Pearson BTEC

L3

Pearson Level 3 Alternative Academic Qualification

BTEC National in

Construction and the Built Environment (Extended Certificate)

Specification

First teaching from September 2025

First certification from 2026

Issue 3

Qualification Number: 610/3959/7

Pearson
BTEC

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About Pearson

We are the world's leading learning company operating in countries all around the world. We provide content, assessment and digital services to learners, educational institutions, employers, governments and other partners globally. We are committed to helping equip learners with the skills they need to enhance their employability prospects and to succeed in the changing world of work. We believe that wherever learning flourishes so do people.

This specification is Issue 3. Key changes are summarised on the next page. We will inform centres of any changes to this issue. The latest issue can be found on our website.

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Welcome

BTEC Nationals are widely recognised by higher education and industry as the vocational qualification of choice at Level 3. They provide students with meaningful and practical learning experiences across a range of career sectors to prepare them to progress to higher education as a route to graduate-level employment.

Recent data has shown that one in five adults of working age in the UK has a BTEC qualification. What's more, well over 90,000 BTEC students apply to UK universities every year and their BTEC Nationals are accepted by over 150 UK universities and other higher education institutions for relevant degree programmes either on their own or in combination with A Levels.

Why are BTECs so successful?

BTECs embody a fundamentally student-centred approach to the curriculum, with a flexible, unit-based structure and knowledge applied through a balanced combination of assignments and examinations. They enable the holistic development of the practical, interpersonal and thinking skills required to succeed in higher education and employment.

When creating these BTEC Nationals we focused on the skills and personal attributes needed to navigate the future, and have worked with many higher education providers, professional bodies, colleges and schools to ensure that their needs are met. Employers are looking for future employees with a thorough grounding in the latest industry requirements and work-ready skills such as critical thinking and problem solving. Higher education needs students who have experience of research, extended writing and meeting deadlines.

We have addressed these requirements by:

- Facilitating and guiding the development of transferable skills through the design and delivery of the qualifications, using a holistic and practical framework which is based on recent research into the most critical skills needed to navigate the future. This Transferable Skills framework has been used to embed transferable skills in the qualifications where they naturally occur and also to signpost opportunities for delivery and development as a part of the wider BTEC learning experience.
  See page 6 for further information.
- Supporting the delivery of Sustainability Education and Digital Skills development naturally through the content design of the qualifications. Mapping is provided for each qualification to identify where the opportunities for teaching and learning exist.
- Updating sector-specific content to ensure it is relevant and future-facing.
- Implementing a consistent approach to assessment with a balanced combination of internal and external assessments to better engage students, make the qualifications more accessible for them and more manageable for centres to deliver.

We are providing a wealth of support, both resources and people, to ensure that students and their teachers have the best possible experience during their course. See Section 5 for details of the support we offer.

This specification document should be used in conjunction with the *Pearson Level 3 Alternative Academic Qualification BTEC National Specification Supplementary Information* document which is available on our website.

A word to students

Today's BTEC Nationals will require commitment and hard work, as you would expect of the most respected applied learning qualification in the UK. You will have to complete a range of units, be organised, take some assessments that we will set and mark and undertake practical tasks and assignments. But you can feel proud to achieve a BTEC because, whatever your plans in life – whether you decide to study further, go on to work or an apprenticeship – your BTEC National will be your passport to success in the next stage of your life.

Good luck, and we hope you enjoy your course.

Summary of changes to Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate) specification Issue 3

Summary of changes made between previous issue and this issue	Page number
Corrections made to synoptic links between units	4, 11, 54 and 71
Grading information updated to remove requirement for students to achieve a Near Pass (N) or above in external units to achieve the qualification	116

Contents

1 Introduction 1

Why choose the Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)? 1

Total Qualification Time 2

Qualification and unit content 3

Assessment 3

Externally assessed units 3

Internally assessed units 4

Synoptic assessment 4

Language of assessment 4

Grading for units and qualifications 5

UCAS tariff points 5

Preparing students for the future 6

Transferable skills 6

Digital skills 6

Sustainability skills 7

2 Qualification purpose 8

3 Structure 10

Qualification structure 10

Synoptic assessment 11

4 Units 12

Understanding your units 12

Internally assessed units 12

Externally assessed units 14

Index of units 17

5 Planning your programme 115

Supporting you in planning and implementing your programme 115

Is there a student entry requirement? 115

6 Understanding the qualification grade 116

Awarding and reporting for the qualification 116

Eligibility for an award 116

Award of the qualification grade 116

Points available for internal units 117

Points available for external units 117

Claiming the qualification grade 118

Award of qualification grade 118

Example of a Grading table Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate) 119

Appendix 1 Glossary of terms used for internally assessed units 121

Appendix 2 Transferable Skills framework 123

Appendix 3 Digital Skills framework 129

Appendix 4 Sustainability framework 131

Annexe A: Formulae and constants 133

1 Introduction

Why choose the Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)?

We've listened to feedback from all parts of the Construction and the Built Environment subject community, including higher education. We've used this opportunity of curriculum change to redesign this qualification so that it reflects the demands of a truly modern and evolving construction and the built environment – a qualification that enables your students to apply themselves and give them the skills to succeed in their chosen pathway.

There are three mandatory units, two externally assessed and one internally assessed, which cover the following aspects of construction:

- construction principles
- construction technology
- construction design.

There are three optional units, from which students chose two, covering the following aspects of construction:

- construction commercial management
- retrofit in construction
- modelling in construction.

The maths, science and materials skills learned will give students the fundamental knowledge needed to enable them to apply skills in a context used within the sector and progress to further study.

The qualification is designed to be taken alongside A Levels as part of a study programme and can link to learning in A Level subjects such as A Level Mathematics, A Level Physics and A Level Design and Technology. It is intended for students that wish to progress to higher education as a pathway to employment.

Total Qualification Time

For all regulated qualifications, Pearson specifies a total number of hours that it is estimated students will require to complete and show achievement for the qualification: this is the Total Qualification Time (TQT). Within TQT, Pearson identifies the number of Guided Learning Hours (GLH) that we estimate a centre delivering the qualification might provide. Guided learning means activities, such as lessons, tutorials, online instruction, supervised study and giving feedback on performance, that directly involve teachers and assessors in teaching, supervising and invigilating students. Guided learning includes the time required for students to complete external assessment under examination or supervised conditions.

In addition to guided learning, other required learning directed by teachers or assessors will include private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision and independent research.

BTEC Nationals have been designed around the number of hours of guided learning expected. Each unit in the qualification has a GLH value of 60, 90 or 120. There is then a total GLH value for the qualification.

Each qualification has a TQT value. This may vary within sectors and across the suite depending on the nature of the units in each qualification and the expected time for other required learning.

The following table shows the qualifications in this sector and their GLH and TQT values.

Qualification title	Size and structure	Summary purpose
Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)	360 GLH (545 TQT) Equivalent in size to one A Level. Students choose 5 units from 6, of which 3 are mandatory and 2 are external. Mandatory content (66%). External assessment (50%).	The Extended Certificate is for students who are interested in learning about the Construction and the Built Environment sector alongside other fields of study, with a view to progressing to a wide range of higher education courses, not necessarily in Construction and the Built Environment-related subjects. It is designed to be taken as part of a programme of study that includes A Levels.

Qualification and unit content

Pearson has developed the content of the new BTEC Nationals in collaboration with representatives from higher education and relevant professional bodies. In this way, we have ensured that content is up to date and that it includes the knowledge, understanding, skills and attributes required in the sector.

Centres should ensure that delivery of content is kept up to date. Some of the units within the specification may contain references to legislation, policies, regulations and organisations, which may not be applicable in the country you deliver this qualification in (if teaching outside of England), or which may have gone out-of-date during the lifespan of the specification. In these instances, it is possible to substitute such references with ones that are current and applicable in the country you deliver subject to confirmation by your Standards Verifier.

Assessment

Assessment is specifically designed to fit the purpose and objective of the qualification. It includes a range of assessment types and styles suited to vocational qualifications in the sector. There are three main forms of assessment that you need to be aware of: external, internal and synoptic.

Externally assessed units

Each external assessment for a BTEC National is linked to a specific unit. All of the units developed for external assessment are of 60, 90 or 120 GLH to allow students to demonstrate breadth and depth of achievement. Each assessment is taken under specified conditions, then marked by Pearson and a grade awarded. Students are permitted to resit the examination twice. This equates to three attempts in total: one inclusive of registration, the remaining two attempts as resits. If students resit an examined unit, the best grade achieved will count towards their overall qualification grade, not necessarily the most recent sitting. External assessments are available twice a year. For detailed information on the external assessments, please see the table in *Section 3.* For further information on preparing for external assessment, see the *Pearson Level 3 Alternative Academic Qualification BTEC National Specification Supplementary Information* document which is available on our website.

Internally assessed units

Internally assessed units are assessed by a Pearson Set Assignment Brief (PSAB), which is set by Pearson, marked by you and subject to external standards verification. Before you assess you will need to become an approved centre, if you are not one already. You will need to prepare to assess using the guidance in the Pearson Level 3 Alternative Academic Qualification BTEC National Specification Supplementary Information document, which is available on our website: https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/btec-spec-supp-info.pdf. You will make grading decisions based on the requirements and supporting guidance given in the units. Where a student has not achieved their expected level of performance for an assignment, they may be eligible for one resubmission of improved evidence for each assignment submitted if authorised by the Lead Internal Verifier. To ensure any resubmissions are fairly and consistently implemented for all students, the Lead Internal Verifier can only authorise a resubmission if certain conditions are met. If the Lead Internal Verifier does authorise a resubmission, it must be completed within 15 working days of the student receiving the results of the assessment.

Feedback to students can only be given to clarify areas where they have not achieved expected levels of performance. Students cannot receive any specific guidance or instruction about how to improve work to meet assessment criteria or be given solutions to questions or problems in the tasks.

If a student has still not achieved the targeted pass criteria following the resubmission of improved evidence for an assignment, the Lead Internal Verifier may authorise, under exceptional circumstances, one retake opportunity to meet the required pass criteria. The retake can be of a task or subset of the Pearson Set Assignment Brief that is of evidence in a new or revised form. The deadline for submission of the retake must fall within the same academic year.

Synoptic assessment

Synoptic assessment requires students to demonstrate that they can identify and use effectively, in an integrated way, an appropriate selection of skills, techniques, concepts, theories and knowledge from across the whole sector as relevant to a key task. Synoptic links between units are flagged within the units. Please refer to *Unit 2: Construction Technology* and *Unit 3 Design for Construction and the Built Environment* for further details.

Language of assessment

Assessment of the internal and external units for these qualifications will be available in English. All student work must be in English. A student taking the qualifications may be assessed in British or Irish Sign Language where it is permitted for the purpose of reasonable adjustment.

For information on reasonable adjustments see the *Pearson Level 3 Alternative Academic Qualification BTEC National Specification Supplementary Information* document, which is available on our website.

Grading for units and qualifications

Achievement in the qualification requires a demonstration of depth of study in each unit, assured acquisition of a range of practical skills required for progression to higher education, and successful development of transferable skills. Students achieving a qualification will have completed all units.

Units are assessed using a grading scale of Distinction (D), Merit (M), Pass (P), Near Pass (N) and Unclassified (U). The grade of Near Pass is used for externally assessed units only. All mandatory and optional units contribute proportionately to the overall qualification grade, for example a unit of 120 GLH will contribute double that of a 60 GLH unit.

BTEC National qualifications are graded using a scale of P to D*, **or** PP to D*D*, **or** PPP to D*D*D* depending on the size of the qualification. Please see *Section 6* for more details. The relationship between qualification grading scales and unit grades will be subject to regular review as part of Pearson's standards monitoring processes on the basis of student performance and in consultation with key users of the qualification.

UCAS tariff points

The BTEC Nationals attract UCAS points. Please go to the UCAS website for full details of the points allocated.

Preparing students for the future

Transferable skills

Recent future skills reports have highlighted the growing importance of transferable skills for students to succeed in their careers and lives in this fast-changing world.

Following research and consultation with FE educators and higher education institutions, Pearson has developed a Transferable Skills Framework to facilitate and guide the development of transferable skills through this qualification. The Framework has four broad skill areas, each with a cluster of skills as shown below:

1. **Managing Yourself**: (1) Taking personal responsibility; (2) Personal strengths and resilience; (3) Career orientation planning; (4) Personal goal setting
2. **Effective Learning**: (1) Managing own learning; (2) Continuous learning; (3) Secondary research skills (4) Primary research skills
3. **Interpersonal Skills**: (1) Written communications; (2) Verbal and non-verbal communications; (3) Teamwork; (4) Cultural and social intelligence
4. **Solving Problems**: (1) Critical thinking (2) Problem solving; (3) Creativity and innovation

Each transferable skill has a set of descriptors that outline what achievement of the skill looks like in practice. Each unit in the qualification will show whether a transferable skill has been:

1. fully embedded through the design of the teaching and learning content and assessment of the unit. Skills that are embedded are 'naturally occurring' in that they are inherent to the unit content and don't require extension activities to deliver.
2. signposted as an opportunity for delivery and development and would require extension activities to deliver.

Units will show a summary of the transferable skills that have been embedded or signposted and *Appendix 2* shows the descriptors for each skill across all the skill clusters.

More information on the framework, its design and relevance for student progression is available in the *BTEC Transferable Skills Guide for Teachers*. Resources and guidance to support teachers in the delivery and development of these skills will be available in the Planning and Teaching Guide for this qualification and through our training offer.

Digital skills

Digital skills are required in every industry as well as in everyday life and with the acceleration of automation and AI in industry it is critical for students to understand how digital technologies are relevant and applied in the context of the sector they are studying.

With this in mind, we have used the Digital Skills Framework published by IFATE as a frame of reference to identify opportunities for the delivery and development of digital skills in this qualification.

This Digital Skills framework has five categories with specific digital characteristics that apply in varying extent across sectors:

1. **Problem Solving** – The use of digital tools to analyse and solve problems
2. **Digital Collaboration and Communication** – Using digital tools to communicate and share information with stakeholders
3. **Transacting Digitally** – Using digital tools to set up accounts and pay for goods/services
4. **Digital Security** – Identify threats and keep digital tools safe
5. **Handling Data Safely and Securely** – Follow correct procedures when handling personal and organisational data

Opportunities to develop these digital skills are identified where they are relevant and appropriate to a sector, meaning that:

- where they naturally occur
- where add no assessment burden
- where they will enhance a student's skills and knowledge in the sector.

Appendix 3 shows a mapping of the teaching and learning content to the five categories of the framework to show where digital skills have been embedded into this qualification.

Sustainability skills

To help students develop sustainability skills, practices and mindset, we have designed content in this qualification, aligned to the UNESCO Sustainable Development Goals (17 SDGs), that are relevant and appropriate to the sector. The SDGs are the most common point of reference for content that addresses sustainability education and provides a useful and pragmatic way of presenting this content.

Sustainability knowledge and understanding may be included in the teaching and learning content but not directly assessed. Alternatively, it could be assessed – the approach chosen for each unit is based on the relevance of knowledge and understanding to the purpose and scope of the unit.

Appendix 4 shows a mapping of the teaching and learning content to the relevant SDGs to show where sustainability concepts have been included in this qualification.

2 Qualification purpose

Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)

In this section you will find information on the purpose of this qualification and how its design meets that purpose through the qualification objective and structure. We publish a full 'Statement of Purpose' for each qualification on our website. These statements are designed to guide you and potential students to make the most appropriate choice of qualification at recruitment.

Who is this qualification for?

The Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate), is an Alternative Academic Qualification (AAQ) designed for post-16 students interested in the Built Environment and aiming to progress to higher education as a route to graduate level employment.

Equivalent to one A Level in size, it is suitable for students looking to develop their applied knowledge and skills in Building and Construction as part of a study programme alongside A Levels.

What will the student study as part of this qualification?

The qualification has been developed in consultation with universities and professional bodies to ensure students have the knowledge, understanding and skills they need to progress to and thrive in higher education.

The qualification has three mandatory units covering the following topics:

- Construction Principles: Properties of construction materials, how they perform and the underpinning scientific principles; mathematical techniques used to solve construction problems
- Construction Technology: Principles and methods of the construction of new buildings; sustainability of construction practice and the impact on the natural environment
- Design for Construction and the Built Environment: Stages and processes involved in designing buildings, including factors that influence the process.
- Students have a choice of two from three optional units, covering the following topics:
- Construction Commercial Management: Commercial management in construction projects, cost management techniques, commercial risk and procurement
- Retrofit in Construction and the Built Environment: Sustainability solutions for buildings, including surveying and specification of efficiency measures
- Modelling in Construction: Principles and use of building information modelling (BIM) technologies; project information models and digital data in collaborative design.

What knowledge and skills will the student develop as part of this qualification and how might these be of use and value in further studies?

Students will develop the following knowledge and skills from the mandatory units:

- Knowledge and understanding of construction materials, construction technology and design of new buildings, and sustainability practices in construction
- Use of mathematical techniques to solve problems in construction contexts
- Technical design and communication skills including sketching, the use of software and visualisations to present information
- Problem solving.

Students will develop the following knowledge and skills from the optional units:

- Knowledge and understanding of cost control, contracting and procurement; retrofit processes and solutions; BIM concepts and processes
- Skills in compiling cost estimates and proposing retrofit solutions
- Critical thinking: The ability to apply mathematical techniques to solve problems and demonstrate technical design and communication skills in construction contexts are key attributes needed for construction degrees. Knowledge about sustainability practices in construction complemented by transferable skills such as problem solving and critical thinking are crucial for the future of the construction industry as well as in STEM education.

Which subjects will complement this qualification?

The following subjects would be suitable to combine with this qualification:

- Mathematics
- Physics
- Design and Technology
- Art and Design.

What further learning will this qualification lead to?

This qualification can lead to progression to the following degrees:

- Architecture BA/BSc
- Construction Management BSc
- Civil Engineering BEng.

3 Structure

Qualification structure

Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)

Students must complete three mandatory units and two optional units.

See *Section 6* for rules on qualification awarding.

Mandatory units – students complete all units

Unit number	Unit title	GLH	Type	How assessed
1	Construction Principles	**120**	**Mandatory**	External
2	Construction Technology	**60**	**Mandatory**	External
3	Design for Construction and the Built Environment	**60**	**Mandatory**	Internal

Optional units – students complete two units

Unit number	Unit title	GLH	Type	How assessed
4	Construction Commercial Management	**60**	**Optional**	Internal
5	Retrofit in Construction and the Built Environment	**60**	**Optional**	Internal
6	Modelling in Construction	**60**	**Optional**	Internal

External assessment

50% of the total qualification GLH is made up of external assessment. A summary is given below. See the unit content and sample assessment materials for more information.

Unit	Type	Availability
Unit 1: Construction Principles	• An external examination set and marked by Pearson • 90 marks	**January and May/June** **First assessment May/June 2026**
Unit 2: Construction Technology	• An external examination set and marked by Pearson • 70 marks	**January and May/June** **First assessment May/June 2026**

Teachers need to teach *Unit 1: Construction Principles* before teaching *Unit 2: Construction Technology*. Content areas in *Unit 1: Construction Principles* marked # will not be assessed as discrete topics in isolation, as it is assumed that students will have an underpinning awareness of material properties.

Synoptic assessment

The assessment of synoptic knowledge requires students to apply learning from one unit to the assessment in another unit. Within the assessments for *Unit 2: Construction Technology* and *Unit 3: Design for Construction and the Built Environment*, students will be assessed on underpinning knowledge, ideas and concepts from *Unit 1: Construction Principles*. Synoptic links are flagged within the units.

There might be some further naturally occurring synoptic opportunities across the qualification where students can synthesise their learning. These will be outlined in the Planning and Teaching Guide to help with planning for your teaching.

4 Units

Understanding your units

The units in this specification set out our expectations of assessment in a way that helps you to prepare your students for assessment. The units help you to undertake assessment and quality assurance effectively.

Each unit in the specification is set out in a similar way. There are two types of unit format:

- Internally assessed units
- Externally assessed units.

This section explains how the units work. It is important that all teachers, assessors, internal verifiers and other staff responsible for the programme review this section.

Internally assessed units

Section	Explanation
Unit number	The number is in a sequence in the sector. Numbers may not be sequential for an individual qualification.
Unit title	This is the formal title that we always use and it appears on certificates.
Unit level	All units are Level 3 on the national framework.
Unit type	This confirms that the unit is internally assessed. See structure information in *Section 3* for full details.
GLH	Units may have a Guided Learning Hours (GLH) value of 120, 90 or 60. This indicates the numbers of hours of teaching, directed activity and assessment expected. It also shows the weighting of the unit in the final qualification grade.
Unit in brief	A brief formal statement on the content of the unit that is helpful in understanding its role in the qualification. You can use this in summary documents, brochures etc.
Unit introduction	This is designed with students in mind. It indicates why the unit is important, how learning is structured and how learning might be applied when progressing to employment or higher education.
Learning aims	These help to define the scope, style and depth of learning of the unit. You can see where students should be learning standard requirements ('understand') or where they should be actively researching ('investigate'). You can find out more about the verbs we use in learning aims in *Appendix 1*.

Section	Explanation
Summary of unit	This helps teachers to see the main content areas against the learning aims and the structure of the assessment at a glance.
Content	This sets out the required teaching content of the unit. Content is compulsory except where shown as 'e.g.'. Students should be asked to complete summative assessment only after the teaching content for the unit or learning aim(s) has been covered.
Assessment criteria	Each learning aim has Pass and Merit criteria. Each assignment has at least one Distinction criterion. A full glossary of terms used is given in *Appendix 1*. Distinction criteria represent outstanding performance in the unit. Some criteria require students to draw together learning from across the learning aims.
Transferable skills	This summarises the transferable skills present within this unit. The key helps to identify whether they are signposted but require additional assessment, embedded and achieved on completion or not present in this unit.
Essential information for Pearson Set Assignment Brief (PSAB)	This shows a brief summary of the activities required for the mandatory Pearson Set Assignment Brief. Centres must download and use the mandatory PSAB without alteration or contextualisation.
Further information for teachers and assessors	This gives you information to support the implementation of assessment. It is important that this is used carefully alongside the assessment criteria and PSAB.
Resource requirements	Any specific resource requirements that you need to be able to teach and assess are listed in this section.
Essential information for assessment decisions	This information gives guidance for each learning aim or assignment of the expectations for Pass, Merit and Distinction standard. This section contains examples and essential clarification.
Links to other units	This shows you the main relationship between units. This can help you to structure your programme and make best use of materials and resources.

Externally assessed units

Section	Explanation
Unit number	The number is in a sequence in the sector. Numbers may not be sequential for an individual qualification.
Unit title	This is the formal title that we always use and it appears on certificates.
Unit level	All units are Level 3 on the national framework.
Unit type	This confirms that the unit is externally assessed. See structure information in *Section 3* for full details.
GLH	Units may have a Guided Learning Hours (GLH) value of 120, 90 or 60. This indicates the numbers of hours of teaching, directed activity and assessment expected. It also shows the weighting of the unit in the final qualification grade.
Unit in brief	A brief formal statement on the content of the unit that is helpful in understanding its role in the qualification. You can use this in summary documents, brochures etc.
Unit introduction	This is designed with students in mind. It indicates why the unit is important, how learning is structured and how learning might be applied when progressing to employment or higher education.
Summary of assessment	This sets out the type of external assessment used and the way in which it is used to assess achievement.
Assessment outcomes	These show the hierarchy of knowledge, understanding, skills and behaviours that are assessed. Includes information on how this hierarchy relates to command terms in sample assessment materials (SAMs).
Content	For external units all content is obligatory. The depth of content is indicated in the assessment outcomes and sample assessment materials (SAMs). The content will be sampled through the external assessment over time, using the variety of questions shown.
Transferable skills	This summarises the transferable skills present within this unit. The key helps to identify whether they are signposted but require additional assessment, embedded and achieved on completion or not present in this unit.
Key terms typically used in assessment	These definitions will help you analyse requirements and prepare students for assessment.

Section	Explanation
Resources	Any specific resource requirements that you need to be able to teach and assess are listed in this section.
Links to other units	This shows you the main relationship between units. This can help you to structure your programme and make best use of materials and resources.

Index of units

Unit 1: Construction Principles 19

Unit 2: Construction Technology 39

Unit 3: Design for Construction and the Built Environment 55

Unit 4: Construction Commercial Management 73

Unit 5: Retrofit in Construction and the Built Environment 85

Unit 6: Modelling in Construction 103

Unit 1: Construction Principles

Level: 3

Unit type: External

Guided learning hours: 120

Unit in brief

Students explore the properties of construction materials, how they are manufactured and how they perform in service. They will also learn how to apply mathematics in construction contexts and how heat, light and acoustics contribute to human comfort levels.

Unit introduction

Job roles in the construction and built environment industry require the application of knowledge and understanding related to the design of structures and infrastructures, selection and use of construction materials, and the provision of human comfort in buildings. Whether you want to become a site manager, designer, engineer or surveyor, you will apply the knowledge and skills to ensure that materials are fit for purpose and that specified quantities are ordered and used on a construction project.

In this unit, you will develop the knowledge and understanding needed to solve a variety of construction related problems by applying scientific knowledge and carrying out mathematical and statistical techniques. You will learn about the science underpinning the manufacture, properties and sustainability of construction materials. You will understand the mathematical principles and techniques to carry out calculations that determine how materials behave under the action of forces or loads when used as structural members and draw conclusions regarding whether a material is fit for purpose. You will understand scientific principles and apply them to heat loss, sound reduction and lighting levels to provide human comfort during structure design, build and refurbishment.

This unit gives a foundation to help you progress to a wide range of higher education qualifications and will support you in a variety of job roles in a wide range of industries.

Summary of assessment

The unit will be assessed through one examination of 90 marks lasting 1 hour and 45 minutes.

Students will be assessed through a number of short- and long-answer questions. Students will need to explore and relate to contexts and data presented.

The assessment availability is twice a year in January and May/June. The first assessment availability is May/June 2026.

Sample assessment materials will be available to help centres prepare students for assessment.

Assessment outcomes

AO1 Recall knowledge of construction materials

AO2 Demonstrate understanding of the principles of construction

AO3 Apply knowledge and understanding of the principles of construction in given contexts

AO4 Analyse information about heat, acoustic and lighting comfort

AO5 Perform mathematical procedures used in solving construction problems.

[SP-PS]

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment. Content areas marked # will not be assessed as discrete topics in isolation.

A: Construction Materials

A1 Technical properties of materials

Students need to have an underpinning awareness of the following material properties.

Content areas marked # will not be assessed as discrete topics in isolation.

A1.1 Mass and density. #

A1.2 Tensile strength. #

A1.3 Compressive strength. #

A1.4 Shear strength. #

A1.5 Bending strength. #

A1.6 Hardness. #

A1.7 Toughness. #

A1.8 Malleability #

A1.9 Workability. #

A1.10 Stiffness. #

A1.11 Fatigue and creep. #

A1.12 Fire resistance. #

A1.13 Resistance to degradation. #

A1.14 Embedded energy. #

A1.15 Embedded carbon. #

A1.16 Recycling potential. #

A2 Technical properties of construction materials

Students will demonstrate knowledge and understanding of key properties of construction materials, how they work in isolation and together to provide composite performance, the benefits and drawbacks of their use, how their properties impact on performance in use and on the specification of materials for construction scenarios including residential, commercial, industrial, entertainment, external works and civil engineering projects and the levels of exposure of materials to the elements.

A2.1 Bricks and blocks:

- **A2.1.1** facing bricks
- **A2.1.2** Class A engineering bricks

A2.1.3 Class B engineering bricks

A2.1.4 common bricks

A2.1.5 aerated concrete blocks

A2.1.6 high-density concrete blocks

A2.1.7 insulated concrete blocks.

A2.2 Concrete:

A2.2.1 prescribed mixes

A2.2.2 design mixes

A2.2.3 new mixes using additives and admixtures

A2.2.4 smart concrete

A2.2.5 hempcrete

A2.2.6 reinforced concrete

- steel reinforcement
- glass reinforcement
- fibre reinforcement
- graphene reinforcement.

A2.3 Stone:

A2.3.1 natural stone

A2.3.2 reconstituted stone.

A2.4 Mortar mixes:

A2.4.1 cement mortar

A2.4.2 lime mortar

A2.4.3 cement lime mortar

A2.4.4 coloured mortar and render.

A2.5 Sand:

A2.5.1 building sand

A2.5.2 sharp sand

A2.5.3 silver sand.

A2.6 Plasterboard:

A2.6.1 sound block

A2.6.2 fire resistant

A2.6.3 standard

A2.6.4 thermal insulating.

A2.7 Glass and glass finishes:

- **A2.7.1** structural
- **A2.7.2** smart
- **A2.7.3** laminated
- **A2.7.4** tempered
- **A2.7.5** float
- **A2.7.6** clear
- **A2.7.7** obscured
- **A2.7.8** low emissivity (low-e glass).

A2.8 Insulation materials:

- **A2.8.1** fibreglass
- **A2.8.2** expanded polystyrene
- **A2.8.3** PIR (polyisocyanurate) boards
- **A2.8.4** mineral wool
- **A2.8.5** cellulose
- **A2.8.6** straw bales
- **A2.8.7** sheep's wool.

A2.9 Plastics used for polythene damp-proof membranes (DPM) and damp-proof courses (DPC).

A2.10 Plastics used for doors and window frames, soffits, bargeboards, fascia and guttering:

- **A2.10.1** polyvinylchloride (PVC)
- **A2.10.2** unplasticised polyvinylchloride (uPVC).

A2.11 Timber and manufactured boards:

- **A2.11.1** hardwoods
- **A2.11.2** softwoods
- **A2.11.3** plywood
- **A2.11.4** chipboard
- **A2.11.5** particle board
- **A2.11.6** medium-density fibreboard (MDF).

A2.12 Roofing materials:

- **A2.12.1** slate tile
- **A2.12.2** concrete tile
- **A2.12.3** pantile
- **A2.12.4** roofing felt

A2.12.5 thatch

A2.12.6 lead flashing

A2.12.7 green/living roofs

A2.12.8 smart roofing materials

A2.12.9 coverings with built-in PV cells.

A2.13 Engineered timber:

A2.13.1 SIPS (Structural Insulated Panels)

A2.13.2 glulam beams

A2.13.3 engineering joists

A2.13.4 cross laminated timber (CLT).

A2.14 Metals

A2.14.1 Steel:

- low carbon steel (mild steel)
- stainless steel
- high strength steel.

A2.14.2 Aluminium alloys.

A2.14.3 Copper.

A2.14.4 Brass.

A2.15 Modern construction materials:

A2.15.1 graphene

A2.15.2 liquid granite

A2.15.3 self-healing concrete

A2.15.4 translucent timber

A2.15.5 paper-based fibre composite material.

A3 Sustainability of construction materials

Students will apply knowledge and understanding of benefits, drawbacks and the factors that affect the sustainability of construction materials and how these impact on the decisions related to the use of materials in construction scenarios including residential, commercial, industrial, entertainment, external works and civil engineering projects.

A3.1 Extraction of materials:

A3.1.1 mining

A3.1.2 quarrying

A3.1.3 forestry

A3.2 Transportation of materials:

A3.2.1 road

A3.2.2 rail

A3.2.3 sea

A3.2.4 air.

A3.3 Manufacturing processes for materials

A3.3.1 Metals:

- steel
- aluminium alloys.

A3.3.2 Concrete:

- plain
- reinforced.

A3.3.3 Bricks and blocks:

- facing bricks
- aerated concrete blocks.

A3.3.4 Glass:

- laminated
- float.

A3.3.5 Timber:

- natural
- manufactured boards.

A3.4 Disposal:

A3.4.1 recycle

A3.4.2 reuse

A3.4.3 landfill

A3.4.4 incineration.

A4 Degradation of construction materials

Students will apply knowledge of the impact of the environment on building materials for various scenarios, degradation methods and types, benefits and drawbacks of the use of preventive and reduction measures, and impact of failure of a single material in a composite element related to construction scenarios including building works, external works and civil engineering projects.

A4.1 Sources of degradation and their cause

A4.1.1 Natural agents

- ageing
- ultraviolet (UV) radiation
- timber infestation

- insect attack
- fungal.

A4.1.2 Timber decay:

- wet rot
- dry rot
- lichens and mosses.

A4.1.3 Moisture movement:

- capillary action
- shrinkage.

A4.1.4 Exposure conditions:

- weathering
- freeze-thaw
- thermal ageing
- creep
- humidity
- loadings.

A4.1.5 Chemical degradation:

- acid rain
- sulphate
- alkalis
- leaching.

A4.1.6 Corrosion in metals:

- oxidation.

A4.2 Remedial measures to prevent and reduce degradation and their benefits and drawbacks:

A4.2.1 use of special paints

A4.2.2 protective coatings.

A4.3 Material failure:

A4.3.1 concrete and reinforced concrete

A4.3.2 brickwork

A4.3.3 timber – external and internal applications

A4.3.4 steel

A4.3.5 mortars.

B: Solving practical construction problems

B1 Algebraic techniques

Students will apply knowledge of mathematical, and algebraic methods and techniques to analyse and provide solutions to practical construction contexts related to surveying, structural analysis, material quantities and setting out.

B1.1 Solving pair of simultaneous linear equations in two unknowns:

- **B1.1.1** elimination method
- **B1.1.2** substitution method.

B1.2 Factorisation and quadratics:

- **B1.2.1** by extraction of a common factor $a(x + y)$, $a(x + 2) + b(x + 2)$
- **B1.2.2** by grouping $ax – ay + bx – by$
- **B1.2.3** quadratic expressions $a^2 + 2ab + b^2$

B1.3 Solving quadratic equations:

- **B1.3.1** factorisation
- **B1.3.2** quadratic formula
- **B1.3.3** rearranging formulae to change subject of formulae.

B1.4 Substituting values into and evaluating formulae.

B1.5 Accuracy of calculations to an appropriate degree of accuracy.

B2 Trigonometric techniques

Application of trigonometric techniques to 2D scenarios to solve construction problems involving the calculation of dimensions, angles, regular areas and irregular areas for surveying, structural analysis and calculation of material quantities.

B2.1 Trigonometric ratios:

- **B2.1.1** sine
- **B2.1.2** cosine
- **B2.1.3** tangent
- **B2.1.4** Pythagoras's theorem.

B2.2 Application of trigonometry to determine dimensions in 2D:

- **B2.2.1** use of the sine rule
- **B2.2.2** use of the cosine rule
- **B2.2.3** triangular area rule.

B2.3 Circular measure including use of the Radian Measure and conversation from degree measure to radians (and vice versa):

- **B2.3.1** arc length
- **B2.3.2** area of sector.

B3 Mensuration techniques

Students will apply knowledge of mensuration techniques for quantity surveying, and buying to analyse and provide solutions to practical construction contexts related to quantity surveying, setting out, structural analysis, material quantities and coverage of materials.

B3.1 Calculation of perimeters and centre lines.

B3.2 Calculation of diameter, radius and perimeter of circles.

B3.3 Calculation of areas of compound and irregular shapes that consist of:

- rectangles #
- squares #
- triangles #
- circles #
- trapeziums. #

B3.4 Calculation of surface areas and volumes of:

B3.4.1 cuboids

B3.4.2 triangular prisms

B3.4.3 spheres

B3.4.4 pyramids

B3.4.5 cones

B3.4.6 cylinders

B3.4.7 compound shapes and areas.

B4 Statistical techniques

Students will apply knowledge of statistical methods and techniques to interpret, analyse and present data related to climate, test results and data, quantities of materials and completion of construction activities.

B4.1 Methods of visual presentation of statistics and data:

B4.1.1 scatter diagrams

B4.1.2 pie charts

B4.1.3 histograms

B4.1.4 cumulative frequency.

B4.2 Averages and measures of central tendency for discrete, continuous, ungrouped and grouped data sets

B4.2.1 Mean:

- discrete data
- continuous data.

B4.2.2 Median:

- discrete data
- continuous data.

B4.2.3 Mode

- discrete data
- continuous data.

B4.3 Dispersion of data:

B4.3.1 range

B4.3.2 standard deviation.

B5 Calculus techniques

Students will apply knowledge of differential calculus methods and techniques to analyse and complete calculations related to practical civil engineering, structural analysis and surveying contexts.

B5.1 Differential calculus to solve construction related problems:

B5.1.1 Basic differentiation techniques:

- algebraic functions #
- trigonometric functions (sine and cosine) including use of the Radian Measure and conversation from degree measure to radians (and vice versa) #

B5.1.2 product rule #

B5.1.3 quotient rule #

B5.1.4 function of a function. #

B5.2 Be able to use differential calculus to solve construction-related problems related to:

B5.2.1 determine maximum and minimum values in relation to construction contextualised problems

B5.2.2 areas

B5.2.3 volumes

B5.2.4 beam deflection.

Students will apply knowledge of integral calculus methods and techniques to analyse and complete calculations related to practical construction contexts.

B5.3 Use of integral calculus to determine areas and volumes of materials, sites and excavations:

B5.3.1 indefinite and definite integration techniques:

- algebraic functions #
- trigonometric functions including use of the Radian Measure and conversation from degree measure to radians (and vice versa). #

B5.3.2 constant of integration. #

B5.4 Be able to use integral calculus to solve construction-related problems related to:

B5.4.1 area

B5.4.2 volume.

B6 Structural analysis

Students will apply knowledge of the different types of structural members and how they behave under different loading and support configurations.

B6.1 Types of structural members:

B6.1.1 beams #

B6.1.2 lintels #

B6.1.3 columns #

B6.1.4 walls #

B6.1.5 struts #

B6.1.6 ties. #

B6.2 Types of structural materials:

B6.2.1 concrete #

B6.2.2 reinforced concrete #

B6.2.3 timber #

B6.2.4 steel. #

B6.3 Types of load:

B6.3.1 dead loads

B6.3.2 live loads

B6.3.3 imposed loads

B6.3.4 point loads

B6.3.5 uniformly distributed loads (UDL)

B6.4 Types of force:

- **B6.4.1** tension
- **B6.4.2** compression
- **B6.4.3** shear.

B6.5 Types of structural failure that can occur in different structural members:

- **B6.5.1** overstressing
- **B6.5.2** overturning
- **B6.5.3** creep
- **B6.5.4** fatigue
- **B6.5.5** bending
- **B6.5.6** buckling
- **B6.5.7** shear
- **B6.5.8** tensile.

B6.6 Students will apply knowledge of appropriate mathematical methods and techniques to analyse and complete calculations related to structural members and loadings

B6.7 Calculation of elasticity:

- **B6.7.1** direct stress
- **B6.7.2** direct strain.

B6.8 Calculation of shear force values for point loaded simply supported beams.

B6.9 Calculation of bending moments for point loaded simply supported beams:

- **B6.9.1** production of shear force diagrams
- **B6.9.2** interpretation of shear force diagrams
- **B6.9.3** production of bending moments diagrams
- **B6.9.4** interpretation of bending moments diagrams
- **B6.9.5** calculation of equilibrium conditions to ensure stability of a beam.

C: Human comfort

C1 Heat

Students will apply knowledge and understanding of scientific principles, and their impact of the natural and built environment on human comfort and the provision of comfortable living and working environments in practical construction contexts including residential, commercial, industrial, education and leisure projects.

C1.1 Scientific principles and their application in the built environment

- **C1.1.1** Air temperature.
- **C1.1.2** Mean radiant temperature.

C1.1.3 Relative humidity.

C1.1.4 Air movement.

C1.1.5 Dry and wet bulb temperatures.

C1.1.6 Mechanisms of heat transfer:

- conduction
- convection
- radiation.

Students need to demonstrate knowledge and understanding of thermometers and control devices including applications, benefits, drawbacks and reasons for their use, in the provision of comfortable living and working environments in residential, commercial and education contexts.

C1.2 Thermometers and their application in determining human heat comfort conditions.

C1.3 Control instruments and their application in determining human comfort conditions in domestic and commercial properties:

C1.3.1 electronic control systems

C1.3.2 thermostats

C1.3.3 remote monitoring systems

C1.3.4 smartphone applications.

Students need to demonstrate knowledge and understanding of the factors that affect the provision of thermal comfort and comfortable living and working environments in practical construction contexts related to domestic dwellings.

C1.4 Factors that affect acceptable thermal comfort

C1.4.1 Current building regulations.

C1.4.2 combination of personal factors and thermal comfort requirements:

- age
- gender
- disability
- clothing
- state of health
- level of activity
- metabolic rate.

C1.5 Principles of heat losses and gains in buildings and methods to control them to provide human comfort in residential, commercial and industrial buildings.

C1.5.1 Causes and impacts of heat loss:

- fabric heat losses

- ventilation heat losses
- thermal bridges
- air changes.

C1.5.2 Factors contributing to heat gains and losses:

- insulating materials and its thickness
- surface area of the external shell
- exposure and impact of local climatic conditions on a building
- temperature difference between inside and outside
- air change rate
- building use.

C1.5.3 Calculation of thermal values for materials, walls and building elements in isolation and in combination.

C1.5.3.1 Calculate thermal conductivity

C1.5.3.2 Calculate thermal resistance.

C1.5.3.3 Calculation of U values.

C1.6 Methods for controlling heat loss from residential and commercial buildings:

C1.6.1 roof, wall and floor insulation

C1.6.2 double/triple glazing

C1.6.3 low emissivity glass

C1.6.4 secondary glazing

C1.6.5 draught reduction

C1.6.6 insulated building materials.

C1.7 Methods of heating a building and the factors affecting their location:

- radiator
- underfloor heating
- storage heaters
- infrared panels
- solid fuel stoves/fires.

C1.8 The source and causes of condensation, the consequences of its occurrence and potential impact on the building fabric and methods of control to provide human comfort in residential and commercial buildings.

C1.8.1 Sources of water vapour in buildings.

C1.8.2 Causes and effects of condensation in buildings.

C1.8.3 Impact of structural temperature profiles.

C1.8.4 Impact of dew-point temperature profiles

C1.8.5 Prediction and prevention of condensation.

C1.8.6 Interstitial condensation.

C1.8.7 Methods for controlling condensation in buildings:

- air conditioning
- heating and ventilation
- dehumidification
- extractor fans.

C2 Acoustic

Students will apply knowledge of the principles of sound, its relation to human comfort and the acoustic fitness for purpose of the area, including the benefits and drawbacks of different approaches relative to its intended use in residential, commercial, industrial, education and leisure contexts.

C2.1 Scientific principles, their relationship to human comfort and their application in the built environment:

C2.1.1 difference between sound and noise

C2.1.2 frequency of sound

C2.1.3 standard units

C2.1.4 reverberation times.

C2.2 Acceptable acoustic comfort parameters of an area relative to its intended use

C2.2.1 Current building regulations.

C2.2.2 Noise criteria indices.

C2.2.3 Personal factors:

- age
- disability
- previous exposure to noise
- state of health
- activity.

C2.3 Measurement of sound levels.

C2.4 Difference between sound insulation and sound absorption.

C2.5 Difference between airborne and impact sound.

C2.6 Issues associated with flanking transmission.

C2.7 Reasons why sound insulation and sound reduction is required.

C2.8 Understanding and application of sound insulation approaches:

C2.8.1 source-path-receiver approach

C2.8.2 improving structural elements

C2.8.3 controlling flanking sound

C2.8.4 use of appropriate materials to reduce sound.

C3 Lighting

Students will apply knowledge of the principles of scientific principles, the provision, benefits and drawbacks of appropriate lighting levels and types to ensure fitness for purpose of the area relative to its intended use in residential, commercial, industrial, education and leisure contexts.

C3.1 Scientific principles and their application in the built environment:

C3.1.1 Differences between natural and artificial light.

C3.1.2 Illuminance levels.

C3.1.3 Daylight factors.

C3.1.4 Glare and glare indices.

C3.1.5 Direct and reflected light.

C3.1.6 Power of a light source.

C3.1.7 Flow of light energy.

C3.1.8 Standard units of measurement:

- candela – power of a light source
- lumen – flow of light energy
- lux – illumination on surface.

C3.1.9 Acceptable illuminance levels for different activities and building use.

C3.1.10 Variation of daylight factors in a room

C3.1.11 Principal components of daylight factor:

- sky component (SC)
- externally reflected component (ERC)
- internally reflected component (IRC).

C3.2 Sources of artificial lighting:

C3.2.1 incandescent lamps

C3.2.2 compact fluorescent lamps (CFLs)

C3.2.3 discharge lamps

C3.2.4 ballast lamps

C3.2.5 light-emitting diodes (LEDs)

C3.2.6 wi-fi lamps

Transferable skills

Managing Yourself	Interpersonal Skills	Effective Learning	Solving Problems
MY – TPR	EL – MOL	IS – WC	SP – CT
MY – PS&R	EL – CL	IS – V&NC	SP – PS *
MY – COP	EL – SRS	IS – T	SP – C&I
MY – PGS	EL – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning.
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Key terms typically used in assessment

The following table shows the key terms that will be used consistently by Pearson in our assessments to ensure students are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only.

Command or term	Definition
Calculate	Determine a value by using the information they already have and applying the relevant mathematical process. For example, 'Calculate the reaction forces…'
Discuss	Consider in detail the different aspects of an issue, situation, problem or argument, and how they interrelate.
Draw	Produce an accurate graphical representation of data by hand (as in a diagram).
Explain	Give a point and provide a justification. Where used, a third point is a further expansion of the justification provided.
Identify	Select the correct response from given information.
Label	Affix a label to; mark with a label.
State/Give/Name	Provide a point of information.

Unit 2: Construction Technology

Level: 3

Unit type: External

Guided learning hours: 60

Unit in brief

In this unit students study the underlying principles and construction methods used in the construction of new buildings. In doing so, students will also consider the sustainability of construction practice and the impact of construction activities on the natural environment.

Unit introduction

The construction industry provides the population of the UK, and the world, with the built environment needed to sustain all aspects of life and economic activity as we know it. Today's buildings can use combinations of modern and traditional techniques and materials in their construction and this unit will provide you with an understanding of the construction technology used in the sustainable design and construction of low-rise domestic and commercial buildings.

In this unit you will examine the various forms of low-rise construction and consider the most appropriate forms for differing site conditions and client requirements. You will gain an understanding of the different types of foundation that could be used on a project and the factors which influence the selection of an appropriate foundation for a given project. You will investigate superstructure design and construction considering the most appropriate and sustainable solutions, specifications and details for given scenarios.

This unit will provide you with the underlying knowledge and understanding of construction technology that supports a wide range of other units within this qualification. A sound knowledge of construction technology is also an essential aspect of most job roles in construction, including Architect, Site Manager, Quantity Surveyor, Planner, Buyer, Estimator, etc.

Summary of assessment

The unit will be assessed through one examination of 70 marks lasting 1 hour and 45 minutes.

Students will be assessed through a number of short- and long-answer questions which will include some sketching of construction details. Students will need to explore and relate to contexts, scenarios and construction drawings. The questions will assess understanding of construction technology and sustainability in the context of low-rise construction.

The assessment availability is twice a year in January and May/June. The first assessment availability is May/June 2026.

Sample assessment materials will be available to help centres prepare students for assessment.

Assessment outcomes

AO1 Recall knowledge of construction technology and sustainable construction

AO2 Demonstrate understanding of construction technology and sustainable construction

AO3 Apply knowledge and understanding of construction technology and sustainable construction when considering different construction scenarios and construction details in the context of low-rise construction.

AO4 Analyse information about construction technology and sustainable construction when considering different construction scenarios in the context of low-rise construction.

[SP-CT]

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment.

A: Forms of low-rise construction

A1 Structural form of low-rise construction

Students will need to understand the use, characteristics, methods of load transfer, differences in construction methods, benefits and drawbacks including sustainability issues of the following forms of low-rise construction.

A1.1 Framed structures

A1.1.1 Skeleton, rectangular frame:

- steel
- in-situ reinforced concrete
- prefabricated concrete.

A1.1.2 Portal frame:

- steel
- laminated timber
- prefabricated concrete.

A1.1.3 Timber frame:

- prefabricated platform frames
- open panel systems
- closed panel systems
- floor cassettes.

A1.2 Structural insulated panels (SIPs):

A1.2.1 walls

A1.2.2 floors

A1.2.3 roofs.

A1.3 Traditional construction, constructed wholly on site comprising:

A1.3.1 cavity walls

A1.3.2 masonry walls

A1.3.3 timber roof structures

A1.3.4 timber floors

A1.3.5 in-situ methods.

A1.4 modular construction:

A1.4.1 four sided modules

A1.4.2 open sided modules

A1.4.3 partially open sided

A1.4.4 corner supported modules

A1.4.5 stair modules

A1.4.6 lift modules

A1.4.7 non-loadbearing modules.

A2 Fire compartmentalisation and protection

Students will need to be aware of fire safety issues, means of escape and methods of fire protection of buildings and occupiers, associated with the design of low-rise construction projects.

A2.1 Fire compartmentalisation

A2.1.1 fire resisting walls and floors

A2.1.2 auto-closing fire resisting doors with vision panels

A2.1.3 fire resisting ceilings

A2.1.4 refuge areas

A2.1.5 protected shafts

A2.1.6 cavity fire barriers

A2.1.7 fire stopping

A2.1.8 fire dampers in ventilation ducts.

A2.2 Fire mitigation measures

A2.2.1 sprinkler systems

A2.2.2 fire extinguishers

A2.2.3 fire blankets

A2.2.4 hose reels

A2.2.5 intumescent strips and seals

A2.2.6 fire alarms

A2.2.7 smoke detectors

A2.2.8 heat detectors.

A2.3 Fire protection to structural elements

A2.3.1 Fire protection to structural steelwork:

- use of intumescent paint
- use of concrete encasement
- use of multi-layer plasterboard
- use of masonry.

A2.3.2 Fire protection to timber structural elements walls and floors

- use of plasterboard linings
- use of fire-resistant linings.

A3 Health and safety associated with construction form

Students will need to understand the general health and safety issues and methods of risk/hazard reduction associated with low-rise construction projects.

A3.1 Specific hazards and risks relevant to different forms of low-rise construction:

A3.1.1 transportation, offloading and distribution

A3.1.2 lifting operations

A3.1.3 working at height

A3.1.4 manual handling

A3.1.5 timescales.

A3.2 General site health and safety:

A3.2.1 control of hazardous substances

A3.2.2 preventing slips trips and falls

A3.2.3 pedestrian walkways

A3.2.4 use of personal protective equipment (PPE)

A3.2.5 safety training

A3.2.6 safety briefings and toolbox talks

A3.2.7 signage

A3.2.8 Construction Skills Certification Scheme (CSCS) cards.

B Foundation design and construction

B1 Subsoil investigation

Students will need to be aware of subsoil investigation methods to obtain data and information for use in foundation design.

B1.1 Investigation methods and their benefits and drawbacks:

B1.1.1 desk study

B1.1.2 walkover survey

B1.1.3 trial pits

B1.1.4 auger holes

B1.1.5 percussion drilling and window sampling

B1.1.6 plate bearing test.

B1.2 Information used for foundation design:

- **B1.2.1** bearing capacity
- **B1.2.2** subsoil classification
- **B1.2.3** groundwater levels
- **B1.2.4** chemical analysis of soil samples and presence of sulphates
- **B1.2.5** presence of obstructions - naturally occurring and from previous development.

B2 Foundation design principles

Students will need to understand foundation design considerations, including the relationship between building load and ground bearing capacity, the foundation footprint and the transfer of loads to a suitable bearing stratum.

B2.1 Factors used during design to minimise settlement:

- **B2.1.1** building load
- **B2.1.2** soil bearing capacity and type
- **B2.1.3** foundation depth
- **B2.1.4** groundwater.

B2.2 Design to minimise other movement:

- **B2.2.1** soil shrinkage
- **B2.2.2** ground heave
- **B2.2.3** differential settlement
- **B2.2.4** effects of tree growth and tree removal
- **B2.2.5** use of cut and fill on sloping sites.

B2.3 Building Regulations – Part A use to determine the:

- **B2.3.1** minimum width of strip foundations
- **B2.3.2** minimum thickness of strip foundations
- **B2.3.3** minimum overlap where foundations are stepped.

B3 Types of foundation

Students will need to understand the use, methods of support, characteristics, substructure detailing, benefits and drawbacks including factors affecting choice of the following foundation types for high and low loadings and high and low ground bearing capacities.

B3.1 Strip.

B3.2 deep strip.

B3.3 Raft.

B3.4 Pad.

B3.5 Pile

B3.5.1 Replacement piles:

- End bearing support
- Friction support.

B3.5.2 Displacement piles:

- end bearing support
- friction support.

B3.5.3 Pile caps.

B3.5.4 Ground beams.

B4 Health and safety associated with working in foundations

Students will need to understand specific hazards, risks, control measures and safe working practice when working in foundations.

B4.1 Working in excavations:

B4.1.1 unstable ground and earthwork support

B4.1.2 safe access and egress

B4.1.3 falls into excavations and use of barriers and signage

B4.1.4 prevention of overburden

B4.1.5 water in excavations.

B4.2 Working in confined spaces:

B4.2.1 air quality and contamination

B4.2.2 gas ingress from damages services

B4.2.3 oxygen depletion

B4.2.4 fire and explosion.

B4.3 Working with insitu concrete:

B4.3.1 cement burns from skin contact

B4.3.2 respiratory problems

B4.3.3 eye irritation.

C: Superstructure design and construction

C1 Walls

Students will explore construction methods and techniques, materials used, stability, detailing, damp proof course (DPC) requirements, external finishes, performance requirements, insulation methods, vapour control, sustainability and benefits and drawbacks of the following wall elements.

C1.1 External cavity walls:

- **C1.1.1** traditional brickwork and blockwork
- **C1.1.2** blockwork with external skin rendered.

C1.2 Solid wall with rainscreen cladding.

C1.3 Internal walls and partitions:

- **C1.3.1** blockwork partitions
- **C1.3.2** timber stud partitions
- **C1.3.3** metal stud partitions
- **C1.3.4** demountable partitions.

C1.4 Prefabricated timber frame construction:

- **C1.4.1** external wall details
- **C1.4.2** cladding options including brickwork
- **C1.4.3** internal wall details.

C1.5 Openings in walls:

- **C1.5.1** head detailing including methods of supporting the wall above the opening
- **C1.5.2** jamb detailing
- **C1.5.3** sill and threshold detailing
- **C1.5.4** windows
- **C1.5.5** doors.

C2 Floors

Students will explore construction methods and techniques, materials used, support, detailing, damp proof membrane (DPM) requirements, finishes, performance requirements, insulation methods, sustainability and benefits and drawbacks of the following floor types and elements.

C2.1 Ground floors:

- **C2.1.1** solid concrete
- **C2.1.2** beam and block
- **C2.1.3** pre-stressed concrete
- **C2.1.4** suspended timber.

C2.2 Intermediate floors:

C2.2.1 beam and block

C2.2.2 pre-stressed concrete

C2.2.3 timber

C2.2.4 platform floors within timber frame construction.

C2.3 Openings and stairs:

C2.3.1 forming openings

C2.3.2 timber stairs

C2.3.3 pre-cast concrete stairs.

C3 Roofs

Students will explore construction methods and techniques, materials and components used, support (including bracing and lateral restraint), detailing (at eaves, verge, abutments and ridge), finishes, performance requirements, insulation methods, vapour control, sustainability and benefits and drawbacks of the following roof types.

C3.1 Pitched roofs including mono pitch, double pitch, gable ended and hipped:

C3.1.1 trussed rafter construction

C3.1.2 traditional timber roofing.

C3.2 Flat roofs

C3.2.1 Warm deck.

C3.2.2 Cold deck.

C3.2.3 Method of achieving required falls:

- firrings
- laser cut tapered insulation
- screed.

C4 Internal finishes

Application, characteristics, benefits and drawbacks of the following finishes.

C4.1 Wall finishes

C4.1.1 Traditional two coat plasterwork.

C4.1.2 Dry lining.

C4.1.3 Ceramic tiling.

C4.1.4 Wood panelling

C4.1.5 Decorating

- paint
- wallpaper.

C4.2 Ceiling finishes:

- **C4.2.1** plasterboard and skim
- **C4.2.2** suspended ceilings
- **C4.2.3** UPVC ceiling cladding
- **C4.2.4** timber boarded ceilings.

C4.3 Floor finishes:

- **C4.3.1** natural timber
- **C4.3.2** laminates
- **C4.3.3** carpets
- **C4.3.4** ceramic tiling
- **C4.3.5** sheet materials.

C5 Health and safety associated with working on superstructures

Students will need to understand specific hazards, risks, control measures and safe working practice when working on superstructures.

C5.1 Working at height and methods of mitigating hazards and risks

- **C5.1.1** Use of mobile elevated working platforms.
- **C5.1.2** Use of scaffolding:
  - stair towers
  - ladder access
  - handrails, intermediate rails and guards
  - platforms and toe boards
  - access gates
  - scaffold logs and inspections.
- **C5.1.3** Materials distribution:
  - use of hoists
  - use of forklift trucks
  - use of telehandlers.

C5.2 General site procedures to improve safety on site:

- **C5.2.1** daily briefings
- **C5.2.2** site inductions
- **C5.2.3** toolbox talks
- **C5.2.4** staff and operative training
- **C5.2.5** signage.

C5.2.6 Use of personal protective equipment (PPE) required at all times whilst on site:

- safety helmet
- high visibility jacket
- safety boots.

C5.2.7 Use of task specific PPE required to deal with specific task related hazards and risks:

- eye protection
- ear defenders
- gloves
- respirators
- dust masks
- knee pads.

D: Sustainable construction

D1 Sustainable urban drainage systems

Students will explore the methods, need for, use, characteristics and benefits of sustainable urban drainage systems.

D1.1 Methods of temporary storage of excess surface water:

D1.1.1 swales

D1.1.2 infiltration basins

D1.1.3 extended detention basins

D1.1.4 wet ponds

D1.1.5 infiltration systems.

D1.2 Methods allowing natural percolation to groundwater

D1.2.1 Filter strips.

D1.2.2 Porous surfaces:

- porous block paving
- permeable tarmacadam
- porous concrete
- gravel.

D2 Sustainable design

Students will explore designs incorporating sustainable construction technologies, including their use, methods, characteristics, benefits and drawbacks.

D2.1 Alternative energy sources to reduce CO_2 emissions:

- **D2.1.1** photovoltaic roof tiles and panels
- **D2.1.2** ground source heat recovery
- **D2.1.3** air source heat recovery
- **D2.1.4** wind turbines
- **D2.1.5** solar hot water panels.

D2.2 Sustainable construction techniques and methods, their use, characteristics, benefits and drawbacks:

- **D2.2.1** green roof technology
- **D2.2.2** high levels of insulation
- **D2.2.3** airtight construction
- **D2.2.4** building orientation to maximise daylight and solar gain
- **D2.2.5** high specification durable construction materials to minimise future maintenance
- **D2.2.6** use of sustainable and recycled materials
- **D2.2.7** brise soleil to reduce the use of air conditioning.

D3 Sustainable site practice

Students will understand the methods used to minimise the impact of construction activities on the built environment.

D3.1 Relocation of animal habitats.

D3.2 Correct storage of fuels and chemicals to prevent ground contamination:

- **D3.2.1** use of bund walls.

D3.3 Segregation of waste for recycling.

D3.4 Dust reduction methods:

- **D3.4.1** damping down
- **D3.4.2** road sweeping
- **D3.4.3** use of dust suppression/collection equipment
- **D3.4.4** wheel cleaning facilities.

D3.5 Use of silt traps on temporary drains.

D3.6 Correct storage and handling of materials to prevent damage.

D3.7 Protective fencing around trees.

D3.8 Use of electric plant and vehicles.

D3.9 Use of alternative energy for site set-up and accommodation.

D3.10 The considerate constructor's scheme.

Transferable skills

Managing Yourself	Effective Learning	Interpersonal Skills	Solving Problems
MY – TPR	EL – MOL	IS – WC	SP – CT *
MY – PS&R	EL – CL	IS – V&NC	SP – PS
MY – COP	EL – SRS	IS – T	SP – C&I
MY – PGS	EL – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning.
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Key terms typically used in assessment

The following table shows the key terms that will be used consistently by Pearson in our assessments to ensure students are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only.

Command or term	Definition
Identify	Select the correct response from given information.
State/Give/Name	Provide a point of information.
Sketch	Produce a graphical representation of a theoretical concept. Does not require scale.
Explain	Give a point and provide a justification. Where used, a third point is a further expansion of the justification provided.
Discuss	Consider in detail the different aspects of an issue, situation, problem or argument, and how they interrelate.

Links to other units

The assessment for this unit allows students to draw upon some of the underpinning knowledge and understanding covered in content area A1 covered in *Unit 1: Construction Principles.*

Unit 3: Design for Construction and the Built Environment

Level: 3

Unit type: Internal

Guided learning hours: 60

Unit in brief

Students will apply the principles and practice of design and construction for low- and medium-rise buildings and structures.

Unit introduction

Almost all human activity takes place in and around buildings and structures that are, for example, places of shelter, work, worship, culture and sport, and these places have a strong influence on our quality of life. The design of buildings requires careful consideration to ensure that they are fit for purpose and meet client/end user requirements. Creating buildings and structures is a unique process that requires input from a team of built environment professionals, who take into account a wide variety of factors.

In this unit, you will learn the principles and practice involved in the design and construction of low- and medium-rise buildings and structures. You will gain an understanding of how design is influenced by client/end user requirements and external factors. You will consider the stages involved in the design and construction process. You will learn about the use of sustainability methods and design techniques, including sketching and computer-aided design (CAD) to provide efficient methods of designing, constructing and maintaining structures over their life cycle. To complete the assessment task within this unit, you should draw on your learning from across your programme.

The design skills, knowledge and understanding covered in this unit will help you progress to higher education and professional qualifications, either in construction or another sector. It will also help you to progress to employment as an apprentice or trainee construction professional.

Learning aims

In this unit you will:

A Explore how construction design and building concepts and processes contribute to a building's fitness for purpose

B Produce a building design to meet requirements of a specific client/end user brief

C Review the success of own building design in meeting requirements of a specific client/end user brief.

Summary of unit

Learning aim	Key content areas	Assessment approach
A Explore how construction design and building concepts and processes contribute to a building's fitness for purpose	**A1** Stages involved in the process of briefing, designing, delivering, maintaining, operating and the use of a building **A2** Factors that influence the design process **A3** Designing for sustainability **A4** Understanding problem solving	Production of information of factors on a client brief impacting on a final design and methods of construction for properties to be designed.
B Produce a building design to meet requirements of a specific client/end user brief	**B1** Project information **B2** Initial project brief **B3** Initial design production **B4** Computer-aided design	Production of annotated hand drawn sketches, drawings and CAD designs.
C Review the success of own building design in meeting requirements of a specific client/end user brief	**C1** Production, construction, handover and use phase **C2** Review of design	Review of a design and design process.

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment.

Learning aim A: Explore how construction design and building concepts and processes contribute to a building's fitness for purpose

A1 Stages involved in the process of briefing, designing, delivering, maintaining, operating and the use of a building

Students will explore the stages related to the design of low- and medium-rise domestic, commercial and industrial buildings.

- RIBA Plan of work:
  - strategic definition
  - preparation and briefing
  - concept design
  - spatial coordination
  - technical design
  - production and construction
  - handover
  - use.

A2 Factors that influence the design process

Students will investigate the requirements and constraints, and their impact on the initial project brief and design process for combinations of rural, urban, greenfield and brownfield settings.

- Client/end user requirements for the project outcomes:
  - building use:
    - to include domestic, industrial, commercial, retail, health, cultural and recreation
    - how the building operates within its defined use
  - spatial requirements – building size, layout, circulation space, number of floors, number and use of rooms
  - flexibility and remodelling potential
  - future extension and alteration potential to meet client/end user's changing needs
  - external and internal aesthetics, types and use of materials
  - sustainability, energy efficiency, alternate types of energy sources
  - age demographic of the building end user(s)
  - target market sector
  - needs of different building end users
  - security requirements for the building and client/end user operations
  - corporate image and branding requirements.

- Planning requirements:
  - planning consent/approval
  - building use classes
  - Local Authority Development Plan
  - design sympathetic to local environment
  - planning objections
  - listed building consent
  - protection of greenbelt land
  - conservation areas
  - tree preservation orders (TPO)
  - contaminated land
  - Sites of Specific Scientific Interest (SSI)
  - Areas of Outstanding Natural Beauty (ANOB)
  - national parks
  - flood risk areas.
- Statutory constraints including subsequent updates:
  - building regulations
  - building safety regulations
  - disability laws/regulations
  - restrictive covenants
  - legislation and restrictions relating to outcomes of the Hackitt report, including restrictions on the architect on specifying cladding.
- Environmental constraints:
  - avoidance of air, water and noise pollution
  - National Planning Policy Framework (NPPF) 2021 guidance with reference to:
    - Part 7 Ensuring the vitality of town centres
    - Part 8 Promoting healthy and safe communities
    - Part 9 Promoting sustainable transport
    - Part 10 Supporting high quality communications
    - Part 11 Making effective use of land
    - Part 12 Achieving well designed places
    - Part 13 Protecting Green belt land
    - Part 14 Meeting the challenge of climate change, flooding and coastal change
    - Part 15 Conserving and enhancing the natural environment
    - Part 17 Facilitating the use of sustainable minerals
  - Wildlife and Countryside protection with reference to protected species and habitat conservation.

- National Design Guide.
- Social constraints:
  - neighbouring property uses
  - local community objections
  - green space requirements
  - environmental requirements
  - mixed and balanced development.
- Project budget and economic constraints:
  - cost planning
  - available funds
  - Government incentives (grants, low or zero VAT, designated business districts, enterprise zones and free ports)
  - local land prices
  - lifecycle costs.

A3 Designing for sustainability

Students will investigate the methods and techniques used in the design of modern construction projects to reduce pollution, the impact on the environment and the carbon footprint of the building.

- Passive solar gain.
- Passive stack ventilation.
- Water use reduction methods:
  - grey water systems
  - rainwater harvesting
  - water efficiency measures and fittings.
- Waste reduction measures:
  - segregation of waste
  - recycling.
- Use of alternative energy sources:
  - ground source – ground source heat pump (horizontal and vertical)
  - air source – air source heat pump (indoor heat exchanger, outdoor heat exchanger, air to air, air to water)
  - wind – micro wind generator (horizontal axis; vertical axis)
  - solar – solar photovoltaic (PV) panels, solar panel (thermal).
- Energy-efficient electrical and mechanical services installations.
- Sustainable and low embodied energy materials.

- Insulation methods to reduce heat loss:
  - floors
  - walls
  - roofs.
- Sustainable landscape design.

A4 Understanding problem solving

- The problem-solving process including stages and activities.
- Problem analysis including fact finding and questioning to understand scope to clearly define the problem.
- Collecting information and use of tools and techniques to design solution.
- Assessing strengths and weaknesses to justify solution.

Learning aim B: Produce a building design to meet requirements of a specific client/end user brief [IS-WC]

Students will need to understand the requirements of the project including any constraints and the project brief before they can produce and present any designs.

B1 Project information

- Information used in the production of building designs.
- Client/end user requirements.
- Site constraints.
- Planning constraints.
- Statutory constraints.
- Environmental constraints.
- Social constraints.
- Economic constraints.

B2 Initial project brief

The initial project brief's purpose and its application.

- Content of an initial project brief:
  - spatial requirements
  - desired project outcomes
  - site information
  - budget requirements.
- Site information:
  - site features – location, size, configuration, orientation, access, topography
  - borehole report used to provide information on geotechnical and ground conditions
  - ground contamination

  - building services availability
  - existing buildings, structures
  - neighbouring structures and the need for temporary and permanent support
  - existing underground services
  - trees
  - rights of way
  - underground transport
  - location in relation to water courses.
- Formal writing tone to meet technical audience and communication purpose.

B3 Initial design production

Production of initial outline design solutions to meet project brief and methods for their presentation to the client/end user.

- Process of design development for low- and medium-rise domestic, commercial and Industrial buildings.
- Outline solution – to communicate use of space and appropriate form of construction including:
  - draft models made by hand
  - 2D and 3D sketches of initial ideas, to include internal and external views, plans and elevations:
    - freehand sketched
    - single-point perspective
    - two-point perspective
    - planometric views
    - isometric views
    - use of line thickness to convey a 3D effect
    - use of shade and light direction
    - freehand rendering techniques.
- Clear communication using technical annotations.
- Clear communication of key features, to include external fabric, roof type, service access, circulation space, windows, doors.
- Using creative tools – problem stories, alternate sectors; mind mapping; learning new methods and procedures; risk taking, overcoming fear of failure.

B4 Computer-aided design

Students will need to be able to use computer-aided design (CAD) to produce virtual models and interiors.

- Setting up CAD projects:
  - number of floors
  - floor levels
  - linking elements, to include top and bottom anchors

- building footprint
- component libraries
- saving in an appropriate format.

- Use of CAD:
  - dimensional control, sizing and scale
  - detail levels, to include appropriate level for drawing use and audience:
    - fine
    - medium
    - coarse
  - use of 'hidden element' features
  - setting up and drawing composite elements:
    - walls
    - floors
    - roofs
  - standard opening components, placing and positioning:
    - doors, to include external, internal, garage and industrial
    - windows
  - inclusion and placing of fixtures and fittings:
    - stairs
    - fitted units and fitted furniture
    - plumbing and sanitary ware fixtures
  - furnishing and lighting for selected internal area.
- External site area:
  - inclusion of features, to include car parking, roads, drives, and specific features such as street furniture, cars
  - inclusion of open spaces, landscaping and planting features.
- Use and manipulation of CAD software to produce virtual models
  - 3D digital project information:
    - 3D views
    - 3D perspective effects
    - surface detailing and effects.
  - 2D digital project information, to include appropriate scale and level of detail:
    - plans
    - elevations
    - sections.

- 3D manipulation:
  - orientation and rotation of images
  - zooming
  - detail level.
- Rendered images:
  - camera views, to include camera position, angle of coverage, shadow effects
  - setting up rendered views:
    - internal lighting effects
    - external lighting effects
    - weather effects
    - seasonal effects
    - sun position
    - lighting/sun on or off
    - detail level
  - processing, saving and printing of rendered images.
- Extraction of 2D and 3D drawings:
  - plans
  - elevations
  - cross sections
  - 3D models.
- Drawing output:
  - setting up borders and title block
  - orthographic drawing conventions, to include third angle
  - scale and placement of images
  - print and screen outputs.

Learning aim C: Review the success of own building design in meeting requirements of a specific client/end user brief

Students will need to understand how their design will impact on implementation and use.

C1 Production, construction, handover and use phases

- Manufacture and construction of building systems:
  - choice of building technology appropriate to the brief:
    - offsite manufacturing, including panels, pods, volumetric with services/ with finishes
    - Brick and Block, Solid and cavity wall construction
    - timber frame construction
    - steel frame construction
    - concrete frame construction

    - Passivhaus construction.
  - site logistics
  - Plan for Use strategy:
    - preparation of building manual for commercial buildings
  - building handover:
    - aftercare
    - rectification of defects
  - ongoing maintenance requirements with reference to:
    - ease of use
    - budget
    - accessibility.

C2 Review of design

Students will need to review the design in terms of the extent to which they meet overall objectives.

- Reviewing the design in relation to:
  - client/end user budget
  - purpose
  - functionality
  - innovation
  - authenticity
  - maintenance requirements
  - aesthetics
  - sustainability including end of life, whole building lifecycle and energy use.
- Review approaches:
  - strengths
  - weaknesses
  - iterative design and incremental improvement
  - peer and client/end user feedback
  - wider issues in building design including social, ethical, moral and environmental impact.
- Analysing data, including qualitative and quantitative analysis techniques; supporting decision-making; support conclusions with reasoned arguments.

Assessment criteria

Learning aim A: Explore how construction design and building concepts and processes contribute to a building's fitness for purpose

Pass	Merit	Distinction
A.P1 Outline the factors that can impact on the potential design from the client brief including sustainability requirements.	**A.M1** Assess the factors that can impact on the potential design from the client brief including supported reasons for sustainability requirements and ways in which some limitations can be overcome. **[SP-PS]**	**A.D1** Evaluate the factors that can impact on the potential design from the client brief including sustainability requirements informed by research, justifying how any limitations can be overcome.

Learning aim B: Produce a building design to meet requirements of a specific client/end user brief

Pass	Merit	Distinction
B.P2 Produce a building design that is realistic and workable, using manual techniques and CAD, with annotated sketches that addresses some client/end user requirements showing some consideration of the initial project brief, covering some key project information. **[SP-C&I]** **B.P3** Produce a design statement to support the drawings to show how the design satisfies the client brief.	**B.M2** Discuss the selection and use of design strategies to inform decisions, presenting ideas in the design statement that show sound consideration for the client/end user requirements and initial project brief and a sound understanding of relevant materials, processes and techniques. **[SP-PS]**	**B.D2** Justify the selection and use of design strategies to inform decisions, presenting ideas in the design statement that show an in-depth consideration for the client/end user requirements and initial project brief and an in-depth understanding of relevant materials, processes and techniques.

Learning aim C: Review the success of own building design in meeting requirements of a specific client/end user brief

Pass	Merit	Distinction
C.P4 Review own building design in relation to how well the methods of construction chosen, material choices, the final layout, design and sustainability requirements meet the client brief. **[SP-C&I]**	**C.M3** Discuss own building design and considerations made in relation to the methods of construction chosen, material choices, the final layout, design and sustainability requirements satisfy the client brief. **[SP-PS]**	**C.D.3** Evaluate own building design and considerations made in relation to the methods of construction chosen, material choices, the final layout, design and sustainability requirements satisfy the client brief, justifying decisions made and including areas for improvement.

Transferable skills

Managing Yourself	Effective Learning	Interpersonal Skills	Solving Problems
MY – TPR	EL – MOL	IS – WC *	SP – CT
MY – PS&R	EL – CL	IS – V&NC	SP – PS √
MY – COP	EL – SRS	IS – T	SP – C&I √
MY – PGS	EL – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning.
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Essential information for Pearson Set Assignment Brief (PSAB)

Pearson sets the assignment for the assessment of this unit.

The PSAB will take 15 hours to complete.

The PSAB will be marked by centres and verified by Pearson.

The PSAB will be valid for the lifetime of this qualification.

Centres are required to check for plagiarism by inspecting progress of student's completion of the tasks, at points during, and after submission.

It is good practice for students to complete as much of the assignment as possible under supervised conditions.

Assessing the PSAB

You will make assessment decisions for the PSAB using the assessment criteria provided.

Section 1 gives information on PSABs and there is further information on our website.

Further information for teachers and assessors

Resource requirements

For this unit, students must have access to:

- a variety of construction sites or projects
- a range of building designers or project managers
- computer-aided design (CAD) software.

Essential information for assessment decisions

Learning aim A

For distinction standard, students will evaluate the factors that influence design and development, and consider in depth how these can impact on the final design. They will provide a justification on how to overcome limitations. Students will make use of developed technical vocabulary in their work. Their evaluation will be informed by research into the site, ground conditions, suitable methods of construction, specific locality of the site including planning restraints/limitations, existing housing styles, house prices and any other relevant information, including sustainability requirements.

For merit standard, students will assess the factors that influence design and development, and consider how these can impact on the final design. They will provide ways in which to overcome limitations. Students will make use of some technical vocabulary in their work. Their assessment will be based on research made to the site, ground conditions, suitable methods of construction, specific locality of the site including planning restraints/limitations, existing housing styles, house prices and any other relevant information, including sustainability requirements.

For pass standard, students will outline the factors that influence design and development, with some consideration of how these can impact on the final design. They will make some use of appropriate technical vocabulary in their work. Students' work will demonstrate that they will have done some research into the site, ground conditions, suitable methods of construction, specific locality of the site including planning restraints/limitations, existing housing styles, house prices and any other relevant information, including sustainability requirements.

Learning aim B

For distinction standard, students will be able to select, use and interpret most of the relevant information in the context of a scenario, showing a balanced consideration of this information with minimal errors or omissions. They will be able to analyse the spatial requirements of a project and provide detailed justifications of suitable forms of construction to produce a design that communicates design intentions with clarity and comprehensively addresses the project brief. Students use annotations that clearly explain the key features and operation of the design.

They will produce the design using industry standards and set of drawings and design documentation that clearly demonstrates and justifies design decisions to meet the brief. Students can produce an accurate and complete model that appropriately addresses the scenario requirements and provide printouts of 3D rendered views.

For merit standard, students will be able to select, use and interpret relevant information in the context of a scenario. They will be able to consider the spatial requirements of a project and consider suitable forms of construction to produce a design that communicates design intentions with clarity and addresses aspects of the initial project brief, with some use of annotations. Students will produce a comprehensive set of design drawings and supporting annotations and design statements detailing how the designs meet the client brief. They can produce a model that addresses most aspects of the scenario requirements and provide printouts of 3D rendered views.

For pass standard, students will be able to select, use and interpret relevant information in the context of a scenario to produce a design. They will be able to consider the spatial requirements of a project and consider suitable forms of construction to produce a design that communicates design intentions with clarity and addresses aspects of the project brief, with some use of annotations. Students will produce a building design that is realistic and workable, using freehand techniques and CAD, with annotated sketches and design statement that addresses some client/end user requirements showing some consideration of the project brief, covering some key project information. They can produce a model that addresses some aspects of the scenario requirements and provide printouts of 3D rendered views, but will have omissions and lack detail.

Learning aim C

For distinction standard, students will provide a detailed critical evaluation of their building design reviewing the whole design process from the initial reading of the client brief through to the final design drawings and supporting statements. They will consider how their design satisfies the client requirements for the site. They will justify decisions made and include areas for improvement.

For merit standard, students will provide a detailed discussion of their building design reviewing the whole design process from the initial reading of the client brief through to the final design drawings and supporting statements. They will consider how their design satisfies the client requirements for the site and changes they would make if they were able to do it again.

For pass standard, students will provide a review of their building design looking at the whole design process from the initial reading of the client brief through to the final design drawings and supporting statements. They will consider how their design satisfies the client requirements for the site and make little regard to changes they would make if they were able to do it again.

Links to other units

The assessment for this unit allows students to draw upon some of the underpinning knowledge and understanding covered in content area A1 covered in *Unit 1: Construction Principles*.

Unit 4: Construction Commercial Management

Level: 3

Unit type: Internal

Guided learning hours: 60

Unit in brief

Students will examine contracts and procurement routes for construction projects. They will prepare a cost estimate and gain an understanding of how construction costs are controlled.

Unit introduction

Commercial management in construction involves overseeing and managing the activities of a construction project. Projects are complex, requiring materials, plant and labour to complete structures like buildings, roads or bridges. The aim is to ensure that a project is completed on time and within budget. Construction projects are generally commissioned with a contract using different procurement routes.

In this unit, you will learn what constitutes a legal contract in construction and the reasons and benefits prompting the use of standard forms of contract. You will gain an understanding of the different procurement routes used for construction projects. You will learn how to identify commercial risks for a project that if left unmanaged, might impact on timely completion or the overall project cost. You will apply your knowledge and understanding to produce an estimate to determine the cost of a construction activity. You will investigate cost management techniques used to monitor the budget of a project.

The skills, knowledge and understanding covered in this unit will help you to progress to higher education and professional qualifications, either in construction, architecture or civil engineering. It will also help you to begin your journey to employment within the construction industry, in professional roles such as project management, cost estimation or site management.

Learning aims

In this unit you will:

A Examine what constitutes a legal contract for a construction project

B Understand methods of procurement for a construction project

C Apply methods for controlling cost during the completion of a construction project.

Summary of unit

Learning aim	Key content areas	Assessment approach
A Examine what constitutes a legal contract for a construction project	**A1** Types of contract **A2** What constitutes a legal contract **A3** Resolving contract disputes	A commercial risk analysis and recommendation for a contract and procurement route for a given project (covers learning aims A and B).
B Understand methods of procurement for a construction project	**B1** Risk analysis **B2** Procurement routes	A commercial risk analysis and recommendation for a contract and procurement route for a given project (covers learning aims A and B).
C Apply methods for controlling cost during the completion of a construction project	**C1** Types of estimate **C2** Compiling an estimate **C3** Dealing with cost changes	An estimate dealing with a cost change for a given project.

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment.

Learning aim A: Examine what constitutes a legal contract for a construction project

A1 Types of contract

Students will need an awareness of different types of construction contract and reason for the use of standard forms of contract.

- Types of construction contract including:
  - design and build
  - lump sum
  - cost-plus
  - guaranteed maximum price
  - target cost
  - construction management
  - time and materials
  - unit price.
- Benefits of using standard forms of contract including:
  - reduces contract preparation costs
  - familiarity and confidence with contract terms
  - shortens the time to achieving a signed contract
  - helps build trust between contracting parties.
- Principal standard contracts used in the construction industry including:
  - Joint Contract Tribunal – JCT
  - New Engineering Contract.
- Analysing data including qualitative and quantitative analysis techniques; supporting decision-making; support conclusions with reasoned arguments.

A2 What constitutes a legal contract

Students will need to understand the elements that constitute a legal contract and the provisions of typical clauses found in construction contracts.

- What constitutes a legal contract including:
  - offer
  - acceptance
  - consideration
  - intention to enter into a legal relationship.

- Provision of typical clauses found in construction contracts including:
  - boilerplate clauses
  - scope of work
  - payment terms
  - variation clauses
  - liquidated damages
  - dispute resolution.
- Reasoning to justify choice of solutions – use of inductive and/or deductive reasoning; considering different perspectives.
- Assessing the benefits and limitations of options and solutions; making judgements on the quality of solutions.

A3 Resolving contract disputes

Students will acquire an awareness of the key approaches to resolve a dispute over a contract.

- Mediation.
- Adjudication.
- Arbitration.
- Litigation.
- Use of language, including correct grammar, spelling, and punctuation and avoiding use of slang terms.
- Different writing tone to meet audience and communication purpose – formal, informal, humour, respectful, enthusiastic.
- Acceptable writing formats for formal letters, business emails, reports and presentations including relevant key sections for each.

Learning aim B: Understand methods of procurement for a construction project

B1 Risk analysis

Students will understand the types of commercial risks that can impact a construction project in terms of time and cost including:

- design data inaccuracy
- inflation
- unexpected ground conditions
- contractor performance and availability issues
- problems with novel or bespoke design solutions
- risk associated with the design
- availability of utility services
- changes to a project's scope or specification

- delay or default by suppliers of materials and components
- subcontractor insolvency
- weather
- health and safety
- cash flow restrictions
- credit risk
- difficulties acquiring land
- social and environmental risk
- unforeseen events (force majeure)
- techniques deployed to reduce the impact of commercial risks associate with a construction project including:
    - risk identification
    - risk assessment
    - risk mitigation including risk avoidance, risk reduction, risk transfer, risk sharing and risk retention
    - risk monitoring and control
    - risk reporting.

B2 Procurement routes

Students will have an awareness of the characteristics of procurement routes generally used in construction including:

- traditional
- design and build
- partnering/alliancing
- construction management
- private finance initiative (PFI)
- public private partnership (PPP)
- using creative tools – problem stories, alternate sectors; mind mapping; learning new methods and procedures; risk taking, overcoming fear of failure.

Learning aim C: Apply methods for controlling cost during the completion of a construction project [SP-PS]

C1 Types of estimate

Students will have an awareness of the different approaches of preparing cost estimates for construction projects.

- Bill of quantities.
- Schedule of rates.
- Provisional sums.

- Purpose and benefits of using Civil Engineering Standard Method of Measurement to compile estimates including:
  - standardised rules for measurement and quantification of construction work
  - compatibility with different types of construction contract
  - standard methods of pricing items of work
  - common classification and description used for work undertaken as part of a construction project
  - enable comparison between different contractor's estimates.

C2 Compiling an estimate

Students will understand cost estimate terminology and have an awareness of how to compile an estimate for a basic given construction activity.

- Unit rate.
- Pricing of materials, plant and labour.
- Use of appropriate wastage percentage.
- Addition of overheads and profit.
- Dayworks.
- Preliminaries.

C3 Dealing with cost changes

Students will need an awareness of how to control construction cost including:

- planning the project budget
- monitoring project budgets
- use of cost contingencies
- valuation of project variations.

Assessment criteria

Learning aim A: Examine what constitutes a legal contract for a construction project

Pass	Merit	Distinction
A.P1 Compare the different types of contract used for construction projects. **A.P2** Outline the elements required to constitute a legal contract for a construction project. **A.P3** Explain approaches to resolve a contract dispute for a construction project.	**A.M1** Assess a brief on the suitability of a contract for a construction project.	

Learning aim B: Understand methods of procurement for a construction project

Pass	Merit	Distinction
B.P4 Produce a commercial risk analysis for a given construction project. **B.P5** Explain procurement routes for a given construction project.	**B.M2** Assess the suitability of procurement routes to minimise commercial risks for a given construction project.	**B.D1** Justify against a brief the suitability of a procurement route to minimise commercial risks for a given construction project.

Learning aim C: Apply methods for controlling cost during the completion of a construction project

Pass	Merit	Distinction
C.P6 Explain the different approaches to preparing a cost estimate for a construction project. **C.P7** Prepare an estimate including labour, plant and material costs for a given construction activity. **C.P8** Explain how costs are controlled during the completion of a construction project.	**C.M3** Assess the suitability of different approaches to prepare a cost estimate including labour, plant and materials with a wastage allowance for a construction project.	**C.D2** Justify against a brief the suitability of an approach to prepare an accurate cost estimate for a construction project.

Transferable skills

Managing Yourself	Effective Learning	Interpersonal Skills	Solving Problems
MY – TPR *	EL – MOL	IS – WC	SP – CT
MY – PS&R	EL – CL	IS – V&NC	SP – PS *
MY – COP	EL – SRS	IS – T	SP – C&I
MY – PGS	EL – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning.
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Essential information for Pearson Set Assignment Brief (PSAB)

Pearson sets the assignment for the assessment of this unit.

The PSAB will take 15 hours to complete.

The PSAB will be marked by centres and verified by Pearson.

The PSAB will be valid for the lifetime of this qualification.

Centres are required to check for plagiarism by inspecting progress of student's completion of the tasks, at points during, and after submission.

It is good practice for students to complete as much of the assignment as possible under supervised conditions.

Assessing the PSAB

You will make assessment decisions for the PSAB using the assessment criteria provided.

Section 1 gives information on PSABs and there is further information on our website.

Further information for teachers and assessors

Resource requirements

This unit does not require access to any specialist resources.

Essential information for assessment decisions

Learning aim A and B

For distinction standard, students must identify the commercial risk associated with a given construction project covering a minimum of ten from the unit content. Students will produce a risk analysis for the given construction project identifying strategies to mitigate the identified commercial risks. Students will research procurement routes for the given construction project and justify the suitability of one route to minimise commercial risk against the project brief.

For merit standard, students must make recommendations for a suitable contract used for construction projects. Students will consider the appropriateness of the different types of payment mechanism covered in the unit content for a given construction scenario and analysing the effectiveness of using a standard form of construction contract. Students will refer to the use or purpose of principal standard construction contracts, like the Joint Contract Tribunal and New Engineering Contract. Students will need to outline the key elements that constitutes a legal contract; offer, acceptance, consideration, and intention to create legal relations. Students will be able to outline the purpose (or provisions) of typical clauses found in construction contracts covered in the unit content. Students will explore measures that might be included in the contract to resolve a contract dispute covering the approaches outlined in the unit content. Students will identify the commercial risk associated with a given construction project covering a minimum of eight from the unit content. Students will produce a risk analysis for the given construction project identifying strategies to mitigate the identified commercial risks. Finally, students will research procurement routes for the given construction project, and assess the suitability of one route to minimise commercial risk against the project brief.

For pass standard, students must compare the types of contracts used for construction projects. Students will consider the appropriateness of the different types of payment mechanism covered in the unit content for a given construction scenario, and the benefits of using a standard form of construction contract. Students will need to outline the key elements that constitutes a legal contract; offer, acceptance, consideration and intention to create legal relations. Students will be able to outline the purpose (or provisions) of a few typical clauses found in construction contracts. Students will explore measures that might be included in the contract to resolve a contract dispute covering the approaches outlined in the unit content. Students will identify the commercial risk associated with a given construction project covering a minimum of five from the unit content. Students will produce a risk analysis for the given construction project identifying

strategies to mitigate the identified commercial risks. Finally, students will research procurement routes for the given construction project, discussing the characteristics of those given in the unit content. Students will identify one route as being appropriate for the given construction project.

Learning aims C

For distinction standard, students will justify the suitability of an approach from the unit content to prepare a cost estimate for a construction project against a brief. Students will explain the benefits of using a standard method of measurement to compile cost estimates. Students will prepare an estimate for a given construction activity, accurately calculating the final cost. Finally, students will explain how costs are controlled during the completion of a construction project covering the stages in the unit content.

For merit standard, students will assess the suitability of different approaches to prepare a cost estimate for a construction project, considering the characteristics of bills of quantities, schedules of rates and provisional sum against a brief. Students will explain the benefits of using a standard method of measurement to compile cost estimates. Students will prepare an estimate for a given construction activity, calculating as a minimum labour, plant and materials cost including a wastage allowance. Finally, students will explain how costs are controlled during the completion of a construction project covering the stages in the unit content.

For pass standard, students will explore different approaches to preparing a cost estimate for a construction project, explaining the characteristics of bills of quantities, schedules of rates and provisional sum. Students will explain the benefits of using a standard method of measurement to compile cost estimates. Students will prepare an estimate for a given construction activity, calculating as a minimum labour, plant and materials cost. Finally, students will explain how costs are controlled during the completion of a construction project covering the stages in the unit content.

Unit 5: Retrofit in Construction and the Built Environment

Level: 3

Unit type: Internal

Guided learning hours: 60

Unit in brief

Students will gain the skills required to propose retrofit developments to buildings, for energy and environmental improvements and contributing to a Net Zero future.

Unit introduction

Retrofitting is the provision/installation of new components or features to an existing building that was not included in the original design. To meet government sustainability targets for carbon emissions and reduce energy consumption, many existing buildings will need to be upgraded. This unit focuses on existing buildings and how to ensure their suitability for now and future generations. The UK has millions of existing properties that require upgrades to improve efficiency to reduce carbon footprint and help meet Net Zero targets for a sustainable future.

In this unit, you will understand how buildings can be retrofitted to improve efficiency and comfort. You will discover that when one part of a building is changed it can affect another. You will also develop the skills required to communicate and implement different improvements, evaluate how different retrofitting options can be prioritised and selected to provide the most environmental and economically sustainable outcomes.

This unit provides progression opportunities to higher education, including Higher Nationals and degree programmes in construction and design related disciplines. It provides the essential skills and knowledge for disciplines such as building surveying, environmental assessment, architecture and design, building services, project management, property development and construction management.

Learning aims

In this unit you will:

A Examine retrofit solutions applied to buildings

B Propose retrofit solutions to an existing building to meet end user needs

C Review retrofit solutions to meet end user needs.

Summary of unit

Learning aim	Key content areas	Assessment approach
A Examine retrofit solutions applied to buildings	**A1** Assessment of the building and situation **A2** Retrofit solutions **A3** Potential issues of retrofit solutions **A4** Suitability of retrofit solutions	Production of a building survey and different retrofit solutions across all aspects of the building with advantages, disadvantages and potential issues.
B Propose retrofit solutions to an existing building to meet end user needs	**B1** Planning and managing retrofit solutions **B2** Legislation and safety	Production of a program of work for the installation of retrofit solutions and a safe system of work for potential retrofit solutions with recommendations, (covers learning aims B and C).
C Review retrofit solutions to meet end user needs	**C1** Methods of communicating proposals and designs **C2** Prioritising potential solutions **C3** Methods of measuring actual benefits of proposed solution	Production of a program of work for the installation of retrofit solutions and a safe system of work for potential retrofit solutions with recommendations, (covers learning aims B and C).

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment.

Learning aim A: Examine retrofit solutions applied to buildings

A1 Assessment of the building and situation

Assessing buildings for potential retrofit solutions - Students will learn how to use non-intrusive surveys, equivalent to RICS Level 1 survey or EPC (Energy Performance Certificate) survey, to carry a building survey for a proposed retrofit with outcomes and implications to include:

- location information
  - roof orientation: north, south, east or west facing
  - average wind/rainfall
  - surroundings
  - listed buildings, conservation areas
  - access
- building structure
  - construction type:
    - traditional or non-traditional construction
    - flat roof or sloped roof
    - solid wall/cavity
    - solid floor/ suspended floor
    - trussed roof/traditional
    - steel frame
    - cladding
  - general description:
    - general condition
    - damage reports
    - signs of damp/rot
    - structural issues

- existing services:
  - heating systems:
    - radiators
    - open fires
    - wood/coal burners
    - underfloor heating
    - storage heaters
    - boilers
    - immersion heaters,
    - existing pipework sizes and condition
  - energy supply:
    - mains gas and electric
    - off grid
    - stored fuel
    - oil/gas/solid fuel
  - taps and water outlets
- other information:
  - assumptions that need to be made
  - energy performance certificate
- problem analysis including fact-finding, informed questioning to explore the scope and impact of problem; breaking down the problem into component parts; reframing problems as questions
- research skills – valid and reliable primary and secondary research to collect information.

A2 Retrofit solutions

Students need to know the range of retrofit solutions that can be applied to buildings, this will include an overview of the installation processes.

- Fabric solutions.
- Floors:
  - solid floor insulation
  - suspended floor insulation
  - floor coverings.
- Walls
  - cavity walls:
    - blown fibres
    - polystyrene beads
    - injected foam.

    - solid walls:
        - external insulation solutions
        - internal insulation solutions
    - cladding.
- Roofs:
    - pitched roof solutions
    - flat roof solutions.
- Windows/doors:
    - frame materials
    - glazing options
    - draught proofing
    - use of automatic doors and revolving doors.
- Renewable and low carbon energy production.
- Heating:
    - heat pumps:
        - air source
        - ground source
        - water source
    - solar:
        - photovoltaic
        - thermal
    - electric boilers
    - hybrid system
    - district and community heat networks.
- Control and monitoring:
    - smart controls
    - zoned heating
    - passive infrared switches
    - smart metering.
- Energy production and storage:
    - solar
    - wind
    - batteries
    - power converters
    - use of thermal energy stores.

- Ventilation
  - improving airtightness
  - passive ventilation
  - active ventilation:
    - whole house (positive input ventilation)
    - heat recovery systems.
- Reducing consumption.
- Water:
  - dual flush toilets
  - aerating outlets
  - electronic sensors
  - rainwater storage
  - grey water usage.
- Reduce rainwater run-off:
  - permeable surfaces
  - rain friendly gardens, roof garden.
- Lighting:
  - low energy and smart lighting
  - use of natural light, roof lights, solar tunnels.

A3 Potential issues of retrofit solutions

- Introduction of a new component/service can lead to changes in existing components or potential defects
  - Damp and mould issues due to installation of insulation:
    - damp proof courses and membranes
    - poor ventilation.
  - Proposed improvements compatible with existing services (existence of a cylinder, radiators large enough for a heat pump).
  - Removal of existing components that have become obsolete:
    - flues
    - service supplies
    - pipework
  - Installing new components without fixing existing issues:
    - weathering issues
    - rot and damage to existing materials
    - leaks and rainwater goods
    - cavity walls with blocked cavity

    - wrongly sized poorly maintained heating systems
    - thermal bridging.
  - Structural considerations:
    - roof structure sufficient for solar panels
    - suitable location for storage/buffer tanks
    - suitability of lintels above windows and doors.

A4 Suitability of retrofit solutions

Selecting solutions that are applicable to the situation considering survey outcomes and end user needs.

- Consideration of whole building and deep retrofitting:
  - spatial/orientation constraints
  - consideration of survey outcome.
- End user requirements
  - Needs of the end user/
  - Different end users will have different requirements:
    - housing
    - office space
    - healthcare
    - education
    - leisure
    - retail
    - manufacturing.
- Costs:
  - purchase costs
  - installation cost
  - operating cost
  - return on investment
  - budgetary requirements
  - maintenance requirements.
- Other requirements:
  - complexity of use
  - human comfort
  - social need
  - aesthetics.

Learning aim B: Propose retrofit solutions to an existing building to meet end user needs [MY-TPR]

B1 Planning and managing retrofit solutions

Precedence of tasks: students will need an overview of the construction methods and processes involved with the logical sequencing of tasks for the retrofit options in learning aim A.

- Structural works will need to be completed before other works are started.
- Safety precautions will be implemented before the start of associated works.
- Windows will need replacing before external insulation installed.
- Solar panels will require scaffolding for installation which would inhibit the installation of external works.
- Radiators would need removing before internal insulation is installed.
- Loft insulation can often be fitted with little effect on other components whereas flat roof or pitched insulation requires more consideration as plasterboard will need to be removed.
- Replacing or installing new pipework or ducting will also need careful consideration of other tasks.
- Sequencing electrical works for microgeneration system installations around first and second fix.
- Regulatory sign off and inspection requirements.
- Program of work.
- Use of Gantt charts, bar charts, linked bar charts.
- Critical paths.
- Safe systems of work – method statements.
- Access and traffic management.

B2 Legislation and safety

- Health and safety considerations
    - Risk assessment.
    - Hazardous materials – asbestos and other hazardous materials could be present in the existing structure.
    - Issues associated with occupied buildings:
        - working with end users/occupants
        - effective communication.
    - Work at height.
    - Manual handling.
    - Use of work equipment.
    - Training and competence.

  - Personal protective equipment.
  - Protection of the general public.
- Legislative considerations
  - Planning legislation:
    - planning permission
    - listed building consent
    - specific planning permission for conservation areas
    - Areas of Outstanding Natural Beauty (AONB)
    - sites of specific scientific interest (SSSI).
  - Building regulations:
    - building regulation approvals
    - building notices
    - building regulation inspections.
  - Property-related legislation:
    - party wall legislation
    - 'Right to light'
    - Tree Preservation Orders (TPO)
    - current legislation relating to property.
  - Legislation linked to Net Zero targets including amount of insulation, glazing.
  - Fire risk assessments.

Learning aim C: Review retrofit solutions to meet end user needs [IS – WC]; [IS – V&NC]

C1 Methods of communicating proposals and designs

- Communicating information:
  - use of language, including correct grammar, spelling, and punctuation and correct use of technical language
  - different writing tone to meet audience and communication purpose – formal, factual
  - Acceptable format for proposals
  - adapting communication style to meet audience needs – changing speed, volume and choice of vocabulary depending on needs; varying use of jargons and acronyms
  - use of visual aids – presentation slides, artefacts, leaflets, cards
  - graphical and electronic forms of communication.

- Types of information:
  - reports
  - specifications
  - instructions
  - signage
  - drawings
  - charts
  - technical data.

C2 Prioritising potential solutions

- Analysis of potential solutions:
  - cost benefit analysis
  - ease of installation
  - disruption
  - payback
  - potential savings:
    - emissions
    - energy consumption
    - cost.
- Advantages and disadvantages of different retrofit solutions:
  - maintenance requirements
  - improved comfort for residents
  - expected lifetime
  - ease of use
  - improved functionality, smart control.

C3 Methods of measuring actual benefits of proposed solution

- Difference between theoretical and actual improvements:
  - Energy Performance Certificate (EPC) verses Energy Use Intensity (EUI)
  - R and U values
  - CO_2 saving
  - Kilowatt hours used
  - reduced consumption of natural resources.
- Reasons for differences between designed improvements and in use:
  - quality of work
  - materials used
  - user error and education
  - erroneous calculations
  - assumptions at the design stage.

Assessment criteria

Learning aim A: Examine retrofit solutions applied to buildings

Pass	Merit	Distinction
A.P1 Perform a survey of an existing building detailing potential retrofit solutions to meet end user requirements] **A.P2** Explain potential issues related to selected retrofit solutions that can be made to an existing building.	**A.M1** Discuss how selected retrofit solutions, that show sound consideration for the end user requirements, can be applied to an existing building with a sound understanding of associated potential issues. **[SP-PS]**	**A.D1** Evaluate how selected retrofit solutions, that show in-depth consideration for the end user requirements, can be applied to an existing building with an in-depth understanding of associated potential issues.

Learning aim B: Propose retrofit solutions to an existing building to meet end user needs

Pass	Merit	Distinction
B.P3 Produce an outline program of work for the installation of proposed retrofit solutions that is realistic and workable, that addresses some end user requirements showing some consideration of the survey. **B.P4** Develop an outline safe system of work for proposed retrofit works that addresses some end user requirements showing some consideration of the survey.	**B.M2** Produce a detailed program of work with a safe system of work for the installation of proposed retrofit solutions that is realistic and workable, that addresses most end user requirements showing sound consideration of the survey. **[SP-PS]**	**B.D2** Produce a comprehensive program of work with a safe system of work for the installation of proposed retrofit solutions that is realistic and workable, that addresses most end user requirements showing an in-depth consideration of the survey.

Learning aim C: Review retrofit solutions to meet end user needs

Pass	Merit	Distinction
C.P5 Explain own recommendation of retrofit solutions for an existing building using appropriate communication methods and covering some relevant and important information. **C.P6** Describe the methods used to measure the actual efficiency against the theoretical benefit of a completed retrofit solution. **C.P7** Explain the importance of comparing the benefits of a retrofit solution to the theoretical benefit.	**C.M3** Discuss own recommendation of retrofit solutions for an existing building using clear communication methods and covering mostly relevant and important information, with reference to selected priorities. **[SP-PS]** **C.M4** Discuss the methods of measuring the actual efficiency against the theoretical benefit of a completed retrofit solution and the importance of doing this. **[SP-PS]**	**C.D3** Evaluate own recommendation of fully developed and prioritised retrofit solutions for an existing building using effective communication methods and justifying all decisions made with relevant information/ evidence. **C.D4** Evaluate the methods of measuring the actual efficiency against the theoretical benefit of a completed retrofit solution justifying the importance of doing this.

Transferable skills

Managing Yourself	Effective Learning	Interpersonal Skills	Solving Problems
MY – TPR *	EF – MOL	IS – WC *	SP – CT
MY – PS&R	EF – CL	IS – V&NC *	SP – PS √
MY – COP	EF – SRS	IS – T	SP – C&I
MY – PGS	EF – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning.
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Essential information for Pearson Set Assignment Brief (PSAB)

Pearson sets the assignment for the assessment of this unit.

The PSAB will take 9.5 hours to complete.

The PSAB will be marked by centres and verified by Pearson.

The PSAB will be valid for the lifetime of this qualification.

Centres are required to check for plagiarism by inspecting progress of student's completion of the tasks, at points during, and after submission.

It is good practice for students to complete as much of the assignment as possible under supervised conditions.

Assessing the PSAB

You will make assessment decisions for the PSAB using the assessment criteria provided.

Section 1 gives information on PSABs and there is further information on our website.

Further information for teachers and assessors

Resource requirements

For this unit, students must have access to:

- to a suitable building to perform a survey
- the built environment for exploration purposes: to analyse existing conversion and adaptation schemes in the locality, as this will enhance an understanding of options and how buildings can change to suit new demands.

Students must inform teachers of their choice of building before performing the building survey and agree the choice formally with the teacher. Teachers must ensure the chosen building is suitable, safe to survey, that the correct permissions have been sought and agreed and allows students to achieve all assessment criteria.

Students must ensure no other students in their cohort are performing the survey on the same building as them.

Essential information for assessment decisions

Learning aim A

For distinction standard, students will draw on varied sources of information to inform rational opinions of the different retrofit solutions for energy reduction and sustainability in a chosen building. Students will demonstrate an in-depth knowledge and understanding of retrofitting as applied to buildings. Students will include an extensive range of options and alternatives that are relevant and appropriate to the chosen building. Students will provide clear evidence in support of their selections and there will be clear links to the social, environmental and economic sustainability of different energy reduction options and reach reasoned and valid judgements. The benefits and drawbacks of the different improvements will thoroughly be evaluated and be related to the scenario and the end user's needs.

The retrofitting options will typically include 12 improvements covering a range of options for fabric improvements, for heating/energy production improvements, for ventilation improvements and for natural resource reduction.

For merit standard, students will discuss the main factors relating to the use of retrofit options in buildings, to explain the similarities, differences, advantages and disadvantages in relation to their application to a chosen building. Students will include a good range of options, most of these options will be relatable to the chosen building. Students will provide evidence to support their choices. The benefits and drawbacks discussed will be mostly related to the scenario and the end user's needs. The retrofitting options will need to include fabric, heating, ventilation improvements and natural resource reduction.

The retrofitting options will typically include 10 improvements for a range of options for fabric improvements, for heating/energy production improvements, for ventilation improvements and for natural resource reduction.

For pass standard, students will carry out a survey of an existing building, the survey will be used to assess the suitability of different retrofit improvements. The survey will contain most details and include measurements and sketches. Minor omissions might be present and most of the information required to allow for a selection of retrofit options will be included. Students will explain the main factors and issues relating to the use of retrofit options in buildings, to explain the similarities, differences, advantages and disadvantages in relation to their application. The options may not all be relatable to the project scenario and some generic responses are expected. The main benefits and drawbacks will be related to the scenario and the end user's needs.

The retrofitting options will typically include 8 improvements covering a range of options for fabric improvements, for heating/energy production improvements, for ventilation improvements and for natural resource reduction.

Learning aims B and C

For distinction standard, students will demonstrate an in-depth understanding of the installation requirements for the potential retrofit improvements. A clear and logical schedule of work will be produced that includes all the improvements selected in the previous task. The order of the tasks will follow a clear precedence of work for the tasks, the students will produce detailed programs of work for the installation of the different improvements. Students will also need to produce a detailed risk assessments and method statements and installer safety information. These will all be applicable to the building surveyed previously and there will be minimal omissions, the documents could be used by a construction worker to carry out the work with no further amendments.

Students will evaluate the selection of the different retrofit options that can be applied to a chosen building. Students will prioritise how the solutions compare, and which solutions will be best suited to the building; considering the building and end user needs. Students must produce clear and justified recommendations for the most effective solutions that could be included and demonstrate an in-depth understanding of the relative costs and inconvenience of the different options. There will be a clear and justified conclusion of retrofit improvements that have been proposed. Students will also include an evaluation of the measurement of the effectiveness of all the options included. This will include an evaluation of the possible reasons why some improvements might not deliver the theoretical benefits proposed and include solutions that that could be implemented to improve the efficacy of the improvements.

Students will consistently use the correct technical vocabulary and appropriate communication methods.

For merit standard, students will demonstrate a good understanding of the installation requirements for the potential retrofit improvements. A clear and logical schedule of work will be produced that includes most of the improvements selected in the previous task. The order of the tasks will mostly follow a clear precedence of work for the tasks, students will also need to produce a detailed risk assessment and method statements and installer safety information. Students will produce programs of work for the installation of the different improvements. These will all be applicable to the building surveyed previously and there might be some omissions, the documents could be used by a construction worker to carry out the work with minor amendments.

Students will discuss the selection of the different retrofit options that can be applied to a chosen building. Students will prioritise how the solutions compare, and which solutions will be best suited to the building; considering the building and end user needs. Students must produce clear and mostly justified recommendations for the most effective solutions that could be included and demonstrate a good understanding of the relative costs and inconvenience of the different options. There will be a clear conclusion of retrofit improvements that have been proposed. Students will also include a discussion regarding the measurement of the majority of the options included. This will include the possible reasons why some improvements might not deliver the theoretical benefits proposed and solutions that that could be implemented to improve the efficacy of the improvements.

Students will mostly use the correct technical vocabulary and appropriate communication methods.

For pass standard, students will demonstrate an understanding of the installation requirements for the potential retrofit improvements. A clear and logical schedule of work will be produced that includes a majority of the improvements selected in the previous task. The order of the tasks will mostly follow a clear precedence of work for the tasks, students will produce programs of work for the installation of the different improvements. Students will also need to produce a risk assessment and method statements and installer safety information. These will all generally be applicable to the building surveyed previously and there might be some omissions, the documents could be used by a construction worker to carry out the work with amendments.

Students will explain the selection of the different retrofit options that can be applied to a chosen building. Students will prioritise how some of the solutions compare, and which solutions will be best suited to the building; considering the building and end user needs. Students must produce clear recommendations for the most effective solutions that could be included and demonstrate an understanding of the relative costs and inconvenience of the different options. There will be a formal conclusion of the retrofit improvements that have been proposed. Students will also describe the measurement of the some of the options included. This will include the possible reasons why some improvements might not deliver the theoretical benefits proposed and might include solutions that that could be implemented to enhance the efficacy of the improvements.

Students will demonstrate the use of the correct technical vocabulary and appropriate communication methods.

Unit 6: Modelling in Construction

Level: 3

Unit type: Internal

Guided learning hours: 60

Unit in brief

Students will develop knowledge and understanding of the principles and use of building information modelling (BIM) technologies to prepare and communicate designs for structures in the built environment.

Unit introduction

Constructors now use digital technologies to design and model construction projects in the built environment. 3D models of structures like buildings, bridges, roads or drainage networks enable constructors to visualise and explore projects before they are built. Models are used to simulate construction sequences, estimate costs, specify materials and generate drawings or sketches.

In this unit, you will learn about project information models, which contain 3D visualisations that bring together the data, drawings and cost schedules associated with the design and construction phase of a built environment project. You will discover how these models are used to support sustainable construction. You will acquire knowledge of how constructors collaborate, using models to communicate and prepare designs across a project team. You will develop and apply Building Information Modelling (BIM) tools to design a given structure for the built environment and generate outputs such as drawings and flythroughs to communicate your design to a team.

The project information modelling skills, knowledge and understanding covered in this unit will help you progress to a construction industry-related degree, specialise in a BIM coordinator role or use BIM techniques to undertake design in your chosen construction profession.

Learning aims

In this unit you will:

A Understand how models and digital data contribute to a collaborative design process in the built environment

B Carry out modelling techniques to design a structure in the built environment for a given client brief

C Communicate a design proposal using digital technology.

Summary of unit

Learning aim	Key content areas	Assessment approach
A Understand how models and digital data contribute to a collaborative design process in the built environment	**A1** Types of models **A2** Work sharing and collaboration **A3** Security of data **A4** Modelling and modern methods of construction	Production of information on how project teams work collaboratively, and keeping data secure using models in the built environment.
B Carry out modelling techniques to design a structure in the built environment for a given client brief	**B1** Use of software to prepare project information models **B2** Creating a project information model for a given client brief	Preparation of a project information model and outputs for a given construction project scenario and communication of the design to the client (covers learning aims B and C).
C Communicate a design proposal using digital technology	**C1** Communicating designs **C2** Communicating documents	Preparation of a project information model and outputs for a given construction project scenario and communication of the design to the client (covers learning aims B and C).

Content

The essential content is set out under content areas. Students must cover all specified content before the assessment.

Learning aim A: Understand how models and digital data contribute to a collaborative design process in the built environment

A1 Types of models (CDE)

Students will need an awareness of the different types of model and data used to prepare designs in the built environment.

- Types of models, including:
  - project information model
  - construction information model
  - asset information model
  - analysis models including structural and hydraulic.
- Types of data, including:
  - 2D and 3D graphical data
  - non-graphical data
  - client information requirements
  - sources of manufacturer and supplier information
  - material specification
  - facilities management and maintenance information
  - costings
  - other documents.

A2 Work sharing and collaboration

Students will need an awareness of how the Common Data Environment (CDE) supports work sharing and collaboration when preparing building information modelling led designs.

- The function of a CDE, including:
  - digital information platform
  - data access
  - data storage
  - real-time design collaboration
  - requests for information
  - change order processes.
- The advantages and disadvantages of working collaboratively in a CDE.
- Measures required to ensure that:
  - a construction project's CDE is up to date
  - the content is suitable and accurate.

A3 Security of data

Students will need to understand the importance of and requirements to protect data, intellectual properties, legal requirements, sensitive designs, specifications and other project information, to include:

- setting and controlling protocols and access permissions
- version control.

A4 Modelling and modern methods of construction

Students will need an understanding of the contribution of the BIM 3D virtual environment and its support of sustainable modern methods of construction to include:

- construction time and waste reduction
- 3D printing and off-site component manufacture
- sustainable materials selection
- service specifications to optimising renewable sources
- energy use and life cycle analysis.

Learning aim B: Carry out modelling techniques to design a structure in the built environment for a given client brief [SP-PS]

B1 Use of software to prepare project information models

Students will need an understanding of the purpose of different types of software as well as the technologies that support the preparation of a project information model, including:

- The types of input data that support the preparation of a project information model:
  - topographical data including survey benchmarks, elevation data and representation as cloud of points
  - underground utilities including electrical network, water supply and wastewater systems, underground construction.
- The difference between CAD and a project information model.
- The purpose of different types of software packages including:
  - create, edit and view models
  - cloud-based platforms for centrally sharing and managing construction data
  - model comparison for clash detection, management and issue monitoring
  - progress tracking, cost management and resource allocation
  - rendering and presentation
  - sketching.
- Reasoning to justify choice of solutions – use of inductive and/or deductive reasoning, considering different perspectives.
- Assessing the benefits and limitations of options and solutions; making judgements on the quality of solutions.

B2 Creating a project information model for a given client brief

Students will become familiar with the tools used to create a project information model for a three-storey building for a given client brief being able to:

- consider factors when responding to client brief including: room sizes and dimensions, materials and finishes, architectural styles (including modern, Tudor, Victorian, art deco), dimensions, budget, fixtures for kitchens and bathrooms, sustainability measures (including energy efficient glazing, insulation, solar panels and rainwater collection and recycling) and natural lighting
- create 2D geometry and dimensions in the x and y plane including creation from a map, diagram or sketch
- push, pull and extrude 2D shapes to create 3D elements
- create components or use building information modelling families and elements including, doors, windows, columns, ceilings, floors, curtain systems, mullions, ramps and stairs
- add material, dimensions and cost properties to a model
- add annotations
- add render and real-life texture to create realistic representations in digital models including brick, concrete, metal or wood.
- Using creative tools – problem solving, alternate sectors; mind mapping; learning new methods and procedures; risk taking, overcoming fear of failure.

Learning aim C: Communicate a design proposal using digital technology [IS-WC]

Students will become familiar with the tools used to create outputs from project information model for a three-storey building.

C1 Communicating designs

- Using project information model to create 2D views including plans, elevation and sections.
- Exporting the model into a real-time rendering solution to produce flythroughs, 360 panoramas and QR code views.
- Simulating construction and phasing sequencing in line with a programme and timeline.
- 3D printed models.

C2 Communicating documents

- Using project information model to estimate costs.
- Using project information model to determine how structures perform with sunlight, orientation, energy consumption and embodied carbon.
- Preparing a Construction Operation Building information exchange (COBie) document to transfer information.
- Use of appropriate technical language.

Assessment criteria

Learning aim A: Understand how models and digital data contribute to a collaborative design process in the built environment

Pass	Merit	Distinction
A.P1 Compare the types of models and data used to design and work collaboratively in the built environment. **A.P2** Outline how a Common Data Environment supports work sharing and collaboration in a design team. **A.P3** Explain the importance of protecting the security of data and information during the completion of design project. **A.P4** Describe how building information models enable sustainable modern methods of construction.	**A.M1** Analyse the contribution of models and a Common Data Environment to the secure flow of information during the preparation of a design for the built environment.	**A.D1** Evaluate the effectiveness of the contribution of models and a Common Data Environment to the secure flow of information during the preparation of a design for the built environment.

Learning aim B: Carry out modelling techniques to design a structure in the built environment for a given client brief

Pass	Merit	Distinction
B.P5 Explain the purpose of the different types of software used to support the preparation of project information model. **B.P6** Produce a project information model for a given client brief in the built environment.	**B.M2** Assess the components, dimensions, materials, sizes and costs used in the project information model for a given client brief in the built environment.	

Learning aim C: Communicate a design proposal using digital technology

Pass	Merit	Distinction
C.P7 Communicate a built environment design proposal using drawings and flythrough from a project information model prepared for a given structure. **C.P8** Communicate a built environment design proposal using documents from a project information model prepared for a given structure.	**C.M3** Assess the effectiveness of the communication of a design proposal using drawings, flythroughs and documents prepared from a project information model for a given structure.	**BC.D2** Justify the components, dimensions, materials, sizes and costs used in the project information model against the given client brief to communicate a design.

Transferable skills

Managing Yourself	Effective Learning	Interpersonal Skills	Solving Problems
MY – TPR	EF – MOL	IS – WC *	SP – CT *
MY – PS&R	EF – CL	IS – V&NC	SP – PS *
MY – COP	EF – SRS	IS – T	SP – C&I
MY – PGS	EF – PRS	IS – C&SI	

Table key

*	Signposted to indicate opportunities for development as part of wider teaching and learning. Requires additional assessment for student to achieve this TS
√	Embedded in teaching, learning and assessment
Blank	TS not embedded or signposted in unit

Essential information for Pearson Set Assignment Brief (PSAB)

Pearson sets the assignment for the assessment of this unit.

The PSAB will take12 hours to complete.

The PSAB will be marked by centres and verified by Pearson.

The PSAB will be valid for the lifetime of this qualification.

Centres are required to check for plagiarism by inspecting progress of student's completion of the tasks, at points during, and after submission.

It is good practice for students to complete as much of the assignment as possible under supervised conditions.

Assessing the PSAB

You will make assessment decisions for the PSAB using the assessment criteria provided.

Section 1 gives information on PSABs and there is further information on our website.

Further information for teachers and assessors

Resource requirements

For this unit, students must have access to:

- building information management software such as Autodesk Revit or Bentley MicroStation to create, edit and view models
- suitable project information model case studies
- examples of online collaboration platforms used as common data environments.

Essential information for assessment decisions

Learning aim A

For distinction standard, students will evaluate the types of models used to design and work collaboratively in the built environment. Students must show a detailed understanding of the purpose and use of each type of model during the different stages of a construction project including the types of data used in the models. They will demonstrate a coherent, structured, comprehensive and wide-ranging evaluation of how a Common Data Environment supports work sharing and collaboration in a design team. Students will evaluate the effectiveness of using Common Data Environment considering the advantages and disadvantages of its utilisation within a project team. They will thoroughly evaluate the importance of protecting the security of data and information, covering the legal requirements to protect intellectual property. The evaluation will provide clear thorough and wide-ranging details of how building information models enable sustainable modern methods of construction.

For merit standard, students will analyse the types of models used to design and work collaboratively in the built environment. Students must show clear awareness of the purpose and use of each type of model during the different stages of a construction project. They must be able to describe the types of data used in the models, with few omissions. They will outline how a Common Data Environment supports work sharing and collaboration in a design team covering it being a digital information platform and measures to ensure information is up to date. They will explain the importance of protecting the security of data and information. The response will describe how building information models enable sustainable modern methods of construction focusing on three aspects from the content.

For pass standard, students will compare the types of models used to design and work collaboratively in the built environment. Students must show an awareness of the purpose and use of each type of model during the different stages of a construction project. They must be able to describe the types of data used in the models, but this may show some omissions. They will outline how a Common Data Environment supports work sharing and collaboration in a design team, but this will be limited, focusing principally on it being a digital information platform. They will explain the importance of protecting the

security of data and information but focus on one aspect such as the requirement to keep sensitive designs confidential. The description will provide some details of how building information models enable sustainable modern methods of construction focusing on one aspect such as the reduction of construction time and waste.

Learning aims B and C

For distinction standard, students will use building information modelling software and tools to prepare a project information model for a three-storey domestic building. Students will be able to position all required building components to a dimensioned grid in the modelling environment. Students will add materials, sizes and cost data to components. The model will be rendered with real-life texture to create a realistic representation of the building. Students will produce using a project information model, fully annotated plans for each floor and elevation of the building, as well as section drawing and a flythrough and external panorama to communicate the key feature of the building to a client. Students will be able to demonstrated modelling skills extending to entering given cost information into the model and be able to prepare a detailed cost estimate document for the full building using the project information model. The cost information entered the model does not need be entirely accurate, what is being assessed is the ability to input and extract cost information. Students will also prepare a statement justifying the purpose of different types of software to support the preparation and communication of a project information model and how features of the final project information model meet the given client brief. The justification against the client brief will consider issues like type size and dimensions of rooms; materials and finishes; architectural style, sustainability measures, window and door positions to provide natural lighting, and fit out for kitchens and bathrooms.

For merit standard, students will use building information modelling software and tools to prepare a project information model for a three-storey domestic building. Students will be able to position key building components such as walls, floors, doors, ceilings and roofs to a dimensioned grid in the modelling environment. Students will add materials, sizes and cost data to components. The model will be rendered with real-life texture to create a realistic representation of the building. Students will produce using a project information model, a fully annotated ground floor plan, first floor plan, front elevation and section drawing as well as a flythrough and external panorama to communicate the key feature of the building to a client. Students will be able to demonstrate modelling skills extending to entering given cost information into the model and be able to prepare a cost estimate document using the project information model for the ground floor of the building. The cost information entered into the model does not need be entirely accurate, as what is being assessed is the ability to input and extract cost information. Students will also prepare a statement assessing the purpose of different types of software to support the preparation of a project information model and the features of the final project information model against the given client brief. It is anticipated that this assessment will cover the choice of materials for finishes such as timber, brick or steel; dimensions and size of rooms; positioning of doors, windows, stairs, fit out for kitchens and bathrooms; and the basic costs.

For pass standard, students will use building information modelling software and tools to prepare a project information model for a three-storey domestic building. Students will be able to position key building components such as walls, floors, doors, ceilings and roofs to a dimensioned grid in the modelling environment. Students will produce, using a project information model, a ground floor plan, first floor plan, front elevation and section drawing as well as a flythrough and external panorama to communicate the key feature of the building to a client. Students will be able to demonstrate modelling skills extending to entering simple given cost information into the model and be able to extract from the model cost estimate document for the ground floor of the building. The cost information entered into the model does not need be entirely accurate, what is being assessed is the ability to input and extract cost information. Students will also prepare a statement exploring the purpose of different types of software to support the preparation of a project information model. At pass this will focus largely on the software used to create edit and view the project information model.

Employer involvement

This unit would benefit from employer involvement in the form of:

- guest speakers
- technical modelling workshops involving staff from local architecture, construction or engineering organisations
- opportunities for observation of completed project information models as case studies.

5 Planning your programme

Supporting you in planning and implementing your programme

There will be lots of free teaching and learning support to help you deliver the new qualifications, including:

- Our Planning and Teaching Guide will help you to plan how to deliver the content and assessments that make up Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate) qualification. It also highlights opportunities to develop the transferable skills identified within the units in this specification.
- Sample Assessment materials are available for each external unit to help you to plan and prepare for assessments.
- Our mapping document highlights key differences between the new qualification and Pearson BTEC Level 3 National Extended Certificate in Construction and the Built Environment (603/0862/X), which this qualification replaces.

Is there a student entry requirement?

As a centre it is your responsibility to ensure that students who are recruited have a reasonable expectation of success on the programme. There are no formal entry requirements but we expect students to have qualifications at or equivalent to Level 2.

Students are most likely to succeed if they have:

- five GCSEs at good grades, and/or
- BTEC qualification(s) at Level 2
- achievement in English and mathematics through GCSE or Functional Skills.

Students may demonstrate ability to succeed in various ways. For example, students may have relevant work experience or specific aptitude shown through diagnostic tests or non-educational experience.

6 Understanding the qualification grade

Awarding and reporting for the qualification

This section explains the rules that we apply in awarding a qualification and in providing an overall qualification grade for each student. It shows how all the qualifications in this sector are graded.

The awarding and certification of these qualifications will comply with regulatory requirements.

Eligibility for an award

In order to be awarded a qualification, a student must:

- complete and **have an outcome** (D, M, P, N or U) for all units within a valid combination
- achieve the **minimum number of points** at a grade threshold.

Award of the qualification grade

The final grade awarded for a qualification represents an aggregation of a student's performance across the qualification. As the qualification grade is an aggregate of the total performance, there is some element of compensation in that a higher performance in some units may be balanced by a lower outcome in others.

BTEC Nationals are Level 3 qualifications and are awarded at the grade ranges shown in the table below.

Qualification	Available grade range
Extended Certificate	P to D*

The *Award of qualification grade* table, shown further on in this section, shows the minimum thresholds for calculating these grades. The table will be kept under review over the lifetime of the qualification. The most up-to-date table will be issued on our website.

Pearson will monitor the qualification standard and reserves the right to make appropriate adjustments.

Students who do not meet the minimum requirements for a qualification grade to be awarded will be recorded as Unclassified (U) and will not be certificated. They may receive a Notification of Performance for individual units. The *Information Manual* gives full information.

Points available for internal units

The table below shows the number of **points** available for internal units. For each internal unit, points are allocated depending on the grade awarded.

Grade	Unit size (60 GLH)
U	0
Pass	6
Merit	10
Distinction	16

Points available for external units

Raw marks from the external units will be awarded **points** based on performance in the assessment. The table below shows the **minimum number of points** available for each grade in the external units.

Grade	Unit size (60 GLH)
U	0
Near Pass	4
Pass	6
Merit	10
Distinction	16

Grade	Unit size (120 GLH)
U	0
Near Pass	8
Pass	12
Merit	20
Distinction	32

Pearson will automatically calculate the points for each external unit once the external assessment has been marked and grade boundaries have been set. For more details about how we set grade boundaries in the external assessment please go to our website.

Claiming the qualification grade

Subject to eligibility, Pearson will automatically calculate the qualification grade for your students when the internal unit grades are submitted and the qualification claim is made. Students will be awarded qualification grades for achieving the sufficient number of points (with valid combinations) within the ranges shown in the relevant *Award of qualification grade* table for the cohort.

Award of qualification grade

Applicable for registration from August 2025.

Extended Certificate (360 GLH)

Grade	Points threshold
U	0
Pass	36
Merit	52
Distinction	74
Distinction *	90

The table is subject to review over the lifetime of the qualification. The most up-to-date version will be issued on our website.

Example of a Grading table Pearson Level 3 Alternative Academic Qualification BTEC National in Construction and the Built Environment (Extended Certificate)

Unit number	GLH	Type (Int/Ext)	Grade	Unit points
1	120	Ext	Distinction	32
2	60	Ext	Near Pass	4
3	60	Int	Pass	6
4	60	Int	Merit	10
5	60	Int	Pass	6
TOTAL	**360**		**Merit**	**58**

Appendix 1 Glossary of terms used for internally assessed units

Term	Definition
Adequate	Student work is satisfactory or acceptable in quality and quantity.
Analyse	Students break the issue/situation down into the key elements and show their understanding of the issues/situation applied to the scenario/context. Responses would be significantly beyond generic.
Apply/use/employ	Students implement a method, technique, process or approach in an activity.
Assess	Students give careful consideration to all the factors or events that apply, identify which are the most important or relevant and make a judgement on the importance of the factors.
Carry out	Students demonstrate skills through practical activities, in line with certain requirements.
Clear/ly	The qualities required are well demonstrated, unambiguous and beyond a basic level.
Coherent	Student intentions are clear, logically structured and can be interpreted by others.
Compare	Students show knowledge and understanding by identifying the main factors relating to two or more items/situations or aspects of a subject that is extended with the required explanations, e.g, similarities /differences, advantages/disadvantages, impacts.
Comprehensive	Used to describe either scope or depth, e.g. • Student work is well developed and thorough covering all aspects/information in terms of both depth and breadth Or: • Students demonstrate in-depth and accurate understanding of the aspects being assessed.
Confident	Student work demonstrates well-developed and secure application of skills or processes that are significantly beyond a basic level.
Consistent	Students demonstrate reliable and constant practice that maintains a set standard.
Create/produce	Students generate an idea/outcome to specific criteria.
Demonstrate	Students carry out and apply knowledge, understanding and/or skills in a practical situation.
Describe	Students provide an account of something, or highlight a number of key features of a given topic or process that shows a level of understanding.
Detailed	Students cover most if not all of the expected requirements and demonstrate a high level of understanding.

Term	Definition
Develop	Students apply a process of improving/progressing skills, concepts or work in order to produce outcomes.
Discuss	An issue, situation, process will be presented and the student will need to break the issue/situation/process down into the key elements, show their understanding of the issues/situation/process applied to the scenario/context (so generic answers are not acceptable), and show interrelationship in their answers.
Effective	Students demonstrate skills or provide outcomes that are well developed with a range of proficient qualities and that achieves objectives
Evaluate	Students consider various aspects of a subject's qualities in relation to its context such as: strengths or weaknesses, advantages or disadvantages, pros or cons. They will come to a judgement supported by evidence which will often be in the form of a conclusion.
Examine	Students demonstrate an ability to thoroughly inspect something in order to determine its qualities beyond a basic exploration.
Explain	Students can give an insight into the topic showing some level of understanding by providing reasons or examples.
Explore	Students undertake practical research or investigation to develop their skills or understanding of the topic/activity.
Implement	Students take actions or measures to put something into effect.
Investigate	Students perform a systematic inquiry into a topic using research skills, usually to demonstrate their understanding of a topic.
Justify	Students give relevant and logical reasons or evidence to support their actions or opinions.
Partial/some	To an extent, but not completely. Students do not include all of the requirements.
Perform	Students demonstrate a range of skills required to complete a given activity.
Prepare	Students organise a task/equipment/individuals/activities in advance of carrying it out.
Realistic/feasible	Students demonstrate insight into the logistics and manageability of proposals/plans/objectives/ideas and show consideration of the potential to achieve the outcomes.
Refine/optimise	Students make considered improvements to outcomes.
Review	Students consider evidence in order to make judgements about the qualities.
Understand	Students demonstrate insight or ability to interpret a subject.
Undertake	Students demonstrate skills through practical activities, often referring to given processes or techniques.

Appendix 2 Transferable Skills framework

Following research and consultation with FE educators and higher education institutions, Pearson has developed the BTEC Transferable Skills Framework to facilitate and guide the development of transferable skills through the BTEC Nationals (2025) qualifications in an intentional, consistent and practical way.

The Framework is a holistic one, consisting of a combination of cognitive, social and emotional skills. It has four broad skill areas, each with a cluster of transferable skills as shown in the skills wheel below:

Code = transferable skill initials-skill cluster initials

Managing yourself

Code	Skill cluster	Performance Descriptor
MY-TPR	Taking personal responsibility	• Demonstrates understanding of their role and responsibilities and the expected standards of behaviour. • Demonstrates compliance with codes of conduct and ways of working. • Makes use of available resources to complete tasks. • Manages their time to meet deadlines and the required standards. • Demonstrates accountability for their decisions or actions.
MY-PS&R	Personal strengths and resilience	• Identifies own personal strengths and demonstrates the ability to use these in relevant areas. • Demonstrates the ability to adapt own mindset and actions to changing situations or factors. • Uses challenges as learning opportunities.

Code	Skill cluster	Performance Descriptor
MY-COP	Career orientation planning	• Undertakes research to understand the types of roles in the sector in which they could work. • Reviews own career plans against personal strengths and identifies areas for development to support progression into selected careers. • Takes part in sector-related experiences to support career planning.
MY-PGS	Personal goal setting	• Sets SMART goals using relevant evidence and information. • Reviews progress against goals and identifies realistic areas for improvement. • Seeks feedback from others to improve own performance.

Effective learning

Code	Skill cluster	Performance Descriptor
EL-MOL	Managing own learning	• Maintains a focus on own learning objectives when completing a task. • Demonstrates the ability to work independently to complete tasks. • Reviews and applies learning from successful and unsuccessful outcomes to be effective in subsequent tasks.
EL-CL	Continuous learning	• Engages with others to obtain feedback about own learning progress. • Responds positively to feedback on learning progress from others. • Monitors own learning and performance over the short and medium term.
EL-SRS	Secondary research skills	• Define the research topic or question. • Uses valid and reliable sources to collate secondary data. • Interprets secondary data and draws valid conclusions. • Produces a reference list and cites sources appropriately.
EL-PRS	Primary research skills	• Defines the research topic or question. • Carries out primary data collection using appropriate and ethical research methodology. • Interprets primary data to draw valid conclusions.

Interpersonal skills

Code	Skill cluster	Performance Descriptor
IS-WC	Written communication	• Produces clear formal written communication using appropriate language and tone to suit purpose.
IS-V&NC	Verbal and non-verbal communications	• Uses verbal communication skills confidently to suit audience and purpose. • Uses body language and non-verbal cues effectively. • Uses active listening skills and checks understanding when interacting with others.
IS-T	Teamwork	• Engages positively with team members to understand shared goals and own roles and responsibilities. • Respectfully considers the views of team members and shows courtesy and fairness. • Completes activities in line with agreed role and responsibilities. • Provides support to team members to achieve shared goals.
IS-C&SI	Cultural and social intelligence	• Demonstrates awareness of cultural and social biases. • Demonstrates diversity, tolerance and inclusivity values in their approach to working with others.

Solving problems

Code	Skill cluster	Performance Descriptor
SP-CT	Critical thinking	• Demonstrates understanding of the problem or issue to be addressed. • Makes use of relevant information to build ideas and arguments. • Assesses the importance, relevance and/or credibility of information. • Analyses, interprets and evaluates information to present reasoned conclusions.
SP-PS	Problem solving	• Presents a clear definition of the problem. • Gathers relevant information to formulate proposed solutions. • Selects relevant and significant information to formulate proposed solutions. • Identifies negative and positive implications of proposed solutions. • Presents and justifies selected solutions to problems.
SP-C&I	Creativity and innovation	• Identifies new and relevant ideas to help solve a problem. • Refines ideas into workable solutions based on test results and/or feedback.

Appendix 3 Digital Skills framework

Problem solving

Using digital tools to analyse and solve problems:

Performance descriptor	Unit mapping
Use digital tools and techniques for research, collaboration and resolution of problems.	Unit 3, content area B
Have up-to-date knowledge of ways that technology is used within a sector.	Unit 6, content area A
Present ideas and finding using digital tools.	Unit 6, content area C
Use digital tools to manipulate data.	Unit 6, content area A

Digital collaboration and communication

Using digital tools to communicate and share information with stakeholders:

Performance descriptor	Unit mapping
Understand and use digital collaboration and communication platforms.	Unit 5, content area C
Use collaboration tools to meet with, share and collaborate with customers and colleagues.	Unit 6, content area A

Transacting digitally

Using digital tools to set up accounts and pay for goods/services:

Performance descriptor	Unit mapping
Use online systems to access and update digital records.	NA
Set-up accounts to complete transactions.	NA

Digital security

Identify threats and keep digital tools safe:

Performance descriptor	Unit mapping
Understand the types of malware.	NA
Understand the threats involved in carrying out online activities.	NA
Protect personal and organisation information and data.	Unit 6, content area A
Keeping systems secure.	Unit 6, content area A

Handling data safely and securely

Follow correct procedures when handling personal and organisational data:

Performance descriptor	Unit mapping
Manage passwords and keep them secure.	NA
Identify website and services that are secure and insecure.	NA
Understand the digital policy for a sector.	NA
Understand the impact of online data.	Unit 6, content area A
Understand copyright and intellectual property.	Unit 6, content area A

Appendix 4 Sustainability framework

Sustainable development goal	Unit mapping
SDG 1: No poverty	NA
SDG 2: Zero hunger	NA
SDG 3: Good health and wellbeing	Unit 1, content area C Unit 2, content area A Unit 3, content area A Unit 5, content area B
SDG 4: Quality education	NA
SDG 5: Gender equality	NA
SDG 6: Clean water and sanitation	Unit 2, content area D Unit 3, content area A Unit 5, content area A Unit 6, content area B
SDG 7: Affordable and clean energy	Unit 1, content area A Unit 2, content area D Unit 3, content area A, C Unit 5, content area A, C Unit 6, content area A, B, C
SDG 8: Decent work and economic growth	N/A
SDG 9: Industry, innovation and infrastructure	Unit 2, content area A, C, D Unit 3, content area A, B, C Unit 4, content area A Unit 5, content area A Unit 6, content area A, B
SDG 10: Reduced inequalities	NA

Sustainable development goal	Unit mapping
SDG 11: Sustainable cities and communities	Unit 1, content area A Unit 2, content area A, C, D Unit 3, content area A, C Unit 4, content area B Unit 5, content area A Unit 6, content area A, B
SDG 12: Responsible consumption and production	Unit 2, content area A, C, D Unit 3, content area B Unit 5, content area A, C Unit 6, content area C
SDG 13: Climate action	Unit 3, content area A Unit 5, content area A Unit 6, content area B
SDG 14: Life below water	NA
SDG15: Life on land	Unit 1, content area A Unit 2, content area D Unit 3, content area A Unit 5, content area A, B
SDG 16: Peace, justice and strong institutions	NA
SDG 17: Partnerships for the goals	Unit 3, content area A Unit 6, content area A

Annexe A: Formulae and constants

Surface areas of regular shapes

Total surface area of a cylinder	$TSA = 2\pi rh + 2\pi r^2$
Curved surface area of cone	$CSA = \pi rl$
Surface area of a sphere	$SA = 4\pi r^2$
Area of a sector of a circle	$A = \frac{1}{2}r^2\theta$
Area of a trapezium	$A = \frac{(a+b)}{2}h$

Volumes of regular shapes

Volume of a cylinder	$V = \pi r^2 h$
Volume of sphere	$V = \frac{4}{3}\pi r^3$
Volume of a cone	$V = \frac{1}{3}\pi r^2 h$

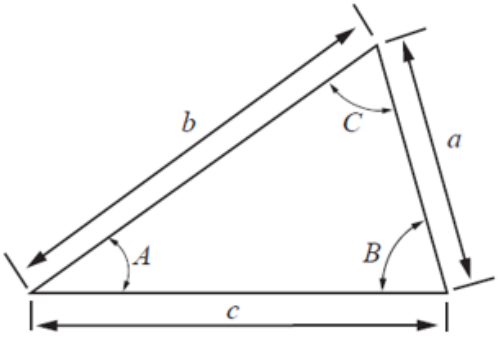
Radians, arc lengths and areas of sectors

Length of an arc of a circle	$s = r\theta$

Graphical techniques

Equation of a straight line	$y = mx + c$

Trigonometric rules



Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ or $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{Sin\ C}{\mathrm{c}}$

Cosine Rule $a^2 = b^2 + c^2 = 2bc\cos A$

Triangular area rule $Area = \frac{1}{2}ab\sin C$

Statistics

Mean $X_m = \frac{\sum X}{n}$

where *x* represents each value in the data set and n represents the number of items of data

Standard Deviation $\sigma = \sqrt{\frac{\sum(X-X_m)^2}{n}}$

Forces, stress and strain

Relationship between force (load), mass and acceleration due to gravity, $F = mg$

Direct stress $\sigma = \frac{F}{A}$

Direct strain $\varepsilon = \frac{\Delta L}{L}$

Resolution of forces in perpendicular directions, $Fx = Fcos\theta,\ Fy = Fsin\theta$

Equilibrium conditions to ensure stability of a beam $\Sigma Fx = 0,\ \Sigma Fy = 0,\ \Sigma M = 0$

Moment of a force: moment = force × distance

Human comfort effect of temperature on construction materials while in situ

Thermal resistance $R_c = \frac{thickness\ of\ material}{thermal\ conductivity}$

$$R_\theta = \frac{thickness}{cross\text{-}sectional\ area\ \ x\ \ thermal\ conductivity}$$

U Values $U = \frac{1}{R_c}$

Thermal conductivity $K = \frac{QL}{A\Delta T}$

Acoustics

Reverberation time $T = 0.161\ \left(\frac{V}{A}\right)$

where V is the volume in m^3 and A is the total absorption surface in m^2

Constants

Acceleration due to gravity, g = 9.81 m/s^2

π = 3.142

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VAT Reg No GB 278 537121

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Publication code:
VQ000307