A TECHNICAL REPORT

ON

STUDENTS'INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

HELD AT

ADE ELECTRICAL

BY

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DEDICATION

I hereby dedicate the Student Industrial Work Experience Scheme (SIWES) Technical Report to God Almighty for his unending love, grace, power, provision and sustenance throughout my three months of industrial training.

ACKNOWLEDGEMENT

All praises, thanks, adoration, honor and glory to Almighty God ,the Lord of the world, the most benefit and the most merciful for His protection, provision, guidance and support for the successful completion of this Industrial Training Exercise.

My appreciation goes to my SIWES supervisor and to all the lecturers in the Department

ABSTRACT

Industrial Training refers to a program whose aim is to provide practical knowledge within a specific period of time. This is to enable students to carry out their practical knowledge acquired during the time of training. However, this period of I.T was based on Electrical wiring, materials used and safety precautions taken during operation..

CHAPTER ONE

INTRODUCTION

The Student Industrial Work Experience Scheme (SIWES) is a skill acquisition training program which its intension is to bridge the gap between the theoritical knowledge acquired in tetiary institution and practical skills required in today's workplace. The Students Industrial Training Work Experience Scheme (SIWES) intension is to expose and prepare students of Universities and of the tertiary institution for the industrial work circumstances they are expected to meet after graduation bringing the gap between theory and practical.

The scheme also enables students get the needed experience in handling machinery available at their workplace that may not be available in their institution.

The program was established due to complaints among industrialists and companies, that graduates lack adequate background studies preparation for employment in industries and companies. Therefore, the scheme was introduced to acquaint students with the needed skills to solve real-life problems and to be in working conditions after graduating.

ABOUT THE STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

The SIWES program was initiated in 1973. It is a tripartite program involving the students, university and industry. The student Industrial Work Experience Scheme is part of the approved Benchmark Minimum Academic Standards (BMAS) for SIWES-approved undergraduate degree program in Nigerian Universities. It is a planned and structured scheme with specific career objectives geared toward developing participants' occupational competencies, whereby students require Relevant Production Skills (RPS) to prepare them for post-graduation real work situations.

The SIWES program is under the umbrella of the Ministry of Education through the Industrial Training Fund (ITF). This was created to bridge the existing gap between the

theory taught in the classroom and practice of science, agriculture, medicine, engineering, technology and other professional programs in the Nigerian Tetiary institutions. This program of aimed at exposing the students to the use of various machines and equipment, professional work methods and ways of safeguarding the work areas in industries as well as other organizations and other parastatals. It is also intended that the students through a process of relation to academic knowledge and practical industrial application would understand the underlying principles and become better focused and acquire the practical application towards excellence in his or her discipline.

The SIWES programme is funded by the Federal Government Of Nigeria and jointly coordinated by the *Industrial Training Fund (ITF)* and *National University Commission (NUC).*

OBJECTIVES OF SIWES

The objectives of Siwes include:

- Providing an avenue for students to acquire skills and experience during their course of study.
- To prepare students for the industrial work situation they are to meet after graduation
- To expose students to work methods and technics in handling equipment and machinery that may not be available in their institutions
- To make the transition from the university to the labour market easy for students and thus enhance students contact for the later job placement.
- To provide students with an opportunity to apply their knowledge in real work situation thereby bridging the gap between theory and practice.
- Enlist and strengthen employers' involvement in the entire educational process and prepare students for employment in industry and commerce

ABOUT THE INDUSTRIAL TRAINING FUND (ITF)

Established in 1971, the Industrial Training Fund has operated consistently and painstakingly within the context of its enabling laws Decree 47 of 1971 as amended in the 2011 ITF Act. In the four decades of its existence, the ITF has not only raised consciousness in the economy, but has also helped in generating o corps of skilled indigenous manpower which has been manning and managing various sectors of the national economy.

Over the years, the ITF has expanded its stryctures, developed training programs, and reviewed its strategies, operation and services in order to meet the expanding and changing demands for skilled manpower in the economy. Beginning as a parastatal '**B**'in 1971, headed by a director, the ITF acme a parastatal '**A**'in 1981 with a Director-General as a chief excutive under the aiges of the Ministry Of Industry. The Fund has a thirteen (13) member governing council and operates with ten (10) departments and three (3) units at the headquarter, thirty-three (33) area offices, three (3) skill training centers, and a center for industrial training excellence.

The main thrust of ITF programs and services is to stimulate human performance, improve productivity and induse value-added production in industry and commerce. Through its skills and vocational and apprentice training programs, the fund also builds capacity for graduates and youths self-employment, in the contect of small-scale industrialization that is the economy.

VISION STATEMENT OF ITF

To be the foremost skills traing developement organisation in Nigeria and one of the best in the world.

MISSION STATEMENT OF ITF

To set and regulate standards and offer direct training intervention in industrial and commercial skill training and development, using a corps of highly competent professional staff, modern techniques and technology.

CHAPTER ONE

THE BASICS OF HOME ELECTRICAL WIRING

Since the 1940s, any house built (or any older home that has been rewired) has had to follow an electrical code: the NEC—written with safety in mind. NEC code identifies types of electrical wires and electrical cable types by color. When you remove a switch plate, you've probably noticed yellow, white, black, red or green wires. They are not there to be decorative; each serves a specific purpose, and some don't play nicely with others.

HOW TO CONNECT ELECTRICAL WIRES

When you're doing wiring installation, you need to identify the parts of the wiring cable, the non-metallic electrical cable: the outer sheathing (the jacket) and the inner wires. The colored "wire" you see—the green, black, red, blue or white—is actually the sheathing that covers the inner copper wires. If you look closely, you'll see markings stamped on the sheathing to let you know the number and gauge of wires inside.

WHAT TYPE OF WIRE IS USED FOR RESIDENTIAL?

Most modern homes use nonmetallic (NM) cable that consists of two or more wires wrapped inside the colored sheathing mentioned previously. The package of wires usually contains one or more hot wires plus a neutral and a ground. To accommodate wiring in an older home or if your wiring just needs work, you can splice the old wires with new NM cable using a junction box that protects wire connections. The larger circuit wires carry circuit voltage that can be really dangerous to touch. If you don't know what kind of wires you have, consider them all to be dangerous.

ELECTRICAL WIRING MISTAKES TO AVOID

An electrical “oops” moment could be really serious, causing short circuits, shocks or fires. These are a few common mistakes you’ll want to avoid:

- Never connect wires outside of electrical junction boxes. If there’s no box, add one and connect the wires inside it.
- Remember the three-inch minimum on wire length. Don’t cut your wires to short. IF you do, add six-inch extensions.
- Never leave sheathing unprotected between frames, as in a ceiling installation. Staple it to a 2× 2 or use metal conduit if the wire runs along the wall.
- Avoid loose switches or loosely connected outlets.
- Never install a three-slot receptacle without a ground wire.
- Don’t recess an electrical box behind a wall surface. Instead, add a wall extension.
- Secure cable with a clamp so wire insulation doesn’t cut or fray.

COMMON HOUSEHOLD ELECTRICAL PROBLEMS

If you have old wiring, you probably have a whole set of issues. One of the more common ones is frayed insulation because there was no grounding, and the wiring wasn’t made to handle today’s heavy-duty appliances. There are several other common electrical problems that are not restricted to old wiring:

- Frequent surges caused by lighting, damaged power lines, or faulty appliances or wiring
- Dips in power supply because of faulty devices (or those made of poor-quality materials) connected to the power grid
- Light switches that don’t work correctly
- A circuit breaker that trips frequently
- An overloaded circuit breaker
- Shocks
- Lights that are too bright or too dim
- High electrical bills

- Lightbulbs that burn out too often
- “Possessed” recessed lights that go out and then come back on

CHAPTER THREE

ELECTRICAL PANELS

Most residential homes rely on the services of their local utility company for electricity. The power coming from the utility company goes through the electrical panel which acts as the main switchboard that distributes the electricity needs within each home. This can be for lights, appliances, and other devices used by members of the household.

There are 4 different types of electrical panels – the main breaker panel, fuse boxes, main lug panels, and subpanels. The main breaker panel is the mother of all the panels in your house. It regulates the circuit breakers and the electricity consumption within the home. Fuse boxes are made up of small fuses which are designed to prevent overloading within your circuits. Main lug panels are comprised of line wires that run into lugs eliminating the need for the main breaker. Subpanels are electrical panels that get their energy from the main panel through a particular circuit. They allow you to control the electrical consumption of members of your household.

Can you identify which types of electrical panels are used within your home? Have you also wondered when you should replace your electrical panel? On average, electrical panels should be replaced every 20 years. Old electrical panels like the fuse box need to be updated to one that can handle your present electrical consumption. However, if you experience flickering lights, the burnt smell coming from your electrical panel, frequent circuit breaker trips, or if there's been a major addition to your electric appliances and devices, then you should have your electrical panel checked and replaced if needed.

HOW DO YOU INSTALL A 200 AMP BREAKER BOX?

Should you need to upgrade into a 200-amp breaker box, you'll need to get a work permit from your local building inspector, get in touch with your utility provider and ask them to temporarily stop the service on the day of installation so that you can proceed with the installation. It's a rather complicated and dangerous job that's why we highly recommend that you hire a professional electrician to get the job done. We here at Arc Angel Electric

can install your 200-amp breaker box, take care of all the permits, and make the necessary inspection for safety purposes.

If you're installing the Square D brand 200-amp breaker panel, it should be the same as installing any other brand of 200-amp panel. The only difference is that the cables are connected through the back of the panel because of its back feed design. Again, we recommend that you leave this to the pros. Our professional electricians at Arc Angel Electric can help you with all your electrical projects.

A 200-amp service will give you the flexibility for your electrical consumption. You can upgrade your 100-amp panel into a 200-amp panel to comply with the new regulations and accommodate your growing need for electricity. Homeowners can change their electrical panel if they are knowledgeable about electrical stuff. However, it is best to entrust the job to electrical professionals at Arc Angel Electric to ensure the quality and safety of the work.

HOW CAN YOU TELL THE DIFFERENCE BETWEEN A 100-AMP SERVICE AND A 200-AMP SERVICE?

A 100-amp service is usually good for a small home without electric heating. The 200-amp service is the current standard for newly built homes to serve all the electrical needs of modern equipment. Physically, the 200-amp breaker is larger than the 100-amp because it holds more circuit breakers.

HOW DOES AN ELECTRICAL PANEL WORK?

The electrical panel receives the electricity coming from your utility provider. The main breaker panel turns the power on or off in all the branch circuits within the house. Electrical current travels through hot wires in your circuit breakers to power your electrical devices.

WHERE SHOULD I PLACE MY ELECTRICAL PANEL?

The National Electric Code says that electric panels should be placed in a spacious room with clear working space, reachable, and well-lit. Your main breaker panel should be placed in an area that people in your house don't usually stay in. The Fire Department has recommended for the home electric panels to be attached outside the homes to make it easier for them to shut off electricity in case there's a fire. The secondary panels can be placed in other rooms such as the bedroom as long as no water can reach them. Therefore, you shouldn't put your electric panels in your bathroom or laundry room.

WHAT SHOULD YOU NOT TOUCH IN A BREAKER BOX?

Always be cautious when working with any electrical panels. It has parts that can electrocute you and it can be lethal. Avoid touching the neutral bus bar, a neutral wire, main black cable, burnt or damaged parts, and exposed metal parts. Remember, it is only safe to touch a circuit breaker when all the power is turned off.

CHAPTER FOUR

WIRING A RESIDENTIAL HOUSE

Wiring is complex and very different from other aspects of home improvement. Knowing how it works is of great benefit to you.

However, some localities only approve a licensed electrician for residential house wiring. This is because of the risks involved in making a simple error. You can do your installation under the supervision of a licensed electrician to avoid costly mistakes.

As a homeowner, you should know specific basic requirements for home wiring for your protection, even if you don't plan to do the wiring yourself.

Let's begin with the room-by-room requirements of home wiring.

REQUIREMENTS FOR WIRING VARIOUS PARTS OF THE HOME

Living room, Dining room, and Bedrooms

These standard living areas require a moderate power supply. The living room, dining, and bedrooms are generally served by 120-volt 15 or 20amp, which can serve more than one room.

Install a wall switch beside the entry door of the room. This switch is to enable you to light the room easily when you enter it. It will control ceiling fixtures or wall light. A pull chain should not control your ceiling light; install a switch.

Your dining room requires a separate 20amp circuit for a microwave or window air-conditioner. All wall sockets must not be more than 12 feet away from one another. If you have any wall section that is wider than 2cm, install an electrical socket.

BATHROOM

Remember that bathrooms are always wet, so be extremely careful. Bathrooms may need more than one circuit because of the lights, vent fans, and outlets for hairdryers and other appliances.

A 20-amp circuit is recommended for the outlet sockets in the bathroom. The circuit can be used to supply the whole bathroom (a single bathroom) if there are no heaters or vent fans with built-in heaters. You can also use a 20-amp circuit for sockets and another 15amp for the lighting.

If you plan to use a vent fan with a built-in heater, have a separate 20-amp circuit solely for it. Your sockets should be at least 120 volts for a bathroom and must have ground-fault circuit-interrupter protection (GFCI).

All light fixtures in the shower area, if not subject to shower spray, must be rated for damp locations. You may add an extra outlet close to the door for your vacuum cleaner, depending on the size of the bathroom.

KITCHEN

The kitchen uses more electricity than any other room in a house. A kitchen with standard appliances requires about seven circuits or more.

Kitchen lighting requires at least one 120/125-volt 15-amp circuit separately. It can power ceiling fixtures, canister lights, strip light, and under-cabinet lights. A switch must be installed for each set of light so that you can control lighting easily.

For portable plug-in appliances, install two 20-amp 120volt circuits for sockets in the countertop areas. Almost all standard kitchen appliances require a circuit dedicated to them. The dishwasher, garbage disposal, refrigerator, and microwave each require 120-volt circuits.

Install an electric range with a 240volt 50-amp circuit even if you won't need it right away. An electric range can be a selling point for you if you want to sell the house.

Check the manufacturer's recommendations to confirm the more appropriate circuit for your dishwasher and garbage disposal between the 15-amp and 20-amp circuits. As for refrigerators and microwaves, the amperage would be 20-amp. Countertop sockets must not be placed farther than 6 feet apart.

HALLWAYS

Hallways can be very long, so they need efficient lighting. You have to install enough light to avoid casting shadows.

If your hallway is 10 feet long, you can use a general outlet. The switches should be installed three-way so that the ceiling light can be controlled from both ends. Make it four-way if the hallway serves a bedroom or any other room.

STAIRWAYS

All steps must be adequately lighted; you don't want trips and falls. Just like the hallway, you need the switches in three-way so that you can put it on or off from both ends. If your stairway has a turn, ensure that the area is appropriately illuminated.

STEPS TO FOLLOW WHEN WIRING A HOUSE

1. Design a wiring diagram

Your first step is to design a wiring diagram. The diagram will show the locations of the breaker box and the path each wire will follow to each outlet.

2. Disconnect power

It is hazardous to ignore this step. Don't be too self-confident. Cut off the power supply before doing any wiring in the home, no matter how little. Switch off the power that leads to your house meter or call your power supplier to cut it off for that short period.

3. Set up an electrical board

Mount your electrical panel at the spot where power enters your house from the supplier. Use a screwdriver and hammer to create holes that power leads can pass through.

4. Install conduits

Start from upstairs to the basement. It is easier this way, and you don't need to use a ladder to push the wire up. Start with the longest cable to avoid wastage. Have at least one foot of extra wire at each end.

Pass the wires through the drilled hole and fasten the clamps. Then, loosen the lugs on the brass bus bar. Put the red into one and the black into the other. Tie white cable to the silver bus bar

5. Understand outlets counts properly

You must know all the outlets needed and how many switches will run in a circuit as discussed above in the requirements for each room.

6. Set up connection

Now, drive a metal ground bar properly into the soil. Then run an eight gauge copper wire from the board to the shaft. Join the ground clamp and ground bus together on the service board.

7. Add a circuit breaker and electrical box

Your circuit breaker should be placed where it is easily accessible. It can be in the basement or utility room. Connect each electrical circuit to the service board to form a circuit breaker.

Connect the white wire of each cable to the silver bus bar and the ground wire to the ground bus bar. The black wire should separate breakers on a paired set.

To avert overloading, design your circuit to cut the length of the cable. Then mount an electrical box at every location of an outlet, light fitting, or switch.

Conclusion

Wiring a house is very delicate. You have to be careful and make sure you attempt your house wiring under the supervision of a qualified electrician. Safety is paramount because a wrong connection can lead to damage to appliances, fire outbreak, or electrocution.

Don't make assumptions; install appliances according to the manufacturer's recommendations. Before you start, take out time to plan using the guidelines above.

CHAPTER FIVE

ELECTRICAL SAFETY PRECAUTIONS

It’s vitally important to take safety precautions when working with electricity. Safety must not be compromised and some ground rules need to be followed first. The basic guidelines regarding the safe handling of electricity documented below will help you while working with electricity:

1. Avoid water at all times when working with electricity. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of the electric current.
2. Never use equipment with frayed cords, damaged insulation, or broken plugs.
3. If you are working on any receptacle at your home then always turn off the mains. It is also a good idea to put up a sign on the service panel so that nobody turns the main switch ON by accident.
4. Always use insulated tools while working.
5. Electrical hazards include exposed energized parts and unguarded electrical equipment which may become energized unexpectedly. Such equipment always carries warning signs like “Shock Risk”. Always be observant of such signs and follow the safety rules established by the electrical code followed by the country you’re in.
6. Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit.
7. Never try repairing energized equipment. Always check that it is de-energized first by using a tester. When an electric tester touches a live or hot wire, the bulb inside

the tester lights up showing that an electrical current is flowing through the respective wire. Check all the wires, the outer metallic covering of the service panel, and any other hanging wires with an electrical tester before proceeding with your work.

8. Never use an aluminum or steel ladder if you are working on any receptacle at height in your home. An electrical surge will ground you and the whole electric current will pass through your body. Use a bamboo, wooden or a fiberglass ladder instead.
9. Know the wire code of your country.
10. Always check all your GFCI's once a month. A GFCI (Ground Fault Circuit Interrupter) is a RCD (Residual Current Device). They have become very common in modern homes, especially damp areas like the bathroom and kitchen, as they help avoid electrical shock hazards. It is designed to disconnect quickly enough to avoid any injury caused by over-current or short circuit faults.

CONCLUSION

During the three months SIWES program i have been able to design, construct and perform experiments that i was unable to do. I want to encourage all students to endeavor to use their IT opportunity properly by getting involved in the practice because the Student's Industrial Work Experience Scheme enlightens students' knowledge and understanding in their field of study.