BTEC

HIGHER NATIONALS

Construction and the Built Environment

UNIT DIRECTORY

First Teaching from September 2019

First Certification from September 2020

Higher National Certificate Lvl 4

Higher National Diploma Lvl 5

Pearson

HNC Construction & The Built Environment Programme Structure 2023-24

Year 1 - 60 Credits

Unit Number	Unit Title	Credits	Level	Core/ Optional
2	Construction Technology	15	4	Core
3	Science & Materials	15	4	Core
5	Legal & Statutory Responsibilities in Construction	15	4	Optional
6	Construction Information (Drawing, Detailing, Specification)	15	4	Optional

Year 2 - 60 Credits

Unit Number	Unit Title	Credits	Level	Core/ Optional
1	Individual Project (Pearson-set)	15	4	Core
4	Construction Practice & Management	15	4	Core
7	Surveying, Measuring & Setting-out	15	4	Optional
21	Site Supervision & Operations	15	4	Optional

Unit 1: Individual Project (Pearson-set)

Unit code	**R/615/1387**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

The ability to define, plan and undertake a project is a critical set of skills needed in various roles within the construction industry. Identifying appropriate information and analysing this, to formulate clear results or recommendations, is required to underpin many of the processes that inform construction projects.

The aim of this unit is to support students in using and applying the knowledge and skills they have developed through other areas of their studies to complete and present an individual project. In addition, this unit will provide students with key study skills that will support them in further study.

Students will be able to identify, define, plan, develop and execute a successful project by working through a clear process. They will develop a project brief; outlining a problem that requires a solution, as well as a project specification, the specific requirements of which the final outcome must meet. They will research the problem, undertaking a feasibility study, and consider a range of potential solutions using critical analysis and evaluation techniques to test, select and contextualise their preferred solution. Students will provide a work and time management plan, keeping a diary of all activities, reflecting on their process and their learning throughout the project.

***Please refer to the accompanying Pearson-set Assignment Guide and the Theme Release document for further support and guidance on the delivery of the Pearson-set unit.**

Learning Outcomes

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

1 Formulate a project that will provide a solution to an identified problem

2 Manage a project within agreed timescales and specification; documenting the process throughout

3 Evaluate potential project management solutions

4 Produce a project report and deliver a presentation of the final project outcomes.

Essential Content

LO1 **Formulate a project that will provide a solution to an identified problem**

Project identification

Research methods

Feasibility studies

Brief and specification

LO2 **Manage a project within agreed timescales and specification, documenting the process throughout**

Resources and resource planning

Costs and cost planning

Work plan:

Gantt charts

Project Evaluation and Review Technique (PERT) charts

Critical Path Method (CPM).

Project tracking:

Progress tracking

Milestones.

LO3 **Evaluate potential project management solutions**

PERT analysis

CPM analysis

LO4 **Produce a project report and deliver a presentation of the final project outcomes**

Report formats

Presentation techniques.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Formulate a project that will provide a solution to an identified problem</td><td rowspan="5">LO1 and LO2

D1 Evaluate the relationship between project identification, feasibility and project planning, with consideration of the impact of project scope on time and resources</td></tr>
<tr><td>P1 Select an appropriate construction-based project, giving reasons for your choice

P2 Identify the main components of a project specification</td><td>M1 Explain why the project specification is of fundamental importance to a successful project outcome</td></tr>
<tr><td colspan="2">LO2 Manage a project within agreed timescales and specification, documenting the process throughout</td></tr>
<tr><td>P3 Identify potential resources, costs and timescales

P4 Describe a range of appropriate techniques for generating realistic potential solutions</td><td>M2 Prepare and update a project management plan, using standard systems of time and resource tracking</td></tr>
</table>

Pass	Merit	Distinction
LO3 Evaluate potential project management solutions		
P5 Explore project management strategies to determine suitability for a given project **P6** Justify the selection of your preferred solution, making reference to your initial project specification	**M3** Compare the outcomes of your initial planned resources, timescales and costs against actual outcomes	**LO3 and LO4** **D2** Appraise your own performance in managing the project; draw conclusions and make recommendations that would further improve your performance in the future
LO4 Produce a project report and deliver a presentation of the final project outcomes		
P7 Produce a written report identifying each stage of the project **P8** Utilise appropriate forms of referencing and citation in the preparation of a written report **P9** Prepare a presentation of your final project outcomes, utilising industry standard software	**M4** Present your final project outcomes and recommendations to a selected audience	

Recommended Resources

Textbooks

BALDWIN, A. (2014) *Handbook for Construction Planning and Scheduling*. London: Wiley-Blackwell.

BUSSEY, P. (2015) CDM 2015: *A Practical Guide for Architects and Designers.* London: RIBA.

CIOB (2010) *Guide to Good Practice in the Management of Time in Complex Projects*. London: Chartered Institute of Building.

GOETSCH, D.L. (2011) *Construction Safety & Health*. London: Pearson.

KELLY, J. and MALE, S. (1992) *Value Management in Design and Construction: The Economic Management of Project*. London: Taylor & Francis.

LAWSON, B. (2005) *How Designers Think: The Design Process Demystified*. London: Routledge.

POTTS, K. and ANKRAH, N. (2014) *Construction Cost Management: Learning from Case Studies*. London: Routledge.

WYATT, D. (2007) *Construction Specifications: Principles and Applications*. New York: Delmar.

Links

This unit links to the following related units:

Unit 5: Legal & Statutory Responsibilities in Construction

Unit 6: Construction Information (Drawing, Detailing, Specification)

Unit 2: Construction Technology

Unit code	**Y/615/1388**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

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 which facilitate enhanced environmental and energy performance, and greater flexibility, in response to ever increasing financial, environmental, legal and economic constraints.

This unit will introduce 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 to be borne in mind when selecting the most suitable technological solution.

Topics included in this unit are: substructure, superstructure, finishes, building services and infrastructure components. On successful completion of this unit a student will be able to analyse scenarios and select the most appropriate construction technology solution.

Learning Outcomes

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

1 Explain the terminology used in construction technology

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

3 Identify the different types of civil engineering/infrastructure technology used in support of buildings

4 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 construction activity:

Low, medium and high-rise buildings, domestic buildings, for example house, flats and other multi-occupancy buildings, commercial buildings, for example offices and shops, industrial buildings, for example, light industrial and warehouses.

Construction technology terminology:

Loadbearing and non-loadbearing, structural stability, movement and thermal expansion, durability, weather and moisture resistance, aesthetics, fire resistance, sound insulation, resistance to heat loss and thermal transmission, dimensional co-ordination and standardisation, sustainability and scarcity of availability, on-site and off-site construction, legal requirements, buildability, health & safety.

Construction information:

Drawings, specification, schedules, CAD, Building Information Modelling (BIM).

Sustainability:

Supply chain

Lifecycle

'Cradle-to-grave'

'Cradle-to-cradle'

Circular economies.

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, Site Reconnaissance, Direct Soil Investigation techniques.

Substructure functions and design considerations:

Different methods for gathering disturbed and undisturbed samples, influence of soil type on foundation design, including water and chemical content, potential loads, position of trees and the impact on foundations, economic considerations, legal considerations (health & safety work in excavations), building regulations, plant requirements.

Types of foundations:

Shallow and deep foundations, strip and deep strip foundations, pad foundations, raft foundations, piled foundations (replacement and displacement piles).

Types of superstructure:

Traditional construction, framed construction: steel, composite concrete and steel, timber.

Walls; roofs; structural frames; claddings; finishes; services.

Walls:

External walls: traditional cavity, timber frame, lightweight steel.

Cladding: panel systems, infill systems, composite panel systems, internal partition walls.

Roofs:

Pitched and flat roof systems, roof coverings.

Floors:

Ground floors, intermediate floors, floor finishes.

Staircases:

Timber, concrete, metal staircases, means of escape.

Finishes:

Ceiling, wall and floor finishes.

LO3 **Identify the different types of civil engineering/infrastructure technology used in support of buildings**

Site remediation and de-watering:

Contamination management: cut-off techniques, encapsulation.

Soil remediation: stone piling, vibro-compaction.

De-watering: permanent sheet piling, secant piling, grout injection freezing, temporary techniques, such as pumping, wells, electro-osmosis.

Substructure works:

Basement construction: steel sheet piling, concrete diaphragm walls, coffer dams, caissons, culverts.

Superstructure works:

Reinforced concrete work: formwork, reinforcement, fabrication, concrete, steel.

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.

Services distribution

Hot and cold water

Single-phase and 3-phase electricity

Air conditioning ductwork.

Services accommodation:

Raised access flooring

Suspended ceilings

Partitioning

Rising ducts.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain the terminology used in construction technology</td><td rowspan="2">D1 Evaluate how the functional characteristics and design selection criteria impact on the eventual design solution</td></tr>
<tr><td>P1 Describe the differences between residential, commercial and industrial buildings
P2 Explain how the functional characteristics and design selection criteria are informed by proposed building use
P3 Discuss the ways in which sustainability can be promoted in building projects</td><td>M1 Apply the terminology used in construction technology to a given building construction project</td></tr>
<tr><td colspan="2">LO2 Describe the different techniques used to construct a range of substructures and superstructures, including their function and design selection criteria</td><td rowspan="4">LO2 and LO3
D2 Prepare a design report identifying superstructure, substructure and civil engineering structures necessary for a given building construction project</td></tr>
<tr><td>P4 Describe the pre-design studies carried out and types of information collected for a given construction site
P5 Explain the functional characteristics and design criteria for primary and secondary elements of a building substructure and superstructure</td><td>M2 Analyse how site conditions impact on the design of foundations
M3 Illustrate how the component parts of an element allow it to fulfil its function</td></tr>
<tr><td colspan="2">LO3 Identify the different types of civil engineering/infrastructure technology used in support of buildings</td></tr>
<tr><td>P6 Describe techniques used for remediating the site prior to construction commencing
P7 Describe the types of substructure works carried out by civil engineers</td><td>M4 Compare different types of structural frame used to carry the primary and secondary elements of the superstructure</td></tr>
</table>

Pass	Merit	Distinction
LO4 Illustrate the supply and distribution of a range of building services and how they are accommodated within the building.		
P8 Describe the supply arrangements for primary services **P9** Explain the distribution arrangements for primary services	**M5** Demonstrate the elements of the superstructure used to facilitate the primary services	**D3** Appraise how the distribution of the primary services impact on the overall design of the building

Recommended Resources

Textbooks

BRYAN, T. (2010) *Construction Technology: Analysis and Choice*, Oxford: Blackwell.

CHARTLETT, A. and MAYBERY-THOMAS, C. (2013) *Fundamental Building Technology.* 3rd ed. Abingdon: Routledge.

CHUDLEY, R. et al. (2012) *Advanced Construction Technology*. 5th ed. Harlow: Pearson Education Limited.

CHUDLEY, R. and GRENNO, R. (2016) *Building Construction Handbook*. Abingdon: Routledge.

FLEMING, E. (2005) *Construction Technology: An Illustrated Introduction*. Oxford: Blackwell.

Links

This unit links to the following related units:

Unit 3: Science & Materials

Unit 6: Construction Information (Drawings, Detailing, Specification)

Unit 7: Surveying, Measuring & Setting-out

Unit 14: Building Information Modelling

Unit 15: Principles of Refurbishment

Unit 18: Civil Engineering Technology

Unit 25: Management for Complex Building Projects

Unit 27: Construction Technology for Complex Building Projects

Unit 35: Alternative Methods of Construction

Unit 46: Advanced Materials

Unit 3: Science & Materials

Unit code	**D/615/1389**
Unit type	**Core**
Credit value	**15**

Introduction

Science and material performance are intrinsically linked through the need to create structures and spaces that perform in both mechanical operation and in providing human comfort.

This unit aims to support students to make material choices to achieve the desired outcomes of a brief. This is approached from the perspective of materials being fit for purpose; as defined by testing standards and properties, but also by consideration of the environmental impact and sustainability. Awareness of Health & Safety is considered alongside the need to meet legislative requirements.

The topics covered in this unit include: Health & Safety; storage and use of materials; handling, and problems associated with misuse and unprotected use; environmental and sustainable consideration in material choices; and human comfort performance parameters. Material choice is developed through the understanding of testing procedures to establish conformity to standards and define performance properties. The performance of materials to satisfy regulations and provide appropriate comfort levels is addressed through design and calculations.

Upon successful completion of this unit students will be able to make informed decisions regarding material choices; based on understanding the structural behaviour of materials established through recognised testing methods, sustainability, context of build, and Health & Safety. Students will also be able to perform the calculations necessary to establish anticipated performance of the materials in-use and therefore determine their compliance with regulations and suitability.

Learning Outcomes

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

1 Review health & safety regulations and legislation associated with the storage, handling and use of materials on a construction site

2 Discuss the environmental and sustainability factors which can impact on and influence the material choices for a construction project

3 Present material choices for a given building using performance properties, experimental data, sustainability and environmental consideration

4 Evaluate the performance of a given building in respect of its human comfort requirements.

Essential Content

LO1 **Review health & safety regulations and legislation associated with the storage, handling and use of materials on a construction site**

Regulations and guidance:

Health & safety management regulations

Design management regulations

Provision and use of equipment regulations

Control and management of hazardous materials through storage, movement and use.

Materials handling and installation:

Risk assessments and method statements (qualitative and quantitative)

Materials storage: moving materials safely; working in confined spaces; working at height

Occupational health risks associated with materials: asbestos-related and respiratory disease; dermatitis and skin problems; musculoskeletal disorders; hand arm vibration

Personal Protective Equipment (PPE).

LO2 **Discuss the environmental and sustainability factors which can impact and influence the material choices for a construction project**

Environmental considerations:

Lifecycle assessment

Environmental profile methodology

Environmental product declaration and certification

Embodied energy

Waste management: the economics and technologies of construction waste disposal.

Sustainability:

Resource availability and depletion: renewable and non-renewable materials

Reuse and recycling of construction and demolition waste

Waste and Resources Action Programme (WRAP).

Environmental assessment methods:

Building Research Establishment Environmental Assessment Method (BREEAM)

Leadership in Energy and Environmental Design (LEED)

Green Star

Estidama, or other forms of environmental assessment

Construction Industry Research Information Association.

LO3 **Present material choices for a given building using performance properties, experimental data, sustainability and environmental consideration**

Material testing:

Testing methods, interpreting test data

Codes and standards.

Structural behaviours

Performance properties: strength, elasticity, toughness, hardness, creep, fatigue, porosity, brittleness, density, thermal conductivity, durability

Inherent material properties.

Relationship between material properties, behaviour and use

LO4 **Evaluate the performance of a given building in respect of its human comfort requirements**

Human comfort provision:

Indoor environmental quality: thermal, illumination, sound, ventilation

Thermal losses and gains

Passive and active design: design solutions, environmental benefit vs implementation cost

Calculations of u-values, lux levels, acoustic and ventilation.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Review health & safety regulations and legislation associated with the storage, handling and use of materials on a construction site		
P1 Explain how regulations impact on the use, storage and handling of a selection of vocationally typical construction materials	**M1** Assess how risk assessments can be used to address significant hazards posed by selected materials or activities	**D1** Discuss how multiple regulations and legislation would apply to a given site activity, highlighting how to plan and manage for safe handling and use

Pass	Merit	Distinction
LO2 Discuss the environmental and sustainability factors which impact on and influence the material choices for a construction project		
P2 Explain material environmental profiling and lifecycle assessment Use a relevant material to exemplify your explanation **P3** Discuss the benefits of product declaration and environmental certification	**M2** Produce a waste management plan for a given project, taking into account a typical range of relevant waste materials	**LO2 and LO3** **D2** Illustrate how the use of sustainable practices and considerations for material choice can improve the environmental rating of the completed building
LO3 Present material choices for a given building using performance properties, experimental data, sustainability and environmental consideration		
P4 Present the results of relevant testing procedures to identify performance characteristics of selected construction materials **P5** Discuss the results in terms of the material properties and regulatory requirements, highlighting any unexpected results and why these may occur **P6** Select construction materials for a given building based upon their performance properties in use	**M3** Assess the effects of loading structural materials and compare the behaviours and performance of materials which could be used for the same function	

Pass	Merit	Distinction
LO4 Evaluate the performance of a given building in respect of its human comfort requirements.		
P7 Define a material selection strategy with regard to human comfort requirements **P8** Identify materials for a selected area within a building and explain how these contribute to a balanced indoor environment	**M4** Perform calculations which relate to a selected area (lux levels, u-values, acoustic and ventilation)	**D3** Evaluate how the use of passive or active strategies can minimise energy, materials, water, and land use

Recommended Resources

Textbooks

BLANC, A. (2014) *Internal Components*. Abingdon: Routledge.

BUXTON, P. (2015) *Metric Handbook: Planning and Design Data*. Abingdon: Routledge.

CASINI, M. (2016) *Smart Buildings: Advanced Materials and Nanotechnology to Improve Energy*. Duxford: Woodhead Publishing.

CLAISSE, P.A. (2015) *Civil Engineering Materials*. Kidlington: Butterworth-Heinemann.

DEAN, Y. (1996) *Materials Technology* (Mitchells Building Series). Abingdon: Routledge.

DORAN, D. and CATHER, B. (2013) *Construction Materials Reference Book.* Abingdon: Routledge.

EVERETT, A. (1994) *Materials. (Mitchells Building Series)*. 5th ed. Abingdon: Routledge.

KATIB, J.M. (2009) *Sustainability of Construction Materials*. Abingdon: Woodhead Publishing Ltd.

LYONS, A. (2014) *Materials for Architects and Builders*. 5th ed. Abingdon: Routledge.

PACHECO-TORGA, F. and JALALI, S. (2011) *Eco-Efficient Construction and Building Materials*. London: Springer.

PACHECO-TORGA, F. et al. (2013) *Eco-efficient Construction and Building Materials, Life Cycle Assessment (LCA), Eco-Labelling and Case Studies.* London: Springer.

THOMAS, R. (ed.) (2006) *Environmental design: An Introduction for Architects and Engineers*. 3rd ed. London: Taylor & Francis.

Links

This unit links to the following related units:

Unit 2: Construction Technology

Unit 9: Principles of Heating Services Design & Installation

Unit 15: Principles of Refurbishment

Unit 16: Principles of Alternative Energy

Unit 35: Alternative Methods of Construction

Unit 46: Advanced Materials

Unit 4: Construction Practice & Management

Unit code	**R/615/1390**
Unit type	**Core**
Unit level	**4**
Credit value	**15**

Introduction

The aim of this unit is to develop and provide students with a holistic understanding of construction practice and management processes. Students will investigate and research the modern construction industry, both from the practical skills embedded within the industry through to its linkage with development on-site and the connection with construction management; including roles within the industry.

The unit compares and investigates small, medium and large construction companies within the market place and how construction processes, for development, have evolved.

Students will also explore how Health & Safety has evolved within the industry, including how the major stakeholders, from companies to site operatives, have embedded Health & Safety into their preferred areas of development and careers. In addition, students will explore Building Information Modelling and how it fits into construction processes/sequences ranging from domestic to large-scale and design and build projects.

The knowledge from this unit will provide students with an understanding of modern construction and management; the skills, management of people and projects, and how Health & Safety have changed the perception of the construction industry.

Learning Outcomes

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

1 Describe the construction industry with reference to company structures and other activities

2 Explain different types of construction companies in the market and their relationships within the tendering process

3 Discuss the key stages in a construction project, and how Building Information Modelling informs the different stages

4 Analyse how the construction industry has developed suitable collaboration strategies in support of greater recognition of Health & Safety.

Essential Content

LO1 **Describe the construction industry with reference to company structures and other activities**

Understanding of the construction industry:

Historical development of the construction industry

Professional and other institutes, including societies

Links between professional, technical and skills professionals

Contractor and head office structure

Site structure and organisation

Types of contractual work tendered by companies.

LO2 **Explain different types of construction companies in the market and their relationships within the tendering process**

Company types:

Professional relationships between companies

Contract tendering

Tender process.

LO3 **Discuss the key stages in a construction project, and how Building Information Modelling informs the different stages**

Master programmes and contract planning techniques

The role of Building Information Modelling (BIM) on the construction

Modern procurement methods within construction

Sustainability

LO4 **Analyse how the construction industry has developed suitable collaboration strategies in support of greater recognition of Health & Safety**

Key stakeholders in the construction process

BIM and collaboration

Health & safety within the construction industry:

Pre-construction regulations and legislation

Site safety.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Describe the construction industry with reference to company structures and other activities		
P1 Explain how the construction industry has developed and encompassed professionalism within its structures **P2** Demonstrate the scope and linkage between all parties within a construction organisation **P3** Identify the type of contractual work tendered by contractors	**M1** Analyse how the construction industry has developed overall in terms of company structures, it's employees and contracted work	**D1** Critically evaluate how construction companies have developed their structure and business ethos
LO2 Explain different types of construction companies within the market and their relationships within the tendering process		
P4 Identify the different types of construction companies in the market **P5** Explain the relationship between different construction organisations	**M2** Analyse the Analyse the relationships between construction companies through contracts and tendering.	**D2** Compare the factors that influence contract relationships between different organisations involved in tendering.

Pass	Merit	Distinction
LO3 Discuss the key stages in a construction project, and how Building Information Modelling informs the different stages		
P6 Identify, with examples, modern construction processes and sequences used within today's industry, highlighting the way they respond to sustainability needs **P7** Explain contract planning techniques used within micro and macro projects **P8** Identify where BIM impacts upon operations and construction companies	**M3** Analyse how construction has developed in terms of innovation, designs, and within contracts for micro and macro projects, and the interrelationship with BIM	**D3** Provide a detailed analysis of how the construction industry has evolved in terms of innovative construction methods and contracts
LO4 Analyse how the construction industry has developed suitable collaboration strategies in support of greater recognition of Health & Safety.		
P9 Explain how Health & Safety has now become an integrated part of the construction process **P10** Describe the government legislation which has benchmarked Health & Safety within construction **P11** Discuss the role of collaboration and communication in ensuring safe working practices	**M4** Demonstrate how the construction industry has benefited through changes in Health & Safety legislation	**D4** Evaluate the impact of Health & Safety legislation, how it has evolved the drivers for it, and its advantages or weaknesses within construction

Recommended Resources

Textbooks

GRIFFITH, A. and WATSON, P. (2003) *Construction Management: Principles and Practice*. Hampshire: Palgrave Macmillan.

HARRIS, F. and MCCAFFER, R. (2013) *Modern Construction Management.* Chichester: Wiley-Blackwell.

KYMMELL, W. (2007) *Building Information Modeling: Planning and Managing Construction Projects*. New York: McGraw Hill Professional.

OTTOSSON, H. (2012) *Practical Project Management for Building and Construction.* Boca Raton: CRC Press.

Websites

www.ciob.org.uk	Chartered Institute of Building (General Reference)
www.rics.org	Royal Institute of Chartered Surveyors (General Reference)

Links

This unit links to the following related units:

Unit 12: Financial Management & Business Practices in Construction

Unit 13: Tender & Procurement

Unit 23: Contracts & Management

Unit 24: Project Management

Unit 25: Management for Complex Building Projects

Unit 38: Personal Professional Development

Unit 45: Maintenance & Operations

Unit 47: Construction Data Management

Unit 5: Legal & Statutory Responsibilities in Construction

Unit code	**Y/615/1391**
Unit level	**4**
Credit value	**15**

Introduction

The construction industry is perceived to be a dangerous, noisy and disruptive area of work which impacts on the use of land and buildings. It is, however, governed by a range of areas of law to ensure that professionals; such as architects, quantity surveyors and contractors, comply with legal and statutory requirements to design, construct and deliver buildings and alterations using safe working practices and utilising land appropriately.

This unit will introduce the different areas of law that are relevant to the construction industry throughout the development process. This includes applying for planning approval to undertake construction activities and using building control regulations to evaluate building design and alterations at the preconstruction stage. The unit will explore the laws of occupiers' liability, trespass and nuisance to manage construction activities on-site, and the legal aspects of the sale and leasing process involved in the disposal of buildings; using the law of contract and land law.

Topics included in this unit are: planning law, building control regulations, insurance, the law of tort and the law of contract and land law.

On successful completion of this unit students will be able to apply legal and statutory requirements and processes common to the construction sector.

Learning Outcomes

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

1 Examine the process used to obtain planning permission for the construction and alteration of buildings

2 Discuss the processes and regulations used to control design and to ensure safe buildings

3 Assess the laws used to ensure that construction sites operate safely and consider adjoining land-users

4 Analyse how the law of contract and land law are used to sell and lease land and buildings.

Essential Content

LO1 **Examine the process used to obtain planning permission for the construction and alteration of buildings**

Gaining planning permission:

The legal framework, legislation and regulatory agencies involved in applying for planning permission

Types of development and types of permitted development where approval is not required

Stages and requirements of the application process, including statutory and public notification requirements

Approval process and conditions.

Appealing planning decisions:

The right of appeal open to applicants and the general public, and legal timeframes for appeal

The stages in planning appeal processes, and procedures and notification periods.

Planning enforcement:

Notification processes and procedures

Right of appeal and timeframes.

LO2 **Discuss the processes and regulations used to control design and to ensure safe buildings**

Building control systems:

History and development.

Legal framework, legislation and regulatory agencies.

Requirements of building control and regulations:

Building regulation standards and areas of jurisdiction

Obtaining approval and right of appeal processes

Approvals, inspection and compliance

Enforcement and dangerous buildings.

LO3 **Assess the laws used to ensure that construction sites operate safely and consider adjoining land-users**

Administration of the law:

Courts, personnel, sources of law, including legislation and case law, speciality courts and alternative dispute resolution methods.

Occupiers' liability:

Duty of care, breach of duty, damage, defences, dangerous premises, visitors, children, independent contractors, trespassers and non-visitors, case law and legislation.

Vicarious liability:

Recognising who is an employer and an employee and application of the course of employment rule.

Independent contractors, general principles and non-delegable duties.

Trespass to land:

Intrusion, possession, defences, remedies, including damages, injunction and ejectment

The operation of the construction industry and trespass

Mitigating measures and the Considerate Contractors Scheme.

Nuisance:

Private nuisance, including interference, unlawfulness, impact of continuity, sensitivity and locality, liability, defences and remedies

Public nuisance, including the operation of the construction industry, nuisance mitigating measures and the Considerate Contractors Scheme.

Insurance:

Types of insurance, including public liability insurance

Employers' liability insurance

Contractors' All Risks insurance

Latent Defects insurance

Machinery insurance

Personal accident insurance and contract bonds.

LO4 **Analyse how the law of contract and land law are used to sell and lease land and buildings**

History and development of land ownership:

Types of land ownership and registration of ownership

Tenure restrictions on ownership, including restrictive covenants and easements.

Law of contract and property conveyancing:

Key stages in the law of contract, including offer, intention, capacity and consideration

The stages and requirements of the property conveyancing process.

Landlord and tenant law:

Legislation, construction and types of leases

Lease terms and conditions, rent and repair responsibilities and management of other agreed terms

Terminating and ending a lease

Lease disputes and mediation processes.

Construction activity and party and boundary walls:

Types of wall, including party walls, party structures, boundary and retaining walls

Key legislation, regulations and case law

Trespass and nuisance considerations

Procedures and obligations on neighbour notification and agreement.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Examine the process used to obtain planning permission for the construction and alteration of buildings</td><td rowspan="5">LO1 and LO2

D1 Evaluate the impact of planning systems and building regulations agencies in managing the development of land and buildings</td></tr>
<tr><td>P1 Explain the key legislation and agencies in the planning process

P2 Explain how planning decisions are made and processes available to appeal and monitor them</td><td>M1 Analyse the role of planning systems and agencies in managing the development of land and buildings</td></tr>
<tr><td colspan="2">LO2 Discuss the processes and regulations used to control design and to ensure safe buildings</td></tr>
<tr><td>P3 Explain the key legislation and agencies in the building control process

P4 Discuss how building decisions are determined and the processes available to appeal and monitor them</td><td>M2 Analyse the application of building regulations in low and medium rise residential and commercial buildings.</td></tr>
</table>

Pass	Merit	Distinction
LO3 Assess the laws used to ensure that construction sites operate safely and consider adjoining land-users		
P5 Explain how the law of trespass and nuisance relate to the construction industry **P6** Discuss how the laws of occupiers' liability and vicarious liability apply to the construction industry	**M3** Produce a plan for a contractor to manage the legal impacts of a large urban construction project	**D2** Design a detailed plan for a contractor to reduce the legal impacts of a large urban construction project
LO4 Analyse how the law of contract and land law are used to sell and lease land and buildings.		
P7 Analyse how land law has evolved to shape modern land ownership and the role of contract law in buying and selling property **P8** Discuss how landlord and tenant law is used to manage property	**M4** Evaluate how the application of land law and landlord and tenant law control the disposal and use of property	**D3** Assess the impact of land law and property law in the development and disposal of a large urban construction project

Recommended Resources

Textbooks

CARD, R., MURDOCH, J. and MURDOCH, S. (2011) *Real Estate Management Law.* 7th ed. Oxford: Oxford University Press.

CLOUGH, R.H., SEARS, G.A., SEARS, K.S., SEGNER, R.O. and ROUNDS, J.L. (2015) *Construction Contracting: A Practical Guide to Company Management.* 8th ed. Hoboken: John Wiley & Sons.

MASON, J. (2016) *Construction Law: From Beginner to Practitioner*. London: Routledge.

UFF, J. (2013) *Construction Law*. London: Sweet & Maxwell.

Links

This unit links to the following related units:

Unit 12: Financial Management & Business Practices in Construction

Unit 13: Tender & Procurement

Unit 14: Building Information Modelling

Unit 23: Contracts & Management

Unit 24: Project Management

Unit 36: Advanced Building Information Modelling

Unit 6: Construction Information (Drawing, Detailing, Specification)

Unit code	**D/615/1392**
Unit level	**4**
Credit value	**15**

Introduction

To achieve successful projects in the built environment requires a range of different types of information: to describe the project, quantify the materials, provide clear instructions for assembly and erection, and to allow for accurate costing and management. Throughout the process of design, construction and post-occupancy management, information is critical.

Through this unit students will develop their awareness of different types of construction information and their uses in the process. Students will engage in the production, reading and editing of construction information, in order to understand how this information informs different stages of the process. Using industry standard tools and systems, students will consider the ways that information may be shared and, through this, the value of collaboration in the information process.

Topics included in this unit are: construction drawing, detailing, Computer Aided Design (CAD), Building Information Modelling (BIM), schedules (door, window, hardware, etc.), specifications, schedules of work, bills of quantities and information distribution and collaboration.

Learning Outcomes

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

1 Evaluate different types of construction information in the context of diverse project types

2 Develop construction drawings, details, schedules and specifications in support of a given construction project

3 Interpret different types of construction information in order to explain a construction project

4 Assess ways in which construction professionals collaborate in the production of construction information.

Essential Content

LO1 **Evaluate different types of construction information in the context of diverse project types**

Construction drawings

Site plans

Floor plans, roof plans, ceiling plans

General arrangement

Elevations

Assembly drawings

Component drawings/details

Schedules

Door schedules

Window schedules

Hardware schedules

Specifications

Performance specification

Outline specification

Full specification

Specification templates/standards

LO2 **Develop construction drawings, details, schedules and specifications in support of a given construction project**

Computer Aided Design (CAD)

Templates

Title blocks

Annotation

Building Information Modelling (BIM)

Specification software

Bills of quantities

Schedules of works

LO3 **Interpret different types of construction information in order to explain a construction project**

Reading construction drawings

Information co-ordination

Clash detection

'Red-lining'

LO4 **Assess ways in which construction professionals collaborate in the production of construction information**

Project roles

Information production

Hierarchy of roles and information

Project collaboration

Document sharing/distribution

Online/cloud-based collaboration

Building Information Modelling (BIM).

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Evaluate different types of construction information in the context of diverse project types</td><td rowspan="5">LO1 and LO2

D1 Justify the use of specific types of construction information in support of a given project</td></tr>
<tr><td>P1 Explain the use of construction information in the context of a project

P2 Describe the different types of construction information and their uses</td><td>M1 Compare different types of construction information to identify their suitability in specific contexts.</td></tr>
<tr><td colspan="2">LO2 Develop construction drawings, details, schedules and specifications in support of a given construction project</td></tr>
<tr><td>P3 Develop a set of general arrangement drawings, selected details and door/window schedules

P4 Produce an outline bill of quantities</td><td>M2 Compose a schedule of works</td></tr>
</table>

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO3 Interpret different types of construction information in order to explain a construction project</td><td rowspan="5">LO3 and LO4
D2 Propose corrections to construction drawings and specifications using industry standard forms of notation</td></tr>
<tr><td>P5 Relate a set of construction drawings to a specification
P6 Evaluate construction drawings and details to identify 'clashes'</td><td>M3 Critique a body of construction information, identifying errors and discrepancies</td></tr>
<tr><td colspan="2">LO4 Assess ways in which construction professionals collaborate in the production of construction information.</td></tr>
<tr><td>P7 Assess the types of information produced by different participants in a construction project
P8 Examine the relationship between different bodies of information and how they work in conjunction</td><td>M4 Compare the roles of CAD and BIM in the collaborative production of construction information</td></tr>
</table>

Recommended Resources

Textbooks

CHING, F.D.K. (2014) *Building Construction Illustrated*. Chichester: John Wiley & Sons.

CHUDLEY, R. (2016) *Building Construction Handbook*. Abingdon, Oxon: Routledge.

Construction Specifications Institute (2011) *The CSI Construction Specifications Practice Guide*. Chichester: John Wiley & Sons.

HUTH, M.W. (2009) *Understanding Construction Drawings*. Delmar Cengage.

KALIN, M. and WEYGANT, R.S. (2010) *Construction Specification Writing: Principles and Procedures*. Chichester: John Wiley & Sons.

KUBBA, S. (2008) *Blueprint Reading: Construction Drawing for the Building Trade*. McGraw-Hill.

Websites

www.designingbuildings.co.uk	Designing Buildings Wiki (General Reference)
www.thenbs.com	The NBS Knowledge (General Reference)
www.csinet.org	CSI (General Reference)

Links

This unit links to the following related units:

Unit 1: Individual Project

Unit 14: Building Information Modelling

Unit 26: Advanced Construction Drawing & Detailing

Unit 36: Advanced Building Information Modelling

Unit 7: Surveying, Measuring & Setting-out

Unit code	**H/615/1393**
Unit level	**4**
Credit value	**15**

Introduction

Infrastructure and new buildings are essential requirements of modern life. In both construction and civil engineering there is a need to conduct initial surveys to assist the design team in establishing a clearly defined starting point. Once designed, the priority becomes to 'set out' the structures to the required accuracy to facilitate the construction process. Finally, 'as built' surveys are necessary to assist future maintenance and improvements to the built asset.

This unit explores the techniques used to set up controls and conduct topographic surveys. It also covers communication of results and methods of Setting-out structures.

On successful completion of this unit students will be able to set up and assess the accuracy of control points. From these or any other control points the students will be able to complete a topographic survey or set out a structure. The students will also be able analyse errors in Setting-out and surveying.

Learning Outcomes

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

1 Undertake a survey to establish a station network for horizontal and vertical control

2 Explain the process of undertaking a topographic survey

3 Apply industry standard techniques in the production, transferring and staking out of co-ordinates of multiple construction elements

4 Prepare a report on the causes of errors and techniques to improve accuracy, including the use of digital data.

Essential Content

LO1 **Undertake a survey to establish a station network for horizontal and vertical control**

Description of types of control points

Primary controls, first and second order

Secondary control

Different methods of marking control points

The use of local, national and grid control available

Conducting a closed traverse

Carrying out a full closed traverse survey for horizontal and vertical controls

Methods for checking accuracy of the traverse

Matching the control station accuracy to national standards or recommendations

Calculations to obtain corrected co-ordinates

LO2 **Explain the process of undertaking a topographic survey**

Purpose of a topographic survey

Links to initial control

Techniques to communicate a completed survey

Cut and fill information obtained from a survey

Methods of completing a topographic survey

Equipment to be used to capture topographic details

Use of free station and GPS to complete the survey

Coding systems for features to be surveyed

Data transfer techniques.

LO3 **Apply industry standard techniques in the production, transferring and staking out of co-ordinates of multiple construction elements**

Examples of construction elements

Building outlines, centre lines of structural elements, boundary locations from national co-ordinates, road centre lines, drainage and hard landscape features.

Setting-out techniques

Holistic view of setting from the whole to the part

Use of free station, reference lines, stake out, tie distances within a total station program

Techniques to obtain Setting-out data, including data transfer

Process of Setting-out structures and offsetting lines of structural elements

Horizontal and vertical control of construction, both initially and as the work commences.

LO4 **Prepare a report on the causes of errors and techniques to improve accuracy, including the use of digital data**

Errors in surveying and Setting-out

Instrumentation error: prism constants, reflector heights, atmospheric influences, calibration certification, free station errors, discrete Setting-out

Human errors: alignment of levelling staffs and hand- or tripod-mounted prisms, physical Setting-out constraints

Improvement of accuracy:

Use of technology to provide checking methods

Testing procedures for instrumentation to be used in Setting-out and surveying

Comparing accuracy of set out element to nationally recognised standards.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Undertake a survey to establish a station network for horizontal and vertical control</td><td rowspan="5">LO1 and LO2

D1 Assess the accuracy of a network in the production of a topographic survey</td></tr>
<tr><td>P1 Describe the types of control networks that are available for surveying, including examples of local and national stations

P2 Carry out a closed traverse survey of a network, including at least five stations

P3 Calculate corrected co-ordinates and heights for the stations and explain the stages used</td><td>M1 Calculate and compare the accuracy achieved in a closed traverse survey</td></tr>
<tr><td colspan="2">LO2 Explain the process of undertaking a topographic survey</td></tr>
<tr><td>P4 Explain the process of conducting a topographic survey for a given plot of land, including initial control

P5 Describe, with examples, common coding systems and data exchange processes, including communicating final outcomes</td><td>M2 Review the content of a topographic survey, including analysis of its suitability to assist the design team in completing the design</td></tr>
</table>

Pass	Merit	Distinction
LO3 Apply industry standard techniques in the production, transferring and staking out of co-ordinates of multiple construction elements		
P6 Extract and transfer the required data from a given project to a total station in order to allow Setting-out to commence **P7** Complete a full Setting-out operation on a given project by utilising a total station free station programme, including both horizontal and vertical control	**M3** Analyse the accuracy achieved from a Setting-out operation from tie distances recorded, total station stored data and another means	**D2** Analyse both the accuracy achieved and the techniques used during the practical exercise
LO4 Prepare a report on the causes of errors and techniques to improve accuracy, including the use of digital data.		
P8 Prepare a report on the common causes of errors in both Setting-out and surveying **P9** Compare the accuracy of Setting-out data to national standards	**M4** Evaluate the causes of errors in surveying, Setting-out and data transfer	**D3** Analyse the techniques used to improve accuracy, including the implication of Setting-out errors and the application of industry standard technology/software

Recommended Resources

Textbooks

IRVINE, W. and MACLENNAN, F. (2005) *Surveying for Construction*. 5th ed. London: McGraw-Hill.

SCHOFIELD, W. and BREACH, M. (2007) *Engineering Surveying*. 6th ed. Oxford: Elsevier.

SADGROVE, B.M. (2007) *Setting-out Procedures for the Modern Built Environment*. London: Ciria.

UREN, J. and PRICE, W. (2010) *Surveying for Engineers*. 5th ed. Basingstoke: Palgrave Macmillan.

Websites

ice.org.uk	Institution of Civil Engineers (General Reference)
tsa-uk.org.uk	The Survey Association (General Reference)

Links

This unit links to the following related units:

Unit 11: Measurement & Estimating

Unit 13: Tender & Procurement

Unit 23: Contracts & Management

Unit 41: Surveying for Conservation, Renovation & Refurbishment

Unit 44: Advanced Surveying & Measurement

Unit 21: Site Supervision & Operations

Unit code	**Y/615/1407**
Unit level	**4**
Credit value	**15**

Introduction

The construction of buildings and infrastructure involves many different types of work and many different people. The skills required to successfully manage the diverse groups of people on a building site, and to monitor and assess their work, is critical to both the success of the project and to ensure the safety of those working.

Through this unit students will develop the skills and techniques necessary to manage the people and processes of a building site, ensuring the quality of work, safe working practices and the interactions of different 'trades'.

Topics covered in this unit include: evaluating construction information, monitoring quality, identifying and notifying of defects, sustainable methods of construction, site safety regulations, Health & Safety regulations, people management, performance management, site meetings, contractor and sub-contractor relations.

Learning Outcomes

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

1 Evaluate construction information to determine quality requirements

2 Prepare a report on defects and recommended remedial actions

3 Assess a pre-construction Health & Safety plan for a given construction project, in relation to local and national regulations

4 Discuss methods for evaluating and improving the performance of site staff.

Essential content

LO1 **Evaluate construction information to determine quality requirements**

Construction information:

Construction drawings

Specifications

Schedules

Building Information Modelling.

Statutory documents related to quality:

Building regulations

Health & safety regulations.

LO2 **Prepare a report on defects and recommended remedial actions**

Site visits and evaluation:

Patent defects

Latent defects

'Walking the site'

Identifying defects

Recording defects

Notifying defects.

On-site testing/off-site testing:

Prototypes

Mock-ups

Testing facilities

Quality certification systems.

Quality control responsibilities:

Architect

Civil engineer

Clerk of works

Contractors/sub-contractors

Site staff.

LO3 **Assess a pre-construction Health & Safety plan for a given construction project, in relation to local and national regulations**

Construction design management:

Client responsibilities

Professional responsibilities

Information recording and sharing.

Statutory health & safety requirements:

Site safety monitoring

Responsibilities

Notifications.

Risk assessment and management

LO4 **Discuss methods for evaluating and improving the performance of site staff**

Working relationships:

Effective communication

Motivation

Managing conflict

Equality and diversity.

Performance monitoring and evaluation:

Supervision and supervisors

Target setting

Review

Self-evaluation

Supervisor evaluation

Peer evaluation

Training and development needs.

Site manager responsibilities:

Leadership techniques

Identifying staff training needs

Training and development planning

Continuing Professional Development.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Evaluate construction information to determine quality requirements		
P1 Define quality requirements for a given project through the review of drawings, specifications and schedules **P2** Explore the relationship between project quality requirements with statutory requirements	**M1** Evaluate the impact of potential changes in project quality requirements that are necessary to meet statutory requirements	**LO1 and LO2** **D1** Review construction information and schedules of defects to ascertain patent defects and the implication for defects liability
LO2 Prepare a report on defects and recommended remedial actions		
P3 Identify defects for a given construction project and produce a schedule of defects **P4** Explore remedial actions necessary to address identified defects	**M2** Discuss the difference between patent and latent defects and their associated implications for remedial actions	

Pass	Merit	Distinction
LO3 Assess a pre-construction Health & Safety plan for a given construction project, in relation to local and national regulations		
P5 Discuss the importance of construction design management for ensuring site safety **P6** Discuss local and national requirements for Health & Safety in relation to construction projects	**M3** Evaluate the impact of Health & Safety violations on construction projects	**D2** Give examples of methods for promoting a positive approach to Health & Safety for a construction team
LO4 Discuss methods for evaluating and improving the performance of site staff		
P7 Describe the methods for evaluating the performance of team members **P8** Recommend training and development strategies to improve performance	**M4** Evaluate the relationship between equality and diversity and performance management in the construction industry	**D3** Analyse the relationship between performance management and Health & Safety legislation

Recommended resources

Textbooks

BARBER, J. and INSTITUTION OF CIVIL ENGINEERS (2002) *Health & Safety in Construction: Guidance for Construction Professionals*. London: Thomas Telford.

CHARTERED INSTITUTE OF BUILDING (2014) *Code of Practice for Project Management for Construction and Development*. 5th ed. Chichester, West Sussex Wiley-Blackwell.

COLES, D., BAILEY, G. and CALVERT, R.E. (2012) *Introduction to Building Management*. London: Routledge.

COOKE, B. and WILLIAMS, P. (2009) *Construction Planning, Programming and Control*. Chichester, West Sussex: Wiley-Blackwell.

DAINTY, A. and LOOSEMORE, M. (2012) *Human Resource Management in Construction: Critical Perspectives.* 2nd ed. London: Routledge.

FORSTER, G. (1986) *Building Organisations, and Procedure*. Harlow: Longman Scientific & Technical.

HARRIS, F., MCCAFFER, R. and EDUM-FOTWE, F. (2013). *Modern Construction Management*. Chichester, West Sussex: Wiley-Blackwell.

HUGHES, P., PHILLIP. W. and FERRETT, E. *Introduction to Health & Safety in Construction: for the NEBOSH National Certificate in Construction Health & Safety*. 5th ed. Abingdon: Routledge.

Websites

www.ciob.org	Chartered Institute of Building
www.pmi.org	Project Management Institute
www.cipd.co.uk	Chartered Institute of Personnel and Development
www.ice.org.uk	Institutions of Civil Engineers

Links

This unit links to the following related units:

Unit 4: Construction Practice & Management

Unit 5: Legal & Statutory Responsibilities in Construction

Unit 6: Construction Information (Drawing, Detailing, Specification)

Unit 12: Financial Management & Business Practices in Construction

Unit 13: Tender & Procurement

Unit 14: Building Information Modelling

Unit 23: Contracts & Management

Unit 24: Project Management

Unit 45: Maintenance & Operations