CHAPTER 1: INTRODUCTION

1.1 Introduction

On-the-Job Training (OJT) acts as a direct practical connection between the Civil Engineering (Technical Stream) course under the National Examinations Board (NEB). Classroom study gives students the basic theoretical understanding of structural mechanics, hydraulics, design codes, and survey mathematics, the OJT period takes students beyond classroom theory and into actual municipal engineering duties and ongoing construction work. By working directly in the field, trainees become familiar with the routine technical, administrative, and practical responsibilities required for infrastructure development.

During this training period, students perform important sub-engineering activities with guidance from qualified technical staff. The principal field activities consist of carrying out land boundary surveys using triangulation methods, converting raw measurements into standardized architectural drawings in AutoCAD, and tracking structural projects. Students develop practical experience assessing civil infrastructure, observing retaining wall construction, and tracking road expansion projects across different terrains.

In the end, the OJT program helps narrow the difference between academic learning and real construction-site practice. By working with actual site limitations, changing weather conditions, and coordination difficulties, trainees develop practical problem-solving ability, professional discipline, and technical skills. This practical exposure prepares graduating students to enter the into the civil engineering workforce as Sub-Engineers or pursue higher technical education.

1.2 Background of OJT

The Technical Stream of the National Examinations Board (NEB) includes On-the-Job Training (OJT) phases at different stages of secondary education so that practical skills grow together with theoretical learning. The total academic and practical progression is divided into four main stages:

- Grade 9: Covers the basic principles of engineering, manual technical drawing techniques, and important workshop safety protocols.

- Grade 10: Provides an introduction to the theoretical concepts of building construction materials, elementary land surveying, and basic Computer-Aided Design (CAD) drafting, followed by introductory field training / OJT.
- Grade 11: Further develops knowledge in structural mechanics, levelling survey operations, and preliminary quantity estimation methods.
- Grade 12: Forms the final stage, through an intensive municipal or construction-site placement intended to prepare students into field-ready Junior Engineering Technicians.

1.3 Objectives of OJT

- Apply Classroom Knowledge: Bridge the gap between classroom calculations and physical construction site operations through practical field implementation.
- Develop Surveying Skills: Build practical working ability in triangulation methods, boundary mapping, and standard land measurement instrumentation.
- Learn Municipal Procedures: Study the technical methods followed for establishing official land boundaries, property area calculations, and municipal record management.
- Strengthen Site Management Skills: Become familiar with structural construction procedures, Quality Assurance/Quality Control (QA/QC) protocols, and occupational safety standards.

1.4 Scope of Works

Throughout the three-month OJT placement, our work covered several major municipal infrastructure activities:

- Land Surveying and Field Measurement: Recording physical measurements of existing public structures, such as a local temple site, to find exact building coverage and support municipal colouring work.

- Site Planning and Drafting: completing land measurements using triangular divisions and site sheet drafting for a public morning walk park divided into garden zones for a peaceful community environment.
- Assessment of Land Area for Public Buildings: Field surveying to set the complete plot area required and covered for constructing a municipal ward office building.
- Structural Work inspection: Site visits to examine construction in progress of municipal retaining walls to learn the methods, structural arrangement, and construction process used at the site.

1.5 OJT Work Program and Planning

In this work, 3-month OJT period consisted of five pivotal infrastructure projects (excluding public holidays):

- **Project 1 - Ward- 13 Area Calculation**

  Completed detailed physical measurements and prepared a record of the structure of the Ward No. 13 office building. Converted the measurements collected in the field into properly scaled floor plans using AutoCAD.

- **Project 2: Park Area Calculation**

  Measured the site boundary in the field and used the Triangulation Method. Separated the irregular plot into a series of connected triangular sections and calculated the total area with Heron's formula

- **Project 3: Local Temple Area Calculation**

  completed surveys of the site boundary and land area for a local temple site. Entered the measurements and observations in the field book, checked the property boundaries, and converted the collected geometric measurements into the required Nepalese land units

- **Project 4: Retaining Wall – Thapa Gau**

examined the different stages of construction of earth-retaining masonry and concrete walls. Examined the foundation excavation work, correct structural positioning, compaction of backfilled soil, and installation of drainage weep holes to reduce water pressure behind the wall.

- **Project 5: Supervision of Road Construction – Purano Naikap**

  examined the widening of an existing narrow passage to form a usable roadway. examined subgrade preparation, installation of longitudinal drainage, sanitary-pipe installation and connection, and slope protection measures

WORK SCHEDULE

Work	From	To	Days worked
Orientation	Baisakh- 29	Baisakh-31	3 days
Ward-13 Area calculation	Jeth-1	Jeth-25	17 days
Park area calculation	Jeth -26	Asad-15	15 days
Temple	Asad-16	Sharawan-4	15 days
Retaining wall -Thapa Gau	Shrawan-5	Shrawan-18	10 days
Road construction- Naikap	Shrawan- 19	Bhadra-3	12 days
		Total days worked	72 days

Note : No works were done in public holidays.

CHAPTER 2: OJT SITE OFFICE DESCRIPTION

INTRODUCTION/HISTORY:

Fig : Chandragiri Municipality Ward No. 13 office

Our On-the-Job Training (OJT) placement was carried out at the Chandragiri Municipality Ward No. 13 office located in Naya Naikap, Kathmandu. As an important local administrative center, this ward office provides important administrative services and support for civil infrastructure to the nearby community.

With support and guidance from the engineering staff, we received detailed technical guidance in land-surveying methods, area-calculation procedures, AutoCAD drafting processes, and road-construction inspection.

Along with office-based technical learning, the engineering team arranged regular visits to ongoing project locations. This combination of professional guidance and field practice gave us useful practical experience to municipal infrastructure development.

SERVICES PROVIDED BY THE OFFICE

The Ward Office provides a wide range of administrative, technical, and community services to support local development. The main municipal activities closely related with civil engineering and our OJT placement include:

Technical & Engineering Services

- Land & Boundary Administration: carrying out land surveys, site measurements, and official plot verification for public and private property development.
- Infrastructure Development: Overseeing municipal planning, structural maintenance, and the implementation of civil engineering projects.
- Roadway & Drainage Works: Managing road construction, corridor widening, slope protection measures, and integrated drainage/sewerage network improvements.
- Field Inspection & Quality Control: completing site supervision, structural inspections, and technical compliance tracking for ongoing public works.

CHAPTER 3: OJT OBSERVATIONS, LEARNING OUTCOMES SKILL DEVELOPMENT

3.1 Project 1: Ward- 13 Area Calculation

Introduction

This project was undertaken to measure and record the exact plot area occupied by the Chandragiri Municipality Ward No. 13 office. Since reliable boundary information was not previously available, our main aim was to carry out a reliable field survey, set the complete plot dimensions, and prepare scaled technical drawings from the measurements collected on site.

Site Location

In this work, project was carried out at the Chandragiri Municipality Ward No. 13 office, Sundari/Naya Naikap, Kathmandu, Nepal. The site is located in the local residential area of Ward No. 13.

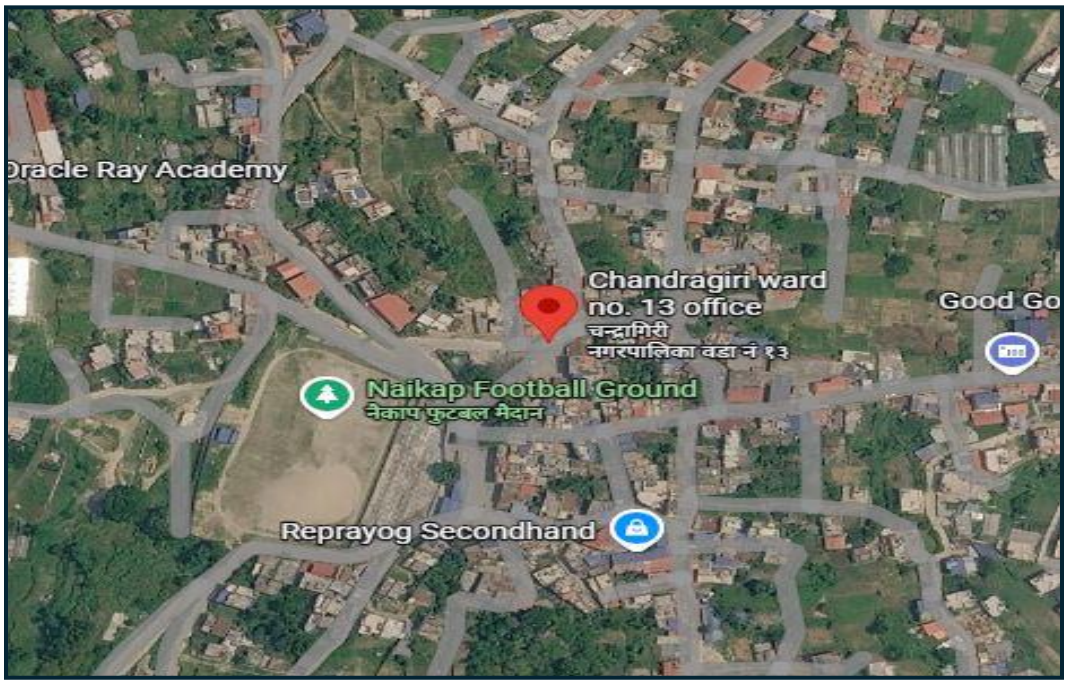


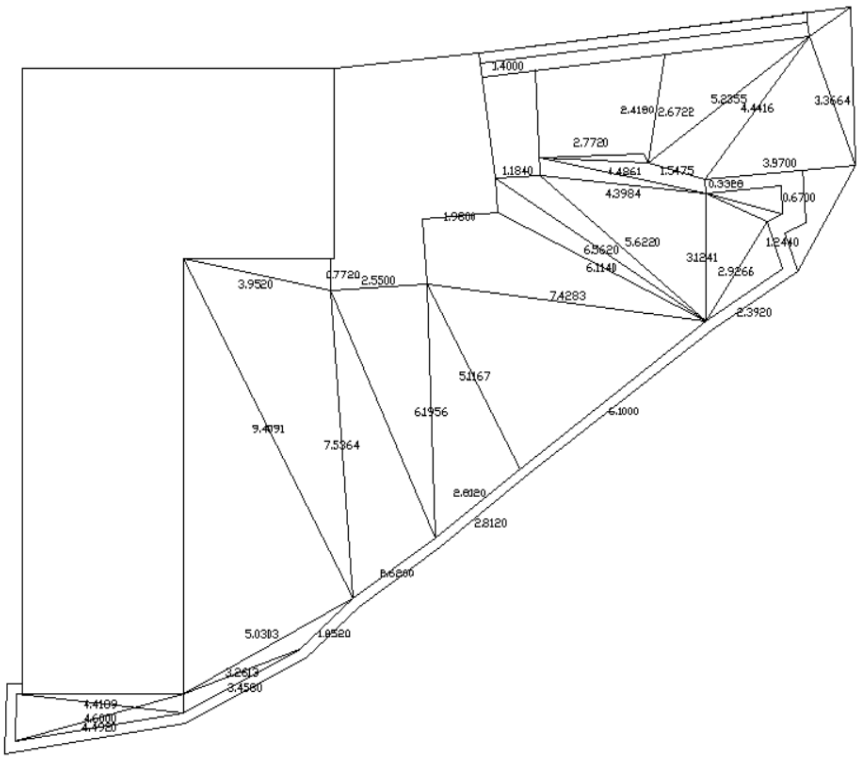
Fig : Satellite image of site location

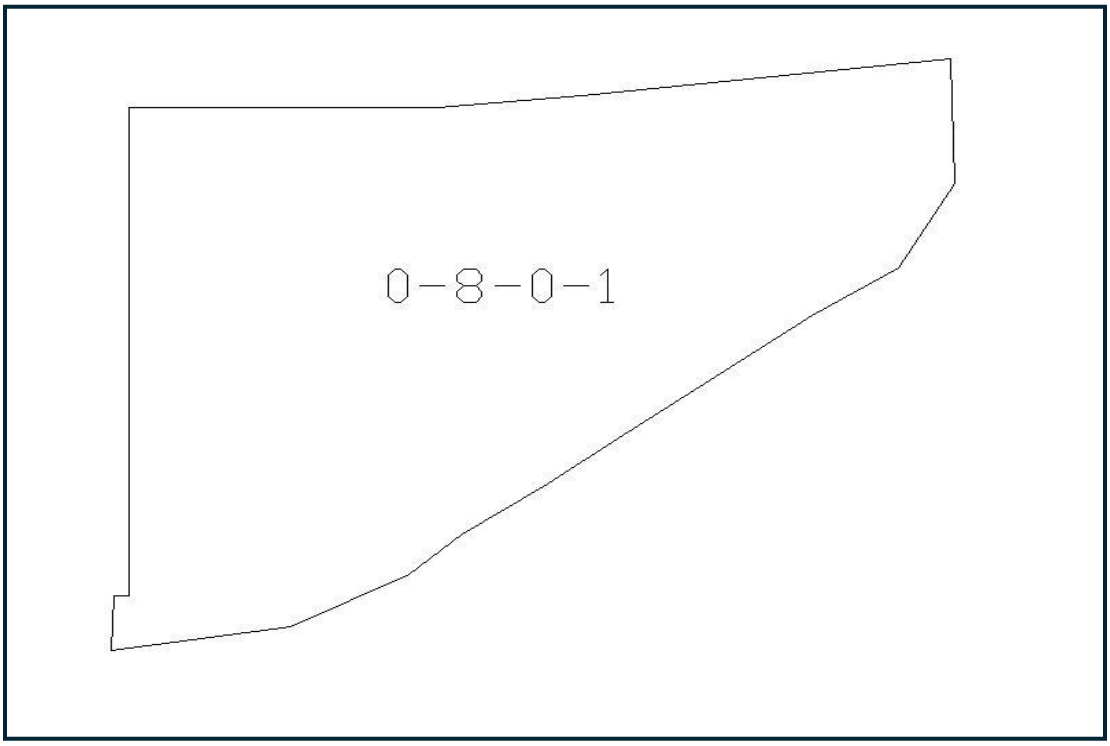
Task Assigned

- Site Inspection: Walked around the Ward No. 13 site to check property lines and plan measurement points.
- Field Measurement: Measured external walls, corners, and total ground space using measuring tapes.
- Field Book Logging: Sketched the building layout and noted all linear dimensions in the field notebook.
- Area Calculation: Calculated the total plot size and building area using standard math formulas.
- CAD Drafting: Drew correct 2D plans and site layouts in AutoCAD using the field data.

Outputs

- **AutoCAD 2D plan**





Note : Area of whole Ward-13- calculated by using AutoCAD's **AREA** tool.

Area			
Ropani	Anna	Paisa	Daam
0	8	0	1

Skill Learned After Project Completion

- Linear Surveying: Mastered tape measurement techniques, boundary line offset calculations, and handling field obstacles.
- Technical Documentation: Gained proficiency in keeping structured field logbooks and sketching correct hand-drawn site layouts.
- Mathematical Area Computation: Applied geometric formulas and area decomposition methods to compute exact building footprints.
- CAD Drafting & Digitization: Improved AutoCAD skills by converting raw hand-measured field data into scaled 2D architectural site plans.
- Field Problem-Solving: Learned how to adapt measurement baselines around physical site obstructions and structural obstacles.

Photographs During Project Execution

Fig: Measuring the side wall of ward-13

Fig: Measuring the gate of ward-13

Fig: Measuring the front wall of ward-13

3.2 Project 2 Park Area Calculation

Introduction

The main purpose of this project was to calculate the complete land area of a local community park in Chandragiri Ward No. 13 through the triangulation surveying method. Because the site had an irregular shape, the plot was carefully separated into a series of connected triangular sections. Using measurements taken directly at the site of all baseline vectors and diagonal boundary lines, the actual area of the land was found to prepare reliable site records for future municipal park development.

Site Location

In this work, project was carried out at a local park in Chandragiri Municipality ward no 13, Kathmandu, Nepal. The site was selected for practical field measurement and area calculation. The boundaries of the park were identified before taking the required measurements.

Fig : Satellite image of site location

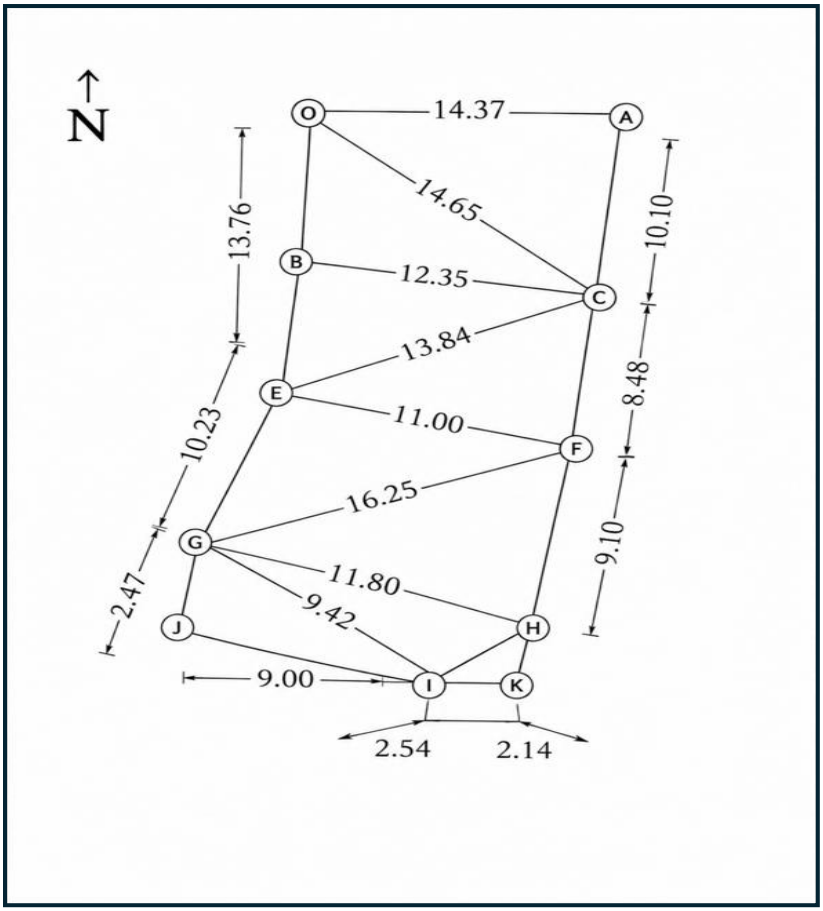
Task Assigned

- Site Setup: Marked key points around the park and divided the irregular ground into basic triangles.

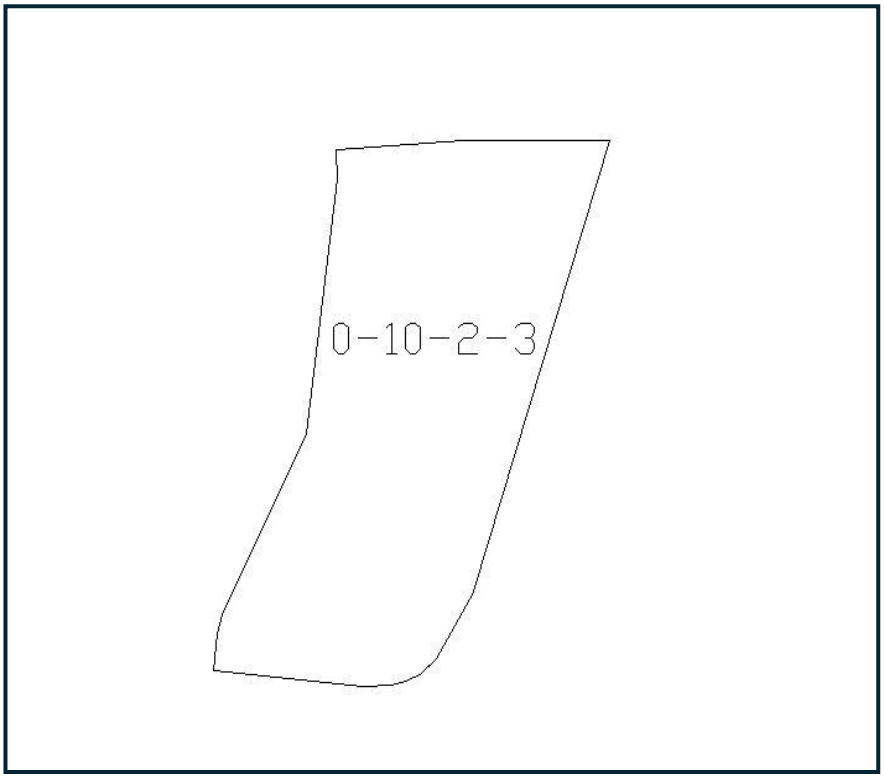
- Field Measurement: Measured all triangle sides, baselines, and diagonals using measuring tapes.
- Field Book Logging: Recorded all measurements and drew rough site sketches in the notebook.
- AutoCAD Plotting: Recreated the triangular park layout in AutoCAD using the measured dimensions.
- AutoCAD Area Calculation: Used AutoCAD's AREA tool and closed polyline properties to calculate the total park area.

Outputs

AutoCAD 2D Plan :



Note : Area of whole Ward-13- calculated by using AutoCAD's **AREA** tool.



Area			
Ropani	Anna	Paisa	Daam
0	10	2	3.5

Skill Learned After Project Completion

- Triangulation Surveying: Learned how to measure irregular land by breaking it down into simple triangles.
- Tape Measurement: Improved skills in measuring baselines and diagonal lines around site obstacles.
- AutoCAD Plotting: Gained experience drawing correct site layouts from field notes in AutoCAD.

- Digital Area Calculation: Mastered using AutoCAD tools (AREA and JOIN commands) to find total land area quickly.
- Error Checking: Learned to compare manual field notes with AutoCAD drawings to fix measurement mistakes.

Photographs During Project Execution

Fig: Measuring the gate of park

Fig: Park

Fig: Measuring the side wall of park

3.3 Project 3: Local Temple Area Calculation

Introduction

The primary objective of this project was to perform a exact land survey and calculate the total surface area occupied by a local temple compound in Purano Naikap, Chandragiri Ward No. 13. Given the site's non-uniform perimeter and structural boundaries, a triangulation survey method was employed. The compound was partitioned into a series of geometric triangles, allowing baseline vectors and offset distances to be systematically measured in the field to prepare reliable site records for the temple premises.

Site Location

The target temple premises are located in Purano Naikap, Chandragiri Municipality Ward No. 13, Kathmandu, nearby to the local Ward No. 13 building. The property features favorable site accessibility from primary local roadways, providing an ideal setting for carrying out direct field surveys, establishing survey baselines, and executing exact land area determinations.

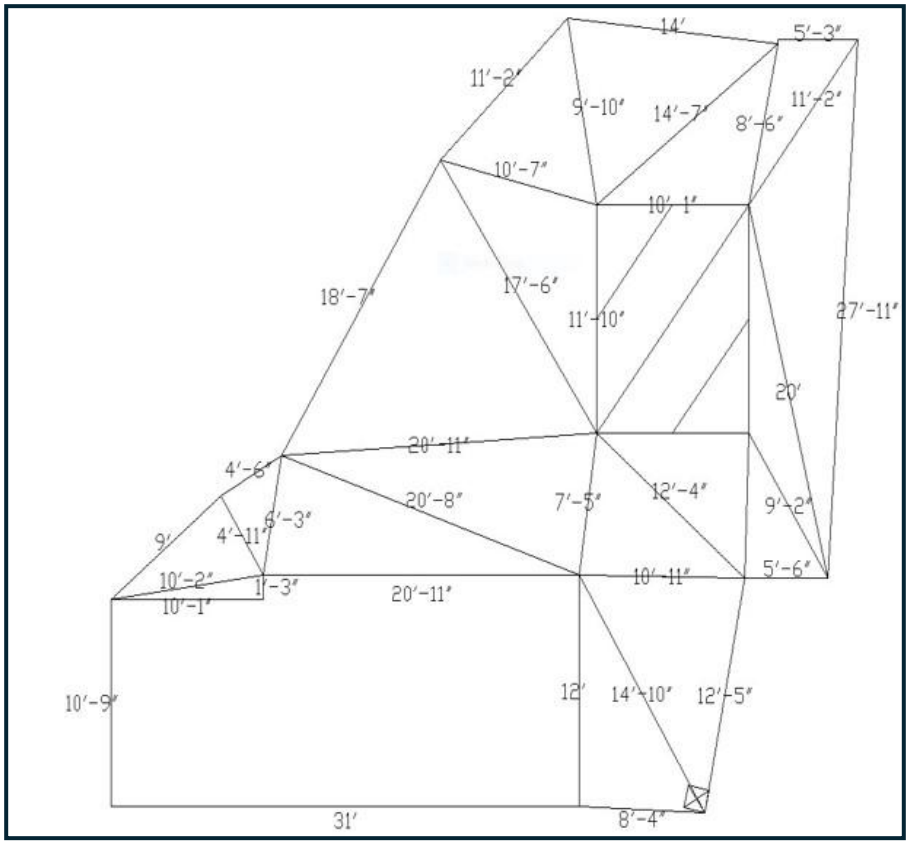
Fig : Satellite image of site location

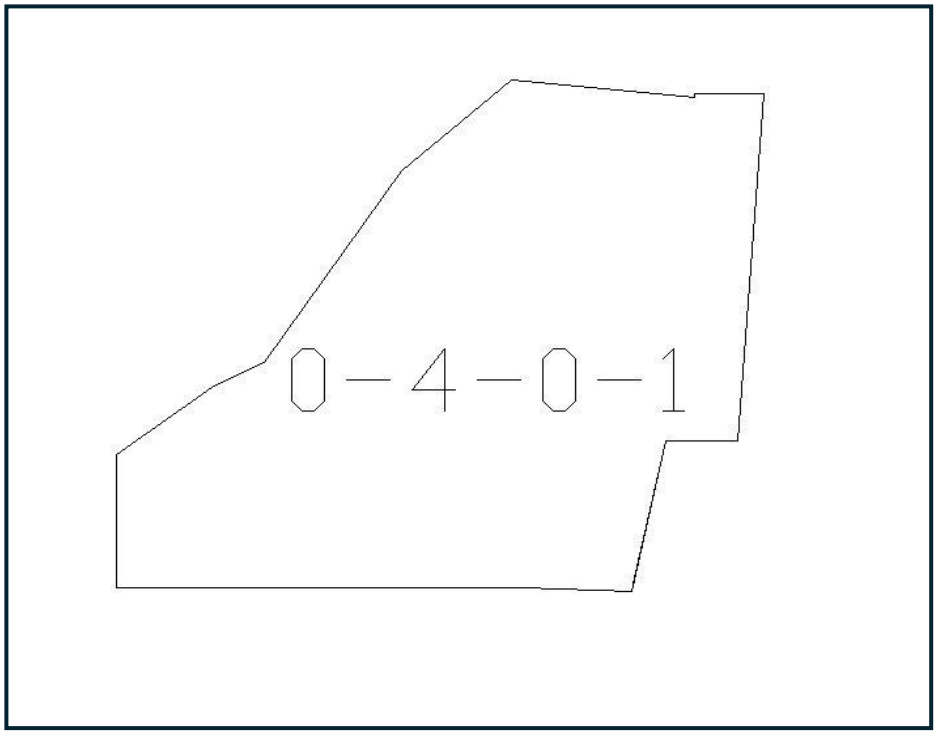
Task Assigned

- Site Walkthrough: Inspected the temple site in Purano Naikap to check boundary lines and obstacles.
- Triangulation Setup: Divided the irregular temple grounds into simple geometric triangles.
- Tape Measurement: Measured all triangle sides, baselines, and diagonals using measuring tapes.
- Field Book Logging: Sketched the temple layout and recorded all measurements in the notebook.
- AutoCAD Area Calculation: Plotted the site layout in AutoCAD and used digital tools (AREA command) to calculate total land area.

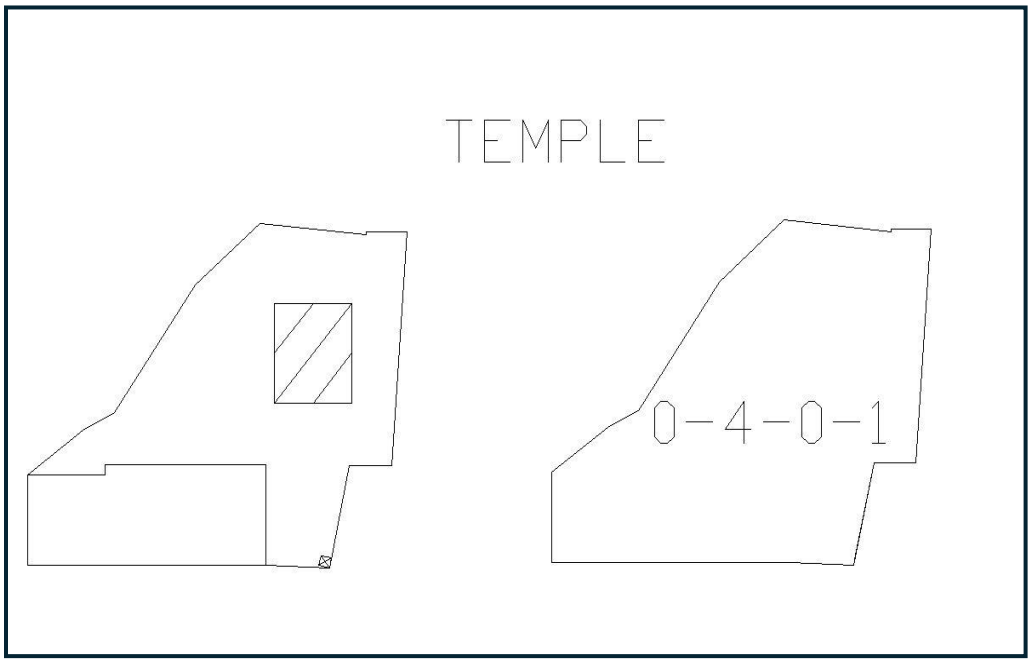
Outputs

AutoCAD 2D Plan :





Area			
Ropani	**Anna**	**Paisa**	**Daam**
0	4	0	1



Skill Learned After Project Completion

- Triangulation Methods: Learned how to handle irregular temple boundaries by dividing the plot into simple triangles.
- Tape Surveying: Practical skill in taking correct baseline and diagonal measurements using measuring tapes.
- Field Sketching: Improved efficiency in drawing clean site layouts and logging linear data in field notebooks.
- AutoCAD Plotting: Hands-on experience drawing correct site perimeters in AutoCAD using direct field data.
- Digital Area Extraction: Mastered using AutoCAD tools (AREA and closed polylines) to calculate exact land area without manual math errors.

Photographs During Project Execution

Fig: Measurement of park by using triangulation

3.4 Project 4: Retaining Wall – Thapa Gau

Introduction

This site visit was carried out to study the structural arrangement and construction procedure of a retaining wall in Chandragiri Municipality Ward No. 14.

Retaining walls are important structures designed to withstand the sideways pressure produced by retained soil and help maintain the stability of sloping ground along steep ground elevations. The site visit gave us practical understanding into structural support mechanisms, foundation placement, and the wall's vital role in stabilizing nearby roadway embankments and nearby terrain.

Site Location

In this work, project site was located along a road expansion corridor in Thapa Gau, Chandragiri Municipality Ward No. 12, Kathmandu, Nepal.

Field observations focused on an active retaining wall project designed to counteract lateral soil pressure and protect the developing roadway infrastructure. The wall serves as a structural barrier to stabilize nearby earth slopes, mitigating land subsidence and soil failure risks along the road edge.

Fig: Satellite image of site location

Tasked Assigned

- Site Safety & Layout Inspection: Walked the construction perimeter in Thapa Gau to review structural layout plans, wall alignment, and site conditions.
- Foundation Bed Assessment: Studied the excavation depth, foundation base leveling, and soil compaction prepared for the wall structure.
- Mortar Mix Ratio inspection: examined on-site batching, checking the proportion of cement and sand (such as a 1:4 cement-sand mortar mix) used as the binding material without coarse aggregates.
- Material & Masonry inspection: Inspected construction materials on-site, block/stone placement alignment, and wall thickness specifications.
- Drainage & Backfill tracking: Checked the placement of weep-holes, gravel filter layers, and backfilling procedures behind the wall.

Observation

- Foundation Work: examined that the base was excavated to stable ground and leveled with a lean concrete layer before starting wall construction.
- Concrete Mix Ratio: Checked the on-site batching where an M20 concrete mix (1 : 1.5 : 3) of cement, sand, and stone aggregates was prepared for strength.
- Formwork & Alignment: Saw timber and steel shuttering set up securely to maintain the wall's shape and alignment along the road edge.
- Drainage System: Noticed PVC pipes installed as weep-holes at regular intervals along with coarse gravel backfill to drain trapped groundwater.
- Road Protection: examined how the retaining wall effectively holds back the hillside soil to prevent erosion and protect the new road.

Skill Learned After Project Completion

- Soil Stabilization: Learned how retaining walls support roadside slopes to prevent soil collapse.
- Mortar Mixing: Understood how to check cement and sand proportions for a strong binder.
- Masonry Construction: Gained knowledge on laying stones or blocks neatly along boundary lines.
- Drainage Setup: Learned how weep-holes release trapped groundwater to reduce pressure on the wall.
- Site inspection: Practice in recording construction steps and writing clean field reports.

Photographs During Project Execution

Fig: Initial stage of retaining wall before back filling

Fig: Constructed retaining wall before back filling

3.5 project 5: Supervision of Road Construction – Purano Naikap

Introduction

As part of our OJT, we visited to an ongoing road-improvement site to observe actual civil construction practices. The work involved converting a narrow 4-foot passage into a wider 13-to-15-foot roadway to improve local accessibility, alongside installing sewer pipelines, side drainage channels, and protective retaining walls.

Our role during the visit was mainly technical inspection, our primary duty was to record road dimensions and follow construction progress. The visit helped us understand how different utility installations and roadway expansion works are executed on-site.

Site location

In this work, project site was located in Purano Naikap , Chandragiri Municipality Ward No. 12, Kathmandu, Nepal. The field study focused on an active road upgrading section, where the narrow existing passage was being systematically widened and stabilized to improve local transportation and access.

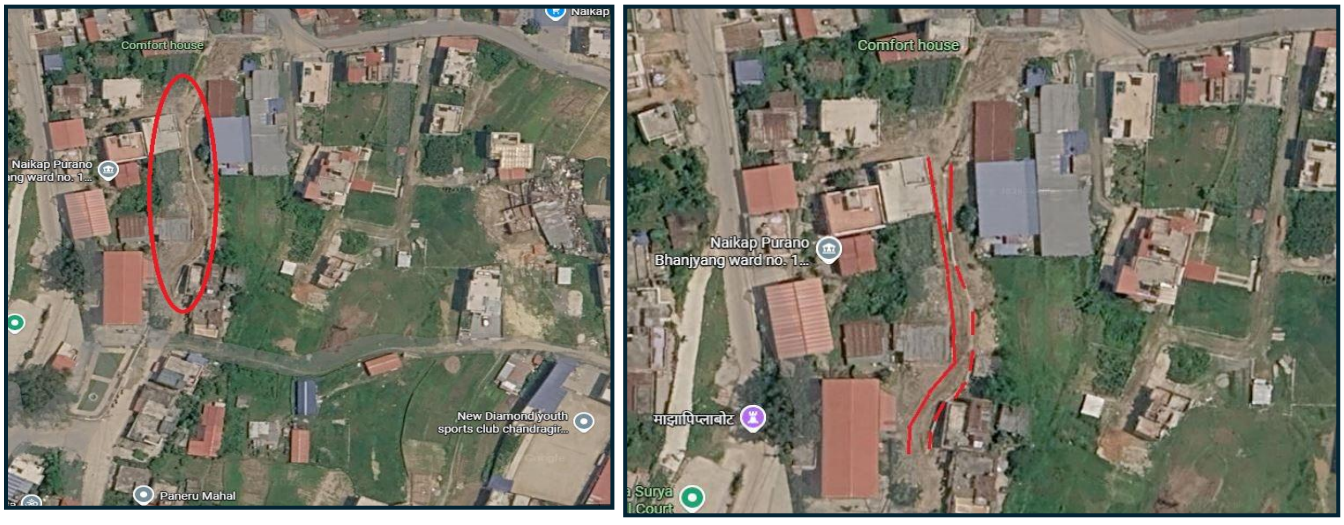


Fig: Satellite image of site location

Tasked Assigned

- Dimensional Field Measurement: Measured the expanded road widths (13 to 15 feet) and recorded linear dimensions across different sections.
- Civil Utility tracking: examined the excavation and placement procedures for side drainage channels and underground sewer pipes.
- Retaining Wall Assessment: Inspected the construction of earth-retaining structures along vulnerable road edges to study slope protection measures.
- Work Progress Tracking: Documented the step-by-step sequence of converting the narrow 4-foot passage into a upgraded roadway to gain practical site supervision knowledge.

Observations

- Road Expansion: The original narrow road was being widened, reaching 13 feet in some narrow sections and 15 feet in most areas.
- Drainage Systems: Side drainage channels were being built to keep rainwater off the surface and protect the road from water damage.
- Sewer Installation: Underground sewer pipes were actively being laid as part of the local infrastructure upgrade.
- Slope Support: Retaining walls were constructed in sections with steep slopes where extra soil support was needed.
- Simultaneous Operations: Multiple construction tasks, including earth excavation, pipe laying, and masonry work, were happening at the same time along the road.

Skill Learned After Project Completion

- Road Widening Techniques: Learned how narrow paths are systematically expanded into wider, usable roads.
- Drainage & Utility Management: Understood the importance of side drains and sewer pipes in preventing water damage to roads.
- Slope Protection: Recognized where and why retaining walls are needed to support loose soil and prevent landslips.
- Field Measurement Skills: Practiced measuring road widths and dimensions accurately using tape measures on-site.
- Multitasking on Construction Sites: examined how different construction activities—like excavation, pipe laying, and wall building—happen at the same time.

Photographs During Project Execution

Fig: Earthen road construction

Fig: Construction of side retaining wall

Fig: Measurement of total road width

CHAPTER 4: GAPS BETWEEN THEORETICAL KNOWLEDGE AND ACTUAL TRAINING

Theoretical Knowledge

Through our academic studies, we developed basic theoretical knowledge in surveying, land measurement, area calculation, AutoCAD drafting, road engineering, drainage systems, and retaining walls. These subjects gave us the foundation needed to understand and interpret activities carried out at actual sites.

Gaps Between Theoretical Knowledge and Actual Field Training

Although classroom study gave us a solid theoretical foundation, practical fieldwork introduced us to different challenges found in actual conditions. The main differences we noticed during our On-the-Job Training (OJT) include:

1. **Surveying and Field Measurement:**

Theoretical exercises generally assume ideal site conditions, whereas real field measurements can be affected by steep terrain, physical obstacles, boundary limitations, and irregular ground profiles.

2. **Land Area Calculation:**

In textbook problems, area calculations usually use clear and predetermined values. During OJT, we first had to measure the irregular dimensions of the actual plot before executing area calculations.

3. **Triangulation Surveying:**

Although we studied the mathematics of triangulation in class, fieldwork taught us how to divide complicated site layouts in a practical way into workable triangles and take correct field measurements.

4. **AutoCAD Drafting:**

In classroom assignments, drawing dimensions are normally given beforehand. During training, we followed the complete working process—first collecting correct field information and then converting those actual dimensions into AutoCAD drawings.

5. **Retaining Wall Construction:**

We understood the mechanics of earth retention theoretically, but watching ongoing construction helped us understand how correct structural positioning, mortar application, and weep-hole placement adapt to ground conditions.

6. **Road Upgrading & Development:**

Textbooks generally describe road construction as a fixed sequence of steps. At actual sites, we examined projects in which road widening, sewer laying, side drain excavation, and wall construction were carried out at the same time.

7. **Site Supervision & Management:**

Academic study mainly emphasizes standard specifications and design needs. Actual site supervision, however, requires continuous tracking, verifying contractor measurements, managing spatial constraints, and tracking worker activity.

8. **Practical Site Environment:**

Classroom exercises generally assume simple and problem-free conditions. Actual construction sites can involve unexpected conditions such as existing structures, narrow working space, and varying soil stability.

Overall Summary

The main difference between theoretical study and field training is that classroom education provides the basic principles, while OJT shows how those principles can be adjusted and applied in real-world scenarios. This experience helped connect the gap between classroom theory and practical site operations across surveying, drafting, road expansion, and civil supervision.

CHAPTER 5: PROBLEMS FACED DURING THE PROJECT

Throughout our On-the-Job Training (OJT), we faced several practical difficulties while carrying out field surveys, linear measurements, construction tracking, and site supervision. Dealing with these actual site difficulties gave us a better understanding of site management and helped us learn how to respond to changing field conditions.

1. **Uneven Terrain and Irregular Boundaries:**

Slope variations, rough ground, and non-uniform site edges made taking straight and exact linear measurements challenging.

2. **Complex Plot Geometries:**

In this work, irregular shapes of real land plots made it difficult to divide the site into standard geometric shapes for area calculations.

3. **Adverse Weather Conditions:**

Unfavorable weather, such as intense heat or rain, occasionally slowed down field activities and made outdoor surveying uncomfortable.

4. **Spatial and Physical Constraints:**

Working in narrow corridors and tight roadside spaces restricted movement when stretching measuring tapes and observing equipment.

5. **Manual Tape and Logging Errors:**

Minor measurement discrepancies occasionally occurred due to tape sag, tension differences, and manual data logging in field notebooks.

6. **Initial Field Inexperience:**

Being new to active construction environments made it slightly difficult to carry out surveying tasks smoothly during the first few days.

7. **Divergence from Theoretical Models:**

Understanding site implementation was initially challenging because live construction workflows often differed from simplified textbook diagrams.

8. **Drafting and Scaling Challenges in AutoCAD:**

Converting raw, irregular field measurements into perfectly scaled and correct digital drawings required extra verification and adjustments.

9. **Site Coordination and Communication:**

Interacting and coordinating effectively with site workers and team members presented occasional communication hurdles during busy operations.

10. **Need for Real-Time Adaptability:**

Varying ground conditions required us to constantly adjust our measuring techniques and inspection approaches to suit the actual site environment.

CHAPTER 6: CONCLUSION

The three-month On-the-Job Training (OJT) served as an invaluable bridge between our classroom studies and real-world civil engineering practices. Throughout this period, we successfully executed five major field assignments: park surveying, temple land measurement, Ward No. 13 building land measurement, retaining wall construction monitoring, and road development measurement and supervision.

Through these diverse projects, we gained hands-on competence in field surveying, linear measurement, area calculation, AutoCAD drafting, and live site supervision. Beyond technical skills, the experience highlighted the vital role that measurement accuracy, team coordination, effective communication, and safety protocols play in project execution. Ultimately, this OJT deepened our understanding of practical construction management and provided a solid foundation for our future engineering careers.

REFERENCES

In this work, theoretical principles, technical guidelines, and procedural knowledge presented in this report were gathered from academic materials, institutional curriculum standards, professional guidance, and digital engineering resources.

- **Academic Curriculum & Coursework:** Technical Stream Engineering Syllabus, National Examinations Board (NEB), Nepal.
- **Faculty & Professional Guidance:** Lecture notes, technical instructions, and field guidance provided by departmental engineering instructors.
- **Textbooks & Technical Literature:** Standard civil engineering textbooks on Surveying, Highway Engineering, Estimating & Costing, and Structural Engineering.
- **Academic Archives:** Previous batch OJT report files and institutional project archives.
- **Online Resources & Search Engines:**
    - Google Search Portal — https://www.google.com (used for technical data retrieval, standard engineering codes, and reference material).