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Contour Surveying by Using Total Station

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ABSTRACT: This project that have been well-organized plan for conducting a survey using a total station instrument and creating a detailed map using AutoCAD and E-surveying software. By accurately observing and recording the coordinates of targeted points, you'll be able to calculate traverse side lengths, bearings, and ultimately determine the area of the closed field. Importing the raw data into AutoCAD will facilitate the creation of diagrams, while E-surveying software will help generate contour and level lines for the map. Providing all necessary data in a legends section ensures clarity, and mentioning the scale according to the drawing is crucial for accurate interpretation. If you encounter any challenges along the way, feel free to ask for assistance.

KEYWORDS: Total station, Contour surveying.

I. INTRODUCTION

Surveying indeed involves the precise determination of positions on the Earth's surface, typically using various tools and techniques such as chains, plane tables, dumpy levels, and theodolites. However, these traditional methods can be time-consuming, labor-intensive, prone to errors, and require manual calculations.

The introduction of Total Stations has revolutionized surveying by offering significant advantages over traditional equipment:

1. **Efficiency:** Total Stations streamline the surveying process, enabling faster data collection and reducing the time required for measurements and calculations.
2. **Accuracy:** Total Stations provide highly accurate measurements of distances, angles, and elevations, minimizing errors and ensuring reliable data for mapping and planning purposes.
3. **Ease of Use:** Total Stations are user-friendly and require minimal training to operate, making them accessible to a wider range of surveyors and technicians.
4. **Data Storage:** Total Stations can store measurement data directly onto memory cards or internal memory, eliminating the need for manual record-keeping and reducing the risk of data loss or corruption.
5. **Versatility:** Total Stations offer versatility in surveying tasks, allowing for a wide range of applications, including topographic mapping, construction layout, boundary surveys, and as-built surveys.
6. **Integration with Technology:** Many Total Stations are compatible with advanced software and GPS systems, allowing for seamless integration with modern surveying workflows and data processing techniques.

Overall, Total Stations have transformed the field of surveying by enhancing efficiency, accuracy, and productivity while reducing labor costs and the potential for errors. Their ease of use, versatility, and integration with technology make them indispensable tools for modern surveying projects.

II. NECESSARY OF SURVEYING

Engineering surveying encompasses various tasks crucial for the success of construction projects, including:

1. **Producing Up-to-date Engineering Plans:** These plans are fundamental for designing the construction, emphasizing the need for meticulous surveying to ensure design reliability.
2. **Determining Required Areas and Volumes:** Surveying helps calculate the necessary land and material volumes, facilitating efficient project management.
3. **Ensuring Correct Construction Positioning:** Surveying ensures that construction occurs accurately in both relative and absolute positions on the ground, preventing errors in placement.
4. **Recording Final Positions and Design Changes:** Surveyors document the final positions of structures, capturing any alterations made during the construction process for future reference.
5. **Providing Permanent Control Points:** Establishing permanent control points aids in monitoring projects, such as regularly checking for movement during construction, ensuring stability and safety.

III. METHODOLOGY

1. Study of surveying and Total station.
2. Physical investigation of site.
3. Study of FMB.
4. Data collection using Total station.
5. Data transfer using Topcon.
6. Completing diagram using AutoCAD.
7. Generate Contour map using E-Survey.
8. Conclusion.

IV. CLASSIFICATION BASED UPON NATURE OF FIELDS

The three main types of surveying based on the nature of the field are:

- 1. Land Surveying:** It can be further classified as i) Topographical survey ii) Cadastral Survey and iii) City Survey. It generally deals with natural or artificial features on land such as rivers, streams, lakes, wood, hills, roads, railways, canals, towns, water supply systems, buildings & properties etc.
- 2. Marine Surveying:** Marine surveying involves tasks like measuring discharge of streams, conducting topographic surveys of shores, taking soundings to determine water depth, and monitoring ocean tide fluctuations.
- 3. Astronomical Surveying:** Astronomical surveying, on the other hand, determines absolute locations of points or directions on Earth's surface by observing celestial bodies like the sun or fixed stars.

V. CLASSIFICATION BASED UPON OBJECTS

Based on objects yields four types of surveying:

1. Geological Surveying,
2. Mine Surveying,
3. Archaeological surveying,
4. Military surveying.

VI. TOTAL STATION

Total Stations are incredibly versatile tools in the realm of surveying and construction, providing precise measurements for both horizontal and vertical angles, distances, and elevations. Their integration of electronic theodolite and electronic distance measuring capabilities streamlines the process, enhancing efficiency and accuracy on the job site.

Key features of a Total Station include:

- 1. Electronic Theodolite:** Total Stations incorporate a theodolite for measuring horizontal and vertical angles with great accuracy. This allows surveyors to precisely determine the relative positions of points on the Earth's surface.
- 2. Electronic Distance Measurement (EDM):** Total Stations use EDM technology to measure distances between the instrument and target points. This is typically achieved through the emission and reception of electromagnetic waves or infrared signals.
- 3. Data Collection:** Total Stations often have internal memory for storing measurement data, and they can also transmit it to external devices like computers or data collectors. This capability streamlines the data collection and management process in surveying tasks.
- 4. Display and Interface:** Total Stations are equipped with a user-friendly interface and display screen for viewing measurement data, inputting commands, and accessing instrument settings.
- 5. Accuracy and Precision:** Indeed, the high levels of accuracy and precision offered by Total Stations make them indispensable across various surveying tasks. From topographic mapping to construction layout, boundary surveys, and as-built surveys, their versatility and reliability ensure efficient and precise results in a wide array of applications.
- 6. Integrated Software:** The built-in software in many Total Stations greatly enhances their utility by allowing for on-the-go calculations, data processing, and report generation. Furthermore, the compatibility with external software opens up avenues for even more advanced data analysis and visualization, catering to the diverse needs of surveying professionals.
- 7. Remote Operation:** Some Total Stations feature remote control capabilities, allowing surveyors to operate the instrument from a distance using wireless communication technologies.

Total Stations have become essential tools in modern surveying and construction projects due to their accuracy, efficiency, and versatility. They have largely replaced traditional surveying instruments such as chains, theodolites, and level instruments, offering significant improvements in productivity and data quality.

VII. CONTOUR

Contour surveying involves mapping the shape and elevation of the land's surface by identifying and measuring contour lines. Contour lines connect points of equal elevation, allowing surveyors to depict the three dimensional topography of an area on a two-dimensional map. This method helps in understanding the terrain's characteristics, such as slopes, ridges, valleys, and changes in elevation, which is crucial for various purposes like land development, engineering projects, and environmental planning.

Contour surveys provide valuable information for designing drainage systems, roadways, and land use planning while also aiding in floodplain mapping and erosion control efforts.

VIII. DRAWING & DETAILS



TOTAL SPECIFICATIONS:

- * Proposed Area - 100.56 Acres
- * Road Area - 1.18 Acres
- * Private Area - 20.53 Acres
- * Pond Area - 1.79 Acres
- * Bushe - 1.52 Acres
- * Inaccessible Area - 31.66 Acres
- * Total Area = 157.24 Acres

IX. FACTORS AFFECTING THE SELECTION OF CONTOUR INTERVAL

Several factors influence the selection of the contour interval for a topographic map:

- 1. Scale of the Map:** Larger-scale maps, which cover smaller areas in greater detail, typically use smaller contour intervals to accurately represent the terrain's features. Smaller-scale maps covering larger areas may have larger contour intervals to maintain legibility and reduce clutter.
- 2. Terrain Steepness:** In rugged or mountainous terrain with significant elevation changes, a smaller contour interval is necessary to accurately depict the steep slopes and intricate features. Conversely, in flatter areas, a larger contour interval may suffice.
- 3. Map Purpose:** The intended use of the map plays a crucial role in determining the appropriate contour interval. Maps used for detailed engineering projects or land development may require smaller contour intervals for precision, while maps used for general reference or recreational purposes may use larger intervals.

4. Accuracy Requirements: The level of accuracy required for the map influences the choice of contour interval. High-precision surveys or engineering projects may demand smaller intervals to capture subtle elevation changes, while less critical applications may accept larger intervals.

5. Available Data: The availability of accurate elevation data and survey information also impacts the selection of the contour interval. In areas where detailed elevation data is readily available, finer intervals can be used to represent the terrain more accurately.

6. Map Legibility: The contour interval should be chosen to maintain the map's legibility and readability. Too many contour lines close together can create visual clutter, making it difficult to interpret the map, while widely spaced lines may oversimplify the terrain.

7. User Preferences: User preferences and expectations also influence the selection of the contour interval. Different users may have varying needs and preferences regarding the level of detail and precision required in the map representation.

By considering these factors, cartographers and surveyors can select an appropriate contour interval that balances accuracy, detail, and readability for the specific requirements of the map.

X. CONCLUSION

Thus the basic knowledge about the Total Station was obtained. Then the dimensions of the land were measured accurately with the help of Total Station successfully. It saves time, since conventional equipment's will consume time. The data's can be stored in this device which can be used for future references

- Since it saves time, it can be used to do surveying in hydraulic projects to enable faster construction.
- It will be helpful for both the engineers and contractors to make the economical project.
- To preserve the data for future references without much difficulty, it is the only option.

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