Open Vocational Education Programme

Course code-455

Basic Rural Technology

4

OUR HOME ENVIRONMENT

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Basic Rural Technology

OUR HOME ENVIRONMENT

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FROM THE DESK OF CHAIRMAN ....

Dear Learner,

Welcome to the National Institute of Open Schooling!

By enroling with this institution, you have become a part of the family of the world's largest Open Schooling System. As a learner of the National Institute of Open Schooling's (NIOS) Vocational Programme, I am confident that you will enjoy studying and will benefit from this very unique School and method of training.

Before you begin reading your lessons and start your training, there are few words of advice that I would like to share with you. We, at the NIOS, are well aware that you are different from other learners. We realize that there are many of you who may have rich life experiences; you may have prior knowledge about trades and crafts that are part of your family's legacy; you may have a sharp business sense that will make you fine entrepreneur one day. Most importantly, you have the drive and motivation that has made you enrol with this institution, which believes in the spirit of freedom. Yes, we are aware that you have many positive aspects to your personality, which we respect and relate to them.

During the course of your study, NIOS will treat you as the manager of your own learning. This is why your course material has been developed keeping in mind the fact that there is no teacher to teach you. You are your own teacher. Of course, if you have a problem, we have provided for a teacher at your Accredited Vocational Institution (AVI). I would advise you that you should always be in touch with your AVI for collection of study material, examination schedules etc. You should also always attend the Personal Contact Programmes and practical / Training sessions held at your study centres. These will give you the necessary hands on training that is very essential to master a vocational course.

Studying for a vocational course is different from any other academic course. Here, while the marks obtained in the examination will indicate your grasp on your subject knowledge, your real achievement will be when you are able to apply your vocational skills in the market. I hope that this skill-based learning will help you perform your tasks better .This course of two year duration Diploma in basic Rural Technology has been developed in colloboration with Vigyan Ashram, Pune. It is a multi skilled programme, which will expose you to a variety of skills. We hope that you will find it useful. On behalf of NIOS, I wish you the very best for a bright and successful future.

Dr. S. S. Jena, Chairman,

National Institute of Open Schooling

FROM THE DESK OF DIRECTOR .....

Dear Learner,

In the fast expanding world of activities, learning new skills has become a necessity. Learning and re-learning has become essential for all. In such an environment, vocational education has assumed great importance. Vocational education, as a stream of education, promotes skill development, and training of youth and directs them towards meaningful employment.

In keeping with the needs of the Learners, NIOS conducts Vocational Education Programmes in many areas through distance mode. These programmes include Agriculture, Home Science, Engineering & Technology, Computer Science, Health & Paramedical. The Courses offered in these areas are aimed at providing self employment & wage employment opportunities for NIOS learners.

Vigyan Ashram under the leadership of late Dr.S.S.Kalbag, developed Rural Technology course for rural youth. Over the years, this course turned many youth into successful entrepreneurs. NIOS accrediated this course as Diploma in Basic Rural Technology and adopted it for further replication through AVI. This course will provide self-confidence to you and a new path to your future. You may be destined for starting a small enterprise and build your own future. This is multi-skilled programme, which will expose you to variety of skills. It includes Rural Engineering (Construction), Agriculture & Animal husbandry, Our Home Envjronment and Health sections. This will help in identifying learner's preference for future vocation. We are confident that this course will prove to be beneficial to you.

We wish you all the best in your future career.

Dr. K. P. Wasnik ,Director (VE),

National Institute of Open Schooling

A WORD WITH YOU . . .

Dear Learner,

Welcome to the Open Vocational Education Programme: "Basic Rural Technology"

This programme is developed specially for all those who are school dropouts and have started many small enterprises, do agriculture work as skilled workforce and they contribute substantially to the progress of India.

The multi-skill content with hands-on experience of this programme stimulates the intellect by going through concrete operations and then abstracting the concepts. At the same time by giving a variety of skills usable in everyday life, open the door of modern technology to the youth, allowing them to form their preferences and know their aptitudes thus enabling them to choose a career. It also improves their self-image and gives them confidence and hope for the future. The level of training, though basic, empowers them to start their own enterprise after a short stint with another enterprise in the field. Basic Rural Technology content and the system of Hands-on training not only make the education relevant but also understandable because it uses the 'learning while doing' system and is closely linked to services to the community. Students will get training by working in real life environment. Learner will also learn basic skill like Drawing, costing and project planning in DBRT programme.

The Self – Instructional Material of this programme consists of Four Modules: 1. Our Health, 2. Agriculture & Animal Husbandry, 3. Rural Engineering (Material, Mechanics, Drawing & Costing) and 4. Our Home Environment. Learner friendly approach has been adopted throughout this material. Each lesson is written in very simple and chronological order. The in- text questions are included in the text matter to analyze the learner's understanding of the lesson. The suggested activities are provided that go beyond classroom.

We hope that this programme will help you to carve an niche in your career and play an important role in the society.

With best compliments

Dr. Pawan Kr. Chauhan
Executive Officer (HPM)
National Institute of Open Schooling

Basic Rural Technology

4

SECTION - A
OUR HOME ENVIRONMENT

Course Content

1

PLANE TABLE SURVEY & MAPS

1.1 INTRODUCTION

Map is a picture of Earth's surface. Mountains, Valleys, Rivers and Sea along with Houses, Roads, Temples, Railway routes etc. are shown in it. In this lesson, we are going to learn about the importance of maps, technical terms , symbols and their types. We are also going to learn how to draw maps? We learn to make this map with the help of plane table instrument.

1.2 OBJECTIVES

After reading this lesson you will be able to:

- know what is map and its importance.
- understand the types of maps, symbols etc.
- use of different instruments in plane table survey.
- learn, how to draw a map using the plane table.

1.3 MAPS

The information, which cannot be given in words, can be expressed in brief through maps. Even those, who are illiterate, can read & understand maps. Language of drawing and reading maps is common all over the world. Oldest maps available are from middle Asia, they are over 5000 years old. Around 2000-2500 years back Greek people had tried to draw world map. At the end of first century, a scientist Tolemi wrote a book "Geographia". He introduced the terms latitude and longitude. He also discussed the method of showing rounded surface of the earth on plane paper.

Module-4

Notes

1.4 IMPORTANCE OF MAPS

Maps are very useful & important to us, How:

1. To understand roads and subways at new places.
2. To calculate distance between two places.
3. To know whether there are two or more paths to the same place and which is the shortest.
4. We can get information about mountains, rivers, valleys or any other thing, which may come on the way, and we can prepare for that.
5. We can get the information like height of the place or ups and downs on the road.
6. Boundaries of the land to define ownership.
7. Places like houses, farmhouses, mines can be shown on the map.
8. We can also mark crops, weather reports, direction of wind, rainfall on the maps.
9. Government needs the map to keep the record of the owners.

Who makes the maps?

An organization 'Survey of India' made the maps of whole India by making survey for over more than 100 years.

At present , we get the maps to scale 1:25,000 or city map with scale 1:10,000. The small scale maps(Means map giving the information of large places) are made with scale 1:10,00,000 or 1:25,00,000. The 1:6,000 maps are used to show ownership of the land and its boundaries.

1.5 TECHNICAL TERMS USED IN THE MAP

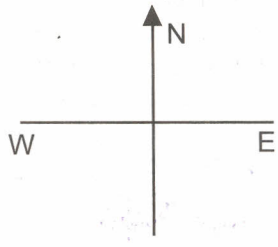
1. Scale

Maps are always to the scale. This means there is a fixed relationship between actual distance or shape and distance or shape on the map. The actual distance is in multiple of the distance taken on the map and this is called scale of map.

The scale is described in terms of 1:25000. This means 1cm distance on the map is equivalent to the actual distance of 25000cm (250 meter). If we know the scale of the map then we can calculate distance between two places.

2. Direction

North direction is marked on the map. Generally, it is on the upward side. Other directions are known from this. Following symbol is used to show north direction.



3. General Symbols

Following symbols are used on the map:

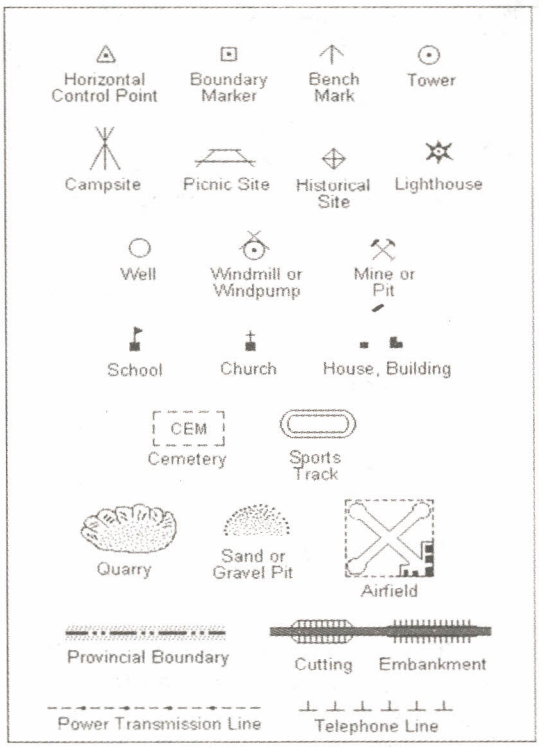
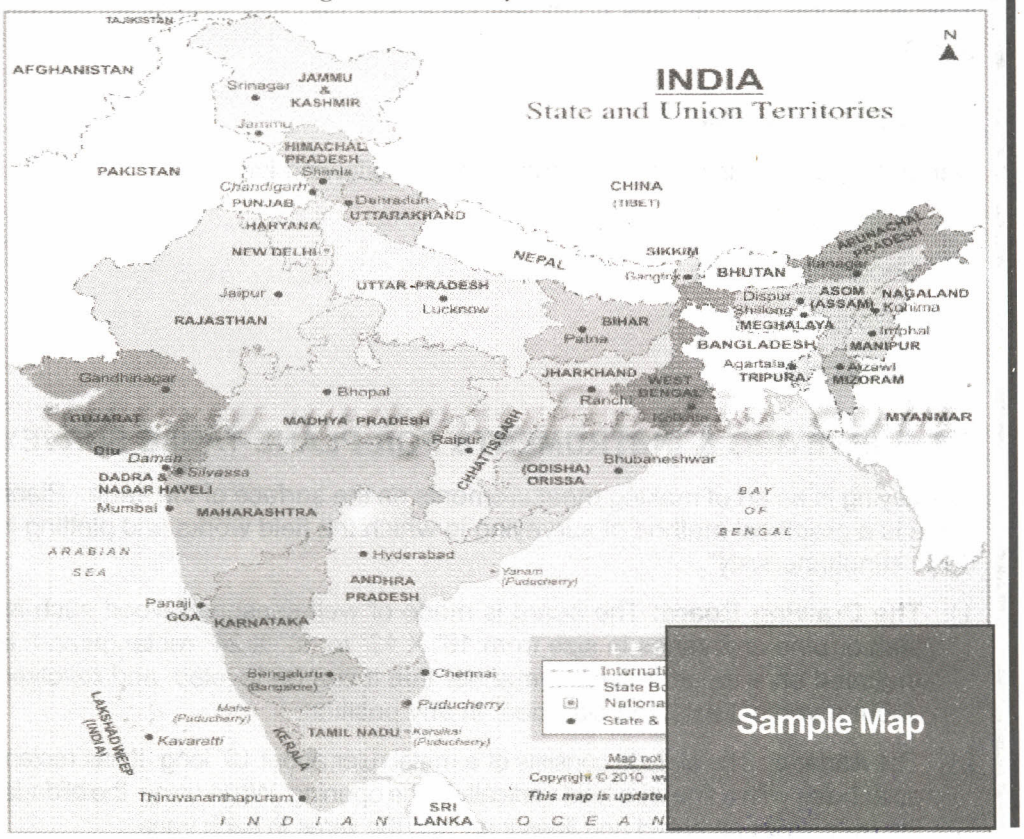


Fig.:1.1 General Symbols



4. Longitude and Latitude

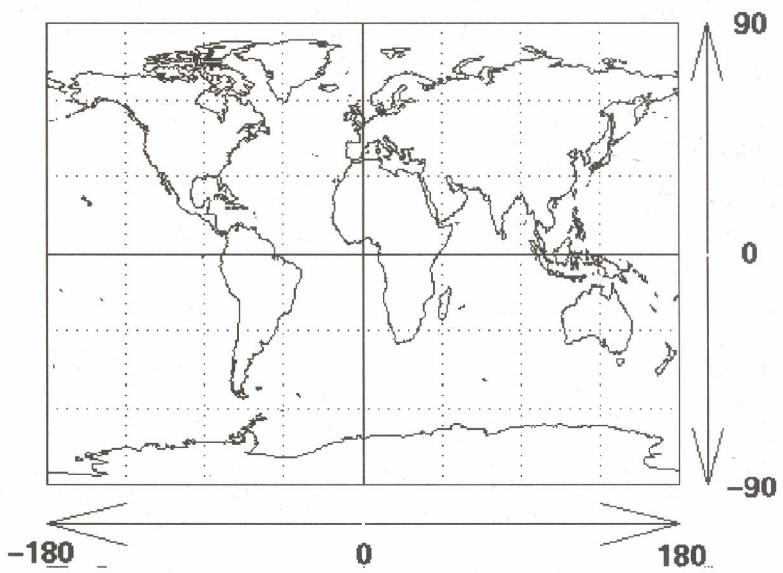


Fig.:1.2 Sample Map

Latitude is measured from the equator, with positive values going north and negative values going south. Longitude is measured from the Prime Meridian (which is the longitude that runs through Greenwich, England), with positive values going east and negative values going west. So, for example, 65 degrees west longitude, 45 degrees north latitude is -65 degrees longitude, +45 degrees latitude.

1.6 TYPES OF MAPS

Depending on the uses of maps, they may be following types:

1. Political map
2. Geographical map
3. Descriptive map
4. Statistical map

1.7 SURVEYING & INSTRUMENTS FOR PLANE TABLE SURVEY

"Surveying is an art of making measurements on the surface of the earth. Plane Table is a graphical method of surveying in which the field works and plotting is done simultaneously".

1) **The Drawing Board:** The board is made of well-seasoned wood such as teak or pine and varies in size from 16" X 12" to 18" X 24" rectangular. It is mounted on a tripod in such a manner that it can be leveled, and revolved about a vertical axis and clamped in any position.

2) **The Alidade :** The alidade consists of a metal ruler about 18" long. It has rectangular holes with a fine wire held vertically in the opening. While using the alidade, the user sights an object and lines it up with the wires in each vane.

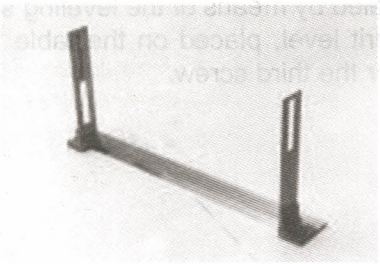


Fig.: 1.3

3) **A compass** is for marking the north direction on the paper .

4) **A plumbing fork** with a plumb bob for centering the table.

5) **Tripod :** A tripod is a three-legged stand for a drawing board , used to stabilize the drawing board.

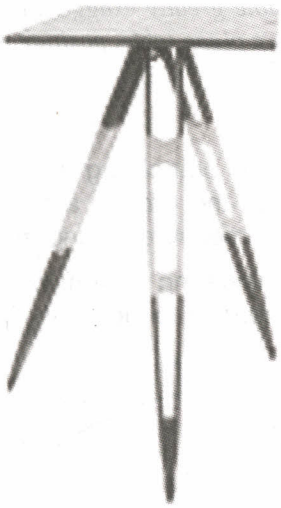


Fig.: 1.4 Tripod

6) **Other items:** Paper, Pins, Pencil , Rubber , Scale etc.

1.8 HOW TO USE THE PLANE TABLE?

We are now going to draw a map of a school ground.

The following operations should be performed while setting up the table at a station:

Initially select a point from where all points will be seen.

1) The legs of the tripod should be spread well apart, and firmly rested on the ground.

2) Centering of the table is done by using plumb bob. If no plumb bob is available, centering of the table may be done by dropping a stone from a point on the underside of the board which is directly under the point on the paper.

3) The table is then leveled by means of the leveling screws with reference to the level tube or spirit level, placed on the table first parallel to the two screws and then over the third screw.

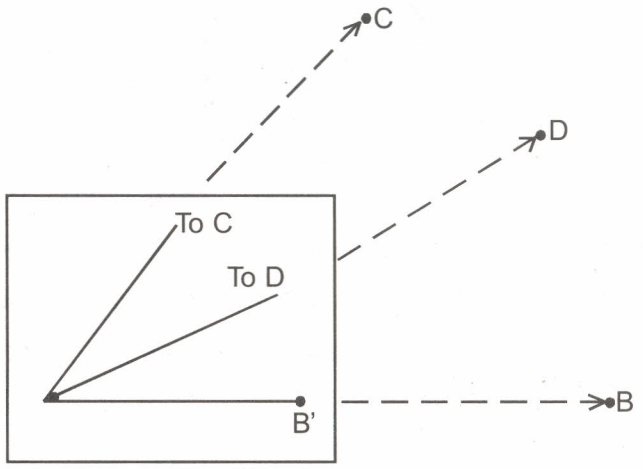


Fig.: 1.5 (plane table greatly exaggerated)
Mapping from a plane table, position A

Method of drawing map

Point A is marked on the paper, coinciding with point A on the ground. Other points viz. B, C, D are on the ground are seen from alidade. Actual distance of point A and point C is measured using meter tape.

A suitable scale is selected considering dimension of the paper and actual distance between the points. According to the scale, a line corresponding point

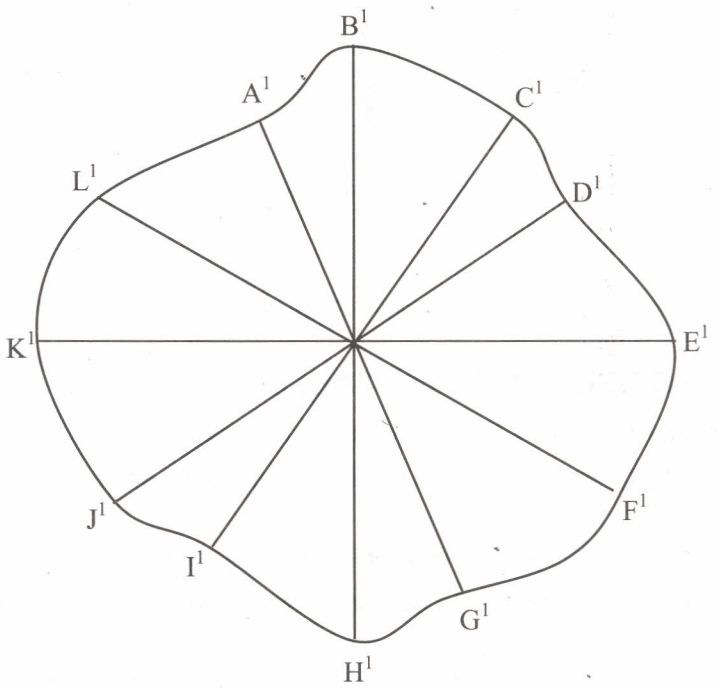


Fig.: 1.6

A to B is drawn on the paper using pencil. All point B, C, D... etc. are marked on the paper and joined with the A. Map is drawn by joining peripheral (B,C,D etc.) points in sequence on the field on paper.

(Sample image of the hand drawn map is shown in fig.1.6)

Precautions while drawing the map

Following precautions need to be taken:

1) The board should be horizontal.
2) The table should be accurately centered.
3) The table should be correctly oriented.
4) The objects should be sighted accurately.
5) The alidade should be correctly centered on the station point.
6) Plotting should be done accurately.

1.9 COMPUTATION OF AREA

One of the objectives of land surveying is to determine the area of the land surveyed.

- To measure area of the plot, first draw the map using plane table methods.
- Divide the entire figure into a number of triangles.
- Area of each triangle is calculated using mathematical formula.
- Areas of all such triangles are added to get the area of the field measured.
- The base and altitude of each triangle are scaled and its area is found by multiplying half the base by the altitude.

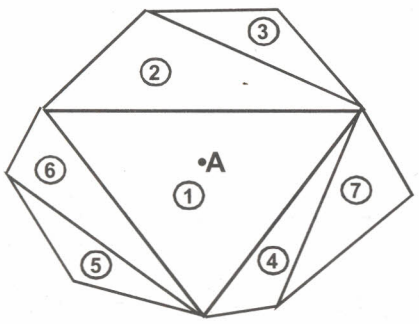
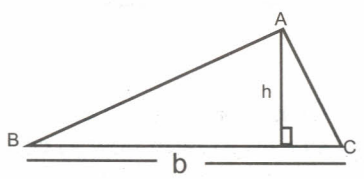


Fig.: 1.8

Area of field = Area of triangle 1 + Area of triangle 2 + Area of triangle 3 + ..



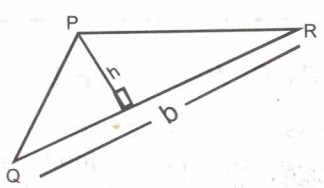
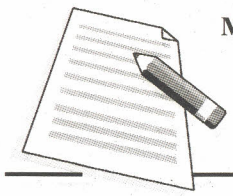


Fig.: 1.9



Module-4

Notes

Area of triangle = ½ x b x h

1.10 Advantages & Disadvanges of Plane Table survey

Advantages of Plane Table Survey:

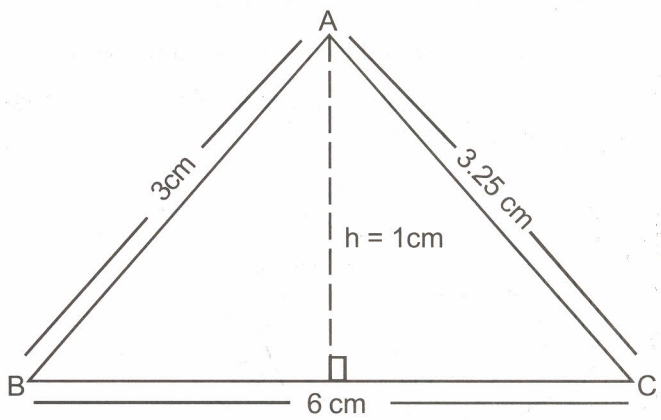
1) It is most suitable for preparing small scale maps.
2) It is most rapid.
3) No great skill is required to prepare a satisfactory map.

Disadvantages of Plane Table Survey:

1) It is heavy to carry.
2) It is not intended for accurate work.

INTEXT QUESTIONS 1.2

1) What is the formula for finding the area of triangle?
2) Find out the area of triangle of side 3cm,3.2cm,6cm?(**fig of the triangle)**



State True /False:

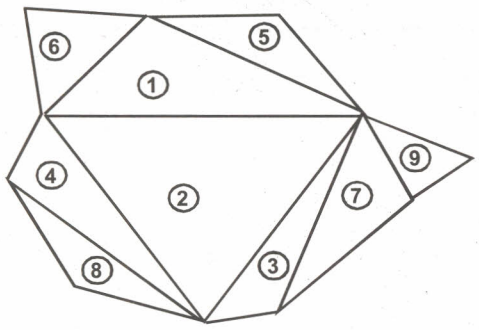
3) Height of triangle is called altitude of triangle (.....)
4) Plane table is intended for the accurate work (.....)

1.11 WHAT YOU HAVE LEARNT

In this lesson, you have learnt, map and its uses . Conducting survey and drawing the maps using the plane table survey. We also learnt how to compute area of the field using the plane table.

1.15 TERMINAL QUESTIONS

Following are reading of base and heights of triangles drawn in the field map drawn using plane table survey. Scale used 1cm: 100m. Calculate area of smaller triangles along with total area of the field.



Triangle No.	Base (cm)	Height (cm)	Area
1	5.5	1.1	
2	5.5	4.8	
3	5.0	2.2	
4	4.3	1.2	
5	4.1	0.7	
6	2.0	0.5	
7	4.2	0.5	
8	3.2	0.7	
9	1.5	0.5	

1.16 ANSWER TO THE INTEXT QUESTIONS

1.1

1. Area of triangle= ½ x B x H sq. units
2. Area of the given triangle = 3sq.cm
3. True
4. False.

1.17 SUGGESTED ACTIVITY

Take the map of world and find out Longitude and Latitude of atleast 5 countries of asia.

2

LEVELING

2.1 INTRODUCTION

It is very common, in our daily life to measure the difference between heights of two or more sights, points or spots. Sometimes we have to mark on the ground points at same level. For example, If we want to built house on sloping side of hill, then we have to mark point of equal-altitude.

Similarly, when we build channel in farm, we need to give proper slope so that water will flow easily by gravity. Water conservation works are carried on the barren sloppy land. Trenches and bunds are constructed on the slopping land. "The imaginary line joining all points of the same height on the ground is called contour line". We will learn about leveling, different types of instruments used for leveling and drawing of contour lines.

2.2 OBJECTIVES

After reading this lesson, you will be able to:

- Understand the use of instruments like spirit level, leveling tube, Dumpy Level.
- Apply the method to mark Contours on ground.

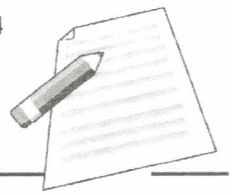
2.3 LEVELING

"Leveling may be defined as the art of determining the relative heights or elevations of points or objects on the earth's surface".

Following instruments are used for leveling:

a) Spirit-level

A bottle contain spirit as a liquid with an air bubble. When air bubble is at the center of two lines, the bottle is on perfect level. If the bubble is not in the center then tripod screws are adjusted to bring the bubble exactly at the center.



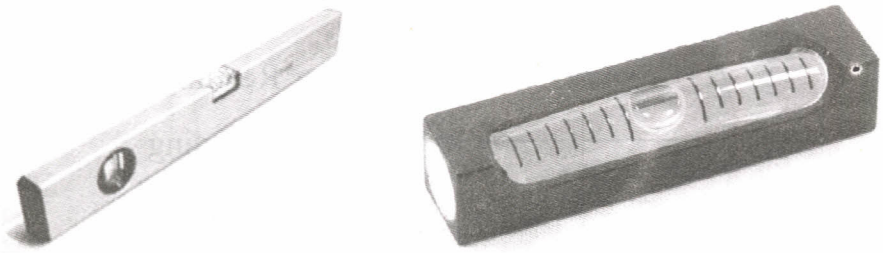


Fig 2.1 Level tube & spirit level

b) Level-tube

Water always remains at the same level. This principle is used in level tube. During construction, level tube is used to ensure all sides of the wall at same level. The level tube along with scale can also be used to find out height difference between two spots.

C) Dumpy Level

Dumpy level has an eyepiece , spirit level and three leveling Screws as well as a focus for the telescope lens – quite often the base has a 360 degree compass. This instrument is used for surveying. Dumpy level is used to measure height, distance direction of spot and we can draw contour. Spirit-level on the telescope is adjusted to plane level.

The dumpy levels have perpendicular cross hairs. There are the two short cross hairs above and below the main cross hair.

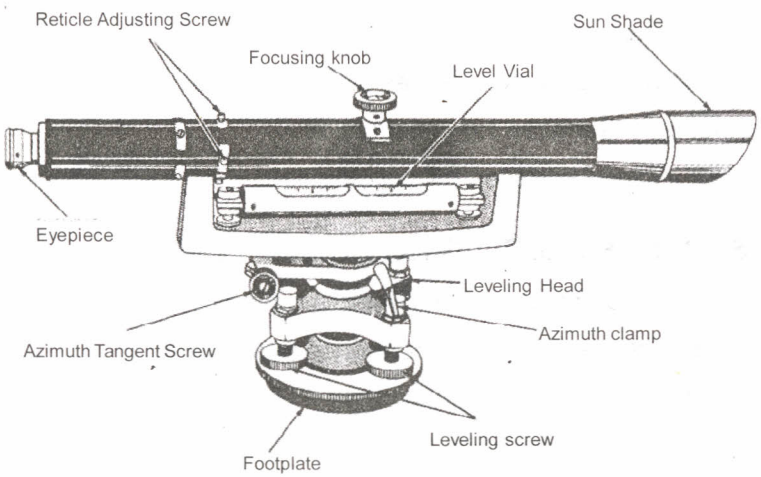


Fig. 2.2 Dumpy Level

The difference between upper reading & lower reading is multiplied by 100 to give you the distance from where you are to where the 'Staff' is:-

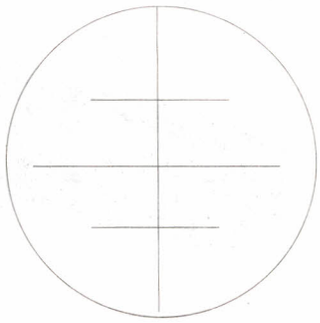


Fig 2.3

Example:

Upper Reading : 2.218

Lower Reading: 2.163

Distance between Staff & Dumpy level

= (Upper Reading - Lower Reading) x 100

= (2.218 – 2.163) x 100

= 0.055 x 100= 5.5m

Distance between staff & Dumpy Level = 5.5 meters.

Dumpy-level has compass to show direction.

2.4 DUMPY LEVELS IS USED FOR:

- Determining the height of a particular point.
- Determining differences in height between points.
- Drawing contours on a land.
- Providing data to calculate volumes for earthworks.
- Setting out level surfaces for construction.
- Setting out inclined surfaces for construction.

2.5 MEASURING HEIGHT USING DUMPY LEVEL:

- The place of which height is to be measured is called Station.
- Height is always measured with reference to sea level.
- Survey of India established benchmarks (B.M) at several places.
- Ideally the distances should be taken from the benchmark.
- If it is not available then we can select point on the map whose distance from sea level is known as the reference.
- We can fix any suitable point as temporary bench mark and all heights can be measured from that point. We can fix any temporary bench mark, but if its MSL(at temporary BM) is not sure,, then before starting the surveying permanent BM reading should be clear.

- Now we will learn how to take actual readings. Please observe fig.2. 4 carefully .
- In the picture Bench mark is setup at a height of 100 ft.
- As a first step we need to know the height of the place from where instrument is placed. In the picture, a boy is standing on a place from where survey will begin.
- To know the height of the instrument place a staff or level rod at bench mark location. And from the instrument take the reading on the staff. In this case reading on the staff is 5.5ft . This reading is called as back-sight reading (BS).

Height of the instrument = BM + BS

= 100 + 5.5 = 105.5 ft.

Now surveyor can go ahead and determine heights of other places. Look at the following figure to take further reading. These readings are called foresight reading (FS):

Now staff or level rods are put on the point (D) height of which is to be measured. The reading on the staff is recorded through telescope of dumpy level. (ref. fig.)

In present case, the reading shows 2.3ft. This reading is called Forward site (FS)

Therefore, height of point D is calculated as follows:

Height of point D = Height of Instrument (HI) – FS

= 105.5 – 2.3

= 103.2 ft

Distance between the instrument and the station D can be measured using meter tape or from the difference between upper & lower readings on the telescope.

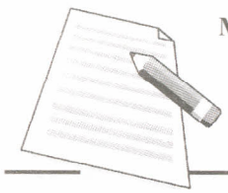
INTEXT QUESTIONS 2.1

(1) Fill in the blanks:

1. To check the level of the surface _____ instrument is used.
2. To determine the height between the two points _____ is used.
3. Water always remains in _____ level.
4. A meson always use a _____ for brick construction.
5. _____ is the lowest level of the earth.
6. Dumpy level survey measurements starts from a _____.

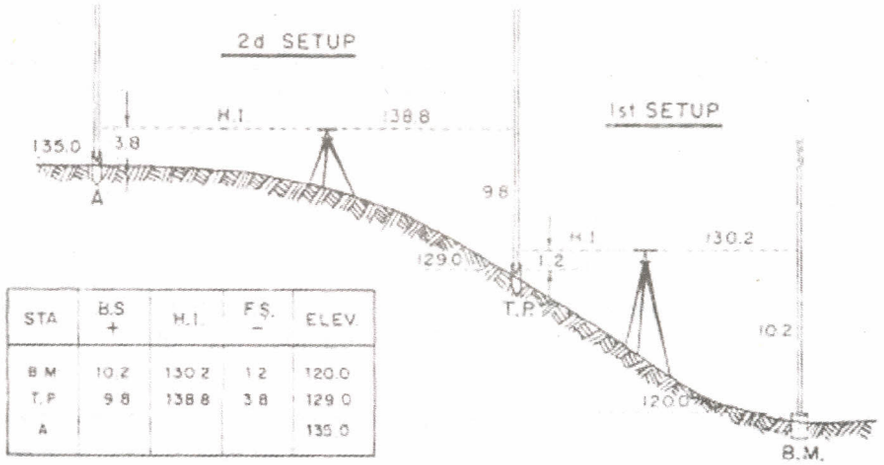
(2) State ture or false:

1. HI= BM+BS (True / False)
2. Elevation=HI +FS(True / False)



2.6 CHANGE POINT

If the area is hilly then you may not able to cover all points from one place. In such cases instrument is shifted to the convenient place. Height of this new station is measured from the existing location before shifting the dumpy level. New readings are for fore and back sights a taken as shown in fig.2.4.



STA	B.S +	H.I.	F.S. −	ELEV.
B M	10.2	130.2	1.2	120.0
T.P	9.8	138.8	3.8	129.0
A				135.0

Station	+BS	HI	FS	Elevation
BM 120ft	10.2 ft	130.2ft	1.2ft	129ft=TP
TP=X 129ft	9.8ft	138.8ft	3.8ft	135ft=A

BM-Bench Mark, TP-Temporary Point

Fig.2.4.

2.7 DRAWING CONTOUR LINES

All points of same heights are join together to draw a contour. For example a survey of plot of 120m. X 100 m. is done and heights are measured at different, points as shown in the fig.2.5

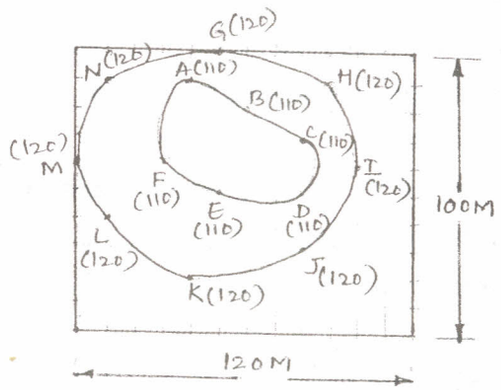


fig.2.5

2.8 USES OF THE CONTOUR LINES

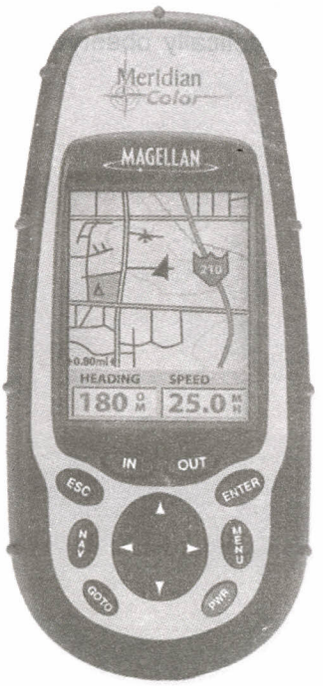
- To estimate the water storage capacity, back water limit and maximum water storage level of the dam.
- Volume of the proposed excavation work,
- To decide whether certain location is visible from another location,
- To decide exact line of railway or road way having safe slope,
- To determine the ground water level from contours of ground water.

2.9 GLOBAL POSITIONING SYSTEM (GPS):

Our ancestors while traveling used different landmarks, position of stars etc to guide them and save them from getting lost. . Now technology makes it possible to locate our position on the earth within a minute. This is possible because of invention of GPS (Global positioning system).

There are 27 satellites revolving around the earth about 18,000Kms. from the earth. There are at least four satellites visible from any point on the earth at any given time. GPS receivers calculate distance of the location from satellites by timing a signal's journey from satellite to receiver.

When you get such distances of the location from three locations, location of the point is accurately located on the surface of the earth. By using the GPS It is possible to carry out survey easily. It is possible to know longitude, latitude , distance of point from sea level. Vehicle tracking is the one of the fastest growing GPS application today. GPS equipped fleet vehicles , public transportaion systems , delivery trucks and courier services use recievers to monitor their location at all times for both efficiency and driver safety.



2.10 WHAT YOU HAVE LEARNT

In this lesson, you have learnt about need of leveling. Different instruments used for leveling and determining height of a place. We also learnt how to determine the height of a place and draw contour. We read about GPS & its applications.

2.11 TERMINAL QUESTIONS

1. Write an essay on the Leveling.

2.12 ANSWER TO INTEXT QUESTIONS

2.1

1. Level tube / spirit level
2. Dumpy Level
3. Same
4. Level tube
5. Sea Level
6. Particular point

1. True
2. False

2.13 SUGGESTED ACTIVITY

Visit any contruction site and practically observe the working of Level tube, Dumpy Level, Spirit Level.

3

BIOGAS

3.1 INTRODUCTION

If solid waste is not disposed properly, then it creates problems like increase in infectious diseases, contamination of ground water etc. Eco friendly ways of disposing the waste such as vermin- composting will help for small quantity of waste disposal. Biogas Technology offers dual advantageous; it will generate biogas as source of energy and also provide slurry which is good quality manure. In this lesson we are going to study details of biogas plant.

3.2 OBJECTIVE

After reading this lesson, you will be able to:

- Explain what is 'Biogas'.
- Explain the operation of Biogas plants.
- Understand different types of biogas plant
- Maintenance of biogas.

3.3 WHAT IS BIOGAS?

Biogas is generated by the bacteria in cow dung. Cow cut the grass with its teeth. Broken grass is digested in cow's stomach by bacteria. They broke it into chemicals and gases. The bacteria which come out with the dung continue with the same process, provided they are with condition similar to the cow's stomach like light and air have to be excluded and the dung has to be kept at a warm temperature, somewhere between 20°C and 40°C. This gives us biogas from the dung.

This kind of bacteria can digest other kind of bio wastes such as kitchen, any material with starch content as well.