

TOTAL STATION TRAINING

TRAINING ON BASIC OPERATION OF A TOTAL STATION

Presented By:



ORBITAL AFRICA LTD

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1. INTRODUCTION

1.1. About Orbital Africa

Orbital Africa is a registered company under the laws of Kenya, CAP 486. **Orbital Africa** is a Geographical Information Systems (GIS), Surveying, Remote Sensing (RS) and spatial planning consulting company helping to deliver Geospatial solutions that enable our clients to become high-performance businesses in Kenya and Eastern Africa region at large.



Orbital Africa is differentiated in the marketplace by consistency in building long-term, trust-based relationships with clients; focusing on value creation and business outcomes; fostering a culture of innovation, collaboration and teaming, leveraging on our delivery networks and project management for quality, speed and cost effectiveness; attracting, developing and retaining the best talent.

By providing outstanding client-tailored Geospatial services, we ensure customer satisfaction at all stages of project planning and execution. Our consulting philosophy is formed around the concepts of teamwork, partnership, service, and quality, both in the coordination of our efforts within our firm and in our interactions with our clients.

1.2. Background of Training on Total Station

We are living in a digital world or rather information age. Technology is rapidly changing and advancing at unprecedented rate. To be at pace with these changes, it's imperative to get acquainted with modern and relevant skills through learning and capacity development. Training is therefore a prerequisite. The development of human resources is probably the single most important success factor for any organization. Training is essential as it enables the staff members of any organization get acquainted with relevant modern GIS and IT skills that enable them to become more productive in an organization.



Furthermore, education and training are vital to the successful implementation of any project. At Orbital Africa, we strongly believe that our wide range of training will meet your organizational needs in handling large Geospatial projects and assignments. We are aware that every organization has a unique group of individuals with a wide range of learning styles and educational needs. In this regard, Orbital is endowed with experts of varied Geospatial dimensional backgrounds with proven training experience. Our trainers have highest level of education background i.e. the PhD level.

The proposed training on the use of Total Station will expose the engineers to basic operation of Topcon GTS 1002 total station including powering on the machine, set-up and configuration, taking readings, data download and processing in AutoCAD Civil 3D software.

1.3. Relevance of Proposed Training

The aim of any topographical survey using a total station is to determine the relative locations of points (places) on the earth's surface by measuring horizontal distances (X and Y), differences in elevation (Z) and directions (θ). The topographical maps that are produced often give the locations of places (observable features within the study area) and information about changes in elevation depicted using contours and spot heights.

The proposed training is relevant in drainage and storm water management. The total station is an important survey equipment for measuring distances, angles and coordinates. The equipment can be used to collect the culvert details, flood inundation depths and durations, availability of boundary walls, relative elevation of adjoining lands, percentage of built up area, drainage directions along the road and drainage directions across the road and the project area in question. The field topographical data obtained such as the spot heights can be used to generate surfaces, contours, elevation/terrain models, cross-sectional and longitudinal profiles. These topo survey outputs are in turn used for:

- Characterization of drainage patterns i.e. drainage directions, areas prone to flooding etc.;
- Identification of stormwater drainage channels infrastructure;
- Identification of the stormwater run-off discharge problems through the existing storm drainage system.

1.4. Overview of Training on Total Station



We propose to conduct our training using Topcon GTS 1002 total station. Topcon GTS 102N machine has been proposed to be used in measuring horizontal angles and distances. It has accuracy of 2" in angular measurements. Built with legendary Topcon precision and durability, the GTS-102N provides the professional a dedicated lay-out solution construction. It has 2 screens, dot matrix graphic LCD display. It has internal memory capable of storing up to 24,000 points of data storage. This total station is ideal for this nature of work.

Total station training entails the use of electronic survey equipment used to perform horizontal and vertical measurements to obtain angles, distances and coordinates of objects/features below, on and above the surface of the earth in reference to a grid system (e.g. UTM, mine grid). Some of the tasks performed by a total station include staking out, topographical surveys, control and offset lines, levelling, traverse surveys and adjustments; resection and intersections etc.

1.5. Our Training Approach

Our training approach shall focus on instructor led training using PowerPoint presentations followed by practical in the field using the total station. This is important since it enables students to interact with the total station to get acquainted with its different parts, functions, operations as well as its inbuilt software tools and functionalities. During the training, we shall utilise the latest total station in the market i.e. Topcon GTS 1002 and software such as AutoCAD Civil 3D, surfer and Eagle Point.

2. TRAINING OBJECTIVES

2.1. Introduction to Training

This training presents in brief the overall objectives, contents, tools and approaches of how the participants will be provided the customized training in surveying with a total station and use of AutoCAD Civil 3D in data processing. This training therefore is aimed at providing uniform, comprehensive and customized guide to the engineers in course of performing survey works in the field by total station in the realm of drainage and storm water management. Since the nature of task demand field works, around 70% of the training time will be focused on imparting practical skills and theoretical concepts. To ensure that the trainees achieve the required understanding on how to effectively execute their roles and responsibilities, multiple training approaches will be used.

Moreover, training program targets participants to be proficient in the use of total station survey, in which the data collected data is anticipated to be processed in AutoCAD Civil 3D. This **five-day (5)** training course package focuses on enhancing the knowledge and skills of the participants through practical exercises and data collection using total station. The course will enable the participants to develop a clear understanding and subsequent use and application of Total Station.

2.2. Training Objectives

- To learn the basic concept of surveying and understand how total station works.
- To learn different parts of the total station as well as how to operate it.
- To learn surveying using total station, techniques and the real-world applications.
- To learn how to use related surveying software (AutoCAD) for data download and processing.
- To generate outputs and present the results in form of contours, surfaces etc.
- To have a clear understanding of the principles of surveying with a total station.
- To have theoretical and practical skills in working with different total station modes.
- To have an opportunity for trainers to share experiences of their specific work and roles.

3. COURSE CONTENTS

- a) **Introduction:** In the first day, the students will be introduced to basic principles of survey, the survey measurement equipment; Total Stations, Level Machines and GPS; Introduction to theoretical background to the basic distance, angle and coordinate measurements.
- b) **Parts of a Total Station:** This section will cover introduction to Topcon GTS 1002 total station; powering on the total station; Getting started with the names and functions of a total station parts; Powering off the total station; the accessories of the total station.
- c) **Setting-up Total Station:** The initial total station setup; Total station modes – (i) angle mode; (ii) distance mode; (iii) coordinate mode; (iv) offset mode; carrying out measurements.
- d) **Surveying (Field Data Collection):** Field data collection; surveying; staking out; resection method; file management; importing and exporting data; area (projection and roadway); downloading data and using it in AutoCAD Civil 3D; plotting and labelling the contours; map layout; map production; applications of topo data in drainage systems.
- e) **Total Station Errors (Types of Errors & Adjustment):** Types of survey/total station errors – angular errors, distance errors; coordinate errors; adjusting index error; adjustment and corrections; total station config; COGO; data post-processing.

3.1. Why Train with Us?

- Our training materials are of high standards and are customized to suit local and user needs.
- We have a reputation for excellence and efficiency in GIS training service delivery.
- Technical support is extended to students even after the training has been completed.
- Our course content is updated from time to time and developing of new programmes is on-going.
- Our courses focus on practical needs of the professionals and the industries in which they work.
- The courses will provide you with practical tools/techniques that can be used immediately.
- Our course instructors are highly skilled professionals who combine academic expertise (With PhD and Msc. degrees in GIS/Surveying) with significant industry experience.

3.2. Expected Outputs

The expected outputs and deliverables include the evaluation report, training report and certificates.

4. QUALIFICATIONS OF TRAINER

Our trainers who conduct the training have MSc. and PhD degrees in Geospatial Engineering, majoring in Survey and 5+ years of work experience. They are competent and love working with survey equipment (total station, drone, GPS etc). Our trainers will deliver on the training expectations!

5. TRAINING TIME TABLE

| TIMETABLE – TRAINING ON TOTAL STATION | | |
|---------------------------------------|---|---|
| <i>Training Period</i> | | 1 week (7 Days) |
| <i>Training Venue</i> | | To be Decided |
| DAY | TIME | DETAILS |
| Day 1 | <i>Start: 08.30 AM End: 04.30PM</i> | Introduction: In the first day, the students will be introduced to basic principles of survey, the survey measurement equipment; Total Stations, Level Machines and GPS; Introduction to theoretical background to the basic distance, angle and coordinate measurements. |
| Day 2 | <i>Start: 08.30 AM End: 04.30PM</i> | Parts of a Total Station – This section will cover introduction to Topcon GTS 1002 total station; powering on the total station; Getting started with the names and functions of a total station parts; Powering off the total station; the accessories of the total station. |
| Day 3 | <i>Start: 08.30 AM End: 04.30PM</i> | Setting-up and Operating a Total Station: The initial total station setup; Total station modes – (i) Angle mode; (ii) Distance mode; (iii) Coordinate mode; (iv) Offset mode; (v) Carrying out measurements... |
| Day 4 | <i>Start: 08.30 AM End: 04.30PM</i> | Surveying (Field Data Collection): Field data collection; surveying; staking out; resection method; file management; importing and exporting data; area (projection and roadway); downloading data and processing it in AutoCAD Civil 3D; plotting and labelling the contours; map layout; map production; working with surfaces, applications of topo data in drainage systems. |
| Day 5 | <i>Start: 08.30 AM End: 04.30PM</i> | Total Station Errors (Types of Errors & Adjustment): Types of survey/total station errors – angular errors, distance errors; coordinate errors; adjusting index error; adjustment and corrections; total station config; COGO; data post-processing. |

6. TRAINING WORKPLAN

| No. | Proposed Activity/Task | Timelines (Days) | | | | | | |
|-----|--|------------------|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Travelling of Trainer to Training Site | | | | | | | |
| 2. | Introduction to a Total Station | | | | | | | |
| 3. | Parts and Functions of a Total Station | | | | | | | |
| 4. | Setting-up and Operating a Total Station | | | | | | | |
| 5. | Surveying (Field Data Collection) | | | | | | | |
| 6. | Total Station Errors (Types of Errors) | | | | | | | |
| 7. | Travelling of Trainer Back to Office | | | | | | | |