

A

Minor Project Report

On

## "Survey of any region using Total Station & Compass"

*In partial fulfillment of the requirement for the award of degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**CIVIL ENGINEERING**

Submitted by

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**DEPARTMENT OF CIVIL ENGINEERING**

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE  
GWALIOR-474005 (M.P)**

**December / 2022**



## Madhav Institute of Technology & Science, Gwalior (M.P.)

(A Govt. Aided UGC Autonomous Institute & NAAC Accredited. Estd. in 1957. Affiliated to RGPV Bhopal)

### CANDIDATE'S DECLARATION

We hereby certify that the Minor Project report entitled **Survey of any region using Total Station & Compass** which is being submitted in **Civil Engineering Department** is a record of our own work carried out under the supervision and guidance of **A.K. Dwivedi**, Professor, Department of Civil Engineering, Madhav Institute of Technology & Science, Gwalior.

All information in this document has been obtained and presented in accordance with academic rules and ethical conduct. We have fully cited and referenced all material and results that are not original to this work.

To the best of our knowledge the material presented in this report has not been submitted to any other place (i.e. institute, university, organization) as thesis/report except the industry, where this work has been carried out.

Date: 24/11/2022

Place: Gwalior

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## **ABSTRACT**

The main objective of this project is to perform the survey of the Statue Ground of MITS Gwalior using Total Station and Prismatic Compass. In this we have to measure the dimensions of the ground, total area of the ground, height of the Statue present in the centre of the Ground. We have used various concepts of surveying of a region here.

Surveying is the fashion by which we find out the relative positions of various types of features on the surface, above the face or below the face of the earth. As per the American Congress on Surveying and Mapping, It's the wisdom & trades of making all important measures to determine the relative positions of points or physical and artistic details above, on, or below the face of the Earth. To construct or modify them in a usable form, or to establish the positions of points in details. This system of surveying also includes the system of establishing points by pre-defined angle and direct measures. From the Sections, plans and Charts drawn by surveying, volume and the area of a some plot or point can be calculated so fluently. A chart always shows the vertical protrusions of the place or point surveyed and not the factual area. But the perpendicular distance can be shown more exactly by sketching the sections.

The planning and designing of all Civil Engineering systems similar as railroads, roadways, tunneling, heads, budgets, waterworks, sewerage workshop, fields, and massive structures, etc. are grounded upon surveying measures. During the process of prosecution of the design of any magnitude is constructed along the lines and points established by surveying.

The processes like the dimension of land and the obsession of its boundaries can not be done without the surveying process. The feasibility of the engineering systems similar as economics and engineering feasibilities of a design can not be duly understood or anatomized without bearing a check work. Surveying is used to prepare a topographic chart of a land face of the earth.

## ABSTRACT

इस परियोजना का मुख्य उद्देश्य टोटल स्टेशन और प्रिज्मीय कम्पास का उपयोग करके एमआइटीएस ग्वालियर के स्टैच्यू ग्राउंड का सर्वेक्षण करना है। इसमें हमें जमीन के आयाम, जमीन का कुल क्षेत्रफल, जमीन के बीच में मौजूद मूर्ति की ऊँचाई को मापना होता है। हमने यहाँ एक क्षेत्र के सर्वेक्षण की विभिन्न अवधारणाओं का उपयोग किया है।

सर्वेक्षण वह फैशन है जिसके द्वारा हम सतह पर, सतह के ऊपर या पृथ्वी के चेहरे के नीचे विभिन्न प्रकार की विशेषताओं की सापेक्ष स्थिति का पता लगाते हैं। सर्वेक्षण और मानचित्रण पर अमेरिकी कांग्रेस के अनुसार, यह पृथ्वी के ऊपर, ऊपर या नीचे बिंदुओं या भौतिक और कलात्मक विवरणों की सापेक्ष स्थिति निर्धारित करने के लिए सभी महत्वपूर्ण उपाय करने का जान और व्यापार है। उपयोग करने योग्य रूप में उन्हें बनाने या संशोधित करने के लिए, या विवरण में बिंदुओं की स्थिति स्थापित करने के लिए। सर्वेक्षण की इस प्रणाली में पूर्व-निर्धारित कोण और प्रत्यक्ष उपायों द्वारा अंक स्थापित करने की प्रणाली भी शामिल है। किसी भूखंड या बिंदु के सर्वेक्षण, मात्रा और क्षेत्र द्वारा तैयार किए गए अनुभागों, योजनाओं और चार्टों से कितनी धाराप्रवाह गणना की जा सकती है। एक चार्ट हमेशा सर्वेक्षण किए गए स्थान या बिंदु के ऊर्ध्वाधर फैलाव को दिखाता है न कि वास्तविक क्षेत्र को। लेकिन लम्बवत् दूरी को खंडों को चित्रित करके अधिक सटीक रूप से दिखाया जा सकता है।

रेलमार्ग, रोडवेज, टनलिंग, हेइस, बजट, वाटरवर्क्स, सीवरेज वर्कशॉप, फील्ड्स और बड़े स्ट्रक्चर्स आदि जैसी सभी सिविल इंजीनियरिंग प्रणालियों की योजना और डिजाइनिंग सर्वेक्षण के उपायों पर आधारित हैं। अभियोजन की प्रक्रिया के दौरान किसी भी परिमाण के डिजाइन का निर्माण सर्वेक्षण द्वारा स्थापित लाइनों और बिंदुओं के साथ किया जाता है।

सर्वेक्षण प्रक्रिया के बिना भूमि के आयाम और उसकी सीमाओं के जुनून जैसी प्रक्रियाओं को नहीं किया जा सकता है। एक डिजाइन की अर्थशास्त्र और इंजीनियरिंग व्यवहार्यता के समान इंजीनियरिंग प्रणालियों की व्यवहार्यता को चेक कार्य के बिना विधिवत समझा या शारीरिक रूप से नहीं समझा जा सकता है। सर्वेक्षण का उपयोग पृथ्वी के स्थलाकृतिक चार्ट को तैयार करने के लिए किया जाता है।

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# **CHAPTER 1**

## **OBJECTIVE**

The main objective of this project is to perform the survey of the Statue Ground of MITS Gwalior using Total Station and Prismatic Compass. In this we have to measure the dimensions of the ground, total area of the ground, height of the Statue present in the centre of the Ground.

A small Picture of the ground on which the survey work is to be performed is given below in figure 1:-



Figure 1

## **CHAPTER 2** **INTRODUCTION**

**S**urveying is the fashion by which we find out the relative positions of various types of features on the surface, above the face or below the face of the earth. As per the American Congress on Surveying and Mapping, It's the wisdom & trades of making all important measures to determine the relative positions of points or physical and artistic details above, on, or below the face of the Earth. To construct or modify them in a usable form, or to establish the positions of points in details. This system of surveying also includes the system of establishing points by pre-defined angle and direct measures. From the Sections, plans and Charts drawn by surveying, volume and the area of a some plot or point can be calculated so fluently. A chart always shows the vertical protrusions of the place or point surveyed and not the factual area. But the perpendicular distance can be shown more exactly by sketching the sections.

During the surveying, the professionals( masterminds) use colorful tools or bias to do their job successfully & precisely, similar as total stations, compass, radio agents, GPS receivers, 3D scanners, digital situations, stumpy position & surveying software etc. The knowledge & Chops of surveying is helpful in numerous phases of engineering. Surveying is of great significance in any engineering systems. exemplifications of some of the introductory significance of Surveying is mentioned below. The first and for utmost necessity in surveying is to prepare a plan and the section of an areas that are to be covered in the design. From these set charts & sections the best possible alignment, possible channel and other necessary details depending upon the nature of the design can be estimated or calculated.

The planning and designing of all Civil Engineering systems similar as

• railroads, roadways, tunneling, heads, budgets, waterworks, sewerage workshop, fields, and massive structures, etc. are grounded upon surveying measures. During the process of prosecution of the design of any magnitude is constructed along the lines and points established by surveying.

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engineering systems similar as economics and engineering feasibilities of a design can not be duly understood or anatomized without bearing a check work. Surveying is used to prepare a topographic chart of a land face of the earth.

## **CHAPTER 3**

### **EQUIPMENTS USED**

Prismatic compass:-



Measuring Tape:-



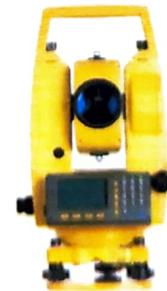
Ranging Rod:-



Tripod:-



Total Station:-



Wooden Pegs:-



Prism Rod:-



Plumb Bob:-



# **CHAPTER 4**

## **THEORY**

### **What do you mean by Total Station?**

A Total Station is an digital and electrically operated surveying instrument used for the measurement and survey work of any area. It is a very useful instrument for estimating points such as and distances. The Total station i.e. used for surveying consists of the Electromagnetic Distance Measuring and Electronic Theodolite.

### **Parts of the Total Station:-**

Major components are as follows:

- 1) Electronic transit theodolite
- 2) Microprocessor
- 3) Electronic distance meter (EDM)
- 4) Electronic data collector & Storage system

### **Advantages of Total Station:-**

Major benefits of using the total stations are as follows:

1. It is very easy of Use
2. Work is done in a speedy way.
3. It is convenient.
4. It has very high accuracy.
5. It also provides CAD interface.
6. It avoids the Manual Mistakes.
7. Fast calculations are possible with this device.
8. Computer Integration becomes easier.

## **Steps to use Total Station during Surveying?**

The following are steps involved in this process are mentioned below:

1. First of all setting up tripod is done.
2. Then the Total Station is fixed on the tripod.
3. Thereafter the Survey Points are focused.
4. The Leveling of the Total Station is done.
5. The Leveling is verified Electronically.
6. Adjustments are made in the Image & the Cross-Hair is focused.
7. At last the Measurements are taken.

## **Importance of Total Station in Surveying:-**

Major importance of the total station in the field of surveying:

1. Measuring Distances.
- 2 Measuring the Angles.
3. Determination of the Co-ordinates.

## **Precautions kept in mind while using Total Station:-**

The precautions that must be taken while using a total station on the field are as follows:

- 1)The devices must be handled properly and also should be held by both hands.
- 2)The tripod should always be mounted on a stable surface as far as possible & practicable.
- 3)The charged battery should be kept along with, so that can be used once the battery is discharged.
- 4)Tripod mounted with Total Station on it must not be carried from one station to another station.
- 5)When the tribrach has been removed from the device i.e. the total station, device should be handled carefully.

## **Explain the Prismatic Compass Surveying?**

The prismatic compass survey is only used to identify bearing angles, and the measuring tape is used to determine the range. It is typically carried by hand and is very small and flexible. With the exception of the magnetic compass, this device is one of the two primary types of magnetic compasses utilized for magnetic bearing measurement. The graduation runs counterclockwise from the south end of the instrument's needle, so the circle is read for that purpose. The mirror, which is also in front of the forward vane, can move up and down the vane, resting flat on top of it or at any angle.

The instrument's mirror, which is typically attached to a compass, can be used to see single objects or very high objects.

The prism, which is either already there or has been installed, can be turned up and down between the two slides that run around the outside of the case. The purpose of this up-and-down movement is to change one's concentration.

The image is seen through the prism mounting's small circular aperture, and the vertical wire in the front aperture can be seen through a small v cut immediately above this aperture. To magnify the graduation image, the Prismatic Adapter consists of a reading mask with a strongly convex shape and a translucent prism with ice at 45 degrees.

The prismatic compass is typically used in rougher working groups because it is usually a small instrument that can be held in one's hand for observation.

The graduate on that device is on a light aluminum ring that is attached to the needle. The graduation zero only corresponds to the graduation point south of the needle, so the needle stays still while the index is rotated with the sighting valves.

## **Components of a Prismatic Compass:-**

Various components of a Prismatic compass are as under:

- 1)A Cylindrical Metal Box
- 2)Eye Valve
- 3)Cover of Glass
- 4)Graduation Circle
- 5)Lifting Pin and Lifting Lever
- 6)Prism
- 7)Spring Break
- 8)Object Vane
- 9)Reflecting Mirror
- 10)Pivot
- 11)Magnetic Needle

## **Advantages of Prismatic Compass:-**

Various advantages of Prismatic compass are as under:

- 1)Firstly both viewing of the object & also observation of the circle can be done simultaneously without shifting the location of the eye.
- 2)The circle is interpreted at the reading where the hairline is seems to be sliced.
- 3)These instruments are very lightweight and compact.
- 4)These devices have less settings to repair it on a station.
- 5)The most important advantage is that if any error is made in any single survey than it doesn't really impact other lines.
- 6)This instrument is very much important to retrace the surveys.

## **Disadvantages of the Prismatic Compass:-**

Various disadvantages of this device are as under:

- 1) This instrument can't be used in the environments considered to have magnetic content.
- 2)They Demands expert persons, especially expertise about the rocks, to recognize the presence of iron ore.
- 3)While using the device it is difficult to keep the compass perfectly still while taking the bearing, so it is hard to totally avoid errors i.e. the errors

can't be neglected.

4) This surveying is not useful for the long distances or larger areas.

## Uses of Prismatic Compass:-

- 1) This instrument can always be used in the survey or traversing process.
- 2) The Prismatic compass is generally used for the rough surveys i.e. the places where the key concern is speed and not precision.
- 3) This is an instrument that is used to calculate the bearings of a magnetic-meridian.

## **CHAPTER 5**

### **PROCEDURE**

#### **PRISMATIC COMPASS:-**

Following procedure is followed for the prismatic compass surveying:-

- ✓ Important tools that are essential in prismatic compass survey are gathered/ arranged, some tools are mentioned below:

A Prismatic compass & a tripod stand.

A Field Book.

A Ranging Rods.

A Measuring Tape etc.

- ✓ After arranging all instruments following work is done:

Centering.

Levelling.

Focusing Prism.

- ✓ When the needle of the compass is suspend freely, it points towards the north direction. Hence , all the angles determined with a prismatic compass are with respect to the north (magnetic meridian).



Figure 2

## TOTAL STATION:-

In order to use a total station for surveying work following steps are taken:

1. First of all the tripod is set on a point.
2. Thereafter the total station is mounted over the tripod.
3. Leveling and centering of the Total Station.
5. The leveling is verified Electronically on the device.
6. The image is focused and the hair are adjusted.
7. And finally the measurements are taken.



Figure 3

The following are steps involved in the use of total station in surveying:-

- 1) Firstly we have taken a station point (P1), whose co-ordinates are (1000,1000,100).
- 2) Then we have taken a back sight point (P2), with the help of Prism rod and total station.
- 3) We have taken a point i.e. (P3) at the ground entry gate
- 4) Thereafter we surveyed the entire ground following the similar steps.

# CHAPTER 6

## OBSERVATION & RESULT

### Total Station Data:-

#### Readings of Total Station:-

POINT	POINT SPECIFICATION	COORDINATES OF POINTS(E,N)	HORIZONTAL DIST	VERTICAL DIST	SLOPING DIST	HORIZONTAL ANGLE	VERTICAL ANGLE
1	Station Point	(1000, 000, 1000, 000, 100, 000)					
2	BAC's Sight Point	[1016, 383, 999, 280, 100, 106]	16.398m	0.026m	16.398m		
3	GROUNd Entry Gate Left side	(1005, 842, 992, 172, 100, 074)	9.768	0.23km	8.771m	106.41dms	88.1806dms
4	GROUNd Entry Gate Right side	(1001, 818, 992, 192, 100, 321)	8.017m	0.241m	8.020m	283.0610dms	88.1644dms
5	Boundary Fence near Dron school	(996, 791, 992, 123, 100, 256)	34.130m	0.176m	34.130m	193.2035dms	89.4218dms
6	Dron School Wall Edge	(996, 161, 106, 886, 100, 044)	34.277m	0.266m	34.728m	183.2903dms	09.3319dms
7	NCC building Side Ground Entry Gate	[1074, 526, 1000, 024, 100, 345]	52.953m	0.056m	52.953m	130.0027dms	89.5624dms
8	Right End Building Gate	[947, 679, 939, 563, 100, 282]	74.526m	0.266m	74.526m	116.2226dms	89.4745dms
9	Electric Pole Near Left Corner of ground	(969, 397, 955, 776, 106, 454)	79.581m	0.107m	79.981m	251.2122dms	89.5529dms
10	Front Left Corner Of Ground	(1020, 054, 993, 073, 100, 074)	53.185m	0.375m	53.781m	2.1.1853dms	89.1600dms
11	Statue Front Right Corner	(1020, 356, 969, 344, 100, 088)	21.217m	0.006m	21.217m	340.5603dms	90.0102dms
12	Statue Back Right Corner	[1713, 073, 980, 472, 100, 122]	35.340m	0.012m	35.340m	337.1544dms	90.0113dms
13	Statue Back Left Corner	(1022, 711, 983, 441, 100, 309)	36.798m	0.001m	36.798m	314.1705dms	90.003dms
14	Statue Front Left Corner	(1022, 977, 983, 243, 101, 595)	23.542m	0.042m	23.542m	373.4347dms	89.5395dms
15	Statue Top		28.107m	4.229m	28.424m	323.5346dms	81.2634dms
16	Statue Bottom		28.435m	1.519m	28.476m	323.5446dms	86.5629dms

**BY TOTAL STATION THE AREA AND PERIMETER OF THE GROUND IS:- 5643.771 sq m AND 458.898m respectively, HEIGHT OF STATUE IS:- 4.229m**

After will use Coordinates from P3 - P10 for calculating area and perimeter of ground. Since it makes an closed traverse in the shape of quadrilaterals.

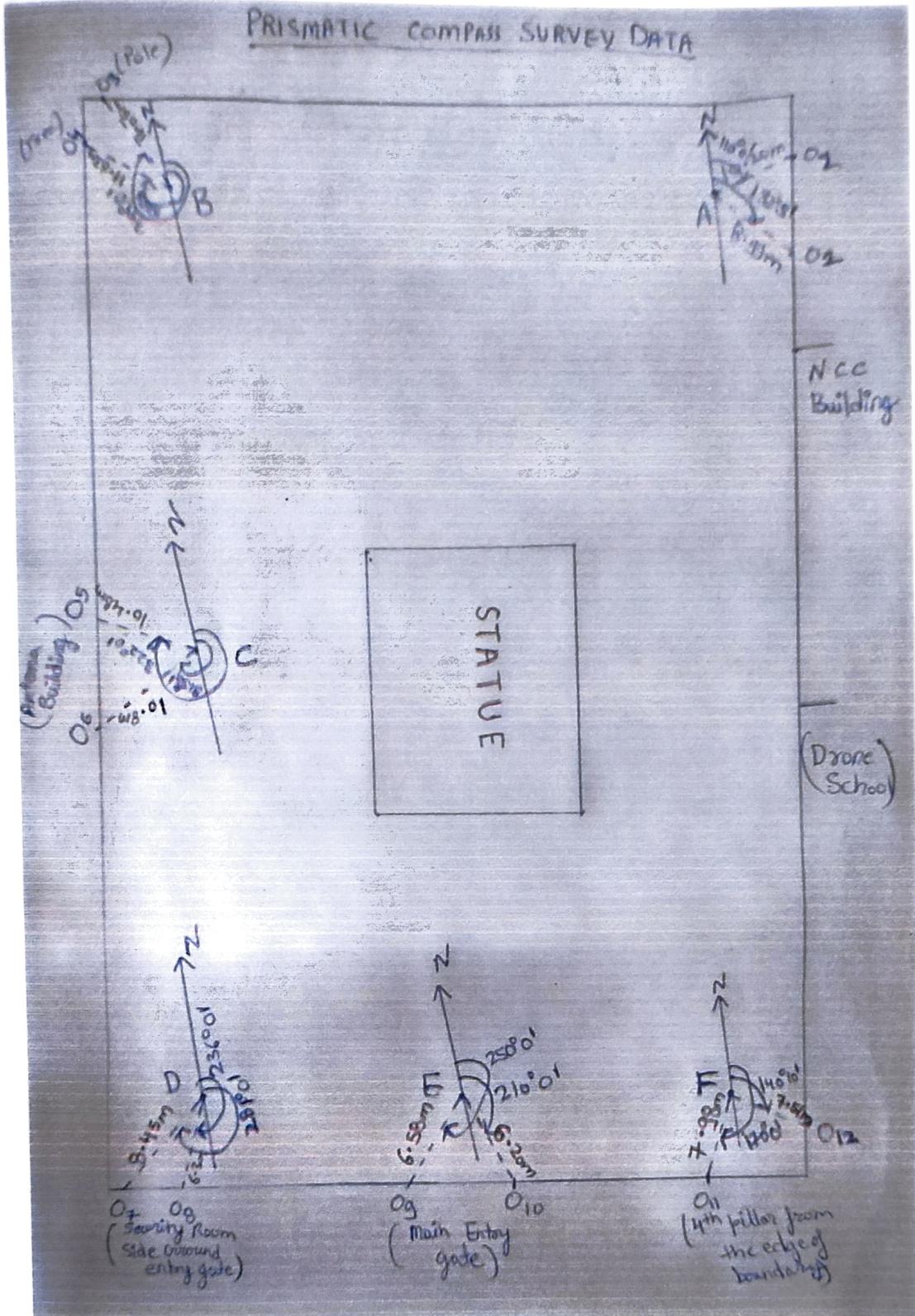
Figure 4

## Prismatic Compass:-

LINE	LENGTH (m)	W.C.B	R.B
AB	77.14 m	290° 7'	S 110° 7' W
BC	24.16 m	225°	S 45° W
CD	32.12 m	215°	S 35° W
DE	46.7 m	110°	S 70° E
EF	30.44 m	158° 10'	S 21° 50' E
FA	56.28 m	46°	N 46° E

Figure 5

## PRISMATIC COMPASS SURVEY DATA



**Figure 6**

CLOSED TRAVERSE OF COMPASS SURVEY

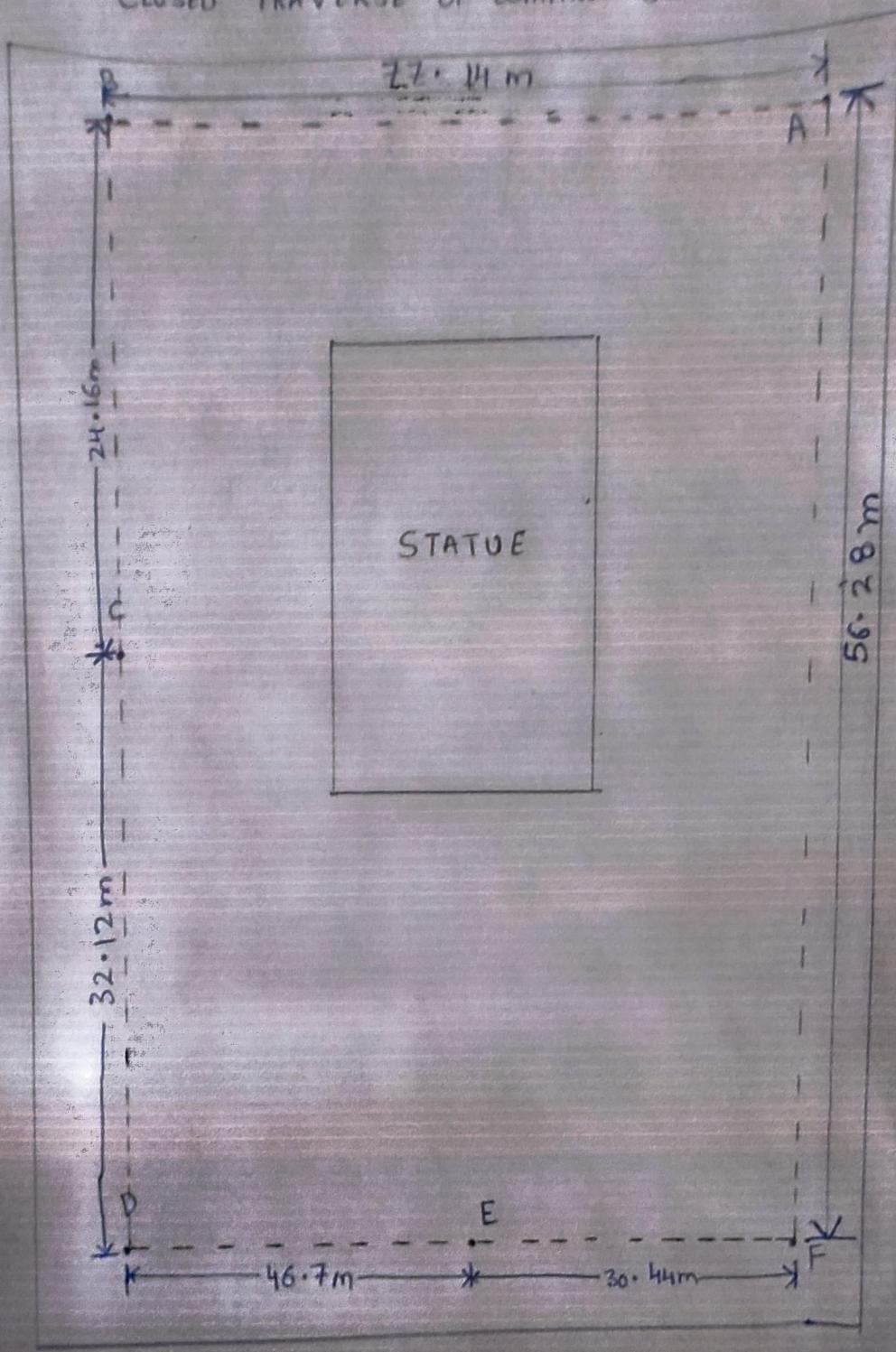


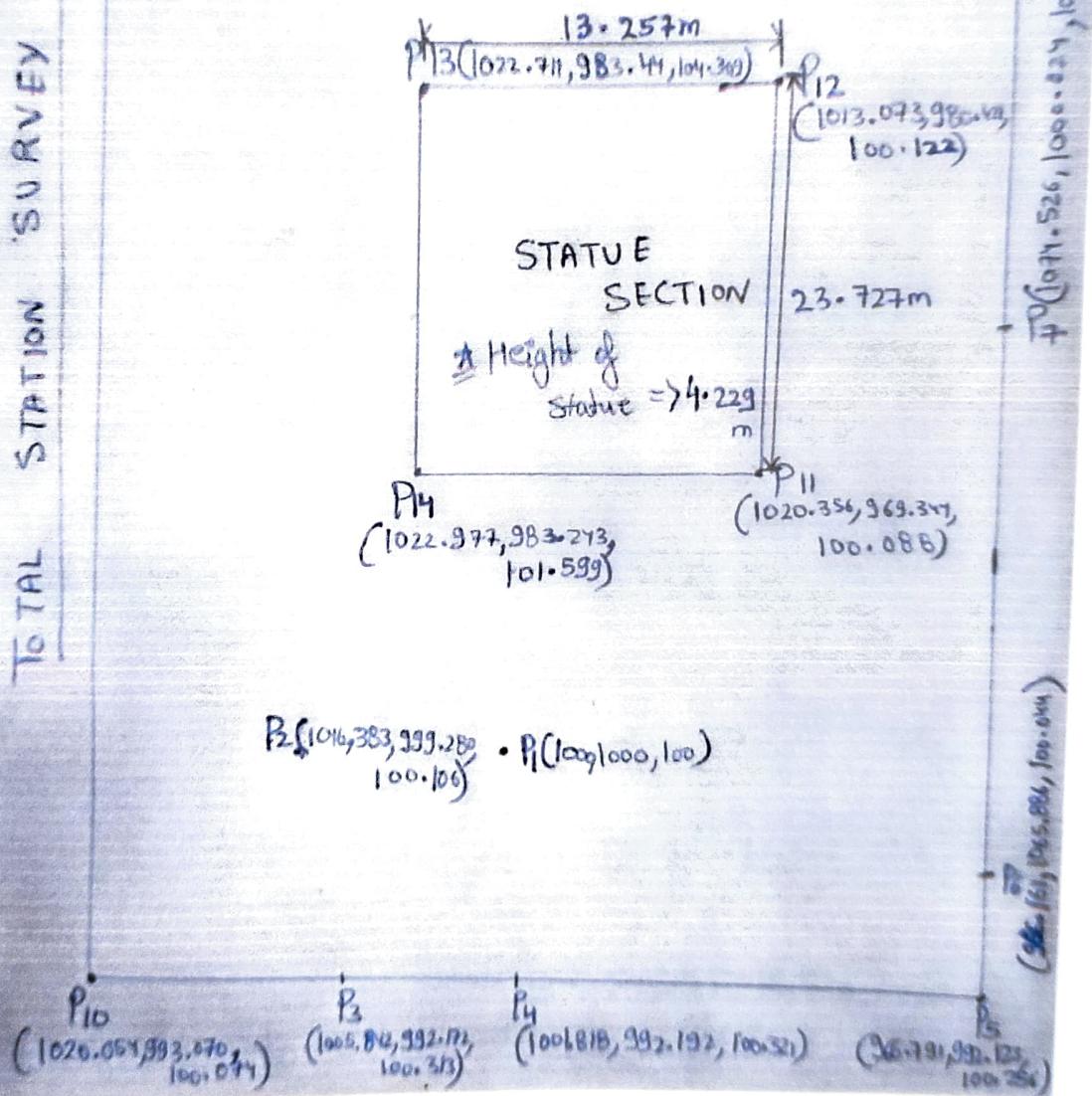
Figure 7

Pg (969, 307, 355, 726, 100-186)

# Area of ground  $\rightarrow$  5643.771 sq m.

$$\# \text{ Perimeter} \Rightarrow 458.898 \text{ m}$$

TOTAL STATION SURVEY DATA



**Figure 8**

## **CHAPTER 7** **CONCLUSION**

In this Project we learned how to use. The Surveying Instruments (i.e.Total Station,Compass) and we surveyed the entire ground using total station and traverse the ground using prismatic compass. Through this we found the area (5643.771 sq m) and perimeter(458.898m) of ground and also height (4.228) of the statue (Madhav Rao Scindhia Ji's). Through this we concluded the survey of ground.

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