TECHNICAL REPORT

ON

STUDENTS' INDUSTRIAL WORK EXPERIENCE

SCHEME (SIWES)

Undertaken at

FEDERAL MINISTRY OF WORKS
ASA-DAM, OPPOSITE HOUSE OF ASSEMBLY KWARA STATE, ILORIN

Written by

OSENI BASIT OLAMILEKAN

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DEPARTMENT OF CIVIL ENGINEERING INSTITUTE OF TECHNOLOGY, KWARA STATE POLYTECHNIC, P.M.B. 1376 ILORIN

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DEDICATION

This report is dedicated to Almighty Allah, the beginning and the end, the door of all things, who spare my life before and after the completion of programme (SIWES). Also to my dearest parent Mr/Mrs Oseni for their moral and financial support toward my success and also to all my friends in **Federal Ministry of works** I pray that you will all reap the fruit of your labour.(Amen).

CERTIFICATION

This is to certify that this report was compiled by **OSENI BASIT OLAMILEKAN** with Matric Number **ND/23/CEC/PT/0224** a student of Civil Engineering Technology Department, Institute of Technology (I.O.T) Kwara State Polytechnic Ilorin, Kwara state on the completion of the Student Industrial Work Experience scheme (SIWES).

ACKNOWLEDGEMENT

My greatest thanks go to Almighty Allah for making this programme (SIWES) of four (4) month a success for me and for spearing my life till date. He is the only God and the greater God. I promised to serve him till life comes to an end by His grace.

My sincere appreciation also goes to my parent Mr/Mrs Oseni for their support and encouragement, both moral and financially throughout the successful completion of the programmes.

My appreciation also goes to the entire lecturers and staff both teaching and non-teaching staff of Civil Engineering Technology Department for long they have been supporting and guiding us. Thank you all and my Almighty Allah will be with you all (Amen).

And to the entire staff and management of **Federal Ministry of works .** I thank you all for your support in making my four (4) months stay a worthwhile. I Love you all.

PREFACE

This booklet contains the details of activities and experience undergone during my four (4) months Student Industrial Work Experience Scheme, also known as SIWES which was held at of **Federal Ministry of Works and Transport.** The experience and knowledge acquired during the programme was written in this report which is basically on construction, which is also essential for the fulfilment of National Certificate. It has exposed me to the use of various tools whose operation techniques work only but theoretically explained in the lecture room. I thank the National Board of Technical Education for the introduction of the Student Industrial Work Experience Scheme (SIWES) programmed to the school of learning.

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CHAPTER ONE

1.0 INTRODUCTION

The student industrial work experience scheme (SIWES) is the accepted skill training program, which form part of the approved minimum academic standards in the various degree programs for all the Nigerian universities. It is an effort to bridge the gap existing between theory and practice of engineering and technology, science, agriculture, medical, management and other professional education program in the Nigeria tertiary institutions. It is aimed at exposing student to machine and equipment, professional work methods and ways of safe guarding the work areas and workers in industries and other organizations.

The scheme is a tripartite program, involving the students, the universities and the industry (employers of labor). It is funded by the federal government of Nigeria and jointly coordinated by the Industrial Training Fund (ITF) and the National Universities Commission (NUC).

1.1 STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) BACKGROUND

The Students Industrial Work Experience Scheme (SIWES), is a skills development programme initiated by the Industrial Training Fund (ITF), in 1973 to bridge the gap between theory and practice among students of engineering and technology in Institutions of Higher Learning in Nigeria. It provides for on-the-job practical experience for students as they are exposed to work methods and techniques in handling equipment and machinery that may not be available in their Institutions.

The SIWES is a working experience programme incorporated into the curriculum of students in the tertiary institution in Nigeria so as to afford the students the opportunity of practical experience of what they had learnt in the classroom. The SIWES programme is usually a requisite to the award in view.

This programme is aimed at inculcating practical, scientific, and social and entrepreneurship skills needed to solve the challenges facing the nation's technology and also contribute to the overall development of the students of these faculties. The SIWES programme for university student in faculty of Technology and faculty of Environmental Design and Management is being

undertaken in part three with a duration of three months and in part four which spans during the rain semester for six months.

In view of this participation, the SIWES program has become a necessary prerequisite for the award of degree in Federal University of Technology Minna, Niger state in line with the education policy of the government.

1.2 OBJECTIVES OF SIWES

The Industrial Training Funds policy Document No. 1 of 1973 which established SIWES outlined the objectives of the scheme. The objectives are to:

1. Provide an avenue for students in higher institutions of learning to acquire industrial skills and experiences during their course of study.
2. Prepare students for industrial work situations that they are likely to meet after graduation.
3. Expose students to work methods and techniques in handling equipment and machinery that may not be available in their institutions.
4. Make the transition from school to the world of work easier and enhance students' contacts for later job placements.

1.3 IMPORTANCE OF SIWES

1. It provides students with an opportunity to apply their theoretical knowledge in real life situation.
2. It exposes students to more practical work methods and techniques.
3. It strengthens link between employers, universities and industrial training fund (ITF).
4. It also prepares the students for the labor market after graduation.

To achieve the objectives of SIWES, I was given a acceptance at the Niger State Ministry Of Works and Transportation to gain a practical knowledge and experience in my field of study.

CHAPTER TWO

2.0 BACKGROUND OF ESTABLISHMENT

Federal Ministry of works and transportation Asa-dam was incorporated in 1984 as a major player of maintenance and supervisions of construction works ranging from difference field such as Engineering, Environment and Supply Services. The ministry is own by Kwara state government.

The ministry maintains a formidable list of highly qualified Professionals- Civil, Building, Electrical, Mechanical Engineers, Administrators and Technicians.

2.4 The Services of Kwara state ministry of works and transportation

2.4.1 Engineering Services

i. They undertakes the supervision of construction/rehabilitation/maintenance of roads, bridges, etc. within the state.

ii. they also undertake the supervision of construction of water supply including construction of Dams, laying of pipes, construction of storage Tanks, installation of treatment equipment including mechanical and electrical works.

iii. Supervision and over oversees the Construction and development of estate housing projects, including estate structures like drainage, Roads, Water supply, Sewage, fencing electrical installation, landscaping, beautification etc. .

They supervise the process fixing rural electrification, including supply and installation of electrical plants and equipment.

iv. Also oversees the construction of Construction of hostels, lecture theatres, libraries, school buildings and laboratories including supply and installation of laboratory equipment for teaching purposes within the state.

2.5 THEORETICAL/GENERAL OVERVIEW

This section of the report provides background information on the general work experience of the trainee. Brief descriptions/general overview of work done and design concepts used in road construction and construction of drainage were fully discussed.

2.6 ROAD CONSTRUCTION

2.6.1 Setting out

This is carried out following the dimensions specified in layout drawings. The commonly used setting out procedure is the profile board method. A series of boards that show the exact level 1 metre above the completed construction level are placed at intervals along the proposed line of the road. A profile board with a fixed height, called the traveler, is used for controlling the excavated levels between these profile boards. By placing the traveler in the sightline between two level boards, it can be seen whether or not the excavation has been carried out to correct levels and adjusted accordingly.

Excavation:

Excavation in construction means the removal of earth to form a cavity in the ground, the basic types of excavation as seen during training are;

i. **Oversite excavation**: this is the removal of topsoil which includes plants, animals and decaying matter which makes the soil compressible, thus unsuitable to support building. Its depth can vary, but usually 150mm is the minimum used.
ii. **Reduce level excavation**: this is the excavation done below oversite to get a uniform level on which to build, this is called formation level and can include both cutting and filling operation.
iii. **Trench excavation**: this is the excavation done normally for strip foundation, its depth can range from 450-2000mm and its width is always 3times the size of block. 150mm block for 450mm width excavation and 225mm bock for 675mm width excavation.

Block work

This is the process of laying concrete masonry units to form either external walls or internal walls as partitions. These masonry units are commonly hollow sand-crete blocks which are much economical per unit of wall area.

Load bearing walls are usually 225mm while non-load bearing walls are usually 150mm.

Concrete works:

- **Concrete**: this is a mixture of cement, sand, aggregate and water in a measured and controlled proportion, concrete can be of different mixes, the mixes used on site during training includes 1:2:4, 1:3:6, and sometimes 1:3:5.
- **Formwork:** formwork is a temporary mould in which concrete is casted and is removed after the concrete sets:
- **Reinforcement bars:** Concrete has no useful tensile strength and is limited in its structural uses. Steel reinforcement bars are used in concrete columns, beams, and slabs. Reinforcement bars have various diameter sizes. They come in 12mm,16mm 18mm, 20mm 24mm 30mm and 32mmdiameter sizes.
- **Casting:** casting is the process of pouring concrete mix into a mould or form laid with reinforcement bars to form a solid mass structure.

2.7.2 Earthworks

Earthwork is one of the major works involved in road construction. It involves the removal of topsoil, along with any vegetation, before scraping and grading the area to the finished 'formation level'. This is usually done using a tractor shovel, grader or bulldozer. Below the formation level, the soil is known as the 'subgrade '. It is essential that the strength of the subgrade is tested prior to earthwork beginning. Various activities involved in earthworks are cut to fill, cut to spoil, borrow pit.

2.8.1 Materials

I. laterite (red sand)
II. shape sand
III. tape (measurement)
IV. water
V. MC1/MC2 Bitumen
VI. Asphal**t**

2.8.2 Machineries/Equipment

I. Paver machine

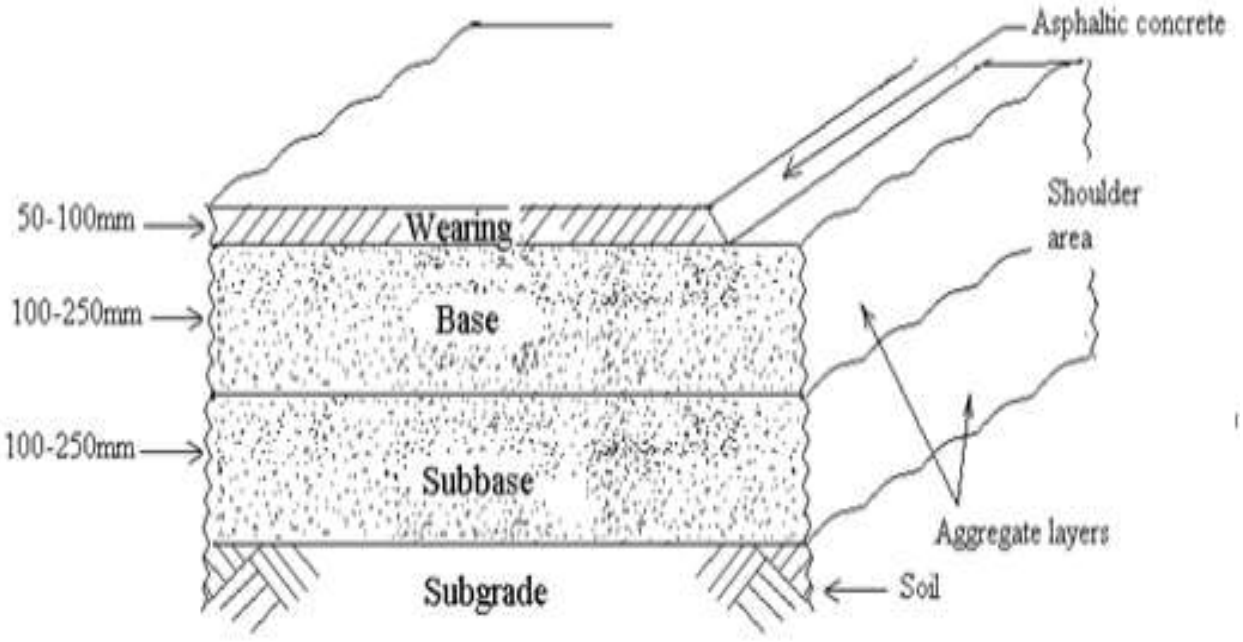
II. Fish born machine
III. Tea boiler
IV. Water tank
V. Grader
VI. Excavator
VII. Cutting machine
VIII. Blowing machine
IX. Sheep foot roller
X. Smooth roller
XI. Rake/ flat head rake
XII. Tipper

2.8.3 Construction of drainage trenches.

This is the outer surface of a road structure. It is the durable surface material laid down on area intended to sustain vehicular or foot traffic such as road or walkway. There are different types of road pavement (surface) which are, asphaltic surfacing, pavers (interlocking) and concrete surfacing.

- **Sub grade:** Subgrade is the native material underneath a constructed road, pavement or railway track. It is also called formation level. (i.e. the soil itself). The subgrade is the foundation of the pavement structure, on which the sub base, base and surface layer are laid. They are commonly compacted before the construction of a road, pavement or railway track, and are sometimes stabilized by the addition of asphalt, lime, Portland cement or other modifiers. Usually to a thickness of 100-250mm.
- **Sub base:** sub base is the layer of aggregate material laid on the subgrade, on which the base course layer is located. It may be omitted when there will be only foot traffic on the pavement, but it is necessary for surfaces used by vehicles. It is often the main load-bearing layer of the pavement. Its role is to spread the load evenly over the subgrade. The materials used may be either unbound granular, or cement –bound such as crushed stone or dry lean concrete (such as 1 : 15) laid and compacted by heavy rollers . The thickness of subbase can range from 75 to 100 mm (3 to 4 in) for garden paths through 100 to 150 mm (4 to 6 in) for driveways and public footpaths, to 150 to 225 mm (6 to 9 in) for heavy used roads, and more for highways.

- **Base course:** The base course serves as the principal structural component of the flexible pavement. It distributes the imposed wheel load to the pavement foundation, the subbase, and/or the subgrade. The base course must have sufficient quality and thickness to prevent failure in the subgrade and/or subbase, withstand the stresses produced in the base itself. It is also often made of crushed aggregates (of a higher strength than those used in the sub base) which are either unstabilised or stabilised with a cementing material such as Portland cement, lime fly ash or asphaltic cement. Usually to a thickness of 100-150mm.
- **Surface course:** The top layer of a road surface is referred to as the wearing course. It is usually made of asphaltic concrete, which is a mixture of asphalt cement bound together with various selected aggregates. This surface protect the base layer from wheel abrasion and to waterproof the entire pavement structure; provides a smooth, well-bonded surface free from loose particles, which might endanger aircraft or people and provides a skid-resistant surface that is important for safe vehicle stops. Usually to a thickness of 50-100mm.



Typical cross-section of road pavement

2.8.4 Material and equipment used

I. Cement
II. Shape sand
III. Granite
IV. Water
V. Wood

2.8.5 Machineries

I. Pale loader
II. Excavator
III. Concrete mixer
IV. Hammer
V. Shovel
VI. Leveling stave
VII. Level instrument

CHAPTER THREE

3.0 Factors Affecting Road Design

There are major factors that necessitate road design which are;

1. **Traffic and loading:** Traffic and loading is the most important factor in the pavement design. The key factors include;

- **Wheel load:** Wheel load on pavement is an important factor to determine the pavement thickness to be adopted. By providing adequate thickness, the load coming from wheels doesn't affect the subgrade soil. The wheel load is acts at particular point on pavement and cause deformations. If the vehicle contains dual wheels on one side of axle, then convert it into equivalent single wheel load. Dual wheeled axle vehicles control the contact pressure within the limits.
- **Contact pressure:** When the vehicle is moving on pavement, a pressure developed between the tire and pavement. If the tire is low pressure tire, then contact pressure will be greater than tire pressure. If it is high pressure tire, then contact pressure will be less than tire pressure. The original Shape of contact area is generally elliptical. But to ease the calculations circular shape is considered.
- **Vehicle Speed:** If the vehicle is moving at creep speed then also damage occurs to the pavement. If vehicle speed is gradually increased then it will cause smaller strains in the pavement
- **Axle configuration:** Axles are the important part of the vehicles which enables the wheels to rotate while moving. By providing multiple axles, vehicle can carry more load. So, the axle load also influences the design of pavement.
- **Moving loads:** The damage to the pavement is much higher if the vehicle is moving at creep speed. Many studies show that when the speed is increased from 2 km/hr to 24 km/hr, the stresses and deflection reduced by 40 per cent.

2. **Structural Models:** The structural models are various analysis approaches to determine the pavement responses (stresses, strains, and deflections) at various locations in a pavement due to the application of wheel load. The most common structural models are layered elastic model and viscos-elastic models.
3. **Material characterization:** The following material properties are important for both flexible and rigid pavements. When pavements are considered as linear elastic, the elastic moduli and Poisson ratio of subgrade and each component layer must be

specified. If the elastic modulus of a material varies with the time of loading, then the resilient modulus, which is elastic modulus under repeated loads, must be selected in accordance with a load duration corresponding to the vehicle speed. When a material is considered non-linear elastic, the constitutive equation relating the resilient modulus to the state of the stress must be provided.

4. **Environmental factors:** Environmental factors affect the performance of the pavement materials and cause various damages. Environmental factors that affect pavement are of two types, temperature and precipitation and they are discussed below:
    - **Temperature:** is the important environmental factor to be considered in the design of pavement. In case of asphalt roads, temperature affects the resilient modulus of surface course. In very hot condition asphalt layers lose their stiffness. At low temperature, asphalt layers become brittle and cracks are formed.
    - **Precipitation:** Moisture variations or precipitation from rain affects the depth of groundwater table. Good drainage facilities should be provided for good strength and support. The ground water table should be at least below 1m from the pavement surface.

CHAPTER FOUR

4.0 Experience gained

4.0.1 Preamble

The trainee did his SIWES at KWARA STATE MINISTRY OF WORKS AND TRANSPORTATION, (a construction engineering, rehabilitation of roads and maintenance), and was opportune to work with engineers on site (we work with civil engineers and others contractors). The trainee was posted to ongoing site of rehabilitation of Sango high way (Ganmo road) and construction of drainage trench at Unity road where he was able to learn various managerial skills used on site in terms of planning and controlling of activities in a construction engineering environment.

During the period of his attachment, the trainee was involved in;

i. Rehabilitation of Sango road (Ganmo road)
ii. Construction of drainage trench at Unity Road (Ganmo road)

4.1 Rehabilitation of Sango (Ganmo road)

It is been mention above the materials used in rehabilitation and construction of a road, this laid to refilling the portholes on the asses road which give the easy asses of transportation and movement by vehicles, and also reduces the rate of accident in the road.

The trainer also gain the proper steps taking for the ASPHALT overlay, right from taking the measurement of the failed sections, scarification of failed portion, filling with laterite and compacting it, applying MC1 bitumen, blowing it and asphalt overlay place.

The process and steps of asphalt overlay with paver machine.

4.1 showing the process of asphalt overlay at prim section.

4.2 **Excavation of drainage trench**

The excavation of drainage and channelization trenches was done with machine (excavator) by the use of labor. The dimension of the line drain is shown

Fig4.2. Excavation of drainage trench with excavator machine

Casting of Open Line Drain

The reinforcement of the line drain was fixed with iron Y10@250c/c as both the main reinforcement and the distribution bar. The open line drain was casted with concrete using 2:3:3 mix ratio

drainage reinforcement/ casted the baseline of the drainage

Drainage after casting

Managerial Experience Gained on Site

Some of the managerial activities done on site include;

i. Oversee operations on a day-to-day basis
ii. Study the drawing and execute the work by managing the labor, materials, and machinery as per daily planning.
iii. Ensure that work is done safely, on time, within budget and to the right quality standards.
iv. Before work starts, the site manager gets things ready by taking on staff, preparing the site and carefully planning the work to be done.
v. Monitors progress, oversee the delivery of materials and carry out safety checks and sort out problems which could as they arise
vi. Supervising the labors at every stage of the construction
vii. Monitoring the work and providing the current status of work to concerned Site Engineer
viii. Keep in close contact with members of their team at all times, and liaise with architects, engineers, surveyors, and planners.

4.2 Problem Encountered

During the rehabilitation of Road around Ganmo area we had a problem with too much moisture on the soil due to the too much rain fall which result on lower appropriate compaction rate of asphalt with laterite, and also one of the major problems we encounter was during the excavation of line drain trenches. Immediately after taking leveling we had a rain fall on the site which was uncontrollable and which led to removal of form work, wear and tear of the trenches, up to the stage which the rising of the water covers whole the surface of the trenches which made it so difficult to get the actual level of the line drain. Which finally result on the closure of the work for the day.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5. 1 SUMMARY

The industrial training enlightened me on practical and field aspects of engineering. During the training, I also came across people from different tribes and different parts of the world thereby improving my human relations.

5. 2 Conclusion

Having completely and adequately undergone the industrial training program, concisely say that the experience was educating and highly commendable students will not be limited to theoretical work done but wisely desire the acquisition of practical knowledge also the familiarity with the machineries' and managerial skills and tactics used in a construction engineering environment will necessarily have to partake in full compliance which serve as a propellant to expose him to the industrial practical work.

Training has exposed me to the following important spheres of development:

1. How to deal and interact with other fellow engineers in the field of civil engineering.
2. Finding that team work is the most important element in every successful project.
3. Learn that the civil engineer is capable of a lot of work such as supervision, implementation, the calculation of quantities and design of structures. Also, an engineer can work as a consultant or contractor.

5. 3 RECOMMENDATIONS

In view of the relevance of the SIWES program, it is important that it is sustained by the government through the Industrial Training Fund (ITF) as it exposes the student to work tools, facilities, and equipment that may not be available in their respective institutions in relation to their course of study. To this end, I recommend that the following under-listed points should be implemented:

i. Students' Industrial Works Experience Scheme (SIWES) needs to be strengthened by all concerned stakeholder in order for its objectives to be fully realized.
ii. Regular monthly allowances for students on attachment should be paid promptly.
iii. Experience staff should always be made to train the students on attachment