

Unit 42: Science and Materials in Construction and the Built Environment

Unit code: T/600/0221

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

This unit develops learner knowledge of the factors that affect human comfort, the performance criteria applicable to construction materials, and the techniques used to produce such materials. They will also gain an understanding of how forces act on structures, construction materials and the techniques used to prevent and remedy their deterioration.

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 Know the basic factors that affect human comfort	1.1 describe the basic factors in simple scientific terms that influence human comfort in the internal environment
	1.2 describe how each factor is measured
	1.3 state acceptable values for each factor
2 Understand how forces act on structures	2.1 interpret underpinning concepts relating to structures under load
	2.2 predict simple structural behaviour from given data
3 Know the performance criteria applicable to construction materials and the techniques used to produce	3.1 identify the main performance criteria relating to the specification

such materials	of a range of vocationally relevant construction materials
4 Understand construction materials and the techniques used to prevent their deterioration	3.2 describe the production and/or manufacturing processes for two vocationally relevant construction materials
	4.1 describe the important features and properties of construction-related materials
	4.2 explain how construction materials can deteriorate in use
	4.3 explain the preventive and remedial techniques used to prevent deterioration of construction materials

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Unit content

1 Know the basic factors that affect human comfort

Factors that affect human comfort: thermal, sound, illumination

Thermal factors: physical factors (air temperature; mean radiant temperature; relative humidity; air velocity); personal factors (eg age, gender, state of health, clothing, level of activity); methods used to measure physical factors (eg thermometers, globe thermometer, hygrometer, anemometer); acceptable range of values for each factor; standard units

Sound factors: loudness of sound; frequency of sound; intrusive sound; sound insulation; methods used to measure each factor (sound level meter); acceptable range of values for each factor; standard units

Illumination factors: level of artificial lighting; level of natural lighting; glare; methods used to measure each factor (eg light meter, daylight meter); acceptable range of values for each factor; standard unit

2 Understand how forces act on structures

Structural members: struts; ties; beams; columns; walls; frames

Underpinning concepts: loadings (dead loads; imposed loads; wind loads); forces (concurrent; non-concurrent; coplanar); load configurations (point; uniformly distributed); stresses (compression; tension; bending, shear)

Predicting structural behaviour: calculations to determine important factors (eg stress, strain, modulus of elasticity, factor of safety; simple beam reactions for point loads and uniformly distributed loads); graphical methods (triangle of forces; parallelogram of forces) to solve simple frame

3 Know the performance criteria applicable to construction materials and the techniques used to produce such materials

Performance criteria relating to the specification: fitness for purpose; visual appearance; costs; resistance to degradation; ease of installation or use; environmental implications; sustainability and recycling potential; COSHH considerations; compatibility

Construction materials relevant to the learner's vocational pathway: eg limes; cements; aggregates; concrete; gypsum plasters; timber; metals; paints; bricks; plastics; liquids (especially water); gases (especially air)

4 Understand construction materials and the techniques used to prevent their deterioration

Features and properties: strength; elasticity; porosity and water absorption; thermal and moisture movement; thermal and electrical conductivity/resistivity; thermal transmittance (U values); durability; workability; density; specific heat capacity; viscosity

Deterioration: corrosion; electrolytic action; fungal attack; insect attack; frost attack; chemical attack; sulphate attack; efflorescence; ultraviolet (UV) attack; stress; fatigue; role of water in failure mechanisms

Preventive and remedial techniques: as applicable to the construction materials specified in learning outcome 3 above

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