SNS COLLEGE OF TECHNOLOGY

Coimbatore – 641 035

An Autonomous Institution

DEPARTMENT OF CIVIL ENGINEERING

23GET102-BASIC CIVIL AND MECHANICAL ENGINEERING

I YEAR / I SEMESTER

UNIT 1 : CIVIL ENGINEERING MATERIALS AND SURVEYING

Topic : Measurement of Angles

UNIT 1 :CIVIL ENGINEERING MATERIALS AND SURVEYING

1. *Introduction to Civil engineering*
2. *Scope of civil engineering*
3. *Building materials*
4. *Brick, stone, cement, concrete, properties-uses*
5. *Introduction to Surveying*
6. *Objectives – types – classification – principles of Surveying*
7. *Measurements of distances, angles*
8. *Concepts of Levelling*
9. *determination of areas*
10. *Illustrative examples.*

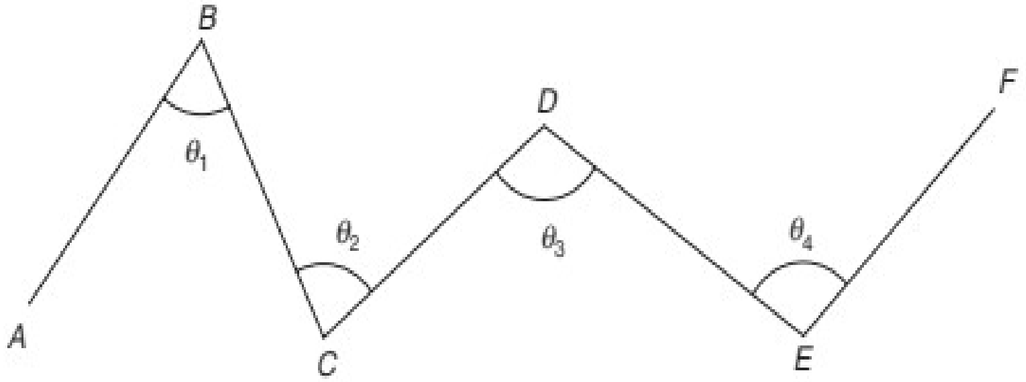
Measurement of Angles

Instruments used for measurement of angles are

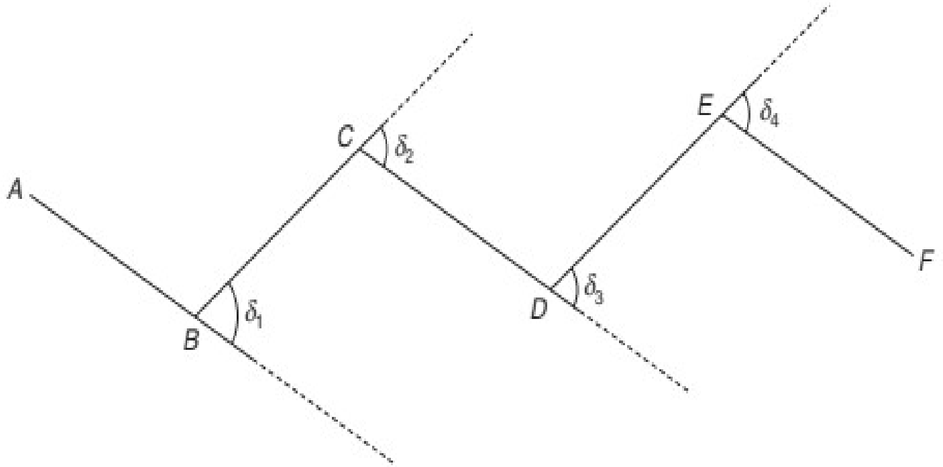
- *Compass*
- *Theodolite*
- *Box Sextant*

Methods of Measurement of Angles

- *Included Angle Measurement*



- *Successive Angle Measurement*



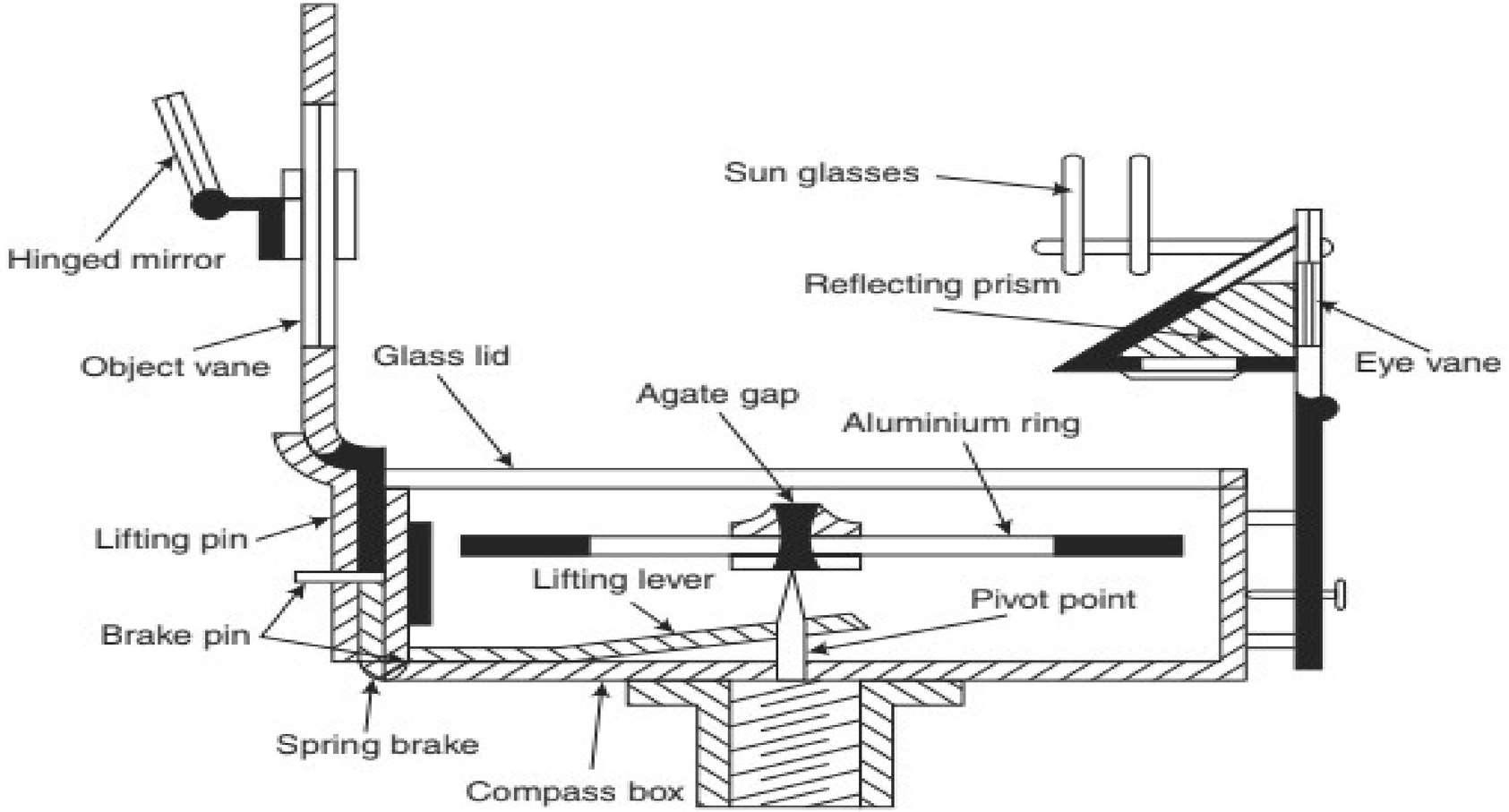
Compass

- *This instrument essentially consists of a freely suspended magnetic needle on a pivot, which can move over a graduated scale. In addition to the above, it has an object vane and an eye vane which will be useful to get the line of sight. This instrument will be supported by a tripod stand while taking observations.*

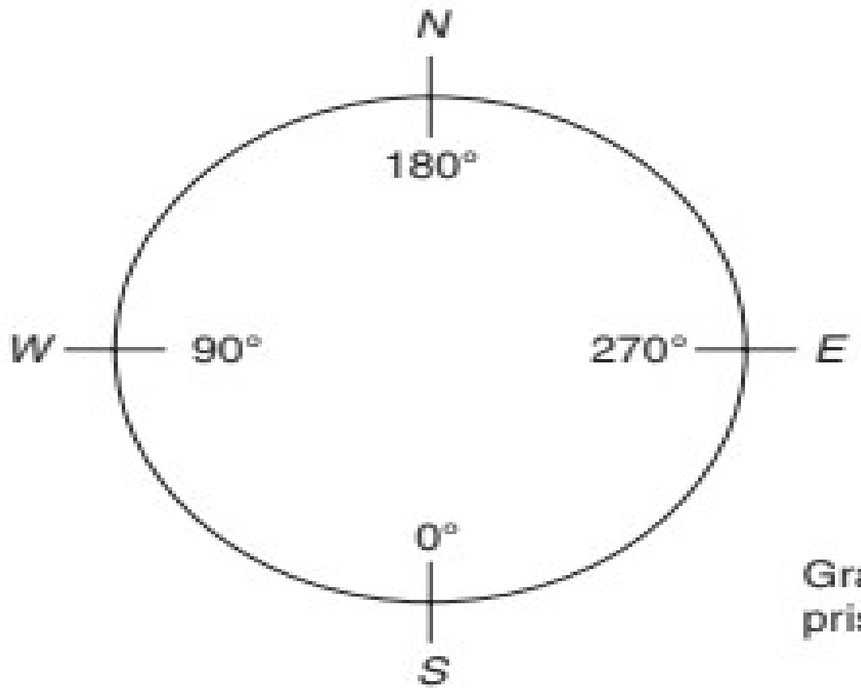
Types of Compass

- *Prismatic Compass*
- *Surveyor's Compass*
- *Trough Compass*
- *Tubular Compass*

Prismatic Compass

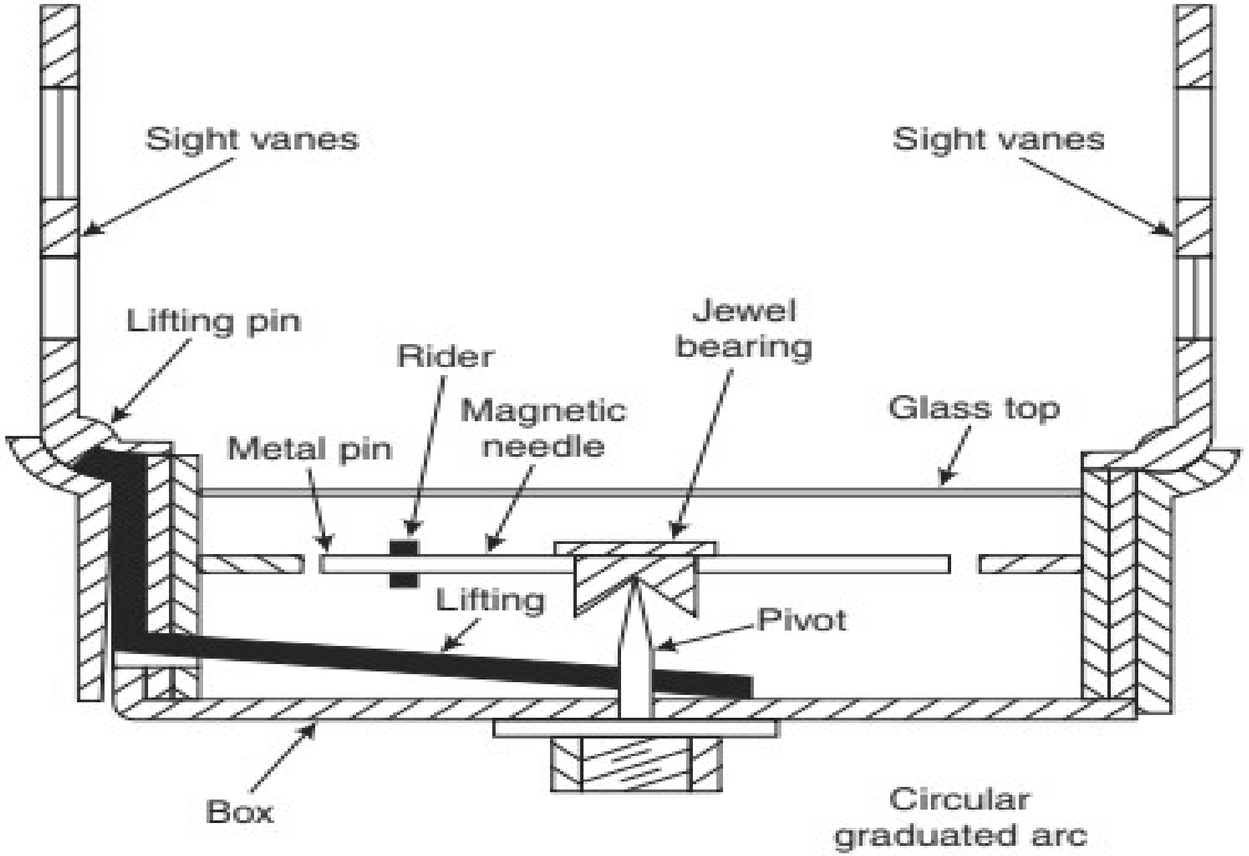


Graduation In Prismatic Compass



Graduation in prismatic compass

Surveyor's Compass



Important Definitions

- *True Bearing*

True bearing of a line is the angle which a line makes with the true north or geographical north, measured always in the clockwise direction. The range of measurement is from 0°–360°.

- *Magnetic Bearing*

It is the angle which a line makes with the magnetic north measured always in the clockwise direction. The measuring range is from 0°–360°.

Important Definitions

- *Whole Circle Bearing (WCB)*

Since the range of 0° to 360° completes a circle, any angle measured in between 0° to 360° directly is called a whole circle bearing. The magnetic and true bearing are just whole circle bearings.

- *Reduced Bearing (RB)*

This is based on quadrantal system wherein any angle is

measured with respect to the north – south line, towards east or west

Important Definitions

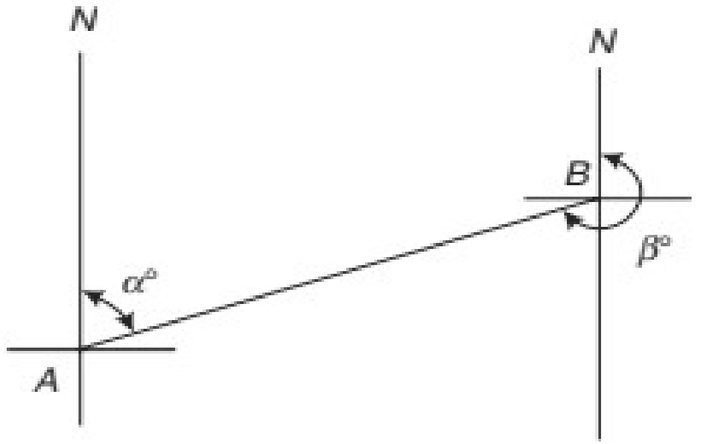
- *Fore Bearing (FB)*

The angle measured from a survey station to the other station, in the direction in which survey is conducted, is called the fore bearing.

- *Back Bearing (BB)*

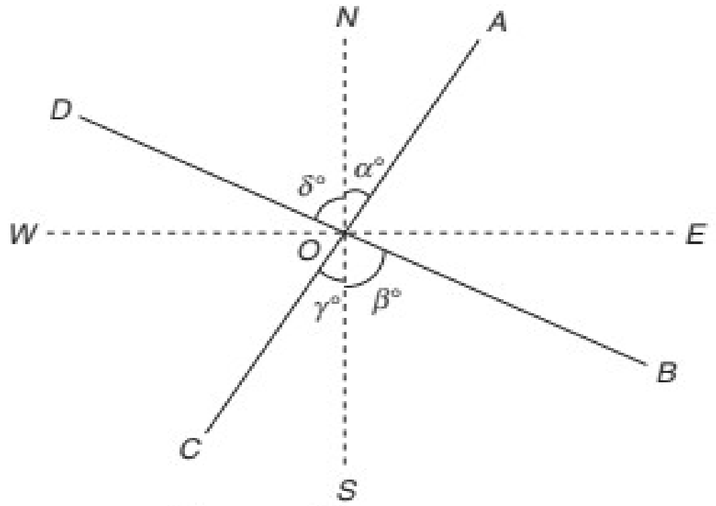
It is the bearing taken from the next station to its preceding station from which the fore bearing was taken.

Reduced Bearing and Fore and Back Bearing



NAB = α° = fore bearing
NBA = β° = back bearing
∴ Fore bearing – back bearing = 180°

Fig. 2.11 *Fore and back bearing*



Representation
Line $OA \rightarrow N\,\alpha^\circ\,E$
Line $OB \rightarrow S\,\beta^\circ\,E$
Line $OC \rightarrow S\,\gamma^\circ W$
Line $OD \rightarrow N\,\delta^\circ W$

Fig. 2.10 *Reduced bearing (or) quadrantal bearing*

Difference Between Prismatic and Surveyor's Compass

	Prismatic compass	*Surveyor's compass*
1.	In the prismatic compass, the magnetic needle and the graduated dial are attached together while the prism and the box rotate.	In the surveyor's compass, the magnetic needle remains freely suspended and stationary while the dial is attached to the box.
2.	The graduations are provided in the clockwise direction.	In this case, the graduations are marked from 0° to 90° in all the four quadrants.
3.	Readings are observed by looking through the prism eye-piece from the south end of the compass.	Readings are taken by directly looking on the dial immediately below the north end of the needle.
4.	The zero of the reading is marked on the south end of the instrument.	Here, it is marked on the north and south end.
5.	A mirror is attached to the object vane for sighting objects at higher elevations or depression.	No such mirror is provided in the object vane.
6.	The position of east and west are in their correct positions.	The position of east and west are interchanged.
7.	By using this, one can obtain directly the whole circle bearings.	This is based on quadrantal system having 0° at north and 90° at east and west ends. With this, it is possible to read only the reduced bearings.
8.	The prismatic compass may be held in hand while taking observations.	The surveyor's compass needs a light tripod or a single pointed rod to support it.

Conversions

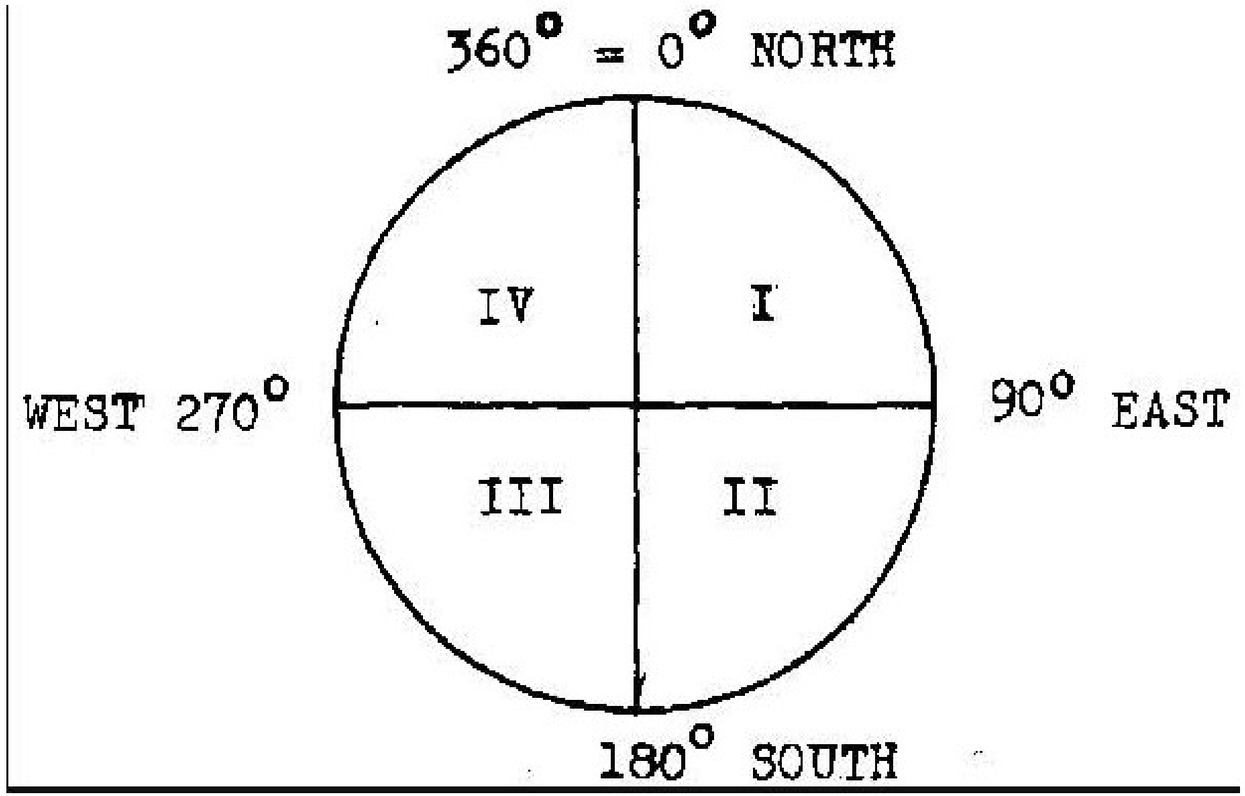
Table 2.2 Conversion of WCB to RB

Case	*WCB between*	*Rule for RB*	*Quadrant*
I	0° and 90°	WEB	NE
II	90° and 180°	180° – WCB	SE
III	180° and 270°	WCB – 180°	SW
IV	270° and 360°	360° – WCB	NW

Table 2.3 Conversion of RB to WCB

Case	*RB Quadrant*	*Rule for WCB*	*WCB between*
I	NE	RB	0° and 90°
II	SE	180° – RB	90° and 180°
III	SW	180° + RB	180° and 270°
IV	NW	360° – RB	270° and 360°

Graduations



Local Attraction in Compass

- *If external magnetic influences are present in the place of observation using a compass, the needle will be seriously deflected from its normal position. Such disturbance due to the surrounding magnetic field is called local attraction.*

Thank You!