End-point assessment plan for BEMS Controls Engineer apprenticeship standard

Apprenticeship standard reference number	Level of this end point assessment (EPA)	Integrated
ST0629	4	N/A

Contents

Introduction and overview 2
EPA summary table 3
Length of end-point assessment period: 3
Order of assessment methods 4
Gateway 4
Assessment methods 5
Weighting of assessment methods 9
Grading 9
Roles and responsibilities 14
Internal Quality Assurance (IQA) 16
Re-sits and re-takes 16
Affordability 17
Professional body recognition 17
Reasonable adjustments 17
Mapping of knowledge, skills and behaviours (KSBs) 18

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the BEMS Controls Engineer apprenticeship standard. It is for end-point assessment organisations (EPAOs) who need to know how EPA for this apprenticeship must operate. It will also be of interest to BEMS Controls Engineer apprentices, their employers and training providers.

Full time apprentices will typically spend 36 months on-programme (before the gateway) working towards the occupational standard, with a minimum of 20% off-the-job training. All apprentices will spend a minimum of 12 months on-programme.

The EPA period should only start, and the EPA be arranged, once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, all of the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO.

All pre-requisites for EPA assessment methods must also be complete and available for the assessor as necessary.

For level 3 apprenticeships and above apprentices without English and mathematics at level 2 must achieve level 2 prior to taking their EPA.

The EPA must be completed within an EPA period lasting a maximum of 3 month(s), beginning when the apprentice has passed the EPA gateway.

The EPA consists of 2 discrete assessment methods.

The individual assessment methods will have the following grades:

Assessment method 1: Professional discussion underpinned by a portfolio

· Fail
· Pass
· Distinction

Assessment method 2: Practical observation with questioning

· Fail
· Pass
· Distinction

Performance in the EPA will determine the overall apprenticeship standard and grade of:

· Fail
· Pass
· Distinction

EPA summary table

On-programme (typically 36 months)	Training to develop the occupation standard's knowledge, skills and behaviours.
End-point Assessment Gateway	• Employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard. • English/mathematics Level 2 Apprentices must complete: • A portfolio which is used to inform the Professional Discussion with an expected 15 pieces of evidence (1 per duty).
End Point Assessment (which would typically take 3 months)	Assessment Method 1: Professional discussion underpinned by a portfolio With the following grades: · Fail · Pass · Distinction Assessment Method 2: Practical observation with questioning With the following grades: · Fail · Pass · Distinction

Length of end-point assessment period:

The EPA must be completed within an EPA period lasting a maximum of 3 month(s), beginning when the apprentice has passed the EPA gateway.

Any supporting material required for the EPA should be submitted no later than 1 weeks after the start of the EPA period.

All portfolio evidence must be submitted at the gateway.

If an EPA assessment method is failed, it should be retaken within the EPA period and in-line with the requirements set out in this assessment plan.

Order of assessment methods

The assessment methods can be delivered in any order.

Gateway

The EPA period should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, that is to say they have achieved occupational competence. In making this decision, the employer may take advice from the apprentice's training provider(s), but the decision must ultimately be made solely by the employer.

In addition to the employer's confirmation that the apprentice is working at or above the level in the occupational standard, the apprentice must have completed the following gateway requirements prior to beginning EPA:

English and mathematics at level 2.

For those with an education, health and care plan or a legacy statement the apprenticeships English and mathematics minimum requirement is Entry Level 3 and British Sign Language qualification are an alternative to English qualifications for whom this is their primary language.

For Professional discussion underpinned by a portfolio, the apprentice will be required to submit:

- A Portfolio that has been produced by the apprentice during the on-programme phase of the apprenticeship, which will be used to inform the professional discussion. The portfolio itself will not be assessed or graded.

- The format and structure of the portfolio needs to be agreed between the employer, the apprentice and the EPAO (e.g. hard copy or on-line). However, the content must be sufficient to evidence that the apprentice can apply the knowledge, skills and behaviours required as mapped to the assessment method.

- There must be at least one piece of evidence relating to each knowledge, skill and behaviour mapped to the assessment method. One piece of evidence can be referenced against more than one knowledge, skill or behavioural requirement. It is expected that there will typically be 15 pieces of evidence (1 per duty).

- The portfolio should contain written accounts of activities which are not reflective and that have been completed and referenced against the knowledge, skills and behaviours, supported by appropriate evidence, including photographic evidence and work products, completed site engineering reports by the apprentice, safety documentation, company policies and procedures as appropriate to the activities. Progress review documentation, witness testimonies, and feedback from colleagues and/or clients should also be included. The apprentice's Manager/Mentor will typically support the development of the portfolio in accordance with company policy and procedures, although the assessment organisation will provide further guidance on the content.

For Practical observation with questioning, the apprentice will be required to submit:

N/A

Assessment methods

Assessment Method 1: Professional discussion underpinned by a portfolio (This Method has 1 component.)

Method 1 Component 1: Professional Discussion underpinned by a portfolio

Overview

This assessment will take the form of a professional discussion, which must be appropriately structured to draw out the best of the apprentice's competence and excellence and cover the KSBs assigned to this assessment method. It will involve the questions that will focus on the evidence supplied in the portfolio, coverage of prior learning or activity and problem solving.

The professional discussion can take place in any of the following:

· employer's premises
· a suitable venue selected by the EPAO (e.g. a training provider's premises)

The rationale for this assessment method is based upon recognised assessment methods used in the wider industry sector of building services of which BEMS is a part and other aligned sectors (e.g. energy/mechanical engineering/engineering & technology) from where the assessor pool will come from (see independent assessor criteria on p15). For these sectors (Chartered Institute of Building Services Engineers/ Institution of Engineering & Technology/ Institution of Mechanical Engineers) the professional registration process used to demonstrate industry credibility and competence is via a Professional Discussion.

This method will also allow some KSBs which may not naturally occur in every workplace or may take too long to observe to be assessed and the assessment of a disparate set of KSBs. BEMS Controls Engineers are expected to be able to communicate technical and other information on a regular basis to colleagues and clients ensuring their explanations are clear and accurate. The assessor will expect to see a wide range of evidence in the portfolio which will allow the KSBs to be explored via questioning to determine competence.

Delivery

The independent assessors will conduct and assess the professional discussion.

The professional discussion may last for up to 150 minutes. The independent assessor has the discretion to increase the time of the professional discussion by up to 10% to allow the apprentice to complete their last answer. Further time may be granted for apprentices with appropriate needs, for example where signing services are required.

During this method, the independent assessor will use the EPAO's question bank and be allowed to generate their own questions based on the evidence in the portfolio.

The professional discussion will be conducted as set out here:

Use the portfolio as the basis for discussion together with the EPAO question bank in order to assess the defined KSB's.

The EPAO should ask a minimum of 10 open questions in order to ensure that the portfolio evidence matches the defined KSB's and so that the associated criteria can be checked against the EPAO marking scheme to ascertain the resulting grade. The open questions should enable the apprentice to evidence the depth and breadth of the relevant KSB's.

The questions and answers are to be recorded either in writing or verbally by the use of a suitable recording device.

Video conferencing can be used to conduct the professional discussion, but the EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided in some way.

The independent assessor must use the assessment tools and procedures that are set by the EPAO to record the professional discussion.

The independent assessor will make all grading decisions.

Venue

The professional discussion should take place in a quiet room, free from distractions and influence.

Other relevant information

A structured specification and question bank must be developed by EPAOs. The 'question bank' must be of sufficient size to prevent predictability and review it regularly (and at least once a year) to ensure that it, and its content, are fit for purpose. The specifications, including questions relating to the underpinning knowledge, skills and behaviours, must be varied yet allow assessment of the relevant KSBs.

EPAOs must ensure that apprentices have a different set of questions in the case of re-sits/re-takes.

Independent assessors must be developed and trained by the EPAO in the conduct of professional discussion and reaching consistent judgement.

EPAOs will produce the following material to support this assessment method:

Outline of the assessment method's requirements
Marking materials
EPAO question bank

Assessment Method 2: Practical observation with questioning (This Method has 1 component.)

Method 2 Component 1: Practical Observation with questioning

Overview

Apprentices must be observed by an independent assessor completing work in their normal workplace, in which they will demonstrate the KSBs assigned to this assessment method. The EPAO will arrange for the observation to take place, in consultation with the employer.

One assessor may observe up to a maximum of 1 apprentice at any one time, to allow for quality and rigour.

The rationale for this assessment method is:

The occupation involves practical activity best assessed through observation; it would be difficult to replicate the working environment in a valid way and employers would doubt the occupational competence of an individual not assessed in this way

Delivery

The observation should take 4 hour(s). The observation may be split into discrete sections held over a maximum of 1 working day(s).The length of a working day is typically considered to be 7.5.hours. During the observation, the assessor will observe works that enables the apprentice to demonstrate the skills and behaviours required to fulfil the pass and distinction criteria and would normally occur during a typical working day. The works selected will ensure that the assessor can observe the range of activities defined in the mapping of KSB's for this assessment method.

The assessor has the discretion to increase the time of the observation by up to 10% to allow the apprentice to complete a task at the end of this component of the EPA. The independent assessor must be unobtrusive whilst conducting the observation.

In advance of the observation, apprentices must be provided with information on the format of the observation, including timescales.

The following activities MUST be observed during the observation:

- Knowledge: working safely and planning and preparing
- Skills: working safely and planning, preparing and working sustainably
- Behaviours: working effectively and efficiently, working with either colleagues, the public, clients or other stakeholders (due to the nature of the occupation there will always be some interaction with at least one stakeholder)

The observation should be conducted in the following way, to take account of the occupational context in which the apprentice operates:

Questions may be asked both during and after the observation is complete. The independent assessor can ask up to 20 open questions generated by themselves in order to illicit additional information which may not have been observed. They may ask follow up questions where clarification is required. This additional questioning must be included as part of the defined time limit.

KSBs observed, and answers to questions, must be documented by the independent assessor.

The independent assessor will make all grading decisions.

Other relevant information

There may be breaks during the observation to allow the apprentice to move from one location to another as required.

Support material

EPAOs will produce the following material to support this assessment method:

• Outline of the observation's requirements
• Marking materials

Venue

The observation can take place in:

· employer's premises
· workplace other than the employer's own premises (e.g. premises of a client)

Question development

EPAOs will create open questions to assess related underpinning knowledge, skills and behaviours. They must develop 'question banks' of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the questions they contain, are fit for purpose.

Weighting of assessment methods

All assessment methods are weighted equally in their contribution to the overall EPA grade.

Grading

Assessment method 1: Professional discussion

KSBs	Fail	Pass	Distinction
K1 **K2** **K3** **K4** **K5** **K6** **K7** **K8** **K9** **K10** **K11** **K12** **K13** **K14** **K15** **K16** **K17** **K18** **K19** **S1** **S2** **S4** **S5** **S8** **S9** **S10** **S11** **S12** **S14** **S15** **S16** **B1** **B2** **B5** **B6** **B8** **B9**	Does not meet the pass criteria	Explains building control technologies and theory and the principles of control logic including the fundamentals of proportional and integral control including: •The primary role and function of the control system •The merits of automated control over manual control methods •The development of interface protocols so data can be shared and exchanged between the BEMS and 3rd party systems e.g. access systems and lighting systems. (K1, K19) Explains the fundamentals of controlling HVAC (heating, ventilation and air conditioning) and building technology (K2) Explains hydrodynamics and hydronic systems in buildings such as cooling systems, heat generation and renewable technology e.g. the transfer of heat energy and cooling energy through a building using water and provides an example of Incorporating these systems into a design. (K3, K5, S2, S4) Explains thermodynamic relationships in air conditioning systems. (K4) Explains the principles and practices of measurement technology by explaining the operation and application of BEMS field devices e.g. sensors and their effects on the energy efficiency and comfort control requirement within buildings	Explains with examples significantly enhanced by the application of appropriate controls theory (K1,K2,K3,K4,K5,K6,K8,K13 K15,K19,S2,S4)

B10 **B11** **B12**		(K6, K13, K15) Explains examples of Control Panel wiring, construction and relay logic and provides an example of incorporating these into the design process. (K7, S5) Explains the control principles associated with the design, function, facilities management and use of the building and applies the principles to create points lists, description of operation and cable schedules to meet the needs of a variety of building stakeholders (e.g. owners/ operators). (K8, S1, S9) Explains the use of communications technology protocols and media. (K9) Explains and applies the practices and procedures for the installation of BEMS wiring systems and explains the general characteristics of electrical installations and how to assess them whilst Identifying the requirements for protection of the electrical installation. (K10, K17, S8, S10) Describes the requirements for the BEMS element of electrical installations. (S11) Explains and applies the principles and practices for the commissioning of BEMS and associated equipment in buildings and explains the requirements of inspection and testing of BEMS element of electrical installations along with the testing, inspection and certification of BEMS related controls equipment. (K11, K14, K18, S12) Describes the requirements of inspection and testing of BEMS element of electrical installations within relevant legislative requirements, specifications, codes of practice and industry recognised practices (S16)	Identifies incorrect control Panel wiring, construction and relay logic and provides an example rectification of the issue. (K7, S5) Describes accurately how the varying needs of building stakeholders were incorporated into the BEMS design (S9) Describes accurately how design documentation is updated following direct feedback from client/ building stakeholder (S1) Describes accurately why and how a particular communications protocol was selected and implemented (K9) Describes accurately a BEMS installation and the associated protection issues, explained with exceptional clarity (K10, K17, S8, S10) Describes accurately the process of value engineering in the requirements of BMS element of electrical engineering (e.g. use of multicore cabling) (S11) Describes accurately an example of a BEMS commissioning project and associated inspection and testing with exceptional clarity (K11,K14,K18,S12)

		Describes the principles for diagnosing and correcting faults in BEMS network systems and BEMS equipment in buildings (K12) Explains the relevant health & safety legislation and safe working practices applying to themselves and others. (K16) Explains the principles for completing conditional site surveys, along with associated recommendations. (S14) Explains the application of energy efficiency measures to optimise comfort in buildings whilst minimising energy usage (S15) Explains the needs and concerns of others, especially in relation to diversity and equality (B1) Explains how to maintain, and enhance productive working relationships by accepting, prioritizing, delegating and undertaking technical and other tasks effectively. (B2, B8) Explains how to work independently and solve problems within their own scope of responsibility, by applying technical and behavioural skills and knowledge to define the problem, identify, evaluate and select alternatives and implement solutions and completing the work to the appropriate specifications and codes of practice. (B5, B6) Describes working effectively with colleagues, the public, clients and other stakeholders (B9) Explains how they have taken responsibility for personal development, demonstrating commitment to learning and self-improvement.(B10) Explains how to work in a way that contributes to sustainable development.	Describes accurately an example of BEMS inspection and testing with specific reference to relevant legislation/specification or code of conduct (S16) Explains in detail how they have defined and solved problems, and identified, evaluated and selected alternatives to implement the solution. (K12) Describes accurately the safe working practice giving particular reference to understanding the requirements for protection of and safe working with electrical installations and BEMS impact on 'wellbeing' (K16) Explains an example of a site survey and subsequent recommendations they made (S14) Describes accurately a specific energy efficiency solution which they were involved with (S15) Describes accurately a situation requiring specific understanding of the needs/ concerns of others in the business environment, in order to work effectively and promote productive working relationships (B1,B2,B8,B9)

		(B12)	Describes accurately an example of their problem solving abilities. (B5,B6) Describes accurately their personal development which in turn has extended their skill set and how this has benefited their business (B10) Describes accurately how they have shown initiative in the implementation of sustainable development within the business environment (B12)

Assessment method 2: Practical observation

KSBs	Fail	Pass	Distinction
S3 **S6** **S7** **S13** **S17** **S18** **S19** **B3** **B4** **B7**	Does not meet the pass criteria	Applies the principles and practices of measurement technology.(S3) Demonstrates the use of communications technology protocols and media e.g. MODBUS and BACNET (S6) Demonstrates commitment and adherence to relevant safety legislation, codes of practice and safe working practices to themselves and others (S7, B3) Demonstrates the principles, for diagnosing and correcting faults in BEMS network systems and BEMS equipment(S13)	Demonstrates capability in the application of the principles/practices of measurement technology in the naturally occurring environment (S3) Shows a logical and methodical approach to the use and integration of communications technology protocols/media appropriate to the naturally occurring evidence (S6) Demonstrates attention to detail in relation to Health & Safety adherence allowing the best use of naturally occurring evidence (S7, B3) Shows a logical and methodical approach to fault diagnosis and correction (S13)

		Undertakes the testing, inspection and certification of BEMS related controls and equipment.(S17) Applies the principles and practices for the design and commissioning of standard network architectures. E.g. Ethernet TCP/IP, MSTP and RS485 (S18) Carries out updates to BEMS system hardware to ensure compatibility with latest products. (S19) Demonstrates effective communication with work colleagues and clients using appropriate methods to communicate technical and other information.(B4) Accepts responsibility for their own work and actions and that of others in their team (if applicable). (B7) Shows an example of responsibilities being exercised in an ethical manner. (B11)	Shows a logical and in-depth approach to BEMS testing & inspection (S17) Demonstrates capability in the application of the principles/practices of design and commissioning of standard network architectures in the naturally occurring environment (S18) Demonstrates attention to detail in updating BEMS system hardware in the naturally occurring environment (S19) Demonstrates capability in terms of effective communication with relevant stakeholders in the naturally occurring environment (B4) Demonstrates their ability to take responsibility for their own actions/that of their team if applicable or explain how they would do so (B7) Demonstrates the importance of business ethics through practical application. (B11)

Overall EPA grading

All EPA methods must be passed for the EPA to be passed overall.

A pass is achieved by meeting ALL pass criteria for each assessment method.

A distinction is achieved by meeting all of the pass criteria and all of the distinction criteria for both assessment methods. Both methods are weighted equally.

Grades from individual assessment methods should be combined in the following way to determine the grade of the EPA as a whole:

Assessment method 1	Assessment method 2	Overall grading
Fail	Fail	Fail
Fail	Pass	Fail
Fail	Distinction	Fail
Pass	Fail	Fail
Pass	Pass	Pass
Pass	Distinction	Pass
Distinction	Fail	Fail
Distinction	Pass	Pass
Distinction	Distinction	Distinction

Roles and responsibilities

Role	Responsibility
Apprentice	• complete the on-programme element of the apprenticeship • prepare for and complete the EPA
Employer	• identify when the apprentice is ready to pass the gateway and undertake their EPA • notify the EPAO that the apprentice has passed the gateway
EPAO	As a minimum EPAOs should: • appoint administrators/invigilators and markers to administer/invigilate and mark the EPA • provide training and CPD to the independent assessors they employ to undertake the EPA • have no direct connection with the apprentice, their employer or training provider i.e. there must be no conflict of interest • have processes in place to conduct internal quality assurance and do this on a regular basis • organise standardisation events and activities in accordance with this plan's IQA section • organise and conduct moderation of independent assessors' marking in accordance with this plan • have, and operate, an appeals process
Independent assessor	As a minimum an Independent assessor should:

	• be independent of the apprentice, their employer and training provider(s) i.e. there must be no conflict of interest • hold or be working towards an independent assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading • have the capability to assess the apprentice at this level • attend the required number of EPAOs standardisation and training events per year (as defined in the IQA section) Plus: ○ Experience of designing, installing, commissioning, servicing and maintaining the range of systems and work activities demonstrated within the BEMS Controls Engineer Apprenticeship Specification. ○ Be recognised as a specialist in BEMS Controls with industry experience supported by a professional CV and verified by the Building Controls Industry Association (BCIA) in line with the current process for approving new members; ○ Plus, must have/be at least one from the following list: - CIBSE Member or Fellow - IET Member of Fellow - IMechE Member or Fellow - Incorporated Chartered Engineer - BCIA Advanced Technical Certificate - Competency Demonstration Report
Training provider	As a minimum the training provider should: • work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period • advise the employer, upon request, on the apprentice's readiness for EPA prior to the gateway • Plays no part in the EPA itself

Internal Quality Assurance (IQA)

Internal quality assurance refers to the requirements that EPA organisations must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must:

- appoint independent assessors who have knowledge of the following occupational areas:
    - Experience of designing, installing, commissioning, servicing and maintaining the range of systems and work activities demonstrated within the BEMS Controls Engineer Apprenticeship Specification.
    - Be recognised as an experienced specialist in BEMS Controls supported by a professional CV and verified by the Building Controls Industry Association (BCIA) in line with the current process for approving new members;
    - Plus, must have/be at least one from the following list:
      - CIBSE Member or Fellow
      - IET Member of Fellow
      - IMechE Member or Fellow
      - Incorporated Chartered Engineer
      - BCIA Advanced Technical Certificate
      - Competency Demonstration Report
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time.
- operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this standard and before they deliver an updated assessment method for the first time
- a minimum requirement of 1 event per year but would operate ongoing monitoring and sampling processes to ensure a standardised approach- this would also include 2 audits and observations of each assessor beach year

Re-sits and re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a re-sit or a re-take. A re-sit does not require further learning, whereas a re-take does.

Apprentices should have a supportive action plan to prepare for the re-sit or a re-take. The apprentice's employer will need to agree that either a re-sit or re-take is an appropriate course of action.

An apprentice who fails an assessment method, and therefore the EPA in the first instance, will be required to re-sit or re-take any failed assessment methods only.

Any assessment method re-sit or re-take must be taken during the maximum EPA period, otherwise the entire EPA must be taken again, unless in the opinion of the EPAO exceptional circumstances apply outside the control of the apprentice or their employer.

Re-sits and re-takes are not offered to apprentices wishing to move from pass to distinction.

Where any assessment method has to be re-sat or re-taken, the apprentice will be awarded a maximum EPA grade of pass, unless the EPAO determines there are exceptional circumstances requiring a re-sit or re-take.

Affordability

Affordability of the EPA will be aided by using at least some of the following practice:

- Using an employer's premises.
- Delivery of professional discussion remotely via video conferencing facilities

Professional body recognition

Professional body recognition is not relevant to this occupational apprenticeship.

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this apprenticeship standard. This should include how an apprentice qualifies for Reasonable Adjustment and what Reasonable Adjustments will be made. The adjustments must maintain the validity, reliability and integrity of the assessment methods outlined in this assessment plan.

Mapping of knowledge, skills and behaviours (KSBs)

Assessment method 1: Professional discussion supported by a portfolio

Knowledge
K1 Understanding building control technologies and theory including: •The primary role and function of the control system •The merits of automated control over manual control methods •The development of interface protocols so data can be shared and exchanged between the BEMS and 3rd party systems e.g. access systems and lighting systems
K2 Understand the fundamentals of controlling HVAC (heating, ventilation and air conditioning) and building technology
K3 Understand hydrodynamics and hydronic systems in buildings e.g. the transfer of heat energy and cooling energy through a building using water
K4 Understand thermodynamic relationships in air conditioning systems
K5 Understand cooling systems, heat generation and renewable technology
K6 Understand the principles and practices of measurement technology
K7 Understand Control Panel wiring, construction and relay logic
K8 Understand the control principles associated with the design, function, facilities management and use of the building
K9 Understand communications technology protocols and media
K10 Understand the practices and procedures for the installation of BEMS wiring systems
K11 Understand the principles and practices for the commissioning of BEMS and associated equipment in buildings
K12 Understand the principles for diagnosing and correcting faults in BEMS network systems and BEMS equipment in buildings
K13 Understand the energy efficiency and comfort control requirement within buildings
K14 Understand the testing, inspection and certification of BEMS related controls equipment
K15 Understand the operation and application of BEMS field devices e.g. sensors
K16 Understand relevant health & safety legislation and safe working practices applying to themselves and others. Give particular reference to understanding the requirements for protection of and safe working with electrical installations and BEMS impact on 'wellbeing'
K17 Understand the general characteristics of electrical installations and how to assess them
K18 Understand the requirements of inspection and testing of BEMS element of electrical installations
K19 Understand the principles of control logic including the fundamentals of proportional and integral control

Skills
S1 Applying the control principles associated with the design, function and use of buildings e.g. to create points lists, description of operation, cable schedules
S2 Incorporating hydrodynamics/ hydronic systems into designs
S4 Incorporating cooling systems, heat generation and renewable technology into designs as applicable
S5 Incorporating Control Panel wiring, construction and relay logic into the design process
S8 Identifying requirements for protection of electrical installations
S9 Incorporating the needs of a variety of building stakeholders (e.g. owners/ operators) within the design of the BEMS system
S10 Applying the practices and procedures for the installation of BEMS wiring systems
S11 Interpreting the requirements for the BEMS element of electrical installations
S12 Applying the principles and practices for the commissioning of BEMS systems and equipment in a variety of building types and environments
S14 Applying the principles for completing conditional site surveys, along with associated recommendations
S15 Applying knowledge of energy efficiency to optimise comfort in buildings whilst minimising energy usage
S16 Identifying the requirements of inspection and testing of BEMS element of electrical installations within relevant legislative requirements, specifications, codes of practice and industry recognised practices

Behaviours
B1 Be aware of the needs and concerns of others, especially in relation to diversity and equality
B2 Create maintain, and enhance productive working relationships
B5 Take responsibility for working independently and completing work to the appropriate specifications and codes of practice
B6 Solving problems within their own scope of responsibility, by applying technical and behavioural skills and knowledge to define the problem, identify, evaluate and select alternatives and implement solutions.
B8 Accepting, prioritizing, delegating and undertaking technical and other tasks effectively
B9 Committed to working effectively with colleagues, the public, clients and other stakeholders
B10 Take responsibility for personal development, demonstrating commitment to learning and self-improvement
B12 Undertake work in a way that contributes to sustainable development.

Assessment method 2: Practical observation with questioning

Knowledge

Skills
S3 Appling the principles and practices of measurement technology
S6 Applying communications technology protocols and media e.g. MODBUS and BACNET
S7 Applying relevant safety legislation, codes of practice and safe working practices to themselves and others
S13 Applying the principles, for diagnosing and correcting faults in BEMS network systems and BEMS equipment
S17 Carrying out the testing, inspection and certification of BEMS related controls and equipment
S18 Applying the principles and practices for the design and commissioning of standard network architectures. E.g. Ethernet TCP/IP, MSTP and RS485
S19 Carrying out updates to BEMS system hardware to ensure compatibility with latest products.

Behaviours
B3 Commit to compliance with health and safety
B4 Strive to communicate effectively with work colleagues and clients using oral, written and electronic methods to communicate technical and other information.
B7 Accepting responsibility for their own work and actions and that of others in their team
B11 Exercise responsibilities in an ethical manner