STO157/AP02

END-POINT ASSESSMENT PLAN

Electrical Power Protection and Plant Commissioning Engineer

Bryan Ashford
Chair of Employer Development Group
September 2016

Contents

Overview 2
End-Point Assessment Gateway 2
End-Point Assessment (Last 6 Months) 2
Knowledge Assessment 3
Technical Interview 3
Practical Observation 4
Re-takes/Re-sits 5
Final Decision Panel 5
Roles and Responsibilities of Assessment Organisation Appointed Staff 6
Grading 6
Assessment Organisations 8
External Quality Assurance 9
Professional Body Recognition 9
Implementation 10
Affordability 10
Manageability/Feasibility 10
Annex A Assessment Method by Element of the Standard 11

Overview

This assessment plan is to accompany the Electrical Power Protection and Plant Commissioning Engineer (EPPPCE) level 4 apprenticeship standard.

Electrical Power Plant, Equipment and Protection Systems require testing and commissioning to confirm that the installation and operation of new and refurbished protection plant & equipment complies with manufacturers' specifications, company procedures and the operating parameters.

Commissioning requires a logical approach which builds from individual component tests through to full system commissioning which means it includes making the equipment live and monitoring equipment integrity when it is first 'turned on.'

This plan outlines the end-point assessment that apprentices must successfully complete to achieve their apprenticeship. The EPPPCE apprenticeship will typically take 36 months, with the end-point assessment taken in the last six months. Performance in the end-point assessment will determine the grade awarded: distinction, pass or fail.

End-Point Assessment Gateway

Employers must satisfy themselves that apprentices are ready for their end-point assessment. Apprentices must demonstrate that they meet the following criteria:

- Achieved English and maths at level 2 or higher
- Satisfactory completion of the formal training plan agreed with the apprentice by the employer
- Sufficient evidence in the form of a work log to allow the apprentice to consistently demonstrate skills, knowledge and behaviours as described in the standard.

Although the apprentice should only be recommended for end-point assessment when they are ready; employers should have a remediation process in place to support any candidate who fails to meet the conditions of the end-point assessment.

End-Point Assessment (Last 6 Months)

Successful achievement of the end-point assessment will lead to final certification of the apprenticeship and demonstrate that the apprentice is a fully competent EPPPCE. They will be able to work safely and confidently to conduct tests and commission protection systems and prove the integrity of other power system plant & equipment. They will be able to take responsibility for testing and commissioning on electrical power projects and ensuring that the work is conducted safely and, reliably meeting customer, quality, time and budget requirements.

It uses the following assessment tools:

- Knowledge assessment (weighting 20%)
- Technical interview, based on a work log compiled during the apprenticeship (weighting 40%)
- An observation of practical work activities (weighting 40%).

The end-point assessment may be completed over a 6 month period and will begin with the knowledge assessment. The remaining two end-point tools will be scheduled according to the scheduling/accommodation of resources to enable cost effective planning. Further details on each assessment tool are provided below.

End-point assessment must be undertaken by an independent assessment organisation that is on the Skills Funding Agency Register of Apprentice Assessment Organisations. Assessment organisations must appoint appropriately qualified and experienced staff – termed 'independent examiners,' 'technical experts' and 'independent assessors' to conduct assessment and form a final decision panel, as defined in this plan.

Knowledge Assessment

Apprentices will be required to complete a standardised knowledge assessment in the last 6 months that will be administered and marked by an independent examiner. The assessment will be paper-based, containing 20 scenario based, short answer questions. The scenarios are based on the 4 knowledge test areas identified in annex A. The test will have 5 questions for each of these 4 topic areas and will test both safety critical elements and technical breadth/depth of understanding. Safety critical questions will necessitate a correct answer to achieve a pass. The questions will be determined and standardised by assessment organisations in consultation with employers.

The test will last a maximum of 2.5 hours. It will be taken by the apprentice under examination conditions. The invigilator may be sourced from the employer but will be approved by the assessment organisation and act under their guidance.

The test will be marked by an independent examiner appointed by the assessment organisation, following a marking guide produced by the assessment organisation. The independent examiner must hold an HNC/HND level electrical engineering qualification at Level 4 or equivalent and have a minimum of 5 years specific commissioning, decommissioning and protection experience. In addition they must be independent i.e. not have been directly involved in the training or management of the apprentice.

A pass will be a minimum of 65% and at least 2 correct answers out of the 5 for each question area. Distinction for this element will be awarded to those with 90% or above. The outcome of the knowledge assessment will be submitted to the final decision panel.

The marking of the independent examiner will be subject to moderation by the assessment organisation.

Technical Interview

In the last 6 months of the apprenticeship, a technical interview based on a review of the apprentice's work log will be conducted by a technical expert accompanied by an independent assessor.

The work log, compiled throughout the apprenticeship and finalised during the end-point period, must be sufficient to evidence the apprentice can apply skills, knowledge and behaviours required as indicated in annex A. Progress review documentation should also be included. The apprentice's Manager/Mentor will typically support the development of the work log in accordance with company policy and procedures, although the assessment organisation will provide guidance on the content of the work log.

The technical interview will typically last 2 hours, but no more than a maximum of 3 hours. This interview will be conducted under controlled conditions. It will cover the knowledge, skills and behaviours in relation to five question areas. Assessment organisations will provide standardised questions in relation to the question areas identified in Annex A. The technical expert conducting the interview may, if required, include follow-up questions to probe for further clarification as necessary.

There will be a maximum of 100 marks available for the technical interview. Criteria for assessing the technical interview is shown in table 1.

The technical expert and independent assessor will be appointed by an assessment organisation. Technical experts must be able to demonstrate an appropriate level of electrical competence i.e. HNC/HND level electrical engineering qualification at Level 4 or equivalent and a minimum of 5 years' experience as a practitioner in this work environment. Due to the small number of technical experts in the industry assessment organisations may need to appoint a technical expert from within the apprentice's own organisation or someone who may be known to the apprentice. For this reason they are accompanied by an independent assessor. Independent assessors must hold an assessor qualification i.e. A1/A2 awards. The assessor must be independent i.e. not have been directly involved in the training or management of the apprentice. The independent assessor's role is to ensure consistency and validity of the technical interview in line with an assessment organisation's policies and processes.

The candidate responses will be documented by the technical expert during the interview. Following the interview the technical expert will assign a preliminary mark. The independent assessor will countersign the documentation if they are satisfied that the interview was conducted in line with assessment organisation guidance and forward to the final decision panel. If no agreement is reached, the assessment organisation will appoint an arbitrator to review the evidence from the technical interview and assign a preliminary mark.

Assessment organisations will provide the template upon which to record the answers and preliminary mark awarded. The interview will be subject to moderation by the assessment organisation.

Practical Observation

Apprentices will complete a practical activity in the last 6 months, assessed by a technical expert. The duration will typically be 1 day. The actual time will be based on the comparable time a competent worker in the industry would take to achieve successful task(s) completion.

This observation will provide the opportunity for the apprentice to synoptically demonstrate core and specific skills, knowledge and behaviours as detailed in annex A, in a working environment. This will offer the opportunity to bring together and apply their learning. Apprentices can expect to be assessed on a range that could include:

- testing, commissioning and maintenance activities on a range of electrical power systems and equipment which may include transformers, switchgear, conductors, battery systems and ancillary equipment
- undertake protection testing, commissioning and maintenance activities involving functionality testing and the injection of currents and voltages into high voltage equipment and their associated protection and control systems to simulate the range of fault conditions and scenarios that can occur on the electrical system
- the use of appropriate range of test equipment to verify protection and control settings and ensure correct installation and operation of modern microprocessor and numerical based protection as well as older electromechanical relays.
- taking appropriate actions to ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system.

The apprentice will be asked questions to confirm their understanding of the rationale for actions taken and the choices made to complete the tasks. The questions will be devised by an assessment organisation depending on the practical observation. The technical expert may, if required, include follow-up questions to probe for further clarification as necessary. Assessment organisations will provide a template upon which to record the observation and any questions and answers.

The technical expert for the observation, is also a member of the final decision panel. They will present the observation outcomes to the final decision panel. The final decision panel will assign the mark for the observation. A maximum of 100 marks are available to contribute towards the overall grade. Criteria for marking the practical observation is shown in table 1.

The technical expert may or may not be the same technical expert that conducted the interview. The technical expert will be appointed by the assessment organisation. Technical experts must be able to demonstrate an appropriate level of electrical competence i.e. HNC/HND level electrical engineering qualification at Level 4 or equivalent and a minimum of 5 years' experience as a practitioner in this work environment.

Due to the small number of technical experts in the industry assessment organisations may need to appoint a technical expert from within the apprentice's own organisation or someone who may be known to the apprentice. During the observation the apprentice is likely to be working on a live electrical network up to 400KV, they will do so under the personal supervision of the technical expert. The technical expert must therefore hold the appropriate safety rule authorisation to undertake the activities described in the practical observation and be authorised by the organisation that owns the premises where the observation is being conducted. Authorisations are required in accordance with the Health and Safety at Work Act and the Electricity at Work Act which form the legal basis for industry safety rules. Authorisation requirements prevent the technical expert being accompanied by an independent assessor.

Assessment organisations will monitor technical experts undertaking observations through examination of documentation on a risk sampling basis.

Re-takes/Re-sits

All apprentices would be offered the opportunity to re-takes/re-sit. However, this will only be available to apprentices who fail an end-point assessment element(s) i.e. they are not offered to apprentices wishing to move from pass to distinction. Apprentices may re-take/re-sit one or more elements within the six month end-point assessment period. Re-take/re-sits outside of the six-month end-point assessment period would require all elements to be re-assessed. Re-sits/re-takes will not be awarded a grade higher than pass. Apprentices should have a supportive action plan to prepare for the re-take/re-sit. Further re-takes/re-sits would be at the discretion of the employer following a 1:1 review with the apprentice to determine the suitability of the apprentice for further testing.

Final Decision Panel

The role of the final decision panel is to assign the mark for the observation following a presentation of the observation evidence by the observation technical expert. They will check and confirm marks awarded for the knowledge test and interview. They will then combine the results of three assessments and assign the overall apprenticeship grade, based on the grading requirements detailed below**.**

Assessment organisations will appoint final decision panels consisting of three people:

- Technical expert who has undertaken the observation
- Technical expert independent of the apprentice and their employer i.e. not from their employer or training provider and with a background in commissioning and protection
- Another member independent of the apprentice and their employer with appropriate electrical technical experience or a representative from a relevant professional body.

One of the independent panel members must act as chair of the panel and will have the casting vote. The technical expert who conducted the observation cannot chair the panel under any circumstances. Therefore, someone independent of the apprentice and their employer will always determine the grade awarded.

Assessment organisation moderators will co-ordinate the final decision panels and observe and intervene where necessary to ensure they are operated in accordance with the guidance, ensuring comparable decisions consistently applied across panels and over-time.

Roles and Responsibilities of Assessment Organisation Appointed Staff

Independent examiner	Marks knowledge assessment
Technical expert	Conducts and records observation Conducts and preliminary marks interview in conjunction with assessor Final decision panel member
Independent assessor	Preliminary marks interview in conjunction with technical expert
Independent technical expert, independent employer/professional body representative	Final decision panel members; one of whom is chair and has final decision making powers
Moderators	Undertake assessment organisation internal quality assurance

Grading

The apprenticeship will be graded distinction, pass or fail. The final grade will be determined by collective performance in the three assessment tools in the end-point assessment. The weighting of the apprenticeship is 40% on the technical interview, 40% on practical observation and 20% on the independent knowledge assessment. A points system will determine if the apprentice has achieved a distinction, pass or fail and is described below:

Distinction – is a minimum of 22.5 points e.g. 10 points technical interview + 10 points practical observation + minimum of 2.5 points knowledge assessment. Where an apprentice has re-taken the knowledge test, they cannot, regardless of the outcome of the re-take and other assessment tools, achieve a distinction.

Pass – a minimum of 12.5 points e.g. 5 points technical interview + 5 points practical observation + 2.5 points knowledge assessment. An apprentice, to achieve an overall pass grade, must achieve a minimum of pass in all aspects of the end-point assessment i.e. they cannot fail one element.

Technical Interview	Points	Grade	Practical Observation	Points	Grade	Assessment %	Points	Grade
85-100	10	Distinction	85-100	10	Distinction	90 – 100	5	Distinction
70-84	5	Pass	70-84	5	Pass	65 – 89	2.5	Pass
≤69	0	Fail	≤69	0	Fail	≤64	0	Fail

TABLE 1

The following table outlines the scoring criteria that will be applied for each assessment method; detailed guidance will be developed by assessment organisations in conjunction with employers.

Annex A shows which elements of the standard will be assessed by each assessment method within the end-point assessment.

In order to be a competent worker all pass criteria needs to be achieved and distinction criteria is in addition

End-point Element	Distinction Criteria	Pass Criteria	Fail Criteria
Technical Interview (100 marks)	**Distinction (85-100)** • Accurately and confidently describes the range of impact of their actions on the plant, equipment and electricity network as a whole and justifies their course of action • Using appropriate engineering theories and principles, justifies their approach to undertaking activities and achieving successful outcomes	**Pass (70-84)** • Provides correct information to describe their understanding of skills, knowledge and behaviours required to undertake their role competently, meeting technical experts requirements, with particular emphasis on: • the application and operation of plant and equipment for the job role • takes ownership of their work and that of others to achieve successful outcomes	**Fail ≤69** • Fails to provide sufficient evidence to meet skill, knowledge and behavioural requirements

Practical Observation (100 marks)	**Distinction (85-100)** • Consults and involves, appropriately, people from team and other areas to capitalise on different skills, perspectives, experience and knowledge • Through positive relationships is able to actively address conflict with positive outcomes • Transmits difficult information in an understandable manner. • Assess the impact of problem situations. Seeks out and attempts to solve root causes of problems • Skilled in assessing impact in different approaches, gathers and analyses information to support course of action. Makes suggestions for improvement • Identifies priorities and actively supports others to meet priorities. Communicates progress to others	**Pass (70-84)** • Achieves practical activities as described in Annex A and meets the expectations of technical experts • Effectively contributes to team success, and suggests valid ideas • Speaks confidently when asked, listens to others and takes required action • Presents all information in a clear and concise manner to sufficient depth for the audience • Recognises and defines problems associated with the job. Tackles issues in a step by step logical way. Makes suggestions for resolution • Chooses and follows appropriate policy and procedure. Recognises and chooses appropriate course of action depending on the situation • Delivers to agreed deadlines and offers some support to	**Fail ≤69** • Fails to provide sufficient evidence to meet skill and behavioural requirements
Knowledge Assessment (100 marks)	Score 90% and Above	Score 65-89%	Score ≤64%

Assessment Organisations

The model involves greater employer leadership in the apprenticeship development, implementation and operation, whilst maintaining a high level of scrutiny and assurance within a quality framework.

All assessment organisations must be on the Skills Funding Agency's Register of Apprentice Assessment Organisations (RoAAO) and work collaboratively to ensure standardisation in delivery of assessment services for the standard e.g. hold cross-organisation standardisation events.

Assessment organisations will:

- provide end-point assessment guidance to apprentices, employers and training providers in relation to the requirements of the practical observation, technical interview/work log, marking of the end-point activities
- ensure the independent examiner, assessor and technical experts make consistent and reliable assessment and preliminary grade judgements through observations and examination of assessment records on a risk sampling basis, i.e. a minimum of 20% for experienced assessors and 100% for new assessors or where inconsistencies have been identified. Furthermore moderators will observe final decision panels to ensure they are conducted fairly and consistently.
- develop knowledge assessments to meet the needs of each specialised role. Assessment organisations must consult with representative technical experts when developing the knowledge assessment. Assessment organisations must ensure that there is consistency and comparability in terms of the breadth and depth of each knowledge assessment, to ensure assessments are reliable, robust and valid and ensure competency accord across the industry
- develop compensatory assessment for learners with special requirements to allow reasonable adjustments to be made to assess the knowledge, skills and competence of the apprentice through alternative assessment techniques. Whilst, these will remove barriers to participation, they must be designed to ensure judgements are not compromised to health and safety and legal requirements
- appoint and approve technical experts and assessors for the purposes of conducting the practical observation and technical interviews, marking and initial grading, based on check of knowledge and experience
- provide training for independent examiners, technical experts and assessors in terms of the requirements of the operation and marking of the assessment tools and initial grading
- provide training for independent examiners, technical experts and assessors in undertaking fair and impartial assessment and making judgements about performance and the application of knowledge and behaviours within a workplace setting
- appoint and approve technical experts, employer representatives and/or professional body representatives participating in final decision panels based on knowledge skills and experience
- provide documentation and guidance in relation to the final decision panel guidance and documentation i.e. making reasonable adjustment, eligibility to enter end-point assessment and conflict of interest
- hold bi-annual standardisation events for independent examiners, technical experts, assessors and panel members to ensure consistent application of the guidance

- ensure assessment organisation moderation staff are trained in assessment and assurance processes and undertake regular continuing professional development
- develop and manage a complaints and appeals procedure.

External Quality Assurance

External quality assurance for this apprenticeship standard will be managed by the Institute for Apprenticeships.

Professional Body Recognition

The Institution of Engineering and Technology (IET) has supported the development of the apprenticeship standard and assessment plan. The current edition of the UK Standard for professional engineering competence (UK-SPEC) has been used as a guide throughout. The continuing support and guidance of this professional institution will ensure the apprentices who qualify, hold eligibility for registration as Engineering Technicians (EngTech).

This apprenticeship is designed to prepare the graduating apprentice to meet the standard required for the registration level of Engineering Technician as defined by the UK Standard for Professional Competence and may do so by submitting an application to their chosen Professional Engineering Institution.

Employers in the sector recognise the greater opportunity of continuing career development post-apprenticeship that professional registration offers. They are confident that retention and development of highly skilled apprentices will be enhanced by Engineering Technician registration as it will encourage the employee to identify opportunities for career progression and take responsibility for their own professional development.

Implementation

Affordability

The initial, indicative end-point assessment costs are expected to be in the region of 9% of the total external apprenticeship costs. The standardised approach will ensure affordability.

Manageability/Feasibility of the Standard and Assessment Plan

It is expected that there would be in the region of 30 new starts initially and approximately 20 starts in subsequent years.

Approved assessment organisations will, with employers, need to undertake work to develop the detail of the end-point assessment.

Annex A - Assessment Method by Element of the Standard –

Electrical Power Protection and Plant Commissioning Engineer

KT	Knowledge Test
TI	Technical Interview
PO	Practical Observation

Core Technical Knowledge	EPA
A comprehensive understanding of electrical power systems	KT & TI
Detailed understanding of the application/operation of relevant plant & equipment	TI
Fault analysis methods in order to interpret results	TI
How high voltage power generation, transmission and distribution plant & equipment operates	TI
Understands protection, control and telemetry equipment and the impact on the electrical network of its operation	KT & TI
Understands commissioning and testing procedures & processes	TI
Understands failure mode(s) of plant and equipment and the impact on the electrical network and the knowledge to identify required remedial actions	TI
Understands high voltage electrical network operations and topologies	KT & TI
Understands high voltage safe systems of work and risk management	TI
Understands the application of Electricity Supply Standards, regulations and policies	KT & TI
Understands test equipment to select appropriate equipment for commissioning	TI

Core Requirements Skills	EPA
Applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant & equipment	PO, TI
Demonstrate application of safe working practices in line with company processes and legislative requirements	**PO, TI**
Uses a range of appropriate test equipment to confirm the suitability of the high voltage plant for conformity and operational service	**PO, TI**
Accurately reads and interprets a wide range of engineering diagrams and drawings	**PO,**
Prepares and checks technical reports	**TI**
Effectively communicate with others to confirm that the tests meet the required standards/specifications	**PO**

Core Requirements - Behaviours	EPA
Team working: safely working as a member of a team to achieve required outcomes within time, cost, quality and budget constraints	**PO**
Interpersonal skills: able to relate to people at all levels and take others' views into account to ensure the best possible outcome	**PO**
Communication: confident and effective communicator both verbally and in writing ensuring that all parties understand	**PO**
Problem solving: pro-actively identifies and solves problems, within personal area of expertise, by using a logical and systematic approach	**PO, TI**
Methodical: identifies and applies procedures and processes as appropriate to the situation	**PO, TI**

Ownership: takes personal responsibility for the work of themselves and others under their control	**PO**

Specific Plant Skills	EPA
Undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment	**PO, TI**

Specific Protection Skills	EPA
Undertakes functionality testing and the injection of currents and voltages into high voltage equipment and their associated protection and control systems to simulate the range of fault conditions and scenarios that can occur on the electrical system	**PO, TI**
Uses appropriate test equipment to verify protection and control settings and ensure correct installation and operation of modern microprocessor and numerical based protection which may include older electromechanical relays.	**PO, TI**
Ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system	**PO, TI**