# Unit 2: Construction Technology

**Level:** **4**

**Credits:** **15**

**Ofqual Code:** **J/618/8081**

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## Introduction

The basic principles of construction technology have not changed for hundreds of years. However, the materials and techniques used to achieve these basic principles are constantly evolving to enable the construction industry to deliver better quality buildings. Scarcity of resources and the continuing demand of more sophisticated clients, end users and other stakeholder interests, are driving the construction industry to provide buildings that facilitate enhanced environmental and energy performance, and greater flexibility. This is in response to ever-increasing financial, environmental, legal and economic constraints.

This unit introduces the different technological concepts used to enable the construction of building elements, from substructure to completion, by understanding the different functional characteristics and design considerations that need to be borne in mind when selecting the most suitable technological solution.

## Learning Outcomes

By the end of this unit, students will be able to:

LO1 Explain the terminology used in construction technology

LO2 Describe the different techniques used to construct a range of substructures and superstructures, including their function and design selection criteria

LO3 Discuss different methods of dealing with site conditions to support building and infrastructure construction

LO4 Illustrate the supply and distribution of a range of building services and how they are accommodated within the building.

## Essential Content

### LO1 **Explain the terminology used in construction technology**

*Types of structures in the built environment*

Building scale (e.g., low, medium, high-rise)

Domestic buildings (houses, flats, multi-occupancy)

Commercial buildings (e.g., offices, shops)

Industrial buildings (e.g., light industrial, warehouses factories).

Civil engineering structures (e.g., roads, highways, bridges, tunnels)

*Structures*

Loadbearing and non-loadbearing

Structural stability

Movement and thermal expansion

*Construction methods*

Timber frame

Steel frame

Masonry

Modern Methods of Construction (MMC) (e.g., offsite manufacture, panellised systems, volumetric/modular)

*Materials*

Types (e.g., timber, concrete, brick, steel)

Properties (e.g., durability, weather and moisture resistance, acoustics, thermal performance, fire resistance)

*Environment*

Insulation (e.g., fibreglass, solid panel, expanded foam, wool)

Heat loss and heat gain

Thermal transmission

Heating and cooling (e.g., passive, active)

*Health and safety*

Fire (e.g., fire resistance, flame spread, smoke, combustion)

Building regulations

Health and safety during construction

*Construction information*

Types of information (e.g., drawings, details, specification, schedules)

Information production (e.g., CAD, Building Information Modelling [BIM])

*Sustainability*

Scarcity and renewability

Supply chain

Lifecycle (e.g., 'Cradle-to-grave', 'Cradle-to-cradle', circular economies)

*Professional bodies*

Codes of practice

Codes of conduct

Professional ethics

LO2 **Describe the different techniques used to construct a range of substructures and superstructures, including their function and design selection criteria**

*Pre-design studies*

Desk-top research

Site reconnaissance

Soil investigation

*Substructure design considerations*

Soil type and content (e.g., water and chemical content, bearing capacity)

Position of trees

Economic considerations (e.g., cost of foundation type, labour, materials)

Legal considerations (e.g., health and safety, building regulations)

Plant requirements

*Types of substructure*

Shallow and deep foundations

Strip and deep strip foundations

Pad foundations

Raft foundations

Piled foundations (including replacement and displacement piles)

*Superstructure design considerations*

Form (e.g., building form, infrastructure form)

Building/infrastructure use

Aesthetics

Substructure type

Site access

Legal considerations (e.g., health and safety, building regulations)

*Types of superstructure*

Masonry (e.g., brick, block)

Framed construction (e.g., timber, steel, composite)

Reinforced concrete

Infrastructure types (e.g., roads, bridges, tunnels)

*Walls*

External walls (e.g., cavity wall, timber frame, lightweight steel)

Wall cladding (e.g., panel systems, infill systems, composite panel systems)

Internal partition walls (e.g., timber framed, steel framed, manufactured panels)

*Roofs*

Roof types (e.g., pitched, flat roof systems)

Roof construction (e.g., beams, rafters, fascia, battens)

Roof coverings

*Floors*

Floor type (e.g., ground floors, intermediate floors)

Floor construction (e.g., decking, subfloor, screed)

Floor finishes (e.g., timber, stone, sheet, poured)

*Staircases*

Staircase types (e.g., straight, dog-leg, circular, helical)

Stair construction (e.g., timber, concrete, metal)

Means of escape

Stair elements (e.g., tread, rise, stringer, nosing)

*Finishes*

Ceiling, wall, and floor finishes.

LO3 **Discuss different methods of dealing with site conditions to support building and infrastructure construction**

*Site remediation*

Contamination management (e.g., cut-off techniques, encapsulation)

Soil remediation (e.g., stone piling, vibro-compaction, phytoremediation)

*De-watering*

Piling (e.g., sheet piling, secant piling)

Concrete methods (e.g., diaphragm walls, coffer dams, caissons, culverts)

Grout injection

Freezing

Temporary techniques (e.g., pumping, wells, electro-osmosis)

LO4 **Illustrate the supply and distribution of a range of building services and how they are accommodated within the building**

*Primary service supply*

Cold water

Gas

Electricity

*Heating*

Heat generators (e.g., boilers, solid fuel burners, combined heat and power plant)

Heating distribution (e.g., hot water, forced air, steam)

Heat delivery (e.g., radiators, fan coil units, air handling)

*Ventilation*

Mechanical (e.g., fans, pressure systems, vacuum systems, exhaust systems)

Natural (e.g., wind driven, stack ventilation, cross ventilation)

*Air conditioning*

Central air vs split system

Components (e.g., compressor, evaporator, cassette)

*Services distribution*

Hot and cold water

Single-phase and 3-phase electricity

Ventilation and air conditioning ductwork.

*Services accommodation*

Raised access flooring

Suspended ceilings

Partitioning

Rising ducts

## Learning Outcomes and Assessment Criteria

| Pass | Merit | Distinction |
|---|---|---|
| **LO1** Explain the terminology used in construction technology | | |
| **P1** Describe the differences between residential, commercial, industrial buildings and infrastructure projects.<br>**P2** Discuss the ways in which sustainability can be promoted in construction projects. | **M1** Analyse the way that construction projects address risk and health and safety. | **D1** Compare the construction terminology used in different types of construction project. |
| **LO2** Describe the different techniques used to construct a range of substructures and superstructures, including their function and design selection criteria | | |
| **P3** Describe the pre-design studies carried out and types of information collected for a given construction site.<br>**P4** Explain the functional characteristics and design criteria for primary and secondary elements of a substructure and superstructure. | **M2** Analyse how site conditions impact on the design of foundations. | **D2** Evaluate a given construction project with regard to the ways that superstructure, substructure and civil engineering structures are used to support the structure. |
| **LO3** Discuss different methods of dealing with site conditions to support building and infrastructure construction | | |
| **P5** Describe techniques used for remediating the site prior to construction commencing.<br>**P6** Describe the types of substructure works carried out by civil engineers. | **M3** Compare different types of structural frame used to carry the primary and secondary elements of the superstructure. | |

| Pass | Merit | Distinction |
|---|---|---|
| **LO4** Illustrate the supply and distribution of a range of building services and how they are accommodated within the building | | |
| **P7** Describe the supply arrangements for primary services.<br>**P8** Explain the distribution arrangements for primary services. | **M4** Demonstrate the elements of the superstructure used to facilitate the primary services. | **D3** Analyse the ways in which the distribution of the primary services impact on the overall design of the building. |

## Recommended Resources

### Print resources

BRYAN, T. (2015), *Construction Technology*, John Wiley & Sons

CHARLETT, A., MAYBERY-THOMAS, C. (2013), *Fundamental Building Technology*, Routledge

CHUDLEY, R., GREENO, R. (2006), *Advanced Construction Technology*, Pearson Education

CHUDLEY, R., GREENO, R., KOVAC, K. (2020), *Chudley and Greeno's Building Construction Handbook*, Butterworth-Heinemann

EMMITT, S. (2018), *Barry's Advanced Construction of Buildings*, John Wiley & Sons

FLEMING, E. (2009), *Construction Technology*, John Wiley & Sons

MCDONOUGH, W., BRAUNGART, M. (2010), *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press

### Links

This unit links to the following related units:

- Unit 3: Science & Materials
- Unit 4: The Construction Environment
- Unit 9: Principles of Heating, Ventilation and Air Conditioning
- Unit 14: Principles of Refurbishment
- Unit 15: Principles of Alternative Energy
- Unit 17: Civil Engineering Technology
- Unit 19: Principles of Structural Design
- Unit 21: Geotechnics & Soil Mechanics
- Unit 22: Scientific Principles for Building Services
- Unit 24: Principles of Off-site Construction
- Unit 31: Advanced Structural Design
- Unit 33: Construction Technology for Complex Buildings Projects
- Unit 35: Sustainable Methods of Construction
- Unit 41: Highway Engineering
- Unit 44: Maintenance & Operations
- Unit 51: Advanced Construction Development & Prototyping
- Unit 52: Advanced Housing Design & Specification
- Unit 53: Advanced Off-site Construction.