



Surveying (G332)

Lecture 6 Theodolite surveying

According to reading method

Transits

Very old and obsolete



Optical

H_z are VL circles are made from glass and the reading are taken by circle reading eyepiece



Digital

Angular readings are displayed digitally on screen



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Theodolites (Transits)

- Theodolite is used to measure the horizontal and vertical angles.
- Theodolite is more precise than magnetic compass.
- Magnetic compass measures the angle up to as accuracy of 30'. However a vernier theodolite measures the angles up to and accuracy of 10'', 20''.
- There are variety of theodolite vernier, optic, electronic etc.

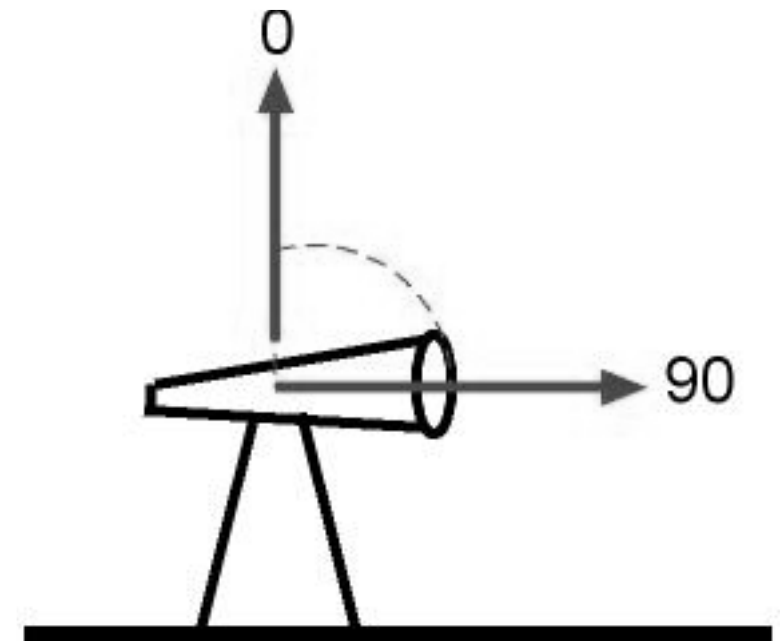


Theodolites (Transits)

They are used to

- establish straight and curved lines.
- To establish or measure distance (Stadia)
- To establish Elevation when used as a level

(When we set the vertical angle to 90°).



Main Theodolite parts

Three assemblies of Theodolite

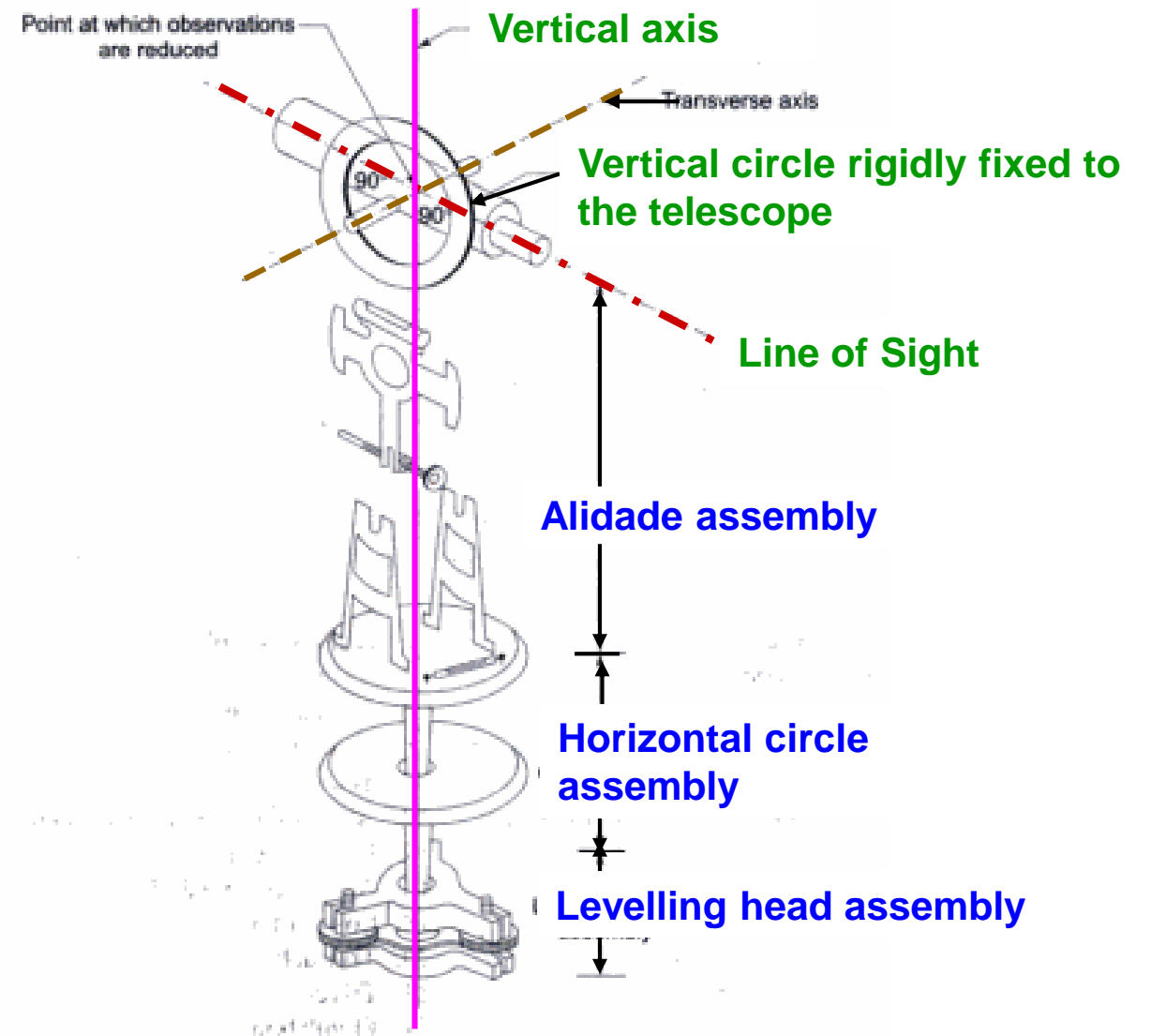
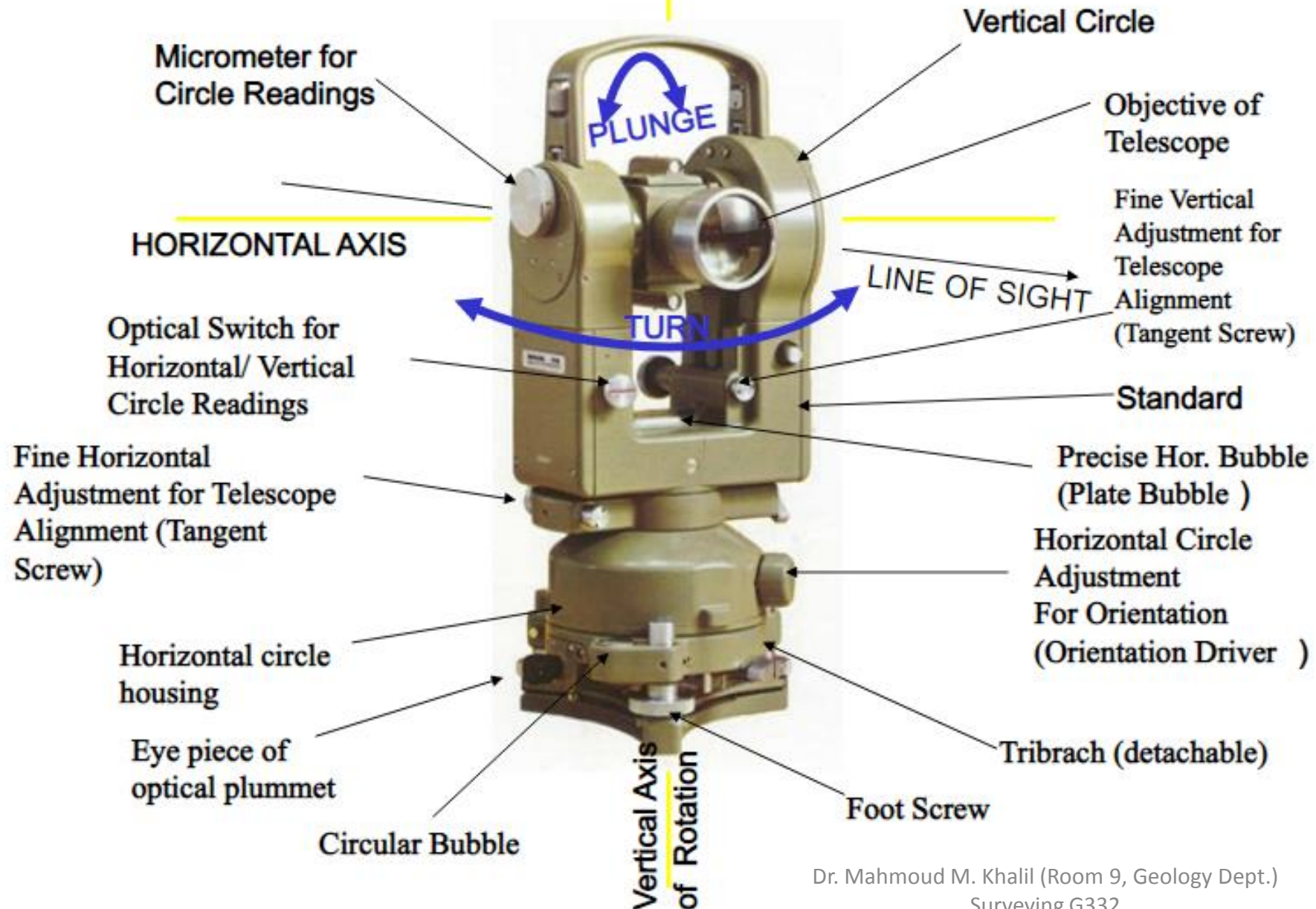


Fig. 4.2 The three assemblies of a theodolite

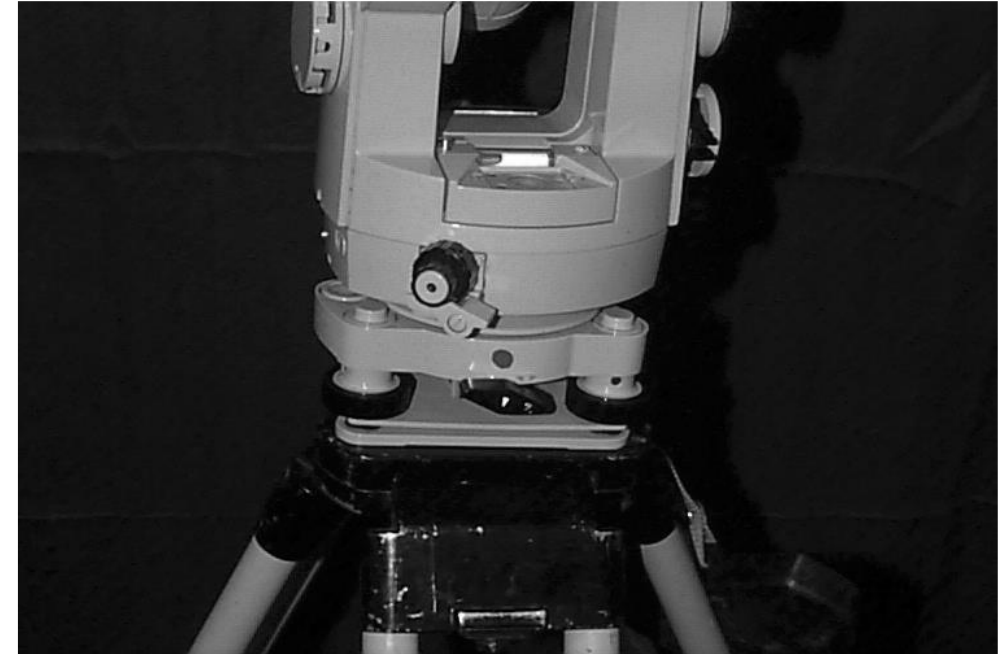
COMPONENTS OF A TYPICAL 'OPTO-MECHANICAL' THEODOLITE



Using the Theodolite

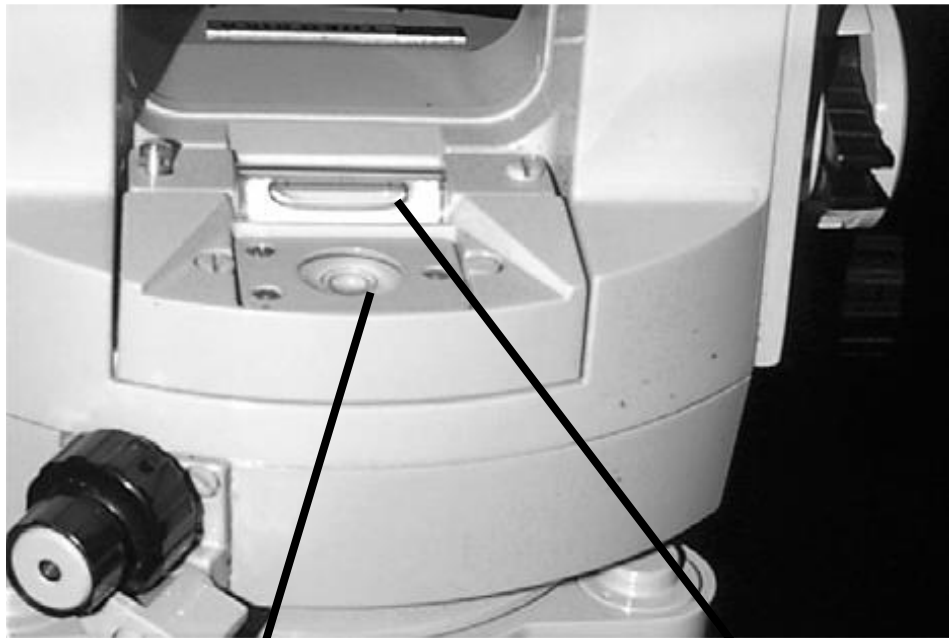


Hold Theodolite by handle
Attach to tripod head
Do not let go of handle
until theodolite is attached to tripod.



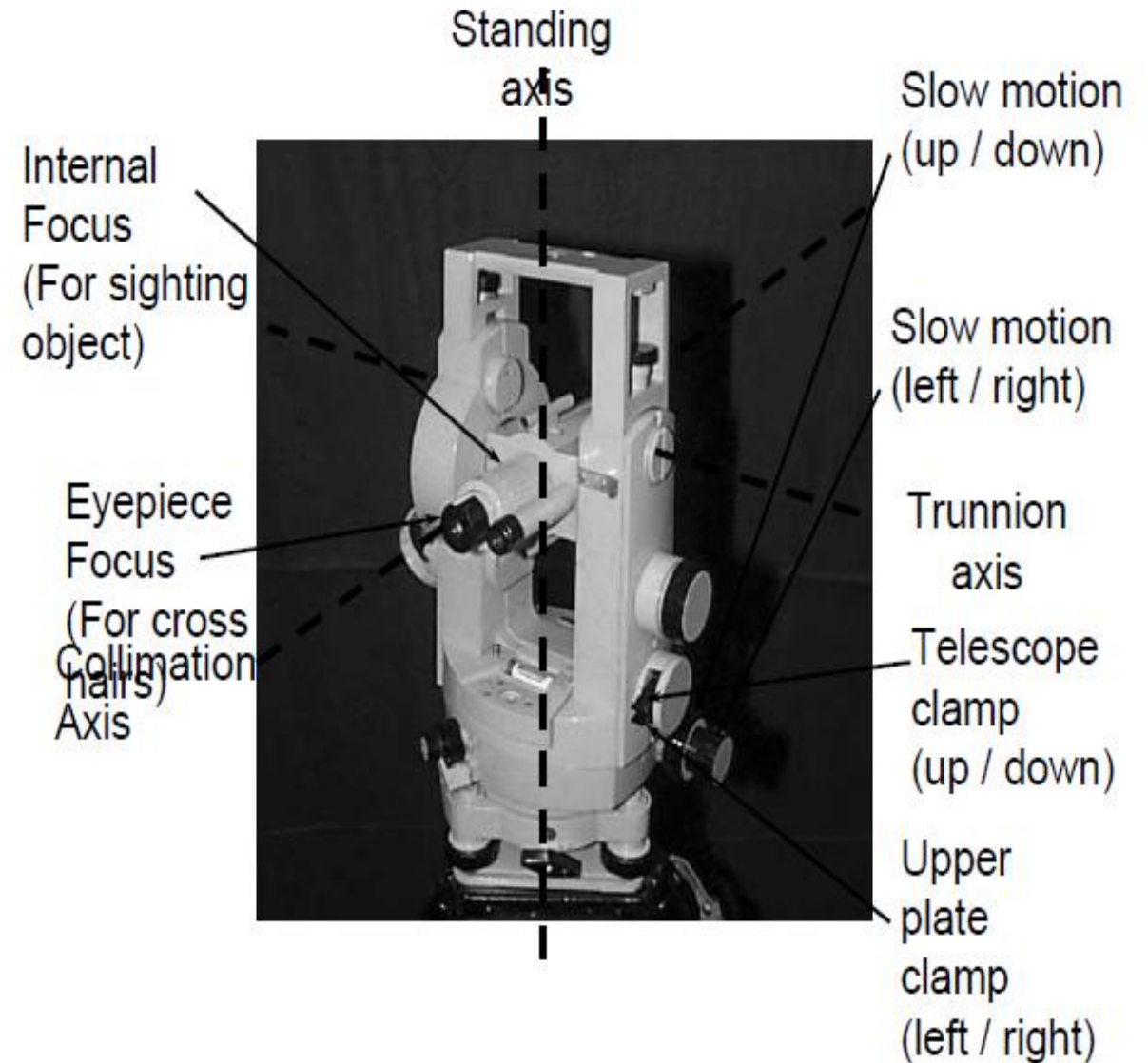
Levelling Screw or Foot Screw

Using the Theodolite



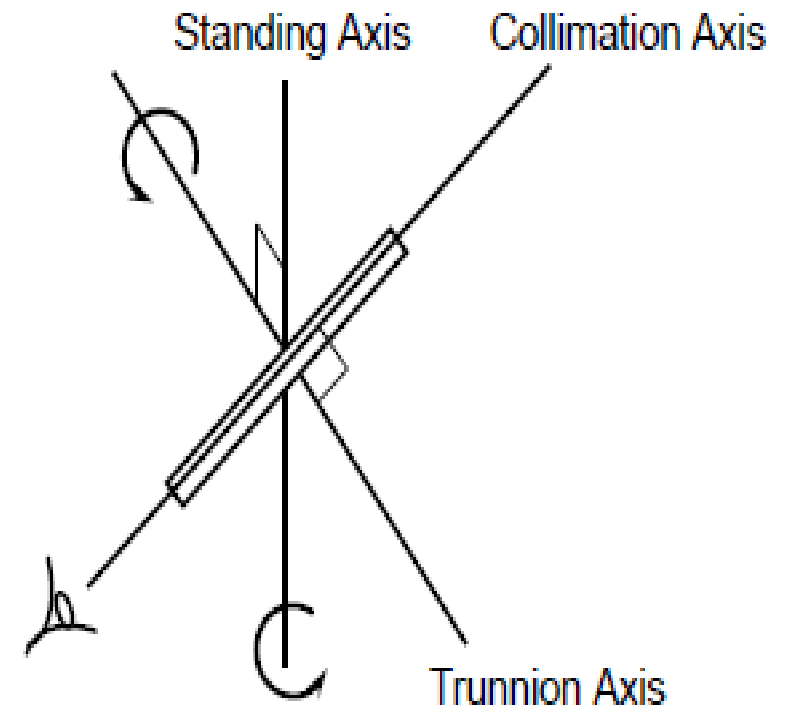
Pond
Bubble
For
approximate
levelling

Plate Bubble
For
accurate
levelling



Using the Theodolite

- All three axes should be mutually at right angles

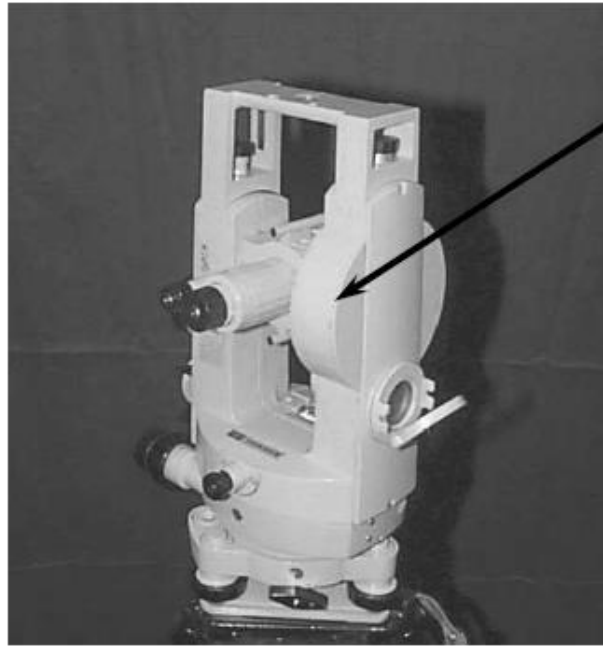


Using the Theodolite

Face Right When the vertical circle of a theodolite is on the right of the observer, the position is called *face right* and the observation made is called face right observation.

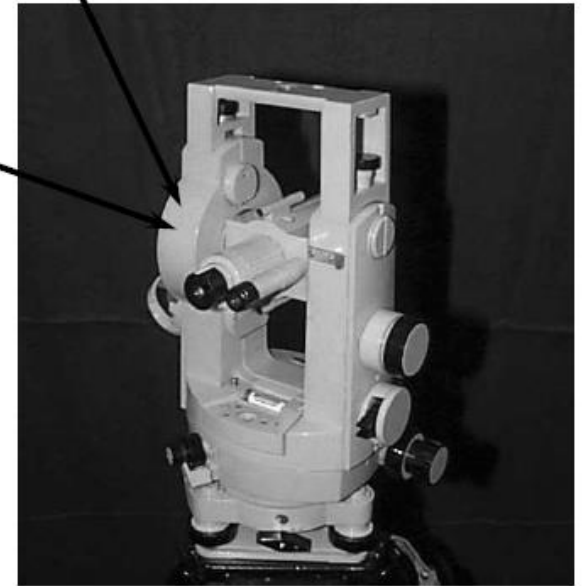
Face Left When the vertical circle of a theodolite is on the left of the observer, the position is called *face left* and the observation made is called face left observation.

By taking the mean of both face readings, the collimation error is eliminated.



Face Right
(F/R)

Vertical Circle - (for vertical angles)



Face Left
F/L

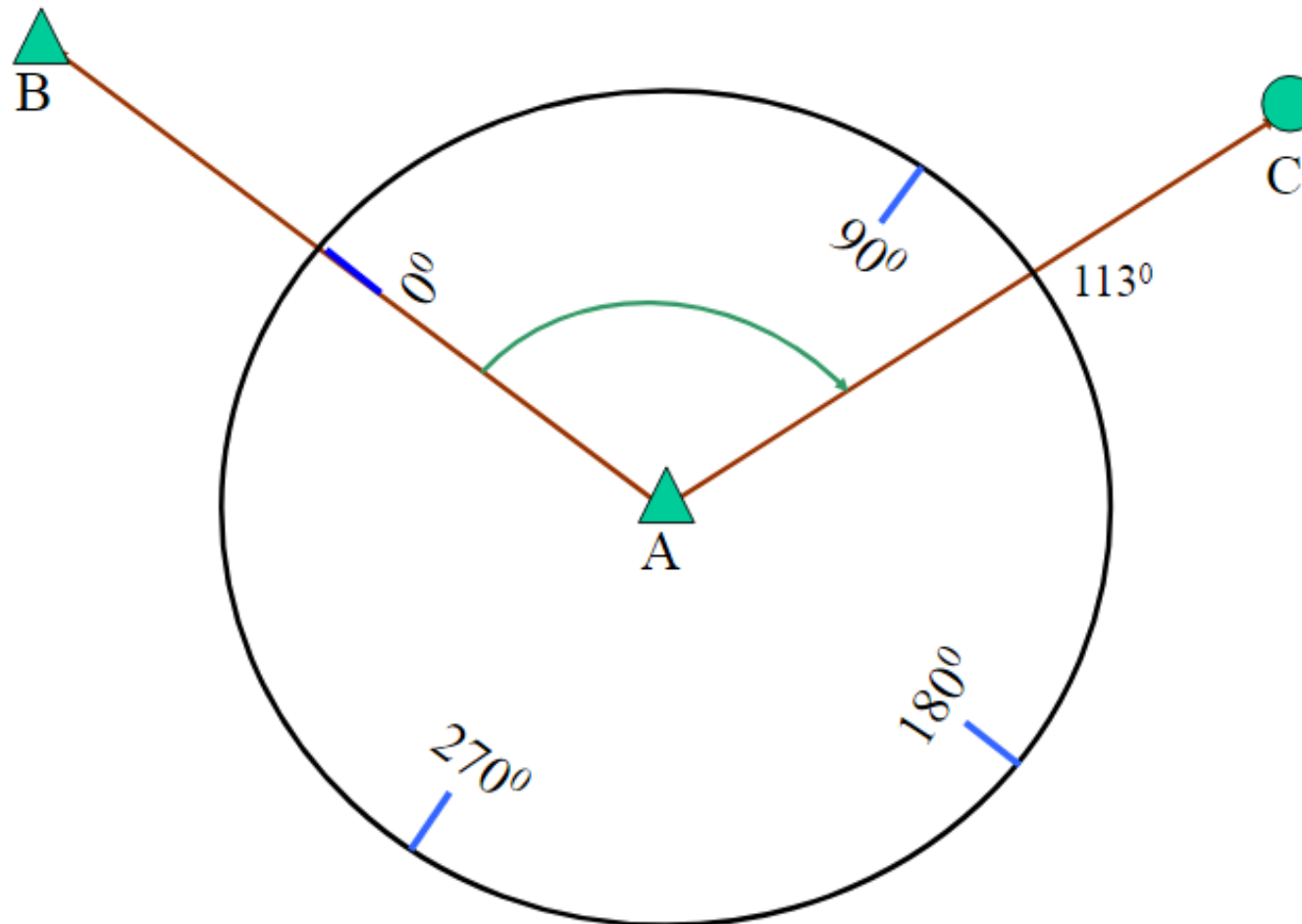
Setting up a theodolite

- **Centering**
- **Levelling**
- **Elimination of parallax**
- **Sighting the target**
- **Reading the angle**

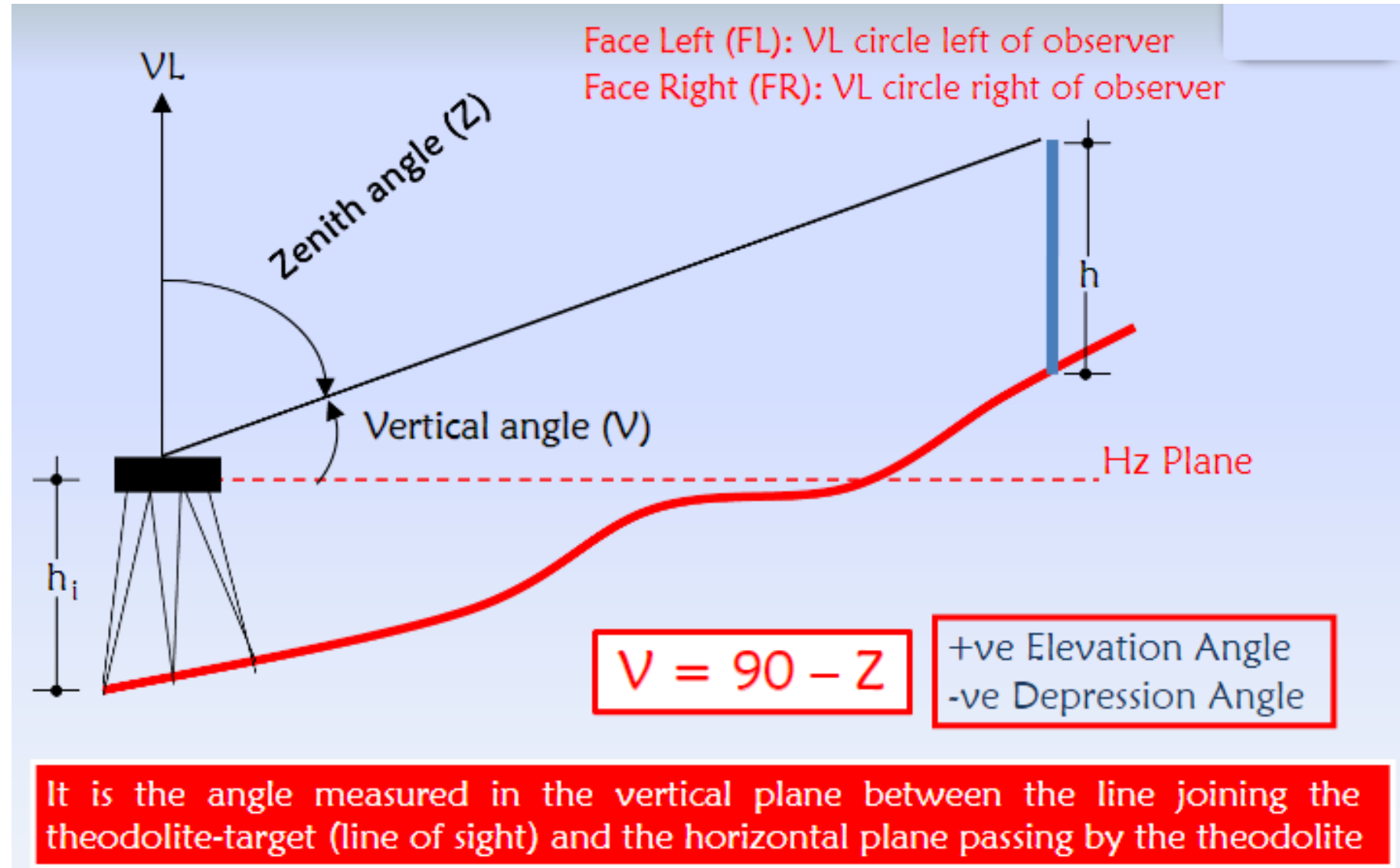
Measuring horizontal angles

- Sight point A on face left
- Set reading on horizontal circle (e.g. $00^{\circ} 00' 00''$)
- Direct the telescope to point B and record 'face left' directions (e.g. $35^{\circ} 26' 20''$)
- Reverse the telescope to 'face right' and read direction to point B ($215^{\circ} 26' 20''$)
- Back to point A on face right and record the reading ()

Measuring horizontal angles

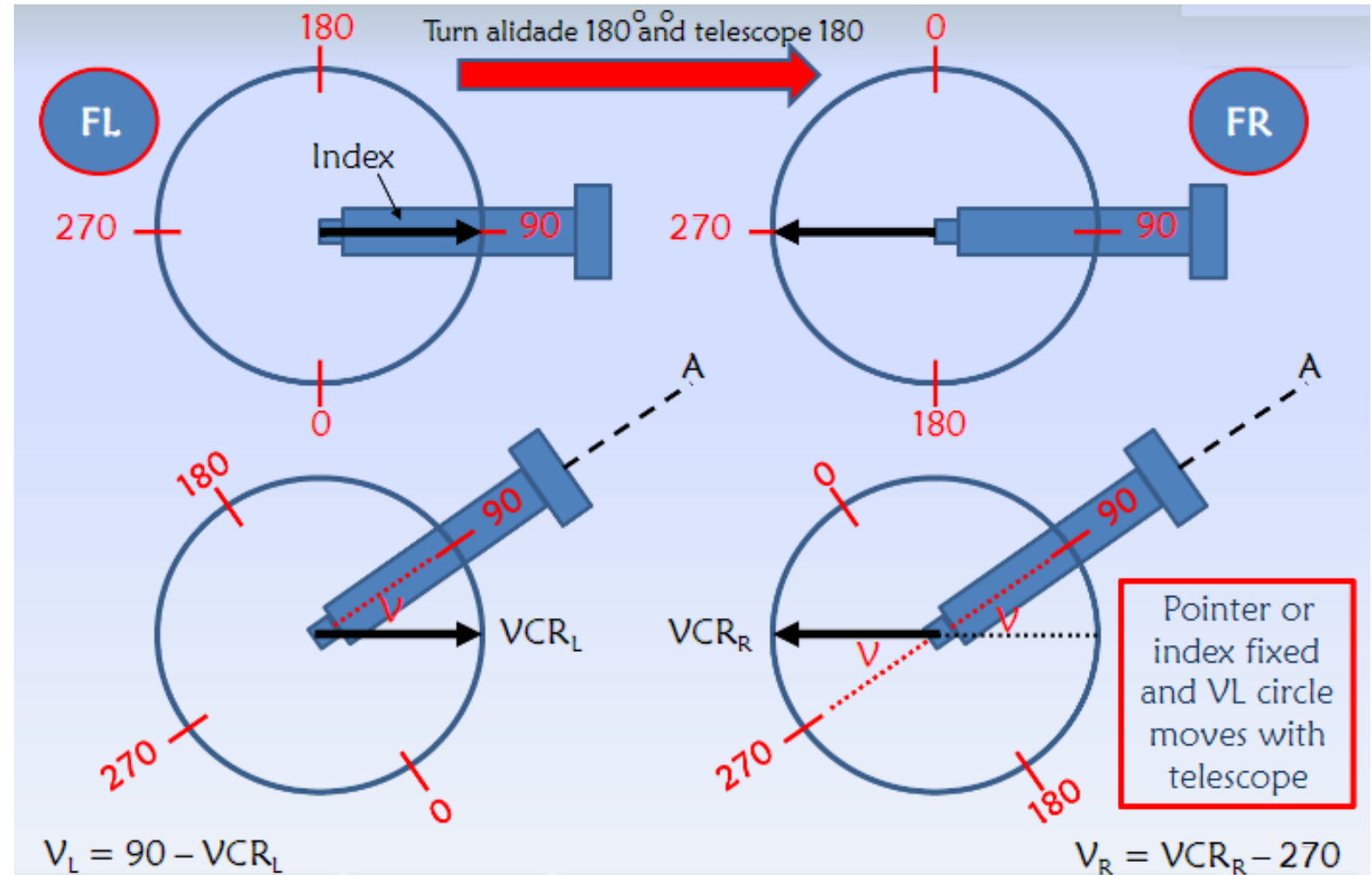


Measuring Vertical angles



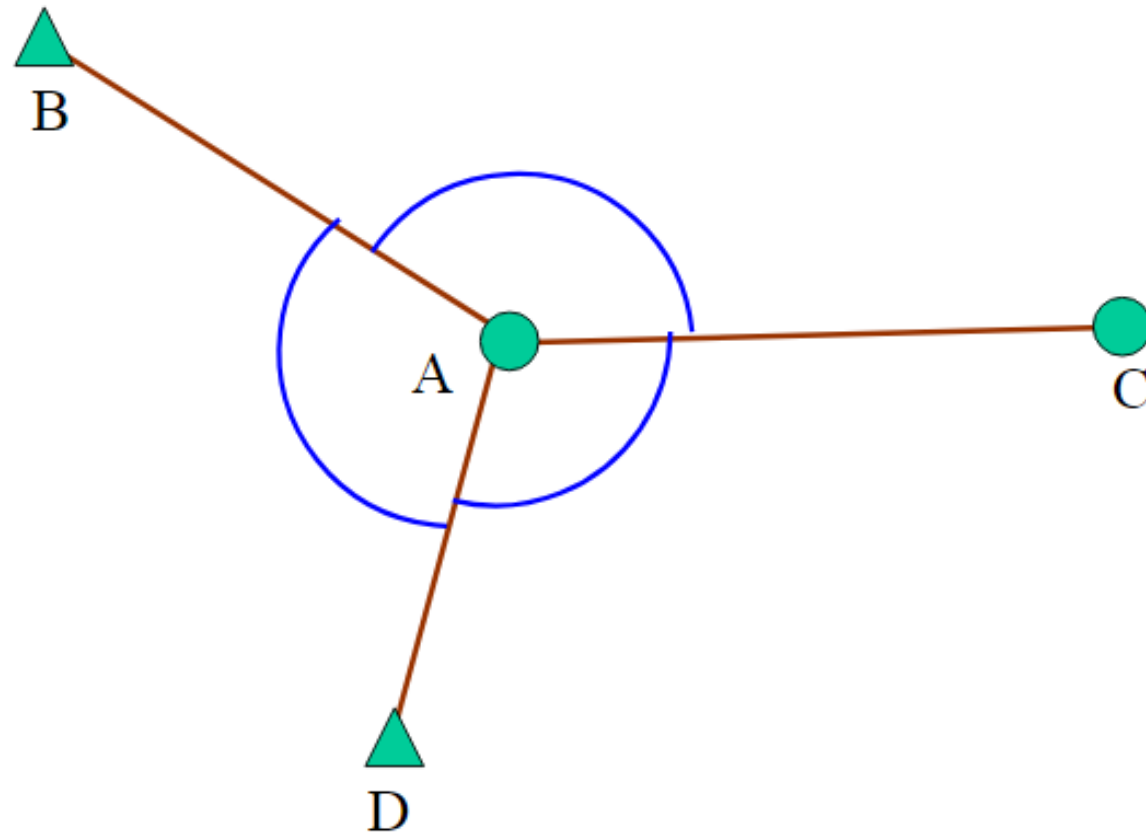
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Measuring Vertical angles



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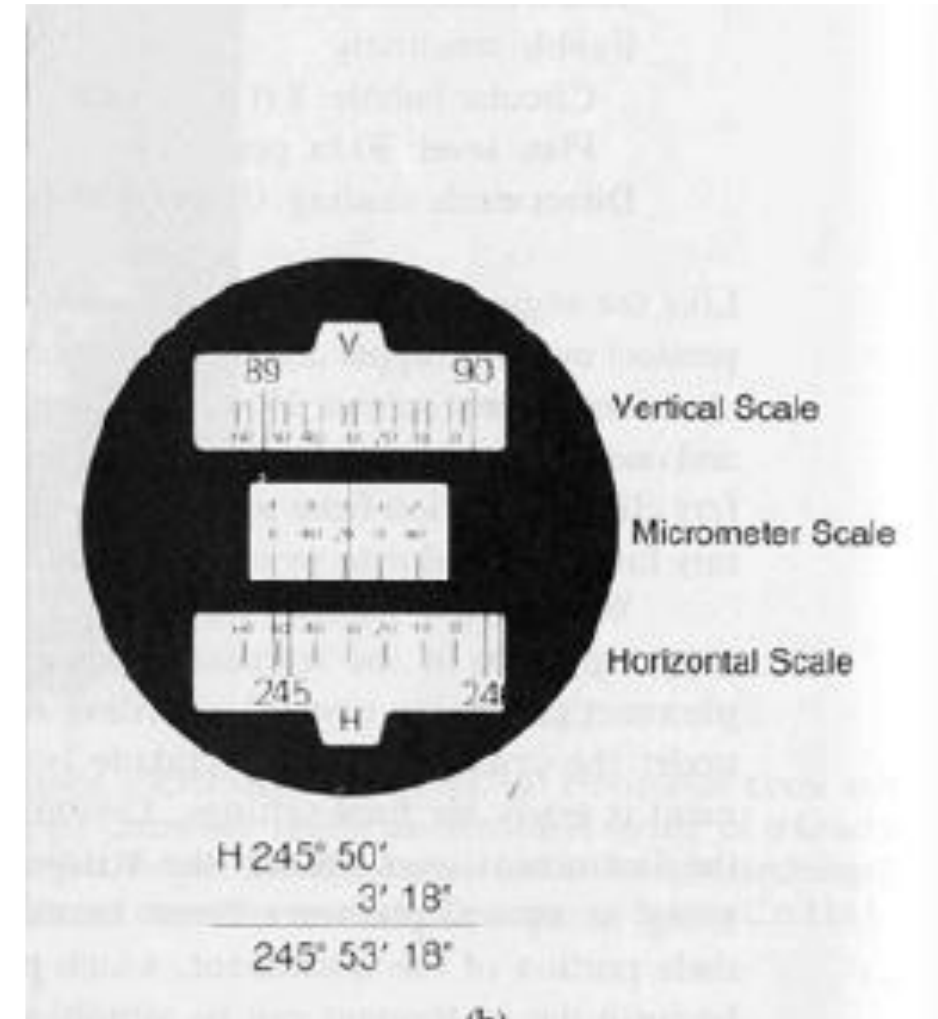
Closing the horizon



Measure all the angles around a point

Angle Measurement with an Optical Theodolite

- Horizontal (H) and vertical (V) scales with micrometer scales



References

- **CE 260 SURVEYING, CHAPTER 5**
- <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=128296>
- <https://www.boeingconsult.com/tafe/ss&so/survey2/theodolite.htm>
- <https://slideplayer.com/slide/4749461/>
- <https://slideplayer.com/slide/4645806/>
- Planimetric Surveying 1, SCM 221, Dr Ahmed Ragheb

Questions

you can drop an email to mahmoud.khalil@mu.edu.eg with your questions

Normally you will get an answer within one to two days

Hope you enjoy the lecture