

CEST 50A Plane Surveying

Traverse Computations

Procedures for Balancing a Closed Traverse:

- Balance the interior angles of the traverse.
- Compute the Bearings or Azimuths of each course.
- Compute the Latitudes and Departures of each course.
- Determine the Linear Misclosure of the traverse.
- Compute the Relative Accuracy of the traverse.
- Compute the corrections for Latitudes and Departures.
- Balance the Latitudes and Departures for each course.
- Compute the coordinates (northings & eastings) of each Traverse Point.
- Compute the area of the closed polygon.

Computing Latitudes & Departures:

$$\text{Lat}_{AB} (\Delta N_{AB}) = \text{Distance}_{AB} (\text{Cos Bearing}_{AB}) \text{ or } \text{Lat}_{AB} (\Delta N_{AB}) = \text{Distance}_{AB} (\text{Cos Azimuth}_{AB})$$

$$\text{Dep}_{AB} (\Delta E_{AB}) = \text{Distance}_{AB} (\text{Sin Bearing}_{AB}) \text{ or } \text{Dep}_{AB} (\Delta E_{AB}) = \text{Distance}_{AB} (\text{Sin Azimuth}_{AB})$$

Determine the Linear Misclosure of Traverse:

$$\text{Linear Misclosure} = \sqrt{(\sum \text{Lat})^2 + (\sum \text{Dep})^2}$$

Determine the Relative Accuracy of Traverse:

$$\text{Relative Accuracy (RA): } 1 : \frac{\text{Perimeter of Traverse}}{\text{Linear Misclosure}}$$

Compute the Corrections for Latitudes & Departures:

$$\text{Corr'n to Latitude}_{AB} (\text{CLat}_{AB}) = \frac{(\sum \text{Lat}) (\text{Distance}_{AB})}{\text{Perimeter}}$$

$$\text{Corr'n to Departure}_{AB} (\text{CDep}_{AB}) = \frac{(\sum \text{Dep}) (\text{Distance}_{AB})}{\text{Perimeter}}$$

Note: The correction to the Latitude and Departures is opposite in algebraic sign to the sum of the Latitudes and Departures.

Balance the Latitudes & Departures:

$$\text{Balanced Latitude}_{AB} = \text{Lat}_{AB} + (\text{CLat}_{AB})$$

$$\text{Balanced Departure}_{AB} = \text{Dep}_{AB} + (\text{CDep}_{AB})$$

Compute Coordinates (Northings & Eastings) of Traverse Points:

Northing "B" (N_B) = Northing "A" (N_A) + Balanced Latitude_{AB}

Easting "B" (E_B) = Easting "A" (E_A) + Balanced Departure_{AB}

Compute Bearings and Distances between two points:

$$\text{Distance}_{AB} = \sqrt{(\Delta E_{AB})^2 + (\Delta N_{AB})^2}$$

$$\text{Bearing Angle} = \tan^{-1} \frac{(\Delta E_{AB})}{(\Delta N_{AB})}$$

Calculations for the Area of a 4 Course Traverse:

Coordinate Method:

$$\text{Area} = \frac{E_A(N_B - N_D) + E_B(N_C - N_A) + E_C(N_D - N_B) + E_D(N_A - N_C)}{2}$$

Double Meridian Distance Method:

Area = Take the sum of the product of the DMD of each course multiplied by the Latitude of each course and divide by 2.

The DMD of each course is computed as follows:

The DMD of the first course = the Departure of the first course.

The DMD of each succeeding course = the DMD of the previous course + the Departure of the preceding course + the Departure of that course.

The DMD of the last course *should* = the Departure of the last course but opposite in algebraic sign.