

## LECTURE 1

### Introduction:

- Surveying is defined as □taking a general view of, by observation and measurement determining the boundaries, size, position, quantity, condition, value etc. of land, estates, building, farms mines etc. and finally presenting the survey data in a suitable form□. This covers the work of the valuation surveyor, the quantity surveyor, the building surveyor, the mining surveyor and so forth, as well as the land surveyor.
- Another school of thought define surveying □as the act of making measurement of the relative position of natural and manmade features on earth□s surface and the presentation of this information either graphically or numerically.

**The process of surveying is therefore in three stages namely:**

#### (i) Taking a general view

This part of the definition is important as it indicates the need to obtain an overall picture of what is required before any type of survey work is undertaken. In land surveying, this is achieved during the reconnaissance study.

#### (ii) Observation and Measurement

This part of the definition denotes the next stage of any survey, which in land surveying constitutes the measurement to determine the relative position and sizes of natural and artificial features on the land.

#### (iii) Presentation of Data:

The data collected in any survey must be presented in a form which allows the information to be clearly interpreted and understood by others. This presentation may take the form of written report, bills of quantities, datasheets, drawings and in land surveying maps and plan showing the features on the land.

### Types of Surveying

On the basis of whether the curvature of the earth is taken into account or not, surveying can be divided into two main categories:

**Plane surveying:** is the type of surveying where the mean surface of the earth is considered as a plane. All angles are considered to be plane angles. For small areas less than  $250 \text{ km}^2$  plane surveying can safely be used. For most engineering projects such as canal, railway, highway, building, pipeline, etc constructions, this type of surveying is used. It is worth noting that the difference between an arc distance of 18.5 km and the subtended chord lying in the earth□s surface is 7mm. Also the sum of the angles of a plane triangle and the sum of the angles in a spherical triangle differ by 1 second for a triangle on the earth□s surface having an area of  $196 \text{ km}^2$ .

## LECTURE 7

### IMPORTANCE OF SCIENTIFIC HONESTY

- Honesty is essential in booking notes in the field and when plotting and computations in the office. There is nothing to be gained from cooking the survey or altering dimensions so that points will tie-in on the drawing. It is utterly unprofessional to betray such trust at each stage of the survey.
- This applies to the assistants equally as it does to the surveyor in charge. Assistants must also listen carefully to all instructions and carry them out to the later without questions.

### CHECK ON MEASUREMENTS

- The second principle is that; all survey work must be checked in such a way that an error will be apparent before the survey is completed.
- Concentration and care are necessary in order to ensure that all necessary measures are taken to the required standard of accuracy and that nothing is omitted. Hence they must be maintained in the field at all times.
- Surveyor on site should be checking the correctness of his own work and that of others which is based on his information.
- Check should be constantly arranged on all measurements wherever possible. Check measurements should be conducted to supplement errors on field. Pegs can be moved, sight rails altered etc.
- Survey records and computations such as field notes, level books, field books, setting out record books etc must be kept clean and complete with clear notes and diagrams so that the survey data can be clearly understood by others. Untidy and anonymous figures in the field books should be avoided.
- Like field work, computations should be carefully planned and carried out in a systemic manner and all field data should be properly prepared before calculations start. Where possible, standardized tables and forms should be used to simplify calculations. If the result of a computation has not been checked, it is considered unreliable and for this reason, frequent checks should be applied to every calculation procedure.
- As a check, the distances between stations are measured as they are plotted, to see that there is correspondence with the measured horizontal distance. Failure to match indicates an error in plotting or during the survey.
- If checks are not done on observations, expensive mistake may occur. It is always preferable to take a few more dimensions on site to ensure that the survey will resolve itself at the plotting stage.

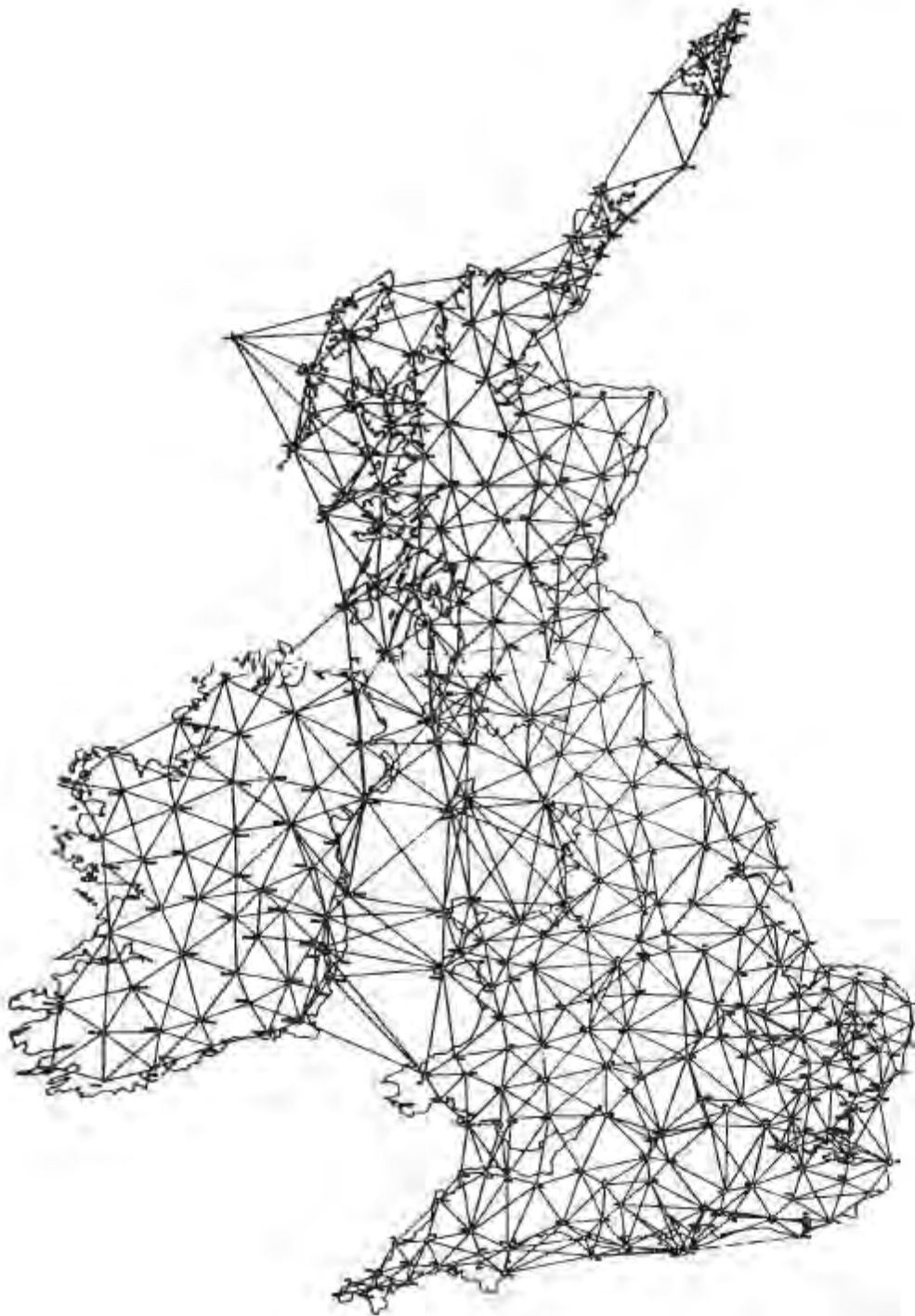


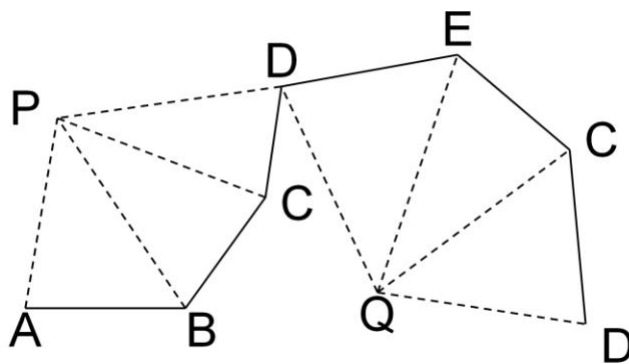
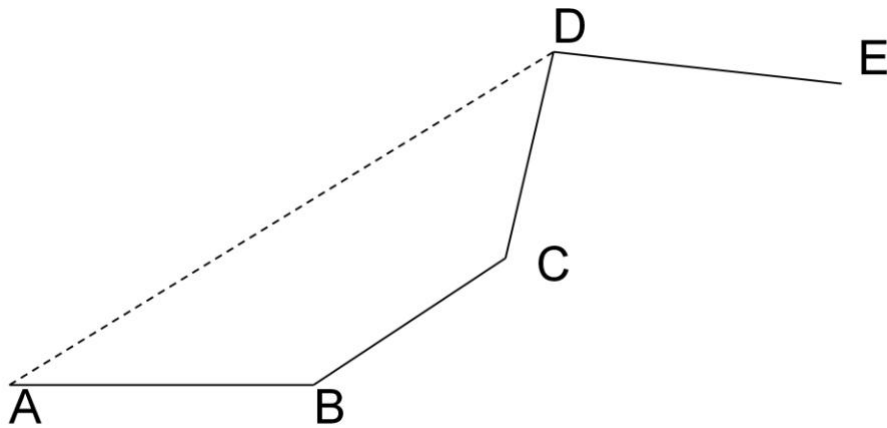
Figure 12.2

The principles of the method are illustrated by the typical basic figures shown in *Figure 12.3*. If all the angles are measured, then the scale of the network is obtained by the measurement of one side only, i.e. the base line. Any error, therefore, in the measurement of the base line will result in scale error throughout the network. Thus, in order to control this error, check base lines should be measured at intervals. The scale

## LECTURE 24

### ☐ Checks in open traverse

- No direct check of angular measurement is available
- Indirect checks
  - ❖ Measure the bearing of line AD from A and bearing of DA from D
  - ❖ Take the bearing to prominent points P & Q from consecutive station and check in plotting.



### By Repetition Method:

- Write the angles in column 4.
- Sum up all the angles and see whether they satisfy the geometric conditions as applicable, i.e.  
 sum of interior angles =  $(2n - 4)$  right angles, (ii) sum of all exterior angles =  $(2n + 4)$  right angles.
- if not, adjust the discrepancy.
- Enter corrections in column 5.
- Write the corrected angles in column 6.
- Starting from the actual or assumed bearing of the initial line, calculate the whole circle bearings of all other lines from the corrected angles and enter in column 7.
- Convert the whole circle bearings to reduced bearings and enter in column 8.
- Enter the quadrants of the reduced bearings in column 9.
- Compute the latitudes and departures of the measured lines from lengths and bearings and put in proper columns 10, 11, 12 and 13 as applicable. Sum up the latitudes and departures to find the closing error.
- Calculate corrections by applying Transit rule or Bowditch's rule as desired.
- Enter the corrections in appropriate columns 14 to 17.
- Determine the corrected latitudes and departures and enter in appropriate columns 18 to 21. They will be corrected consecutive coordinates.
- Calculate the independent coordinates of all other points from the known or assumed independent coordinates of the first station. As a check the independent coordinates of the first point should be computed. It should tally with the known or assumed value.

### **BALANCING THE CLOSING ERROR GRAPHICALLY:**

For rough surveys or traverse of small area, adjustment can also be carried out graphically. In this method of balancing, the locations and thus the coordinates of the stations are adjusted directly. Thus, the amount of correction at any station is proportional to its distance from the initial station.

Let  $P_0 Q_0 R_0 S_0 T_0 P'$  is the graphical plot of a closed-loop traverse PQRSTP. The observed length and direction of traverse sides are such that it fails to get balanced and is depicted in its graphical presentation by an amount  $P_0 P'$ .