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Preparation of Topographic and Contour Map Using Total Station

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ABSTRACT: In this project Topographical and contour map has done for a “Masala Industry”, Perundurai. The Total station is a highly accurate surveying instrument that can measure distances, angles, and elevations with great precision. We have used a Total Station(krypton), Prism, Tripod, Measuring tape with krypton study manual. The measurements are made possible by accurate observation of information of targeted points. This study specifically focuses on the preparation of a topographic map for 100 Acres identify the information for contour. The method used for this study was to collect field data for each feature of “ Masala Industry” to preparation of a topographic map. We provided the temporary benchmark and change point in permanent places of Masala Industry. All these data taken by using Total station can be imported to AutoCAD. Contour lines and level lines were generated by using E-surveying software.

KEYWORDS: Total station, Topographic map, Contour map.

I. INTRODUCTION

Absolutely, topographical surveys are fundamental for understanding the layout of the land. They provide crucial data for designing and executing various projects, from infrastructure development to urban planning. The detailed representation of terrain through contour lines in topographical maps is invaluable for visualizing the landscape's features and characteristics.

The methods for topographical mapping have evolved significantly with advancements in technology. Photogrammetric techniques utilize aerial photography to capture detailed images of the terrain, while remote sensing satellites gather data from space. Geodetic satellites contribute by providing precise positioning information. On the ground, terrestrial methods such as using theodolites, Electronic Total Stations (ETS), and Terrestrial Laser Scanners (TLS) offer high-resolution data collection directly from the surface, allowing for detailed and accurate mapping. Each method has its advantages and is chosen based on the specific requirements of the project and the desired level of detail.

A Total Station is a sophisticated surveying instrument that combines an electronic theodolite with an electronic distance meter (EDM). Additionally, it features a microprocessor, electronic data collector, and storage system, offering comprehensive functionality for surveying tasks.

Objectives

When our Masala Industry is construct, this Project will be very useful for

- Detailed map of the natural and man-made features of land.
- Cutting and Filling of site,Project development purpose.
- Topographic map, which thus shows valleys and hills, and the steepness or gentleness of slopes.

Study Area

We have Surveyed “Masala Industry”. The site is located in Perundurai. It is a type of Industrial building G+1. The total area of the field is about 100 Acres.The Industrial building consists of storage build machinery hall , store room , labor room , compound wall, etc .

Site Visit

• Visit the site to conduct a visual inspection and to identify any features that need to be surveyed. This may include buildings, vegetation, and natural features such as roads and streams.

• Topographic maps can be used to plan for the construction of new buildings or the renovation of existing buildings. The maps can help to identify the best locations for new structures and to ensure that they are compatible with the existing topography.

Location

- This area that the group covered for this activity is from “Masala Industry”, Perundurai.
- Topographical and contour starting from NMI, perunduari arch to NMI Temple
- Topographical and contour area covered by up to 100 Acres.



Fig.1. View of the Site

Date and time of Survey

The Topographical and contour conducted last February 12, 2024 (Monday) to 29, 2024 (Tuesday) at around 10:00 AM to 4.00 PM.

Weather

- The weather for the first day of survey was sunny.
- Overall, the weathering condition in our NMI site was slightly cooler.

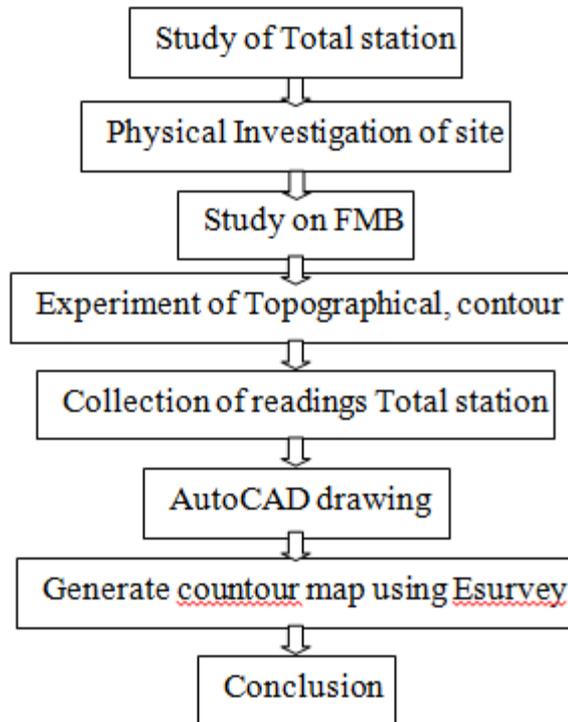


Fig.2. View on weathering condition at one location

Data Collection

Surveyor walked along link and located object or point by foot step. Basic information for planning purpose like location of traffic signs, and distance of utility lines from the road are obtained. Thus, measurements of turning radii and turning restriction in intersections are not included. In addition, road marking was also noted as added information.

II. METHODOLOGY



Prism

Prisms, typically attached to surveying poles, serve as targets for distance measurement. Prism poles aid in accurately measuring ground elevation using various sighting tools like total stations, transit levels, automatic levels, or laser levels. In land surveying, total stations commonly employ purpose-built glass prism reflectors for EDM signal reception. These instruments typically have a range of up to 1,500 meters (4,900 feet) with an accuracy of around 1.5 millimeters (0.059 inches) \pm 2 parts per million.

Temporary Benchmark

The benchmark, or Temporary Benchmark (TBM), is typically set up at the end of the day's work to serve as a reference point for continuing work the next day. It's essential for the benchmark to be located near a permanent object to ensure easy identification and continuity of the surveying process. This helps maintain accuracy and efficiency when resuming work.



Fig.3. TBM

Change Point

The point at which two readings are taken on the staff, one before moving the instrument to a new position and one after setting the instrument on the new position, is called a Turning Point in leveling. This process helps ensure accurate measurements by accounting for any changes in elevation when relocating the instrument.



Fig.4. Change Point

AutoCAD

Absolutely, CAD software is a fundamental tool for land surveyors, providing them with the capability to create precise and detailed representations of surveyed areas. CAD modeling allows for the creation of virtual representations of various features such as buildings, landscapes, and infrastructure, aiding in accurate visualization and presentation of survey data. It enhances the efficiency and effectiveness of surveying processes by enabling surveyors to analyze, design, and communicate information effectively.

III. TOPOGRAPHIC SURVEY

Features of topography survey

- Topographical surveys provide valuable information that can assist in the development of construction and planning projects.
- It ensures that important factors such as terrain and building elevations are considered during the design process.
- It helps in achieving an in-depth and accurate picture of the building, land, and other structures of the land.

Coordinates in topographical surveying

Coordinates serve as precise indicators of a location's position on the ground, map, or plan. Typically represented as numerical figures, they denote the distance from two perpendicular coordinate axes, which run either from south to north or from west to east. The point where these axes intersect is known as the point of origin or "zero" point. In navigation devices, coordinates aid in locating destinations efficiently. For three-dimensional descriptions, a third coordinate indicating height is necessary. Additionally, coordinates can be expressed using a combination of figures and letters, as seen on chess boards, site or city maps, or in spreadsheets, facilitating easy referencing and communication of locations.

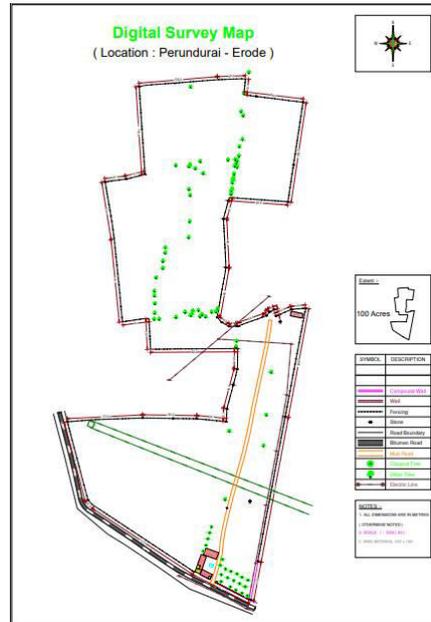


Fig.5. Topographic Map

IV. CONTOUR

Characteristics of contour lines In surveying

These are basic principles of interpreting contour lines on a topographic map:

- Lines never intersect; they either close within the map boundaries or extend beyond them.
- Closely spaced contour lines signify steep slopes, while widely spaced lines indicate gentle slopes.
- Higher elevation within closed contours denotes a hill or mountain.
- Lower elevation within closed contours suggests a depression or basin.
- Each contour line represents a constant elevation, meaning elevation remains consistent along a single line..

Contour interval

The contour interval in surveying refers to the vertical distance or elevation difference between two adjacent contour lines on a topographic map. Different maps may have varying contour intervals based on the size and terrain of the area being mapped. Typically, the contour interval is indicated on the right-hand bottom side of the map. However, if it's not specified, it can be calculated. A common contour interval is 20 feet for a scale of 1:24,000.

Contour maps

Contour maps are valuable tools for visualizing elevation data. Each contour line represents a constant elevation, with the spacing between lines indicating the steepness of the terrain. The contour interval, or the difference in elevation between two consecutive lines, remains consistent throughout the map, allowing for accurate interpretation of the landscape's topography.

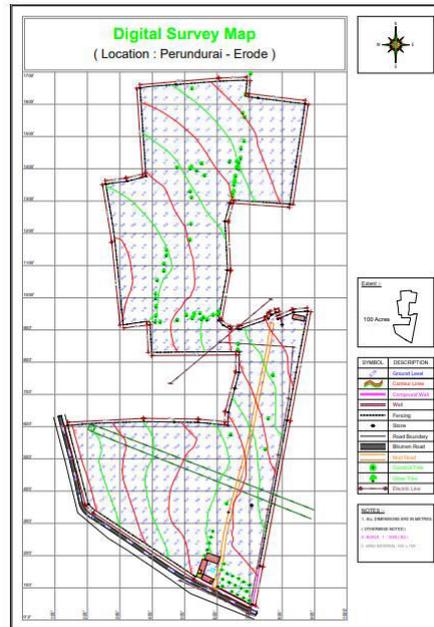


Fig.6.Contour Map

V. CONCLUSION

Total station instruments were employed in surveying of the "Masala Processing Industry" in Perundurai for the creation of topographic and contour maps of the region. The instruments used are found to be produce reliable data under any conditions for the production of topographic map. This proved invaluable for strategizing future expansion and upholding the infrastructure of the industry. The precise coordinates derived from the total station instruments were integrated into AutoCAD to generate the topographic map. Additionally, E-survey software was utilized to adjust the coordinates and generate the contour map delineating the boundaries of the study area. The final adjusted boundary coordinates determined by the total station yielded excellent results, showcasing its precision and accuracy.

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