CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter explains the step-by-step procedures, equipment, and techniques employed in executing the digital mapping of the Federal Staff School located in Adewole, Ilorin. It provides a comprehensive account of how the fieldwork was conducted, the instruments used, data processing strategies, accuracy checks, and the final map production process.

3.1 OFFICE PLANNING

Office planning is a crucial stage in the execution of a digital mapping project. It involves all preparatory and post-fieldwork activities that are performed in an office environment to ensure the smooth flow of the survey, proper organization of data, and the successful production of a final digital map. In this project, the office planning phase included organizing field teams, preparing equipment, coordinating data management, setting up software environments, and performing map design layout.

Tab. 3.1 shows the value of Controls

Station	Northing	Easting
SC/KWI.334R	938052.240	675605.928
SC/KWI.333R	9377797.689	675548.031
SC/KWI.332R	937809.422	675500.648

3.1.1 FIELD RECONNAISSANCE

Field reconnaissance is a preliminary and essential phase of any land survey project. It involves a thorough inspection of the project area to collect key information that will guide the design and execution of the main survey. In this project, field reconnaissance was carried out at the Federal Staff School, Adewole, Ilorin to understand the terrain, determine the best instrument setup locations, and assess environmental conditions that could affect data collection.

Objectives of the Field Reconnaissance

- To visually assess the geographical extent and boundaries of the school premises.
- To identify and locate all major physical features to be mapped (buildings, fences, pathways, vegetation, etc.).
- To determine suitable and stable locations for the establishment of control stations.
- To identify possible obstacles to line-of-sight such as trees, utility poles, or parked vehicles.
- To determine the accessibility of different parts of the survey area and plan for personnel movement.

To observe weather conditions and their potential effect on the accuracy of instrument readings.

3.2 INSTRUMENT USED

Selection of instrument to be used is:

- Total station
- Tripod
- Linear tape
- Steal tape
- Field book
- Pencil
- Targets and their tripod
- Reflectors stand and target
- Nails Pegs

3.3 TEST OF INSTRUMENT

Before the commencement of the actual field data collection, all surveying instruments intended for use were subjected to thorough testing and calibration. This was done to confirm their functionality, accuracy, and reliability in order to avoid erroneous data collection that could affect the quality of the final map.

The check was carried out as follows:-

The total station was set on a pillar, temporary adjustment was centering, leveling, and focusing.

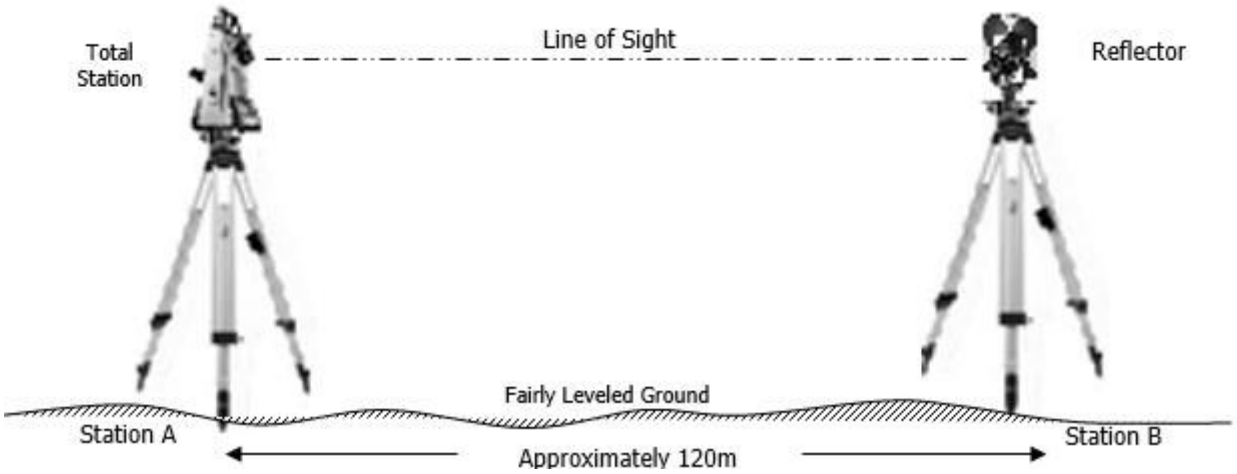

Fig. 3.1: Show the instrument test.

Tab. 3.2: Show the result of instrument test

Inst Stn.	**Sight (Reflector)**	**Face**	**Hor.Circle Reading**	**Ver. Circle Reading**
	B	L	87º 35’ 10”	88º 26’ 15”
A	B	R	267º 35’ 12”	271º 33’ 46”
			Diff= 180º 00’ 02”	Sum= 360º 00’ 01’

Horizontal Collimation = [(FR – FL) - 180º]/2

= [(180º 00’ 02’ - 180º 00’ 00”) /2]

= 00º 00’ 02”/2

= 00° 00’ 01”

Vertical Collimation = [(FR – FL) - 360º]/2

= [(360º 00’ 01” - 360º 00’ 00”)/2]

= 00º 00’ 01”/2

= 00° 00’ 01’’

3.4 MONUMENTATION

Monumentation is the process of establishing and physically marking control points on the ground to serve as reference positions for the survey. These control points are critical for ensuring accuracy, consistency, and repeatability throughout the mapping project. In this digital mapping survey of the Federal Staff School, Adewole, Ilorin, monumentation formed the foundational framework on which the entire survey operation was built.

Purpose of Monumentation

To serve as the origin points for horizontal and vertical measurements.

To act as reference points for instrument setup during the data acquisition phase.

To provide permanent markers that can be revisited for future surveys or verification.

To facilitate proper georeferencing and coordinate transformation.

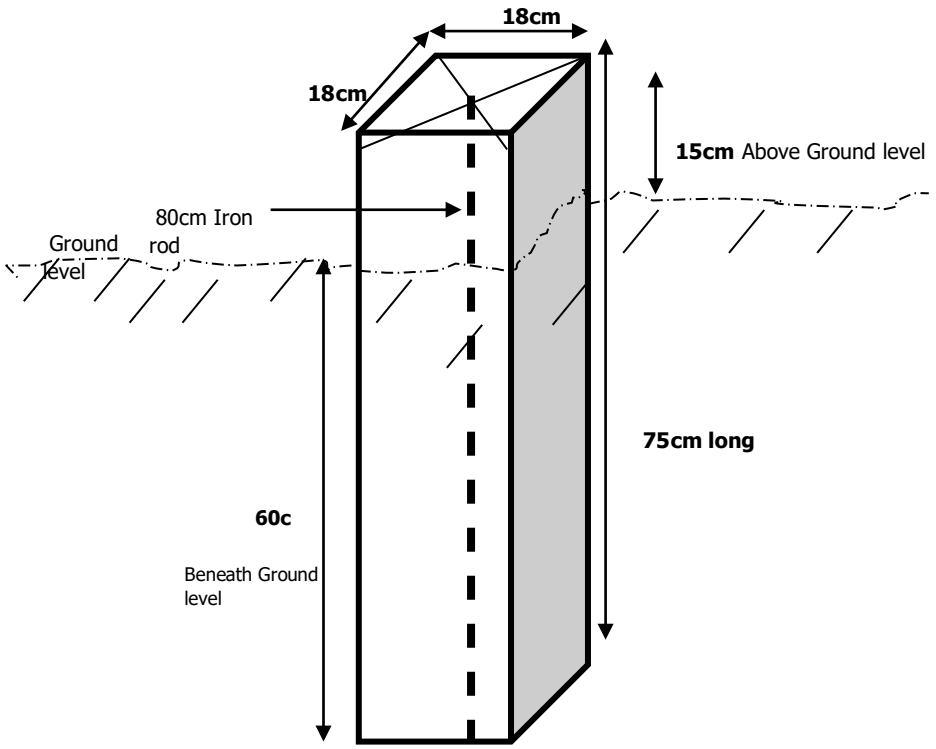

Fig.3.2 typical third order survey beacon

3.5 DATA ACQUISITION

Data acquisition refers to the process of collecting all necessary field measurements and spatial information from the project area using surveying instruments. This phase is the core of the fieldwork and directly determines the quality and accuracy of the resulting digital map.

Types of Data Acquired

Topographic Data: Elevation and spatial distribution of land surfaces and slopes.

Planimetric Features: Physical features like buildings, roads, trees, fences, poles, playgrounds, etc.

Coordinate Data: Precise X, Y, and Z values for all observed points.

3.5.1 GEOMETRIC DATA ACQUISITION

Geometric data acquisition refers to the process of obtaining accurate spatial data that describes the shape, size, relative position, and alignment of physical features on the Earth's surface. It is a critical step in digital mapping because it forms the foundation upon which the entire map is built. In this project, geometric data acquisition involved using Total Station and GPS receivers to capture the positions of permanent and semi-permanent features within the school premises.

Objectives of Geometric Data Acquisition

To collect spatial coordinates (X, Y, Z) of all relevant features

To determine angular and linear relationships between features.

To establish geometric accuracy for the digital map output.

3.5.2 PERIMETER TRAVERSE AND GEOMETRY POINTS GENERATION

A perimeter traverse is a type of closed-loop survey that follows the boundary of a site. It is carried out by measuring a sequence of connected lines (legs), capturing both distances and angles, to create a closed polygon that represents the boundary outline of the area. In this project, a perimeter traverse was conducted around the boundary of Federal Staff School to define its exact extents.

Purpose of Perimeter Traverse

To establish a closed geometric framework enclosing the entire site.

To determine boundary coordinates for referencing all internal features.

To validate control station accuracy through misclosure checks.

Geometry point generation refers to the process of creating distinct coordinate points for individual features based on the raw measurements collected during field data acquisition. These points represent real-world objects in digital space and serve as the primary inputs for digital map creation.

STATION	EASTING (m)	NORTHING (m)	REMARKS
PT1	675945.300	940823.730	Established
PT2	676048.460	940788.200	Established
PT3	675981.000	940628.000	Established
PT4	676020.620	940593.770	Established

3.6 DATA PROCESSING

Data processing is the stage in the digital mapping workflow where raw field measurements are systematically converted into usable spatial information through a series of computational and analytical operations. The accuracy, clarity, and utility of the final map largely depend on the quality of this stage. In the case of the Federal Staff School, Adewole, Ilorin, data processing involved several interrelated tasks including data transfer, cleaning, formatting, coordinate adjustment, feature extraction, and map compilation using specialized software tools.

Objectives of Data Processing

- To transfer and organize raw field data collected using the total station and GPS.
- To perform corrections for errors and inconsistencies.
- To apply appropriate coordinate systems and projections.
- To convert observed coordinates and attributes into meaningful graphical representations.
- To generate an accurate, detailed, and visually intuitive digital map.

This simply refers to the graphical representation i.e. plotting of plan and it was plotted using AutoCAD and Ms-word software in a computer system and a suitable scale was used to have the hard copy format. Presented information includes; boundaries, details and pegs. Conventional signs and symbols were also used to represent features of the plan accordingly. The digital map was produced using AutoCAD software and following the under listed proc

- on the computer and it was allowed to boot
- start menu was clicked
- select programs was clicked

- from the notepad, a script files for the coordinate as p-line easting, northing, was structured
- file was saved with the extension screw
- AutoCAD was launched
- file menu was clicked
- sub menu [news] was clicked and the name was saved
- format was clicked and all necessary settings were carried out [i.e. units, direction etc.]
- then ‘ok’ was clicked to aspect the parameters settings
- tools were selected
- run script was clicked on
- escape key was clicked, z enter and e enter were pressed one after the other in order to zoom the extent of the plan being drawn and the plotted plan was displayed
- text was clicked
- escape key was pressed, Z then E enter key
- text writing and other necessary editing were done
- coordinates of the details were all typed