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

HELD AT:

SESTEC ELECTRICAL AND ELECTRONIC COMPANY

ECWA CLINIC IKEJI AREA, MOPAMORO LOCAL GOVERNMENT KOGI STATE.

BY:

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SUBMITTED TO:

DEPARTMENT OF ELECTRICAL/ELECTRONICS ENGINEERING INSTITUTE OF TECHNOLOGY (I.O.T), KWARA STATE POLYTECHNIC, ILORIN.

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DEDICATION

From the depth of my mind, I dedicated this piece of report to the rock of ages, Almighty Allah, a very present help in the times of need.

Also, to my caring father and my sweet mother for being there for me always.

ACKNOWLEDGEMENT

Thanks to Almighty God, 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 domination and also to my parents; **Mr. and Mrs OLANREWAJU** for their words of encouragement and to my brothers and sisters who are too numerous to mention.

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.

And to those whose names did not appear who at the point or the other contributed to the success of this write up.

I say thank you and GOD BLESS YOU

PREFACE

The Students Industrial Works experience Scheme (SIWES) is a programme that enable student to go out in order to acquire more knowledge especially on the practical aspect of what has been taught in school, this will help them to gain more experience on their field of study.

The report is written according to the immense experience and knowledge I gained during the programme at **SESTEC ELECTRICAL AND ELECTRONIC COMPANY**, where electrical services were touched one after the other.

During this four (4) months programme, I have been able to see physically a lot of equipment, instrument materials and tools needed in electrical and electronics engineering, and also have been able to practice by myself in the field on some aspects of electrical installation. The experience acquired is immense, versatile etc. and my prayer is that these experience will grow and take root in my heart by God's Grace.

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CHAPTER ONE

1.0 INTRODUCTION

Student industrial work experience scheme (SIWES) programmed, it was establish in year 1973 by Federal Government of Nigeria through the Industrial Training Fund (ITF) under the NTBE (National Board for Technical Examination). It has it's 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) It 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.

Objective of the Student Industrial Work Experience Scheme (SIWES), also include:

- To prepare student for the future.
- To contribute immensely to the attribute of qualified student.
- To assist the students towards a full potential.

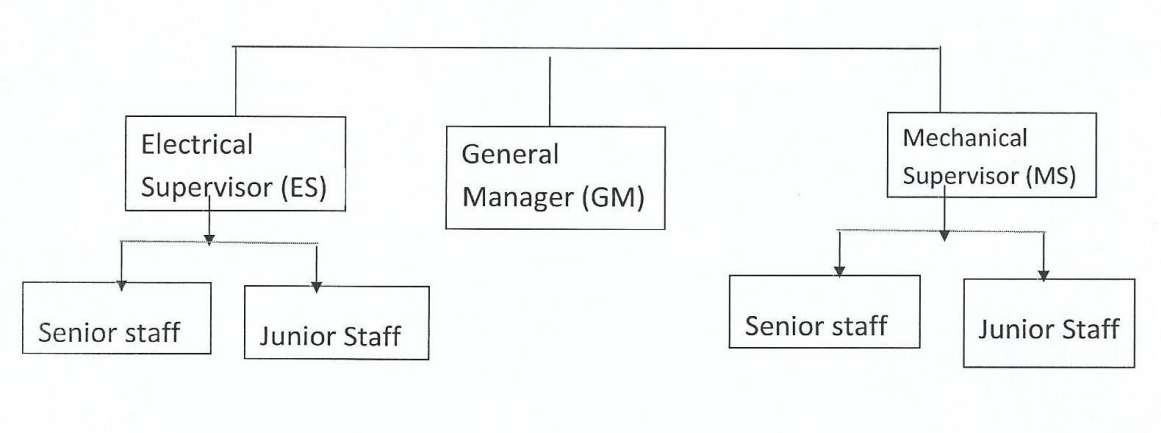
- To enhance quality education in all higher institutions of learning.
- To enable students to have more knowledge in their area of specialization.
- To enable students to be self-employed as the case may be.
- To give the students skills in handing business opportunity.

1.3 HISTORICAL BACKGROUND OF JOB OLANIPEKUN LICENCED ELECTRICAL ENGINEER & CONTRACTOR

EASY ELECTRICAL ENGINEER is a company that was established about fifteen (15) years ago and its main is to carry out repairs and maintenance works as well as wiring and other electrical and electronics works.

CHAPTER TWO

2.0 ORGANIZATIONAL CHART OF EASY ELECTRICAL ENGINEER



CHAPTER THREE

3.0 INSTALLATION PLANNING

Before installation work of any building commence, the distribution of electricity supply has to be done; the distribution of electricity supply has to be carefully planned in order to ensure that the requirement of part one, no 1 of the I.E.E. regulations is met. Regulation no 1 state that all electrical conductors should be of sufficient size and current rating for which they are to be used. Provision also has to be made so that "appeals will be suitable for the maximum power demanded by the apparatus when it is used and shall otherwise be constructed, installed and protected as to prevent danger so far as is reasonably practicable.

Normally if supply is to be obtained from the public mains, the first step is to get in touch with the local office of power holding company of Nigeria plc nearer to you. This is done by filling neap form 74A (form of application for supply) and in addition with the neap form 74A (form of application for supply if a large load or industrial consumer).

The last paragraph is very important because the supply authority (PHCN) will be able to advice whether supply is readily available, whether there is need for extension, or reinforcement of their mains of which the consumer may have to contribute to the cost of this. For an industrial consumer with a large load, he may be close or far from an existing 33KV or 11KV supply.

Some of the forms of wiring used in Nigeria are surface wiring using PVC sheathe cable, surface conduit wiring, half conduit wiring, trucking system of wiring.

3.1 ELECTRICAL LAYOUT PLAN

Various outlet points shall be located on the architectural building plan according to the requirement of the client as a draft.

This is best done by collecting the requirement of the client on a rough note and plan. The electrical consultant will consider the requirement of the I.E.E. regulation, factories act regulations, electricity supply regulations and I.E.E. code as the case may be and finally arrive at a suitable point on the architectural building plan using the current symbols as required by the regulation.

3.2 ELECTRICAL INSTALLATION

Electrical Installation has to do with the transferring of electricity from the supply authorities' overhead distribution to various consumer premises. Making use of contentiously appliances in residential, industrial and commercial building. It brings the supply from the main supply

to the consumer premises causing them to be in close association with it and to enjoy the use of electricity. Therefore, care must be taken to ensure that the supply is safely used and controlled by the consumers in carrying out work on installation, in order for this, some factors or precaution must be put into consideration.

3.3 FACTORS TO BE CONSIDER DURING INSTALLATION

1. Safety electrical installation works must be carry out according to the regulations (I.E.E.) to ensure the safety of users of the building and the appliance. In order to ensure safety, all electrical conductors should be of sufficient size and convert rating for the purpose which they are to be used. Also provision must be made so that the apparatus will be suitable for maximum power by the apparatus when it is in use and will otherwise be installed and protected to prevent danger.

2. Installation must be planned out and carried out to avoid unnecessary cost and expenses. Materials must be cheap and it must be of good quality in order to avoid burnt doing and after installation. The economy of length of cable used must be considering ensured by centralizing the distribution board.

3. Installation should be carried out according to plan and recommendation of the client and finishing of the installation must appear as attractive and neat in order to create good impression in the mind of the client.

4. Installation must be durable to enhance long lasting of the installation. This could be attained by using the current type of quality materials in the installation.

5. Provision for future expansion must be considered as existing load may be increased due to expansion of the residence

3.4 TOOLS USED IN AN ELECTRICAL INSTALLATION

These are tools to be used when carrying out installation, repairs and maintenance of equipment's in the fieldwork and domestic service. This tool helps to improve the quality of our works and also save time used during installation.

These Are Some Tools And Their Functions:

1. Hammer: As the name imply, it is use for clipping cable to a surface or nailing during an operation.

2. Neon Tester: for checking weather of a conductor.

Neon Tester

3. A Pair of Side Cutting Pliers: For cutting Conductor.

Pliers

4. Allen Key: Used for losing and tightening hollow head bolts.
5. Jim let: Combination Pliers: Are used for cutting, twisting and holding the cables.
6. Clipping Used for forming holes in wooden blocks.
7. Raw Pliers Drill: Use for forming holes in blocks or concrete.
8. Centre Punch: Used for making points in metal before drilling.
9. Per Knife: For removing insulation for cables.
10. Pliers: This is used for cutting an insulator and conductor
11. Mallet Hammer: A hammer that the head is made up of rubber, for knocking fragile materials.
12. Screw Driver: Used for screwing bolt in and out.
13. Fishing Tape: Used for fishing cables during electrical installation.

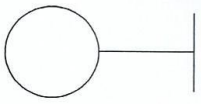
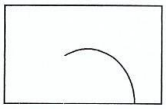
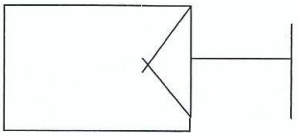
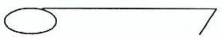
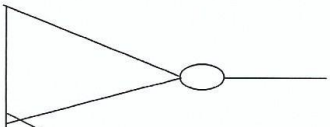
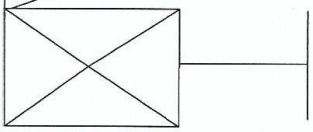
3.5 DEFINITION OF TERMS USED IN ELECTRICAL INSTALLATION DESIGN AND DRAFTING

1. **Accessory:** Any device other than lighting associated with the wiring and current using appliance of an installation for example, a switch, fuse, lamp holder or a plug.
2. **Apparatus:** This includes all machines, electrical fitting that use conductors for connections, for example, electric motor, fluorescent fitting, electric kettle, television, video player etc.
3. **Appliance:** Any device that uses electricity for a particular purposes, excluding lighting fitting and electric motor for example, radio, cooker and electric iron.
4. **Bus bar Chamber:** A distribution board containing bus bars without fuse or circuit breaker, but intended to feed two or more circuit or distribution board through switch fuses.

5. **Cable:** A length of insulated conductor (solid or stranded) or of two or more of that conductor each provided with his own insulation, which are laid up together.
6. **Armoured Cable:** A cable provided with helical wrapping or wrappings of steel wire or wire tape to serve as mechanical protection.
7. **P.V.C Sheathed Cable:** A cable of which the conductor insulation and mechanical protection is of polynylchor.
8. **Cable Duct:** A duct casting sit in concrete often laid before the concrete is poured after which the cable are to be drawn.
9. **Cable Ranking:** A cast to cables, constructed of metal sheet, wood insulating material 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.
10. **Circuit:** This is the arrangement of conductors for the purpose of carrying current.
11. **Final Sub-Circuit:** An outgoing circuit connected to a distribution board which is intended to supply electrical energy direct to current using apparatus.
12. **Circuit Breaker:** A mechanical device for making and breaking a circuit both under normal and abnormal condition, such as those of a short circuit, the circuit being broken automatically.
13. **Consumer Control Unit:** It is a distribution board incorporating a main switch or a main circuit breaker within its unit.
14. **Insulation of Conductor:** Is a suitable non-conducting materials enclosing surrounding or supporting a conductor.
15. **Joint Box:** A base firming part of wiring of an installation (usually surface) provided to contain joints in the conductor and junction box is a box connecting two or more length of conduit duck and trunking.
16. **Switch Gear:** Is an apparatus for controlling the distribution of electrical energy for protecting electrical circuit machine.
17. **Lighting Fitting:** A device for joining a lamp or lamps together with any holder, shade or reflector, for example wall bracket fitting, lamp holders and a florescent fitting.

3.6 ELECTRICAL INSTALLATION GRAPHICAL SYMBOL

The IEE regulation often changes these symbols from time to time, but the appropriate symbols from the IEE regulation as used by the Electricity Regulation for Federation of Nigeria are as follows:

SYMBOL	MEANING
1. 	Wall Bracket
2. 	Fan Regulator
3. 	Change over switch
4. 	1-way switch
5. 	13 A socket outlet
6. 	15 A socket outlet
7. 	Cooker Control unit

3.7 SIZE OF CABLE AND USES IN AN ELECTRICAL INSTALLATION

S/N	SIZE OF CABLE	USES
i.	$1.5mm^2$	For Lighting
ii.	$2.5mm^2$	For Socket of 13Amps and 15Amps
iii.	$4mm^2$	For AC and Cooker Control Unit
iv.	$6mm^2$	For Cooker Unit
v.	$10mm^2$	For Meter and Distribution Board
vi.	$16mm^2$	For Servicing Building

3.8 TESTING ON COMPLETED INSTALLATION

Every new installation or extension to an existing installation should be thoroughly tested in order to avoid a kind of danger to ourselves and damaging of the material used. Test can be carried out in different ways.

(i) Verification of the polarity

(ii) Installation test

(iii) Earthling test

Before a complete installation may be connected to the supply, a number of test are required to indicate the general conduction of the installation both with regard to the installation resistance of the conductors and other current carrying parts and with regards to the conductance of the earthling system. The tests which are to be made are not a complete guarantee of the quality of the installation for all time, and regular testing is necessary in order to be maintained in a proper condition throughout its life.

CHAPTER FOUR

4.0 WIRING SYSTEM

When choosing a system of wiring for a building, the following must be put into consideration.

1. **Neatness of the finished job:** There is need for our finished job to be neat, it enable people and even the owner of the job to appreciate us and our job and to see if a particular wiring system that is choosing for a building will not be an eye saw.
2. **Time required to complete the wiring:** We must ensure that the length of time allocated for the completion of the job did not fail; this will encourage our client to trust us and commit more work into our hands.
3. **The durability of the installation:** That is, if a particular wiring system will withstand the hazard condition usage or will last long as expected of the installation. For example, a surface PVC sheathed wiring will prove hazardous in a metal workshop.
4. **Future extension and alternation:** One must ensure that a system of wiring will gives room for future extension. For example, a concealed conduit wiring will not be suitable for factory installation which is often subject to extension.
5. **Damage to the fabric of the building by cut away:** It is better to wire a complete multistory building using surface wiring system than using a concealed conduit wiring system which may weaken the walls and pillars of the building.
6. **Special consideration like dampness:** Flammable etc. in a situation which is either permanently damp or temporary damp. Fitting and wiring materials must be used to prevent, in case of moisture to the wiring.
7. **Cost of installation:** Cost is one of the important aspects to be considered when deciding a system of wiring because the client may want to wire his/her building in full conduit because of the neat appearance but by the time he/she sees the estimated cost of the wiring he/she may not be able to afford the cost.

4.1 PVC SHEATHED CABLE IN WIRING SYSTEM

This involves the use of PVC insulated cable which consists of 1,2 or 3 core cable laid up together.

It is the most commonly used cable in Nigeria for domestic wiring. It can be used for surface wiring further mechanical protection.

It should not be installed where it can come in contact with gas pipe, water pipe or any other meter work.

Another disadvantage is that it should not be installed when the ambient temperature is very low as the cable insulation often cracks under low temperature.

4.2 CONDUIT SYSTEM OF WIRING

A conduit can simply be defined as a tube channel, in electrical installation work. "conduit " refers to metal tubing or non-metallic tubing and the most common form of conduit used for electrical installation work in residential and office building is insulated or plastic conduit.

Classification of conduit

Conduit in general is divided into two major classes, that is class "A" when is insulated or plastic conduit and class "B". This is metal conduit.

Metal conduit

There are three main types of metal conduit, which are the light gauge steel screwed conduit and the non-ferrous metal (copper, aluminum and zinc buss alloy) conduit.

Insulated conduit

The Advantages Of This Type Of Conduit Is That:

i. No abrasion
ii. Resistance to corrosion
iii. Absence of condensation
iv. Easy bending by light heating of conduit

Light gauge steel conduit

This type of conduit can only be run on surface of wall, ceiling and floor because of the opening on the pipe. Grip fitting are often used as the conduit is unscrewed.

Advantages of heavy gauge conduit

i. It is cheaper than the screwed conduit
ii. It is only suitable for dry situation and not suitable for where there is likely hood of heavy mechanical damage.

4.3 CONNECTION OF WIRE DURING WIRING SYSTEM

It is essential during wiring system for all engineer or electrician that are to carry out wiring to know the polarity of the wires that is, an engineer must be able to differentiate the **Life, Neutral and earth wires** by all means as misconnection of wire during wiring is very risky. The engineer must know how to connect wire when light is taken from the pole to the cut out finally to the meter before the connection of load wire.

4.4 WIRING ACCESSORIES

1. **Lamp Holder:** These are designed for quick removal and replacement of lamp and yet they must hold the lamp and form metallic contact to prevent overheating. There are three main size of lamp holder the Bayonet- cap (B.C), the Medium Edison screw (E.S) and the Goliath screw (G.E.S). There are other variations such as three slots B.C for the smaller discharge lamps. For ordinary tungsten filament lamps up 150w the lamp corps and thus the lamp holders are B.C, up to 200w the corps are E.S and above 200w they are G.E.S In every case where a lamp is to be installed, the appropriate size and the type of holder must be fitted. Lamp holder may be either the insulated type of Bakelite of brass type with porcelain interior.
2. **Fuses:** a fuse element consists essentially of a piece of copper or tin lead alloy wire which will melt when carrying a predetermined current. This element with contacts, Carrier and base is called Fuse. It is placed in series with the circuit or sub-circuit to be protected and automatically breaks the circuit when overloaded. In general, the regulations regarding fuses require that fuse shall be accessible and shall be fitted either on the front of a switch board or in a distribution board. The fusing values of normal duty fuses vary from 160 t0 200 percent of the carrying capacity.
3. **Ceiling Roses:** The great majority of the ceiling roses already installed contains either two or three connection plates each plate including a pillar terminal for the circuit wires and a screw terminal with washer for the flexible wire connection.

Below are the different types of ceiling rose, the first being an ordinary 2 plate rose in which the barrier between the terminals. The second illustration is semi-recessed rose for direct fixing to an iron conduct box. The third is a mounded typed ceiling rose with loose interior. The cover has "KNOCKOUTSS" in the outer rim to provide entries for surface wiring.

4.5 FACTOR AFFECTING THE CHOICE OF WIRING SYSTEM

These are the factors that one must put into consideration when chosen a type of wiring system.

1. The cost
2. Type of building in which the installation is situated
3. Durability of installation
4. Appearances
5. Future extension and alteration
6. Damage to the fabric of building
7. Time required completing the wiring
8. Quality of the cables to be used

CHAPTER FIVE

13.0 CONCLUSION AND RECOMMENDATION

13.1 CONCLUSION

After going through four months of Student Industrial Work Experience Scheme (SIWES) Prgramme at **SESTEC ELECTRICAL AND ELECTRONIC COMPANY**, I can now lay my hand on some practical aspect of my chosen career especially on wiring system and repair, the programme made me to understand how relevant my career is to my environment and to the world.

The practical experiment which is the purpose of the industrial training programme was acquire before the completion of my National Diploma which is to prepare and expose me to the practical field of my career. My sincere appreciation goes to my Lecturers in school (Kwara State Polytechnic, Ilorin I.O.T) and **SESTEC ELECTRICAL AND ELECTRONIC COMPANY,** Finally, I appreciate the effort of national board for technical education (NBTE) for introducing training fund (I.T.F). It is indeed a good step in the right direction. I cannot forget the assistance rendered by the Kwara State Polytechnic, Authority. It has all been to the overall benefit of the students.

5.2 RECOMMENDATION

I, a student of Kwara State Polytechnic, Ilorin who had undergone the student industrial work experience scheme (SIWES), appreciate the effort of the government towards the technical development in the country so far. I want to strongly recommend that more can

still be done to improve technical development of this nation when such programme (SIWES) and others is put into consideration and is taken very important in our society. However, the government should please and try as much as possible to ensure all engineering student graduating from school to be competent and practicing engineers by organizing workshops, seminars, conferences and by establishment of more industries respectively to contain all the graduates in the engineering field.