Assessment Plan – Building Services Design Technician Apprenticeship Level 3

Summary

A Building Services Design Technician provides assistance to engineers and other construction professionals in the development of cost effective technical and sustainable design solutions involving the production of three dimensional models, calculations, specifications, reports and drawings taking into account, where appropriate, pre-fabrication techniques. Their work typically includes systems such as renewable technologies, heating, ventilation, air conditioning, drainage, lighting, power, controls and lifts. Buildings and infrastructure take on many forms from newly built facilities to the refurbishment of premises for every sector of industry. As a design technician the apprentice could be working under supervision in a design consultancy, a contractor or a manufacturing company.

The Building Services Design Technician Apprenticeship provides an integrated programme of knowledge and skills acquisition alongside developing confidence and maturity. Successful achievement of the Apprenticeship Standard demonstrates that the apprentice has the skills knowledge and behaviours to work competently as a Building Services Design Technician.

This assessment plan ensures that successful candidates will have satisfied the requirements for registration as an Engineering Technician with the relevant Professional Engineering Institution as the first step in a career as a Building Services Design Engineer. Engineering Technician is an internationally recognised benchmark of competence with associated professional title – EngTech.

The end point assessment will be in two stages and undertaken in the last two months of the apprenticeship: -

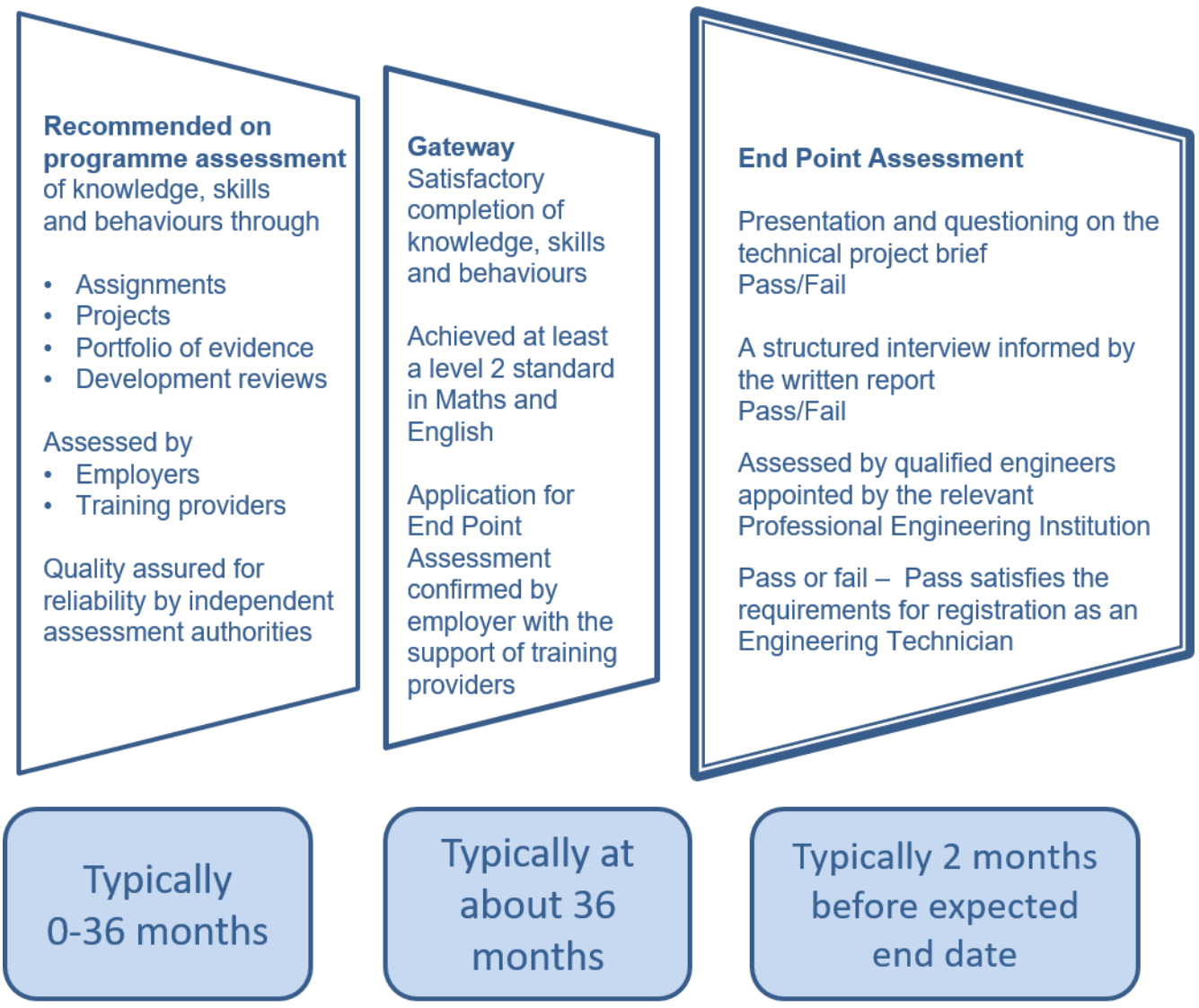
STAGE 1

- A project which will test the apprentice's ability to integrate the knowledge, skills and behaviours acquired during the apprenticeship by developing a response to a technical project brief set by the Professional Engineering Institution, with a number of options and a rationale for the choice of one as the optimum solution.
- A written report submitted to the Assessor Panel demonstrating the knowledge and experience gained in the apprenticeship has been integrated to deliver required outputs and the attainment of the pre-defined Engineering Council UKSPEC competencies for an Engineering Technician The report will be used to inform the structured interview

STAGE 2

- A 10 minute presentation by the apprentice to the Assessor Panel showcasing their response to the project brief. This will be followed by 10-15 minutes of questions and discussion.
- A 30-40 minute structured interview based on the written report submitted prior to the interview the purpose being to determine the apprentice's ability to integrate the knowledge, skills and behaviours acquired during the apprenticeship

To be successful the apprentice must pass the Presentation and the Structured Interview. The assessment will satisfy the requirements for registration as an Engineering Technician by the Engineering Council. The Assessor Panel will consist of two experienced, qualified and trained Building Services Engineers nominated by the relevant Professional Engineering Institution. Benchmarking the End Point Assessment against the Engineering Council UKSPEC requirements for EngTech means that the assessment outcomes will be consistent and reliable, allowing a fair and proper comparison between apprentices employed across the UK in different types and sizes of organisations.



Assessment Overview

Assessment method	Area Assessed	Assessed by	Grading
Presentation and questioning on technical project brief	Knowledge, skills and behaviours from across the Standard. Details for each method can be found in Annex A	Assessor Panel appointed by the relevant Professional Engineering Institution	Pass/Fail
Structured interview informed by written report			Pass/Fail

On programme assessment

The recommended approach is that the apprentice will demonstrate their progress through a combination of written/on-line examinations, assignments, documented development reviews with experienced professionals, completion of work based projects, and the maintenance of a portfolio of evidence. These will be supervised by in-company mentors and tested by external assessors and verifiers.
The recommended qualifications for the achievement of the standard will be a Level 3 Diploma in Construction and the Built Environment (Building Services Engineering) and a Level 3 Diploma for Building Services Engineering Technicians.

Process Summary

Gateway

- satisfactory completion of knowledge skills and behaviours as set out in the apprenticeship standard.
- employer confirmation and request for End Point Assessment

Project Brief

- Professional Engineering Institution checks application and issues technical project brief
- Apprentice responds to the brief and prepares to showcase their work at the interview

Written Report

- Apprentice completes a written report of 1500-2000 words which demonstrates how, in the course of their apprenticeship, they integrated the knowledge, skills and behaviours needed to be a competent Building Services Design Technician. The report is verified by a professionally qualified engineer, submitted by the apprentice and will be used to inform the structured interview

Review of report

- Two trained and qualified assessors review the written report and assess it against all of the knowledge, skills and behaviours listed in the apprenticeship standard, record their findings on the Assessment Form against the relevant knowledge, skill and/or behaviours and agree areas that need to be explored further as part of the interview. This is in line with current professional engineering institution practice and Engineering Council requirements.

Presentation

- Apprentice makes a 10 minute presentation to the Assessor Panel on their response to the technical project brief followed by 10-15 minutes of questions and discussion

Interview

- This is followed by a 30-40 minute interview informed by the written report. The purpose of the interview is for the Assessor Panel to be confident that the that the apprentice has acquired and can use the knowledge, skills and behaviours needed to be a competent Building Services Design Technician

Decision

- the Assessor Panel submits the completed knowledge, skills and behaviours Assessment Form along with a recommendation as to whether or not the apprentice has successfully passed the End Point Assessment and satisfied the requirements for registration as an Engineering Technician.

Assessment Gateway

The apprentice will need to demonstrate ~~that they have~~ satisfactory completion of all aspects of their apprenticeship before they are able to undertake the End Point Assessment, including having achieved at least a Level 2 standard in Maths and English. Once satisfied that the apprentice is ready to undertake the End Point Assessment the employer will submit an application to the relevant Professional Engineering Institution.

End point assessment

What will be assessed

The apprentice will be expected to demonstrate through a presentation setting out their response to a technical project brief and structured interview informed by a written report that they have acquired the knowledge, skills and behaviours as described by the statements in the Standard and can, through their integration, competently undertake the role of a Building Services Design Technician. See Annex A for a mapping of the standard against the assessment methods.

How will it be assessed

The End Point Assessment will use the relevant professional engineering institution's Engineering Technician review process, which is an existing and well-respected synoptic assessment that covers the broad areas of knowledge, skills and behaviours identified in the Standard using a range of assessment methodologies outlined below.

The assessment will be in two stages

STAGE 1 – it is anticipated that completing the project and written report will take about 6 weeks

1 Project
The Professional Engineering Institution will provide the apprentice with a technical project brief. The purpose of the brief is to set the apprentice a task which will assess their ability to integrate a range of knowledge, skills and understanding they have acquired during their apprenticeship. For detail on areas covered see Annex A.

A bank of technical project briefs will be developed and maintained securely by the Professional Engineering Institution (using the expertise of the members of the professional engineering institution's register of assessors). The bank will be reviewed and refreshed every two years. Each project brief will be approved by the professional engineering institution panel responsible for EngTech registration as complying with the requirements for EngTech and meeting the demand for consistent content, depth and breadth. The project briefs will be made available on request to all organisations approved to assess the Building Services Technician Apprenticeship on the Register of Apprentice Assessment Organisations.

Criteria for the Project Brief

The bank of project briefs will need to cover the range of building services specialisms and employment sectors as listed in the occupational profile at the top of the Apprenticeship Standard.
Each project brief will be a maximum of 500 words and designed to take between 25-30 hours to complete
Generically the project brief will involve research and preparing material for the presentation and include a requirement for

- A project plan summarising the actions needed to complete the task with a timeline
- Calculations and drawings appropriate for level 3
- Reference to
    - relevant scientific and engineering principles
    - relevant legislation and standards

- health and safety considerations
- any environmental sustainability concerns

- At least two options proposed with a rationale for the chosen option
- A reflective evaluation as to how the apprentice went about the process of producing the response to the project brief – what worked, what didn't work, obstacles that needed to be overcome and how this was achieved, what they would do differently next time.

2 Written Report (1500 – 2000 words) – the apprentice will submit a reflective account which gives

- 3 examples of tasks undertaken in the course of their apprenticeship where the Apprentice solved a technical problem, explaining their role and how they selected the appropriate techniques, procedures and methods used. The report prepared by the Apprentice should explain any scientific, technical or engineering principles used, how the findings / recommendations were made, what they did to their employer or other people involved such as clients or suppliers and include anything they did to ensure the safety of people, equipment or data.
- 3 examples of how they identified, planned, and organised the resources needed to effectively complete a project or task, explaining how the Apprentice took into consideration cost, quality, safety and any environmental impact. The report should make reference as to what equipment was used, how data was gathered and analysed and how the Apprentice initiated the project to produce the desired outcome.
- 3 examples of how the Apprentice has complied with the Professional Engineering Institution's Code of Conduct, how the Apprentice keeps in touch with developments in their technical area and how the Apprentice intends to continue to develop their knowledge and skills.

A registered member of a Professional Engineering Institution (IEng or CEng) who works with the apprentice will verify that the work described in the written report has been carried out by the apprentice. The written report will be submitted electronically to the professional engineering institution at least three weeks ahead of the date of the interview and Two trained and qualified assessors will review the written report and assess it against the knowledge, skills and behaviours listed in the apprenticeship standard, record their findings on the Assessment Form against the relevant knowledge, skill and/or behaviour and agree areas that need to be explored further as part of the interview.

STAGE 2 – anticipated time from submission of the written report to interview will be 3-4 weeks.

The Assessor Panel of two qualified and trained assessors will assess both elements of the End Point Assessment.

Presentation. The apprentice will give a 10 minute presentation showcasing their response to the technical project brief. The Assessor Panel will be made aware of the content of the project brief 3 weeks in advance of the presentation. The presentation will be supported by 'hard copy' such as slides, drawings, spreadsheets which the apprentice will have prepared beforehand and made available at the start of the presentation. Suitable equipment for the presentation will be provided. The presentation will be followed by 10-15 minutes of question and discussion. The presentation and discussion will be marked on the Assessment Form according to the grading criteria set out in this Assessment Plan and awarded a mark of Pass or Fail.

Structured Interview This is then followed by a 30-40 minute structured interview with an Assessor Panel of two assessors. The purpose of the discussion is so that the two Assessor Panel members can assure themselves that the apprentices has the competence to work as a Building Services Design Technician.

The questions should focus on 4 main areas in the context of the occupational specialism demonstrated in the written report. At least one question must be asked for each of the 4 areas,

- Technology and problem solving – questions about the use of software tools in design and data collection, awareness of the range of factors affecting choice of engineering solutions, choices of systems and components, health and safety, environmental impact and sustainability, whole life costing,

- Management – questions about working to quality, time and budget, planning workload, the importance of technical standards and procedures, keeping proper records.
- Communication – questions exploring examples of technical and non-technical presentations and reports, working as part of a team.
- Commitment and ethics – questions about client confidentiality, the importance of safe systems of work, the need for sustainable solutions, professional development,

The structured interview will be marked according to the grading criteria set out in this Assessment Plan and awarded a mark of Pass or Fail.

To achieve an overall pass for the End Point Assessment the apprentice must gain a pass grade for both the presentation and the structured interview.

The presentation and interview can be either face-to-face or remotely via a video link. It will be the same process whichever meeting style is used.

What will apprentice have to do?

- Prepare and present a response to a technical project brief including any handouts and/or slides.
- Submit a written report on the knowledge and competences gained during the apprenticeship.
- Attend an interview
    - Make a 10 minute presentation showcasing their response to the project brief, answer questions and take part in a discussion based on the presentation
    - Take part in a structured interview

Where will the assessment take place?
The Professional Interview will be set up in a suitable venue to minimise travel wherever possible by the professional engineering institution and the apprentice or remotely via a video conference link

Who

Who will carry out assessment and who will be on the Register?
The End Point Assessment will be carried out by an Assessor Panel of two assessors appointed by the relevant Professional Engineering Institution which has the ability to assess applicants as Building Services Design Technicians and award the status of EngTech.

Following receipt of the application for End Point Assessment the professional engineering institution will check that it is all in order and then select two assessors matched to the apprentice's area of specialism.

The professional engineering institution will be on the Register of Apprentice Assessment Organisations

Minimum requirements for assessors
The members of the Assessor Panel are required to be professionally qualified members of a Professional Engineering Institution and must have been trained to carry out their role as assessors. Applicants must either be working in the industry or, if not or recently retired (up to two years), they will need to demonstrate that they have maintained links with the industry and current practices. Each application to become an assessor must be ~~is~~ evaluated on its own merits. The evaluation process will consider all relevant factors such as a minimum of five years industry experience, professionally qualified to at least EngTech, involvement in mentoring others and post-professional qualification experience. Once appointed the assessor will undertake training as required by the professional engineering institution and be subject to the professional engineering institution's quality assurance process including maintaining and submitting annual CPD records. This includes how to undertake assessments, marking standardisation, questioning techniques and observing interviews and is a tried and tested process within the professional engineering institutions which are licensed by the Engineering Council, the UK regulatory body for the engineering profession.

How will the panel work and who will have the casting vote?

The Assessor Panel will be appointed by the Professional Engineering Institution.

The Written Report and End Point Assessment Application submitted by the apprentice will be checked by Professional Engineering Institution staff to ensure that all is in order before they are passed onto the Assessor Panel members for them to study ahead of the interview.
The Assessor Panel members will consider the submitted documents, record their findings on a review form which lists the knowledge, skills and behaviours from the standard and agree between themselves on the areas to be covered in the interview. The assessors will record their findings for both the presentation and the structured interview on the same review form. The assessors will mark each component as pass or fail backing their decision up with evidence from the various elements of the End Point Assessment. To be successful the apprentice must demonstrate that they have met all of the knowledge skills and behaviours in the standard and have obtained a pass grade for both the presentation and structured interview elements of the End Point Assessment.

The completed form with the Panel's recommendation will then be submitted to the professional engineering institution for audit and approval.

If the two assessors cannot agree then the outcome is a provisional fail and the completed review forms will be submitted to the relevant registration panel within the professional engineering institution for a final decision.

Final judgement

Who makes the final decision about whether the apprentice has passed?
The relevant professional engineering institution which will be registered and listed on the Register of Apprenticeship Assessment Organisations (RoAAO). If the apprentice has been unsuccessful they will have to apply to resit/retake the End Point Assessment taking into account assessor feedback on areas where they did not demonstrate competence. If the apprentice passes the presentation element they only have to resit/retake the structured interview. The resit/retake must include a structured interview even if it was passed first time round. The resit/retake must be taken within 6 months of the original End Point Assessment

Independence

Who is providing the independent End Point Assessment?
The Professional Engineering Institution will coordinate the entire End Point Assessment process completely independently of the employer and any training providers. The assessors appointed to carry out the End Point Assessment will not be from the apprentice's employer or training provider related to the apprentice in any other way.

How is this deliverable for all employers?
The interview arrangements will ensure that all apprentices are within reasonable travelling distance of the venue for the professional interview and use will be made of video conferencing when possible

Summary of roles and responsibilities

Employers will submit the application for the End Point Assessment once the apprentice can demonstrate that they have successfully completed all aspects of their apprenticeship programme.
The professional engineering institution will be responsible for coordinating the entire End Point Assessment completely independent of the employer and training provider. This includes

- The recruitment, training and monitoring of assessors
- Administration associated with the carrying out of the End Point Assessment
- The End Point Assessment itself
- Quality control of the assessment process
- Dealing with any issues or appeals that arise
- Applying for the apprenticeship completion certificate

Quality Assurance - internal

The professional engineering institution will have its own internal quality assurance procedures to ensure that the assessment process is valid and reliable. These procedures are in accordance with the Engineering Council requirements from which it gets its license in the first place.
The End Point Assessment will be conducted by assessors who are trained, approved and reviewed by the relevant professional engineering institution.
The professional engineering institution will sample all failures and 10% of passes of the End Point Assessment results for consistency and reliability. Regular meetings are held with assessors to provide an update and feedback on the assessment process.

The professional engineering institution has an appeals process if an Apprentice wishes to challenge the process of the professional discussion.

Quality Assurance - external

We are investigating options for External Quality Assurance with the Engineering Council and the Assessment Plan will be updated once those arrangements are confirmed.

End point Grading

A grading exemption has been applied for in relation to the Building Services Design Technician Standard

The table below outlines the scoring criteria that will be applied for each assessment method.

End point assessment method	Pass criteria	Fail Criteria
Presentation	Using Annex A provides evidence of knowledge, skills and behaviours required to • Review and select appropriate techniques, procedures and methods to undertake tasks (K1, S1) • Use appropriate scientific, technical or engineering principles (K2, S2) • Identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions (S2, B6) • Identify, organize and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact (K3, S2, S3) • Work reliably and effectively without close supervision to the appropriate codes of practice (K3, S3, B2, B4, B5) • Use oral, written and electronic methods for the communication in English of technical and other information (K4, S4, B7) • Manage and apply safe systems of work (K6, S5, B1) • Undertake engineering work in a way that contributes to sustainable development (K7) To pass the apprentice must demonstrate achievement of all these grading criteria.	Fails to provide evidence to meet knowledge, skills and behaviours as required in Annex A for this assessment method
Structured interview	Using Annex A provides evidence of knowledge, skills and behaviours required to • Review and select appropriate techniques, procedures and methods to undertake tasks (K1, S1) • Use appropriate scientific, technical or engineering principles (K2, S2) • Identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions (S2, B6) • Identify, organize and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact (K3, S2, S3)	Fails to provide evidence to meet all the knowledge, skill and behaviour requirements as required in Annex A

	• Work reliably and effectively without close supervision to the appropriate codes of practice (K3, S3, B2, B4, B5) • Accept responsibility for work of self and others (S3, B2, B4) • Accept, allocate and supervise technical and other tasks (S3) • Use oral, written and electronic methods for the communication in English of technical and other information (K4, S4, B7) • Work effectively with colleagues, clients, suppliers or the public, and be aware of the needs and concerns of others especially when related to diversity and equality (K3, S3) • Comply with the Codes of Practice of the professional engineering institution (K5) • Manage and apply safe systems of work (K6, S5, B1) • Undertake engineering work in a way that contributes to sustainable development (K7) • Carry out and record Continuing Professional Development (CPD) necessary to maintain and enhance competence in own area of practice (K8, S6, B2, B3) • Exercise responsibilities in an ethical manner (K5) To pass the apprentice must demonstrate achievement of all these grading criteria.	

Implementation

Affordability

The cost of the End Point Assessment is the cost of

- Logging applications for end point assessment and issuing project brief.
- Setting up the interview and appointment of assessors
- Venue costs
- Assessor travelling and subsistence expenses
- Quality assurance to ensure consistency and rigour
- External quality assurance payment
- General administration of the process

This is estimated to be of the order of 4% of the total cost of the apprenticeship.
In drawing up these costs the affordability and feasibility of the End Point Assessment were taken into account including the option of undertaking the interviews by video conferencing link.

Professional body recognition

This is embedded in the process – the End Point Assessment will be carried out by the relevant professional engineering institution and the outcome is that the apprentice will have fully satisfied the requirements for EngTech registration with the Engineering Council. EngTech registration is linked to membership of the professional engineering institution and so, on successful completion of the End Point Assessment, the apprentice is also eligible to apply for membership of the institution.

Consistent

Benchmarking the end point assessment against the Engineering Council UKSPEC requirements for EngTech and the internal and external quality assurance processes mean that the assessment outcomes will be consistent and reliable, allowing a fair and proper comparison between apprentices employed in different types and sizes of organisations and at different geographical locations.

Volumes
In the first year of delivery starting September 2017 - it is estimated that 80 apprentices will be starting on the programme. It is anticipated that this will rise to a figure of approximately 120 apprentices a year in future years. Colleges already deliver part-time academic qualifications for the industry and so there are no issues with capacity and scalability. Similarly, Professional Engineering Institutions already deliver their professional review assessment processes and have the required infrastructure in place.

ANNEX A

Building Services Design Technician

MAPPING OF EPA METHODOLOGY TO STANDARD

Ref	Core knowledge to be assessed	Presentation[1]	Structured Interview[2]
K1	**The different techniques and methods used to design building engineering services projects.** This includes an understanding of how technologies, components and requirements are converted into building engineering systems designs including use of relevant standards.	✓	✓
K2	**The appropriate scientific, technical and engineering principles relating to the design of building engineering services projects.** This includes an understanding of the mathematical, scientific and engineering techniques required to support the design and construction processes	✓	✓
K3	**How to work effectively and contribute to engineering solutions by the correct use of resources and time.** This includes an understanding of project management systems, tools and techniques as they are applied to the design and construction process	✓	✓
K4	**How to communicate effectively using a range of techniques**. This includes an understanding of different communication methods and when to use them; how to write technical reports, technical drawing conventions and engineering terminology; collaboration and effective team working.	✓	✓
K5	**The code of conduct of relevant professional bodies and institutions including ethics and their application in design and delivery of projects.** Understanding the protection of client confidentiality, the need to adhere to corporate and institutional policies on ethics and diversity and the professional obligation to make a contribution to society		✓

[1] Based on response to technical project brief
[2] Informed by a written report

K6	**Safe working practices and how to comply with them.** Understanding of regulations such as Construction, Design and Management (CDM), hazard identification, and risk mitigation.	✓	✓
K7	**Sustainable development and their own contribution to economic, environmental and social wellbeing.** Understanding of legislative, company and client sustainability and environmental policies and their effect on the design and construction of buildings.	✓	✓
K8	**Sources of and approaches to Continuing Professional Development (CPD).** Understanding of appraisal schemes, CPD obligations and competency requirements relating to self and others.		✓

Ref	Core skills to be assessed	Presentation	Structured Interview
S1	**Select and use appropriate scientific, technical and engineering principles, techniques and methods to contribute to the design and delivery of building engineering services projects.** Ability to produce and self-check; calculations, models and drawings; use appropriate software systems and other tools for data gathering, CAD, BIM, Revit, project management; and assist with site surveys and inspections	✓	✓
S2	**Work with others to contribute to produce integrated engineering solutions by the correct use of resources and time.** This includes the ability to contribute to developing and evolving solutions to engineering problems whilst working to programme and within budget.		✓
S3	**Manage and maintain the quality of their work and that of others.** Assess the task to be done, plan/schedule work and manage time; decide when to allocate work to other people; maintain the flow of information; follow technical procedures, check work at an appropriate level and against appropriate standards and specifications. Keep well organised personal records of work undertaken		✓
S4	**Communicate effectively and appropriately with others using a range of techniques** including verbal communication, written reports, models and drawings.	✓	✓
S5	**Keep themselves and others safe by adhering to safe working practices.** Ability to identify hazards and assess risks, follow safe systems of work and adhere to all company safety policies.	✓	✓
S6	**Maintain their skills base and learning.** Ability to assess their own competence against training objectives and identify development needs and training action plans		✓

Ref	Core behaviours to be assessed	Presentation	Structured Interview
B1	Take a responsible approach to health and safety	✓	✓

B2	Be professional, proactive and receptive to constructive advice and guidance		✓
B3	Be willing to learn new skills and to adapt in the light of experience		✓
B4	Know one's limitations and when to ask for help or escalate		✓
B5	Work independently when appropriate and take responsibility for and pride in their work	✓	✓
B6	Demonstrate a positive approach to problem solving	✓	✓
B7	Show an ability to contribute to discussions as part of a team	✓	✓