



# **A TECHNICAL REPORT ON STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)**

**HELD AT:**  
**SESTEC ELECTRICAL COMPANY**  
*ECWA CLINIC IKEJI AREA, MOPAMORO LOCAL  
GOVERNMENT KOGI STATE.*

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**IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
AWARD OF NATIONAL DIPLOMA (ND) IN CERTIFICATE IN  
ELECTRICAL/ELECTRONICS ENGINEERING**

**AUGUST – DECEMBER, 2024**

## **DEDICATION**

This report work is dedicated to the Almighty Allah, the Alpha and Omega. The one who make me whom I am today, also dedicated to my parents; **Mr. and Mrs; RAJI** and to all the staff of **SASTEC ELECTRICAL COMPANY**. Lastly, to my brothers and sisters.



## **ACKNOWLEDGEMENT**

Thanks to Almighty Allah, who is able to do all things and make me to excel abundantly above in all I ask and think, according to the power that works in me unto him the glory and adoration.

The success of this report however would not have been possible without the invaluable support, assistance and encouragement of a large number of people who are too numerous to mention.

I say thank you and GOD BLESS YOU.

## PREFACE

Student industrial work experience scheme is geared towards educating and giving the participant i.e. the student to the practical aspect of the academic discipline and course he or she is pursuing.

The technical report is based on all the training acquired by me during the course of my industrial attachment, the attachment lasted for four months (August to December, 2024).

This program is organized for all engineering and technological students of higher institution of learning, is a sure way of achieving the quest for technological and self-reliance in a country like ours where the need for technological advancement cannot be over emphasized.

My acquired experience on this industrial work which I did at ***ECWA CLINIC IKEJI AREA, MOPAMORO LOCAL GOVERNMENT KOGI STATE.*** has given me insight into the course of my study. It has exposed me and given me the knowledge about the various types of electrical and inverter installation and some work techniques, whose operational techniques work only, but theoretically explained in our lectures room. I want to appreciate the national board of technical education for the introduction of the student industrial work experience scheme programme for the higher institution to prepare us for a better future.

### **ABSTRACT**

This report cover the systems of electrical installation the types of electrical installation system, such as surface wiring system, trunking wiring system and conduit wiring system, the tools and instruments used and their uses, various types of materials used in electrical installation including the cable to be use and various things to consider before the electrical installation of a building.

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## **CHAPTER ONE**

### **1.0 INTRODUCTION**

Student industrial work experience scheme (SIWES) programmed, it was established in year 1973 by Federal Government of Nigeria through the Industrial Training Fund (ITF) under the NTBE (National Board for Technical Examination). It has its headquarter in Jos, Plateau State. The major reason behind the establishment of SIWES programmed and the importance of the student to display their talents and also learn the practical aspects of their fields of study. After their graduation, they will have something valuable to contribute to the society. They will also be able to face future challenges in their respective field of study.

### **1.1 SPECIFIC AIMS OF SIWES.**

- a) To introduce trainee to the industrial atmosphere and discipline.
- b) To provide opportunity for the trainee student to apply knowledge obtained in form of lecture and practical to industrial reality.
- c) To provide an opportunity for the trainee student to assess their own suitability for carriers.
- d) To enable the industrial to be able to recruit graduates to the post appropriate to their background, training and the orientation during the change over from student to work status.
- e) To be introduced to as wide a range of industrial skills as much as possible.
- f) To enable trainee student become familiar with the organization and control of the industries similar to where they are likely to work after graduation.

### **1.2 OBJECTIVES**

Specifically, the objectives of the students industrial Work Experience Scheme are to provide an avenue for students in Nigeria Tertiary Institutions to acquire industrial skills and experience in their course of study.

## CHAPTER TWO

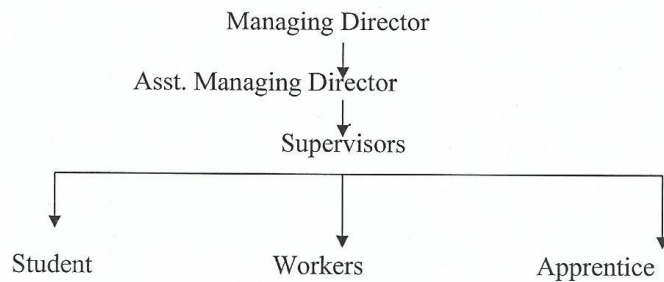
### 2.0 BRIEF HISTORY OF THE ORGANIZATION

**SASTEC ELECTRICAL COMPANY**, ECWA CLINIC IKEJI AREA, MOPAMORO

LOCAL GOVERNMENT KOGI State. Was established in year 1989 and it is composing of the highly technical.

The Chairman of the company has experience in electrical wiring installation and inverter installation especially in house and company wiring, he has works in many company. He had been a Technician since year 2008. Ha has many apprentice under his company he trained many SIWES/IT students. The company has done many electrical wiring in different such as church, duplex, hotel and many more.

#### 2.1 ORGANIZATION CHART



## CHAPTER THREE

### 3.0 ELECTRICAL TOOLS AND INSTRUMENTS

Electrical Engineering makes use of different instrument in performing different operations.

Some of the instruments used are listed below:

- Screw driver
- Bending spring
- Gloves
- Pliers
- Hammer
- Tester
- Fixing tape
- Hack saw
- Centre punch
- Bench vice
- Spanner
- Soldering iron
- Safety belt
- Raw plug drill
- Cutting pliers

### 3.1 USES OF THE ABOVE TOOLS AND INSTRUMENTS

- i. **Screw Driver** - it is used for loosening and tightening screw.
- ii. **Bending Spring** – it is made up of spring, it is used in bending PVC pipe when working on conduit wiring system.
- iii. **Gloves** –it is used to guard against electrical and mechanical damages to the hands.

- iv. **Pliers** – it is used for cutting, disconnecting or removing installation material like rubber from a conductor. It is also used to hold material firmly in order to couple the material.
- v. **Hammer** – it is used for clipping cable to a surface.
- vi. **Tester** – it is used to check whether a conductor is live. It is also used to detect the flow of current in a conductor.
- vii. **Fixing Tape** – it is used in passing wire into PVC pipe when working on conduit system wiring.
- viii. **Hacksaw** – it is used for cutting metal and PVC pipe when working on conduit wiring system.
- ix. **Center Punch** – it is used for making point in metal or concrete blocks before drilling.
- x. **Bench Vice** -for Viking metals for the purpose of cutting or threading.
- xi. **Spanner** – for tightening and losing hexagonal headed bolt and nuts.
- xii. **Soldering Iron** – for soldering cable conductor joints.
- xiii. **Safety Belt** – for prevention and holding the body when climbing concrete poles.
- xiv. **Cutting Pliers** – for cutting conductors
- xv. **Raw plug Drill** – for forming holes inside the block or concrete.

### 3.2 MAINTENANCE OF THE TOOLS.

The maintenance are listed below.

- Keep the tools in cool and dry place.
- It should be check regularly.
- It should be kept away from rain.
- It should be taking away from in sting.

### 3.3 SOME SAFETY PRECAUTION IN ELECTRICAL INSTALATION.

- ❖ Always put on your overall when in workshop or any place of work.
- ❖ Always remove the fuse when carrying out installation on live cable.
- ❖ Test the conductor polarity by means of tester not by touching it ordinarily.

- ❖ It is dangerous to operate electrical machine you are not familiar with.
- ❖ Spark from switch cause serious burns.
- ❖ Always use correct tools for all jobs. Since incorrect tools used can result in accident.
- ❖ When using ladder, ensure that it is placed properly to avoid it from falling down.
- ❖ When working on concrete pole with ladder, ensure safety belt is used to hold the body when working.

### 3.4 DEFINITION OF MAJOR TERMS USED IN ELECTRICAL INSTALLATION

- **Accessory:-** Any device, other than a lighting fittings associated with the wiring and current using appliance of an installation for example a switch, a Fuse, a Lamp holder, or a plug.
- **Apparatus:-** This include all machines, Electric fitting that use conductors for connections. For Example Electric motor, Fluorescent fittings; Television.
- **Appliance:-** Any device which use Electricity for particular purpose, excluding fighting fitting or independent motor, for Example, Radio, Cooker, or Electric Iron.
- **Cable:-** A Length of insulated single conductor (Solid or stranded), or of two or more such conductor, each provided with its own insulation, which are laid up together.
- **Armored Cable:-** A cable provided with Herbal (Wrappings of Steel) or wire or steel tape to serve as mechanical protection.
- **PVC Sheathed Cable:-** A Cable of which the conductor insulation and mechanical protection is of polyvinyl-chloride.
- **Cable Trunking:-** A cast for cables, constructed of metal sheet, wood or insulating materials and may be of rectangular or square cross section of which one side is removable or hinged for the whole of its length for the purpose of laying cable therein.

- **Circuit Breakers:-** A mechanical device for making and breaking a circuit both under normal and abnormal condition, such as those of a short circuit being broken automatically.
- **Consumers Control Unit:-** It is a distribution board incorporation a main switch or main circuit breaker within its unit.
- **Consumer Terminals:-** This is the point of a consumers installation where the services of the supply is connected.
- **Distribution Board:-** This is an assemblage of parts including one or more fuses or miniature circuit breaker, arrange for the purpose of distribution of Electrical energy to final sub-circuit and to other distribution boards.
- **Earth Continuity Conductor:-** This is the earth wire that connect the earthen terminal on a apparatus to the earthing rod.
- **Earth Electrode:-** A metal rod or rods metal plate or mat having effectual connection with the general mass of the earth.
- **Earthed:-** Effectually connected to the general mass of the earth.
- **Earthed Lead:-** This is the final conductor that connects the earth continuity conductors to the earth electrode.
- **Electric Discharge Lamp:-** This is lamp of hermetically sealed bulb or tube containing gas or metal intending to be vaporized during operation.
- **Fuse:-** It is a device for opening a circuit by means of a conductor designed to melt when an excessive current flows. Its consists of two parts, the base and the bridge.
- **Installation of Conductor:-** It is a suitable non-conductor material enclosing surrounding or supporting a conductor.
- **Joint Box:-** A Box forming part of wiring of an installation (usually surface) provided to contain joints in the conductor.
- **Junction Box:-** A box connecting two or more length of conductor or trunking appliance.

- **Length of Run:-** For the purpose of the table of current rating and volt drop, the length of run is the point -to- point distance measured along the route taken by the cable.
- **Lighting Fitting:-** A device for containing a lamp or lamps together with any holder, shade or reflector for Example, (wall Bracket fittings) Lamp holder, & fluorescent fittings.
- **Point in wiring:-** Any terminal of the fixed wiring intended for the attachment of a lighting fittings or a device for connecting to the supply a current using appliance for Example, a point of light, (the switch, the lamp holder, and the wire that connects them together.
- **Space Factor:-** Is the ratio of the effective cross sectional area covered by the cable cross-section to the total cross sectional area of the conduit pipe, duct or turning in which they used for conduit it is 40% for trunking 45% and dicing 35%.
- **Switch:-** A device other than a fuse or circuit breaker for closing and opening a circuit.
- **Switch Fuse:-** A device consisting of a switch and one or more fuse, so that the fuse is not being carried by the moving part of the switch.
- **Switch – 1 Way:-** This is Switch meant to control a lamp or set of lamp in one position.
- **Switch 2-Way:-** This Switch meant to control a lamp or set of lamp in two way position only.
- **Switch Intermediate:-** This is the Switch that meant for controlling a lamp or set of lamp in three or more position.
- **Switch Fuse-switch:-** A switch that a moving part of which carried one or more fuses for heavy current control.
- **Switch Board:-** An assembly of switch gear with or without instrument but excluding local switches in final sub-circuit.

- **Switch Gear:-** It is a device for controlling the distribution of electrical energy or for controlling electrical circuit, machine and current using appliances.
- **Switch Main Switch Gear:-** The main switching device in a switch board arrangement which is meant to switch on or off the incoming supply from the authority to all part of the block. It is located at the lower block.

### 3.5 WIRING SYSTEM.

When choosing a system of wiring from a building, the following point must be put into consideration:

- **Neatness of the finished jobs:-** To see if a particular wiring system if choosing a for a building will not be eyes sure.
- **Time required to complete the wiring:-** That is, if therefore length of time that is allocated for the completion will not fail, particularly urgent jobs being allocated by government .
- **The durability of the installation:-** If a particular wiring chosen withstanding the hazard condition of usage or will last long as expected of the installation. For Example, a surface PVC. Sheathed wiring will prove hazardous to a metal workshop.
- **Future Extension and Alteration:-** One must ensure that a system of wiring will give room for future addition. For Example, a concealed conduct wiring will not be suitable for factory installation which is often subjected to extension.
- **Drainage to the fabric of the building by cut away:-** For Example, it will be better to wire a completed multi-storey building in surface wiring than concealed conduct which may weaken the wall and pillars when chiseled to form channel.
- **Special consideration like dampness:-** Flammable in a situation which is either permanently damp or intemtionally damb, damp proof fitting and wiring materials must be used to prevent ingress of moisture to the wiring and

if flammable situation all accessories and apparatus to be used must be of flame proof type.

- **Cost of installation:-** Cost is one of the important aspect to be considered when deciding on a system of because a client may want to wire his or her building in fill conduit, because of the neat appearance but by the time he or she sees the estimated cost of the wiring he or she may not be able to afford the cost.

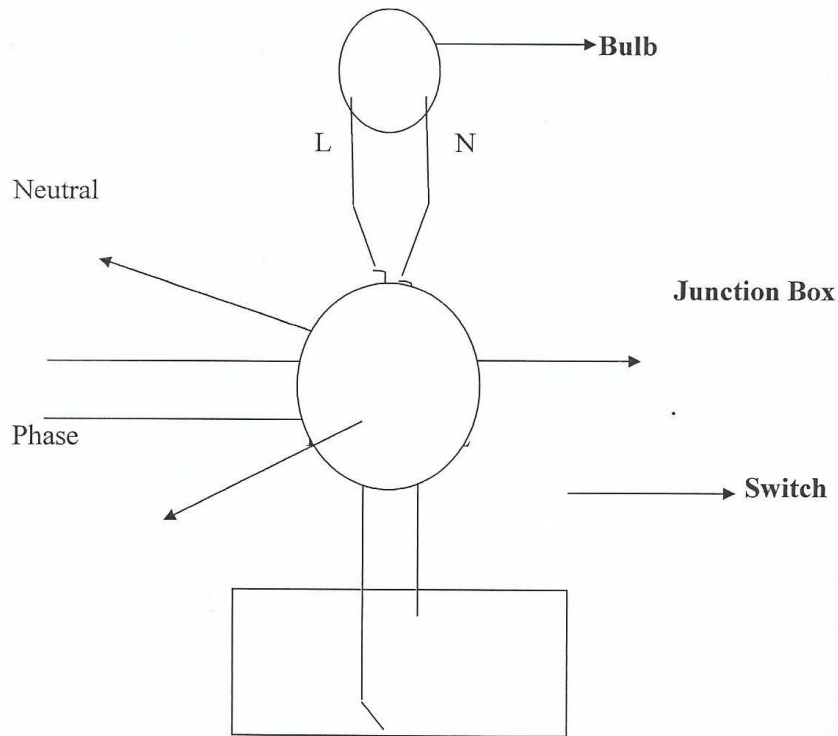
### **3.6 TYPES OF WIRING SYSTEM**

1. Surface wiring system
2. Trunking wiring system
3. Conduit wiring system

### **3.7 SURFACE WIRING SYSTEM**

This is the system of wiring by which is called PVC sheathed wiring on surface, this involve the use of PVC insulated laid up in flat formation with a close covering of thought PVC as mechanical protection since there is no metal sheat. A bare conductor as in twin and earth cable will be enclosed in PVC sheat to serve as the earth continuity conductor.

Block Diagram for Connection of Bulb And Switch In Surface Wiring System



**3.8 CONDUIT WIRING SYSTEM**

It is laying of PVC pipe inside the blocks for passing cables for conduit wiring.

**3.9 TYPES OF PVC PIPE LAYING SYSTEM.**

- Half conduit system wiring.
- Full conduit system wiring.

**3.9.1 HALF CONDUIT SYSTEM WIRING**

This system of wiring it require laying for PVC pipe inside the block and on the ground, it require less cost and less materials.

### 3.9.2 FULL CONDUIT SYSTEM WIRING.

This is the system of wiring by which it require laying of PVC pipe inside concrete blocks, on the ground and including the inside of the ceiling such as that there won't be a space for cable to be showing or to be seen outside. It require more cost than the half conduit system of wiring, it is require more materials than the half conduit, its more well presentable for the well wise customers.

### 3.10 LAYING OF PVC PIPE

Good conduit work can only be achieved when there is good PVC pipe laying. The following points will assist Electricians in this field.

- **PLANING THE LAYOUT:-**The following point should be considered before starting the actual layout.
  - i. The Building should be studied property (e.g if it is bungalow).Draw your layout.
  - ii. Make sure the consumer has a requirement clearly before started in the architects drawing.
- **MARKING OUT:-**During the marking out, the following procedure should be taking.
  - i. Position of the boxes for Switches, Sockets, Cooker, etc. should be clearly marked.
  - ii. Position of the Distribution Board.

The laying cannot be done by using chalk to make marks and lines as following.

- **Channeling and cutting bricks or concrete:** After the marking out of the building, the next thing is to use chisel or hammer to cut or channel the bricks in order to put conduit pipes inside the bricks.
- **Preparing the conduit:-** Conduit comes in length, length should be cut to size with hacksaw having a fine tooth blade. It should be cut in a pipe vice. Preparing the conduit will also involve bending of the conduit depending on the type of conduit being installed which may heavy or light gauge conduit, full or half pvc pipe laying system.

- **Piping of the channeled Bricks:-** After the cutting and bending of conduit to desire length, the next thing is to put the conduit pipe inside the channeled bricks, floor or concrete.
- **Gumming and Dressing of the Channeled Bricks:-** After the piping of the channeled brick and dress it to it normal position.

#### **Size and Cable Used in an Electrical Installation:**

| S/N  | SIZE OF CABLE | USES                             |
|------|---------------|----------------------------------|
| i.   | 1.5mm         | For lighting                     |
| ii.  | 2.5mm         | For Socket of 13Amps and 15A     |
| iii. | 4mm           | For AC and Cooker Control unit   |
| iv.  | 6mm           | For Cooker Unit                  |
| v.   | 10mm          | For meter and distribution board |
| vi.  | 16mm          | For Servicing Building           |

#### **TYPE OF SWITCH THAT WE HAVE:-**

We have different type of switch as follow:

- We have One Gang Switch.
- We have Two Gang Switch.
- We have Three Gang Switch.
- And we also have Four Gang Switch.

#### **HOW TO CONNECT INDICATOR RING.**

Indicator ring is the system of a ring that we use to detect an Electricity using mechanical motor machine, Such as (**GENERATOR**).

## **CHAPTER FOUR**

### **4.0 RELEVANCE OF THE EXPERIENCE GAINED AT STUDENTS FIELD OF STUDY**

In summary, this program has exposed me to some practical aspect in relation to my course of study (Electrical engineering) and I benefitted greatly from the program. What I learnt at various site involves the following

- Installation of wiring system
- Type of wire suitable for installation
- Types of wiring system
- Tools suitable for electrical installation

### **4.1 MATERIAL NEEDED IN ELECTRICAL INSTALLATION**

- Pipes 20mm and 25mm
- Earth leakage circuit breaker( ELCB)
- Distribution board
- Wires e.t.c

### **4.2 EARTH LEAKAGE CIRCUIT BREAKER (ELCB)**

It is a safer devices used in electrical installation with high earth impedance to prevent shock it detects small stray voltages on the metal enclosures of electrical equipment and interrupts the circuit if a dangerous voltage is detected

#### **4.2.1 PURPOSED OF ELCB**

- The main purposes of earth leakages circuit breaker is to prevent injury to humans and animal due to electric shock
- To detect faults currents from life to the earth ground wire within the installation.

#### **4.2.2 TYPES OF ELCB**

There are two types of ELCB which are

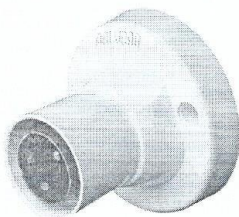
- Voltage operated

- Current operated

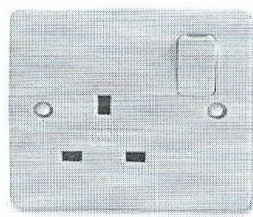
**Voltage operated:** These devices sense a voltage to decide the earth leakage. A single phase voltage elcb will have six terminals. Which are:

- Line in
- Line out
- Neutral in
- Neutral out
- Earth
- Fault

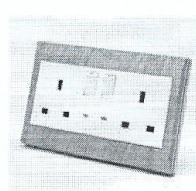
### MATERIALS USED IN ELECTRICAL INSTALLATION



Lamp holder



13A Flush Socket



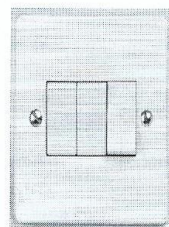
13A Double socket



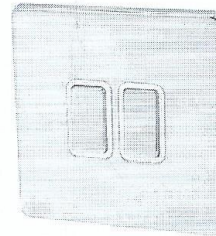
Conductor Cable



Lamp holder and Bulb



3-way flush switch



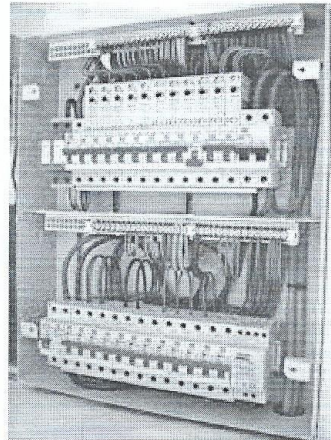
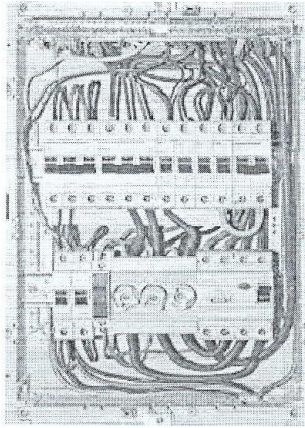
2-way flush switch



1-way flush switch

### 3.8 DISTRIBUTION BOARD

A distribution board is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure.



## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATION**

#### **5.1 CONCLUSION**

The SIWES programmed had contribution positively to my exposure and training in the field of electrical and electronics engineering. It has also helped me to put practice the knowledge gained in classroom with the actual industrial experience. Also to develop a critical and realistic approach to problems with their solution in the electrical field.

#### **5.2 RECOMMENDATION**

The polytechnics should make it compulsory for all students, since the programmed goes way in improving student's practical and theoretical experience.

SIWES programmed is such a program that exposes student to the practical aspects of what he/she has been taught theoretically in the school. A body also should be setup to give penalties to any student who refuses to go give him/her SIWES programmes.

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