

Assessment Plan – Building Services Design Engineer Non-Integrated Degree Apprenticeship Level 6

Summary

A Building Services Design Engineer will manage a team of engineers and technicians and will collaborate with other construction professionals to design the various services found in buildings and infrastructure projects. The work typically includes systems such as renewable and emerging technologies, energy management, heating, ventilation, air conditioning, drainage, lighting, power, water services, controls, life-safety systems, communications and building transportation (e.g.lifts). Buildings and infrastructure take on many forms from newly built facilities to the refurbishment of premises. As design engineers they could be working in a design consultancy, a contractor or a manufacturing company.

The Building Services Design Engineer Degree 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 Engineer.

This assessment plan ensures that successful candidates will have satisfied the requirements for registration as an Incorporated Engineer with the relevant Professional Engineering Institution. Incorporated Engineer is an internationally recognised benchmark of competence with associated professional title – IEng.

Prior to taking the End Point Assessment the apprentice must meet the following criteria:

- Achieved a level 2 English and Maths as per the standard and general apprenticeship requirements
- Completed the formal training plan agreed with their employer
- Completed the formal academic learning as defined by the training provider, equating to 360 on-programme credits
- Have sufficient evidence to demonstrate competence in all core knowledge, skills and behaviours as described in the standard.

The End Point Assessment will be in two stages and typically undertaken in the last two months of the apprenticeship: - In summary the two stages (more detail provided later in the plan) are

STAGE 1 – work in preparation for presentation and structured interview

Research Assignment which will test the apprentice's ability to integrate the knowledge and skills acquired during the apprenticeship through a response to a research assignment set by the Professional Engineering Institution.

Engineering Practice Report (4500 - 5000 words) – the apprentice will write and submit an Engineering Practice Report. The Report should clearly demonstrate that the apprentice has achieved the knowledge, skills and behaviours set out in the standard through references to the contribution they have made to the design, management and delivery of projects.

A registered member of a Professional Engineering Institution (IEng or CEng) who works with the apprentice will sign to verify that the work described in the written report has been carried out by the apprentice.

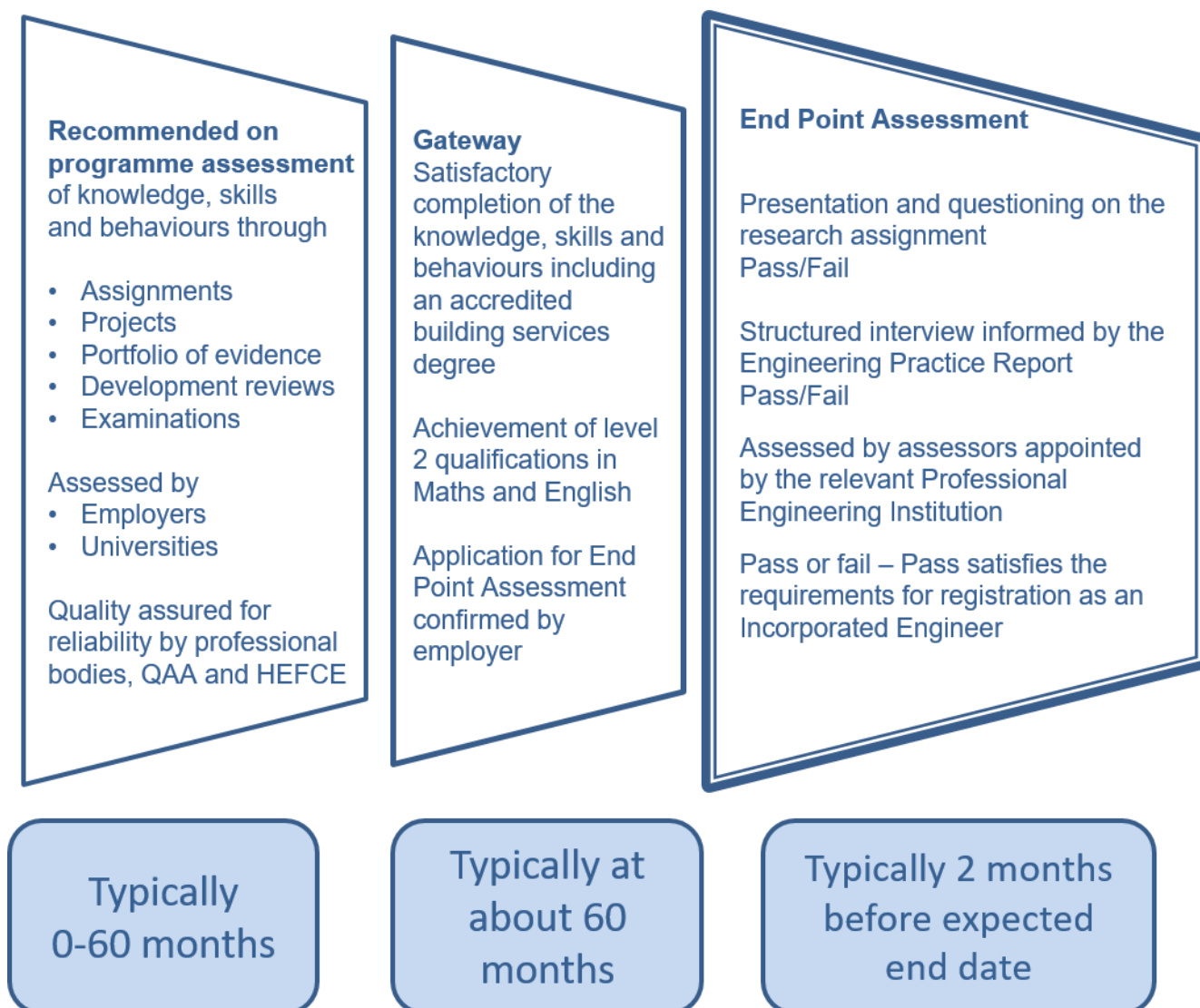
The Engineering Practice Report will be submitted electronically to the Professional Engineering Institution who will pass it on to the Assessor Panel at least four weeks ahead of the date of the interview.

STAGE 2 - anticipated time from submission of the Engineering Practice Report to interview will be 3-4 weeks

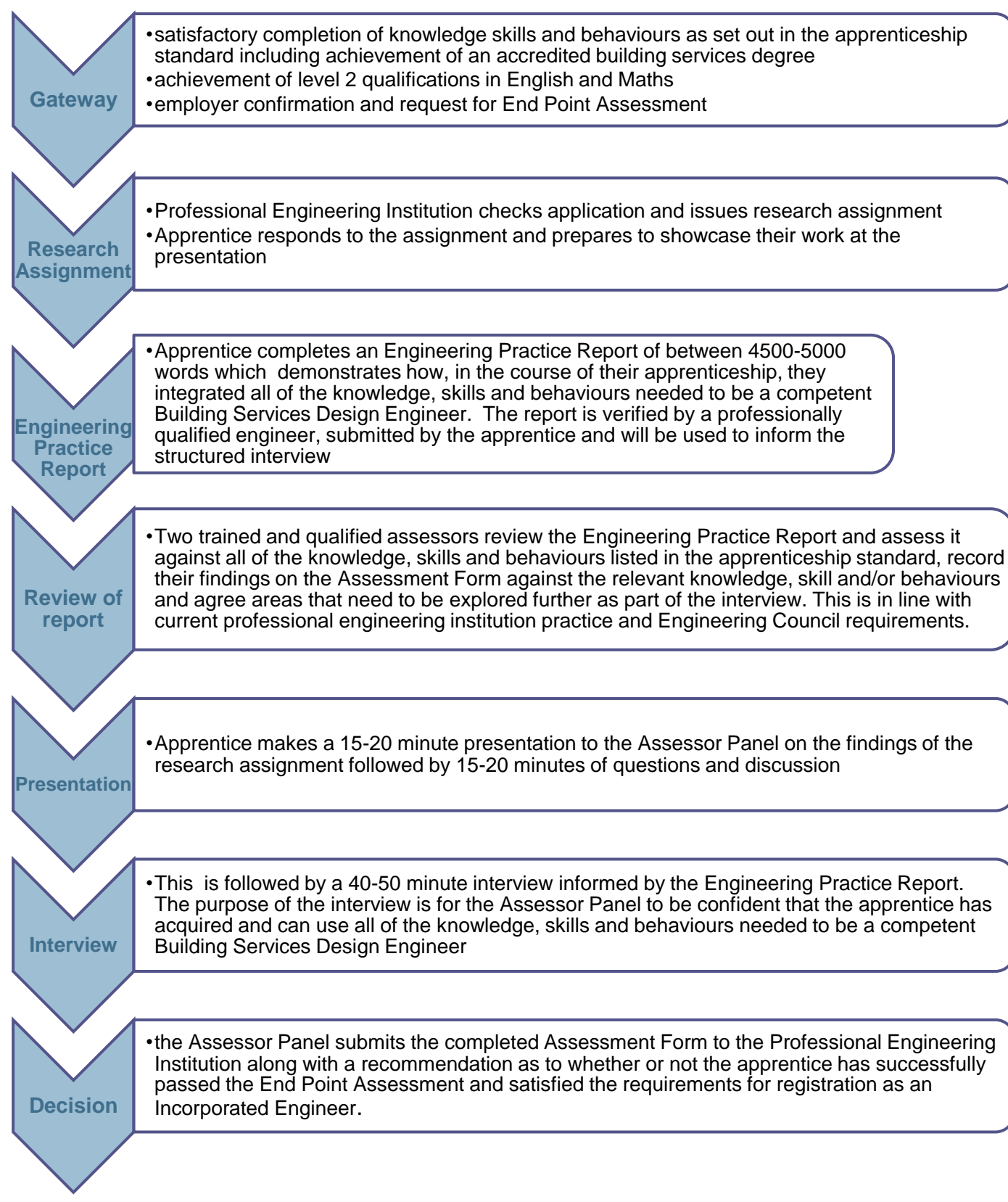
Presentation and questioning on research assignment- the apprentice will give a 15-20 minute presentation to the Assessor Panel showcasing the findings of their research assignment. This will be followed by 15-20 minutes of questions.

Structured Interview– a 40-50 minute structured interview based on the Engineering Practice Report submitted prior to the interview the purpose being to determine the apprentice's ability to integrate all of the knowledge skills and behaviours acquired during the apprenticeship.

To be successful the apprentice must pass the Presentation and Structured Interview. The assessment will satisfy the requirements for registration as an Incorporated Engineer as set out by the Engineering Council. The assessors will be experienced, qualified and trained Building Services Engineers nominated by the relevant Professional Engineering Institution. Benchmarking the End Point Assessment against the Engineering Council UK-SPEC requirements for IEng 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.



Process Summary



Assessment Overview			
Assessment method	Area Assessed	Assessed by	Grading
Presentation and questioning on research assignment	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 Engineering Practice Report			Pass/Fail
On programme assessment			
<p>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.</p> <p>To achieve the apprenticeship the apprentice will need to have completed a BSc or BEng degree in building services engineering accredited by the relevant Professional Engineering Institution and listed on the Engineering Council website.</p>			

Assessment Gateway
<p>The apprentice will need to demonstrate satisfactory completion of all aspects of their apprenticeship before they are able to undertake the End Point Assessment, including having achieved Level 2 qualifications in Maths and English and successfully completed an accredited building services degree. 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.</p>
End point assessment
What will be assessed
<p>The apprentice will be expected to demonstrate through a presentation setting out the findings of their research assignment and structured interview informed by a written report that they have acquired all of 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 Engineer.</p>
How will it be assessed
<p>The End Point Assessment will use the relevant Professional Engineering Institution's Incorporated Engineer 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.</p> <p>The assessment will be in two stages</p> <p>STAGE 1 – this is in preparation for the presentation and interview. Both elements will be carried out concurrently and take 8 weeks to complete</p> <p>1 Research Assignment</p>

The Professional Engineering Institution will provide the apprentice a research assignment, who will have 8 weeks to complete the assignment. The purpose of the research assignment is to assess their ability to integrate a range of knowledge, skills and understanding they have acquired during their apprenticeship.

A bank of research assignments 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 three years. Each research assignment will be checked and approved by the Professional Engineering Institution. This is to make sure that the research assignments are comparable in terms of difficulty and so maintain quality standards over time. The research assignments will be made freely available on request to all organisations approved to assess the Building Services Design Engineer Degree Apprenticeship on the Register of End-point Assessment Organisations (RoEPAO).

Criteria for the Research Assignment

The bank of research assignments 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 research assignment will be a maximum of 500 words and designed to take between 30-40 hours to complete.

Generically the research assignment will involve research and analysis associated with improving the design, performance and/or delivery of building services systems and components and the preparation of material for the presentation.

The research assignment will ask the apprentice to

- Research and report on an improvement or innovation that will impact on the design and/or delivery of building services systems or components.
- Discuss the advantages and disadvantages of the chosen improvement or innovation paying particular attention to its impact on sustainability (e.g. energy usage, waste management, whole-life costing)
- Consider what changes need to occur to make the chosen improvement or innovation a reality. This will include critically examining the role of the design authority, asset owner, asset manager and supply chain in encouraging or impeding the deployment of the improvement or innovation.
- Make an informed prediction as to what will happen justifying their prediction with evidence from the market.

2 Engineering Practice Report (4500 - 5000 words) which should clearly demonstrate the achievement of knowledge, skills and behaviours as set out in the standard at a level of responsibility commensurate with that of an Incorporated Engineer. The apprentice will have 8 weeks to complete the report.

The Report should review career and experiences to date including

- A general overview of the type of work and training undertaken
- A table setting out the different projects described later in the body of the Report. The number of projects referred to is dependent on the requirement to demonstrate achievement of the full range of knowledge, skills and behaviours as set out in the Standard. It could be one long-term project or a number of shorter term projects.
- A summary of key features of each project chosen – client, scope, value and dates
- A demonstration as to how the experience gained in each project is linked to the achievement of the knowledge, skills and behaviours listed in the standard, their role, insight into the important decisions they were responsible for or made a significant contribution to. The examples must demonstrate where they have exercised independent judgment – as an engineer and a practicing professional

A registered member of a Professional Engineering Institution (IEng or CEng) who works with the apprentice will sign to verify that the work described in the Engineering Practice Report has been carried out by the apprentice.

The Engineering Practice Report will be submitted electronically to the Professional Engineering Institution who will pass it on to the of Assessor Panel at least four weeks ahead of the date of the interview.

Two trained and qualified assessors will review the Engineering Practice Report against the the knowledge, skills and behaviours listed in the apprenticeship standard, record their findings on the Assessment Form against the relevant knowledge, skills and behaviours and agree areas that need to be explored further as part of the interview.

STAGE 2 – anticipated time from submission of the Engineering Practice 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 15-20 minute slide presentation showcasing the findings of their research assignment. The Assessor Panel will be made aware of the subject of the research assignment three weeks in advance of the presentation. The presentation will be supported by 'hard copy' which should include a copy of the slides and information such as drawings, spreadsheets which the apprentice will have prepared beforehand and made available at the start of the presentation. The presentation will be followed by 15-20 minutes of questions 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 40-50 minute structured interview with members of the Assessor Panel. The purpose of the discussion is so that the Assessor Panel members can assure themselves that the apprentice has the competence to work as a Building Services Design Engineer.

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

- Technology and problem solving – questions about the range of factors affecting choice of engineering solutions, the implementation and evaluation of design solutions, choices of systems and components, health and safety, environmental impact and sustainability, whole life costing, the use of software tools in design and data collection.
- Management – questions about planning for effective project implementation, planning, budgeting and organisation, managing teams and developing staff, continuous improvement
- Communication – questions exploring examples of technical and non-technical presentations and reports, working as part of a team, presenting and discussing proposals.
- 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 the findings of a research assignment including any handouts and/or slides.
- Submit an Engineering Practice Report setting out the knowledge and competences gained during the apprenticeship.
- Attend an interview

- Make a 15-20 minute presentation showcasing their findings of their research assignment, answer questions and take part in a discussion based on the presentation
- Take part in a 40-50 minute structured interview informed by their Engineering Practice Report.

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 Engineers and award the status of IEng.

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 appropriate to the apprentice's area of specialism.

The Professional Engineering Institution will be on the Register of End-point Assessment Organisations (RoEPAO).

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 currently working in the industry or recently retired (up to two years), will need to demonstrate that they have maintained links with the industry and current practices. Each application to become an assessor will be evaluated on its own merits. The evaluation process will consider all relevant factors such as a minimum of three years industry experience, professionally qualified to at least IEng and have 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 CPD records on request. This training 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 Engineering Practice 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 two members of the Assessor Panel members for them to study ahead of the interview.

The two members of the Assessor Panel will consider the submitted documents, record their findings on the Assessment 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 mark the presentation (including the research assignment) and structured interview as pass or fail, backing their decision for the interview with evidence from the engineering practice report. The Engineering Practice Report will not be marked. 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 fail and the completed review forms will be submitted to the Professional Engineering Institution's quality assurance panel for audit.

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 End-point Assessment Organisations (RoEPAO). 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 as evidenced in the summary report on the Assessment Form.

If the apprentice does not pass the presentation, subject to the feedback they receive, they may have to undertake further work on the research assignment. If the apprentice passes the presentation element they only have to resit/retake the structured interview, which will involve resubmitting the Engineering Practice Report. Subject to the feedback they receive, they may have to undertake further work on the Engineering Practice report. The resit/retake must include a structured interview even if it was passed first time round.

The assessor feedback will be provided in writing at the same time as the apprentice is informed that they have failed the End Point Assessment. The resit/retake must be taken within 12 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 satisfactorily 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
- Informing the apprentice of the outcome of the End Point Assessment
- 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 on at least an annual basis 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

The EQA will be delivered by the Engineering Council, working in partnership with the IfA.

End point Grading

A grading exemption has been applied for in relation to the Building Services Design Engineer 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	<p>Using Annex A provides evidence of knowledge, skills and behaviours required to</p> <ul style="list-style-type: none"> • Maintain and extend a sound theoretical approach to the application of technology in engineering practice (K1) • Use a sound evidence based approach to problem solving and contribute to continuous improvement (S1) • Identify, review and select techniques, procedures and methods to undertake engineering tasks (K1) • Contribute to, implement and evaluate the design and development of engineering solutions taking into account critical constraints such as concern for safety and sustainability (K3, K4, S3, B5) • Communicate with others at all levels including preparing communications, documents and reports on technical matters and exchanging information and providing advice to technical and non-technical colleagues.(K8, S7) • Present and discuss proposals (K8, S7) • Demonstrate personal and social skills including those related to diversity and equality (B1, B6) <p>To pass the apprentice must demonstrate achievement of all these grading criteria.</p>	Fails to provide evidence to meet all the knowledge, skill and behaviour requirements as required in Annex A
Structured Interview	<p>Using Annex A provides evidence of knowledge, skills and behaviours required to</p> <ul style="list-style-type: none"> • Maintain and extend a sound theoretical approach to the application of technology in engineering practice (K1) • Use a sound evidence based approach to problem solving and contribute to continuous improvement (S1) • Identify, review and select techniques, procedures and methods to undertake engineering tasks (K1, K2, S2) • Contribute to, implement and evaluate the design and development of engineering solutions taking into account critical constraints such as concern for safety and sustainability (K3, K4, K5, S3, S4,) • Plan for effective project management including risk identification, assessment and management, securing the necessary resources and applying the necessary 	Fails to provide evidence to meet knowledge, skills and behaviours as required in Annex A for this assessment method

	<p>contractual arrangements with other stakeholders,(K6, S5)</p> <ul style="list-style-type: none"> • Manage tasks, people, and resources to plan and to budget working to agreed quality standards, programme and budget, within legal and statutory requirements (K4, K6 S5) • Manage teams and staff to meet changing technical and managerial needs (K7, S6) • Manage continuous quality improvement (S3) • Communicate with others at all levels including preparing communications, documents and reports on technical matters, exchanging information and providing advice to technical and non-technical colleagues.(K8, S7) • Present and discuss proposals (K8, S7) • Demonstrate personal and social skills including those related to diversity and equality (B1, B4) • Comply with relevant codes of conduct including those of the professional engineering institution and all relevant legislation and regulatory frameworks. (K4, K9, B6) • Manage and apply safe systems of work.(K4,S4, B5) • Undertake engineering activities in a way that contributes to sustainable development.(K3, K5, S1) • Carry out and record Continuing Professional Development necessary to maintain and enhance competence in area of practice. (S8, B7) • Exercise responsibilities in an ethical manner. (B2, B6) <p>To pass the apprentice must demonstrate achievement of all these grading criteria.</p>	
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Implementation

Affordability

The cost of the End Point Assessment is the cost of

- Logging applications for end point assessment and issuing research assignment.
- 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 IEng registration with the Engineering Council. IEng 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 UK-SPEC requirements for IEng 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 40 apprentices will be starting on the programme. It is anticipated that this will rise to a figure of approximately 70 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 Engineer

MAPPING OF EPA METHODOLOGY TO STANDARD

Ref	Core knowledge to be assessed	Presentation ¹	Structured Interview ²
K1	The mathematical, scientific and engineering principles, methods and modelling that underpin the design of complex building services systems including the quantitative methods used to understand the performance of systems and components and current and emerging technologies. Examples include: comfort criteria, heat transfer calculations, building management systems, fluid dynamics theory for ventilation and water flow, electrical power theory, lighting engineering theory. Using psychrometric charts to determine cooling and humidification loads. Using fan/pump characteristics to determine operating capability	✓	✓
K2	The digital solutions used to model, design, analyse and evaluate building services systems. Examples include: Using building information modelling to design heating, ventilation and air-conditioning systems, and integrate system components with architectural and structural elements. Using computer programs for heating load assessments. Using dynamic thermal modelling programs to calculate carbon emissions and demonstrate compliance with Building Regulations Part L criteria. Using spreadsheet techniques for calculating and summing electric power loads		✓
K3	The research techniques used to improve the performance of building services systems and components with particular reference to sustainability and reduced carbon emissions and including the use of market intelligence and evidence from best practice. Examples include: Using post-occupancy evaluation outcomes indicating the specific occupancy patterns, space usage and behavioural characteristics and their impacts on energy consumption and carbon emissions, so that future designs can be improved	✓	✓
K4	The quality standards, codes of practice, legal and regulatory frameworks such as building regulations and construction and design management regulations that govern the design of building services systems with particular reference to health, safety and welfare and environmental impact. Examples include: Building Regulations Part L Conservation of Fuel and Power and Part F Ventilation; Electricity at Work Regulations, air quality regulations	✓	✓
K5	The principles and techniques of whole life evaluation in the design of building engineering services systems taking into account critical constraints, including due concern for safety and sustainability. Examples include: Running costs for mechanical and electrical systems, including fuel costs and operation and maintenance costs; carbon usage assessments including both operational carbon from energy usage and embodied carbon from materials usage, including		✓

¹ Based on findings of research assignment.

² Informed by the Engineering Practice Report

	replacements and upgrades; mechanical and electrical equipment replacement strategies		
K6	The principles and techniques of effective project management including resources, cost and risk assessment. Examples include: project programmes for the building services design activities; resources planning against project stages and 'deliverables' schedules for producing mechanical and electrical drawings and specifications. Using stage-by-stage cost allocation and expenditure profiles and cumulative schedules of risks		✓
K7	How to manage teams and develop staff to meet changing technical and managerial needs. Examples include: building teams, briefing and providing direction, reviewing and appraising performance in relation to delivery of building services projects. Using change-management techniques to address client/architect changes and impacts on building services design loads, layouts and plant spaces		✓
K8	How to communicate effectively through reports, drawings, specifications, presentations and discussions with both technical and non-technical people. Examples include: Contributions to proposals reports for building services solutions to meet the client brief; concept diagrams for explaining the design principles of complex mechanical and electrical systems in layman's terms; specifications for mechanical and electrical installations	✓	✓
K9	Examples include: Dealing in a fair and honest way in activities such as selection of suppliers/contractors for tender lists for building services contracts; and in reviewing tenders and making recommendations for award of contracts		✓

Ref	Core skills to be assessed	Presentation	Structured Interview
S1	Use a sound, evidence-based approach to problem solving to develop building services engineering design solutions which maintain and enhance the quality of the environment and community and meet client, financial and safety objectives. Examples included: Use feedback from previous projects, and in-use data from operational buildings, and incorporate lessons learnt into building services designs and management systems with cost-benefit analysis	✓	✓
S2	Identify, review and select techniques, procedures and methods best suited to undertake the design of complex building services systems and components. Examples included: comparison and selection of methods for equipment sizing for power systems; assessing the suitability of computational fluid dynamics for understanding thermal and ventilation dynamic characteristics in complex scenarios		✓
S3	Promote the continuous improvement of the design of building services systems and components. This includes using market intelligence and best practice and participating in design reviews and evaluation. Examples include: maintaining awareness of technical developments in equipment such as chillers, boilers and generators; and good practice methods for system configurations and control. Participating in design critiques for the building services strategy at the concept design stage	✓	✓
S4	Manage and apply safe systems of work including responsibility for own obligations for health, safety and welfare issues, assessing and controlling risk, working with health, safety and welfare legislation and best practice. Examples include: Undertaking hazard identification and risk assessment for building services systems involving electricity, gas, rotating plant, refrigerants, hot surfaces, testing and commissioning. Planning suitable access and facilities for operation and maintenance of mechanical and electrical equipment		✓
S5	Managing the planning, budgeting and organization of tasks, people and resources through the use of appropriate management systems, working to agreed quality standards, project programme and budget, within legal, contractual and statutory requirements. Examples include: Use employer's quality management system for stage-by-stage project delivery; assessing required person-hours for design, site visits, inspections and witnessing in relation to fees		✓
S6	Manage teams and develop staff to meet changing technical and managerial needs. Examples include: Provide team briefings and guidance on interpretation and application of new energy regulations or employer/institutional design guidance on lighting design		✓
S7	Communicate effectively through reports, drawings, specifications, presentations and discussions with both technical and non-technical people. Examples include: Presenting building services design concepts and proposals to a client using diagrams, data in context and interactive discussions on the intended operational performance and user benefits	✓	✓
S8	Carry out and record the continuing profession development needed to maintain and enhance knowledge and competence as a building services design engineer. Examples include: Learning and evidence records from project activities, such as		✓

	mechanical/electrical systems design calculations; heating, cooling and power load assessments; lighting calculations; equipment capacities and selection; schematic and layout drawings for mechanical and electrical services; witness reports from commissioning; writing reports; and attendance at seminars, lectures and workshops		
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Ref	Core behaviours to be assessed	Presentation	Structured Interview
B1	Be aware of the needs and concerns of others, especially in relation to diversity and equality	✓	✓
B2	Demonstrate reliability, integrity and respect for confidentiality		✓
B3	Be confident and flexible in dealing with new and changing interpersonal situations		✓
B4	Create, maintain and enhance productive working relationships		✓
B5	Demonstrate a strong commitment to health, safety and welfare	✓	✓
B6	Demonstrate a personal commitment to professional and ethical standards, recognizing one's obligation to society, the profession and the environment.	✓	✓
B7	Take responsibility for personal development, demonstrate commitment to learning and self-improvement and be open to feedback.		✓