TECHNICAL REPORT

STUDENT INDUSTRIAL WORKING EXERIENCE SCHEME (SIWES)

ATTACHMENT HELD AT

Y.S LICENCED ELECTRICAL CONTRACTOR

&

FEDERAL LOW HOUSING ESTATE PHASE1B OLOJE ILORIN, ILORIN KWARA STATE.

COMPLIED BY

ZUBAIR NUHU ABDULLAHI

ND/23/EEE/PT/0066

SUBMITTED TO

THE DEPARTMENT OF ELECTRICAL ELECTRONICS ENGINEERING

INSTITUTE OF TECHNOLOGY

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN ELECTRICAL ELECTRONICS ENGINEERING

AUGUST -DECEMBER 2024

ACKNOWLEDGEMENT

Indeed, all praises are due to Almighty Allah, the Creator of all minds and the Master of the judgement day, for His maximum protection, provision and infinitude for evading me to complete this training.

My sincere appreciation will go to my industrial based supervisor, for his care, instruction and support for me throughout the period of this training. I will not fail to record my gratitude to the institutional based supervisor, Engr. Sulyman .K

My unalloyed gratitude is due to my parents for their care and support all the time. May Almighty Allah continue replenishing your pocket to my siblings, I say Jazakumullah Khyara

.

DEDICATION

This student industrial work experience scheme (SIWES) report is dedicated to almighty God. The master of universe, the giver of all inspiration and to my parent's and sibling brothers and sisters, for tolling so hard to get me educated towards the Four (4) months student industrial work experience scheme programme.

TABLE OF CONTENT

CHAPTER ONE

1.0 Introduction

The student's industrial work experience scheme (SIWES) has been designed to expose the students to practical aspect of what they were been taught in the classroom. The scheme was made to serve as complement to the deficiencies that were faced in the class room and also to give room for students who find it very difficult to adapt fully to the lecture method of teaching. This student's industrial work scheme was introduced by the Federal Government in 1971 when the Military Head of State and Commander in Chief of the Armed Forces, General Yakubu Gowon.SIWES was established by Industrial Trust Fund (ITF) in 1974 in conjunction with the National Board for Technical Education (NBTE) to solve the problem of adequate practical skills acquisition before employment. The programmed was aimed at exposing the students to practical knowledge the course they study in higher institutions in Nigeria, to be familiar to practical environment like exposing them to life machines and other hard tools of work.

Finally thescheme will enable the students above readiness to face the challenges of employment and experience in the work environment.

1.1 **Definition of Siwes**

SIWES can be defined as a student's industrial work experience scheme, it is skill learning programme designed by ITF to expose and prepare students of universities, polytechnic and college of education and so for the industrial work situation they like meet alter graduation.

1.2 Objectives of Siwes

The aims of objectives of the student industrial work experience scheme (SIWES) are to:

1. To build students with various experience related to their course of study
2. To evaluate student knowledge
3. To student to professional practices.
4. To provide skills personnel
5. To indicate sub-reliance in student.

1.3 Importance of Siwes

The following are the importance of SIWES to students in general;

I. It provides the students the opportunity to put what they learnt into practice.

II. It exposes the students to various activities in the offices by filling and checking document signed.

III. It provides the students of higher institution the opportunity to improve practically.

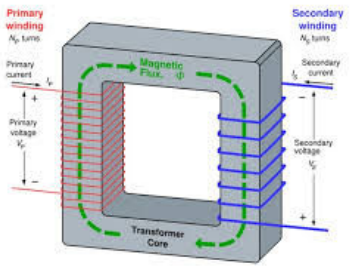
IV. It improves the scope of knowledge of students experience before returning to their institution.

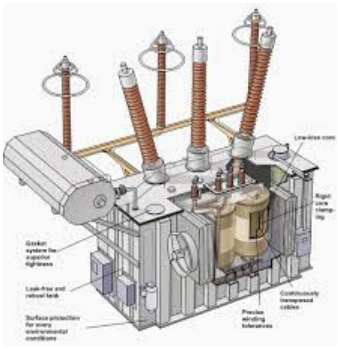
CHAPTER TWO

INTRODUCTION

2.0 TRANSFORMER,

device that transfers electric energy from one alternating-current circuits to one or more other circuits, either increasing (stepping up) or reducing (stepping down) voltages . the Transformers are employed for widely varying purposes; e.g., to reduce the voltage of conventional power circuits to operate low-voltage devices, such as doorbells and toy electric trains, and to raise the voltage from electric generators so that can be transmitted over long distances.





2.0.1 THE FUNCTIONS PERFORMED BY ELECTRICAL AND ELECTRONICS ENGINEERS INCLUDE

(1) basic research in physics other sciences, and mathematics in order to extend knowledge applicable to the field of electronics

(2) applied research based on the findings of basic research and directed at discovering new applications and principles of operation,

(3) development of new materials, devices, assemblies, and systems suitable for existing or proposed product lines,

(4) design of devices, equipment, and systems for manufacture,

(5) field-testing of equipment and systems

, (6) establishment of quality control standards to be observed in manufacture, (7) supervision of manufacture and production testing,

(8) postproductionassessment of performance, maintenance, and repair, and (9) engineering management, or the direction of research, development, engineering, manufacture, and marketing and sales.

Consulting

The rapid proliferation of new discoveries, products, and markets in the electrical and electronics industries has made it difficult for workers in the field to maintain the range of skills required to manage their activities. Consulting engineers, specializing in new fields, are employed to study and recommend courses of action.

electric circuit, path for transmitting electric current. An electric circuit includes a device that gives energy to the charged particles constituting the current, such as a battery or a generator; devices that use current, such as , or computers; and the connecting wires or transmission lines. Two of the basic laws that mathematically describe the performance of electric circuits.

electromagnetic field,

a property of space caused by the motion of an electric charge. A stationary charge will produce only an electric field in the surrounding space. If the charge is moving, a magnetic field is also produced. An electric field can be produced also by a changing magnetic field.

2.2 CABLE

A cable is a collection of several wires covered in a single sheath, whereas a wire is a single electricity conductor. The use of wires and cables makes it possible for electricity to be used in many different places. Diverse cables are utilized in various settings, including homes and the telecom industry.

cable, in electrical and electronic systems, a conductor or group of conductors for transmitting electric power or telecommunication signals from one place to another. Electric communication cables transmit voice messages, computer data, and visual images via electrical signals to telephones, wired radios, computers, teleprinters, facsimile machines, and televisions. There is no clear distinction between an electric wire and an electric cable. Usually the former refers to a single, solid metallic conductor, with or without insulation, while the latter refers to a stranded conductor or to an assembly of insulated conductors. With fibre-optic cables, made of flexible fibres of glass and plastic, electrical signals are converted to light pulses for the transmission of audio, video, and computer data.

2.2.1 ELECTRIC POWER CABLES

The most common type of electric power cable is that which is suspended overhead between poles or steel towers. These aerial cables consist of a number of wires, usually of copper or aluminum, twisted (stranded) together in concentric layers. Copper or aluminum is chosen for high electrical conductivity, while stranding gives the cable

flexibility. Because aerial cables are frequently subjected to severe environmental stresses, alloys of copper or aluminum are sometimes used to increase the mechanical strength of the cable, although at some detriment to its electrical conductivity. A more common design is to include in the stranded cable assembly a number of high-strength, noncorrosive steel wires. Many aerial cables, especially those operating at high voltages, are bare (uninsulated). Cables operating at lower voltages frequently have coverings of asphalt-saturated cotton braid, polyethylene, or other dielectric (non conducting) material. These coverings offer some protection against short-circuiting and accidental electric shock.

2.3 TYPES OF CABLE

Main Feeder Wires:

Power is delivered from the service Weather head to the building via the main feeder cables and wires. Solid or stranded 600v THHN cables having a rating of 25% more than the maximum needed load is utilized for this purpose.

Panel Feed Wires:

Power is delivered to the main distribution junction box through the panel feed wires. Typically, these THHN cables are black insulted and have ratings of 25% higher than the maximum load current.

NON-METALLIC SHEATHED WIRES:

In-house wiring uses non-metallic or NM encased wires. It could be made up of two or more insulated conductors, along with an insulated or bare ground conductor.

For added protection, there is a second layer of XLPE plastic sheathing. Electricians currently install interior systems using the most recent version, NM type-B. Both solid

and stranded conductors are possible. Conduits can be more easily navigated with stranded conductors.

Single Conductor Wires:

For electrical layout within a home, single conductor cable is the most typical option. It is offered in various gauges, color (to distinguish between phase, neutral, and ground), and solid or stranded conductors. Better connections can be made with a single solid wire, however single stranded wires are simpler to route via conduits. The insulation options for both of them are THW and THHN.

2.4 ELECTRICAL CABLE VOLTAGE

An electric cable is measured in volts and, depending on these, they are categorized into one group or another:

- **Low voltage cables (up to 750 V):** in a variety of applications, and with thermoplastic and thermoset coatings. They are designed and built according to harmonized standards.
- **Low Voltage cables (up to 1,000 V):** (also called (0,6/1 kV) The cables in this section are used for industrial power installations in various fields (general industry, public installations, infrastructures, etc.). They are designed according to international standards (UNE, IEC, BS, UL).
- **Medium Voltage cables:** from 1 kV to 36 kV. They are used to distribute electricity from electrical substations to transformer stations.
- **High Voltage cables:** from 36 kV. They are used to transport electricity from the generating plants to the electrical substations.

CHAPTER THREE

3.0 Installation

Change over switch is used in control systems. The device equipped with three position changeover switch I-0-II enables to choose either the control of one of two output circuits or their total switch off. It also enables cooperation and control of home building automation devices and receivers with maximum 10 A current.

The device is designed for single-phase installation and must be installed in accordance with standards valid in a particular country. The device should be connected according to the details included in this operating manual. Installation, connection and control should be carried out by a qualified electrician staff, who act in accordance with the service manual and the device functions. Disassembling of the device is equal with a loss of guarantee and can cause electric shock. Before installation make sure the connection cables are not under voltage. The cruciform head screwdriver 3,5 mm should be used to instal the device. Improper transport, storage, and use of the device influence its wrong functioning. It is not advisable to instal the device in the following cases: if any device part is missing or the device is damaged or deformed. In case of improper functioning of the device contact the producer.

A changeover switch is a device that can make your life a lot easier when there is a power outage that affects your house. Changeover switches are designed to switch the power source of an electrical circuit, and their most common application is to switch a house's electricity supply from the main power grid to a "generator system" in the event of a power outage. That means you'd be able to keep your house partially or fully powered during a power outage, allowing you to continue with your normal home activities like using appliances, cooking, and keeping your food properly refrigerated.

Generator Changeover Switch

A changeover switch is a device that can make your life a lot easier when there is a power outage that affects your house. Changeover switches are designed to switch the power source of an electrical circuit, and their most common application is to switch a house's electricity supply from the main power grid to a "generator system" in the event of a power outage. That means you'd be able to keep your house partially or fully powered during a power outage, allowing you to continue with your normal home activities like using appliances, cooking, and keeping your food properly refrigerated.

Generator Changeover Switch?

A generator changeover switch is needed when a generator is wired to a house electrical circuit. There are many situations in which generators need to be wired in conjunction with the main power supply, and having a changeover switch provides:

- **Safety**: A changeover switch provides a safe connection between the three circuits. Without the switch, a wired generator can continue to power the home even if the power has been restored. This is extremely dangerous because it can lead to a back feed of the electric current and cause an electric overload. A changeover switch also allows you to quickly cut power from a faulty generator, which can help prevent accidents and electrical fires.
- **Convenience**: A changeover switch allows you to quickly change your power source and keep your appliances running safely and efficiently without the hassle of connecting cords and wires. This also eliminates the risk of making wrong connections that might damage your appliances or even result in serious accidents.

MANUAL CHANGEOVER SWITCHES

Manual changeover switches have to be manually operated and therefore, are less expensive and more common than automatic switches. Manual switches must be flicked when necessary and depending on the installation and switch type, they need to be configured to control which circuits or areas of the house will receive power from the generator.

3.1 CONNECTION OF SOLAR PANEL

Solar panel wiring (also known as stringing), and how to wire solar panels together, is a fundamental topic for any solar installer. It’s important to understand how different stringing configurations impact the voltage, current, and power of a solar array so you

can select an appropriate inverter for the array and make sure that the system will function effectively.

Solar panels can be connected in series or parallel, depending on the system's needs.

Series connection

- Connect the positive terminal of one panel to the negative terminal of the next panel
- Increases voltage while keeping current constant
- Good for systems that need higher voltage, like inverters or long cable runs

Parallel connection

- Connect the positive terminals of multiple panels together, and the negative terminals together
- Increases current while keeping voltage constant
- Good for systems that need higher current, like when panels might be shaded

3.1.1 BENEFITS OF SERIES AND PARALLEL CONNECTIONS

- Understanding the difference between series and parallel connections can help optimize the performance and efficiency of your solar panel system
- Most solar panel systems are designed with both series and parallel connections

3.2 SERIES VS. PARALLEL STRINGING

In terms of electrical connections, "series stringing" means connecting components like solar panels one after another, adding up their voltage while keeping the current constant, while "parallel stringing" connects components side-by-side, adding up their current while maintaining the voltage at a constant level; essentially, series stringing increases the overall voltage, while parallel stringing increases the overall current.

Key differences:

- **Voltage:**

  In series stringing, the voltage of each component adds up, resulting in a higher overall voltage; in parallel stringing, the voltage remains the same across all components.

- **Current:**

  In series stringing, the current stays the same throughout the circuit, while in parallel stringing, the current from each component adds up, resulting in a higher total current.

  WHEN TO USE SERIES STRINGING:

- When you need to achieve a higher voltage to power a specific device.
- When dealing with long cable runs, as the lower current in a series circuit reduces cable losses.

  WHEN TO USE PARALLEL STRINGING:

- When you need to increase the current to power a larger load.
- When shading is a concern, as a shaded panel in a parallel circuit won't significantly affect the entire system.
- Often, solar panels are wired using a combination of series and parallel connections to optimize both voltage and current based on system requirements.

3.4 WIRE AND CABLE

Wire and cable are flexible metal conductors that are used for a variety of purposes, including electrical transmission and mechanical support.

3.3. 1TYPES OF WIRE AND CABLE

- **Bare cables**: Uninsulated wires and conductors
- **Overhead insulated cables**: Cables with insulation
- **Control cables**: Cables used for control purposes
- **Special cables**: Cables with specific purposes
  Where to buy wire and cable
- **Konga**: Sells a variety of wire and cable products, including pure copper wire, armored cable, and optical cable
- **Jumia**: Sells a variety of wire and cable products, including pure copper wire, solar panel extension cables, and conduit wire
- **GZ Industrial Supplies**: Sells a variety of wires and cables for domestic and industrial use
- **Buildings and more**: Sells a variety of wires and cables, including flexible wires
- **Electric Mall**: Sells a variety of wire and cable products, including Coleman cable

3.5.0 HOW TO INDICATE WIRE

To indicate a wire, typically you use a color coding system where different colors represent different functions like "hot" (live) wire being black or red, "neutral" wire being white, and "ground" wire being green or green with a yellow stripe; this color coding helps identify the wire's purpose in an electrical circuit.

3.51 KEY POINTS ABOUT INDICATING WIRES:

- **Color Codes:**
- **Black/Red:** Usually indicates a "hot" or live wire carrying power.

- **White/Gray:** Represents a "neutral" wire returning power to the source.
- **Green/Green with Yellow Stripe:** Represents a "ground" wire.

Marking with Tape:

If the standard color coding isn't available, you can use electrical tape to mark wires with specific colors to indicate their function.

Wire Gauge:

The thickness of a wire is often indicated by a number called the "wire gauge" which is usually printed on the wire itself.

CHAPTER FOUR

4.0 INSTALLATION OF 20 MM PIPE

The Diginity 20mm Bendable PVC Pipe is flexible and durable, ideal for various plumbing and construction projects. Each bundle contains 25 pieces, providing excellent value and versatility.

4.0.1 Conduit Installation Steps:

1. Step 1: Mark Conduit Placement:
2. Step 2: Cut and Prepare Conduit:
3. Step 3: Install Conduit Fittings:
4. Step 4: Mount Conduit Supports:
5. Step 5: Assemble the Conduit System:
6. Step 6: Pull Wires:
7. Step 7: Install Conduit Accessories:
8. Step 8: Verify and Secure Connections:

4.1 INSTALLATION OF D4 THREE PHASTER

What are the requirements for installation of a 3 phase electrical panel board

Requirements for Three Phase Wiring Installation

- Three Phase Energy meter: 1 No.
- Three Pole MCCB, 63A (100 or 250A in US) : 1 No.
- Double Pole: 63A, 30mA Trip Current (RCD/GFCI): 3 No.
- Triple Pole MCBs, 63A (100-250A In US): 3 Nos.
- Single Pole, 20A, MCB: 6 Nos.
- Single Pole, 16A (20A in US): MCB: 3 Nos.

- 

-

- **4.2 INSTALLATION OF 3BY3 AND 3BY6 SWITCH**

  To install a 3x3 or 3x6 switch, you need to: turn off the power to the circuit at the breaker panel, locate the existing electrical box in the wall, cut a hole if necessary, secure the switch box to the wall, run the electrical wires through the box, connect the wires to the switch terminals according to the wiring diagram, then attach the faceplate to the switch box; ensure you follow proper electrical safety procedures and consult an electrician if you are unsure about any steps.

  Detailed steps:

  Preparation:

  - **Safety First:** Turn off the power to the circuit at the breaker panel.
  - **Locate the box:** Find the existing electrical box in the wall where you want to install the switch.
  - **Check box size:** Verify if the existing box is large enough to accommodate the 3x3 or 3x6 switch mechanism.
    Cutting the Wall (if needed):
  - **Mark the hole:** Use a level to mark the outline of the switch box on the wall.
  - **Cut the hole:** Carefully cut the hole using a drywall saw or a suitable cutting tool.
    Installing the Switch Box:
  - **Insert the box:** Gently push the switch box into the hole cut in the wall.
  - **Secure the box:** Fasten the box to the wall using screws or clamps depending on the box design.
    Wiring the Switch:

- **Thread the wires:** Feed the electrical wires through the knockout holes in the switch box.
- **Connect wires:** Connect the incoming power wires to the appropriate terminals on the switch according to the wiring diagram.
- **Connect switch wires:** Attach the wires for each switch to their corresponding terminals.
  Attaching the Faceplate:
- **Align the faceplate:** Carefully align the switch faceplate with the switch box.
- **Secure the faceplate:** Screw the faceplate onto the switch box to hold it in place.

4.3 INSTALLATION ROUND BOXES

Install a Junction Box

1. Mount the Box. Separate the circuit wires at the existing splice and loosen the cables as needed to make room for the new junction box. ...
2. Attach Clamps to the Box. Install a cable clamp for each cable, as needed. ...
3. Secure the Cables. ...
4. Join the Wires. ...
5. Fit the Wires in the Box.

Your junction box needs to be spacious enough for the number of wiring connections you need to make. A small box will likely be able to splice two cables but no more than this. A large box may be able to handle as many as four to six cables.

4.4 INSTALLATION OF 6BY3 AND 9BY9 ADAPTABLE BOXES

9×9 ADAPTABLE BOX

Adaptable Boxes are available in plastic and metal construction, both with and without knockouts. Our range includes weatherproof and galvanized Adaptable Boxes.

Used Mainly for containing wiring junctions as well as various other uses including keeping electrical connections out of sight to deter tampering. These boxes are incredibly useful for installations where you need to adapt the junction box to suit your cable requirements.

CHAPTER FIVE

5.0 CIRCUIT BREAKER

A circuit breaker is an electrical switch that automatically shuts off the flow of electricity when it detects a fault in an electrical circuit. Circuit breakers are used to protect electrical circuits from damage caused by short circuits, overloads, or ground faults.

5.0.1 HOW CIRCUIT BREAKERS WORK

- Circuit breakers detect faults using protective relays
- When a fault is detected, the circuit breaker trips, or shuts off, the flow of electricity
- Circuit breakers are reusable, unlike fuses, which need to be replaced when they fail
  Uses of circuit breakers
- Circuit breakers are used in homes, offices, and industries
- Small circuit breakers protect individual household appliances
- Larger circuit breakers can protect high voltage circuits that supply electricity to cities
  Circuit breaker types Oil circuit breakers, Gas circuit breakers, and Vacuum circuit breakers.

  Circuit breaker characteristics Operating voltage, Nominal intensity, Cutting power, Closing power, and Number of poles.

5.1 CONNECTION OF WIRING IN JUNCTION BOXES

To connect wiring in a junction box, you can use wire nuts or other connectors to join wires together. You should ensure that all connections are secure and no bare wire is exposed.

Steps for connecting wiring in a junction box

1. Turn off the power at the mains
2. Strip the insulation from the ends of the wires
3. Join the wires together using wire nuts or other connectors
4. Feed the connected wires into the junction box
5. Secure the box to the wall or surface
6. Double-check all connections for tightness
7. Turn the power back on at the mains
8. Test all connections using a voltage tester
   Tips for connecting wiring in a junction box

- Use the correct size junction box for the number of wires you need to connect
- If you need to connect more wires than the box can hold, you can use a box extender
- If the box is located outdoors, use a weatherproof box to prevent moisture from seeping in

5.3 HOW TO CONNECT WIRE FROM DISTRIBUTION BOX

To connect wire to a distribution box, you can connect the incoming wires to the busbars, then connect the output to the circuit breakers.

Steps

1. Connect the incoming phase wires to the busbars via a main switch
2. Connect the incoming neutral to the lower busbar on the right side of the panel
3. Connect the output of the energy meter to the Dual pole MCB
4. Connect the main fuse to the live wire
5. Connect the main switch to the live and neutral wires

5.4 INSTALLATION 200W LIGHT BULB

The 200A/CL/HDRP Feit Electric high lumen incandescent 200-watt bulb is for your ideal yard, garage, utility or barn lighting where you need to brighten up a large area. It replaces traditional bulbs with a light output of 3305 lumens and an average life of 1,000 hours / 0.9 years.

5.5 CONCLUSION

Conclusions about electricity include the growth of renewable energy sources, the need for grid infrastructure, and the importance of resilience.

Renewable energy

- Wind and solar power are becoming the main way to meet growing electricity demand.
- The transition to renewable energy is happening in every region of the world.
- This transition is signaling the end of the fossil fuel era.
  Grid infrastructure
- The grid infrastructure and system flexibility needed to support wind and solar power is not keeping pace with the deployment of those sources.
- This creates bottlenecks.
  Resilience
- To improve resilience, operators of the electricity system should work together to conduct emergency preparedness exercises.
- These exercises should simulate failures, attacks, and other impairments that cause large-scale power loss.
  Financing
- Many developing countries face high financing costs for renewable electricity projects.
- They need financial support to take advantage of the opportunities that a faster rollout would bring