INSTITUTE OF TECHNOLOGY

A TECHNICAL REPORT OF THE STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

UNDERTAKEN AT:

MINISTRY OF WORKS AND TRANSPORT.

IBIKUNLE ABDULHAMID OLAITAN
CIVIL ENGINEERING DEPARTMENT
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DEDICATION

This is dedicated to God Almighty , who has guided me through my industrial training to my mother who has been there from the beginning of my education , also to everyone who has contributed to my upliftment till today.

ACKNOWLEDGEMENT

I thank God almighty, who has preserved my life to attain this great height of education. Providing me a suitable and correlated placement to my course of study and for granting me enough wisdom, knowledge and also saw me through the period of the SIWES.

Alongside, I think the SIWES officer and the entire staffs of the ministry, who had made it possible for me to understand and learn.

I will like to appreciate my mother Mrs. IBIKUNLE for her support throughout the whole period sponsoring me financially and materially to make this industrial training period a success.

Also to the SIWES coordinator, the Head of Department, and all the Engineers who have made the gradual molding of young students into future Engineers their mandate, may God strengthen you all.

ABSTRACT

This technical report is a detailed write-up comprising of my four month's student's industrial work experience scheme undertaken at; (MINISTRY OF WORK AND TRANSPORT), Ilorin Kwara State.

The ministry had some ongoing work of some road. Such as, construction of road at Ganiki area Sango Ilorin. Which will all be explained in details in this report?

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CHAPTER ONE

1.1 INTRODUCTION TO SIWES

The Student Industrial Work Experience Scheme (SIWES) is a skill training program design to expose and prepare students of Universities, Polytechnics, Colleges of Technology, and Colleges Agriculture and or Colleges of Education for the Industrial work experience they likely to meet after graduation. The scheme also affords students the opportunity of familiarizing and exposing themselves to the needed experience in handling equipment and machinery that are usually not available in their institute. Before the establishment of the scheme, there was a growing concern among industrialists that graduate of tertiary institution lack adequate practical background (studies) preparatory for employment in industries. Thus, the employers were of the opinion that the theoretical education going on in institutions of higher learning was not responsive to their needs. It is against this background that the rationale for initiating and designing the scheme by the fund during its formative years-1973/74 was introduced to acquaint students with the skills of handling employer's equipment and machinery. The ITF solely funded the scheme during its formative years. But as the financial involvement becomes unbearable to fund, it withdrew from the scheme. The federal government handed over the scheme in 1979 to both the National Universities Commission (NUC) and the National Board for Technical Education (NBTE). Later, the Federal Government in November 1984 reverted the management and implementation of the SIWES programme to ITF and it was effectively taken over by industrial training fund in July 1985 with the funding being solely borne by the Federal Government.

SIWES is a tripartite programme involving the students, the Polytechnic and the industry (employer of labour). The programme is funded by the Federal Government of Nigeria and jointly coordinated by Industrial Training Fund (ITF) and National Board for technical Education (NBTE).

1.2 AIMS AND OBJECTIVES

Specifically the objectives of the Students Industrial Work Experience Scheme (SIWES) are to:

- Provide an avenue for students in institutions of higher learning to acquire industrial skills and experience in their course of study, which is restricted to Engineering and Technology including Environmental studies and other courses that may be approved. Courses like, NCE (Technical), NCE Agriculture, NCE Business, NCE (Fine and Applied Arts) and NCE (Home Economies) in colleges of Education are also included.
- Prepare students for Industrial work Experience they are to undergo after graduation
- Make transition from school to world of work easier and enhance students contacts for later job placement
- To Enlist and strengthen employer's involvement in the entire education process and prepare students for employment in Industry and commerce\
- To satisfy accreditation requirement set by the NBTE.
- To provide student opportunity to see the real World of theirs

CHAPTER TWO

2.1 BRIEF INTRODUCTION AND BACKGROUND HISTORICAL OF THE FIRM

The ministry was established in 1984, under the administration of Governor Gbolahan Mudasiru, the Ministry of Transportation and the ministry of work was merged and became the ministry of works and transport. The ministry was setup for two main objectives: To setup a centralized transit system within the metropolis.

CHAPTER THREE

SITE EXPERIENCE GAINED

3.1 SETTING OUT

Setting out is simply the process of extracting information from the construction drawings and transferring it with standard equipment onto the natural ground. This involves planning, various stages and instruments.

The planning stage of setting-out process requires the assemblage of materials and instrument required for the process. The following equipment/instrument are required for setting-out.

a. Steel tapes: these are more suitable type of setting out instrument because they are not subject to the same degree of stretching as the fibrous or nylon tape. However, the accuracy of the setting-out depends on the condition of the tape and expertise of the user.

b. Levels: automatic levels are usually more commonly used because they produce better reliable results.

c. Theodolites: these are used in surveying to determine vertical and horizontal angles by utilizing a tiny telescope that may move within the horizontal and vertical planes.

d. Total station: a total station combines the functionality of theodolite with that of level and electronic distance meter (EDM) such that it can determine angles, levels and distances and also have the capacity to store this information to be later transferred to computer for further processing.

f. Ranging poles: ranging poles of length 2 m or 2.5 m are commonly used for alignment in setting-out long straight lines.

g. Profiles: a profile is a wooden stake to which cross-piece in constating colored steps is nailed. For sewer works, sight rails which are goal post type of profiles are preferred. The profiles are erected over the offset pegs in order to remain clear of excavation.

h. Travellers: they are mobile profile boards used in conjunction with sight rails. The length of the traveler is usually 2.0 m, equals the sight rail in height and the length must be kept in multiples of 0.25 m.

i. Corner profile: they are constructed from stout wooden stakes to which wooden boards are securely nailed.

j. Setting-out pegs: these are marks used to define ground points usually 40- or 50-mm square wooden pegs about 0.5 or 0.75 m long with a point cut at one end. Pegs are commonly wooden and of usual precise sizes, 50 mm x 50 mm x 500 mm in soft ground and 25 mm x 25 mm x 300 mm in hard ground. Pegs should be colour coded with paint. Centerline pegs are coloured white, offset pegs are yellow while level pegs are blue.

They are placed reasonably accurately in position, and then the precise point required is marked by a nail hammered into the legs leaving about 10 mm projecting. Reference points and other important marks may be further secured by scooping a shallow trench around the peg and gently heaping concrete around it to keep it firm. If necessary, a light railing may be erected around it to warn Lorries and other vehicles to keep clear.

Permanent marks, though not often used due to time and cost involved are constructed from concrete blocks set up to 1 m into the ground and built up to any required height. A brass plate with a drilled centre-mark or a pipe or other devices is set into the concrete to define the precise point.

SETTING-OUT ROADS

Setting-out of roads involves three processes combining initial horizontal control, vertical control and establishment of reference marks.

1. Horizontal control – the initial setting-out process involves physically pegging on the ground the centerlines of the road. The setting-out

processes for both roads and railways are similar, except for technical differences in the actual construction works. The baseline being the centerline of the new works, it is usually defined in one of three ways by the designer, and the setting-out process for each of the following ways that the centerline has been established must be considered;

a. Plan location only

b. Centre-line straights ground marked

c. Co-ordinated centerline

Once the centerline has been aligned or ranged by one of the three methods above, the pegging of the line takes place with pegs being placed along the line at continuous changes at intervals of 20 or 25 m. Pegs are numbered in 100-m units. Thus,

Chainage + Origin = 0 + 00

Chainage + 1st peg = 0 + 25

Chainage + 2nd peg = 0 + 50

Chainage + 3rd peg = 0 + 75

Chainage + 4th peg = 1+ 00

Additional intermediate pegs are placed at bridge centres, intersections and at the beginning and end of transitional and circular curves. The first stage of the work is complete when all centerline pegs on straights and curves have been pegged and checked. The next stage of the work consists of pegging the limits of the work area. The limits include:

a. Fencing limits – these are pegged first as the contractor must provide at least temporary fencing to secure right of way and prevent trespass claims from landowners.

b. Top soil strip limits – pegs are used to guide removal of top soils often within fencing limits.

2. Vertical control (Levelling) – vertical control is required at all stages of the work. A series of temporary benchmark (TBM) must be established along the route at about 300 m to provide level control. They are placed close to fence limits to avoid damage by machinery and surrounded by concrete. Cross-section levels would also be provided to enable computation of earth work quantities.
3. Reference marks – lastly, reference marks would be established usually at tangent points, road intersections, bridge control points, sufficient intervisible centre-line pegs etc. The marks must be fixed clear of plants and close to the fence line. Reference marks should be made in such a way that they are recoverable even after destruction.

Summarily, in setting-out roads and railway works, pegs are first established at intervals say 20 – 25 m intervals along the centerline of the route. These pegs are consecutively numbered from the commencement of the routes for easy identification of any change along the route, while the offset pegs are positioned left and right of the centerline pegs at about 3 – 5 m. There may also be need to set-out curves such as simple horizontal curves, compound curves, transition curves and reverse curves using predetermined curve parameters.

SETTING-OUT DRAINAGES

Drains are laid to gradient such that the flow of water allows the drain to be self-cleansing. The old rule of thumb which states that 100-mm, 150-mm and 225-mm drains were laid to falls of 1:40, 1:60 and 1:90 respectively is satisfactory for drains where the water flow is fairly low. In combined drains that contain both foul and storm water and where the quantity of flow is greater, shallower gradients are used.

3.2 EXCAVATION OF DRAINAGE TRENCH

The surveyor marked out the dept of the trench to be excavated with a mechanical excavating machine.

For a 1m x 1m drainage, the mathematical process of obtaining the required dept is to sum together the dept of the required drain + base + blinding.

For dept:

A drain of dept1000 mm, base of 150 mm and blinding of 50 mm.

Hence 1000mm + 150mm + 50mm = 1200mm (1.2 m)

So an excavation of 1200mm (1.2m) is required from the to level of the road surface.

For width:

A minimum of (2.5 x width) m is advisable.

For a 1 m x 1m drainage,

Since the drainage internal width is 1m, using

1.5 x width =

2.5 x 1m = 2.5m

2.5m width excavation minimum is acceptable to create space for construction work area.

Figure 3.2: Excavator

3.3 CLEARING OF SITE

The process of site clearance is generally undertaken as part of enabling works, carried out to prepare a site for construction. It involves the clearing the site to allow other remedial, treatment or demolition works to take place before the actual construction works can begin.

It involves clearing a site of any machinery or equipment, unwanted surplus materials, rubbish, and so on. Site clearance may also involve clearing away vegetation and surface soil, and levelling and preparing the ground for the planned construction works. Care should be taken to ensure that there are the correct approvals in place, particularly for trees which may be protected.

A site waste management plan (SWMP) may be prepared before site clearance begins. This describes how materials will be managed efficiently and disposed of legally, explaining how the re-use and recycling of materials will be maximized. All types of waste present on the site must be removed safely and efficiently. If there is any contaminated waste or potentially hazardous substances (such as asbestos), professional disposal experts must be consulted to safely handle them.

Site clearance might be carried out as part of the main construction contract, or it may be carried out in advance of the main contract, and might be part of a wider contract including other enabling works or facilitating works, such as; demolition works, soil stabilization works, services diversion, constructing access roads, and so on.

3.4 SITE INVENTORY AND ANALYSIS

Inventory

A site inventory is simply a list of elements that currently exist on the property. Elements that exist on adjacent properties should also be considered if they impact the future design.

The location of inventoried elements can be recorded on a base map or simple plot plan. Arrows and other symbols can be used to indicate elements such as views, wind, and sun.

Analysis

The site analysis is an evaluation or judgment of features on the site. Once all of the elements on the property are identified, the pros and cons of each element are then evaluated. Often, the site inventory and analysis phase of design occur at the same time.

3.5 RUNNING LEVEL

Running levels is a series of measurements taken to determine the difference in elevation between points. It's a basic operation in topographical surveys and is used to establish the elevation of points relative to a datum.

Some guidelines for running levels in surveying:

- Start and finish at known points
- A leveling traverse can start and finish at the same known point or two different known points. This ensures the traverse is completed accurately.
- Use the rise and fall method
- This method is preferred by surveyors because it provides important checks.
- Take accurate readings
- It's important to note down readings accurately and in the correct format in a field book.
- Use a datum level

A datum level is an arbitrary horizontal plane used as a reference point for measuring verti

Figure 3.5: Theodolite & leveling staff

3.6 BLINDING DRAINAGE TRENCH

Blinding concrete is a handy concrete pour which aids in the construction of pavements and footings. This quick little article will take a look at exactly what it is and what are its benefits…

Blinding concrete is a thin concrete pour, usually of lower strength grade, which is laid as base preparation beneath pavements and footings. The purpose of blinding concrete is to provide a smooth, level base for reinforcement to be chaired upon and also to prevent concrete seepage into the support soil or water being soaked up by the soil and extracted from the concrete mix. Blinding may also be used to increase a shallow footings founding depth. A mix ratio of 1:3:6 was used during my site experience.

3.7 SLUMP TEST

This is also known as slump cone test which is to determine the workability and consistency of concrete mix prepared at the construction site during the progress of the work. Concrete slump test is carried out from batch to check the uniform quality of concrete during construction.

Apparatus for slump test

- Slump cone
- Base plate
- Tamping rod
- Sample scoops
- Slump cone filling funnel
- Measuring devices

Using a slump test a mix could be:

1) True Slump: representing a mix with with low to medium workability

2) Shear Slump: harsh mix, low cement content, poor aggregates grading, improper shape and texture etc.

3) Collapse Slump: representing mix with high workability.

Figure 3.7: Slump test

3.8 DRAINAGE CONSTRUCTION

Next step is laying of concrete base on the blinded surface and the positioned reinforcement.

1) A concrete base of 150 mm is to be laid or cast on the blinded floor, concrete grade C20 of ratio 1:2:4 is allowed (See concrete grading and mix ratio).
   A guiding panel is placed into position to guild in the laying of the concrete base in order to achieve a uniformly alignment base edge, thickness and width, also to manage concrete material while pouring. The base is cast with the U shape reinforcement bottom in between the concrete base achieving concrete cover below and above.
2) After setting and drying of the concrete base, next is to position the side wall panel form work.
3) The floor base is marked to give the required one meter (1000 mm) internal width where the panel will be positioned. The panel wall spacing is 100mm, and wall height of 1000mm (1 meter), the panel is lubricated, clipped and prepared to accept the Concrete.
4) After casting, and setting, the panel is removed and concrete cured.
5) Back filling and compaction of the back filling is done immediately after the back filling in order to avoid settlement.

Figure 3.8: Drainage

3.9 CULVERT CONSTRUCTION

Culvert is defined as a tunnel structure constructed under roadways or railways to provide cross drainage or to take electrical or other cables from one side to other. It is totally enclosed by soil or ground. Pipe culvert, box culvert and arch culvert are the common types used under roadways and railways.

Culvert construction involves a number of steps, including:

1) Excavation: Trenches are dug from one side of the road to the other side
2) Bedding: Bedding is supplied and placed
3) Structures: Headwalls, wing-walls, aprons, drops, and intakes and outlet structures are constructed
4) Backfilling: Trenches are backfilled
5) Maintenance: The work area is left clean and tidy

Figure 3.9: Culvert

3.10 SOIL STABILITY

Soil stabilization is used to increase the load-bearing capacity of soil, which is important when the soil isn't suitable to support the weight of a road's structure

The mechanical stabilization involves the following steps

Clearing and Stripping:

- Clearing: Remove vegetation, debris, and any existing structures from the road alignment.
- Stripping: Carefully remove the existing topsoil layer using machinery like:
- Graders: For large-scale removal and leveling.
- Backhoes: For smaller areas and more precise excavation.
- Bulldozers: For moving and stockpiling the removed topsoil.
- Excavation: Excavate the roadbed to the required depth using:
- Excavators: For digging trenches and shaping the roadbed.
- Backhoes: For smaller excavations and fine-tuning the roadbed profile.
- Laterite Placement and Compaction:
- Transport and Spread: Transport the laterite material to the site using dump trucks and spread it evenly across the excavated area using a grader.
- Compaction: Compact the laterite layers using heavy rollers:
- Static Rollers: For initial compaction.
- Pneumatic Rollers: For achieving higher density and better compaction.
- Vibratory Rollers: To break down air pockets and achieve optimum compaction.

Subgrade Preparation:

- Leveling: Ensure the laterite layer is level and smooth using a grader.
- Compaction Control: Conduct regular soil tests to ensure proper compaction levels are achieved.
- Stockpiling Topsoil: Store the removed topsoil in a designated area, preventing contamination and erosion.

Figure 3.10: Grader

3.11 ASPHALT, WALKWAY AND SHOULDER

1. Preparation

Shape and Grade: Ensure the stabilized subgrade is properly shaped and graded to the required cross-section for the walkway and shoulder.

Edge Restraint: Install edge restraints (such as curbs or concrete edges) to define the walkway and shoulder boundaries and prevent material from spreading.

2. Base Course Construction

Material Placement: Spread a layer of aggregate base material (e.g., crushed stone, gravel) over the stabilized subgrade to the required thickness.

Compaction: Compact the base course thoroughly using a vibratory roller to achieve the desired density and stability.

3. Asphalt Placement

a) Truck Delivery: Transport hot asphalt mix to the site using asphalt trucks.
b) Spreading: Spread the asphalt evenly and accurately using a paver machine.
c) Compaction: Compact the asphalt layer using a pneumatic tire roller or vibratory roller in multiple passes to achieve the desired density and smoothness.

d) Finishing: Use a hand tamper or screed to smooth out any irregularities and ensure a uniform surface.

4. Shoulder Construction

a) Material Placement: Spread the appropriate shoulder material (e.g., crushed stone, gravel, stabilized soil) to the required thickness.
b) Compaction: Compact the shoulder material using a vibratory roller or other suitable equipment.
c) Shape and Grade: Shape the shoulder to the desired slope and ensure proper drainage.

5. Quality Control

a) Regular Testing: Conduct regular tests to ensure the asphalt and shoulder meet the specified thickness, density, and other quality requirements.
b) Visual Inspection: Conduct visual inspections to identify and rectify any defects or imperfections.

6. Finishing Touches

a) Edge Repair: Repair any damaged edges or joints.
b) Surface Treatment: Apply a tack coat or seal coat to protect the asphalt surface from weathering and improve its durability.
c) Line Striping: Apply pavement markings (lines, symbols) as per design specifications.

4.1 RECOMMENDATIONS

- **TO THE ORGANIZATION**

1. I would recommend that the organization should keep on the way of attaching the student to Engineer to work with them on various fields like in construction of structure, construction of road, bridge and the position of the student to various sections to learn more about the chosen course of study.

2. I would recommend that the organization should give more attention to SIWES students in term of attachment with an Engineer in various fields and to provide adequate facilities and qualities instrument for practical skill in order to improve the development of technology in our country, especially in Kwara State.

- **TO KWARA STATE POLYTECHNIC**

1. I would suggest that the department of Civil Engineering in Kwara State Polytechnic should expose students to various practical skills in term of construction activities like construction of road, student should be exposed to various instrument and machine in construction such as, grading machine, rolling macine, excavator etc.
2. I would recommend that Kwara State Polytechnic should inprove herself on modern computer outrage for SIWES students in term of architechtural

design and bridge or road construction with computer and this will also improve the development of the school.

4.2 CONCLUSIONS

Student Industrial Training scheme is a very essential exercise that must be compulsory on all students, because it enable students to gain more practical experience and more knowledge about he/she had learnt in school.

I will also advise the organization to give room for young Engineers who had received their experience scheme, tested and justified should be given employment opportunity to offer his/her course of study and the school should try as much as possible to improve the educational system in order to make education more interesting to young ones.

Reference

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