a piece of equipment that has been PAT Tested and describe/draw the information given on the label**

VARIOUS VOLTAGES

230 VOLTS

BLUE

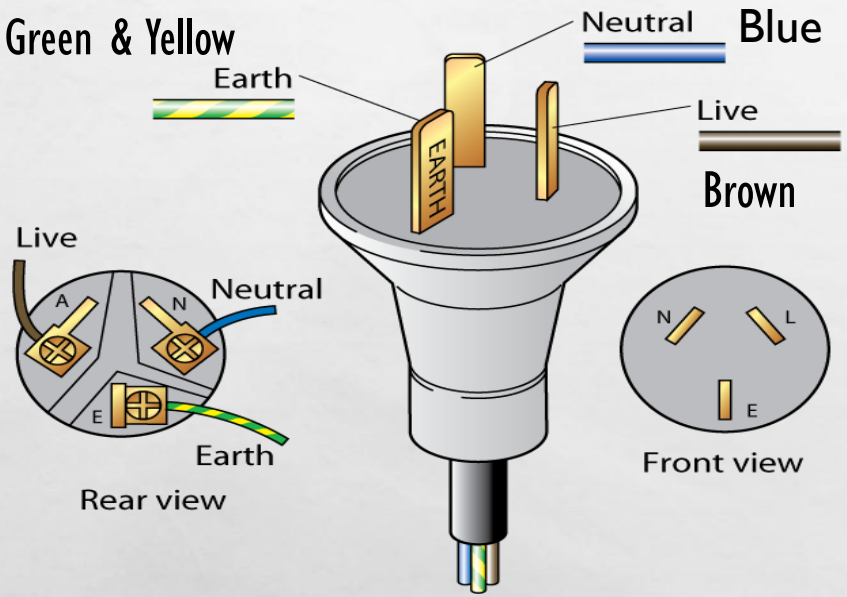
110 VOLTS

YELLOW

415 VOLTS

RED

VOLTAGES



There are two main types of voltage in the UK:

- 230 v
- 110 v

On construction sites 110 volts is used. A transformer should be used to convert the 230 V to 110 V.

In the wiring there should be three wires.

- The live and neutral carry the alternating current.
- The earth wire is a safety device.

VARIOUS VOLTAGES

- The voltage on construction sites should be 110 Volts.
- The standard voltage through out the uk is 230 Volts.
- 415 Volts is used when extra power is required i.e. woodwork machinery.

415 VOLTS MACHINERY

CONVERTS 230V POWER

INPUT TO 415V

SPINDLE MOULDER

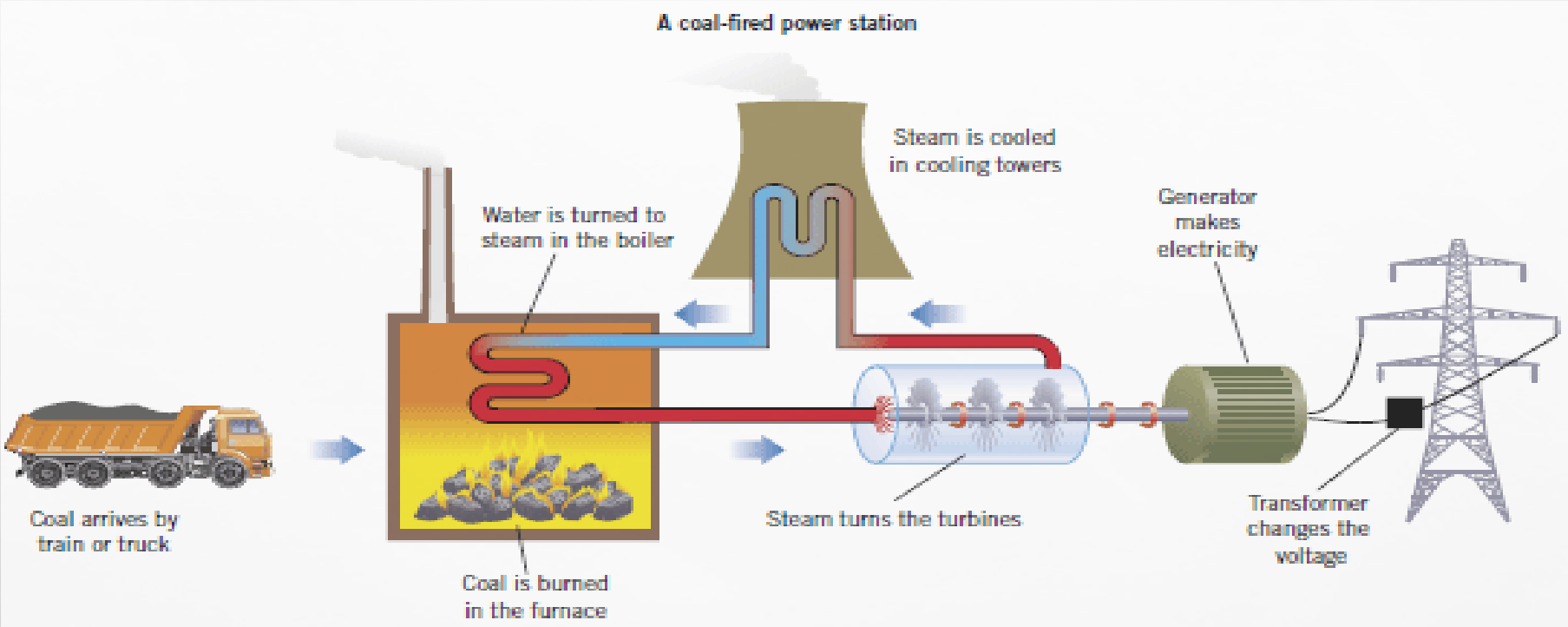
RADIAL ARM SAW

SATRO mobile

AN ELECTRIC SHOCK

ALWAYS NEEDS MEDICAL ATTENTION EVEN IF THE SYMPTOMS CANNOT BE SEEN OR THE PERSON FEELS FINE AFTERWARDS!

In the UK, our electricity is generated in a number of different ways. It is important to have different fuel sources and technologies to generate electricity so that we have a constant supply and are not overly reliant on one type of power generation.
Below is an example of a coal-fired power station.
DISCUSS and draw other types of power stations.



Most of the UK's electricity is produced by burning **fossil fuels**, mainly natural gas (42% in 2016) and coal (9% in 2016). A very small amount is produced from other fuels (3.1% in 2016). The volume of electricity generated by coal and gas-fired power stations changes each year, with some switching between the two depending on fuel prices.

21% of our electricity comes from **nuclear reactors**, in which uranium atoms are split up to produce heat using a process known as fission. The UK's nuclear power stations will close gradually over the next decade or so, with all but one expected to stop running by 2035. Several companies have plans to build a new generation of reactors, the first of which could be running by 2018.

Renewable technologies use **natural energy** to make electricity. Fuel sources include wind, wave, marine, hydro, biomass and solar. It made up 24.5% of electricity generated in 2016 - this will rise as the UK aims to meet its EU target of generating 30% of its electricity from renewable sources by 2020.

Source - https://www.energy-uk.org.uk/our-work/generation/electricity-generation.html