Unit 60: Surveying Technology in Construction and Civil Engineering

Unit code: K/600/0457

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to give learners the opportunity to understand the principles of optics and the electromagnetic spectrum used for surveying, and the sources of errors that are inherent in surveying instruments. The unit also aims to develop skills in making survey measurements.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes	Assessment criteria
1 Understand how the principles of optics and electromagnetic waves are applied in surveying	1.1 Explain the principles of optics as they relate to survey instruments and measurements
	1.2 Describe the principles of electromagnetic waves as they relate to survey measurements
2 Understand the sources of systematic errors arising from the use of surveying equipment	2.1 Discuss systematic errors in surveying measurements
	2.2 Explain the need for systematic calibration of surveying instruments
3 Be able to use procedures for making survey measurements	3.1 Select the appropriate surveying procedures for three different surveys
	3.2 Use the selected procedures to perform surveys

Unit content

1 Understand how the principles of optics and electromagnetic waves are applied in surveying

Principles of optics: reflection; refraction; mirrors; lenses; prisms

Principles of electromagnetic waves: properties of waves; atmospheric influences; application to distance measurement; application to remote sensing

Surveying applications: theodolites; automatic optical levels; total stations

2 Understand the sources of systematic errors arising from the use of surveying equipment

Sources of systematic errors: in the use of tapes; levels; theodolites; electronic distance measurement (EDM)

Tapes: calibration errors

Levels: collimation errors

Theodolites: bubble and electronic plummets; horizontal and vertical collimation errors

Electronic distance measurement (EDM): collimation adjustment of modular instruments; scale and index errors

Systematic calibration: to reduce systematic errors listed above

3 Be able to use procedures for making survey measurements

Survey measurements: linear surveys; levelling; control surveys; GPS; remote sensing

Linear surveys: corrections for slope; sag; temperature; tension

Levelling: corrections for refraction; curvature

Control surveys: traversing and trigonometrical heighting; corrections for scale factor and connection to National Grid

Global Positioning System (GPS): differential GPS; multi-path

Remote sensing: satellite and aerial imagery; photogrammetry; laser scanning