

Unit 85: Structural Analysis and Design in Construction

Unit code: A/600/0334

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

The aim of this unit is to enable learners to develop an understanding of design structures and skills in designing structural elements in timber, in-situ reinforced concrete and steel.

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 the concepts and data required to design structures	1.1 Discuss the structural concepts and design data required to carry out structural design
2 Be able to design structural elements in timber	2.1 Analyse structural elements to ascertain their adequacy
	2.2 Produce a suitable section size for a single-grade glued laminated beam
	2.3 Produce a suitable design for a load-bearing timber stud partition
3 Be able to design structural elements in in-situ reinforced concrete	3.1 Analyse structural elements made from in-situ reinforced concrete
	3.2 Produce designs for structural elements in in-situ reinforced concrete
4 Be able to design structural elements in steel	4.1 Analyse structural elements in steel

	4.2 Design structural elements in steel
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Unit content

1 Understand the concepts and data required to design structures

Structural concepts: shear force and bending moments; loading and support conditions; beams, frames and columns; determinate and indeterminate structures; conditions of equilibrium; degree of indeterminacy; redundancy

Design requirements: serviceability; British Standards; European Codes of Practice; design brief; specifications, material selection

2 Be able to design structural elements in timber

Structural elements: single-grade glued laminated beam; ply-webbed I-beam; load-bearing timber stud partition

Analysis: strength classes; service classes; magnitude and duration of loading; bearing and shear stress; conditions of equilibrium; theorem of three moments; permissible stress design; load factor design; limit state design

Design: form factor; depth factor; slenderness; selection of suitable section size

3 Be able to design structural elements in in-situ reinforced concrete

Structural elements: continuous beams; one-way spanning slabs

Analysis: theorem of three moments; beams over two and three spans; beams over unequal spans; approximate analysis; permissible stress design; load factor design; limit state design

Design: reinforcement details including diameter, spacing and overlaps; bonding and anchorage; cover required; fire resistance

4 Be able to design structural elements in steel

Structural elements: restrained beams eg fixed, pinned, propped; rigid frames eg portal frames

Analysis: slope deflection method; moment distribution method; inflection points; permissible stress design; load factor design; limit state design

Design: suitable sections; connection details