TECHNICAL REPORT

ON

STUDENTS' INDUSTRIAL WORK EXPERIENCE

SCHEME (SIWES)

Undertaken at

LATUS CONSTRUCTION LIMITED
IBADAN SUIT 18, FUNDER COMPLEX, BEHINDE GLORY TUBERNANCE , OJU-IRIN

Written by

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ND/23/CEC/PT/0240

Submitted To:

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

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FORAWARD OF NATIONAL DIPLOMA (ND) CERTIFICATE IN CIVIL ENGINEERING

AUGUST-NOVEMBER, 2024

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 OWOADE for their moral and financial support toward my success and also to all my friends in **LATUS CONSTRUCTION LTD** pray that you will all reap the fruit of your labour.(Amen).

CERTIFICATION

This is to certify that this report was compiled by **OWOADE TIMOTHY IFEOLUWA** with Matric Number **ND/23/CEC/PT/0240** 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 Owoade 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 **LATUS CONSTRUCTION LTD.** 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 **LATUS CONSTRUCTION LTD**. 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.

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

1.3 IMPORTANCE OF SIWES

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

CHAPTER TWO

2.0 BACKGROUND OF ESTABLISHMENT

Latus Construction Limited Ibadan Suit 18, Funder Complex, Behinde Glory Tubernance , Oju-Irin way was incorporated in 2000 as a major player of maintenance and supervisions of construction works ranging from difference field such as Engineering, Environment and Supply Services.

The LATUS Construction Ltd maintains a formidable list of highly qualified Professionals- Civil, Building, Road Construction, Administrators and Technicians.

2.4 The Services of Latus Construction Limited

2.4.1 Engineering Services

i. 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.

ii. 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.

iii. They undertakes the supervision of construction/rehabilitation/maintenance of roads, bridges, etc. 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. **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.
ii. **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.
iii. **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.

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.

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 1:1:4, 1:3:7, and sometimes 1:3:6.
- **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.

Materials

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

Machineries/Equipment

I. Grader
II. Excavator
III. Cutting machine
IV. Blowing machine
V. Sheep foot roller
VI. Paver machine
VII. Fish born machine
VIII. Tea boiler
IX. Water tank
X. Smooth roller

XI. Rake/ flat head rake

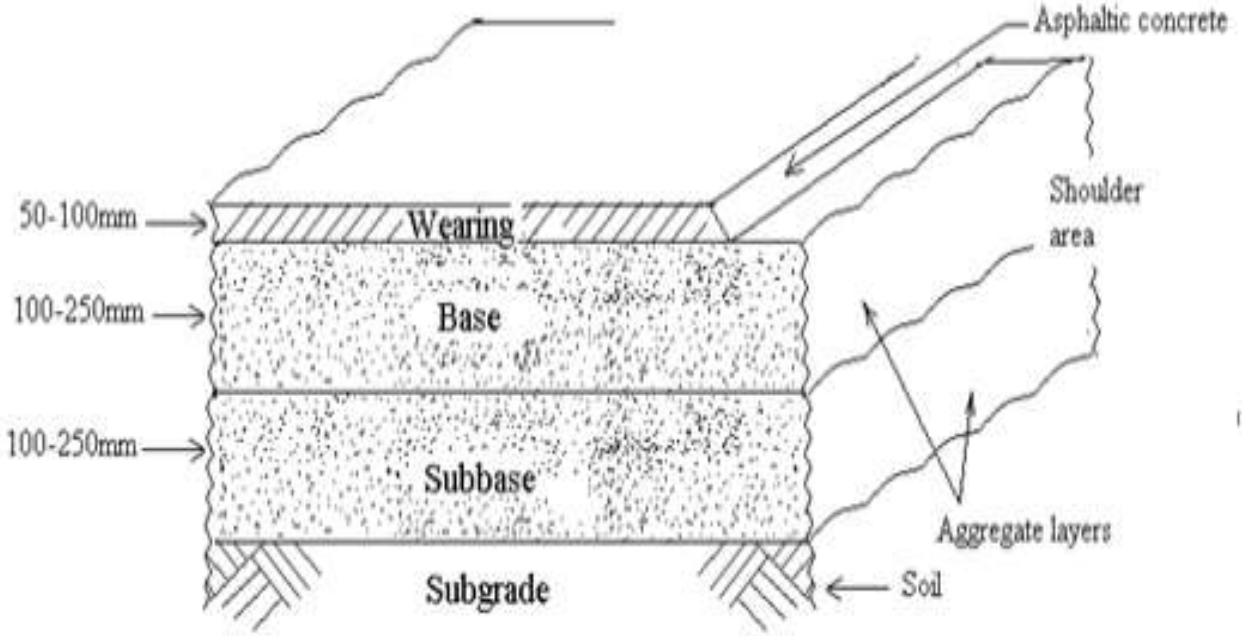
XII. Tipper

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.
- **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 unestablished or stabilised with a cementing material such as Portland cement, lime fly ash or asphaltic cement. Usually to a thickness of 100-150mm.
- **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.
- **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

Material and equipment used

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

Machineries

I. Shovel
II. Leveling stave

III. Level instrument
IV. Pale loader
V. Excavator
VI. Concrete mixer
VII. Hammer

PRIMING

This is the spraying of MC1 (Medium curing) on the surface of the prepared base course material e.g. laterite or stone base. After spraying the MC1, it should be allowed for about 1-hourto allow it penetrate into the base course material. It is recommended to spray 0.9 *l*/m2, 1.o *l*/m2 or 1.1*l*/m2. MC1 is one of the amongst the product of cutback bitumen. After applying MC1, it should be allowed to cure for a minimum of **48 to 72 hours** before asphalt is placed, with no rain in the forecast. The temperature of MC1 during the application process should not be less than **1500C.**The main purpose of priming is to;

a. To plug capillary voids in the base course surface to prevent migration of moisture,
b. To provide adhesion between the base course and the succeeding asphalt course.
c. For the prime coat to be successful, it must be able to penetrate into the base course at least ½inchesTo coat and bond loose material particles on the surface of the base,
d. To harden or toughen the base surface to provide a work platform for construction equipment,

ASPHALT OVERLAYING

An asphalt overlaying is simply the process of installing a new layer of hot mix asphalt directly over the existing asphalt on roads. The main aim of overlay is to add structural support to the existing pavement. Overlaying existing asphalt is a good solution when the existing road is still in decent shape and the existing elevations will allow proper drainage without milling of the entire surface. To maximize the overlays useful life, failed sections of the existing pavement were cut, excavated and replaced. If the percentage of bitumen in the asphalt mix is high, it will result in **folding** of the road surface and if the percentage of the aggregates is higher in the mix, it will result in **excessive cracking** of the road. This not only results in poor surface, but it result in a surface that retains water, thereby reducing the life span of the road by accelerating the ravelling process. Hot mixed asphalt is manufactured at temperatures between 270oF and 325oF, depending on the environmental

conditions and the distance from the hot mix plant to the site, hot mixed asphalt can lose between 5oF and 25oF.After overlaying the hot asphalt, it is left for the temperature to cool to a temperature **below 80oc** before compaction is started. The measurement of temperature at our site is done by the use of thermometer. If the compaction process is started at a temperature above 80oc, it leads to development hairy crack which enlarges as time passes. In the overlay process, if the hot mix asphalt pavement cools too quickly, the entire surface will ravel living a rough, rocky surface in a short period of time. For the compaction of the newly over-laid asphalt, smooth wheel and pneumatic rubber tyre rollers are used. The smooth wheel roller compacts it first, water is sprayed to the wheel so that the asphalt does not stick to the wheel during the compaction process.

Pneumatic finisher ready for use

compaction of laid asphalt

CHAPTER THREE

3.0 DRAINAGE SYSTEM

The road surface must be constructed with a sufficient camber or cross fall to shed rainwater quickly and the formation of the road must be raised above the level of the local water table to prevent it being affected by ground water.

One of the most important aspects of the design of a road is the provision made for protecting the road from surface water or ground water. If water is allowed to enter the structure of the road, the pavement will be weakened and it will be much more susceptible to damage by traffic. Water can enter the road as a result of rain penetrating the surface or as a result of the infiltration of ground water.

Water can also have a harmful effect on shoulders, slopes, ditches and other features. High water velocities can cause erosion which, when severe, can lead to the road being Alternatively, low velocities in drainage facilities can lead to silt being deposited which, in turn, can lead to a blockage. Blockages often result in further erosion. A good road drainage system, which is properly maintained, is vital to the successful operation of a road. It has four main functions:

1. To convey rainwater from the surface of the carriageway to outfalls
2. To control the level of the water table in the subgrade beneath the carriage way
3. To intercept ground and surface water flowing towards the road
4. To convey water across the line of the road in a controlled fashion.

The first three functions are performed by side drains and the fourth by culverts, drifts and bridges.

3.1 SIDE DRAINS

The cost of side drains will normally be calculated as part of the cost of earthworks Side drains should be flat-bottomed if they are to be maintained by hand or 'v'-shaped if they are to be maintained by machine. Wide flat drains, known as 'meadow drains', can be used with advantage if there is room. The longitudinal gradient of side drains should always exceed 0.5 per cent to reduce the possibility of silting up. In hilly terrain, providing side drains with the same gradient as the road may result in water velocities that are too high. It may therefore be necessary to reduce the maximum gradient to an acceptable level by the

provision of shallow dams or scour checks. These are often constructed of masonry, but can also be constructed in concrete or even timber. Wide drains are preferred to reduce the velocity and so minimise erosion. The provision of turnouts or cut-off drains should also be considered to reduce or control the amount of water in the side drains. Costing may need to take account of these and the need to line drains with masonry or concrete in highly erodible soils.

Excavated Drainage trench Plate

Blinding and concrete base

Arranged re-bars

Arranged re-bars with concrete base

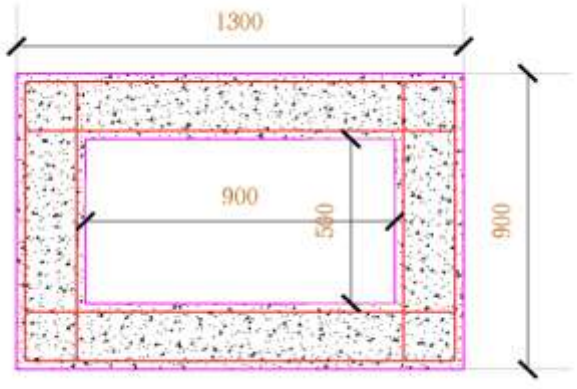
The use of culvert pipes to convey surface water under a road alignment is common, and provides a relatively cheap and durable solution. Most countries make concrete pipes of up to one metre diameter and these may be cost effective provided that they can be transported and handled. Corrugated galvanised steel pipes, often known by the trade name 'Armco', are available in larger diameters and are usually more expensive, but lighter and easier to handle. There should be little maintenance required for either material other than an annual inspection and clearing of accumulated silt or debris, although corrosion may occur to metal pipes in some circumstances. Culvert pipes require headwalls to protect the ends of the pipe and to direct water either towards or away from the culvert. The outfall of the culvert must be protected against scour and environmental damage downstream.

A culvert is an opening through an embankment used for the conveyance of water by mean of pipe or an enclosed channel, or it is a transverse and totally enclosed drain under a road or railway. It is typically embedded so as to be surrounded by soil. A culvert may be made from pipe, reinforced concrete or other material. A structure that carries water above land is known as **aqueduct**. Culverts are commonly used both as cross-drains for ditch relief and to pass water under a road as natural drainage and stream. A culvert may be a bridge – like structure design to allow vehicle or pedestrian traffic to cross over the water way while allowing the adequate passage for the water. The culvert type and shape selection is based on a number of factors including:

a) Requirement for hydraulic performance

b) Limitation on upstream water surface elevation

c) Roadway embankment height.



cross section of a culvert

CHAPTER FOUR

EXPERIENCED GAINED

4.1 EXPERIENCED GAINED

Working at the construction department as a student trainee in Latus Construction Limited, has given me the opportunity of getting a firsthand appreciation of construction technology learning its fundamentals, learning to work with various equipment used in construction & project management. I was able to apply some of the theoretical knowledge gained during my study at the university of real work situation thereby Road construction between school work and actual practice. I learnt invaluable lessons on the code of conduct of big firms and it prepared me for work scenarios, I am likely to meet after graduation.

Personally, one of the most important skills I gained during the course of my IT was commercial communication skills within major companies during the course of my work, I had to interact with engineers and IT professionals from surveying firms, manufacturing companies, multinational companies and others, to carry out projects, I had to work together with personnel from different departments. I also had to relate with senior engineers from my company and our international service partners.

I was able to have the basics experience on road construction from earth excavation, filling, compaction to pouring of Asphalt carried out on the road pavements. I was able to have the basic knowledge on bridge from substructure to super structural components. I was able to observe the construction of some of the components with their reinforcements such Retaining walls, Parapet walls, Approach slap, Deck slab and drainages.

4.2 EQUIPMENTS/MACHINERIES USED IN SITE

1. Excavators
2. Bulldozers
3. Graders
4. Rollers
5. Tower crane
6. Batching plant
7. Concrete mixer
8. Backhoe loader
9. Trenchers
10. Concrete pump

11. Forklift
12. Paver

4.3 LABORATORY TEST CARRIED OUT ONSITE

a. Soil density test
b. Slump test
c. Moisture Content test
d. Spraying test

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 SIWES CHALLENGES

1. Encounter transporting fee due to long distance of the site.
2. I wasn't able to visit other on-going projects by Ministry of works, Jos, hence, no experience was gained in regard to their operations.
3. During my first few weeks, I had difficulties understanding a lot of the terms and terminologies that was used at the site because a lot of them were very new to me, This made it hard for me to follow the procedures at beginning.

5.2 CONCLUSION

The Students Industrial Work Experience Scheme has contributed greatly to a practical and theoretical understanding of my future career and other diversified field of knowledge. The aim of industrial attachment no doubt has been that of always bridging the gap between theory and practice and I would say as a matter of fact that it has fulfilled its purpose on me.

I got to understand the overall basics experience needed in bridge and road construction, there by observing different operations of equipment and machineries used on site.

This program also taught me to be highly versatile and flexible in all my engagement (in all fields of career) and to a great extent, I now know what it takes to stand out in one's career in such a competitive atmosphere.

5.3 RECOMMENDATIONS

1. During the 24 weeks IT program many students do face certain challenges and in respect of this, I present the following recommendations:

2. Securing an IT placement these days is becoming unbearable especially when approaching 'alien' firms. Institutions in conjunction with the ITF can help students to secure placements thus saving the students time, energy and resources.

3. Some students may wish to work in a particular firm, but the means towards this achievement is highly limited due to several reasons; for example, accommodation. If this issue can be appropriately handled, it will go a long way in mitigating this challenge experienced by so many students.

4. The coordinating body of SIWES endeavors to liaise with professional bodies like NIA to facilitate and ensure the placement of student in reputable companies and organizations for proper monitoring and training.