HRT436 Mesleki İngilizce

- **Amacı**: Harita muhendisliğinde kullanılan mesleki ingilizce terimlerini ögretmek, mesleki konulardaki İngilizce metinleri anlama konusundaki düzeyini geliştirmek, ve Öğrencilere mesleki konularda çeviri deneyimi kazandırmak.
- **Dersin İçeriği**:Kenar ölçmeleri (çelik şerit ve EDM); Açı ölçmeleri (takeometri, teodolit ve total station); Hata kavramı; Poligon hesabı; Nivelman; İleriden ve geriden kestirme; Jeodezik ölçmeler ve jeodezide datum; GPS hakkında genel bilgiler

- **Dersin Değerlendirmesi**: 1 Arasınav (%40), ve 1 Final sınavı (%60)
- **Kaynaklar**: C.D. Ghilani, P.R. Wolf; Elementary Surveying, Pearson Education International Edition, Twelfth Edition, 2008 .

DISTANCE MEASUREMENT

- In plane surveying, the distance between two points means the horizontal distance. If the points are at different elevation, the distance is the horizontal length between vertical lines at the points.

- In surveying, that most circumstances, all distance are presumed to be horizontal distances. This dictates that every field measurements taken be either measured horizontally, or if not, reduced to a horizontal distance mathematically.

- Distances can be measured in two ways:
  1. Horizontal distance
  2. Slope (surface) distance

The horizontal distance between two points is the distance between those points measured on a horizontal plane.

The slope distance between two points is a distanced measured along the surface of the earth.

DISTANCE MEASUREMENT

Methods for making linear measurements ;

There are several methods to measure distances.

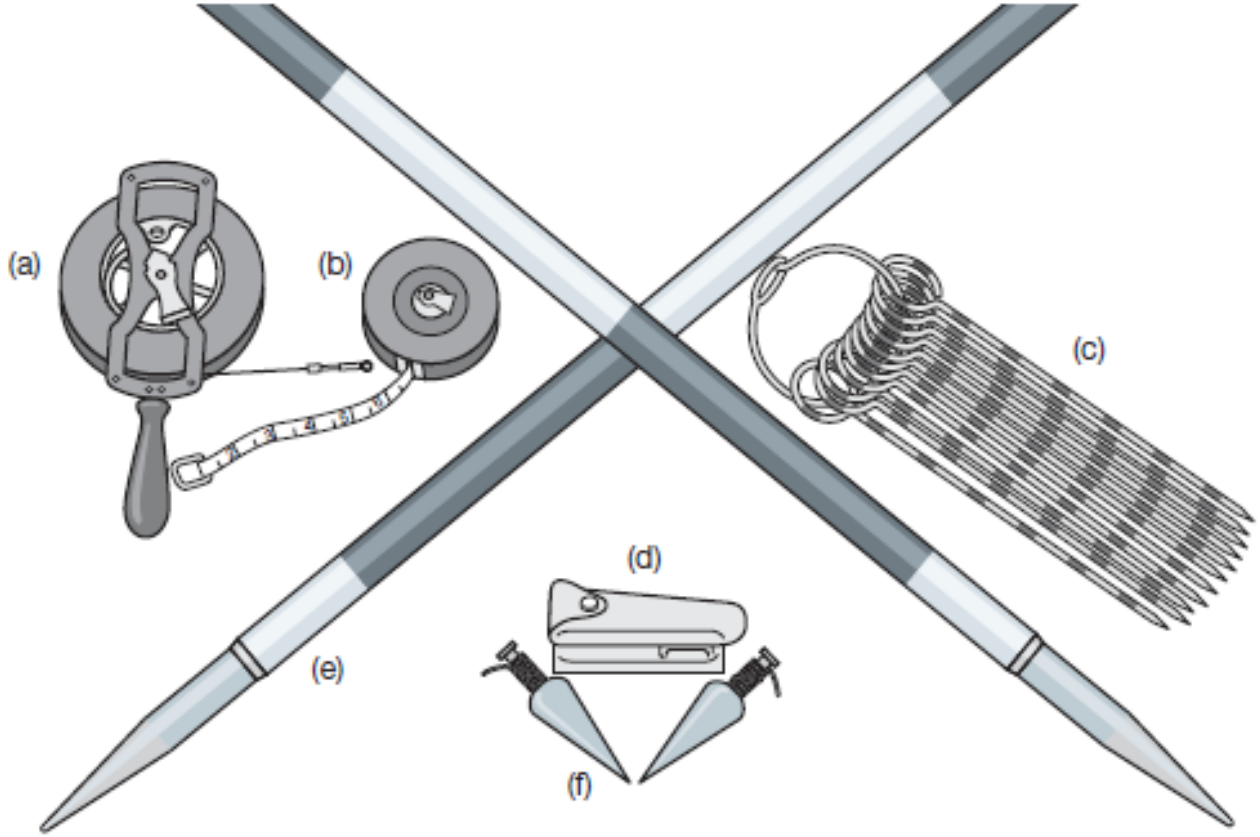
- Taping
- Tacheometry
- Electronic Distance Measurement
- Others

Most surveying field distance measurements are accomplished by using either taping (steel or fiber glass tape) or electronic distance measurements (EDM) .

1.TAPING :

- Taping is the linear measurement of the horizontal distance between two points using a surveyor's tape.
- Measurement of horizontal distances by taping consists of applying the known length of a graduated tape directly to line a number of times.

Taping equipment and accessories:



Taping equipment and accessories:

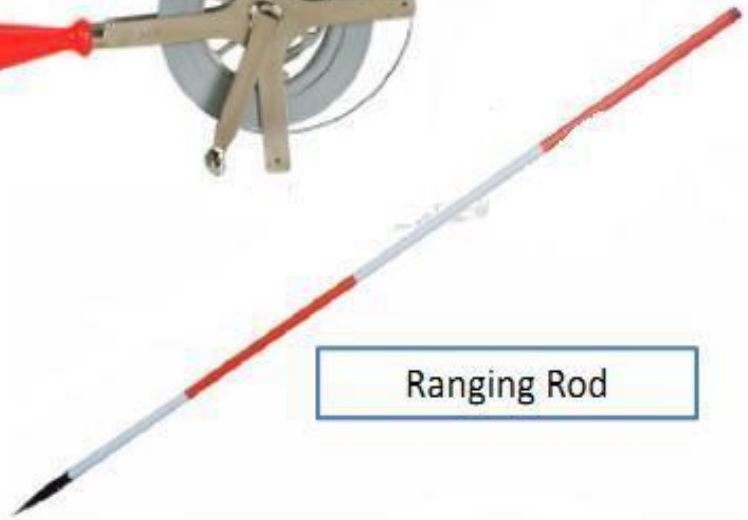
Plumb-Bob

Pegs

Steel Tape

Tripod

Chalk



Ranging Rod

Taping equipment and accessories:

- Metric tapes have standard lengths of 10, 20, 30, 50, 60 ,100 m. All can either be wound on a reel (a) or done up in loops.
- Invar tapes are made of special steel to reduce length variations caused by differences in temperature.
- Cloth (metallic) tapes are actually made of high-grade linen, with fine copper wires running lengthwise to give additional strength and prevent excessive elongation. (b)
- Chaining pins (taping pins) are used to mark tape lengths .Most taping pins made of sharply pointed at one end, have a round loop at the other end, and are painted with alternate red and white bands (c) .
- The hand level is a simple instrument used to keep tape ends at equal elevations when observing over rough terrain (d) .

Taping equipment and accessories:

- Range poles (lining rods) made of wood, steel or aluminum. The main utility of range poles is to mark the line being measured so that the tape's alignment can be maintained (e).
- Plump bobs are used in taping to permit the surveyor to hold the tape horizontal when the ground is sloping. A graduation mark on the horizontal tape can be transferred down to a point on the ground using the plumb bob string. Also, a plumb bobs can be used to provide precise theodolite and total station sightings.(f)

TAPING ON LEVEL GROUND

- The subsections that follow describe steps in taping on level ground using a tape.
- Using range poles, the line to be measured should be marked at both ends, and at intermediate points where necessary,
- Taping requires a minimum of two people, a *forward tapeperson* and a *rear tapeperson*.
- The forward tapeperson is lined in by the rear tapeperson. Directions are given by vocal or hand signals.

TAPING ON LEVEL GROUND

- The rear tapeperson holding the 0m end of a tape over the first point lines in while the forward tapeperson, holding the other end of the tape. For accurate results the tape must be straight and the two ends held at the same elevation. A specified tension is applied.
- In some case, Plumb-bob is used to hold the tape above ground in a horizontal position. Placing the plumb-bob string over the proper tape graduation and securing it with one thumb, mark each end point on the tape. The rear tapeperson continues to hold a plumb over the fixed point, while the forward tapeperson marks the length. In measuring a distance shorter than a full tape length, the forward tape person moves the plumb-bob string to a point on the tape over the ground.

TAPING ON LEVEL GROUND

- When the tape has been lined in, tension has been applied, and the rear tapeperson is over the point, "stick" is called out. The forward tapeperson then places a pin exactly opposite the zero mark of the tape and calls " stuck". The marked points is checked by repeating the measurement until certainty of its correct location is assured.
- After checking the measurement, the forward tapeperson signals that the point is "OK!" the rear tapeperson pulls up the rear pin, and they move ahead. The forward tapeperson drags the tape, paces roughly 30m, and stops. The rear tape person calls "tape" to notify the forward tapeperson that they have gone 30m. The process of measuring 30m lengths is repeated until a partial tape length is needed at the end of the line.

DISTANCE MEASUREMENT:

1)Sources of error in taping:

a)Instrumental errors : A tape may differ in actual length from its nominal graduates length because of a defect in manufacture or repair, or as a result of kinks.

b)Natural errors: The horizontal distance between end graduations of tape varies because of the effects of temperature, wind, and weight of tape itself.

c)Personal errors: Tapeperson setting pins, reading the tape.

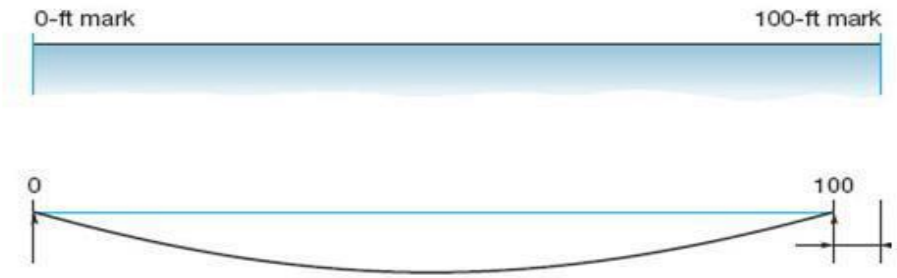
Sources of error in taping:

- Temperature:
  - Whatever material is used to make a tape, that material will expand and contract with any change in temperature. Some
- materials are more affected than others, but every tape will change
- length somewhat if warmed or cooled.
- If precise measurements are needed, an adjustment needs to be made for the change in temperature between the current temperature and the temperature at the time the tape was checked against a known distance.

Sources of error in taping:

1.3. Sag:

When a tape is suspended from each end and not supported along it's length, the weight of the tape causes it to sag. Because of sag, the horizontal distance is less than the graduated distance between tape ends. Sag can be reduced by applying greater tension. For all measurements, adequate tension should be applied to minimize the effective shortening of the tape.



Sources of error in taping:

1.4. Tension (inconsistent pull):

While a certain amount of tension is desirable to help offset the sag effect, it will also stretch the tape. Steel will still stretch to some degree if tension is applied. When a tape is checked against a known distance, the applied tension should be controlled.

1.5.Improper Plumbing:

Practice and steady nerves are necessary to hold a plumb bob still long enough to mark a point. The plumb bob will sway, even in calm weather. Errors caused by improper plumbing are random, since they may make distances either too long or to short. However, the errors would be systematic when taping directly against or in the direction of a strong wind.

Sources of error in taping:

6. <u>Tape not horizontal and tape off-line:</u>

- Error caused by the tape not being horizontal are systematic and always make recorded lengths longer than true lengths. Also, errors from the tape being off – line are systematic and they too make recorded lengths longer than true lengths. This type of error can be eliminated by careful alignment.

7. <u>Incorrect reading or interpolation (mistake):</u>

- The process of reading to hundredths on tapes graduated only to tenths, or to thousandths on tapes graduated to hundredths, is called interpolation. Errors from this source are random over the length of a line. They can be reduced by care in reading, employing a magnifying glass.

Sources of error in taping:

1.8. Constant errors:

If a tape has been kinked or broken and spliced back together, there is a good chance that there will be a consistent error for any distances measured using that portion of the tape. This error needs to be added or subtracted as appropriate each time.

ANGLES AND DIRECTIONS

Determining the location of points and orientations of lines frequently depends on measurements of angles and directions. Angles measured in surveying are classified as either horizontal or vertical, depending on the plane in which they are observed.

Horizontal angles are the basic observations needed for determining azimuths. Vertical angles are used in trigonometric leveling, and for reducing slope distances to horizontal.

Angles are most directly observed in the field with theodolites and total stations.

ANGLES AND DIRECTIONS

An angle is defined as the difference in direction between two convergent lines. Three basic requirements determine the angle.

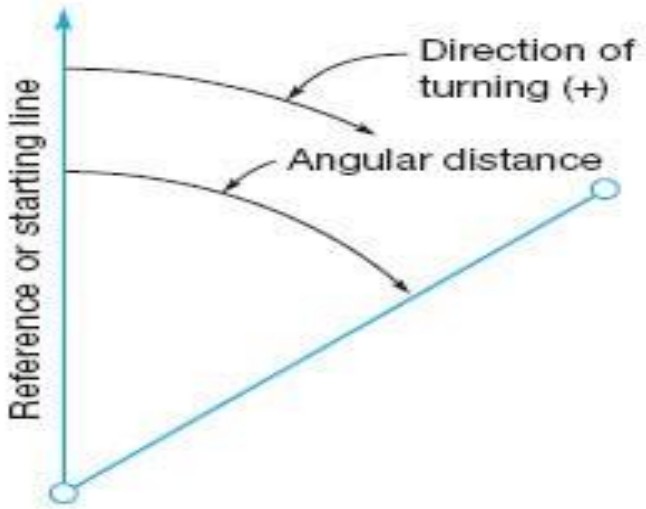


Figure:1(C.D.Ghilani & P.R.Wolf,2008)

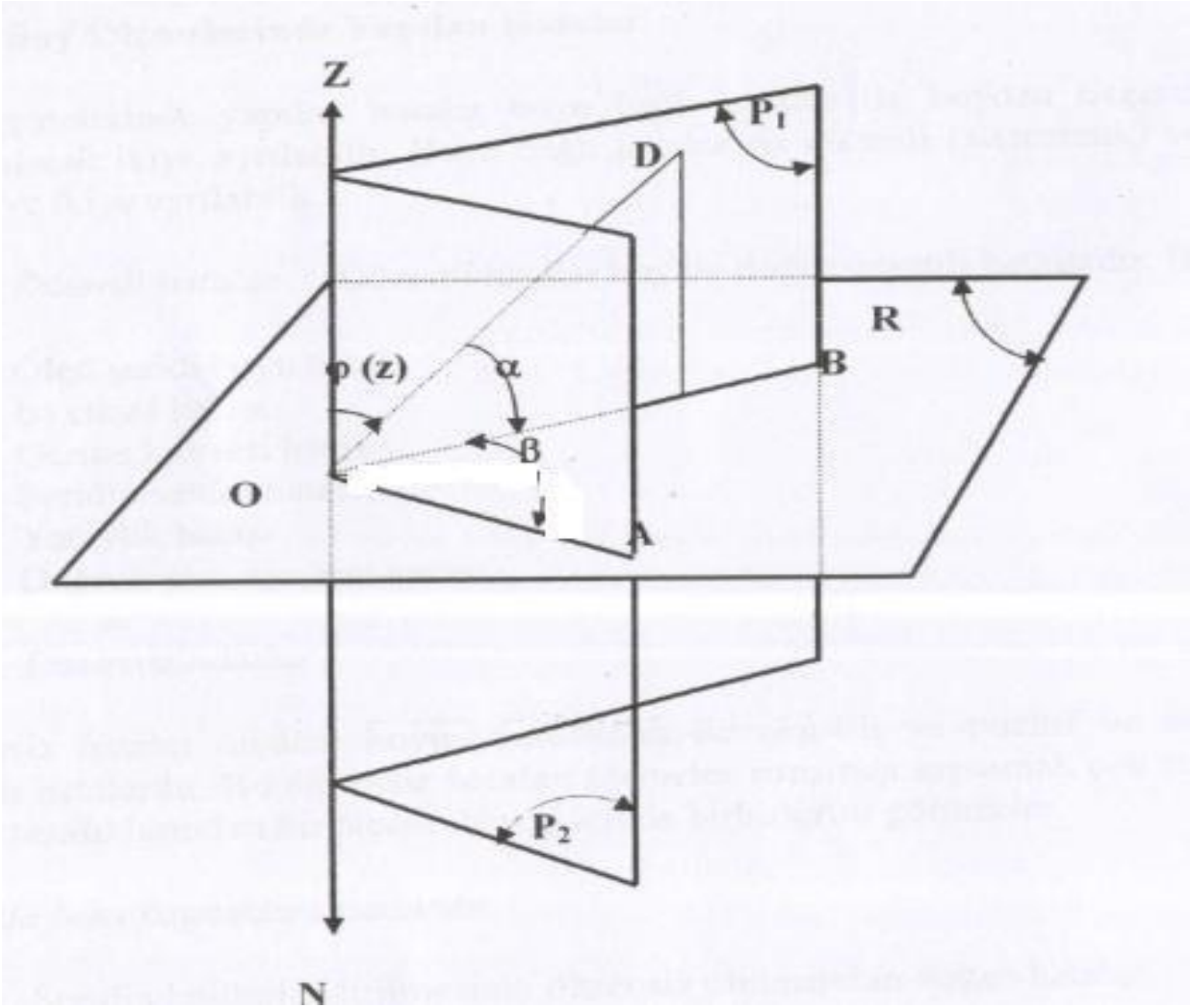
As shown in this figure:1,

(1) reference or starting line

(2) direction of turning

(3) angular distance (value of the angle).

ANGLES AND DIRECTIONS



ANGLES AND DIRECTIONS

Vertical line: is a line that follows the direction of gravity as indicated by a plumb line. (Figure2: ZN line)

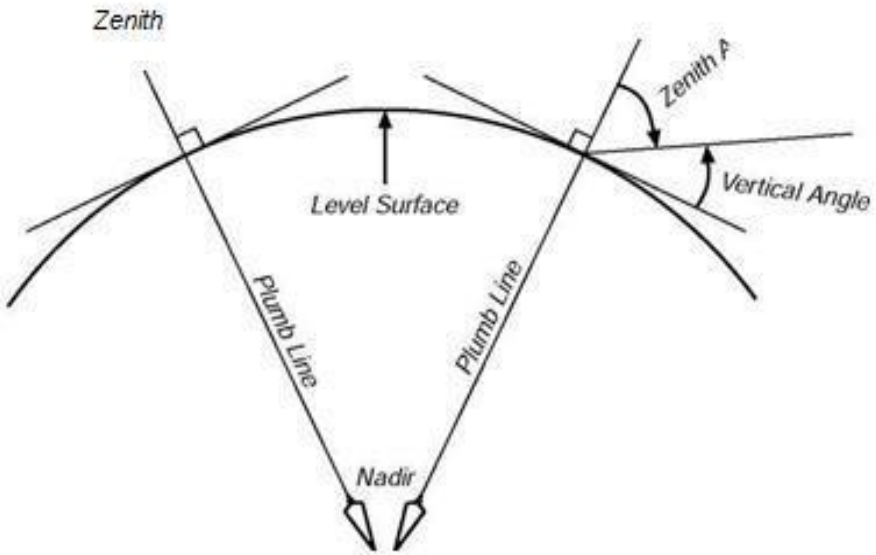
Horizontal line: is a line in a horizontal plane. In plane surveying, a line perpendicular to the vertical. (Figure2: OA and OB line)

Horizontal plane: is a plane perpendicular to the direction of gravity. In plane surveying, a plane perpendicular to the plumb line. (Figure2: R plane)

Vertical plane: is a plane, including vertical line, perpendicular to horizontal plane. (Figure2: P_1 and P_2 plane)

Horizontal angle: is formed by the directions to two objects in a horizontal plane. (Figure2: ß angle, BOA angle)

ANGLES AND DIRECTIONS



(*Basic Surveying The Theory and Practice,2000.*)

Level surface: is a curved surface that every point is perpendicular the plumb line.

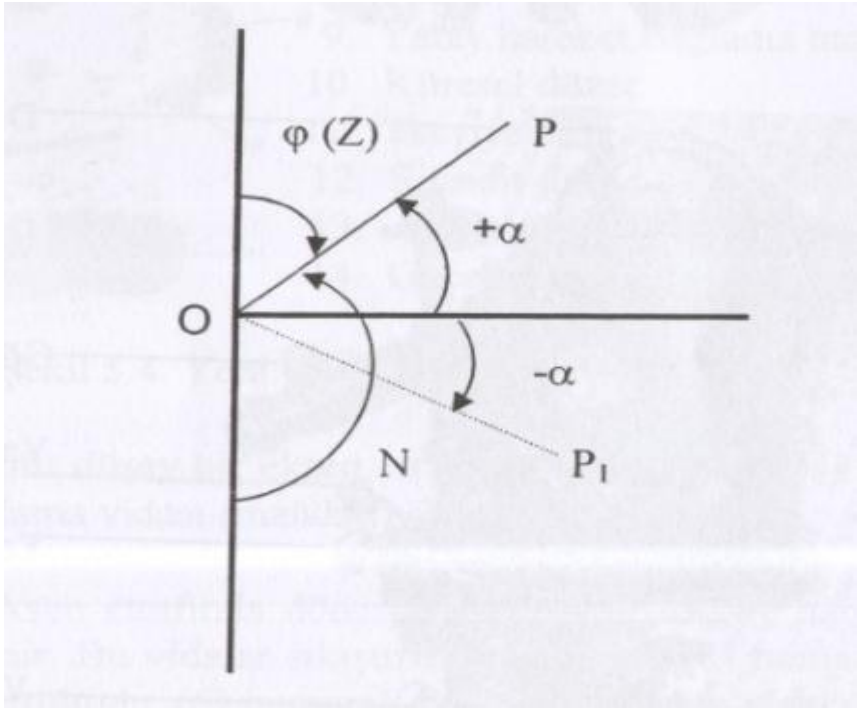
Plumb line: is a line that follows the direction of gravity.

Zenith (vertical) angle : is formed by two intersecting lines in a vertical plane, one of these lines being horizontal.

Altitude angle: is the complementary angle to the zenith angle and is formed by two intersecting lines in a vertical plane, one of these lines directed toward the zenith.

ANGLES AND DIRECTIONS

Vertical angles:



- Z : zenith angle
- N : Nadir angle
- α : slope angle
  - (altitude angle)
  - N : 200^g - Z
- Z + α = 100^g

ANGLES AND DIRECTIONS

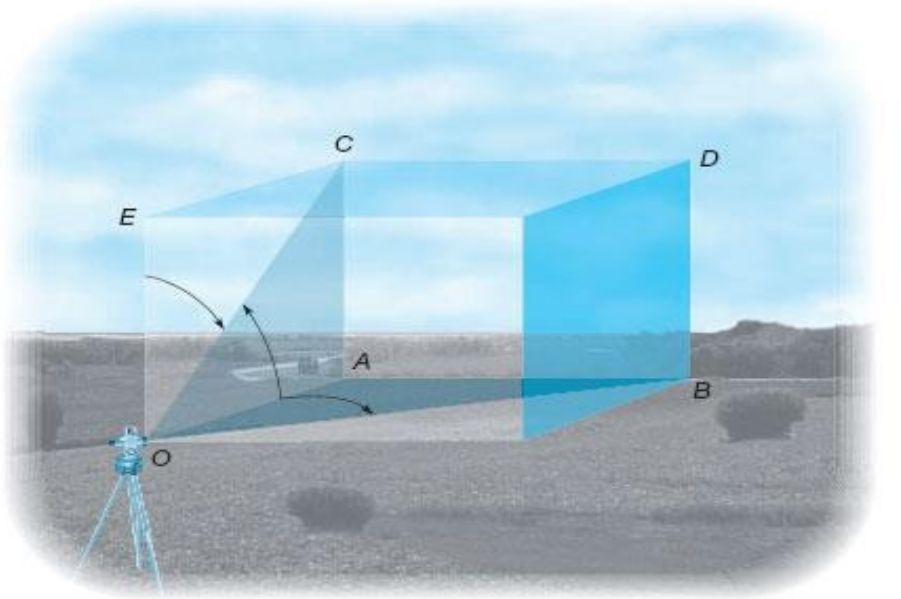


Figure:5 (C.D.Ghilani & P.R.Wolf,2008)

In the Figure:5; OAB and ECD are horizontal planes, and OACE and ABDC are vertical planes.

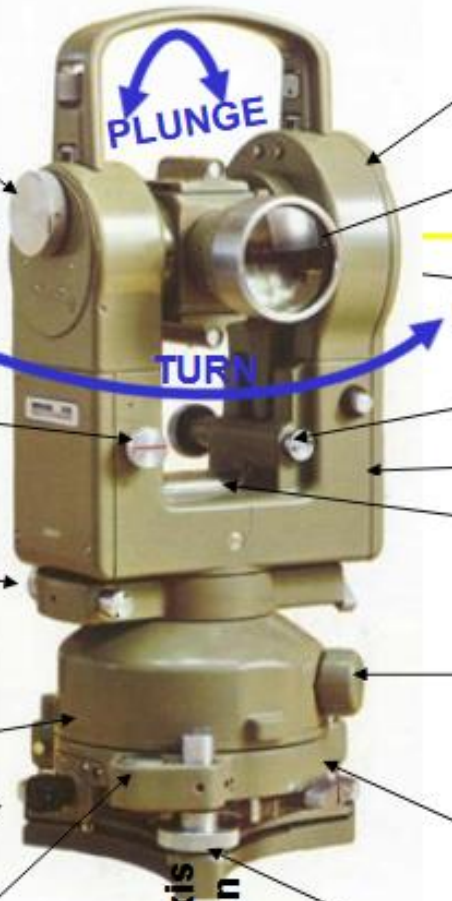
Then as illustrated, horizontal angles, such as angles AOB, and horizontal distances OA and OB , are measured in horizontal planes.

Altitude (vertical) angles, such as AOC, are measured in vertical planes; zenith angles, such as EOC, are also measured in vertical planes; vertical lines, such as AC and BD, and slope distance, such as OC, are determined along inclined planes.

Theodolite:

A theodolite is an instrument which is used primarily to measure angles, both horizontal and vertical. It is also used for many other subsidiary work during surveying such as setting up of intermediate points between inter visible points, establishment of inter visible points, prolonging a line, etc.

COMPONENTS OF A TYPICAL 'OPTO-MECHANICAL' THEODOLITE



Micrometer for Circle Readings

Vertical Circle

Objective of Telescope

Fine Vertical Adjustment for Telescope Alignment (Tangent Screw)

Optical Switch for Horizontal/ Vertical Circle Readings

Standard

Fine Horizontal Adjustment for Telescope Alignment (Tangent Screw)

Precise Hor. Bubble (Plate Bubble)(Tubular bubble)

Horizontal Circle Adjustment For Orientation (Orientation Driver)

Horizontal circle housing

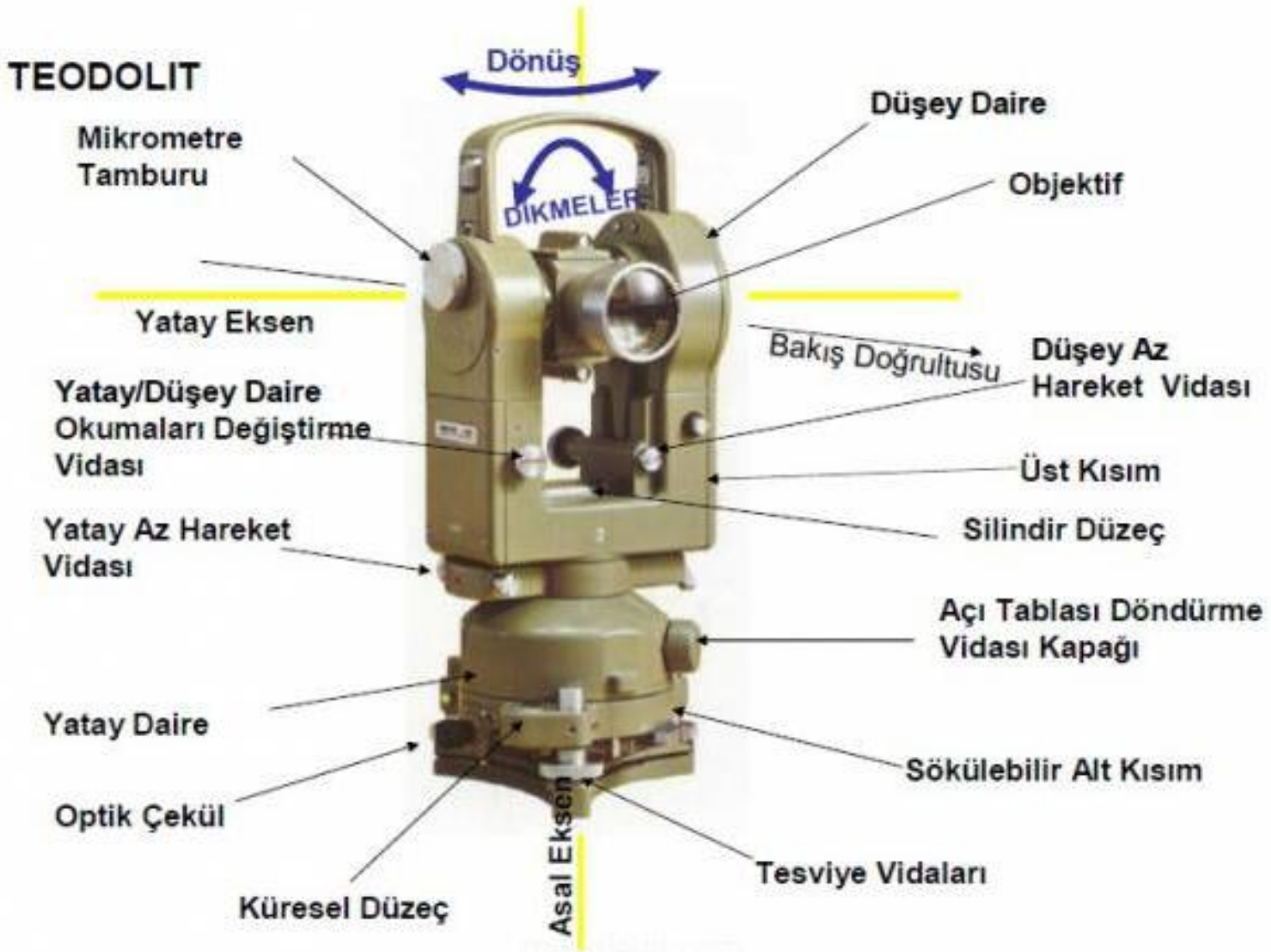
Eye piece of optical plummet

Tribrach (detachable)

Foot Screw

Circular Bubble

Teodolitin Ana Parçaları



Main Components

- **Upper Plate**: It is the base on which the standards and vertical circle are placed.
- **Vertical Scale (Circle): I**t is a full 400g scale. It is used to measure the angle between the line of sight (collimation axis) of the telescope and the vertical axis.

- **The Lower Plate**: It is the base of the whole instrument. It houses the foot screws and the bearing for the vertical axis.

- **Horizontal Scale (Circle):** It is a full 400g scale. It is often placed between the upper and lower plates. It is capable of full independent rotation about the trunnion axis.
- **Standards** are the frames which supports telescope and allow it to rotate about vertical axis.

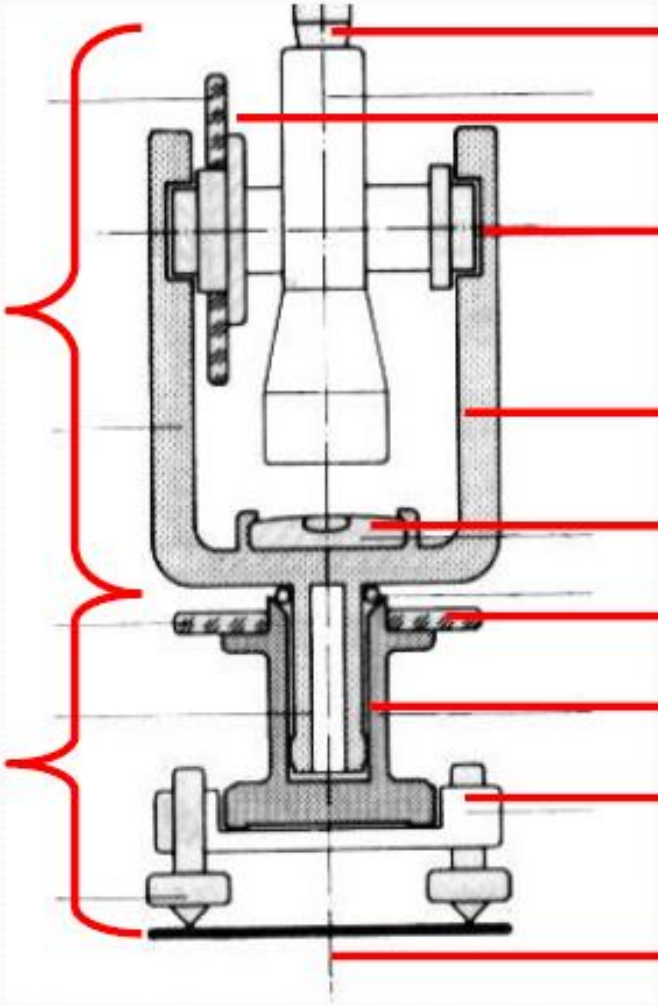
Main Components

- **Clamps and tangent screws (fine motion screw) :**
- There are two clamps and associated tangent screws.
- **Lower clamp screw** locks or releases the lower plate. When this screw is unlocked both upper and lower plates move together.
- The associated **lower tangent screw** allows small motion of the plate in locked position.
- The **upper clamp screw** locks or releases the upper plate. When this clamp is released the lower plate does not move but the upper plate moves with the instrument. The **upper tangent screw** allows the fine adjustment.
- **Vertical Clamp and Tangent Screw (fine motion screw)** : This allow free transiting of the telescope. When clamped, the telescope can be slowly transited using vertical tangent screw.
- **The horizontal clamp screw and fine motion screw (tangent screw)** controls locks the upper part of the theodolite in any desired position on its horizontal plane. Fine motion screw provides precise adjustment in the horizontal positioning of the telescope

- The ***tribrach*** consists of three screws, a circular level, clamping device to secure the base of the total station, and threads to attach the tribrach to the head of a tripod. As shown in Figure, some tribrachs also have optical plummets (described below) to enable centering accessories over a point without the instrument.
- An ***optical plummet***, built into either the tribrach or alidade of total station instruments, permits accurate centering over a point.

Figure Tribrach with optical plummet

Axes of Theodolite



Upper Plate
Üst yapı

LowerPlate
Alt yapı

Dürbün Telescope

Düşey açı dairesi vertical circle

Muylu ekseni

Gövde

Silindirik düzeç

Yatay açı dairesi horizontal circle

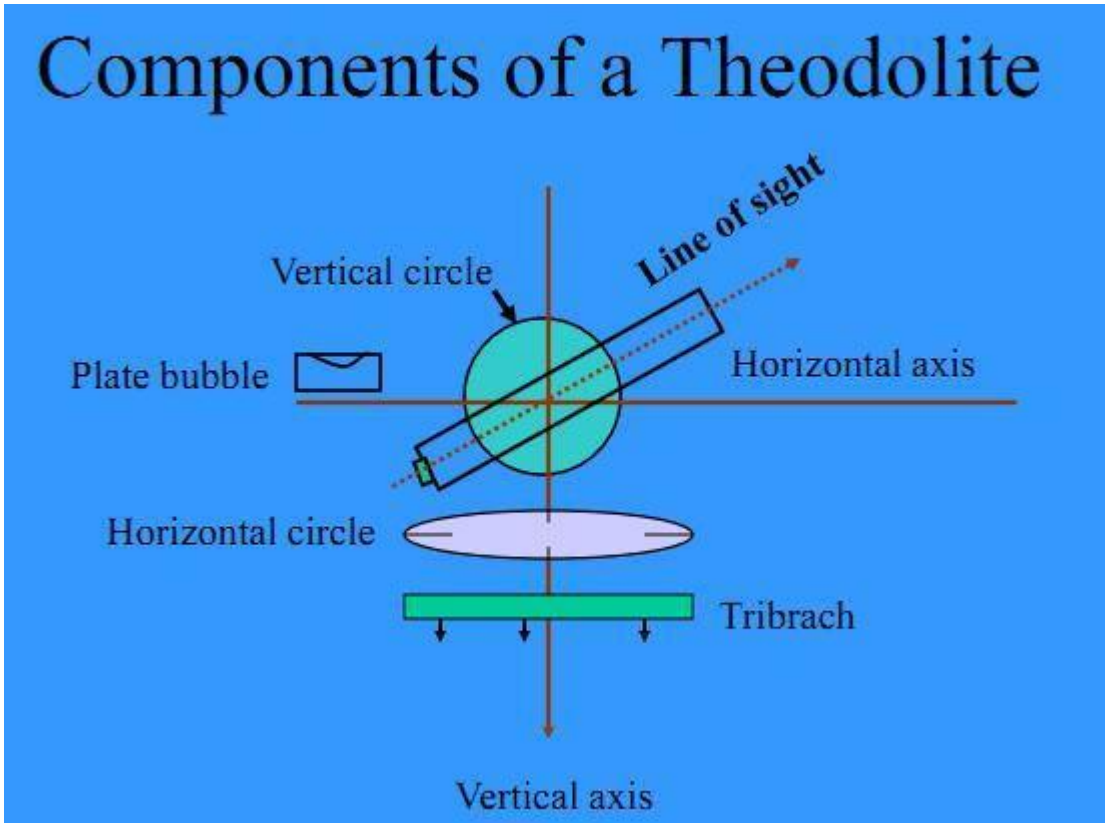
Düşey eksen yuvası

Üç ayak tribrach

Düşey eksen Vertical axis

Theodolite:

Components of theodolite



Theodolite:

<u>Axes of theodolite:</u>

SS: Vertical (standing) axis

TT: Horizontal (Trunnion) axis

PP: Plate(tubular) bubble axis

CC: Collimation axis(line of sight)

$CC \perp TT$

$PP \parallel TT$

$SS \perp PP$

$SS \perp TT$

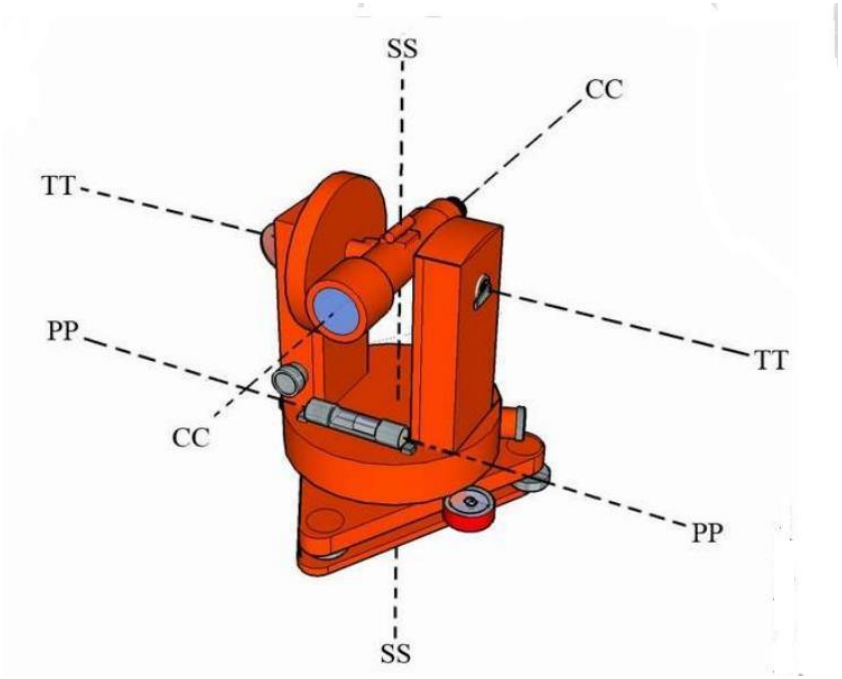


Figure:10(H.Özener , Surveying Lecture Notes

Theodolite:

Axes of theodolite:

The most important relationships are as follows:

1. The axis of plate bubble should be in a plane perpendicular to the vertical axis.(main axis order).
2. The line of sight should be perpendicular to the horizontal axis.
3. The horizontal axis should be perpendicular to the vertical axis