Training Qualifications UK

Qualification Specification

TQUK Level 3 Certificate in Design, Engineer, Construct! The Digital Built Environment (RQF)

Qualification Number: 603/2052/7

Version 4

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Introduction

Welcome to TQUK

Training Qualifications UK (TQUK) is an Awarding Organisation recognised by the Office of Qualifications and Examinations Regulation (Ofqual) in England and CCEA Regulation in Northern Ireland.

TQUK offers qualifications which are regulated by Ofqual and, in some cases, by CCEA Regulation. All regulated TQUK qualifications sit on the Regulated Qualifications Framework (RQF) and are listed on the Register of Regulated Qualifications.
Our qualifications are designed to support and encourage learners to develop their knowledge and skills. This development may result in progression into employment or career development in the workplace. Our qualifications also allow learners to progress onto further qualifications. Please visit our website for news of our new and coming soon developments.

Centre Recognition

To offer a TQUK qualification, a centre must be recognised by TQUK.

The TQUK centre recognition process requires a centre to have in place a number of policies and procedures to protect the learners undertaking a TQUK qualification and the integrity of TQUK's qualifications. These policies and procedures will also support a recognised centre's quality systems and help support the centre to meet the qualification approval criteria.

Recognised centres must seek approval for each qualification they wish to offer.

The approval process requires centres to demonstrate that they have sufficient resources, including suitably qualified and occupationally competent staff to deliver, assess and quality assure the qualification and access to appropriate support in the form of specialist resources. Qualification approval must be confirmed before any assessment of learners takes place.

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Qualification Specifications

Each qualification TQUK offers is supported by a specification that includes all the information required by a centre to deliver the qualification. Information in the specification includes unit information, learning outcomes, and how the qualification is assessed.

The aim of the qualification specification is to guide a centre through the process of delivering the qualification.

Please read it alongside the TQUK Centre Handbook. Details of TQUK's procedures and policies can be found on our website.

Qualification specifications can also be found on our website. If you have any further questions, please contact TQUK.

Centres must ensure they are using the most recent version of the qualification specification for planning and delivery purposes.

Reproduction of this document

Centres may reproduce the qualification specification for internal use only but are not permitted to make any changes or manipulate the content in any form.

Centres must ensure they use the most up-to-date pdf version of the specification.

Use of TQUK Logo, Name and Qualifications

TQUK is a professional organisation and the use of its name and logo is restricted. TQUK's name may only be used by recognised centres to promote TQUK qualifications. Recognised centres may use the logo for promotional materials such as corporate/business letterheads, pages of the centre's website relating to TQUK qualifications, printed brochures, leaflets, or exhibition stands.

When using TQUK's logo, there must be no changes or amendments made to it, in terms of colour, size, border or shading. The logo must only be used in a way that easily identifies it as TQUK's logo. Any representation of TQUK's logo must be a true representation of the logo.

It is the responsibility of the centre to monitor the use and marketing of TQUK's logos and qualifications on their own materials as well as on those of any re-sellers or third parties they may use. TQUK must be made aware of centre relationships with re-sellers of TQUK qualifications. TQUK must be made aware of any additional websites where the centre intends to use TQUK's name and/or logo. If this information is changed, TQUK should be notified immediately. TQUK is required to monitor centres' websites and materials to ensure that learners are not being misled.

If a centre ceases to be/surrenders recognition as a TQUK centre, it must immediately discontinue the use of TQUK's logo, name, and qualifications from all websites and documents.

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The Qualification

The TQUK Level 3 Diploma in Design Engineer Construct! The Digital Built Environment (RQF) is regulated by Ofqual.

The qualification was developed in association with Class Of Your Own® Limited (COYO).

COYO has licensed the Intellectual Property Rights in the Design Engineer Construct! Learning Programme to TQUK, on an exclusive basis, for incorporation into the TQUK DEC qualifications.

At development, this qualification was supported by:

Industry	Professional Bodies and Specialist Organisations	Further and Higher Educational Establishments
The qualification is formally supported by the following industry bodies; leaders in the Built Environment sector and represent some of the UK's most respected companies. These include:	The qualification is formally supported by professional bodies and specialist organisations including:	This qualification is formally supported by leading universities including:
• Mott MacDonald • Topcon Positioning Systems • Laing O'Rourke • Willmott Dixon • Arup • BAM • Balfour Beatty • Bentley Systems	• Royal Institution of Chartered Surveyors • Chartered Institute of Building • Chartered Institution of Civil Engineering Surveyors • UK BIM Alliance	• Newcastle University • Heriot-Watt (including Edinburgh, Dubai and Malaysia campus) University • Dundee University • London South Bank • Westminster • Salford University • University of Northumbria

The TQUK Level 3 Diploma in Design Engineer Construct! The Digital Built Environment (RQF) has been tariffed by UCAS and attracts the following points:

Grade	Points
A*	28
A	24
B	20
C	16
D	12
E	8

The results of the TQUK Level 3 Certificate in Design, Engineer, Construct! The Digital Built Environment (RQF), and the TQUK Level 3 Diploma in Design, Engineer, Construct! The Digital Built Environment (RQF) are not reported to UCAS through Awarding Body Linkage (ABL). This does not reflect the validity of the qualification. HEPs will need to ask applicants to provide their own evidence of achievement.

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Qualification Purpose

Design Engineer Construct! Level 3 is an advanced programme for learners looking to increase their knowledge of professional practice in the Built Environment and provides an excellent opportunity to advance knowledge gained at Level 2 and extend the knowledge and skills required to progress to the professional workplace and/or university.

Learners develop, design, deliver and evaluate a fit-for-purpose, functional building that can be based on their own interpretation of a 'real' project brief. Their building should be highly sustainable and inclusive and enable learners to demonstrate advanced knowledge and use a range of industry processes and digital skills.

The qualification fosters the knowledge and skills required to define, develop, deliver and evaluate a digital construction project from concept to handover. It encourages learners to focus on the impact on the end user, the wider community and the environment, setting standards for resource efficiency, and committing to sustainable procurement. Learners will understand the need for accurate technical information regarding the proposed site, and the constraints and challenges a site can present.

Building types they might consider are:

- an office block
- a housing project e.g. for the elderly, sheltered accommodation
- an outdoor activity centre
- a mixed-use development e.g. apartments and integrated café
- a school for special educational needs
- a neo-natal unit.

Learners can use an existing site as the 'building site' location of their building and/or use web-based mapping programmes and other technology platforms to access a range of industry-specific site information.

Learners are empowered to take ownership of their own project, focusing on a justifiable need for the end users they have identified.

Where possible, we recommend learners are given access to professional volunteers e.g. through the Class Of Your Own 'Adopt A School' scheme and Professional Body outreach programmes.

The Design Engineer Construct!® Learning Programme (now commonly known as 'DEC') has gained a solid reputation as "the most innovative, challenging and relevant curriculum development in recent years", championed by respected leaders, and referenced in numerous national reports.

Aligning with the Sustainable Development Goals, the themes of social, environmental and economic sustainability run throughout Design Engineer Construct! programmes and learners discover how to minimise their own and their community's impact on the planet through role play and project-based learning. They understand the value of inclusivity and diversity, designing for a world where everyone matters.

Entry Requirements

The qualification is accessible to learners in secondary schools, University Technical Colleges, Further Education Colleges, International Schools and other educational institutions.

There are no specific entry requirements, however, learners should have a minimum of Level 2 literacy and numeracy skills. We recommend that learners have achieved a minimum GCSE Mathematics grade 5 (C). This qualification is suitable for learners aged 16 years and above.

Centres should ensure that any learner registered on a TQUK qualification undertakes an initial assessment to ensure they have the ability to complete the course in full. The outcomes of the process inform:

- early judgements about the learner
- the focus and level of learning
- the skills and needs that will be developed and supported.

A review of a learner's prior achievements, well-managed interviews and diagnostic tests are all suitable forms of initial assessment.

Progression

This qualification will provide opportunity for progress into higher education or employment in the Built Environment. It provides access to a wide range of career pathways, including Architecture and Architectural Technology, Geospatial and Property Surveying, Quantity Surveying and Cost Management, Information Management, Civil, Structural and Building Services Engineering and Construction Project Management.

The qualification complements other subject areas at Level 3, such as mathematics, physics, engineering, computer science, art, geography, business studies and design technologies to broaden the curriculum. Past students have also combined with art and humanities subject – we recommend consulting with employers and universities for specific progression requirements. With a range of transferable knowledge and skills, learners can also access wider industry opportunities, for example in the town planning, creative and digital, financial, and legal sector.

Structure

Learners must successfully complete all three mandatory units to achieve the qualification.

Title	Unit ref.	Level	Guided learning hours	Credit value
Defining a sustainable construction project	A/615/8835	3	60	10
Developing a sustainable construction project	F/615/8836	3	60	10
Investigate design, structural and service aspects of a sustainable construction project	R/616/9176	3	60	10

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Guided Learning Hours

These hours are made up of all contact time, guidance or supervision of a learner by a teacher, supervisor, tutor, trainer or other appropriate provider of education or training.

GLH for this qualification is 180 hours.

Directed study requirements

Learners are expected to study and complete aspects of their assessment portfolio in their own time. This additional time is expected to be approximately 120 hours over the cycle of the programme.

Total Qualification Time

This is an estimate of the total length of time it is expected that a learner will typically take to achieve and demonstrate the level of attainment necessary for the award of the qualification i.e. to achieve all learning outcomes.

Total Qualification Time is comprised of GLH and an estimate of the number of hours a learner is likely to spend in preparation, study or any other learning including assessment which takes place as directed by, but not under the supervision of, a lecturer, supervisor or tutor. The credit value for a qualification, where given, is determined by TQT, as one credit corresponds to 10 hours of learning.

The Total Qualification Time for this qualification is 300 hours.

Assessment

It is essential that all learners are assessed in English unless the qualification specification specifically states that another language may be accepted. This ruling also applies to all learner evidence presented for external quality assurance purposes.

The recognised centre is required to have one or more delivery sites which offer facilities to support the programme of learning and assessment. These must comply with health and safety regulations and have in place appropriate access arrangements. All training and/or assessment sites must include the following facilities:

- A practical space to be used for learning and assessment activities. This should offer multimedia facilities such as a data projector and laptop, flipchart and pens.
- Architectural model-making facilities (card, foam board).
- A high specification* IT suite and IT hardware (minimum requirements will be advised to each Centre.
- Industry standard design software such as, Autodesk, Bentley.

The use of industry-standard software is a critical element of the programme and prepares learners for working life in a modern, digital industry. Training is available through Class Of Your Own and advised to each Centre.

The qualification is assessed by a combination of an

- Internally assessed and externally moderated portfolio (50%)
- Externally set and externally marked examination (50%).

The externally set and marked exams will take place on a date published in advance by TQUK.

Dates for submission of work for standardisation and moderation will be published alongside dates for the exams.

The externally set and externally marked examination requires learners to sit the exam in conditions as set out in the TQUK Exam and Invigilation Procedure in the TQUK Centre Handbook. The exam will test learners on the knowledge assessment criteria identified in the unit tables. Where an assessment criterion has been identified as 'knowledge' the exam will test general knowledge of a learner on this topic where the portfolio will show the application of this knowledge in a specific context.

The qualification is graded with grades A*/A/B/C/D/E. The overall grade for the qualifications is calculated using a points-based system. A point score is awarded for each assessment component (exam and portfolio), before being weighted, combined and translated into a grade.

Internal assessment portfolio marking

Allocating learning outcome marks

The internal assessor will mark the portfolio assessment criteria in accordance with the clear levels of attainment contained in the assessment matrix found at the end of this specification. Each learning outcome is allocated mark based on the average of marks achieved for the assessment criteria within that learning outcome. Each assessment criteria is eligible to achieve between 1 – 6 marks. A 0 (zero) will be allocated when evidence presented does not meet the minimum requirements.

The overall unit score is then aggregated by adding the total learning outcome score:

Unit marking scale							
Unit Points	Fail	E	D	C	B	A	A*
Unit 1 combined score (X3 tasks)	0	3	6	9	12	15	17
Unit 2 combined score (X3 tasks)	0	3	6	9	12	15	17
Unit 3 combined score (X3 tasks)	0	3	6	9	12	15	16

Portfolio mark and grade

The unit points are then added together to create an overall grade for the portfolio for submission to the awarding organisation.

Portfolio marking scale							
Combined unit score	0-8	9-17	18-26	27-35	36-44	45-49	50-54
Portfolio Grade	Fail	E	D	C	B	A	A*

The learner attainment record is designed in a way to lead the assessors through this process. The portfolio points are then submitted to TQUK.

For a learner to gain an overall pass on the portfolio aspect, they must achieve a minimum pass on each unit of the portfolio.

All portfolios should be submitted as a single PDF file. If learners have completed work in a visual format, teachers should keep a record and add this into the learner's portfolios once they have been submitted and before submitting to TQUK. Therefore all physical work should be scanned and added to the portfolio before submission.

External exam marking

The TQUK external assessors are required to mark the exam in accordance with the pre-standardised mark scheme. All papers are then subject to the application of grade boundaries in order to maintain comparable standards over time.

Learners are eligible to achieve up to a maximum of 60 marks per paper.

Points scale							
Marks	0	Variable marking					60
Grade	Fail	E	D	C	B	A	A*

Calculating the qualification grade

The mark from the exam is converted into a mark out of 54 to align with the overall portfolio mark.

The portfolio and exam points are then weighted as follows:

- 50% Portfolio: Points X 0.5 to weight the portfolio score
- 50% Exam: Points X 0.5 to weight the exam score

Weighted points are added to produce a Final Points Score. These points are used to determine the overall grade for the qualification. As the exam grade is based on a variable scale, with grade boundaries shifting yearly, final grading calculations are dynamic and may be subject to change.

All assessments are required to have a minimum of a Pass awarded in order for the learner to achieve a final grade. Learners who do not reach a minimum of a Pass for all assessments will not be awarded the qualification.

Special Consideration requirements

The recognised centre is required to ensure all learners who are disadvantaged, unable to complete the full learning programme due to emotional or physical difficulties, or subject to any adverse circumstances during their registration period are made aware of and able to access and request specification consideration in accordance with the *TQUK Access Arrangements Policy*.

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Re-assessment requirements

Externally assessed exam

External reassessment requires learners to retake the examination on a date specified by TQUK. Exam dates will be published in September for the following year.

Centres will be required to pay an additional reassessment fee per learner. Details of reassessment fees can be found in our resit and resubmission fees document located at www.tquk.org/design-engineer-construct/.

Internally assessed portfolio

Portfolio reassessment requires learners to submit new evidence for units. New evidence must be presented in line with specified awarding windows. Learners who submit a portfolio with new evidence will always be part of the cohort sample.

Centres will be required to pay an additional reassessment fee per learner. Details of reassessment fees can be found in our resit and resubmission fees document located at www.tquk.org/design-engineer-construct/.

Support from TQUK

Recognised centres will be able to access support from TQUK whenever necessary. External Quality Assurance activities will be undertaken on a regular basis. TQUK also offers recognised centres the service of a Client Relationship Officer whose role is to support centres with any administration queries or qualification support.

Centres will also be able to access support and resources from Class Of Your Own Limited. These include student workbooks, training programmes, support materials, resource banks, online teaching support and bespoke industry engagement.

Course Delivery

Pre-Course Information

All learners should be given appropriate pre-course information regarding any TQUK qualifications. The information should explain the qualification, the fee, the form of the assessment and any entry requirements or resources needed to undertake the qualification.

Initial Assessment

Centres should ensure that any learner registered on a TQUK qualification undertakes some form of initial assessment. The initial assessment should be used to inform a teacher/trainer on the level of the learner's current knowledge and/or skills.

Initial assessment can be undertaken by a teacher/trainer in any form suitable for the qualification to be undertaken by the learner/s. It is the centre's responsibility to make available forms of initial assessment that are valid, applicable and relevant to TQUK qualifications.

Teaching resources

All teaching materials and additional resources used to support the delivery of this qualification must be age-appropriate. Centres must ensure when developing or sourcing delivery materials that careful consideration is given to the safeguarding and wellbeing of their learners in line with the centre's policies and procedures.

Learner Registration

Once approved to offer a qualification, centres must follow TQUK's procedures for registering learners. Learner registration is at the discretion of the centre and in line with equality legislation and health and safety requirements.

Centres must register learners before any assessment can take place.

Tutor, Assessor and Internal Quality Assurer Requirements

All members of staff involved with the qualification (assessing or IQA) will need to be occupationally competent in the subject area being delivered. This could be evidenced by a combination of:

- A higher level qualification in the same subject area as the qualification approval request
- Experience of the delivery/assessment/IQA of the qualification requested
- Work experience in the subject area of the qualification.

Staff members will also be expected to have a working knowledge of the requirements of the qualification and a thorough knowledge and understanding of the role of tutors/assessors and internal quality assurance. They are also expected to undertake continuous professional development (CPD) to ensure they remain up to date with work practices and developments associated with the qualifications they assess or quality assure.

Tutor

Tutors or trainers who deliver a TQUK qualification must possess a teaching qualification appropriate for the level of qualification they deliver. This can include:

- Further and Adult Education Teacher's Certificate
- Cert Ed/PGCE/Bed/MEd
- PTLLS/CTLLS/DTLLS
- Level 3 Award/Level 4 Certificate/Level 5 Diploma in Education and Training.

Assessor

Staff who assess a TQUK qualification must possess an assessing qualification appropriate for the level of qualification they are delivering or be working towards a relevant qualification and have their assessment decisions countersigned by a qualified assessor. This can include:

- Level 3 Award in Assessing Competence in the Work Environment
- Level 3 Award in Assessing Vocationally Related Achievement
- Level 3 Award in Understanding the Principles and Practices of Assessment

- Level 3 Certificate in Assessing Vocational Achievement
- A1 or D32/D33.

Specific requirements for assessors may be indicated in the assessment strategy/principles identified in individual unit specifications.

Internal Quality Assurer

Centre staff who undertake the role of an Internal Quality Assurer (IQA) for TQUK qualifications must possess or be working towards a relevant qualification and have their quality assurance decisions countersigned by a qualified internal quality assurer. This could include:

- Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice
- V1 qualification (internal quality assurance of the assessment process)
- D34 qualification (internally verify NVQ assessments and processes).

It is best practice that those who quality assure qualifications also hold one of the assessing qualifications outlined above. IQAs must follow the principles set out in Learning and Development NOS 11 - Internally monitor and maintain the quality of assessment.

External Quality Assurance

External Quality Assurance will be undertaken by TQUK to ensure that centres are satisfying TQUK quality assurance compliance with the requirements associated with their TQUK recognised centre status and formal written agreement. This will consist of physical activities and remote reviews.

Useful Websites

Office of Qualifications and Examinations Regulation

Register of Regulated Qualifications

For further details regarding approval, please refer to the following websites:

Regulated Qualifications Framework (RQF) in England (and includes vocational qualifications in Northern Ireland)

Scottish Credit and Qualifications Framework (SCQF)

Education and Skills Funding Agency (ESFA) and Learning Aim Reference Service (LARS)

Insight

For more information on Design Engineer Construct! and Class Of Your Own, please visit:

Design Engineer Construct!

Class Of Your Own

A full list of useful links is available through Class Of Your Own's teaching resources and 'DEC School' eLearning platform. All Centres will be invited to use 'DEC School' as their central resource for learning and teaching support.

Mandatory Units

Title:		Defining a sustainable construction project	
Unit reference number:		F/615/8822	
Level:		3	
Credit value:		10	
Guided learning hours:		60	
Learning outcomes The learner will:		**Assessment criteria** The learner can:	
1.	Be able to research and convey the project remit.	1.1	Identify a significant construction project for in-depth study.
		1.2	Communicate the vision for the project.
		1.3	Set the scene for the project in the context of the existing environment.
		1.4	Set the scene for the project in the context of the end user.
		1.5 **(K)**	Write a mission statement for the project.
2.	Be able to set standards for sustainability in a construction project.	2.1 **(K)**	Define commitments to positively impact on the local community and the local environment.
		2.2 **(K)**	Define and explain commitments to energy and water efficiency, and carbon reduction.
		2.3 **(K)**	Define commitments to minimise construction waste.
		2.4 **(K)**	Define and explain commitments to ethical sourcing of materials and responsible procurement.
		2.5 **(K)**	Define and explain sustainability monitoring and reporting procedures for the lifecycle of the project.
3.	Be able to define site information required at pre-design phase.	3.1 **(K)**	Identify the importance of site analysis and the roles of professional consultants at the pre-design phase.
		3.2 **(K)**	Determine what topographical information is required and outline appropriate, effective ways to collect accurate data for a particular site.
		3.3 **(K)**	Identify information required to produce a geotechnical report and relate it to the specified project.
		3.4 **(K)**	Identify information required to produce an ecological study and relate it to the specified project.

		3.5 **(K)**	Identify information required to produce a hydrology study and relate it to the specified project.

Assessment Guidance:

All assessment criteria will be expected to be evidenced in the learner's portfolio.

1.1: Learners will select an appropriate project either through an existing genuine architectural competition, or by identifying a building which they believe is needed in their own town.

1.2: Learners should articulate their high level, aspirational ambitions for their project; What it will achieve when it is completed in the context of the people who will use it, the environment in which it sits and the sustainable objectives it will realise.

1.3: Learners should discuss the existing built environment and infrastructure, describe the current social, economic and environment situation and the general aesthetics and 'feel' of the area, what it means to the people who live and work, and indeed what it means to them personally.

1.4: Learners will provide a profile of the end user of their building project, detailing anticipated wishes and demands. They may choose to research end users in similar facilities both physically and operationally.

1.5: Learners will determine clear values, objectives and outcomes for their project, ideally working as a team to identify key themes, for example purpose, environmental impact, design excellence, sustainability, economic contribution. Learners might gain inspiration by exploring the mission statements of leading architecture, engineering and construction companies.

2.1: Learners will produce a statement which outlines their commitment to positively impact the local community and the local environment not only in terms of the building itself and its entire lifecycle, but also through the ethos, behaviour and passion of the entire project team in caring for the community and protecting the environment in the immediate vicinity of the project. This should be based on referenced research evidence.

2.2: Learners will produce a statement which outlines their commitment to energy and water efficiency, and to reduce carbon emissions throughout the entire lifecycle of the building, and also through the ethos, behaviour and passion of the entire project team. This should be based on referenced research evidence.

2.3: Learners will produce a statement which outlines their commitment to waste minimisation throughout the entire lifecycle of the building, and also through the ethos, behaviour and passion of the entire project team

2.4: Learners will produce a statement which outlines their commitment to ethical sourcing and responsible procurement throughout the entire lifecycle of the building, and also through the ethos, behaviour and passion of the entire project team.

2.5: Learners should explore existing industry procedures to produce a methodology. Valuable guidance can be found by registering with BREEAM, an internationally recognised measure and mark of a building's sustainable qualities, and certified buildings are immediately identifiable as having been planned, designed, constructed and operated in accordance with best practice sustainability principles.

3.1: Learners will understand the importance of an adequate site investigation and describe who and what is involved, and why it is carried out. They will outline the risks involved in gathering insufficient or inadequate data.

3.2: Learners will understand the role of the topographical surveyor in providing accurate survey data. They will explore the limitations of everyday mapping information in providing accurate geotechnical data and how technology has advanced the methods of surveying. Learners will compare methodologies and technologies and will determine appropriate above ground survey methods for their project including laser scanning, satellite based positioning systems (GPS/GNSS), electronic distance measurement (total station), Geographical Information Systems (GIS) and ground penetrating radar (GPR) for below ground utility mapping. Learners will define appropriate vertical/horizontal accuracy and understand the need for precision to establish boundaries, elevation for flood plain data, positioning of trees, water courses and other natural features, existing buildings and manmade features, and also the need to discover existing utilities running through and adjacent to the site. They will explore the limitations of surveying tools, for example GPS requires good satellite geometry and visibility. Tree canopies and dense, built up areas can render GPS methods ineffective.

3.3: Learners will understand the role of the geotechnical surveyor in providing accurate ground condition information regarding soil and geologic conditions on and below the surface. They will understand the process of site analysis through desk study, survey and reporting.

3.4: Learners will understand the role of the ecology professional in providing accurate information regarding vegetation and wildlife and their habitats in the local area. They will understand the process of site analysis through desk study, survey and reporting.

3.5: Learners will understand the role of the hydrology professional in providing accurate information regarding the quality, position and flow of watercourses in the local area. They will understand the process of site analysis through desk study, survey and reporting

Amplification:

(K) – This symbol refers to **Knowledge,** which indicates that the **Assessment Criteria** will also be measured by an **External Synoptic Exam.**

Title:		Developing a sustainable construction project	
Unit reference number:		F/615/8836	
Level:		3	
Credit value:		10	
Guided learning hours:		60	
Learning outcomes The learner will:		**Assessment criteria** The learner can:	
1.	Be able to prepare a design brief and take steps to appoint an effective design team.	1.1 **(K)**	Explain the purpose of a design brief.
		1.2 **(K)**	Describe the role and responsibility of the client in a construction project.
		1.3 **(K)**	Prepare the design brief for a specific construction project and receive critical feedback for client sign off.
		1.4 **(K)**	Formalise the appointment of an integrated Project Team.
		1.5 **(K)**	Produce an organogram outlining professionals and their roles at each phase of the project.
2.	Be able to use building information modelling techniques for concept design.	2.1	Create preliminary concept designs based on the design brief.
		2.2 **(K)**	Assess concept designs for space requirements, circulation and accessibility.
		2.3 **(K)**	Assess concept design to produce preliminary cost and lifecycle cost prediction.
		2.4 **(K)**	Perform energy analysis relative to form, orientation, weather, surfaces and glazing.
		2.5	Present information for whole project lifecycle and provide validation for chosen model.
3.	Be able to prepare information and resources needed to support a planning application.	3.1 **(K)**	Explain the planning process for a specific construction project.
		3.2 **(K)**	Make use of current legislation and guidance.
		3.3 **(K)**	Prepare a planning feasibility study for a specific construction project.
		3.4 **(K)**	Describe what is meant by the term 'undesirable precedent' in planning decisions and provide an example of such.
		3.5	Formulate justification and present evidence for the approval of a specific project.

Assessment Guidance:

All assessment criteria will be expected to be evidenced in the learner's portfolio.

1.1: The learner will explain what a design brief is and what purpose a design brief serves within a construction project.

1.2: The Client plays a major role in any construction project and has a wide range of responsibilities including ensuring that all appointees are competent and that suitable managers are appointed to oversee the project.

1.3: Learners will prepare an effective, jargon-free design brief which conveys a client's vision, their goals and their priorities and provides an accurate account of the project's deliverables. The brief should refer to a budget estimate and realistic timeline and should confirm the main point of contact and decision maker(s). Operational management must be a key part of the brief. Learners will present to an audience which will act as client in the development. The learner must present with conviction and confidence and make appropriate adjustments on receiving critical feedback.

1.4: Learners should describe the engagement of an efficient, multidisciplinary team focusing on their ability to work together in a collaborative digital environment driven by the benefits of Building Information Modelling.

1.5: Learners will outline key members of the Project Team with specific reference to the role of the Information Manager.

2.1: Learners will produce a number of concept design options extracting key information from the design brief. They will understand the benefits of conceptual modelling as a critical stage of building design such as enabling the communication of ideas and supporting early stage analysis for building life cycle sustainability and cost.

2.2: Learners will determine how their concept design maximises efficient and effective space use for those who will use it and how it facilitates the safe, convenient movement of people, both able bodied and disabled. They should define spatial requirements for a range of occupant activities and equipment and consider how the positioning of elements such as corridors, lifts, escalators, and staircases contribute to the optimisation of the flow of people through a building. They should be encouraged to explore the size of rooms and areas with specific purpose.

2.3: Learners will produce high-level estimates based on number of occupants and area or volume on a standard £/m2 and £/m3 basis according to the type of project they have designed. Whilst this is a function that can be quickly carried out using industry software, learners should understand the methodology behind calculation, the risks involved in estimation, and the impact of lifecycle costing on sustainability.

2.4: Learners will produce a high level analysis of overall energy use. They will provide a solar study taking into account the shading effects of surrounding buildings where applicable and recommending ways to maximise solar gain. They will explore the effects of making changes to form and orientation to maximise energy efficiency and make comparisons. Whilst this is a function that can be quickly carried out using industry software, learners should understand the methodology behind calculation, the risks involved in estimation, and the impact of analysis on sustainability.

2.5: Learners will present an effective, efficient concept model which is most aligned to the project design brief, life cycle objectives and vision.

3.1: The 'National Planning Policy Framework' sets out planning policies for England and how they are expected to be applied. It provides guidance for local planning authorities and decision-takers, both in drawing up plans and making decisions about planning applications. It is important that learners understand the need to involve the wider community in the process and the introduction of the 'Localism Act' and the new 'Neighbourhood Planning' framework empowers communities to have their say regarding development in their neighbourhoods. If a construction project is classed as a 'major development' it is crucial that the community is involved at an early stage. Relevant aspects of national, regional and neighbourhood planning should be identified and used to justify the need for the project.

3.2: Learners will align significant legislation to their specific project. They should be aware of a number of acts and codes of practice from Level 2 including Tree Preservation Orders (TPOs) and the Wildlife and Countryside Act 1981. The Disabled Persons Act 1981 ensures that the needs of disabled persons are provided for in any development schemes. The Equality Act 2010 ensures that local planning policies need to take into account the particular needs of women, young people and children, older people, ethnic minorities, children and disabled people. The Party Wall Act 1996 prevents and resolves disputes in relation to party walls (walls of adjoining dwellings e.g. semi-detached houses and terraces), boundary walls and excavations near neighbouring buildings. Right to Light - a private, legally enforceable easement or right to a minimum level of natural illumination through a 'defined aperture', usually a window opening. Planning applications must also be decided in accordance with the Local Development Framework (LDF).

3.3: Learners will create a feasibility study outlining how their proposal will conform and respond to particular areas of policy and legislation.

3.4: Learners will explain the term 'undesirable precedent' in the context of building design and its impact on planning law/codes of practice. A large number of case studies can be found on the internet and learners should provide an appropriate example aligned to their own project.

3.5: Learners will explain the planning process and identify the documentation required for an application, including the following: - Ownership certificate, fees, drawings, application form. In addition a design and access statement should be produced and justified to access the full marks available.

Amplification:

(K) – This symbol refers to **Knowledge,** which indicates that the **Assessment Criteria** will also be measured by an **External Synoptic Exam.**

Title:		Investigate design, structural and services aspects of a sustainable construction project	
Unit reference number:		R/616/9176	
Level:		3	
Credit value:		10	
Guided learning hours:		60	
Learning outcomes The learner will:		**Assessment criteria** The learner can:	
1.	Be able to deliver a project.	1.1 **(K)**	Analyse relevant architectural precedents.
		1.2 **(K)**	Explore specific materials and their properties, justify material choices.
		1.3	Gather information using charts and tables to inform the sizes of rooms and spaces.
		1.4 **(K)**	Generate schedules of accommodation.
		1.5	Analyse the information and justify choice.
2.	Gather and analyse information to develop the structural elements.	2.1 **(K)**	Explore different structures within the built environment: frame, shell, mass.
		2.2 **(K)**	Explore how forces affect structural elements: tension, compression, shear, torsion and bending.
		2.3 **(K)**	Gather information about different structural materials and compare their properties.
		2.4	Use charts and tables to define loading scenario.
		2.5 **(K)**	Analyse the information and make choices as to the type of structure and materials most suitable.
3.	Gather and analyse information to develop the building services elements.	3.1 **(K)**	Explore what is meant by occupant comfort and how it can be measured.
		3.2 **(K)**	Gather information from case studies related to aspects of building services heating, ventilation and lighting.
		3.3 **(K)**	Use tables and charts to define lighting levels, temperatures and air exchange rate.
		3.4 **(K)**	Apply science and maths and use industry-standard software to calculate the need for different building services.
		3.5 **(K)**	Analyse the information and make choices as to the appropriate technologies to use.

Assessment Guidance:

All assessment criteria will be expected to be evidenced in the learner's portfolio.

1.1: Learners will identify relevant precedents in terms of function and location and analyse to highlight features that could inspire and inform the architecture of their proposals.

1.2: Materials should be selected in terms of their aesthetics, sustainability, cost and performance. Learners will create a table that compares the materials and presents the data. Compare U values, cost and aesthetics.

1.3: Learners will refine the function and occupancy of each space and use data from guidelines to calculate the area and height of spaces and rooms using correct units. Learners can measure the sizes of comparable rooms within the school building and use these to inform their own designs.

1.4: Learners will produce a schedule of accommodation that can be used to inform and test the architectural model.

1.5: Learners will explain how their building meets their design brief.

2.1: This criteria presents students with the ideal opportunity to meet with their industry partners to explore buildings in the real world, where different structural forms have been used.

2.2: Learners will create a simple structural model (spaghetti and marshmallows work well) and record what happens when different loads are applied.

2.3: Learners will compare the properties of reinforced concrete, steel, aluminium, brick and modern manufactured materials e.g. SIPs. Learners will compare their structural properties, e.g. concrete is strong in compression, steel is strong in tension

2.4: Learners will research the dead loads of different materials and the imposed loads of different activities that will take place in your building.

2.5: Learners will use the research to make choices about the type of structure they think is most appropriate, and which materials they would use for the different elements.

3.1: Learners will research the different aspects of occupant comfort; thermal, visual, air quality and acoustic. Learners will explain how they can be measured (metrics) and achieved through the provision of building services.

3.2: Learners will research best practice in building services and identify strategies and technologies that could be applied.

3.3: Learners will collect data to define the recommended lighting levels (lux), temperatures and air exchange rates for the building types.

3.4: Learners will benefit from real life examples presented by industry partners, this could include:

- Heat loss calculations using U Values
- Lighting calculation using free software such as Dialux
- Water consumption using on-line software
- Fire exits using information from building regulations Part B

3.5: Learners will use the research to explain choices that will improve occupant comfort and be energy efficient.

Amplification:

(K) – This symbol refers to **Knowledge,** which indicates that the **Assessment Criteria** will also be measured by an **External Synoptic Exam.**

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Maths of Design, Engineer Construct! The Digital Built Environment

At Level 3, learners will be expected to have an understanding of the following maths concepts:

- Addition
- Subtraction
- Multiplication
- Division
- Rounding
- Fractions and simplifying fractions
- Percentages and increases/decreases by percentage
- Ratios and working to scale
- Perimeters and circumferences
- Area of shapes – Squares, rectangles (Area = width * length), triangles (Area = ½*b*h), circles (ΠR^2)
- Area of rooms through subtraction and/or addition
- Pythagoras – $c^2 = a^2 + b^2$

Learners will be expected to have an understanding of basic arithmetic skills to support the calculation of various costs including:

- Addition, subtraction, multiplication, division, estimation, rounding and percentage calculations of various budget costs reported in £ and £/m2.

Learners will be able to apply their maths knowledge to understand lighting and energy requirements and use this to compare efficiency including:

- Use of calculations to compare and contrast different options for lighting and energy requirements based on cost, room size.
- Use of the following formulas with to calculate lighting requirements:
  - Lumens = lux x area.
  - Bulbs required = lumens required / lumens of light bulb.

Learners will have an understanding how volume and area of various building components are calculated or in situations concerning the functional requirement of a building and relative room sizes:

- Common building elements include floors, walls and roofs.
- Elements may take the shape of triangles, squares, circles, rectangles and trapeziums.
- Calculation of various room sizes.
- Calculation of volume of common building elements such as:
  - Cube/Rectangle = length * width * height
  - Triangle = 0.5 * b * h * length
  - Cylinders = πr^2 * h

Additionally, learners will be expected to demonstrate the following maths knowledge and skills within the portfolio component:

- Learners will be able to apply their maths skills to understand calculation of area and volume within a building, along being able to apply these calculations with consideration to contexts costings including:
    - Application of level 2 concepts of area and volume of shapes in combination or reduction e.g. a room and a roof or a roof with a window.
    - Combine costs and areas to make accurate costing calculations.

Learners will be able to assess concept design to produce preliminary cost and lifecycle cost prediction including:

- Application of maths skills to scenarios involving measurements in £/m^2 and £/ m^3.
-

Learners will understand how to calculate heat loss for various periods of time and materials using U-Values.

- Surface Heat Loss (W) = U Value (W/m^2 C) x Wall Area (m^2) x ΔT (C).
- Compare and contrast different insulation materials to identify most efficient.

Standard units

Learners may be required to convert units within the same measurement type. **When providing answers to exam questions, learners should state units.**

Measurement	Standard Unit	Conversions
Money	Pound, £	N/A
Length	Metre, m	Millimetre (mm) and Kilometre (KM)
Mass	Kilogram, kg	Gram (g)
Temperature	Celsius, (°C)	Kelvin, K
Power	Watts, W	Kilowatts, K
Force	Newton, N	Kilonewton (kN)
Light	Lumens, Lux	
Sound	Decibels, db	

All maths skills and knowledge listed may be assessed in the external set and marked component.

Unit 1: Section 1: Be able to research and convey the project remit				
	0	1-2	3-4	5-6
1.1: Identify a significant construction project for in-depth study.	No evidence submitted or fails to meet minimum requirement.	Brief outline of the project.	Some explanation of the need for the project.	The need for the project has been justified and evidenced.
1.2: Communicate the vision for the project.	No evidence submitted or fails to meet minimum requirement.	Simple vision outlined.	Vision outlined with some points explained.	Clear vision with illustrated and explained positive impacts.
1.3: Set the scene for the project in the context of the existing environment.	No evidence submitted or fails to meet minimum requirement.	Simple maps and 'street view' images with little explanation the area.	A more detailed description of the existing environment, transport, demographics.	Further detail provided with photos of the existing environment and explanation of how this could impact on the project.
1.4: Set the scene for the project in the context of the end user.	No evidence submitted or fails to meet minimum requirement.	Obvious end users such as customers or residents have been identified.	Simple explanations of a wider range of end users.	Detailed explanation of the needs of users from different contexts, employees, maintenance as well as more obvious customers.
1.5: Write a mission statement for the project.	No evidence submitted or fails to meet minimum requirement.	Generic mission statement.	Mission statement is specific to the project.	Mission statement is concise but specific to the project with clear criteria.

Unit 1: Section 2: Be able to set standards for sustainability in a construction project				
	0	1-2	3-4	5-6
2.1: Define commitments to positively impact on the local community and the local environment.	No evidence submitted or fails to meet minimum requirement.	Limited impacts identified.	Range of impacts identified.	Specific examples to the project explained.
2.2: Define and explain commitments to energy and water efficiency, and carbon reduction.	No evidence submitted or fails to meet minimum requirement.	Limited impacts identified.	Range of impacts identified.	Specific examples to the project explained.
2.3: Define commitments to minimise construction waste.	No evidence submitted or fails to meet minimum requirement.	Limited impacts identified.	Range of impacts identified.	Specific examples to the project explained.
2.4: Define and explain commitments to ethical sourcing of materials and responsible procurement.	No evidence submitted or fails to meet minimum requirement.	Limited impacts identified.	Range of impacts identified.	Specific examples to the project explained.
2.5: Define and explain sustainability monitoring and reporting procedures for the lifecycle of the project.	No evidence submitted or fails to meet minimum requirement.	Limited description of monitoring or reporting.	Some description of different methods of monitoring and reporting.	Explanation of BREEAM or other measure and examples of activities at different points in lifecycle.

Unit 1: Section 3: Be able to define site information required at pre- design phase				
	0	1-2	3-4	5-6
3.1: Identify the importance of site analysis and the roles of professional consultants at pre-design phase.	No evidence submitted or fails to meet minimum requirement.	Brief description of the need for site analysis.	Some explanation of the need for site analysis and the professionals involved.	Explanation of stages of survey (desk study, walk over and detailed survey) and increasing level of detail and expertise.
3.2: Determine what topographical information is required and outline appropriate, effective ways to collect accurate data for a particular site.	No evidence submitted or fails to meet minimum requirement.	Description of what a topographical survey is.	Some awareness of different methods of capturing data.	Comparison of the different methods of collecting data leading to most appropriate method being selected for their site.
3.3: Identify information required to produce a geotechnical report and relate to the specified project.	No evidence submitted or fails to meet minimum requirement.	General explanation of geotechnical data.	Map or visit but with limited analysis.	Site specific Geotechnical data gathered and analysed for the site.
3.4: Identify information required to produce an ecological study and relate to the specified project.	No evidence submitted or fails to meet minimum requirement.	General explanation of ecological data.	Map or visit but with limited analysis.	Site specific Ecological data gathered and analysed.
3.5: Identify information required to produce a hydrology study and relate to the specified project.	No evidence submitted or fails to meet minimum requirement.	General explanation of hydrology data.	Map or visit but with limited analysis.	Site specific Hydrology data gathered and analysed.

Unit 2: Section 1: Be able to prepare a design brief and take steps to appoint an effective design team				
	0	1-2	3-4	5-6
1.1 Explain the purpose of a design brief.	No evidence submitted or fails to meet minimum requirement.	Brief description of a design brief.	Some description of a design brief. Touches on its purpose.	Detailed description of a design brief. Purpose of the design brief is explained clearly.
1.2 Describe the role and responsibility of the client in a construction project	No evidence submitted or fails to meet minimum requirement.	Brief outline of the role of a client	Some description of a client's role and responsibilities	Detailed description of a client's role and responsibilities
1.3 Prepare the design brief for a specific construction project and receive critical feedback for client sign off	No evidence submitted or fails to meet minimum requirement.	Simple design brief with few measurable criteria	A design brief that includes a budget, timescale and deliverables	Detailed design brief that includes a budget, timescale and deliverables. Evidence of feedback.
1.4 Formalise the appointment of an integrated Project Team	No evidence submitted or fails to meet minimum requirement.	An outline of BIM and it's benefits	A description of BIM and how the process could be applied to their project mentions PAS119:2 and EIR	A detailed explanation of BIM and how can be applied to their project include details of what would be included in an EIR
1.5 Produce an organogram outlining professionals and their roles at each phase of the project	No evidence submitted or fails to meet minimum requirement.	A simple organogram	A more detailed organogram and an explanation of its use	An organogram that spans the whole project timeline and an explanation of its use.

Unit 2: Section 2: Be able to use building information modelling techniques for concept design				
	0	1-2	3-4	5-6
2.1: Create preliminary concept designs based on the design brief.	No evidence submitted or fails to meet minimum requirement.	A single concept that meets the brief.	More than one concept with annotation that describes how it meets the brief.	A range of different concept designs that are annotated to explain how they meet the brief.
2.2: Assess concept designs for space requirements, circulation and accessibility.	No evidence submitted or fails to meet minimum requirement.	Different spaces are identified.	Spaces are identified and different layouts explored (e.g. bubble diagrams).	Spaces are identified and different layouts explored (e.g. bubble diagrams) and evaluated.
2.3: Assess concept design to produce preliminary cost and lifecycle cost prediction.	No evidence submitted or fails to meet minimum requirement.	Benchmark cost calculated.	Benchmark costs for different concepts are calculated using rates.	Benchmark costs for different concepts are calculated using rates for building type and compared.
2.4: Perform energy analysis relative to form, orientation, weather, surfaces and glazing.	No evidence submitted or fails to meet minimum requirement.	Solar or energy analysis of concept.	Solar or energy analysis of different concept designs.	Solar and energy analysis of different concept designs with evaluation.
2.5: Present information for whole project lifecycle and provide validation for chosen model.	No evidence submitted or fails to meet minimum requirement.	Explanation of why concept is suitable.	Comparison of concepts and explanation of why the chosen concept is the most suitable.	Chosen concept justified by comparing the criteria from 2.1-2.4

Unit 2: Section 3: Be able to prepare information and resources needed to support a planning application				
	0	1-2	3-4	5-6
3.1: Explain the planning process for a specific construction project.	No evidence submitted or fails to meet minimum requirement	Brief description of the planning process.	Explanation of national and local planning policy and the documents needed for a planning application.	Explanation of national and local planning policy and a detailed explanation of a relevant planning application.
3.2: Make use of current legislation and guidance.	No evidence submitted or fails to meet minimum requirement.	At least 3 different pieces of relevant legislation explained.	At least 3 pieces of relevant legislation described and related to their project.	At least 3 pieces of essential legislation applied to their development and justified in detail.
3.3: Prepare a planning feasibility study for a specific construction project.	No evidence submitted or fails to meet minimum requirement.	A simple explanation of the feasibility of the project.	Explanation of how the project will benefit the area and meet planning policy (local or national).	A detailed explanation of the benefits that the project will bring with reference to relevant planning and legislation.
3.4: Describe what is meant by the term 'undesirable precedent' in planning decisions and provide an example of such.	No evidence submitted or fails to meet minimum requirement.	Brief description of an undesirable precedent.	Undesirable precedent described and a relevant example explained.	Example of undesirable precedent with a balanced explanation of the reason it is undesirable.
3.5: Formulate justification and present evidence for the approval of a specific project.	No evidence submitted or fails to meet minimum requirement.	Simple explanation of why their project should be built.	Planning application, including explanation why their project should be built.	A complete and fully justified planning application for their project.

Unit 3: Section 1: Gather and analyse information to develop the design				
	0	1-2	3-4	5-6
1.1: Analyse relevant architectural precedents.	No evidence submitted or fails to meet minimum requirement.	Images of different buildings collected with a brief description.	A number of different relevant precedents described in detail.	A range of relevant local, national and international precedents analysed.
1.2: Explore specific materials and their properties, justify material choices.	No evidence submitted or fails to meet minimum requirement.	Brief description of materials with some evaluation and comparison.	Different material choices explored and compared.	Materials for different building elements explored and evaluated in terms of sustainability, performance, aesthetics and cost.
1.3: Gather information using charts and tables to inform the sizes of rooms and spaces.	No evidence submitted or fails to meet minimum requirement.	Some relevant data collected.	Most size data collected and presented.	All relevant room and space sizes researched using charts, tables and own measurements.
1.4: Generate schedules of accommodation.	No evidence submitted or fails to meet minimum requirement.	A simple schedule generated.	Numbers and sizes of rooms.	Detailed schedule generated using the data from 1.3.
1.5: Analyse the information and justify choice.	No evidence submitted or fails to meet minimum requirement.	Explained choices and decisions.	Choices are justified using research.	Different options are analysed, and most suitable choice is justified.

Unit 3: Section 2: Gather and analyse information to develop the structural elements				
	0	1-2	3-4	5-6
2.1: Explore different structures within the built environment: frame, shell, and mass.	No evidence submitted or fails to meet minimum requirement.	Images of different structures have been collected and labelled.	Different structures examined, and their type defined.	A number of different structures have been analysed and their type and materials explained.
2.2: Explore how forces affect structural elements: tension, compression, shear, torsion and bending.	No evidence submitted or fails to meet minimum requirement.	Basic definitions of forces.	Definition of forces and Basic explanations of how loads affect structures.	Modelling exercises that lead to explanations of the different forces on the elements of a structure.
2.3: Gather information about different structural materials and compare their properties.	No evidence submitted or fails to meet minimum requirement.	Most obvious structural materials (steel, concrete and timber) materials compared.	A broader range of structural materials compared, and their strengths and weaknesses identified.	A broad range of structural materials compared in terms of a range of factors such as performance, availability, fire resistance.
2.4: Use charts and tables to define loading scenario	No evidence submitted or fails to meet minimum requirement.	Types of loads defined, and limited data provided.	Types of loads defined and loading data provided for dead and live loads	Types of loads defined, and comprehensive data collected for dead, live, snow and wind based on the building use.
2.5: Analyse the information and make choices as to the type of structure and materials is most suitable	No evidence submitted or fails to meet minimum requirement.	The materials for structural elements have been chosen and explained.	A range of materials for elements have been compared.	Different types of structure and materials have been compared and choices have been justified.

Unit 3: Section 3: Gather and analyse information to develop the building services elements				
	0	1-2	3-4	5-6
3.1: Explore what is meant by occupant comfort and how it can be measured.	No evidence submitted or fails to meet minimum requirement.	A brief explanation of what is meant by occupant comfort.	The 4 areas of occupant comfort have been explained.	4 areas of occupant comfort defined, and the methods of measuring explained.
3.2: Gather information from case studies related to aspects of buildings services heating, ventilation and lighting.	No evidence submitted or fails to meet minimum requirement.	A simple case study explaining how building services are used.	More than one case study used to inform different options for heating, ventilation and lighting.	Several case studies used to provide information about the different options for heating ventilation and lighting.
3.3: Use tables and charts to define lighting levels, temperatures and air exchange rate	No evidence submitted or fails to meet minimum requirement.	Values defined for overall lighting, temperature and air exchange rate.	Values defined for overall lighting, temperature and air exchange rate related to the use of the building.	Values defined for lighting, temperature and air exchange rate related to the use of different zones/areas.
3.4: Apply science and maths and use industry standard software to calculate the need for different building service.	No evidence submitted or fails to meet minimum requirement.	Software has been used to model and test one aspect building services.	Software and calculations have been used to model and test different building services.	Software and calculations have been used to model and test and compare different building services.
3.5: Analyse the information and make choices as to the appropriate technologies to us.	No evidence submitted or fails to meet minimum requirement.	The methods of heating lighting and ventilating the building have been explained.	Different methods of heating lighting and ventilating the building have been compared.	Different methods of heating lighting and ventilating the building have been compared and choices have been justified.