CE 371 Surveying
TRAVERSING _1

Dr. Ragab Khalil
Department of Landscape Architecture
Faculty of Environmental Design
King AbdulAziz University
Room LIE15

Overview

- Introduction
- Types of Traverses
- Methods of Measuring Traverse Angles
- Measurement of Traverse Sides
- Angle Misclosure
- Radial Traversing
- Notes on Azimuth Computations
- Mistakes in Traversing

Introduction

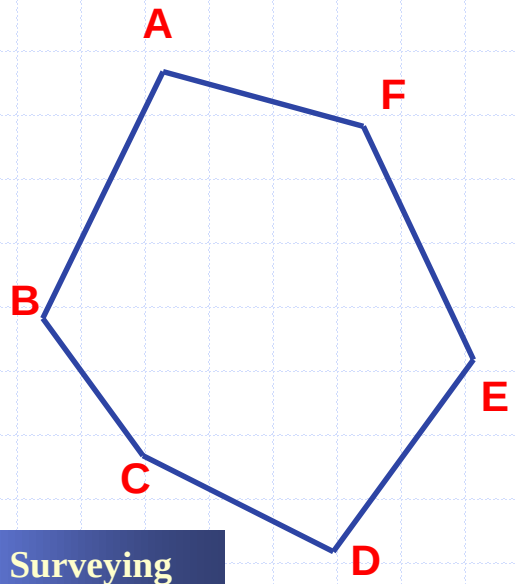
- **A traverse** is a series of consecutive lines whose lengths and directions have been determined from field measurements.
- **Traversing** is the act of establishing traverse stations and making the necessary measurements.
- **Traversing** is one of the basic means of determining the relative locations of points, and the lengths and directions of lines.

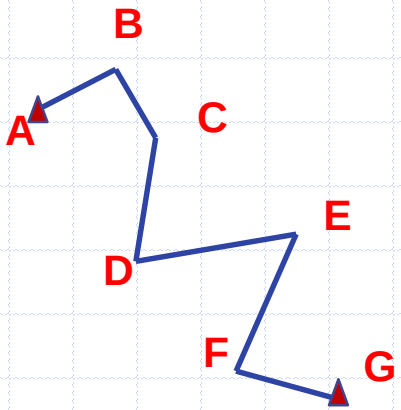
Types of Traverses

- There are two types of traverses

1. Closed traverse:

1. traverse lines return to the starting point thus forming a closed polygon (geometrically and mathematically closed).
2. traverse lines start at one control point and close at another control point, thus forming a geometrically open traverse but mathematically closed.



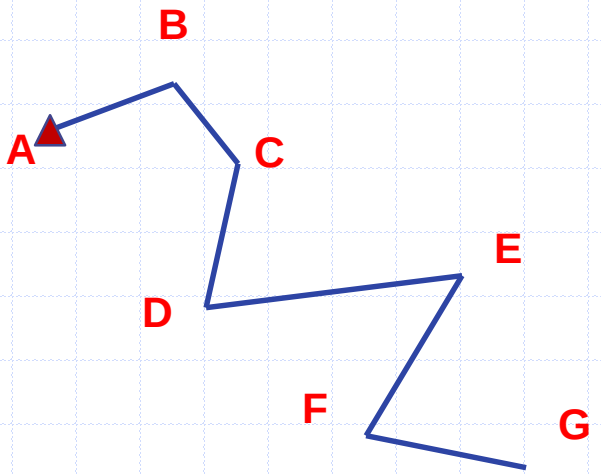


Types of Traverses

- There are two types of traverses

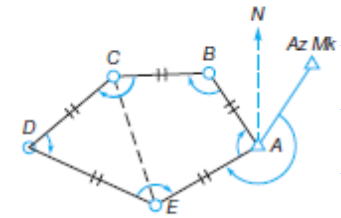
2. Open traverse:

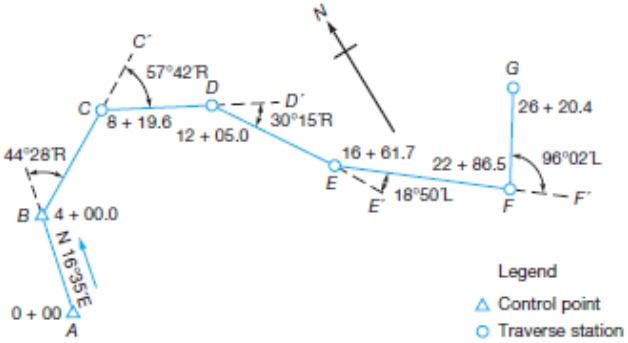
1. A series of lines starting at a point and closing at another point.
2. One or both terminal points are non-control points.
3. Thus forming a geometrically and mathematically open traverse.
4. Such traverses should be avoided, if possible, because there is no way of checking measurements.

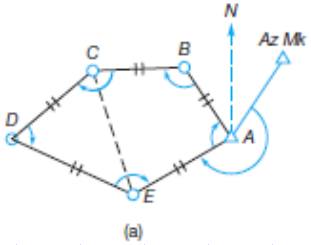


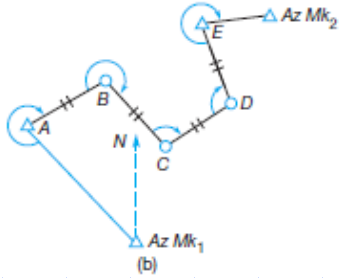
Methods of Measuring Traverse Angles

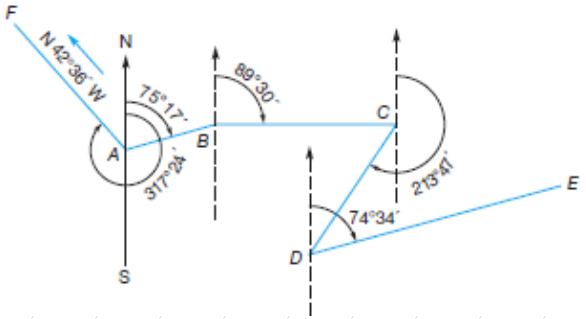
- Traversing by Interior Angles
- Traversing by Deflection Angles
- Traversing by Angles to the Right
- Traversing by Azimuths
  - Total station
  - compass











Measurement of Traverse Sides

- Traverse sides are measured by
  - tapes,
  - EDM instruments, or
  - by stadia.
- The method used depends on the required accuracy

Angle Misclosure

In a polygon traverse

$E_c = \Sigma(\text{Interior angles}) - 180\,(n-2)$

$E_c = \Sigma(\text{Exterior angles}) - 180\,(n+2)$

Allowable angle misclosure E_A $\quad E_A = k\sqrt{n}$

n : the number of traverse angles

K : constant

= 1.7″ 1st order

= 3″ 2nd order class 1

= 4.5″ 2nd order class 2

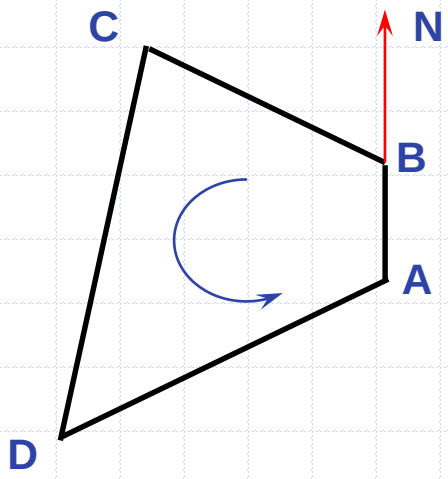
= 10″ 3rd order class 1

= 12″ 3rd order class 2

Sometimes k is taken as the least division of the theodolite scale.

Angle Misclosure example

The angles were measures using 5″ theodolite



Point	Internal Angle	Adjusted Angle
A	132 15 30	**132 15 28**
B	126 12 52	**126 12 50**
C	069 41 18	**069 41 16**
D	031 50 28	**031 50 26**
Σ actual	**360 00 08**	**360 00 00**
Σ =(n-2)*180	**360 00 00**	
Misclose	**08″**	Corr. =8″/4=2
Allowable	**10″**	**5″ *√4**

Missing Angle example

- In a six-sided polygon traverse five interior angles were observed as 121°36 ′06″, 125°16 ′04″, 123°21′ 44″, 121°09′ 58″, and 120°30′ 12″. Calculate the value of the missed angle. (the measured angles are correct)

- Solution

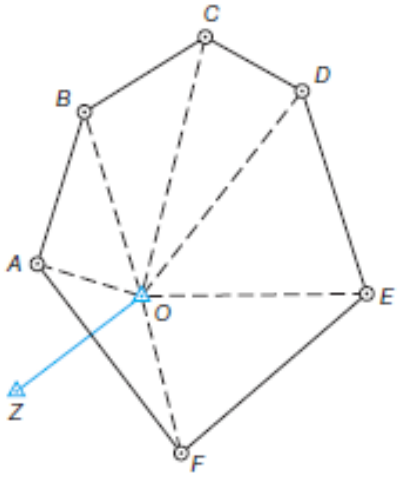
- Σ observed = 121° 36′ 06″+ 125° 16′ 04″+ 123° 21′ 44″ +121°09′ 58″ + 120°30′ 12″ = 611° 54′ 04″

- Σ (interior angles) =(n-2)*180 = (6-2) x 180 = 720°

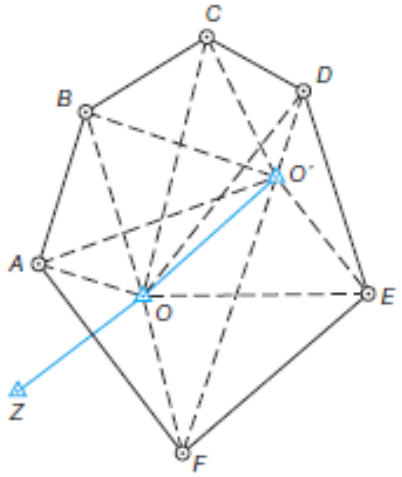
- The missed angle = 720 - 611° 54′ 04″ = 108° 05′ 56″

Radial Traversing

- Radial traversing is used when it is difficult to set up the theodolite on traverse stations.
- Radial traversing is also used in topographic surveys for ease of use.
- Radial traversing is best suited for total stations where all angles and distances are measured from one instrument setup



(a)



(b)

Notes on Azimuth Computations

- Clockwise polygon traverse:

  Azimuth of a line = back azimuth of the previous line - the interior angle.
- Counterclockwise polygon traverse:

  Azimuth of a line = back azimuth of the previous line + the interior angle.
- Open traverse with angles to the right:

  Azimuth of a line = back azimuth of the previous line + angle to the right.
- Open traverse with angles to the left:

  Azimuth of a line = back azimuth of the previous line - angle to the left.
- Traverse with deflection angles:

  Azimuth of a line = azimuth of the previous line + deflection angle.

  (Clockwise deflection angle is positive, counterclockwise is negative)

Mistakes in Traversing

1. Errors in measuring angles and distances.
2. Poor selection of traverse stations (angle points).
3. Failing to measure the angles with double centering and repetitions.
4. Occupying or sighting on the wrong station.
5. Failing to sharply focus the lenses and to remove parallax.
6. Failing to center the theodolite exactly over the point.
7. Confusing angles to the right or left, or horizontal to vertical angles.
8. Misreading and miswriting measurements.

Summary

- Introduction
- Types of Traverses
- Methods of Measuring Traverse Angles
- Measurement of Traverse Sides
- Angle Misclosure
- Radial Traversing
- Notes on Azimuth Computations
- Mistakes in Traversing