1.4 COMPASS SURVEYING

The principle of surveying is traversing; which involves a series of lines, which are connected Compass surveying, is a branch of surveying in which directions of survey lines are determined with a compass and lengths of the lines are measured with a tape or a chain

INSTRUMENTS USED FOR COMPASS SURVEYING

- ✓ The various instruments used in the compass survey are :
- Prismatic compass
- Tape
- Ranging rods
- Tripod
- Arrows
- Plumb Bob

TYPES OF COMPASS

a) To measure the directions

- PRISMATIC COMPASS
- SURVEYOR'COMPASS

b) To measure the angles

- Sextant
- theodolite

THE PRISMATIC COMPASS

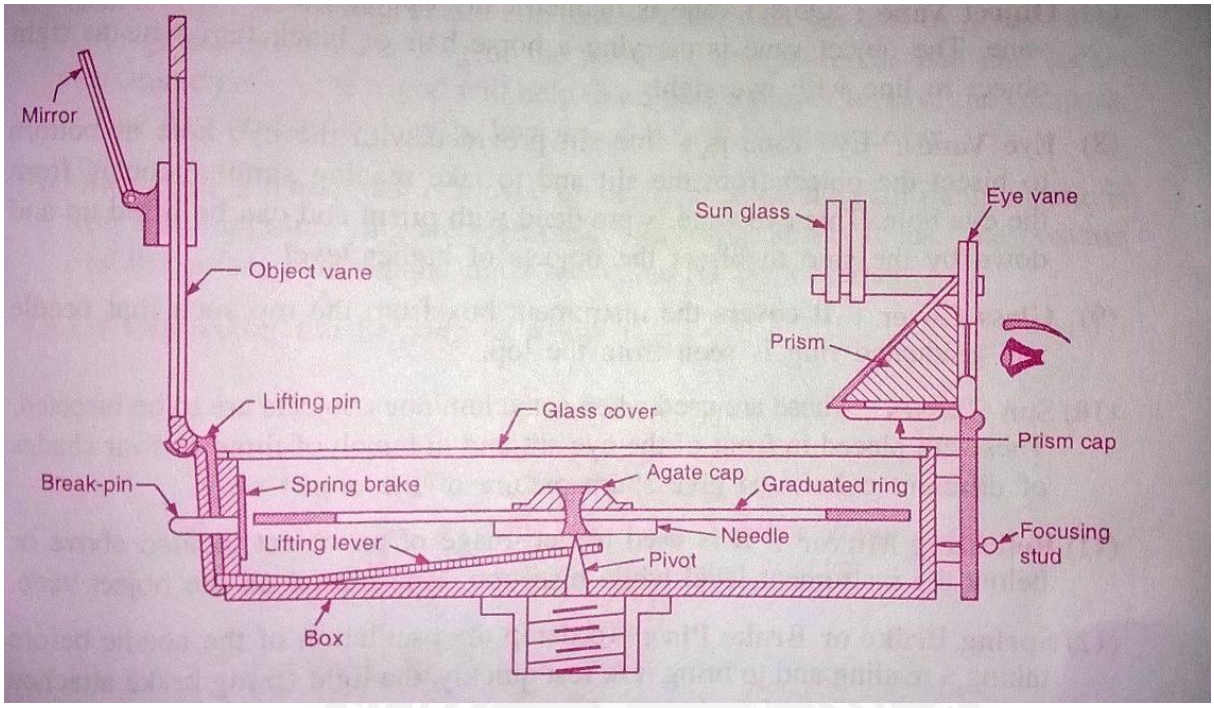

Fig. Prismatic Compass
(https://slideplayer.com/slide/4767731/)

CONSISTING PARTS

1. Cylindrical metal box
2. Pivot
3. Lifting pin and lifting liver
4. Magnetic Needle
5. Graduated Ring
6. Prism
7. Object vane
8. Eye Vane
9. Glass Cover
10. Sun Glasses
11. Reflecting Mirror
12. Spring Brake or Brake Pin

PRISMATIC COMPASS

- Prismatic Compass comprises of a magnetic needle attached to the circular ringmade up of aluminum.
- The needle is on the pivot and will orient itself in the magnetic meridian

- The objective vane defines the line of sight and the eye slit, both attached tothe compass box.
- A triangular prism is fitted below the eye slit.
- The readings increase in clockwise direction.
- The object vane frame can be folded on the glass lid, which covers the top atbox.
- Lever, which lifts the needle of the pivot and holds it against the glass lid.
- When bright objects are sighted, dark glass may be interposed in to the line ofsight.

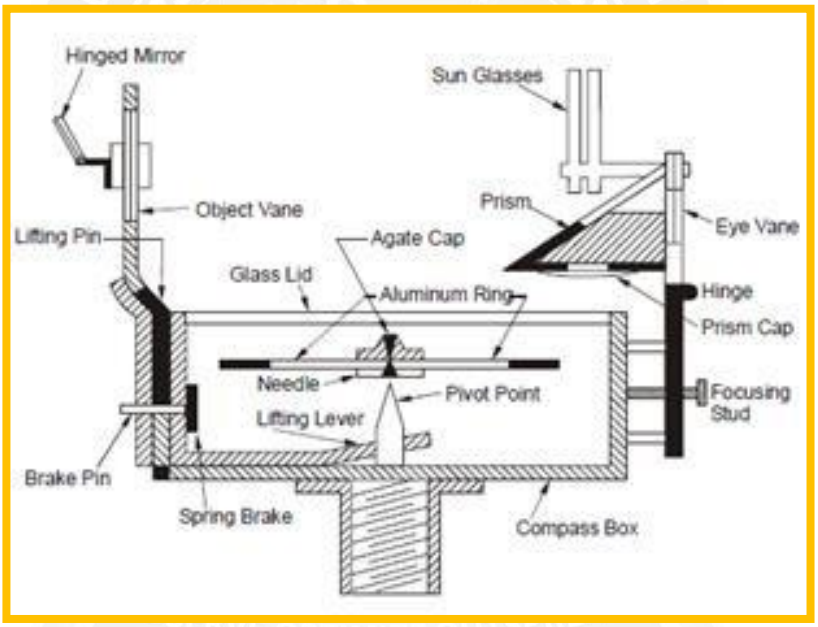

Fig. Prismatic Compass
(https://www.brainkart.com/article/Compass-survey_6527/)

Adjustments of Prismatic Compass:

The following are the adjustments usually necessary in the prismatic compass:

- Centering
- Leveling
- Focusing the prism

CENTERING:

The center of the compass is placed vertically over the station point by dropping a

small piece of stone below the center of the compass; it falls on the top of the peg marking that station.

LEVELLING:

By means of ball and socket arrangement, the Compass is then leveled the graduated ring swings quite freely. It may be tested by rolling around pencil on the compass box.

FOCUSSING THE PRISM:

The prism attachment is slid up or down focusing until the readings are seen to be sharp and clear.

THE SURVEYOR'S COMPASS

In this type of compass, reading is taken from the top of glass and under the tip of north end of the magnetic needle directly. No prism is provided here. Construction and bearing system of the surveyor's compass differs from prismatic compass.

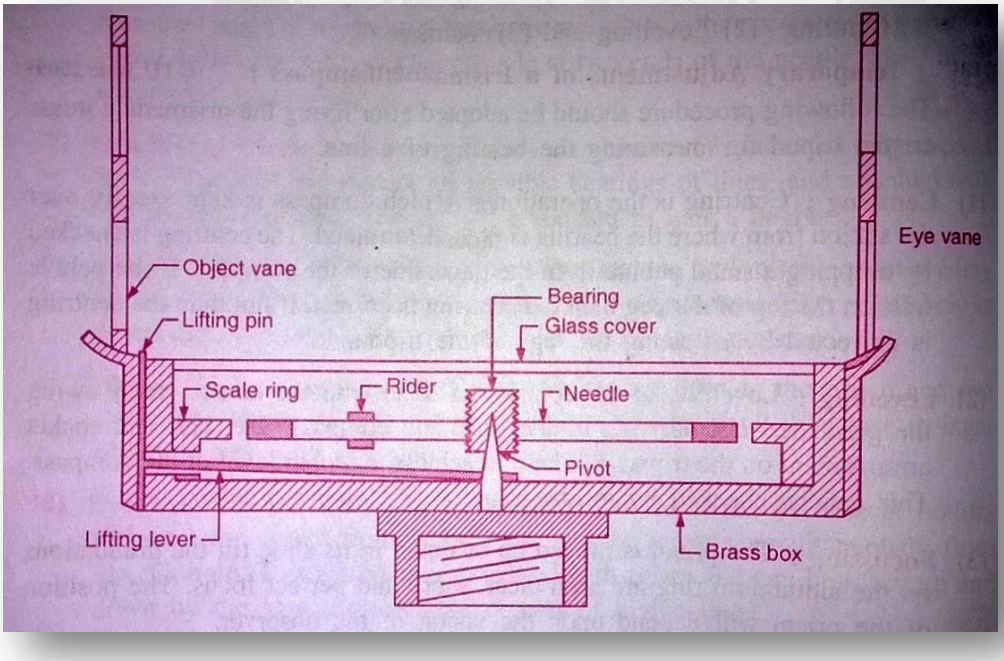

Fig. Surveyors Compass
(https://slideplayer.com/slide/4767732/)

CONSISTING PARTS

WORKING OF SURVEYOR'S COMPASS

1. Centering
2. Levelling
3. Observing the bearing line

4. Magnetic bearing
5. Grid bearing
6. Arbitrary bearing

Bearing

bearing of a line is its direction relative to a given meridian

TYPES OF BEARINGS

1. True bearing
2. Magnetic Meridians and Magnetic Bearing
3. True Meridian and True Bearing
4. Arbitrary Meridian and Arbitrary Bearing

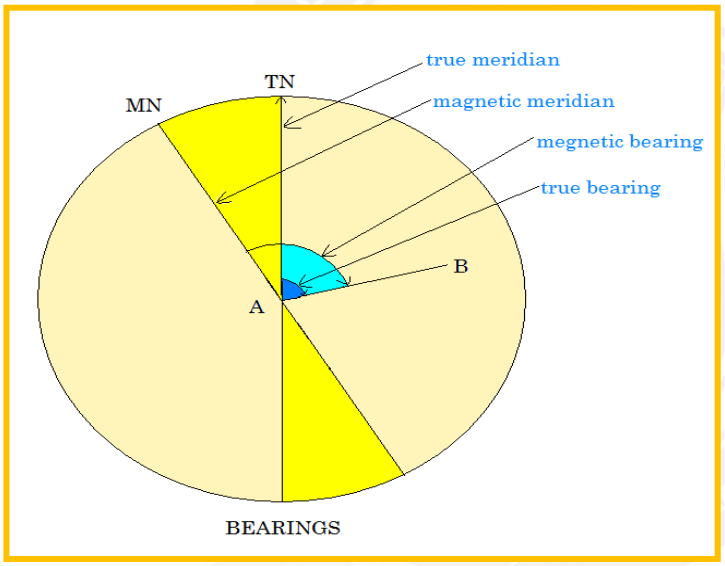

Fig- Bearing diagram

(https://www.chegg.com/homework-help/definitions/magnetic-bearing-8)

TYPES OF MERIDIANS

Azimuth

The angle b/w a line and the meridian measured with clockwise direction usually from north

DEFLECTION ANGLE

The angle b/w a line and the prolongation of the proceeding line

ANGLES TO THE RIGHT

If the angles are measured clockwise from the proceeding line to the following line

INTERIOR ANGLE

Inside angles between adjacent lines of a polygon

FORE BEARING

The angle measurement in forward direction

BACK BEARING

The angle measurement in backward direction

The difference b/w FB and BB= 180˚

DESGNATION OF BEARING

WHOLE CIRCLE BEARING (WCB)

The bearing of a line is always measured clockwise from the north point towards the line

REDUCED BEARING

The bearing of lines are measured clockwise from north or south

MEASUREMENTS OF BEARINGS

W.C.B OF ANY LINE	**QUADRANT IN WHICH IT LIES**	**RULE FOR CONVERSION**	**QUADRANT**
0° to 90°	First	RB = WCB	N-E
90° to 180°	Second	RB = 180° - WCB	S-E
180° to 270°	Third	RB = WCB - 180°	S-W
270° to 360°	Fourth	RB = 360° - WCB	N-W

Problem-I

Convert the following whole circle bearings of lines to quadrant bearings.

a) OA 32° b) OB 109° c) OC 211° d) OD 303°

a) W.C.B of OA = 32° Quadrant bearing = N 32° E

b) W.C.B of OB = 109°

quadrant bearing = 180° – W.C.B = 180° – 109° = S 71° E

c) W.C.B of OC = 211°

quadrant bearing = W.C.B – 180° = 211° – 180° = S 31° W

d) W.C.B of OD = 303°

quadrant bearing = 360° – W.C.B = 360° – 303° = N 57° W

Problem2

Convert following reduced bearings to the whole circle bearings: (i)N 52°30'E (ii)S 30°15'E (iii)S85°45'W (iv)N 15°10'W

(i) R.B. = N 52°30'E & which is in the NE quadrant, Therefore W.C.B =same as R.B = 52°30'

(ii)S 30°15'E which is in the SE quadrant, Therefore W.C.B =180° -30°15'= 149°45'

(iii)S 85°45' W which is in the SW quadrant, Therefore W.C.B =180° + 85°45' =265°45'

(iv)N 15°10'W which is in the NW quadrant, Therefore W.C.B =360° - 15°10' =344°50'

Local Attraction

A compass needle is affected by the presence of masses of iron and steel such as lamp posts electric cables, steel girders etc., they deflect the needle and the effect of this disturbance is called local attraction. Due to local attraction, the difference between the fore bearing and back bearing of a survey line will not be equal to 180°

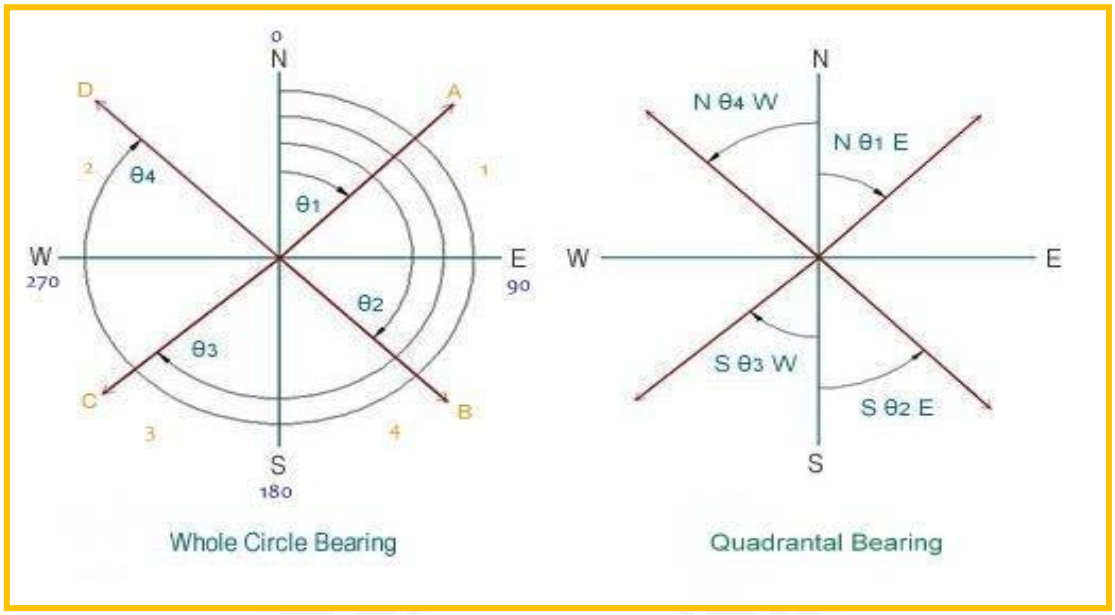

Fig- Quantrant Bearing
(https://civilsnapshot.com/whole-circle-bearing-quadrantal-bearing/)

Problem 3

The following are the bearings of the lines of the closed traverse ABCDA taken with a compass in a place where local attraction was suspected.

Line.	F.B.	B.B
AB	35°30’	215°30’
BC	115° 15’	294° 15’
CD	180° 45’	3 °45’
DA	283 °45’	101 °45’

Observed F.B. of BC = 115°15’ Add = 180°0’

Correct BB of BC = 295°15’

Less Observed BB of BC = 294°15’ Error due to local attraction at C = 1°00’

Since the error is negative all bearing observed at C must be corrected by adding 1°00’

Observed F.B. of CD = 180°45’ Add correction = 1° 00’

Correct FB of CD = 181°45’ Deduct 180° = 180° 00’

Correct BB of CD = 1°45’. Observed BB of CD = 3°45’.

Error due to local attraction at D = 2°00'.

Hence, all bearings observed at D must be corrected by -2°00' for local attraction.

Observed F.B. of DA = 283°45' Add correction at D = - 2°00' Correct FB of DA = 281°45'

Less = 180°00' Correct BB of DA = 101°45'

This is the same as the observed BB of DA, which shows that there is no local attraction at A.

The corrected bearings of the lines will be as follows

Line.	**F.B.**	**B.B**
AB	35°30'	215°30'
BC	115° 15'	295° 15'
CD	181° 45'	10 °45'
DA	281 °45'	101 °45'