JSS3 BASIC TECH THIRD TERM

SIMPLE ELECTRICAL WIRING

BUILDING (FOUNDATION)

BUILDING (WALLS)

Topic: **Simple Electrical Wiring**

Content

- **Electrical Circuit**
- **Wiring Tools**
- **Accessories**

Electric Circuits

An electric is a complete path through which electrons or current flows. The path is made up of cable or wire which connect all the components of the circuit.

Components of an electric circuit include:

(i) **Battery or generator**: This is referred to as the power source.

(ii) **Conductor:** This is the cable or wire used in connecting other components. The conductor is made of copper.

(iii) **Load**: This includes the lamp and the other electrical appliances connected to the circuit e.g. radio and T.V. sets, fan, etc.

(iv) **Control:** This refers to the electric component that is used to switch "on" and "off" current. Fuses are included as control since they cut off in case of excess voltage.

V = voltage, I = current, and R = Resistance

Mathematical relationship between voltage, current and resistance is expressed as follows

V = IR, I = V/R and R = V/I

Example:

(i) A current of 0.5A flows in a circuit with resistance 60 ohms. Calculate the potential difference within the circuit.

Solution

(i) V = IR

Current (I) = 0.5A, Resistance (R) = 60Ω

Voltage (V) = 0.5 x 60 = 30 volts

Wiring Tools and Materials

Hand tools used in the process of electrical installations are referred to as wiring tools. They are common tools such as pliers, hammer, screwdrivers, small knives, punches, cutters, hand gloves e.t.c. Wiring materials includes, black sole tape, clips, wooden block, cable, screws, etc.

Uses of Wiring Tools and Materials

Pliers: These are used in holding, cutting and joining conductor or cables. The pliers are coated or insulated with rubber materials.

Hammer: It is a tool used to drive in nails inside the walls to hold some of the wiring accessories such as wooden blocks. Clips are held on the walls with nails driven in the hammer.

Screwdriver: This is specially used to drive screw nails inside the socket and lamp holders to fasten them on the wooden block. Most screwdriver used in wiring (electrical installation) are equally used as testers i.e. used to determine the presence of current in the live cable. There are three types: Star, flat and ratchet screw drivers.

Small knives are used to peel the rubber coatings of the cable for joining. Punches are used to make holes on walls to allow the passage of the cables from one apartment to another.

Cutters are used to cut the wires where necessary.

Hand gloves are used to protect the hand from electric shock etc.

Black sole tapes are used to cover exposed conductors.

Metal clips are used to hold the cables firm on the walls while the screws hold the lamp holders etc.

Wiring Accessories

An electrical accessory is any device other than luminaries (lighting fittings) associated with the wiring and current utilizing appliances of an installation. Examples of electrical accessories include: tumbler switches, lamp holders, ceiling switches, ceiling roses, joint boxes, fuse boxes, socket outlets/plugs, lamp holder, adaptors, connector, etc.

Accessories are related for the maximum voltage, and in some cases rated for the maximum current they are designed to withstand without undue overheating or failure. Some accessories are coated or covered with protective substance to make them suitable for a particular or various possible environment hazards.

The consumer's equipment begins with the main switch gear, fuse box or consumer unit to which the accessories are connected through surface or embedded wiring systems for lighting and power points. All socket outlets have their earth terminals connected to the consumer's so that appliances and consumers are protected against dangerous earth leakage by the use of the three-pin plug which allows connection to earth.

Wiring circuit for lightening and power points: In simple electric wiring, two electric circuits are observed: series circuit and parallel circuits.

Generally, all house wiring is done so that points of lights are connected in parallel, except for special cases like ceremonial lightings, photo studios and dark rooms which utilize series of lighting for increased brightness. Each circuit has its beginning connected to the fuse-way in the fuse box or splitter unit, then to a switch then separately to switches ; or looped by switch feeds then to the lamp holders or lighting fittings (through the lamp feed0 and back to the neutral

terminal of the fuse box (through the neutral conductor). Multi-core cables e.g. twin or three core- insulated and sheathed cables are used on surface wiring in connection with joint boxes, but single insulated core cables are used in conduit to permit easy branching with less jointing; however the basic circuits are the same.

Assessment

A current of 0.8A flows in a circuit with resistance 80 ohms. Calculate the potential difference within the circuit.

Topic: BUILDING (Foundation)

Content:

- **Definition and function of foundation**
- **Types of foundation**

Foundation

The foundation in its widest sense can be said to be expanded base of a wall or a column in addition to the ground or sub-soil, which the building stands is the natural foundation, and the expanded base which is constructed with concrete or masonry materials like rocks, stone, or bricks is called the artificial foundation. However, when the word 'foundation' is used ordinarily, it means artificial foundation. In a swampy and waterlogged area, foundation also embraces the long concrete poles driven, or concrete cast into bored holes for purposes of carrying the structure above it.

Function of Foundation

The foundation, acting as a large flat-heeled shoe worn by the building, bears the total weight of the building and ensures that the weight is evenly distributed over the surface area of the foundation in such a manner that eliminate unequal settlement.

1. It receives and supports the loads (weight) of the building and transmits them to the solid part of the ground.

2. It ensures that the weight of the building is evenly distributed over the surface area of the foundation to avoid unequal settlement.

Types of Foundation

There are five major types of foundation:

1. Strip foundation

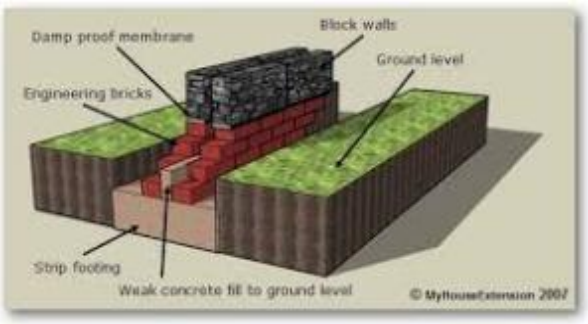
2. Raft foundation

3. Pad foundation

4. Pile foundation

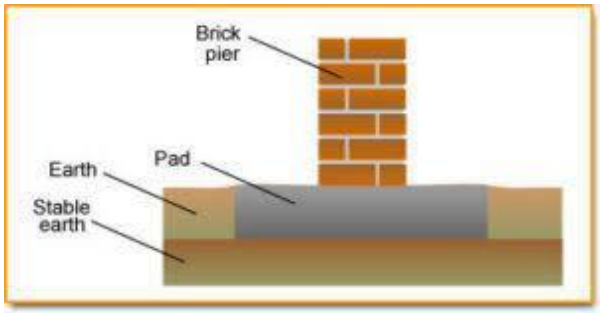
5. Stepped foundation

1. **Strip foundation:** This is a continuous strip of concrete under walls. It carries a uniformly distributed load. It is the most common in Nigeria.

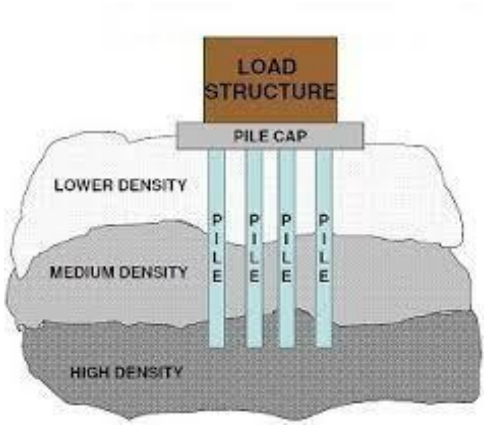


2. Raft foundation: This is a continuous concrete base under the whole building. The concrete here in reinforced with iron bars. This type of foundation is usually used where the bearing capacity of the soil is very low e.g. clay soil, marshy or water logged area.

3. Pad foundation: This is an isolated concrete base under the columns. The area of the foundation will depend on the load it is going to carry. The depths of the reinforcement are supplied by the structural engineer.



4. **Pile foundation:** This is the type of foundation used to transmit load through soft oil, streams or rivers. In this type, the concrete or timber is driven down until it reaches a hard surface underneath. The properties of soil should be known to determine the type of use.



5. **Stepped foundation:** This is a strip foundation constructed on a sloppy ground. Also where the nature of the soil in a building site is not the same, for instance, if some parts of the ground is sandy and other part is clayey, stepped foundation will be incorporated.

Assessment

Briefly explain the types of foundation

Topic: BUILDING (Walls)

Content:

- **Materials foe wall making**
- **Types of walls**
- **Bonding materials**

Wall

Walls are continuous vertical structure of a building which are built primarily to perform any or a combination of these functions:

i. Enclose space, as in the external walls of a building, boundary or fence wall, reservoirs, and so on.

Ii. Divide space as in partition and compartment walks.

iii. Carry load and provide support for other elements and fitments for the building structure like the load of the floor and the roof above, windows, electrical fittings, air conditioners, sanity and water supply fitments.

Walks in the building can, in addition, be used as a shield against bad weather; some are used for screening spaces from view, and yet some are also used for decoration. Walls may or may not be constructed to carry any load.

Materials for making Walls

There are variety of materials for the construction of walls in Nigeria, walls are with any or combination of these materials – grasses, leaves, tree branches, tree trunks, timbre, stone, mud, bricks of clay, sand, concrete blocks, metal sheets, concrete, timer products (manufactured wood), synthetic materials and glass, curtain, zinc. Some of these walls are shown.

Types of Walls

Walls may be classified according to the materials for which they are made of or according to the purpose they serve.

Classification of walls according to their materials

i. Block wall/masonry

ii. Stone wall

iii. Mud wall

iv. Timber wall

v. Zinc wall

vi. Brick wall

vii. Glazed wall

viii. Concrete wall

ix. Metal wall

Classification of walls according to their functions

i. This wall supports or carry load from the upper floor or roof.

ii. Non-load bearing wall: This wall does not support other loads apart from its own.

iii. Partition wall: This wall divides space inside building g into rooms or compartments.

iv. Parapet wall: This is a wall above the roof plane. It is used in concrete roof. Also, it is used to guide the edge of a roof or balcony. It is usually protected with coping.

Parapet wall

Cavity wall: This is a twin wall built of two thick leaves of block separated by small gap. The purpose is to avoid moisture penetration through walls.

Bonding

Bonding is a process of laying blocks or bricks so that the blocks or bricks lap or project beyond those immediately above or below them. Masonry walls have little tensile strength compared to their great weight, therefore whenever there is a slight settlement especially near a corner or joint, the walls tend to crack. Bonding or otherwise tying together of the units of masonry is the best practical way of preventing these cracks. An unbounded wall which is easily identified by the presence of continuous vertical joints is a very weak structure. When a load is transmitted to the unbonded wall, it is practically concentrated on the portion between the continuous vertical joints with the result that the portion may end to "drop" and the wall shears along the joint. The unbounded wall therefore has little strength and stability. The same load transmitted to a bonded wall is distributed and borne by a larger number of flocks or bricks and therefore over a larger area.

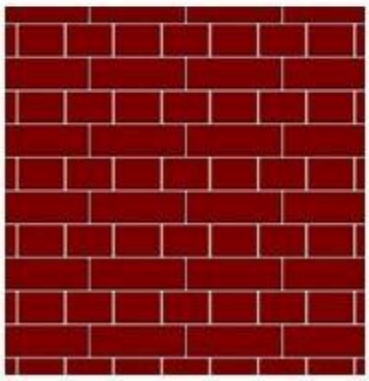
Types of Bond

1. Flemish bond

2. English bond

3. Stretcher bond

Fleming bond



English bond

Assessment

List the types of bond you know