UNIT-1.

8 August, 2017

* **Surveying :** → Surveying is the branch of engg. in which we determine the relative position of points on above or below the surface area.

* **Uses of Surveying :** →
(i) To find out distance b/w two point or objects.
(ii) To find out height b/w two point or object.
(iii) To study the topography of the area.
(iv) To Calculate the area of Surface.
(v) To find out area & Volume of water bodies & reserwear.
(vi) To draw the map of highway & railway.

* **Type of Surveying :** →
(i) Plane
(ii) Geodetic

(i) **Plane Surveying :** → The surveying in which the curvature of earth is not taken into account while taking observation is known as plane surveying.

(ii) Ea : → Earth is Consider to be plane hence its required precision.

* (iii) Geodetic Surveying :→ The Surveying in which Curvature of earth is taken into account is known as geodetic Surveying. This type of Surveying required higher precision & generally used in great trignometric Surveying.

GTS :→ Great Trignometric Surveying.

* Principle of Surveying :—

(i) Location of a point by measurment from two point of reference.

(ii) Work from whole to part.

(i) Location of a point by measument from two point of reference:→ In this type of Surveying we have to fix a new station i.e. from the fix station the previous & forword station must be visible. In this type of Survey must have two type of measurment.

(i) Linear & angular measurment.

* Work from whole to part :

→ Linear measurment done with the help of chain, staff.

→ Angular measurment done with the help of Theodolite.

* Work from whole to part :→ Acc. to this principle the whole area which is to be surveyed is divided into triangles & then side of triangle is measured by chain or tape. If there is any error in measurment then it will not effect the whole work. If error occur in any part then it can be easily deducted & eliminated.

* Types of measurment :→ (i) Linear (ii) Angular.

(i) Linear Measurment :→ Linear measurment is used to find out horizontal distance it is done with the help of chain or tape.

Linear measurment are of two type :—

(i) To measure Horizontal distance :→ The measurment taken into horizontal plane is known as horizontal distance.

(ii) Vertical distance :→ The measurment taken into the vertical plane is known as vertical distance.

2. **Angular Measurment** :⟶ Angular measurment is used to find out the angles b/w two object. To find out the horizontal & Verticle distance angular measurment is done with the help of Compass, theodolite etc.

Angular measurment divide into two parts :

(i) **Horizontal Angles** :⟶ The angular measurment taken in the horizontal plane is known as horizontal angles.

(ii) **Vertical angle** :⟶ The angular measurment taken in the vertical plane is known as vertical angle.

* **Instrument used for taking measurment** :

(i) **chain or tape** :⟶ To measure horizontal distance.

(iii) **Ranging Rod** :⟶ Line ranger, Cross staff for ranging purposes.

(iiii) **EDM / Edrim** :⟶ Electronic distntometer Tachometer. used for indirect measurment.

(v) **Prismatic Surveyors** :⟶ used for direction & horizontal angular measurment.

(vi) **Theodolite** :⟶ used for horizontal & Verticle angle & height of an object & setting out Curve.

(vii) **Plane Table** :⟶ It is used for both plotting & field work simultaneously.

(viii) **clinometer** :⟶ used for measuring slope.

(ix) **Planimeter** :⟶ used for find out of area.

(x) **Pentagraph** :⟶ used for enlarging & reducing of plans.

* **Classification of Surveying** :⟶

classification based on instrument used :⟶

(i) **Chain Survey** :⟶ The surveying in which linear measurment is taken directly by using chain or tape. & no angular measurment is taken is known as chain survey & triangulation survey.

(ii) **Compass Survey** :⟶ The survey in which angular measurment of a traverse are taken with the help of

Compass & length is measured by with the help of chain or tape is known as Compass Survey.

(iiii) Plane Table :→ Surveying in which field work & observation & plotting work are done simultaneously is known as plane table. survey.

* Theodolite :→ The Surveying in which horizontal & Verticle angles are measure the help of theodolite & length of various kind are measured with chain or tape is known as theodolite. survey.

Tachometric :→ The Survey in which horizontal & Verticle angles as well as horizontal & Verticle distance are measured with the help of tachometer is known as tachometer. Here no use of chain or tape.

* Classification of based on object of Survey

(i) (ii) (iii) Engg. Survey (iv) Military Survey Geological Survey Mine Survey.

* Classification of nature of field of Survey:

(i) Topographical Survey (ii) Cadastral Survey (iii) City Survey (iv) Marine or Hydrographic Survey. (v) Astrological.

UNIT-2

CHAIN SURVEY

* Purpose & principle of chain Survey :→

Chain Survey is based on the triangulation In chain Survey the whole area which is to be surveyed is divided into a networks of triangles. The side of triangle are directly measured with the help of chain or tape. In chain surveying there is no angular measurment is done.

(i) chain Survey stable for plane area &
(ii) it is useful for small area.
(iii) It is used where the well condition triangles is easy to made.
chain Survey is best for preparation for small scale map.

* Disadvantage of chain Survey :→

(i) Chain Survey is not stable for plane
(ii) area, it is not useful for small area.
It is used where the well condition
(iii) triangle is not easy to made.
chain Survey not best for small scale map.

Chain :→ An instrument which is used to measure distance b/w two point in the field is known as chain.

Chaining :⟶ The process of measuring distance b/w two points in the field with the help of chain or tape is known as chaining.

Type of chain :⟶

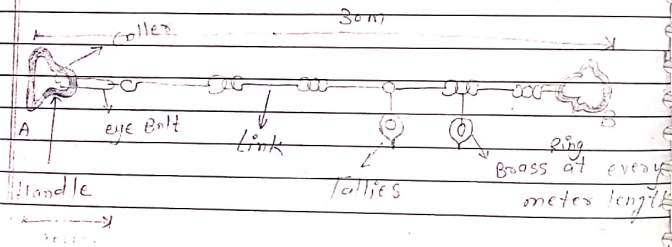
(i) **Revenue chain :⟶** Length = 33 feet
Link = 16.

(ii) **Gunter chain :⟶** Length = 66 feet
Link = 100.
Distance = 0.66 feet.

(iii) **Engg. chain :⟶** Length = 100 feet
Link = 100
Tallies are provide a every tending.

(iv) **Metric chain :⟶** Length = 20 or 30 m
1 Link = 20 cm.
Total = 100 or 150.

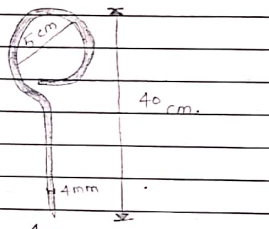
(i) Tallies are provided at every 5 m.
(ii) Brass ring are provided at every 1 m.
(iii) All the tallies are diff. in shape.



* **Steel band (chain band) :⟶**

Length = 20-30 m.
Width = 12-16 mm.
Thickness = 0.32 — 0.6 mm.
Steel band is known as band chain & it is graduated in Meter, Centimeter & decimeter.

Arrow :⟶ Arrow is used to record chain length during chaining. It is made up of steel wire, rounded at one end & sharp pointed at other end.
Length of arrow is approximate = 40 cm.
Diameter of rounded circle = 5 cm.
Diameter of wire = 4 mm

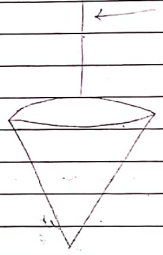


Wooden peg :⟶ These are made up of wood & in square shape at the top & sharp pointed at the bottom length generally = 15-20 cm.
The top square portion lies in b/w 2.5 × 3 cm. The wooden pegs are used

for permanent marking in the field during chaining. & the pegs are driven into the ground with the help of hammer.

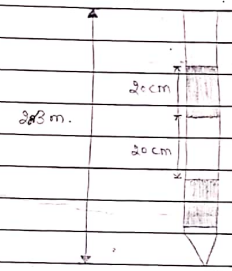
Wooden peg

Plumb bob : → Plumb bob is made up of a heavy weight metal & in conical shape. It is for centering purpose. It transfers the point to the ground while surveying is done in sloping ground or while using apparatus (to marks station for the ground).



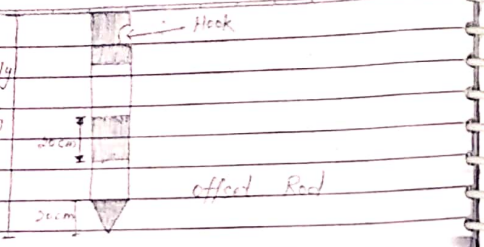
Plumb bob.

Ranging Rod : → It is made up of steel or timber pipes. ranging rod are circular in shape having length is 2-3 m. The whole rod is divided into parts of 20 cm. of alternate colour of either black or white, white or red. The bottom of the rod is sharp for easily driven into ground. Sometimes flag is provided at the top of ranging rod for clear visibility. It is used to draw a line & ranging a line.



Ranging Rod.

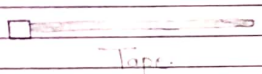
Offset Rod : → It is made up of timber or steel pipes. Offset rod are circular in shape & having length is 2-4M. The whole rod is divided into parts of 20 cm of alternate colour of either black or white, white or red. The bottom of the rod is sharp for easily driven into ground. Sometimes hook's is provided at the top of offset rod for chaining.



Tape : →

(i) Linen tape or cloth tape.

It is made up of linening cloth of 12-15 mm. wide. It is available in 10-30 m length & generally used for measuring offset. At the end of tape brass ring is provided having length is included in the tape length. In linen tape there is a large probability of tear & wear.



(ii) Steel Tape : → It is made up of steel band of width 6 mm to 16 mm. It is available in different sizes upto 50 m. A brass ring is provided at the starting of tape. There is less chances of tear & wear. Steel should be rust proof metal & less sensitive to temprature.

(iii) Invar Tape : → Steel - 64%
Ni - 36% made up of

Steel & Ni alloy. It is less temprature sensitive. In it less chance of tear & wear rust proof and a brass ring is provided at the starting point.

(iii) Metallic Tape : → It is made up of lanein cloth with the reinforcement brass or copper metal wires. A brass ring is provided at the starting. generally it is graduated in Meter, cm, Deci. and available in different length. It can be used for all type of survey.

* Wooden Mallete : → It is made up of hard wood length = 22-25 cm & dia = 7-10 cm at the end. The length of wooden handle is 45 cm. It is used for driven the wooden peg into the ground.

Numerical : →

Ques. 1. Length of a survey line measured with 30 m chain was found to be 720 m find the true length of the chain find 5 cm too short?

Ans. Correct length = 30 m
Measured distance = 720 m
Incorrect length = 30m - 5cm = 30m - 0.05m
= 29.95m

True length = $\frac{\text{Incorrect chain length} \times \text{Measured distance}}{\text{Correct chain}}$

$= \frac{29.95 \times 720}{30} = 718.8$ ft

Base line : ⟶ The line on which frame work of survey is build is known as base line. The longest line of the survey is generally considered is base line.

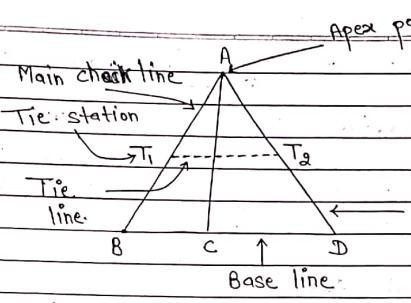
Check line : ⟶ The line joining the apex point ~~line~~ of triangle to the some fix point on its base is known as check line. Check line is used for interior detailing of triangle made in the field.

Tie line : ⟶ The line joining two objects or two points as tie station on the main chain line. It is also used for interior detailing & accuracy frame work.

Frame Work : ⟶ The system of lines covering the area to be surveyed is called frame work or skeleton of survey.

Well Condition triangle : ⟶ The triangle in which all the angles are greater then 30° & less then 120° is known as well condition triangles.

Bad Condition triangles : ⟶ A triangle having angle less then 30° & more then 120° is known as bad condition triangles.



(FRAME WORK)

operation in chain Survey :—

(i) **Ranging :—** Straight line.

(ii) **chaining :—** Survey with the help of surve

(iii) **offsetting :—** When one line draw with respect to another line.

Survey Station : ⟶ The point in th field on the chain line is known as survey station.

Main Survey Station : ⟶ The station on the boundries of surve line is known as main station.

Field book : ⟶ A notebook in which survey work is recorded by measurment and drawing is known as field book.

Field book are of two types :—

(i) Single line field book

(ii) Double line field book.

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* Sources of Error in chain Survey : →

(i) **Instrumental Error** : → The error by Causes by faulty adjustment of the instrument is known as instrumental error.

(ii) **Natural Error** : → The error Caus by natural Causes such Variation temp. heavy rainfall wind, refraction.

(iii) **Personal Error** : → The error Cause by the person which is doing Survey is known as personal error. e.g:- unequal tension in chain not siting properly the object.

* Classification of Error : →

(i) **Cumulative error** : → These error or error occur due to incorrect length of chain wrong ranging Variation in temp. & when chain is not being straight.

(ii) **Compensating error** : → These are error due to holding incorrectly the chain. Incorrect Centering & any incorrect adjustment of apparatus or instruments.

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Mistakes : → These error are occur due to Carelessness & inexperienced person.
Mistakes are generally in Counting the chain length.
Mistakes in taking reading displacement of arrows.
Mistakes in recording.

* Obstacles in chain Survey : →

(i) Pond (ii) lake (iii) River (iv) Building
(v) Hedge (vi) Depression or Vally
(vii) Hill (viii) unclear visibility
(ix) undesirable weathering agents.

Tuesday.

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CHAPTER-3

1 Aug, 2017.

Compass Survey :⟶ The branch of Surveying in which bearing of sides of traverse are taken with the help of Compass & the length is measured by using chain or tape is known as Compass Survey.

Compass :⟶ The instrument which is used for measurment angle as well as direction is known as Compass.

Compass are of two types :—

(i) Prismatic Compass (ii) Surveyor Compass

(1.) **Prismatic Compass** :⟶

Construction :⟶ It is circular in shape & its diameter is 110 mm. It made up of a non magnetic material. The different part of prismatic Compass observe were.

(i) **Box** :— It is circular in shape

(ii) **Needle** :— ~~In the middle of circular ring & show the needle is in b/w north & South direction.~~ North & South

(iii) **Graduated Ring** :⟶ In this Compass the angle in b/w 0° to 360°.

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(iv) Object Vane (v) Eye Vane or Eye piece Object Vane & Eye Vane is fixed diametrically in opposite to each other.

(vi) **Glass Cover** :— It is made up of transparent glass & used for protection graduated ring, needle etc.

(vii) **Mirror** :— Mirror is installed at the object Vane & used for taking reading easily

(viii) **Sunglasses** :— It is provided for clear focusing

(ix) **Pivot** :— It is just like a pole on which magnetic needle is on rest

(x) **Prism** :— In prismatic Compass prism is used for taking reading. It is work on principle of refraction.

(2.) **Surveyor Compass** :⟶ (i) Box (ii) Magnetic needle (iii) Pivot (iv) Glass Cover (v) Graduated Ring (0-90°) (vi) (vii) Object Vane (viii) lifting pin Eye Vane

* **Bearing** :⟶ Bearing of a line is the horizontal angle made by the Survey line with a reference direction or meridian.

The meridian is classified is :—

(1.) **True Meridian** :⟶ The direction from any point along a meridian towards north pole of the earth is known as true north.
True meridian is defined as the plane that passes through true north pole & true south pole at the place of observation.
True meridian is establish by astronomical survey it is also known as azimuth.

(2.) **Magnetic Meridian** :⟶ Magnetic meridian is a line that is taken parallel to the direction by freely moving magnetised needle. It is never fix for place or time.

(3.) **Arbitrary OR Assumed Meridian** :⟶
A specific direction taken as a meridian for small survey is known as arbitrary meridian.

✱ (1.) **True Bearing** :⟶ The horizontal angle made b/w a line or object with true meridian is known as true meridian. bearing

(2.) **Magnetic Bearing** :⟶ The horizontal angle b/w a line or object & magnetic meridian is known as magnetic bearing.

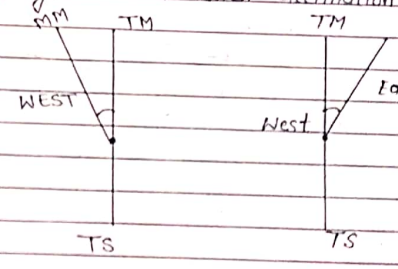
(3.) **Arbitrary Bearing** :⟶ The horizontal angle made by a line or object with an assumed meridian is known as arbitrary bearing.

✱ **Magnetic Declination** :⟶ The angle b/w true meridian & magnetic meridian is known as magnetic declination.
The magnetic declination is different act as different places. The magnetic meridian is differ from the true meridian result in magnetic declination.
Magnetic meridian can be deflected to the East side of the true meridian or West side of the true meridian.

True bearing of a line =
Magnetic bearing ± Declination

(+ve) Sign is used when declination is East side.

(-ve) Sign is used when declination is West side.

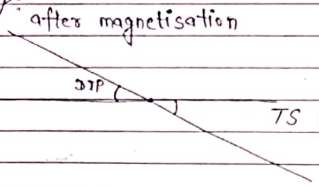


* **Agonic Line** :→ The line having zero declination is known as agonic line.

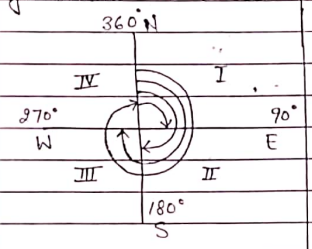
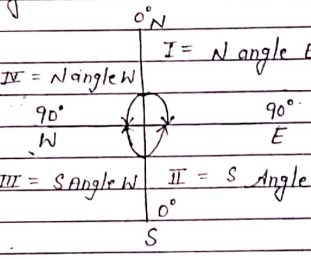
* **Isogonic line** :→ The line of some declination is known as isogonic line.

Changes in Declination :— Magnetic declination changes time to time. It is change due to occurance of storm. It change due to existence of electric poles in the nearby area. It is also changes seasonaly greater in summer & less in winter. Declination is more during day & less during night.

* **Magnetic Dip** :→ Due to the magnetic effect of earth the magnetised needle will not remain in horizontal position. It will be inclined towards the pole. This deflection of pole needle with the horizontal is called dip of needle or magnetic dip.

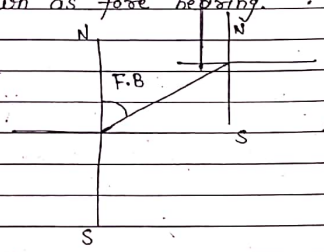


Difference b/w Whole Circle bearing & Reduced bearing OR Quadrantal bearing.

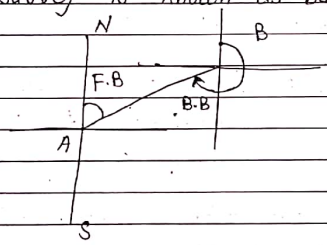
	W.C.B	Q.B or R.B
(i)	It stands for whole Circle bearing.	It stands for quadrantal & reducing bearing.
(ii)	In this system the graduation 0° to 360°.	In this system the graduation 0° to 90°.
(iii)		
(iv)	W.C.B System is in prismatic Compass.	R.B System is in Surveyor Compass.
(v)	Measurment are always taken in clockwise direⁿ.	Measurment are taken in both clockwise & anticlockwis
(vi)	This System is easy for measurment of angle.	This system is quite difficult for taking measur-ment of angle.
(vii)	No need of direction represent an angles.	Direction is much neccssary to represent an angle without direction there is no use of measured angle.

(viii)	Angles are measured directly as :- 30°, 120°, 280° etc.	Angles are measured with direction i.e. N 30° E, N 20° E, S 30° E, S 60° W.
(ix)	Bearing Can be 0° to 360°	Bearing never exceed greater than 90°.

* **Fore Bearing :→** The bearing in the direction of progress of survey is known as fore bearing.



* **Back Bearing :→** The bearing in the opposite direction of progress of survey is known as back bearing.



Fore Bearing ± Back Bearing = 180°

Fore Bearing = BB + 180° | < 180° ⇒ +ve
" " = B.B − 180° | > 180° ⇒ −ve

* **Conversion from W.C.B to R.B**

Angles	W.C.B	R.B	Quadrantal
0-90°	0-90°	0-90°	I = NE
0-180°	0-180°	R.B = 180° − W.C.B	II = SE
0-270°	0-270°	R.B = WCB − 180°	III = SW
0-360°	0-360°	R.B = 360° − W.C.B	IV = NW.

* **Conversion from R.B to W.C.B**

~~Angle~~ Quad.	R.B	W.C.B
I	N 90° E	0-90°
II	S 90° E	W.C.B = 180° − RB
III	S 90° W	W.C.B = RB + 180
IV	N 90° W	W.C.B = 360° − RB.

* **Local Attraction :→** If the magnetic needle deflect from the true magnetic north then the difference b/w true magnetic north & the north pointed by magnetic needle at a particular station is known as local attraction.

* **Deduction of Local Attraction :→** The back bearing & fore bearing of a line should differ by 180° if these differences greater then 180° or less then 180° then there will be error or local attraction. After elimination of error the difference comes < 180° or > 180° then there will be local attraction exist.

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* Sources of Local Attraction :→ (i) Magnetic rock or iron ore
(ii) Electric pole
(iii) Presence of iron ~~pole~~ rail
(iv) Underground iron pile
(v) Any metallic with Surveyor

→ How to Calculate bearing from included angle ?

(i) For anticlockwise traverse :—
F.B of a line = B.B of a previous line + included angle.

(ii) For clockwise traverse :—
F.B of a line = B.B of previous line — included angle.

* Instrument used in Compass Survey :
(i) Trough Compass
(ii) Ranging rod
(iii) Magnetic Compass
(iv) Levelling Staff
(v) Spirit Level
(vi) Gunter chain
(vii) Prism
(viii) Tripod Stand
(ix) Plumb bob
(x) steel tape
(xi) Theodolite
(xii) Plane table

Types of Traverse :→ (i) Open traverse (ii) close traverse

Close Traverse :→ When a series of Straight Connect line form a closed circuit, then it is known as close traverse.

OR

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When the finishing point of a Survey Coincide with Stating point of a Survey it is known as close traverse.
Ex: Survey of boundries of any area.

Open Traverse :→ When the finishing point of a Survey does not coincide with Starting of a Survey i.e. it is known as open traverse.

Check For Close Traverse :→ (i) The Sum of interior angle Should be equal to $(2n-4) \times 90$.
(ii) The Sum of exterior angle Should be equal to $(2n+4) \times 90$.
(iii) The Sum of deflection angle Should be equal to 360°.

* Precaution for Compass Survey :→
(i) Centering & levelling should be done Carefully.
(ii) The Sources of local attraction Should be avoided.
(iii) To detect local attraction fore & back bearing of every line Should be taken.
(iv) The bearing of important line Should be taken twice.
(v) Avoid touching the Compass glass with moist fingers.

* Advantages or Disadvantages of Compass Survey : →

Advantages : → (i) It is quick process of Surveying. Bearing of a line Can be observed from any intermediate point.

(ii) Bearing of line observed independently there is less chances of error.

(iii) It is suitable for area where chain Surveying is difficult.

(iv) Instrument easy to handle & Careing.

Disadvantages : → (i) This is less accurate method.

(ii) It is unstable for the area where the chances of local attraction is great.

Error : → (i) Instrumental (ii) Natural (iii) Personal.

Adjustment of Compass : →

(i) Setting of Compass on tripod Stand.
(ii) Levelling of Compass.
(iii) Centering of Compass.

* Diff. b/w Prismatic & Compass Survey *

	PRISMATIC COMPASS	SURVEYOR COMPASS
(i)	In prismatic Compass the needle is attached to graduated circle.	The needle is not attached to graduated circle.
(ii)	The graduated circle is not fixed in magnetic Compass box.	The graduated circle is fixed with the box in Surveyor Compass.
(iii)	The reading is taken with the help of right angle prism.	The reading is taken directly by looking down-ward through the glass Cover.
(iv)	Prismatic Compass Can be used with or without tripod.	Surveyor Compass Can't be used without tripod
(v)	The graduation are in W.C.B on the graduated circle.	The graduation are in quadrantal bearing system on the graduated circle.
(vi)	In prismatic Compass eye vane is small metal with fine slit.	
(vii)	The mirror is provided on the object vane for taking reading.	No mirror is provided in object vane.

CHAPTER-4

LEVELLING

* **Level Surface** :⟶ The surface parallele to the surface of earth is known as level surface. The surface of still water is assumed to be level.

* **Levelling** :⟶ The process of determining relative height of different point on the earth surface is known as levelling.

(i) Levelling is used for preparing plans or map. (2) levelling is used for making layout of grodient (Slope). (2) levelling is used to find out difference of elevation of two point.

(iii) Levelling is used for preparing map.

(iv) It is used for find out the depth of cutting or filing for any work.

(v) For setting points in the field to check the height of the object.

* **Mean Sea Level** :⟶ It is the average height of the Sea for all the stages of tides (ज्वार). At mean Sea level the height is assumed to be zero.

Bench Mark :⟶ It is a fix point of known height or elevation. Levelling work is always started from bench mark.

Types of Bench Mark :⟶

(i) GTS Bench Mark (Great trignometric Survey)
GTS is estblished by Indian Govt. at regular interval of distance through all over Country. In GTS the mean sea level is taken from krachi. GTS Survey is an accurate survey.

(ii) **Permanent Bench Mark** :⟶ Permanent bench mark are the points fixed in b/w the GTS bench mark by the Govt. such as PWD, ME Permanent bench marks are on the plinth of building, culverts, railway station or highway etc.

(iii) **Temporary Bench Mark** :⟶ The reference point estblished during the levelling when there is discounuity in the work is known as temporary bench mark.
The reduce level of these point are calculated from the reference point. Temporary bench mark are used for levelling of small work area.

* **Reduce Level** : → It is denoted by R.L. It is the Vertical distance or height of a poi measured above or below the datum Surface. It is also known as elevatio of a point.

* **Datum Surface** : → Datum Surfac is any assumed leve Surface with reference to which the elevation of other point are determine

* **Level (Dumpy Level)** : → It is a instrument used for measuring elevation of object or Surface with the help of levelling Staff.

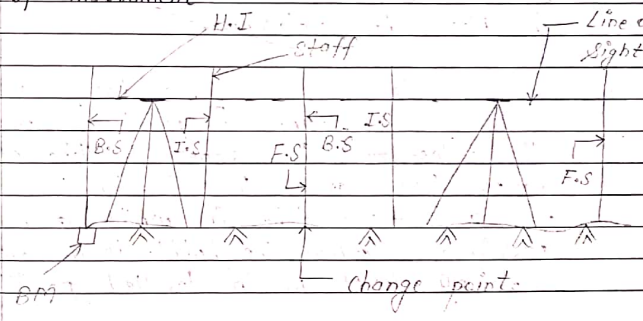
* **Line of ~~Collimation~~ Collimation** : → The line passing through Center of the object glass & Crossha of the diaphram is known as line of ~~polymotion~~ Collimation.

* **Axis of Telescope** : → An imagi -ry line passing through Center of eye piece & object piece & Cross hair of diaphram is kno as axis of telescope.

* **Axis of Bubble Tube** : → An imaginar line passing throug the longitudinal curve of the bubble a its mid point is known as axis of bubble tube. Axis of the bubble tub is horizontal when bubble is in Center.

* **Height of Instrument** : → The reduc level of line polymotion of a properly level instrume is known as height of instrument. Height of instrument is obtained by ba Side reading + Reduce level of bench mar

* **Back Sight OR Back Sight reading** : → This is the firs Staff reading taken in any set up of the instrument. This reading is always ~~readin~~ taken on a point of known R.L e.g. B.M o change point. It is abbereviated as B.S. There will be only one B.S. in each set of instrument.



* **Fore Sight Reading :** → It is the last staff reading at any set up of the instrument. It is always taken at a point of unknown elevation & indicates the shifting of instrument. It is abbreviated F.S.

* **Inter Sight Reading or Intermediate Sight :** It is any other reading b/w the B.S & F.S in the same set up of instrument. It is always taken on the points whose elevations are to be determined. It is denoted by I.S. There can be any point of no number of I.S.

* **Construction Of Dampy level :** →

(i) **Telescope :** → It is used for sighting the object which are far away from the station. It consist of eye piece, object piece & cross air are provided in b/w the telescope.

(ii) **Level Tube :** → A horizontal bubble tube is provided parallel to the telescope for proper levelling of the dampy level at the station. It consist of a glass tube in which a bubble is provided when the bubble is in center the dampy level is in levelled position.

(iii) **Foot Screw :** → At the bottom side of dampy level 3 foot screws are provided which are equally spaced these screws help in levelling of level. For level of dampy level, first we put the horizontal level tube in parallel of any of 2 foot screw then move the screw either inward or outward direction. After that put the level tube perpendicular to third foot screw & move the third screw either in inward & outward direction until the bubble turn in center.

(iv) **Clamping Screw :** → It is used to clamp the telescope at target.

(v) **Slow Motion Tangent Screw :** → This is used for slowly moment of telescope after clamping the telescope forgetting exact reading.

(vi) **Focusing Screw :** → (i) Eye piece (ii) Object piece.
It is provided at the eye piece for clear visibility of cross air. The parallax of eye piece is eliminated by focusing nobe of eye piece & other focusing screw is provided at telescope for focusing of object piece. This screw held in manifying the object for clear visibility.

(vii) Circular Ring :→ A circular ring is provided above the foot Screw for measuring angles. This ring is graduated from 0° to 360°.

(viii) Circular Bubble Tube :→ A circular tube is also provi on dampy level which is used for levelli of tripod Stand. When the bubble of this tube is in center then the tripod is ~~in~~ levelled.

* Temporary Adjustment of Dampy Leve

1.) Fixing of level on tripod stand :→ Firstly Select the proper position for fixing of level from where a large no. of readin Can be obtained without changing the instrument Station after that fix the level on tripod at that point.

2.) Levelling of Dampy Level :→ The dampy level is level by us tripod legs until the bubble of circular bubble tube run in its center after that the dampy level ~~by~~ is level by using foot Screws.

Put the horizontal level tube parallel to any of two foot Screw & move Screw either inwards or outwards direct se

until the bubble runs it in center. Now put the horizontal bubble tube perpendi-cular to third foot Screw & move this Screw either inward & outwards direction until the bubble in center. Now rotate the telescope if the bubble remain still in center then the dampy level is levelled

3.) Centering :→ It is done with the help of plumb bob by hanging plu bob on the hook provided at the center of tripod.

(*) Focusing of telescope :→ (i) Eye piece It is focused by nobe provided on the eye piece a wh paper is put on the object glass & aft that rotate the nobe of eye piece til the cross air become clearly visible.

(ii) Focusing of object piece :→ Dire the telescope towards the object & see the object i the object is not clear visible then rotate the telescope till the object becom clearly visible.

CHAPTER-5

Thursday

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7 Sep. 2017

Plane Table Surveying

* **Plane Table Survey :** → The Surveying in which field work & plotting work both are done simultaneously in the field is known as plane table Surveying.

* **Accessories used in plane table Surveying**

(i) Ranging Rod
(ii) Chain
(iii) Tape
(iv) Plane Table
(v) Tripod Stand
(vi) Alidade
(vii) Trough Compass
(viii) U-Fork
(ix) Plumb bob
(x) Spirit level
(xi) Drawing Sheet
(xii) Wooden peg
(xiii) Wooden Mellate.

* **Drawing Accessories :** →

* **Plane Table with tripod Stand :** → Plane table is able Consist of wooden board & a tripod stand. Tripod Stand Can wooden or metallic wooden board in rectangle Shape having size Vary from 30 x 40 cm to 65 x 75 cm.

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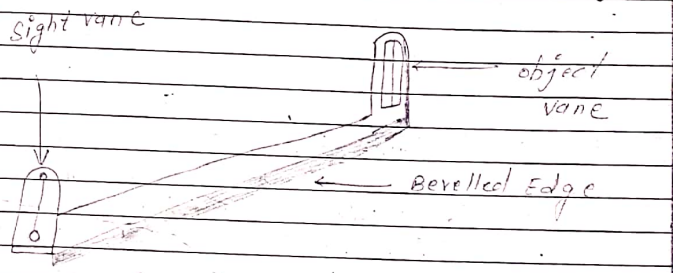
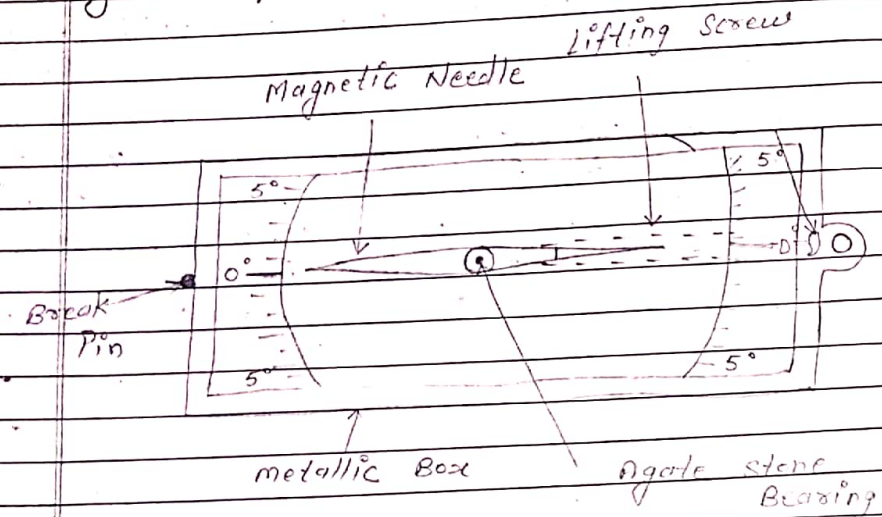
* **Alidade :** → It is made up of brass at the one end of the alidade eye Vane is fixed & other end of object Vane is fixed with the help of lifting pin. Object Vane is provided with a thin horse hair & eye Vane is provided with fine slit. The base of the alidade is plane & graduated in ~~the~~ mm & cm & it is used for drawing a line on the sheet with proper Scale. A Circular bubble tube is also provided at the base of the alidade to level the table

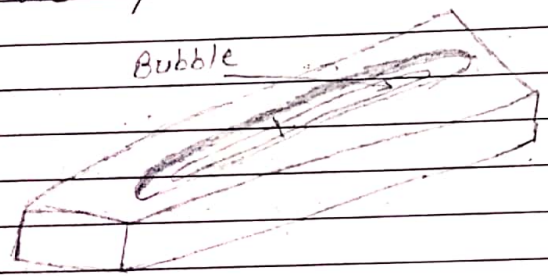


* **Trough Compass :** → It is Consist of a non-magnetic metal & it is in rectangle Shape a glass is provided on the top of rectangle box in the rectangle box a needle is provided at the centre & at the end of the box to graduate Scales are provided in which

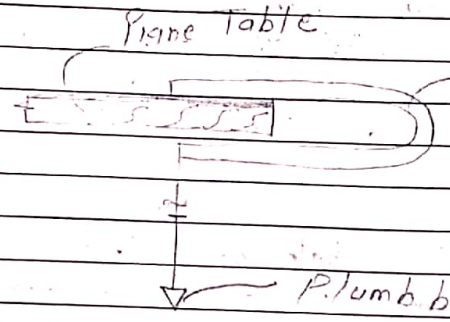
0° is marked at the Center magnetic needle Show magnetic north & magnetic South when it is to the zero of the zero of Scale.



* Spirit Level :→ It is Consist of metal from in which a Circular tube is provided with a bubble of Spirit. It is used for levelling of table. If the bubble of Spirit level lying on plane table is in Centre then the plane table is levelled.



* U- Fork :→ U- fork is Consist of a metal Spirit which is bent in U- Shape at the oneend of the U- frame a book is provided for hanging the plum bob the other end of the U- frame is pointed in Shape. It is used to transfer the ground point on the sheet.



* Setting or temporary adjustment of plane Table :→

(i) Fixing of plane table :→ Select the suitable station for fixing table & marked these station by driving wooden peg. Fix the plane table board on tripod stand & maintain the height of tripod as per suitability. Fix drawing sheet on the board for plotting work.

(2) Setting up the table : →

(i) Centering : → The centering of plane table is done with the help of U-frame. Take any point on the sheet now place the pointed end of the U-frame at that point & suspended the plumb bob to the hook of the U-frame. Shift the table until the point of the sheet is exactly vertical above the ground station.

(ii) Levelling : → It is done with the help of Spirit level. the table is levelled by placing spirit level parallel to the each side of the plane table board. The bubble is brought to the Center of the tube at every position of the table with the help of adjustment length of tripod.

The levelling & centering both should be proper.

(3) Orientation : → It is done by rotating the plane table in such a way that the plotted line in the plane table are parallel to the corresponding line on the ground. Orientation is neccssary where the instrument has setup at more than two station. It is done by trough compass or back sighting

(4) Sighting of the object : → When once table has been setup then the point to be located by sighting through alidade. Alidade should be pivoted on the instrument station. Survey lines are drawn then from the instrument station along the edge of alidade

* Method of Plane Tabeling : —

(i) Radiation (ii) Intersection
(iii) Traversing (iv) Resection.