Unit 35: Sustainable Methods of Construction

Level: 5

Credits: 15

Ofqual Code: T/618/8111

Introduction

The construction industry seeks to be dynamic and forward thinking but, in reality, most buildings are still constructed using many of the same materials and processes that have been utilised for centuries. While there is accumulated knowledge in the use of 'tried-and-tested' methods, these are not always the most efficient or cost effective. Combined with this is the fact that the construction industry is one of the largest contributors to CO2 emissions and is under increasing pressure, and legislation, to improve its processes and practices.

However, the industry faces further challenges. As one of the most important sectors of the global economy, it is imperative that construction is able to meet the demands for housing, office, institutional and commercial development. Continuing to build using traditional methods will not be sufficient. One of the ways in which the sector is exploring how to address sustainability and increase productivity is through the development and implementation of alternative forms of construction.

On successful completion of this unit, students will have examined how the construction industry impacts on the environment, explored alternative construction methods that are fit for purpose, considered government policy implications and health and safety constraints associated with alternative construction methods, and designed a fit-for-purpose structure using an alternative construction method.

Learning Outcomes

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

LO1 Examine how the construction industry impacts on the environment and how changes in the industry can create broader social and economic benefits

LO2 Explore sustainable construction methods that are fit for purpose in a given context

LO3 Discuss the potential benefits and challenges associated with different forms of sustainable construction

LO4 Present a design proposal, utilising a selected sustainable construction method, and explain how it is 'fit for purpose' in the given context.

Essential Content

LO1 **Examine how the construction industry impacts on the environment and how changes in the industry can create broader social and economic benefits**

Environmental impact

Global warming

Carbon emissions

Construction statistics (e.g., carbon emissions, energy consumption)

Social and economic factors

Industry contribution to national economies

Government targets (e.g., carbon reduction, energy use)

International agreements/accords (e.g., Paris Agreement, Kyoto Protocol)

Housing demand (e.g., affordable homes, housing market)

Urbanisation (greenfield use, brownfield sites)

Sustainability protocols

Passivhaus/Passive House

BREEAM

LEED

SAP (Standard Assessment Procecure)

Code for Sustainable Homes

LO2 **Explore sustainable construction methods that are fit for purpose in a given context**

Timber systems

Timber frame

Cross-laminated timber

Off-site manufacture

Prefabrication

Panelised systems (e.g., structural insulated panels (SIP), ceramic composite panels)

Volumetric systems

Modularisation/componentisation

Other

Traditional

Rammed earth

Cob/adobe

Sandbag

Straw bale

Other

LO3 **Discuss the potential benefits and challenges associated with different forms of sustainable construction**

Potential benefits

Improved working conditions (e.g., off-site construction in controlled environment)

Reduced environmental impact (e.g., reduced waste, lower emissions, better component/building performance, better use of renewables)

Faster construction (e.g., off-site construction has less impact from adverse weather, automated systems can operate longer hours, modular/panelised systems require less time on site)

More reliable/higher quality (e.g., off-site construction works at lower tolerances, less human error, technology integration throughout process)

Challenges

Market acceptance (e.g., public perception of 'new', untested at larger-scale buildings)

Industry investment (e.g., cost of off-site facilities, retraining of staff, closing 'skills gaps')

Legislation and regulation (e.g., some building regulations do not support alternative methods, complex health and safety regulations (off-site+on-site))

LO4 **Present a design proposal, utilising a selected sustainable construction method and explain how it is 'fit for purpose' in the given context**

Client requirements

Building use

Budget

Environmental targets

Project type

Residential (e.g., multi-occupancy, apartments, flats)

Commercial (e.g., office buildings, shopping centres)

Cultural (e.g., museums, theatres, stadiums, exhibition halls)

Industrial (e.g., factories, warehouses, garages)

Medical/scientific (e.g., hospitals, clinics, laboratories)

Project scale

Single-storey vs multi-storey

Long-span

High traffic (e.g., large number of occupants/users)

Design proposal

Strategy

Feasibility (e.g., construction costs, operational costs)

Drawings/models (e.g., plans, sections, elevations, details)

Permissions (e.g., planning permissions, building regulations, health and safety)

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Examine how the construction industry impacts on the environment, and how changes in the industry can create broader social and economic benefits		
P1 Explore how the construction industry has an impact on the environment. **P2** Examine how social and economic factors have an effect on the construction industry.	**M1** Assess how effective government targets and national statistics have been on environmental protection.	**D1** Evaluate the potential for environmental protection through the specification of sustainable construction methods.
LO2 Explore sustainable construction methods that are fit for purpose in a given context		
P3 Examine the development of sustainable construction methods using examples. **P4** Explore sustainable construction methods and their application to different building types.	**M2** Compare sustainable construction methods in terms of effectiveness, cost and performance.	

Pass	Merit	Distinction
LO3 Discuss the potential benefits and challenges associated with different forms of sustainable construction		
P5 Explore the potential benefits of sustainable methods of construction. **P6** Explain the challenges associated with sustainable methods of construction.	**M3** Illustrate the ways in which different sustainable methods of construction may address challenges.	**D2** Justify the use of a chosen sustainable construction method in meeting a range of challenges.
LO4 Present a design proposal, utilising a selected sustainable construction method, and explain how it is 'fit for purpose' in the given context		
P7 Produce design and technical information to support a proposed sustainable method of construction for a given building type. **P8** Present a design proposal that utilises sustainable methods of construction.	**M4** Evaluate the integration of health and safety, building regulations and statutory requirements in a sustainable construction proposal.	

Recommended Resources

Print resources

COTTERELL, J., DADEBY, A. (2012), *The Passivhaus Handbook: A practical guide to constructing and retrofitting buildings for ultra-low energy performance*, Green Books

ELIZABETH, L., ADAMS, C. (2005), *Alternative Construction*, Wiley

GARBER, R. (2014), *BIM Design*, John Wiley & Sons

HICKEY, T. (2014), *Construction Technology: Designing Sustainable Homes*, Gill Education

JONES, B. (2015), *Building with Straw Bales*, Green Books

LAWSON, M., OGDEN, R., GOODIER, C. (2014), *Design in Modular Construction*, CRC Press

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 2: Construction Technology
- Unit 4: The Construction Environment
- Unit 13: Building Information Modelling
- Unit 14: Principles of Refurbishment
- Unit 15: Principles of Alternative Energy
- Unit 23: Construction Economics & Sustainability
- Unit 32: Advanced Construction Drawing & Detailing
- Unit 33: Construction Technology for Complex Buildings Projects
- Unit 47: Advanced Building Information Modelling.