UNIT-5 (ELECTRICAL INSTALLATION)

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COMPONENTS OF LT SWITCHGEAR

Here’s an easy-to-understand explanation of these electrical components, cable types, and related concepts, with real-life examples and memory tips.

Switch Fuse Unit (SFU)

A **Switch Fuse Unit (SFU)** is a safety device that combines a manual switch with a fuse. When you turn the switch off, it completely disconnects the power from the circuit. The **fuse** inside is a safety wire designed to melt and break the circuit if too much current flows, protecting the equipment from damage. Think of it as an "on-off switch with a built-in bodyguard."

- **Real-life example:** You'd find these in older homes or industrial settings, often used for a main power supply to a large motor or a distribution panel.
- **Memory tip:** **S**witch **F**use **U**nit = **S**afety **F**irst **U**nit.

Miniature Circuit Breaker (MCB)

An **MCB (Miniature Circuit Breaker)** is an automatic safety switch.[1] It's a modern replacement for the fuse. Instead of a wire that melts, an MCB has a bimetallic strip that heats up and bends, or an electromagnetic coil that trips a switch, breaking the circuit when too much current flows. After it trips, you can simply switch it back on, unlike a fuse which needs to be replaced.

- **Real-life example:** These are the small switches you see in your home's main

consumer unit (fuse box). Each switch typically controls a different part of your house, like the lights or the power outlets in a specific room.

- **Memory tip: M**iniature **C**ircuit **B**reaker = a **C**onvenient **B**reaker.

Earth Leakage Circuit Breaker (ELCB) & Residual Current Circuit Breaker (RCCB)

An **ELCB (Earth Leakage Circuit Breaker)** and its modern successor, the **RCCB (Residual Current Circuit Breaker)**, are designed to protect you from electric shock.[2] They detect a small imbalance in the current flowing to and from an appliance. This imbalance, often called a "leakage current," indicates that some electricity is escaping to the ground, possibly through a person touching a faulty appliance. When this happens, the ELCB/RCCB trips, instantly cutting off the power.

- **Real-life example:** These are often the main switches in your consumer unit, or in specific circuits, especially for areas where water is present, like a bathroom or kitchen. The test button on the device allows you to manually check if it's working.
- **Memory tip: E**arth **L**eakage **C**ircuit **B**reaker = a **L**ife-saving **C**ircuit **B**reaker.

Molded Case Circuit Breaker (MCCB)

An **MCCB (Molded Case Circuit Breaker)** is a heavy-duty version of an MCB.[3] It's used for protecting high-current circuits, typically in commercial and industrial applications. It's physically larger and can be adjusted to trip at different current levels.[4]

- **Real-life example:** You'd find MCCBs in a factory or a large commercial building's

main power distribution board, protecting large machinery or the entire building's electrical system.

- **Memory tip: M**olded **C**ase **C**ircuit **B**reaker = a **M**ighty **C**ircuit **B**reaker.

Wires, Cables, and Earthing

Types of Wires and Cables

A **wire** is a single conductor, while a **cable** is an assembly of one or more insulated wires encased in a protective sheath.

- **Live Wire:** This is the "hot" wire that carries the full electrical potential (voltage). It's typically colored **brown** or red.
- **Neutral Wire:** This wire completes the circuit, allowing electricity to flow back to the power source. It's typically colored **blue** or black.
- **Earth Wire (Ground Wire):** This is a safety wire. It's connected to the metal casing of an appliance and physically to the ground. If the live wire accidentally touches the casing, the earth wire provides a safe path for the current to flow to the ground, tripping the circuit breaker and preventing an electric shock. It's typically colored **green and yellow**.

Earthing

Earthing is the process of connecting the non-current-carrying metal parts of an electrical appliance to the earth. This creates a safety path for fault currents, preventing a dangerous buildup of voltage on the appliance casing. This is a crucial safety measure to protect against electric shock.

- **Real-life example:** The third, longer pin on a three-pin plug is the earth connection. The metal casing of your toaster or washing machine is connected to this pin. If a fault occurs, the current flows through the earth wire and trips the breaker.

Batteries

A **battery** is a device that converts stored chemical energy into electrical energy. It has two terminals, a positive (+) and a negative (-), which create a potential difference, causing current to flow.

Types of Batteries

1. **Primary Batteries (Non-rechargeable):** These batteries can only be used once. The chemical reaction that produces electricity is irreversible.
    - **Real-life examples:** Alkaline batteries (AA, AAA, 9V) used in remote controls and flashlights.
2. **Secondary Batteries (Rechargeable):** The chemical reaction in these batteries is reversible. You can recharge them by applying an external electric current, restoring their chemical energy.
    - **Real-life examples:** Lithium-ion batteries in your smartphone or laptop, and lead-acid batteries in your car.

Tariff

A **tariff** is the rate at which an electricity provider charges for the electricity consumed. It's the price you pay per unit (kilowatt-hour or **kWh**) of electricity.

Types of Tariffs

1. **Flat Rate Tariff:** A single, fixed price per unit of electricity, regardless of the time of day or amount of electricity used. This is the simplest type of tariff.
    - **Real-life example:** A basic electricity plan where you pay 15 cents for every kWh you use, whether it's at 2 a.m. or 2 p.m.
2. **Time-of-Use (TOU) Tariff:** The price of electricity changes based on the time of day. It's more expensive during **peak hours** (when demand is high) and cheaper during **off-peak hours** (when demand is low).
    - **Real-life example:** An electricity plan where you pay 20 cents/kWh from 4 p.m. to 9 p.m. but only 10 cents/kWh from 10 p.m. to 7 a.m. This encourages people to use appliances like dishwashers and washing machines at night to save money.
3. **Maximum Demand Tariff:** This tariff is mainly for industrial and commercial customers. The bill is based on two components: the amount of energy consumed and the highest power demand recorded during a specific period. This penalizes companies that have sudden, large spikes in power usage.
    - **Real-life example:** A factory might be charged for its total energy consumption, but also a separate fee based on the highest power load it drew at any single moment during the billing cycle. This encourages the factory to manage its energy usage to avoid high peaks.

1. Electrical Circuit Elements - Resistance, Inductance, Capacitance |BEE|

ALL UNITS PLAY-LIST