TOPIC 2

ACCESSORIES & TOOLS IN ELECTRICAL INSTALLATION

LEARNING OUTCOMES:

APPLY THE CONCEPT AND PRINCIPLE OF ELECTRICAL SAFETY AND REGULATION IN PERFORMING ELECTRICAL WIRING ACCORDING TO MS IEC 60364

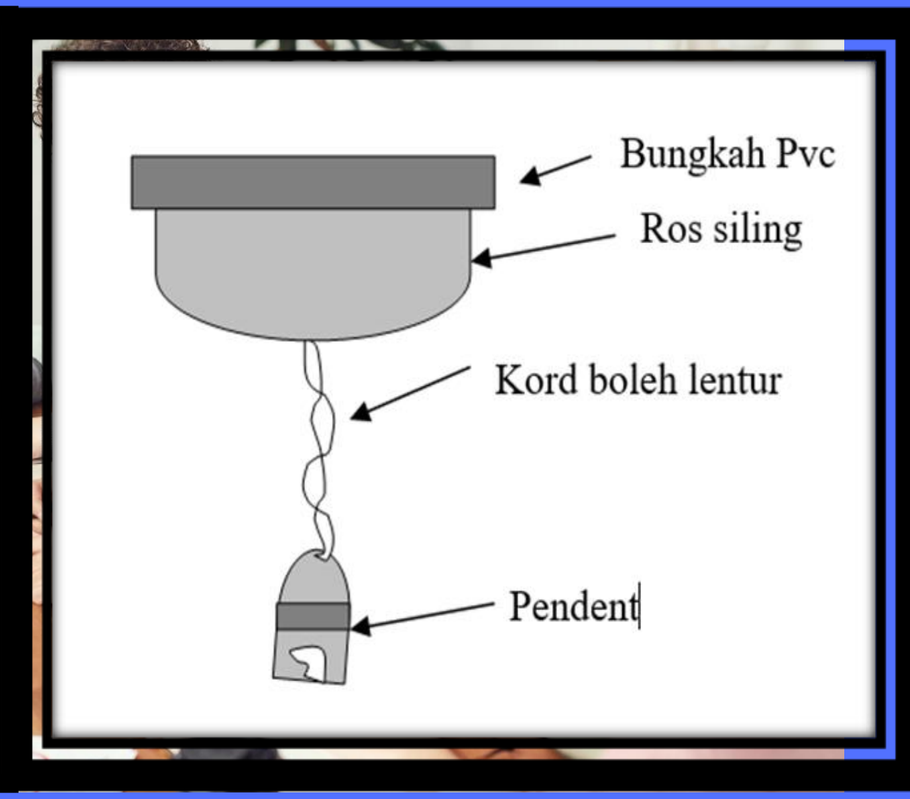
WHAT YOU SHOULD KNOW

1. Remember the function and installation method of the accessories for electrical installation.

1. Understand the usage of the electrical installation tools

Domestic Installation Accessories

1. CEILING ROSE



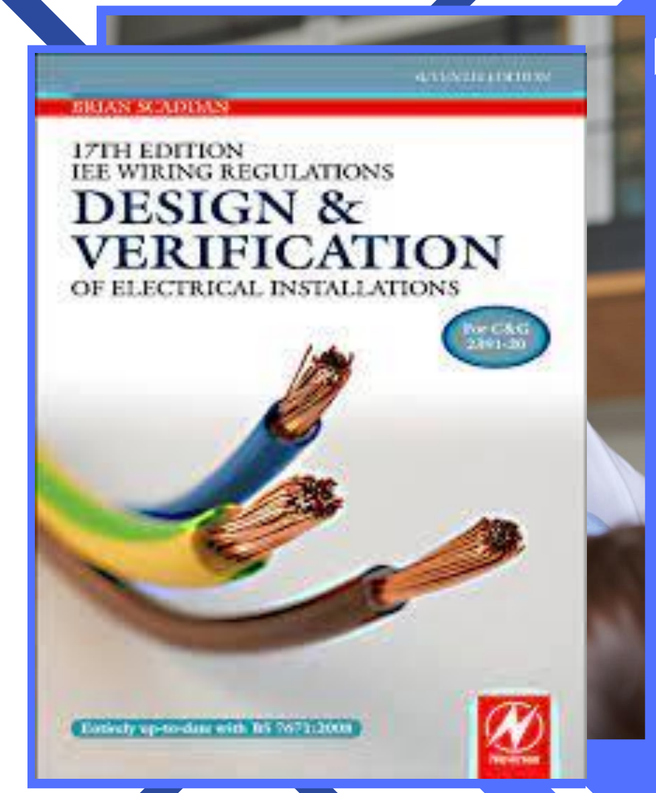
- The ceiling rose is the finishing connection point for fixed wiring

- From the Ceiling Rose will be connected to a flexible cord for connection to loads such as lights, fans and etc

IEE REGULATION

(Institution of Electrical Engineers Wiring Regulations)

- Ceiling roses shall not be installed in any circuit operating at a voltage not normally exceeding 250 only.
- Ceiling roses cannot be used for the installation of more than one product unless they are specifically designed for multiple products.
- The earth source of the ceiling rose shall be connected to the earth continuity conductor for each and sub circuit.
- Permanent phase twists should not be used on fixed wiring unless it is not easily touched.

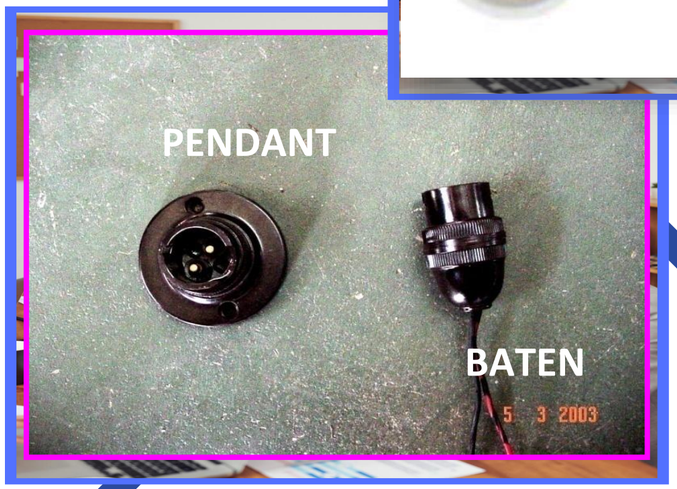


2. LAMPS HOLDER

- Used to hold the lamp and can facilitate the connection of the lamp to the supply.

- It is designed so that the lamp can be removed and replaced quickly.
- The lamp holder has two terminals namely for the phase conductor connection source and neutral to connect to the lamp

- Pangkal Kilas - up to 150W
- Skru Edison - up to 200W
- Skru Goliath - more than 200W



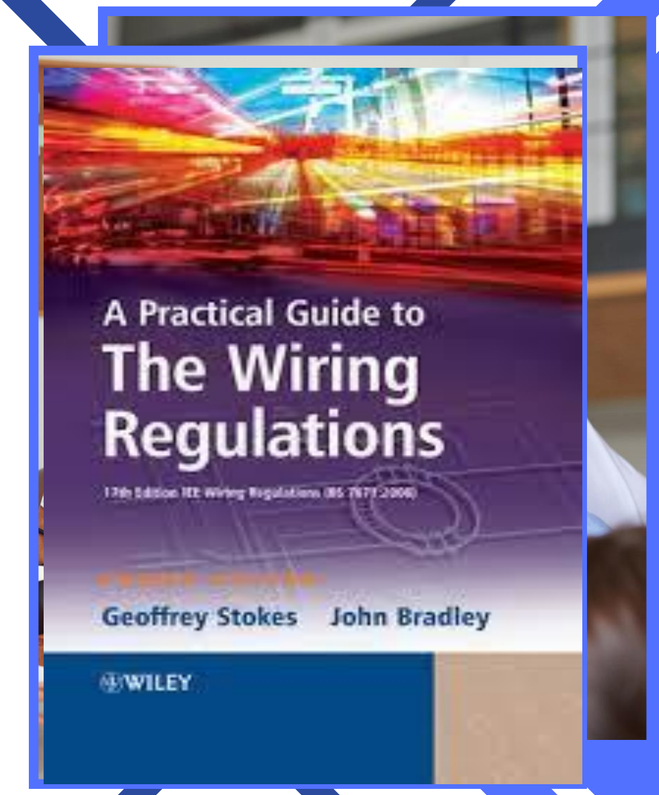
- Mentol pangkal kilas

- Edison screw light bulb

- Goliath screw bulb

IEE REGULATIONS

- Supply voltage does not exceed 250V
- Types of torque bases installed in damp & easily accessible areas must be earthed.
- Must be heat resistant



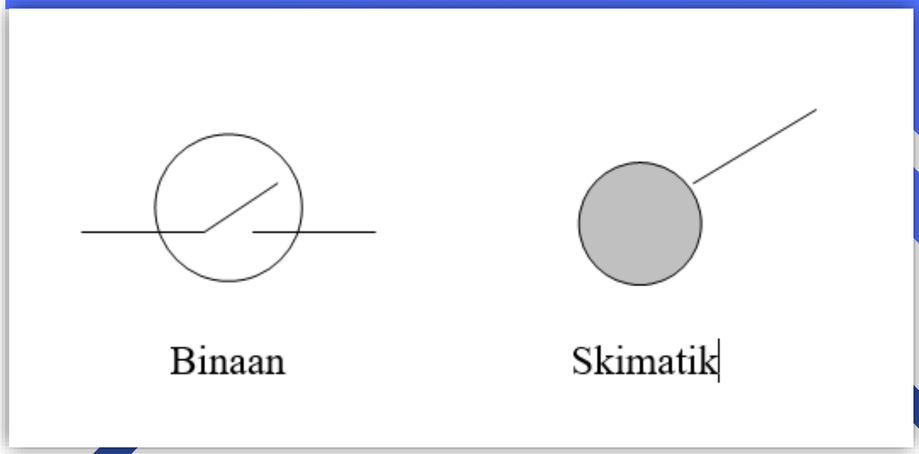
3. SWITCH

1 A switch is and additional then can disconnect and connect electrical circuit manually either directly or through the intermediate of a rope or stalk on the normal current of the circuit.

2 The switch must also be able to withstand the excess current due to the load redundancy or short circuit.

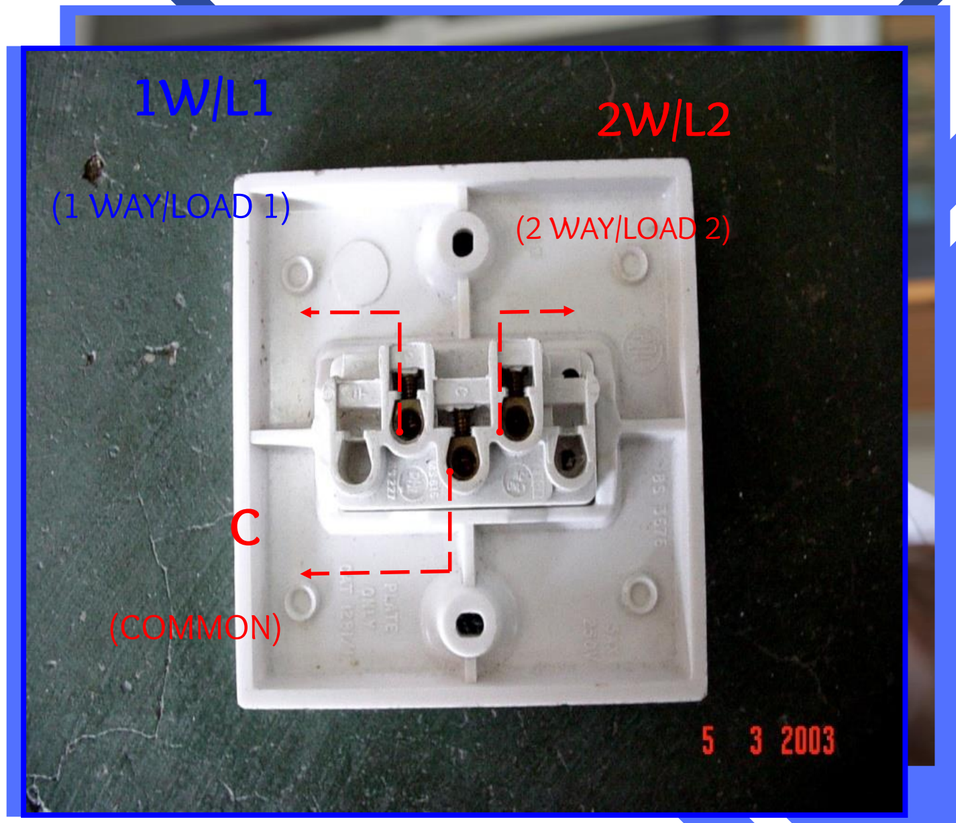
1 WAY SWITCH

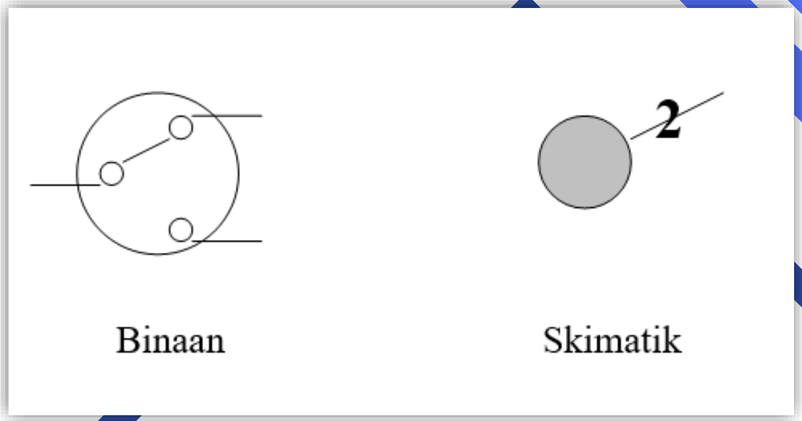
- This type of switch has two terminals for the connection of the supply phase conductor and to the load.
- The switch is used to control a lamp or load in one position such as in a room



2 WAY SWITCH

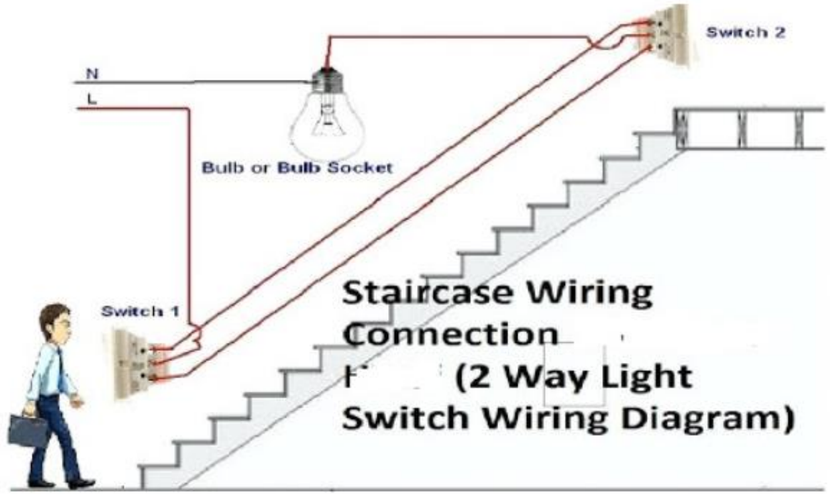
- For the use of two way switch control must have two units two way switches.
- The two way switch can control one lamp or more than two different places or positions.
- It is usually used in places such as stairs or corridors. .



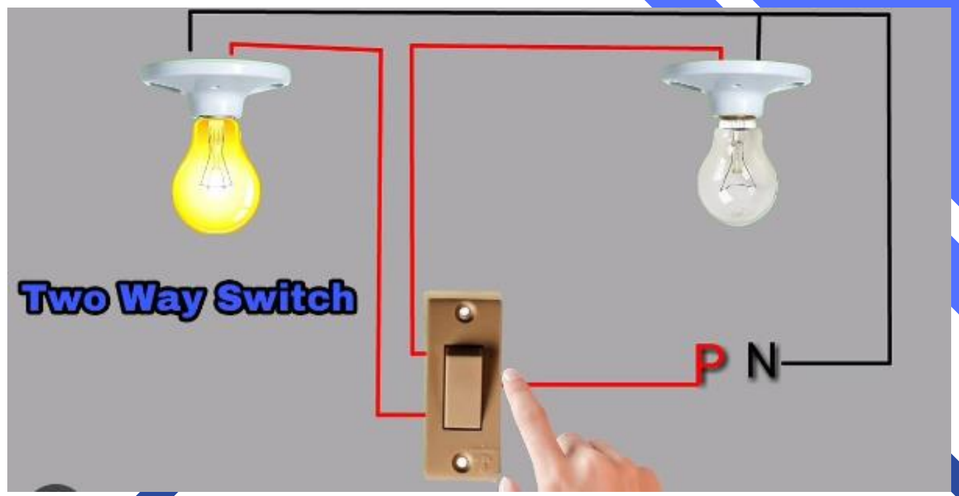


2 WAY SWITCH

- The two way switch control one lamp.

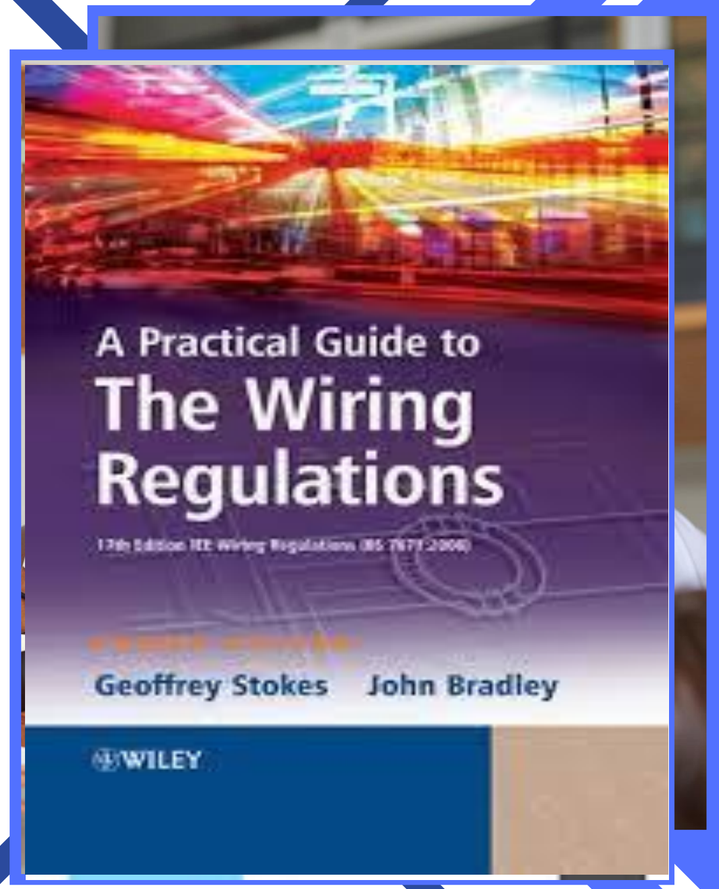


- The two way switch control two lamp.



IEE REGULATIONS

- The **Institution of Electrical Engineers (IEE)**, which is since 2006 known as the **Institution of Engineering and Technology (IET)**, was originally based in the **United Kingdom**. Its headquarters is located in **Savoy Place, Lon**

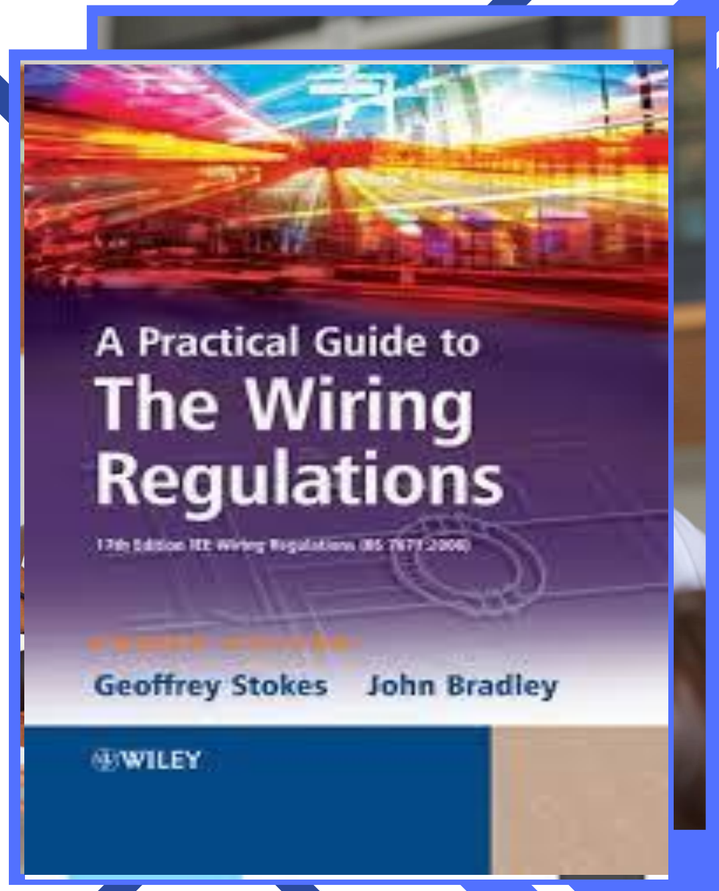


- The **IEE regulations** typically refer to the set of rules and standards established by the **Institution of Electrical Engineers (IEE)**

IEE REGULATIONS

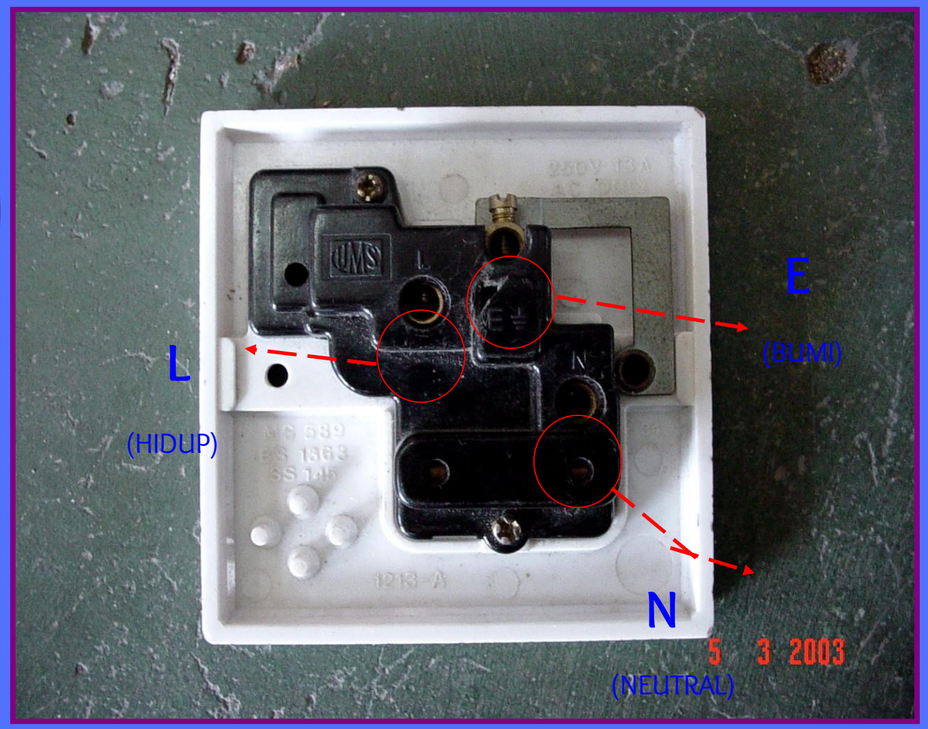
Examples :

- Every switch used for the bathroom must be placed in a place that is not easily accessible by the user.
- The nominal current of each switch controlling the discharge lamp circuit must not be less than twice the amount of constant current flowing in the circuit.
- If the switch is used to control filament and discharge lamps, the nominal current must not be less than the total current of the filament lamp and twice the total constant current of the discharge lamp.
- Minimum Cable Size: 1.0 mm^2 for lighting circuits, with a 6A circuit breaker (Malaysia biasanya akan guna kable saiz 1.5 mm).



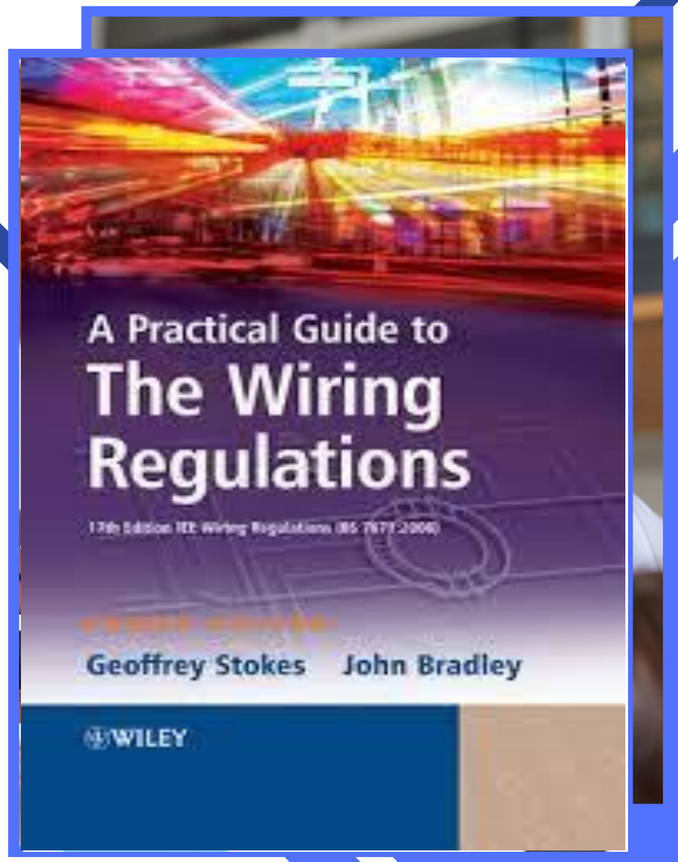
3. SWITCH SOCKET OUTLET (SSO)

- An outlet socket is a device that has several current-carrying contacts and is used to allow portable electrical appliances such as radios, table fans, table lamps etc.
- To be connected to the final small circuit to receive electrical supply using a suitable plug.



IEE REGULATIONS

- The earth source of each socket shall be earthed.
- It is not allowed to install in a bathroom that has a fountain or shower.
- For floor sockets, protection efforts should be made during floor washing work.
- Only the supply voltage does not exceed 250V, unless it is specially made.
- Soket Alir Keluar (SAK) for whole household use must be of type MS 589 (Malaysian Standard 589)

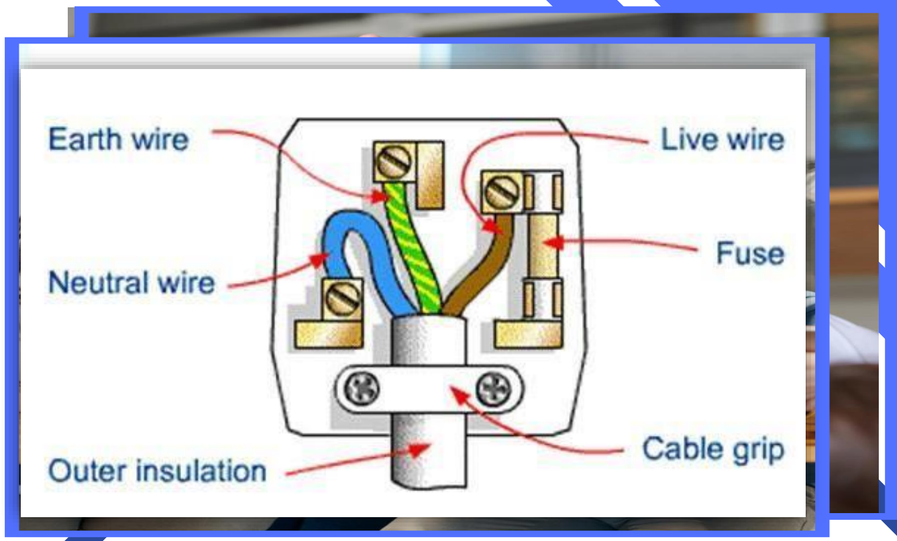


4. PLUG

- A plug is a device that has several contact pins connected to a flexible cord and can be connected to an outlet socket with the pins located on the plug.

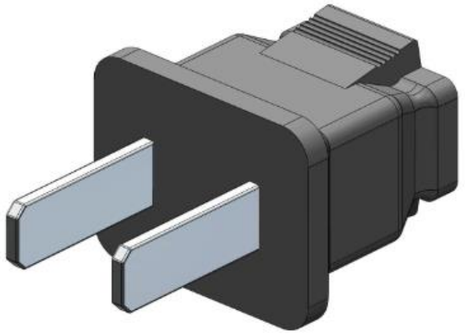
- Plugs are used as supply connectors from outlet sockets to electrical appliances such as table fans, table lamps, scrubbers and more via flexible cords.

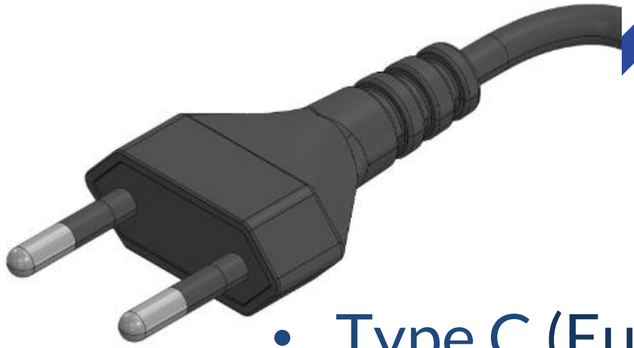
- Plugs can be divided into two types : a) Two pronged plug
  b) Three pronged plug



PLUG TYPES

- Two pronged plug





- Type C (Europe)

- Type A (North America , Mexico)

- Three pronged plug

- Type D (Europe)
- Type G (Malaysia, Hong Kong)

DISTRIBUTION BOARD@ DB (SINGLE PHASE)

BEFORE WIRING

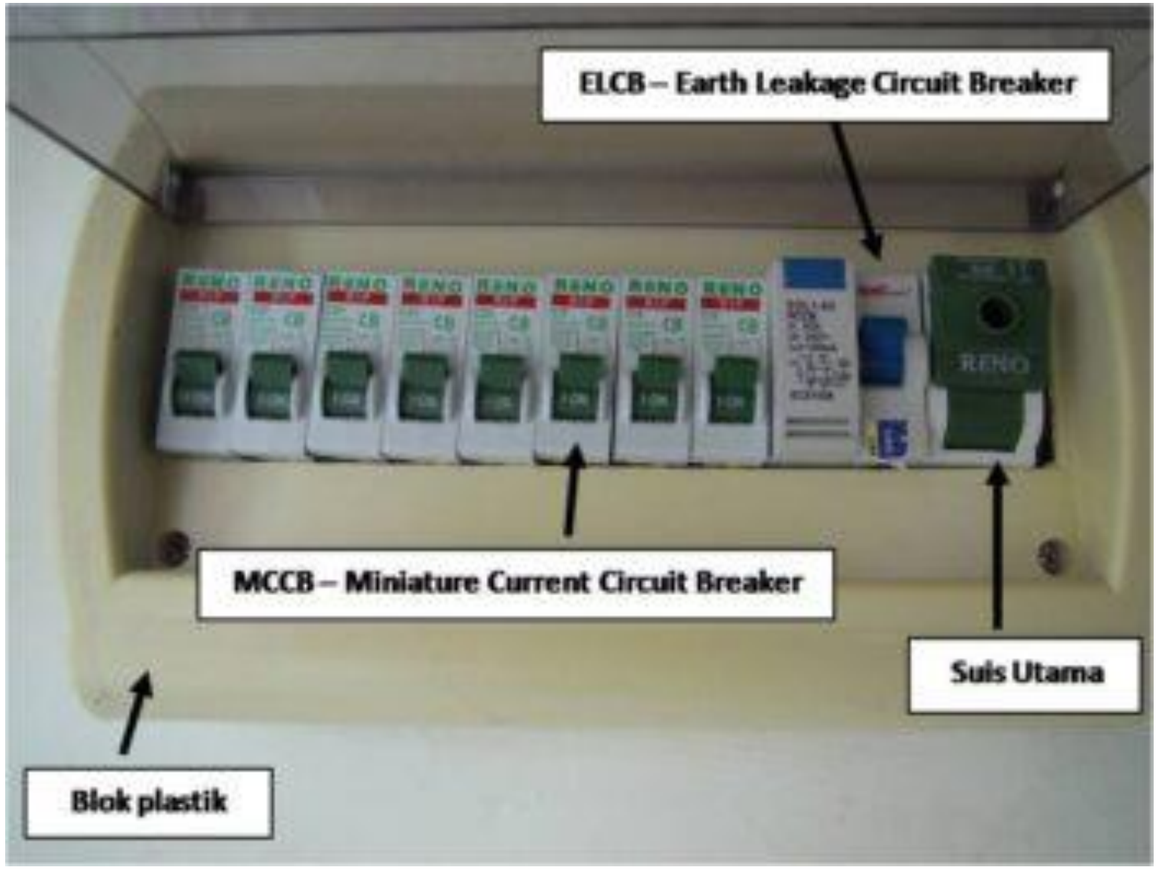
AFTER WIRING

DISTRIBUTIN BOARDS
(KOTAK AGIHAN)

- *There are two types of Distribution Fuse Boxes that are commonly used in installation work, namely:*
  i. Single phase Distribution Fuse Box supplied with a voltage of 240 volts
  ii. Three -phase Distribution Fuse Box supplied with a voltage of 415 volts.

- *The body of the distribution board is made of wood, PVC or metal.*
- *Inside there are several sites for Phase, Neutral and earth conductors. Each terminal is segregated.*
- *The rate of the protection device depends on the amount of load current in the circuit.*

DISTRIBUTIN BOARDS



MAIN SWITCH@ Molded Case Circuit Breaker @ MCCB

- *When there is a fault in an electrical circuit, a current larger than normal current called fault current or short circuit current that may be many times larger than normal current will flow and if this current is not protected or allowed to continue flowing, then it will endanger the system and users.*

- *One device used to eliminate these faulty currents or short -circuit currents is a circuit breaker.*

MANY TYPES OF MCCB

- Air Circuit Breakers
- Moulded-Case Circuit Breakers
- Earth Leakage Circuit Breakers
- Miniature Circuit Breakers

MAIN SWITCH@

Molded Case Circuit Breaker

Keluaran ke ERCB/RCCB

Masukan dari meter KWj

MAIN SWITCH

@Molded Case Circuit Breaker @MCCB

- *Serves as a device that can disconnect the distribution supply to the user by simultaneously opening the live and neutral wires if one of the poles of the supply is not grounded by using a networked two-pole switch*

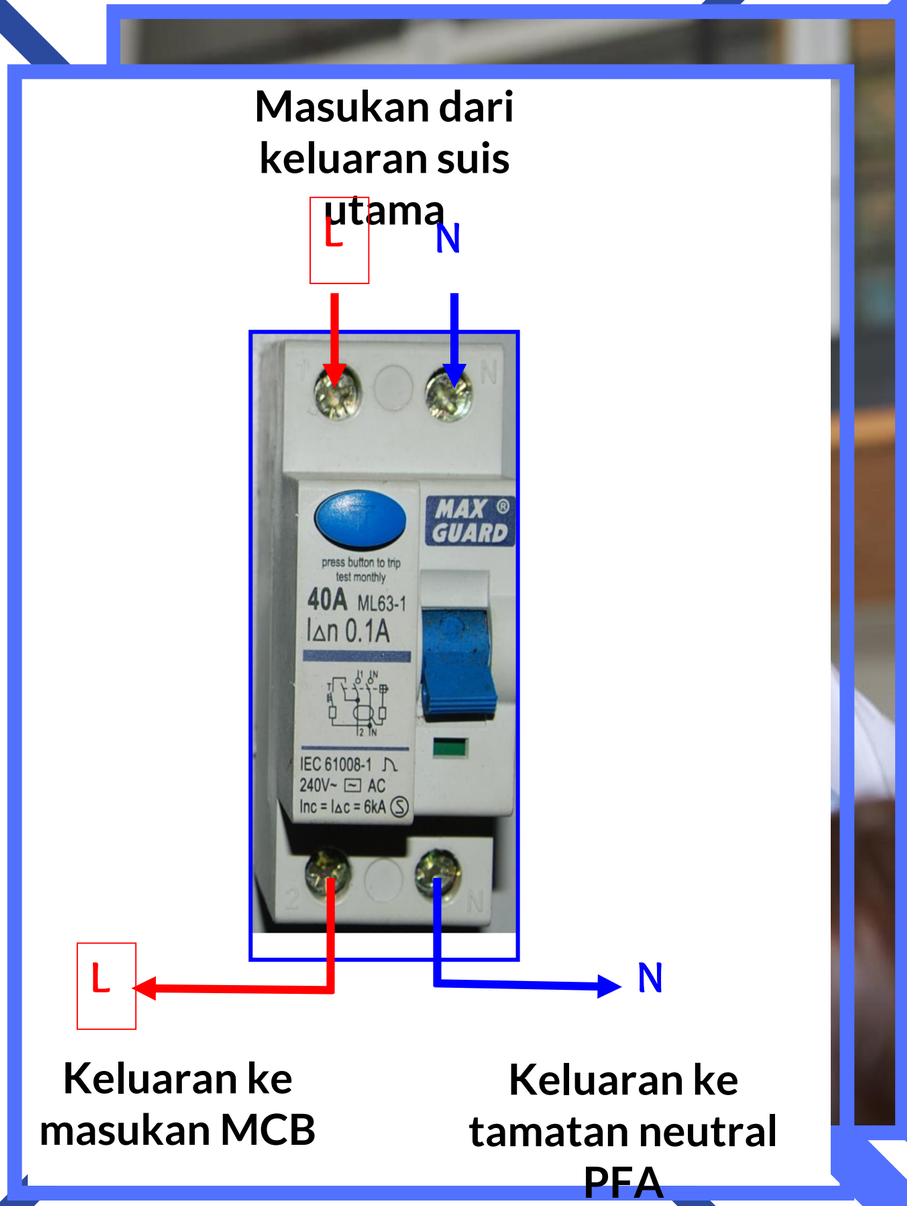
- *The purpose of having an isolator is to protect the user from getting a continuous electric shock. Therefore isolators must be installed at the beginning of the wiring circuit for each installation as required by electrical regulations.*

EARTH LEAKAGE CIRCUIT BREAKER (ELCB)

- Nama lain ELCB : Earth Leakage Circuit Breaker (ELCB) @ Pemutus Litar Bocor ke Bumi.

- *Serves as earth current leakage protection and circuit isolator.*

- *Circuit breakers are made in various forms and types of operation, among which are the oil-filled type, the gas blown type, the air blown type (wind), the vacuum type and the miniature type.*

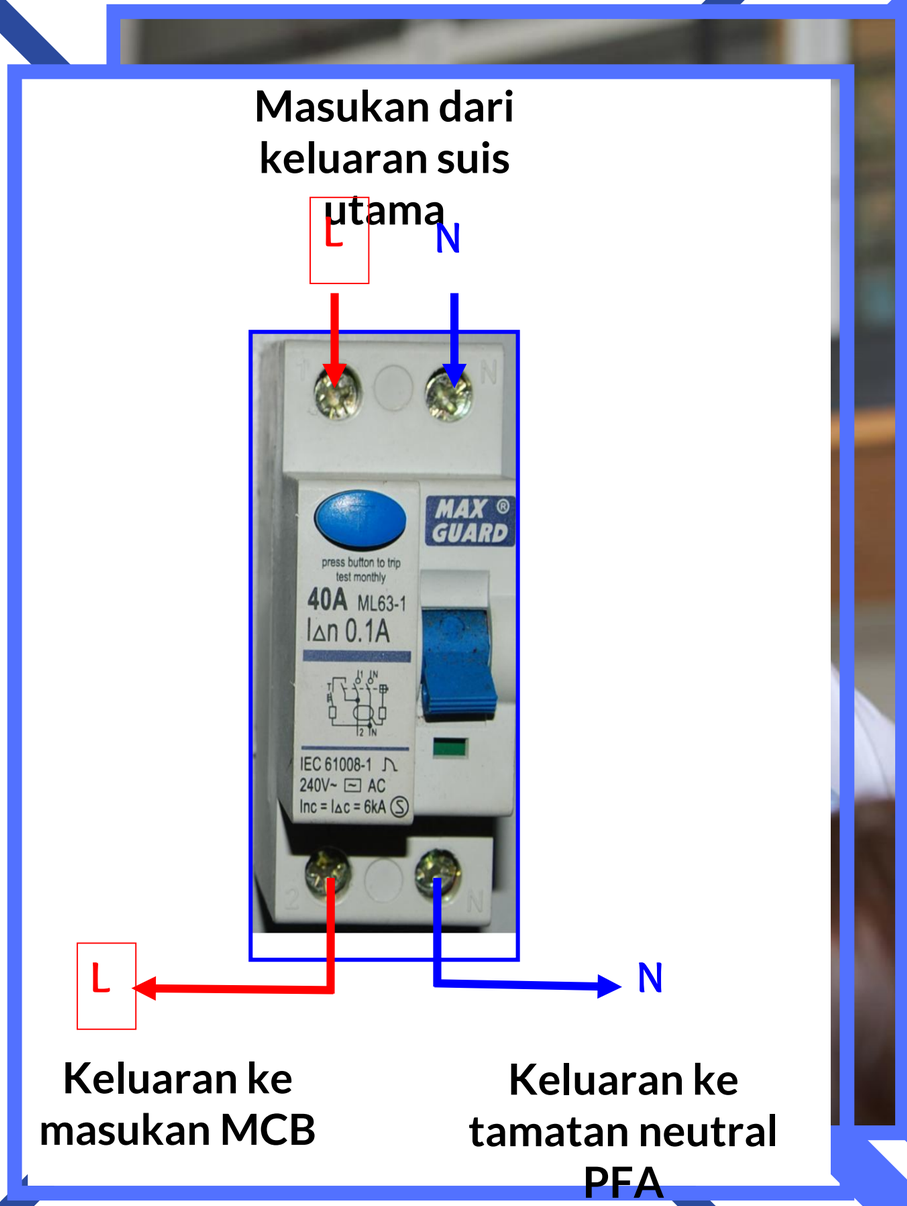


RESIDUAL CURRENT CIRCUIT BREAKER (RCCB)

- Nama lain RCCB : Residual Current Circuit Breaker (RCCB) @ Pemutus Litar Arus Baki.

- *Serves as earth current leakage protection and circuit isolator.*

- *Circuit breakers are made in various forms and types of operation, among which are the oil-filled type, the gas blown type, the air blown type (wind), the vacuum type and the miniature type.*



RESIDUAL CURRENT CIRCUIT BREAKER (RCCB)

Nilai RCCB mestilah sama/kurang dari nilai cutoff supply TNB. (fiuse TNB)

Cth :

jika cutoff TNB = 63 A … maka DB guna RCCB :C63A @ C40A

Jika TNB supply cutoff 32A.. Maka DB guna RCCB : C40A sahaja

- *Lampu dan kipas*

IΔn = Residual Current Sensitivity (Sensitiviti Arus Bocor Ke Bumi I00mA)

- *Soket dan alatan elektrik*

IΔn = Residual Current Sensitivity (Sensitiviti Arus Bocor Ke Bumi 30mA)

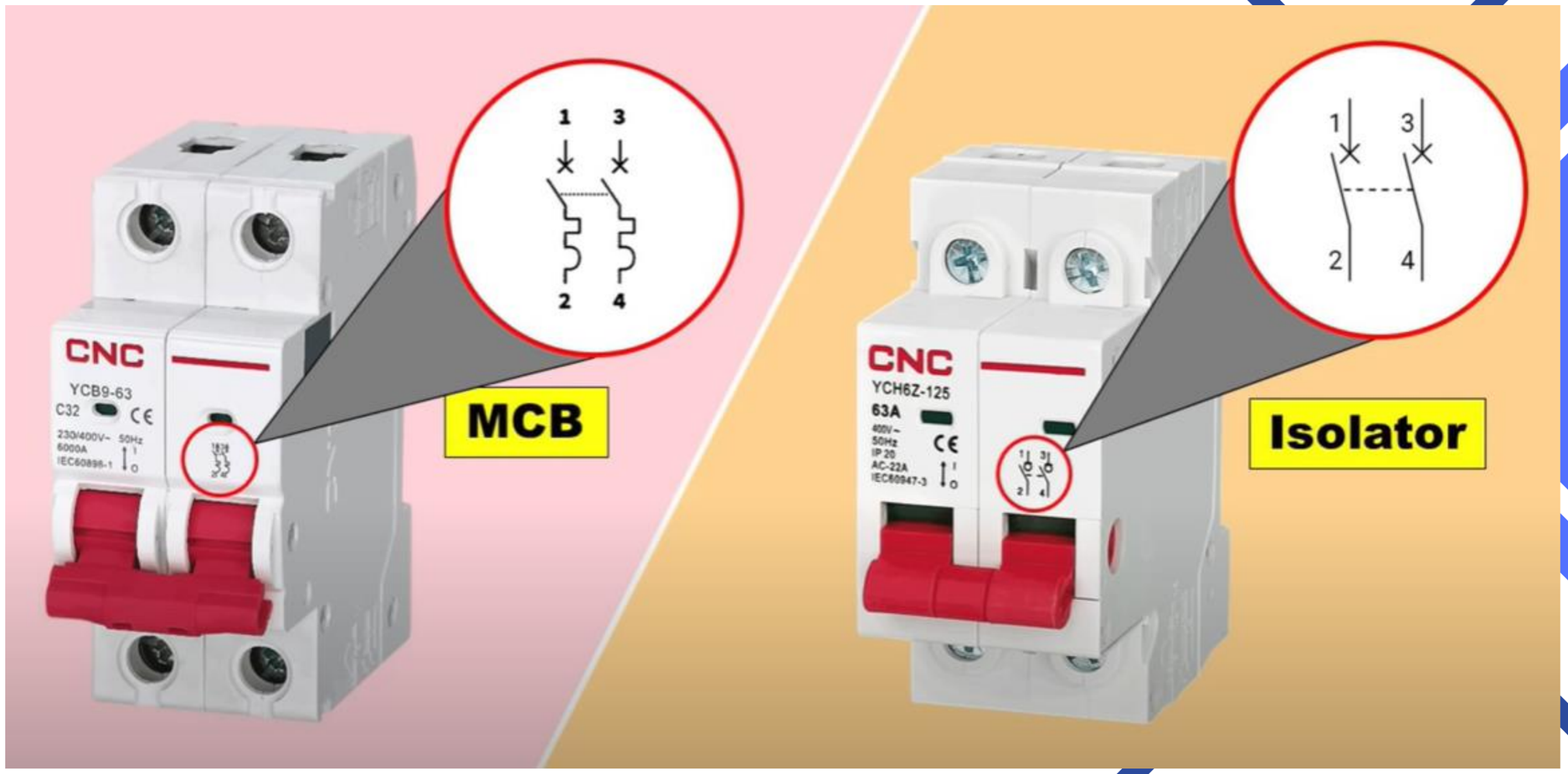
PERBEZAAN DI ANTARA ELCB DAN RCCB

ELCB	RCCB
ELCB (Earth Leakage Circuit Breaker) merupakan suis automatik yang berfungsi berdasarkan VOLTAN.	RCCB (Residual Current Circuit Breaker) merupakan suis automatik yang berfungsi berdasarkan ARUS.
ELCB berfungsi apabila terdapat arus yang mengalami kebocoran akibat sentuhan wayar Live dan Earth.	RCCB berfungsi apabila terdapat arus yang mengalami kebocoran akibat sentuhan wayar Live dan Earth.
Apabila berlaku sentuhan antara Live dan Earth, akan wujud beza upaya antara titik A dan titik B. Fenomena ini akan menyebabkan voltan antara dua titik ini meningkat dan melebihi had voltan yang telah ditetapkan oleh pengeluar ELCB.	RCCB berfungsi apabila ada ketidakseimbangan arus diantara Live dan Neutral. Semua mengetahui bahawa pada suatu litar sesiri, arus masukan adalah sama dengan arus keluaran. Apabila berlaku sentuhan wayar Live dan Earth, arus masukan tidak sama dengan arus keluaran kerana sebahagian daripada arus yang sepatutnya mengalir pada keluaran telah mengalir melalui wayar bumi. Sebahagian arus yang tinggal pada keluaran ini dinamakan arus baki (residual current).

MINIATURE CIRCUIT BREAKER (MCB)

- MCB @ Pemutus Litar Kecil.
- *A circuit breaker specified in BS 3871 is an overcurrent protection device that has a high breaking rate and is used to connect and disconnect circuits under normal and abnormal conditions such as short circuits and over currents.*
- *MCB LIGHTING CIRCUIT 6A @ 10A (lamp, fan, bell)*
- *MCB POWER CIRCUIT 16A, 20A, 32A (Airconditioner, electric motor, electrical appliances)*

DIFFERENCE BETWEEN MCB & ISOLATOR



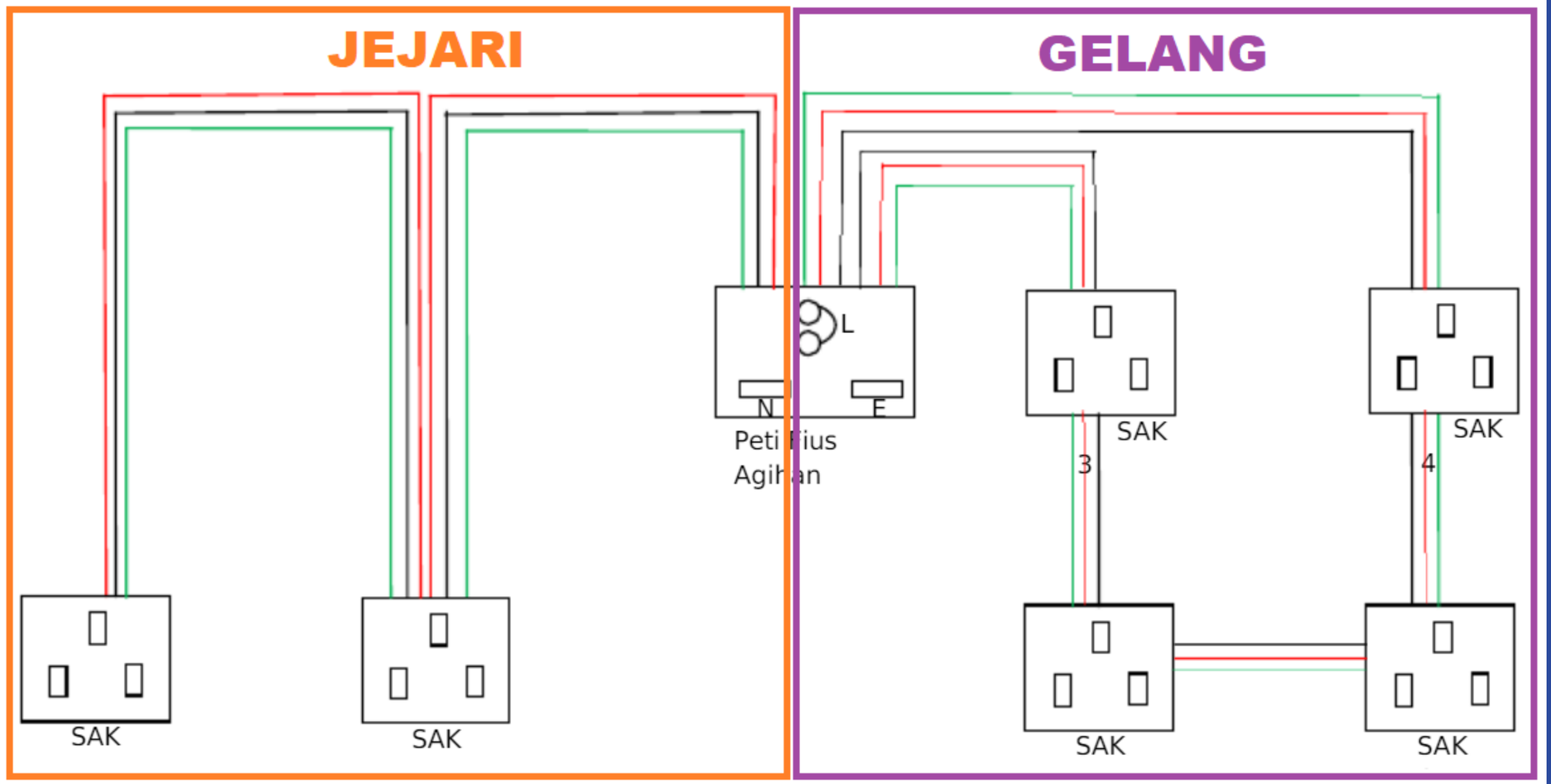
MCB RATING VS CABLE SIZE

Jenis Litar	Unit	Saiz Kabel (mm^2)	Nilai MCB (Ampere)
Litar Lampu/Kipas	13	1.5	6
Penghawa Dingin Dgn Suis DK	1	4	20
Pemanas Air Dengan Suis DK	1	4	20
Soket Alir Keluar 13A (Jejari)	2	2.5	20
Soket Alir Keluar 13A (Jejari)	4	4	32
Soket Alir Keluar 13A (Gelang)	6	2.5/4	32

Foot note :

Suiz DK = Suiz dwikutub @ double pole swith

JEJARI VS GELANG



Foot note :

SAK = Soket Alir Keluar

$$P = VI$$

$$R = \frac{V^2}{P}$$

footnote :

aircond 1 HP= 746 watts

lampu/kipas loceng ekzos fan

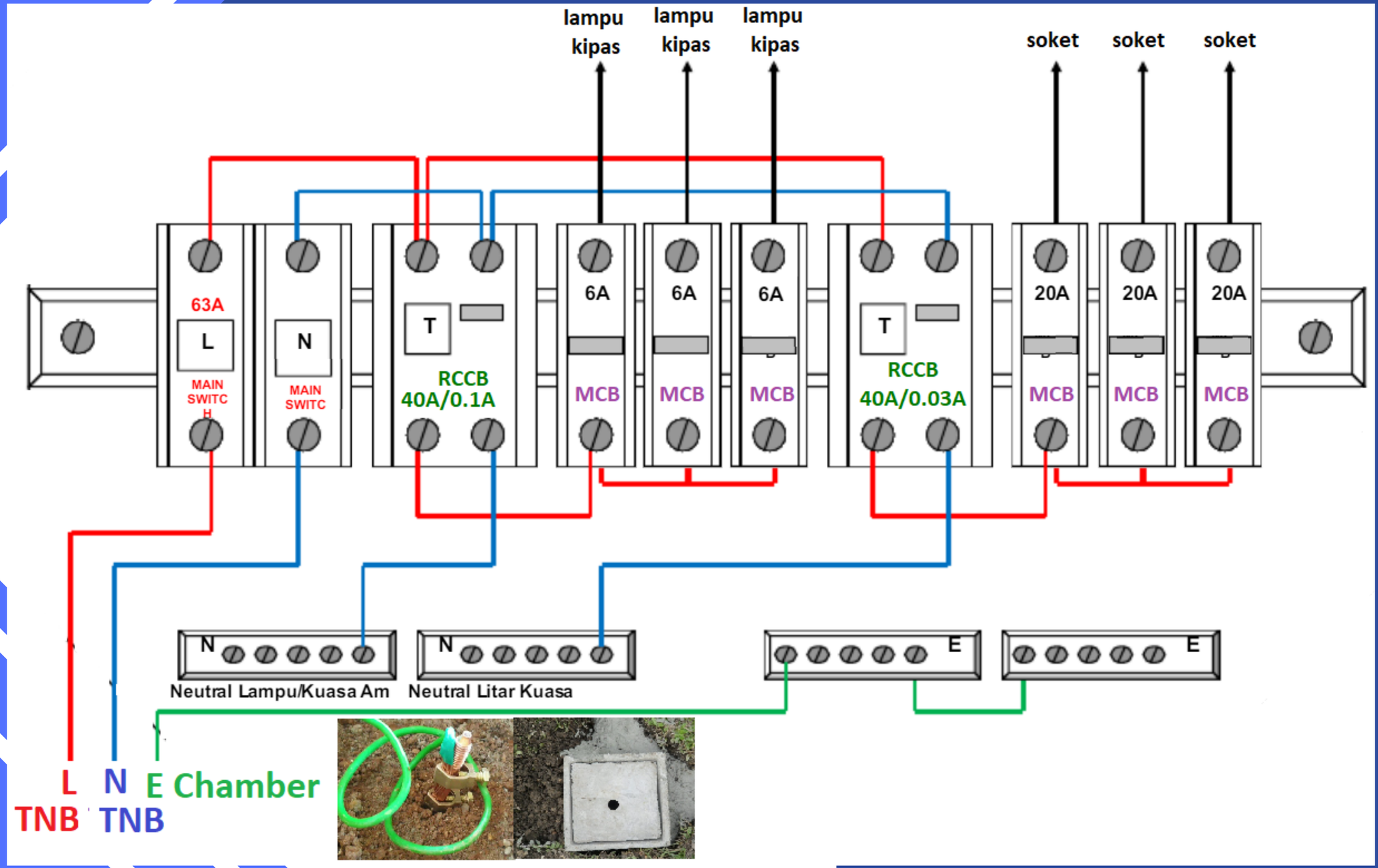
lampu/kipas/loceng/ekzos fan

chendelier besar /plug 13A

aircond 1 HP /water heater /plug 13A/plug 15A

aircond atas dr 1HP

DB WIRING DIAGRAM



WIRING TOOLS

HAMMER

A tool specially designed for nailing clips or tins to grip wiring. Have a different head. One side is round and the other side is flat

CABLE CUTTER

- *There are various types of cable cutters on the market, the following are examples of cable cutters that are commonly used in wiring works.*
- *It is used to cut the cable and also remove the PVC wrap on a cable*

PLIER

- *There are various types of joint pliers on the market, the following are examples of cable joint pliers that are commonly used in wiring works.*

- *It is used to hold, grip, cut, bend and shape cables.*

SCREW DRIVER

- *There are different types of screwdrivers. It is used to install and remove screws.*

- *The correct use of a Phillips or plate screwdriver depends on the shape of the screw head*

TEST PEN

- *To detect leakage of electric current or live cables. In addition, it can also be used for light work such as tightening small screws.*

- *This test pen is suitable and safe to use to detect voltage 50 ~ 500V.*


The End