ENERGY & UTILITIES
INDEPENDENT
ASSESSMENT SERVICE

EPA Specification

Level 4 End-point Assessment for Electrical Power Protection and Plant Commissioning Engineer

ENERGY & UTILITIES INDEPENDENT ASSESSMENT SERVICE

Contents

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 1 – Introduction

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

About the Energy and Utilities Independent Assessment Service (EUIAS)

The EUIAS is an independent End-point Assessment organisation (EPAO) approved by the Education and Skills Funding Agency (ESFA) (number EPA0009) to offer and carry out the end-point assessments (EPA) for the Level 3 Electrical Power Protection and Plant Commissioning Engineer Apprenticeship Standard (ST0157). This specification relates to assessment plan ST0157/AP02.

The EUIAS was established in 2014 and is part of Energy & Utility Skills Limited. The EUIAS delivers rigorous and robust apprenticeship end-point assessment services for the energy and utilities sector, and for technical and safety-critical sectors. In May 2016, The EUIAS became the first end-point assessment provider to have achievers on the English Trailblazer apprenticeship standards.

About End-point Assessment

End-point assessment is the term given to the assessments taken by apprentices at the end of their apprenticeship, and which must be passed in order for the apprentice to be awarded a certificate of achievement. Apprentices must be trained by training providers approved by the ESFA and their end-point assessments must be carried out by an EPAO approved by the ESFA. The assessment is designed, delivered, assessed and quality assured by the EPAO, with further external quality assurance provided by an external quality assurance (EQA) provider.

The EPA typically consists of three assessment components each of which must be passed in order to achieve an overall pass. For the Electrical Power Protection and Plant Commissioning Engineer standard, the assessments are a Knowledge Assessment, a Technical Interview and a Practical Observation.

End-point assessment is based on two documents that have been written by an employer group – the Standard and the Assessment Plan, both of which can be found on the website of the Institute for Apprenticeships and Technical Education, www.instituteforapprenticeships.org.

The EPAO designs the assessments to cover the standard, while complying with the assessment plan. It is important for training providers supporting apprenticeships:

- to ensure their training programmes cover all the elements required by the standard
- to have access to suitable premises, plant, machinery and equipment for the practical observation

How to Use this EPA Specification for Electrical Power Protection and Plant Commissioning Engineer

Welcome to the EUIAS EPA Specification for the Electrical Power Protection and Plant Commissioning Engineer (EPPPCE) Apprenticeship Standard.

The EUIAS internally quality assures all end-point assessments in accordance with its IQA process and IfATE requirements. This standard is externally quality assured by Ofqual on behalf of the IfATE.

This Specification is available from the EUIAS website (www.euias.co.uk) as a complete document, and also in its individual sections to allow customers to download what they require. **Important: the web site will always contain the latest version of this document so please check back to ensure you are using the latest version.**

This Specification outlines what you need to know about the end-point assessments for this standard and provides details of the on-programme delivery requirements. It provides advice and guidance for trainers on how to prepare apprentices for the end-point assessment.

The Specification provides end-to-end details of the how the EUIAS works with customers, from initial engagement to the completion of end-point assessment.

Audience:

Section 2 will be of interest mainly to the external quality assurance body to ensure the assessment methods cover the standard.

Section 3 will be of interest mainly to administrators and those responsible for planning and scheduling end-point assessments.

Section 4 will be of interest to those ensuring that apprentices have covered all the required elements of the standard during their apprenticeship, and to apprentices themselves.

Sections 5 and 6 will be of interest to those who support apprentices in preparing for the end-point assessments, and to apprentices themselves.

At a glance

Apprenticeship standard: Electrical Power Protection and Plant Commissioning Engineer

Assessment Plan: ST0157/AP02

QAN 603/7290/4

Level: 4

On-programme duration: Typically, 36 months, with end-point assessment taking place in the last six months

Grading: Fail/Pass/Distinction

End-point Assessment methods:

- Knowledge assessment
- Technical interview, based on a work log compiled during the apprenticeship
- An observation of practical work activities

Quality Assurance:

Quality assurance of the end-point assessment is designed in accordance with the Assessment Plan. The main features of EUIAS quality assurance are:

- Assessments carried out by
  - an Independent Assessor for the interview
  - an employer Technical Expert for practical work activities
- Ongoing internal quality assurance
- Moderation and final grading carried out by an employer Final Decision Panel acting on behalf of EUIAS.

External quality assurance is provided by Ofqual.

In this guide, you will find:

- Detailed amplification and guidance of the standard and guidance on how to prepare the apprentice for gateway
- Detailed information on which part of the standard is assessed by which assessment method
- A section focused on the end-point assessment method where the assessment criteria are presented in a format suitable for carrying out practice assessments
- Suggestions on how to prepare the apprentice for each part of the end-point assessment
- A practice test that you can use with apprentices.

Is this the right standard for you?

The Electrical Power Protection and Plant Commissioning Engineer standard has been designed by the trailblazer group of employers for EPPPC engineers who will work across the electrical power sector in power generation, power transmission and power distribution.

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.'

A large part of the assessment activity is the observation of practical work activities where the apprentice competently demonstrates their skills required to perform their job role. It is important that the setting provides the opportunity to cover all the requirements of the standard. It is essential that the employer and provider check that they have the right site with the right opportunities for the apprentice to cover all the requirements of the assessment. The apprentice will not be assessed on the job that they do but on the requirements of the standard.

Purpose

This EPPPC Engineer End-point Assessment provides evidence that can be used to show and secure the confidence of others that the apprentice has acquired, the skills, knowledge and understanding which confirms their ability to perform functions of an occupational role to the standards required. It provides evidence of apprenticeship competence, for example, to clients/customers or to their employer to allow them to progress within their career

Standard overview

The EPPPC Engineer works within strictly defined processes and procedures to exacting standards. Any Electrical Power Plant & Equipment and Protection System requires testing and commissioning to confirm that the installation and operation of new and refurbished protection plant & equipment comply with manufacturers' specifications, company procedures and the operating parameters.

EPPPC engineers will work with other engineers to install, conduct tests and commission protection systems and prove the integrity of other power system plant & equipment. They will be responsible for testing and commissioning on electrical power projects and ensure that the work is conducted safely and, reliably, meeting customer, quality, time and budget requirements.

The apprentice would be expected in their job role to:

- apply sound engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission & distribution plant & equipment
- apply safe working practices in line with company processes and legislative requirements
- use of a wide range of test equipment to confirm the suitability of the high voltage plant for conformity and operational service
- accurately read and interpret a wide range of engineering diagrams and drawings
- prepare and check technical reports
- effectively communicate with others to confirm that the tests meet the required

standards/specifications.

Additionally, specific plant skills include

- undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment.

Specific protection skills include

- 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
- use appropriate 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
- ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system.

On-programme requirements

The employer or training provider should ensure that they have developed and can deliver a programme of training and learning that will enable the apprentice to develop the knowledge, skills and behaviours that will be assessed as part of this standard. The programme must cover all the knowledge, skills and behaviours of the standard.

The planning, organisation and delivery of the on-programme element of the apprenticeship is the responsibility of the employer or training provider and it is their responsibility to ensure they are compliant with all applicable regulations.

For all roles it is recommended that throughout the period of learning and development, and at least monthly the apprentice should meet with their training provider or employer to record their progress against the standard. At these reviews, the employer should:

- set learning and development goals
- track the apprentice's progress
- coordinate 20% of the apprentice's time being spent in off-the-job training.

The employer must satisfy themselves that the apprentice:

- has developed and demonstrated the knowledge, skills and behaviours as specified in the standard
- can successfully demonstrate their ability to work safely and competently as an EPPPC Engineer.

Once the apprentice is deemed competent, the relevant section(s) of the standard should be signed off by the on-programme assessor and employer.

Readiness for end-point assessment

The apprentice must satisfy all requirements of the final gateway before entering end-point assessment:

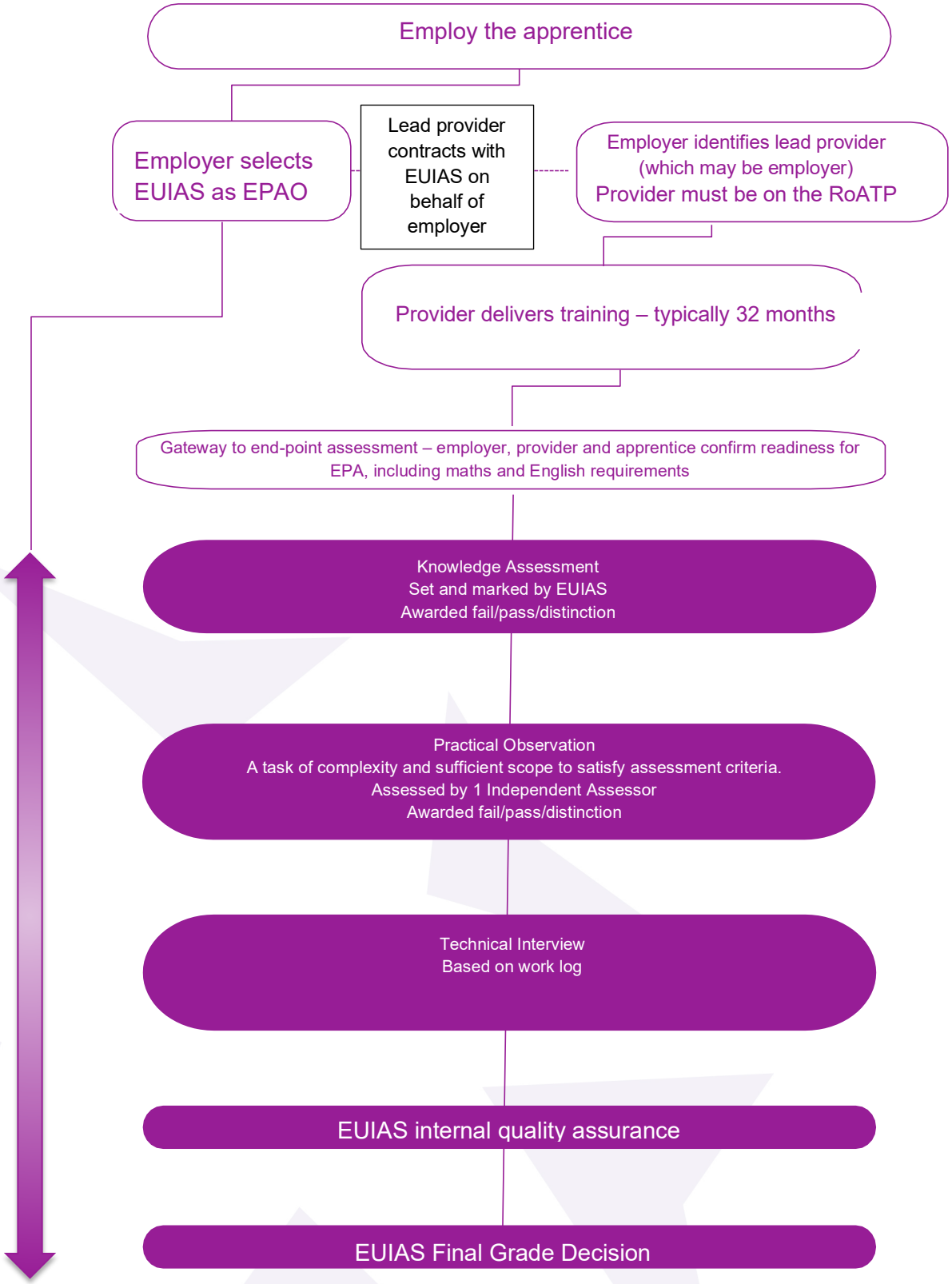
- Achieved English and maths at level 2 (or equivalent) or higher
- Satisfactory completion of a formal training plan agreed with the apprentice by the employer
- Sufficient evidence in the form of a work log to allow the apprentice to consistently demonstrate skills, knowledge and behaviours as described in the standard
- The employer, training provider and apprentice must be confident that the apprentice has developed all the knowledge, skills and behaviours defined in the apprenticeship standard. To ensure this, the apprentice must attend a formal meeting with their employer to complete the Gateway Eligibility Report
- The apprentice and the employer must engage with the Service Delivery team at EUIAS to agree a schedule for each assessment activity to ensure all components can be completed within a 6-month assessment window. Further information about the gateway process in Section 3
- The employer, training provider and apprentice must be confident in ensuring that all EPA assessment completed documentation is uploaded to the EUIAS system as instructed by the Service Delivery Team

Order of end-point assessments

The end-point assessment for EPPPC Engineers uses the following assessment tools:

- Knowledge Assessment
- Technical interview, based on a work log compiled during the apprenticeship
- An observation of practical work activities.

The end-point assessment takes place in the last 6 months. There is no prescribed order of the assessments. EUIAS recommend that the Knowledge Assessment is completed first and the technical interview completed last.



Overview of the EPA process – EPA-related activities in purple

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 2 – Mapping the Standard

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

Purpose

The purpose of this section is to introduce the elements of the standard and the referencing system used by the EUIAS. It provides and 'at-a-glance' view of which parts of the standard are assessed by which assessment method.

The Standard

The standard is divided into Knowledge, Skills and Behaviours, plus specific skills.

Technical Knowledge:

EPPPC Engineers will have

TK1 a comprehensive understanding of UK electrical power systems

TK2 a detailed understanding of the application/operation of relevant plant & equipment

TK3 fault analysis methods in order to interpret results

TK4 how high voltage power generation, transmission and distribution plant & equipment operates

TK5 protection, control and telemetry equipment and the impact on the electrical network of its operation

TK6 commissioning and testing procedures & processes

TK7 failure mode(s) of plant and equipment and the impact on the electrical network and the knowledge to identify required remedial actions

TK8 high voltage electrical network operations and topologies

TK9 high voltage safe systems of work and risk management

TK10 the application of Electricity Supply Standards, regulations and policies

TK11 test equipment to select appropriate equipment for commissioning

Core Skills

The EPPPC Engineer, working autonomously, will:

S1 apply sound engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission & distribution plant & equipment

S2 apply safe working practices in line with company processes and legislative requirements

S3 use of a wide range of test equipment to confirm the suitability of the high voltage plant for conformity and operational service

S4 accurately read and interpret a wide range of engineering diagrams and drawings

S5 prepare and check technical reports

S6 effectively communicate with others to confirm that the tests meet the required standards/specifications

Specific Plant Skills

PL1 undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment

Specific Protection Skills

PR1 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

PR2 use appropriate 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

PR3 ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system

Behaviours

B1 Team working: safely working as a member of a team to achieve required outcomes within time, cost, quality and budget constraints

B2 Interpersonal skills: able to relate to people at all levels and take others' views into account to ensure the best possible outcome

B3 Communication: confident and effective communicator both verbally and in writing ensuring that all parties understand

B4 Problem solving: pro-actively identifies and solves problems, within personal area of expertise, by using a logical and systematic approach

B5 Methodical: identifies and applies procedures and processes as appropriate to the situation

B6 Ownership: takes personal responsibility for the work of themselves and others under their control

The Knowledge, Skills and Behaviours statements are assessed in the End-point Assessment elements as follows.

Knowledge Assessment	Knowledge (TK1, TK5, TK8, TK10)
Technical Interview	Knowledge (TK1, TK2, TK3, TK4, TK5, TK6, TK7, TK8, TK9, TK10, TK11)
	Skills (S1, S2, S3, S5, PL1, PR1, PR2, PR3)
	Behaviours (B4, B5)
Practical Observation	Skills (S1, S2, S3, S4, S6, PL1, PR1, PR2, PR3)
	Behaviours (B1, B2, B3, B4, B5, B6)

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 3 – Service Delivery and Gateway Eligibility

- EUIAS Service Delivery
- How to prepare for gateway
- The Gateway meeting
- Timeline

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

EUIAS Service Delivery

Whether you are an employer or a training provider (or both) your initial engagement will probably be with a business development manager who will introduce you to this document and take you through the EPA service that we offer. Our aim is to make the experience as straightforward and easy to engage with as possible.

The key to a successful EPA experience is early identification of requirements to enable proper planning to take place and this section explains the requirements for preparing for the Electrical Power Protection and Plant Commissioning Engineer (EPPPCE) EPA.

> All the requirements discussed below are important, but some of them are critical, in particular the Gateway Eligibility Requirements. It is important to note that the end-point assessments cannot proceed without the Gateway Eligibility requirements being met. A completed Gateway Eligibility Report with supporting documents is required for each apprentice before EPA.

The EPA Window

All end-point assessments have a 'window' during which the end-point assessment must be completed, to avoid apprentices 'timing out'. The EPA window for the EPPPCE standard is 36 - 42 months. The EPA window for each apprentice commences on the date they take the first element of their EPA. This will be the day of the Knowledge Assessment. Typically, all EPA activities must be completed within this 32 – 36 month window and EUIAS will work with you to schedule the EPA as close to the beginning of the window as possible to allow for re-sits if necessary.

Service Level Agreement (SLA) and Cohort Registration Form

EUIAS uses three documents to capture the details of the end-point assessment agreement:

- Service Level Agreement form – signed by employer
- Cohort Registration form – signed by employer; this form identifies the apprentices in the cohort
- Learner Data Form

An EPAO Appointment form must also be completed by the employer or the employer/provider.

Initial Engagement

Initial engagement with EUIAS will usually take place well before the EPA is due to take place and sometimes before the apprentices start their programme. The initial engagement meeting will cover:

- The numbers of apprentices in the cohort
- Any Reasonable Adjustments you want to apply for
- The expected date(s) of EPA
- The employer or lead provider for each apprentice
- Completion of the Service Level Agreement

- The Knowledge Assessment – where it will take place and who will invigilate
- The Interview – where it will take place and how the work log will be shared with EUIAS
- Compilation of the work log that is reviewed during the Interview – what to put in it and how to signpost it
- The Practical Observation - where it will take place

Further details of the assessment methods are in Section 5 of this EPA Specification.

The EUIAS operates a two-stage payment schedule:

- Stage One applies at the registration stage when the initial registration fee is due
- Stage Two applies at Gateway, when the balance of the agreed fee is due

During the initial engagement, we will also cover the support that is available for the employers and or training providers. We are confident that most, if not all the answers you need are contained within this Specification, but we are always available to provide answers to specific queries using the Help Desk email enquiries@euias.co.uk

Appointment and Registration

The appointment stage is the first formal stage of working with EUIAS. This stage must involve both the employer and the training provider (if applicable).

Successful appointment involves the completion of the Cohort Registration Form, officially appointing EUIAS as the EPAO for this cohort. The form contains

- Details of the training provider (if applicable)
- Confirmation of learner numbers and names
- Confirmation of expected EPA dates
- Confirmation of the level of service agreed with EUIAS, with pricing
- Confirmation that you will give a minimum of three months' notice of apprentices being ready for EPA (especially important if you bring forward the completion date)
- Signatures from both the employer and the training provider (if applicable)
- A purchase order from the lead-provider to EUIAS to the value agreed

If it has not already taken place, the details of the EPA will be discussed (as described in the Initial Engagement Section above) with the employer and training provider (if applicable) to agree roles and responsibilities.

On Programme

It is the responsibility of the training provider to create and deliver the apprentice training programme, ensuring you comply with the relevant ESFA rules. The EUIAS has no formal involvement in the 'on-programme' aspect of the apprenticeship. However, we DO provide guidance on how to put together the work log that is required for the Technical Interview. This can be found in Section 5.

We do appreciate that circumstances change so please notify us if:

- expected end-dates change, giving at least three months' notice of readiness for end-point assessment
- any cohort details change, especially if an apprentice drops off the programme
- any anticipated changes in venues for the end-point assessments.

Scheduling the end-point assessment

The EPA for EPPPCE is very resource intensive, both in terms of availability of specialist settings for the Practical Observation and in terms of availability of the specialist assessors that are required. The apprentices must be available for all assessments. Employer, training provider and EUIAS must keep in touch and notify each other of any changes as soon as they occur.

To help things run smoothly, you must inform EUIAS between 3 and 6 months before you expect to have your Gateway meetings with the cohort. The EUIAS Service Delivery team will be contacting you during this time, to facilitate two-way communication. Your proposed EPA date may be sooner than was originally anticipated at the time of registration, which is OK so long as the apprentice(s) has been on programme for at least a year.

We cannot confirm any EPA arrangements until we have confirmation of Gateway Eligibility Report, as discussed in the next section, but we will put together a provisional plan and share it with you. As a customer, you probably want to confirm Gateway Eligibility Report on one day and have the first end-point assessments the next day. The reality is that scheduling takes time and can take varying periods of time. The early notification helps us put together a provisional schedule, but we can only confirm it after Gateway Eligibility Report requirements are all met. The fewer changes you make to the information you give us three months before Gateway, the sooner it will be before we can start the EPA. We too commit to making last-minute changes as rare as possible.

We always aim to accommodate your requirements when scheduling, taking account of availability of apprentices, location and availability of assessment venues, availability of assessors and also ensuring that we have evidence of the pre-requisites.

As soon as possible after Gateway, EUIAS will confirm with you the end-point assessment arrangements for each apprentice in the cohort.

We will always try to schedule as soon as possible within the 6-month window, to allow time for any re-sits before the window closes.

How to prepare for gateway

On completion of their on-programme learning apprentices should be ready to pass through 'gateway' to their end-point assessment.

At this point, the employer, training provider and apprentice should hold a Gateway Eligibility meeting. The purpose of this meeting is to confirm that all parties agree the apprentice has met the requirements of the apprenticeship standard and is ready for end-point assessment. Note that the EUIAS is NOT present at this meeting. It is your sole responsibility to assure yourself, along with the training provider (if applicable) that the apprentice is ready for end-point assessment.

You are advised that the apprentice should prepare for this meeting by bringing along work-based evidence, including:

- evidence of satisfactory completion of their formal training plan
- sufficient evidence in the form of a work log which demonstrates consistent achievement of the skills, knowledge and behaviours as described in the standard.

Before the meeting, apprentices must have achieved:

- Level 2 English
- Level 2 maths.

Apprentices should be advised by employers and providers to gather this evidence throughout their on-programme training, **copies or scans of certificates WILL be required by EUIAS** before the apprentice can start EPA. Typically, the maths and English qualifications will be functional skills qualifications at Level 2 or GCSEs at grade C or above, or grade 4 and above.

It is recommended that employers and providers complete regular checks and reviews of this evidence to ensure the apprentice is progressing and achieving the standards before the gateway meeting is arranged.

The Gateway meeting

To comply with end-point assessment rules, EUIAS is not present at the Gateway meeting. Ideally it would be conducted with the apprentice, training provider and the employer present. Gateway meetings last about an hour and are completed on or after the apprenticeship on-programme end date.

During the meeting, the apprentice, employer and training provider will discuss the different aspects of the apprenticeship standard and confirm that the apprentice has met the full criteria of the apprenticeship standard during their on-programme training. A copy of standard and the assessment plan (ST0157/AP02) should be available at the meeting. This can be accessed via the link below:

Electrical power protection and plant commissioning engineer / Institute for Apprenticeships and Technical Education

In addition, the apprentice should be informed that EUIAS will be conducting the end-point assessment and that copies of the following policies are available on the EUIAS web site at euias.co.uk

- Appeals Policy

- Complaints Policy

A full list of EUIAS policies can be accessed via the link below:

https://www.euias.co.uk/end-point-assessment/policies/

At the meeting, the apprentice should be informed that they are required to have proof of their identity with them for each end-point assessment element. EUIAS will accept the following as proof of identity:

- a valid passport
- a UK driving licence
- a valid warrant card issued by HM forces or uniformed services
- other photographic ID card such as an employee ID card or travel card.

At the meeting, the Gateway Eligibility Report (GER) below must be completed, agreed and signed by all 3 parties* and submitted to EUIAS at enquiries@euias.co.uk with the subject line 'GER – apprentice name – provider name'.

A completed GER form is required for every apprentice entered for end-point assessment.

*Where possible. We recognise that some meetings will take place at distance in which case an email agreement from the apprentice should be appended to the GER form.

The Gateway Eligibility Report is a requirement of EUIAS. If it is not possible to have the employer present at the time the Gateway Eligibility Form is completed by the apprentice and training provider, EUIAS will contact the employer to gain their signature.

Reasonable adjustments

If you wish to apply for reasonable adjustments on behalf of any of your apprentices, please do so at the same time as submitting the GER form, using the EUIAS Reasonable Adjustment Policy and Application that can be found at www.euias.co.uk. This can also be directly accessed via link below

https://www.euias.co.uk/wp-content/uploads/2020/07/Reasonable-Adjustments-Policy-and-Application-v5.0.pdf

Re-sits and Re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a resit or a re-take at the employer's discretion.

The apprentice's employer will need to agree that either a resit or re-take is an appropriate course of action. A resit does not require further learning, whereas a re-take does.

Apprentices should have a supportive action plan to prepare for a resit or a re-take.

An apprentice who fails one or more assessment methods, and therefore the EPA in the first instance, will be required to resit or re-take the failed assessment method(s) only.

The timescales for a resit/re-take are agreed between the employer and EPAO. Apprentices may

re-take/re-sit one or more elements within the six month end-point assessment period. All assessment methods must be taken within a six month period, otherwise the entire EPA will need to be resat/re-taken.

Resits and re-takes are not offered to apprentices wishing to move from pass to a higher grade.

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

EUIAS resit and re-take policy can be found at www.euias.co.uk. This can also be directly accessed via link below

https://www.euias.co.uk/wp-content/uploads/2020/02/Re-sit-and-Re-take-Policy-v5.0.pdf

Timeline

Typical timeline in months, before and after the Gateway.

Initial engagement – typically 32 months before Gateway

Initial engagement, informal meeting between EUIAS and to agree:

- The numbers of apprentices in the cohort
- Any Reasonable Adjustments you want to apply for
- Expected location(s) for the Practical Observation
- The expected date(s) of EPA
- The Training Provider
- The payment schedule
- Completion of Service Level Agreement (employer AND lead provider)

Registration - 32 months before Gateway to 6 months before Gateway

The apprentice is on-programme and compiling their work log to support the Technical Interview.

Formal Appointment/registration using the Cohort Registration form (Triggers Stage 1 payment) EUIAS:

- EUIAS will issue the Privacy Notice which must be shared with every apprentice in the cohort

Employer and training provider:

- Confirmation of expected EPA dates
- Confirmation of the level of service agreed with EUIAS, with pricing

- Confirmation that you will give three months' notice of apprentices being ready for EPA
- Completion of the Learner Submission form including each learner in the cohort
- A purchase order from the lead provider to EUIAS to the value agreed

Update calls (as agreed)

- EUIAS will periodically call designated contact to enquire about progress towards EPA
- EUIAS provides on-going support via enquiries@euias.co.uk
- Employer or training provider will give at least 6 months' notice of any proposed change to EPA dates

6 months before Gateway to Gateway

Employer or training provider provides details of Practical Observation to EUIAS i.e. venue, type of plant/equipment

3 months before Gateway to Gateway

- Employer or training provider to compile evidence of meeting eligibility requirements (Level 2 English and maths;)
- Employer or training provider should also be arranging practice assessments for apprentices

Gateway

Employer and training provider:

- Provide completed Gateway Eligibility Report for each apprentice
- Ensure ALL eligibility requirements are met for each apprentice going forward to EPA
- Purchase order for Stage 2 payments

Gateway, and the 6-month EPA window

End-point Assessment window (NB. 6-month window for each apprentice commences on the date of their first EPA activity)

The Knowledge Assessment must be completed first. Our pricing is based on being able to test every apprentice in the cohort at the same time (Knowledge Assessment).

EUIAS:

- Schedule the assessments, in discussion with the employer/training provider
- Provides assessors for all assessment activities (unless otherwise agreed)

- Provides invigilator for Knowledge Assessment (if agreed in the price)
- Arranges re-sits within the 6-month EPA window, if required
- Carries out a final moderation to confirm grading decisions
- Will provide results of EPA with 11 days of final moderation

Employer or training provider:

- Ensures apprentices are briefed and prepared for EPA, including location and timings of assessments
- Ensures apprentices are preparing for the Technical Interview by collating evidence for their work log
- Provides venue for the Knowledge Assessment (and re-sits if required)
- Provides access and details of venue for Practical Observation, as previously agreed with EUIAS

NB. A re-take will be arranged, with the agreement of all parties, for apprentices who have failed an element or elements and are deemed to require further training before being ready for end-point assessment.

Time-line summary for Employers and training provider; refer to previous section for details

32 months before Gateway

- Complete SLA (employer and provider) and Learner submission form
- Completion of Employer Appointment and Cohort Registration form
- Raise purchase order for registration fees (Stage 1 payment)

6 months before Gateway

- Notify EUIAS of any changes to EPA dates
- Confirm arrangements for the practical Observation with EUIAS
- Apprentices completing their portfolio

3 months before Gateway

- Employer/training provider compiling eligibility documents (English/maths) for all apprentices
- Carry out practice assessments with apprentices

Gateway

- Gateway meeting between apprentice, provider and employer to confirm Gateway readiness
- Return completed Gateway Eligibility Report, with required documentation, to EUIAS, one per apprentice

The 3 month EPA window

- Ensure apprentices are available for their EPA activities
- Provide EUIAS with apprentice work logs 2 weeks before interview
- Knowledge Test must be first

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 4 – Amplification and Guidance

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

The Electrical Power Protection and Plant Commissioning Engineer standard in detail

The Electrical Power Protection and Plant Commissioning Engineer consists of:

- Technical Knowledge (11 elements)
- Skills (10 elements)
- Behaviours (6 elements)

The following pages list each of the elements of the standard and additional amplification and guidance from EUIAS on the range and depth expected.

Knowledge: Amplification and Guidance	EPA
TK1 A comprehensive understanding of UK electrical power systems	**KA, TI**
Including: • The range of system voltages found on UK power networks and how they are represented on network diagrams • The types of high voltage apparatus used on power networks and their operational symbols • The types and purpose of network transformers, including typical vector groupings and the methods used for voltage control • The purpose and operational capabilities of network circuit breakers, including their method of operation and typical fault activation sequence • The types of electrical relay used for the protection of power networks, including their operating characteristics and typical settings • The purpose of “electrical discrimination” and the methods and types of apparatus used to achieve it on the network • The requirements and methods used for earthing substations, the dangers which can arise, and the methods used to manage them • The effect of load on the electrical network including the methods and equipment used to monitor and control its effects	

Knowledge: Amplification and Guidance	EPA
• The factors which determine the circuit ratings of network apparatus, including underground cables and operational switchgear	
TK2 The application and operation of system plant & equipment	**TI**
Application of knowledge to: • Influence and / or organise the planning of protection and commissioning projects using company equipment and methodology • Conduct protection and / or commissioning operations on relevant plant and equipment • Gain further technical information / specifications about plant and equipment which is being worked on during projects **Plant and equipment** such as circuit breakers, switchgear, relays, transformers, isolators, resistors **Operations** such as operating cycles, safe isolation requirements	
TK3 Fault analysis methods and how to interpret results	**TI**
Application of knowledge to: • Determine the appropriate fault analysis method/s**,** to use through critical thinking and analysis of the options available • Plan and organise fault analysis operations in a logical and systematic manner for the work to be undertaken • Conduct fault analysis operations, taking ownership of the work and solving problems as they arise in the project • Interpret the results of fault analysis operations to identify and implement solutions to resolve engineering problems **Fault analysis methods** such as pre inspection, visual inspection, physical examination using approved tools/equipment, testing procedures to determine condition of equipment/plant	
TK4 How high voltage power generation, transmission and distribution plant & equipment operates	**TI**
Application of knowledge to: • Plan and organise work projects, using knowledge of the relevant plant and apparatus requirements	

Knowledge: Amplification and Guidance	EPA
• Conduct protection and commissioning operations on relevant plant and equipment during work projects	
TK5 Understands protection, control and telemetry equipment and the impact on the electrical network of its operation	**KA, TI**
Including: • The purpose and methods of the equipment used for unit protection on the network, including knowledge of typical protection schemes, types of relay and their settings, protection zones and the positioning / arrangement of equipment used in the circuit • The purpose and principles of earthing power network systems including the terminology used and the causes and effects of poor / inadequate earthing of systems • The purpose and principles of voltage transformers (VT) and current transformers (CT) in relation to the operation of power circuits, including knowledge of the different uses of CT's and VT's and their characteristics • The function and benefits offered by the remote control of network apparatus via telemetry including the type of systems and equipment used and the advantages and disadvantages • The role of a Commissioning and Protection Engineer working on network protection equipment including their technical duties and responsibilities Application of knowledge, during protection / commissioning projects, to: • Support the planning of work on protection / control / telemetry systems • Influence work decisions and support work conducted on protection / control / telemetry systems	
TK6 Commissioning and testing procedures & processes on high voltage apparatus	**TI**
Application of knowledge to: • Plan and organise commissioning and testing procedures on plant and equipment • Influence and support work decisions made during commissioning and testing operations on plant and equipment	

Knowledge: Amplification and Guidance	EPA
• Identify and resolve technical problems during commissioning and testing operations **Testing procedures** such as ROEP, CB timing test, use of equipment such as CT analysers	
TK7 Failure mode(s) of plant and equipment, their impact on the electrical network and the required remedial actions	**TI**
Application of knowledge to: • Recognise the symptoms and causes of relevant plant / equipment failure, such as RCD burnout, during work conducted on the network • Assess potential impact on the wider network of plant, of equipment failure • Support the analysis for decisions made to undertake remedial work on relevant plant and equipment following failure • Support remedial testing / work conducted on the network	
TK8 Understands high voltage electrical network operations and topologies	**KA**
Including: • The critical factors to take into consideration when commissioning substation Current Transformers (CT''s) and the purpose and method of conducting Primary Injection tests • The typical method and sequence of operations for an auto recloser detecting a fault on the network and the actions should a circuit breaker fail to clear a fault successfully • How substations are controlled remotely using a networked system, identifying the function and benefits offered by telemetry including the type of systems and equipment used • The typical power transformer vector groupings found on power networks and how to identify the different vector groups • The typical operational process undertaken for the safe isolation of a piece of network apparatus, identifying the symbols used to identify apparatus on the network and the responsibilities of persons involved	

Knowledge: Amplification and Guidance	EPA
• The typical tests and checks which should be carried out on a primary substation feeder circuit breaker with overcurrent and earth fault protection to ensure correct operation and the reason for each	
TK9 High voltage safe systems of work and risk management	**x**
Application of knowledge to: • Plan and carry out safe systems of work and risk management procedures relevant to their work projects • Enable recognition of the range of roles and responsibilities of persons involved in implementing and maintaining safe systems of work • Identify and manage risks relevant to their work during projects conducted on the network Safe systems of work such as toolbox talks, checklists, safeguarding equipment, Safety Rules, RAMS, putting people to work & RAMS, Work at height, COSHH, RIDDOR	
TK10 Understands the application of Electricity Supply Standards, regulations and policies	**KA, TI**
Including: • Recognise and implement the requirements of the Electricity at Work Regulations 1989 and the Electricity Safety, Quality and Continuity Regulations 2002 during work projects, identifying the differing responsibilities of persons involved • Recognise the effect and influence the power industry regulator Ofgem has on the planning and operational activities conducted during work projects on the network. Identifying the methods used by the regulator to control price increases and maintain standards • Support the process of the issue, receipt and / or cancellation of a safety document and identification of the responsibilities of the persons involved in the process	

Knowledge: Amplification and Guidance	EPA
TK11 The type and application of test equipment used for commissioning purposes	**TI**
Application of knowledge to: • Plan the use of test equipment and procedures required for protection and / or commissioning work • Conduct relevant test procedures in a logical and methodical manner on plant and / or apparatus for protection and / or commissioning work • Correctly interpret and record in a clear and concise manner test results which have been gained during the testing conducted **Test equipment** such as multimeters, test sets, analysers	

Skills: Amplification and Guidance	EPA
S1 Applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant & equipment	**TI, PO**
Application of knowledge on: • Relevant company engineering processes such as maintenance tests, commissioning procedures	
S2 Demonstrate application of safe working practices in line with company processes and legislative requirements	**TI, PO**
Application of knowledge to: • Relevant company safe working practices, processes, and legislative requirements, such as isolations, NSIs. risk assessment, managing hazards, manual handling, working at height, use of PPE, method statements	
S3 Use of a wide range of test equipment to confirm the suitability of the high voltage plant for conformity and operational service	**TI, PO**
Application of knowledge to: • Use different types of test equipment, for calibration and testing procedures e.g. voltage, polarity, earth loop impedance, to confirm the suitability and conformity of high voltage plant / equipment for operational service • Apply testing procedures and processes in a planned and methodical manner • Correctly interpret the test results • Use test information to make informed decisions and solve problems by using a logical and systematic approach	
S4 Accurately read and interpret a wide range of engineering diagrams and drawings	**TI, PO**

Skills: Amplification and Guidance	EPA
Application of knowledge covering: • A core knowledge of the range and specific use / purpose of a range of **engineering diagrams and drawings** such as tripping diagrams, circuit diagrams, wiring diagrams, layout diagrams, single line diagram, AC & DC schematic diagrams • Ability to use technical engineering diagrams and drawings to plan and organise the work activity	
S5 Prepares and checks technical reports	**TI**
Application of knowledge covering: • A detailed knowledge of the Company reporting methods and processes • The ability to produce and check technical reports in a methodical manner to record and inform the business of work projects • The ability to present technical information from reports in a clear and effective manner to sufficient depth for the audience • A clear understanding of the company process for reporting, amending incorrect and inaccurate technical information when identified	
S6 Effectively communicate with others to confirm that the tests meet the required standards/specifications	**TI, PO**
Application of knowledge covering: • Ability to identify the relevant internal / external stakeholders and the information they need to be given for confirmation of the testing • Ability to communicate both verbal and written information ensuring that all relevant parties understand the information given • Ability to present all information to others in a clear and concise manner and listen and respond to queries / questions • Ability to ensure that recipient/s understand any critical safety / technical information and confirm their understanding where necessary	

Specific Skills: Amplification and Guidance	EPA
Plant Skills	
PL1 Undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment	**TI, PO**
PL1 forms the subject title of a main topic area for discussion in the interview. • A core knowledge of the company testing, commissioning and maintenance procedures relevant to the electrical systems / equipment relevant to their work activity • A clear plan of action to undertake the work operations in a logical manner which considers the resources required for the work • The ability to competently follow the appropriate policy / procedure and implement the work plan to achieve their objectives • The ability to competently deliver the work objectives to meet the agreed deadlines / timescales • The ability to recognise and define potential problems and identifies and solve them in a step by step logical way, where necessary • The ability to take ownership and personal responsibility for the work of themselves and others under their control during the work activity	
Protection Skills	
PR1 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	**TI, PO**

Specific Skills: Amplification and Guidance	EPA
Plant Skills	
PR1 forms the subject title of a main topic area for discussion in the interview. • A core knowledge and understanding of the method and purpose of injection testing on the high voltage equipment • A clear plan of action to undertake testing operations in a logical manner which considers the resources required for the testing operations • The ability to inspect and use the test / injection equipment in accordance with the Company polices / manufacturer's instructions • The ability to identify and apply testing / injection procedures in a methodical manner as appropriate to the situation • The ability to gather and interpret the test / injection results gained to meet the objectives of the testing operation • The ability to record / report the test / injection results gained to meet Company requirements / standards	
PR2 Use appropriate 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	**TI, PO**
PR2 forms the subject title of a main topic area for discussion in the interview. • A core knowledge of the purpose and operation of microprocessor / numerical based protection • A core knowledge of the relevant test procedures and control settings used to verify the correct operation of the protection equipment being worked on • The ability to choose and follow the correct methods / procedures to carry out the installation / testing of protection equipment • The ability to apply the correct methods / procedures to verify the correct control settings / operation of the protection equipment in a methodical manner	

Specific Skills: Amplification and Guidance	EPA
Plant Skills	
• The ability to correctly gather and interpret test results obtained to inform actions taken for the protection system being worked on • The ability to communicate progress to others by recording / reporting the outcome of their installation / testing operations in accordance with Company policies and procedures	
PR3 Ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system	**TI, PO**
PR3 forms the subject title of a main topic area for discussion in the interview. • A core knowledge of how the protection system being worked on interfaces with the associated high voltage equipment and the wider network • A core knowledge of the relevant test procedures and equipment used to verify the correct interface of the protection equipment with the system • The ability to choose and follow the correct methods and procedures to practically achieve the testing / verification of the protection system being worked on • The ability to methodically apply the correct methods and procedures to verify the correct interface of the protection system being worked on • The ability to recognise and tackle technical issues in a step by step logical and methodical way and achieve an effective resolution • Their ability to communicate progress to others by recording / reporting the outcome of their protection operations in accordance with Company policies and procedures	

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 5 – Assessment

- Assessment summary
- Retake and resit information
- Overall grading
    - 5.1 Knowledge Assessment
    - 5.2 Technical Interview
    - 5.3 Practical Observation

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

Assessment Summary

The end-point assessment for Electrical Power Protection and Plant Commissioning Engineer (EPPPCE) consists of three components:

Knowledge Assessment

- The test ensures that the apprentice has acquired the underpinning knowledge to enable them to perform their role. The test consists of 20 scenario based short answer questions to be answered in a 2 ½ hour assessment under controlled conditions. The scenarios are based on the four Knowledge Assessment areas identified in section 4. There will be 5 questions for each of the topic areas.

Technical Interview

- This is a face-to-face interview based on a review of the apprentice's work log. The interview will be expected to last 2 hours, but no more than 3 hours. It is conducted under controlled conditions. It will cover the knowledge, skills and behaviours in relation to four question areas identified in section 4.

Practical Observation

- This is a skills-based practical exercise which will take 1 day. The exact duration will be similar to the time expected for a competent worker to successfully complete a similar task. The observation will provide the opportunity for the apprentice to synoptically demonstrate core and specific skills, knowledge and behaviours as identified in section 4.

Roles and responsibilities

Normally, for the Knowledge Test the employer or provider will provide the invigilator, who will be briefed on how to act in accordance with EUIAS Invigilation guidelines. This will be agreed at the Registration stage (see Section 3).

An employer Technical Expert for is required for the Practical Observation.

EUIAS will provide an Independent Assessor for the interview, and the employer/provider must also provide a technical expert to accompany the independent assessor

Final grading is carried out by an employer Final Decision Panel which consists of three people:

- The employer Technical Expert who has undertaken the observation
- A technical expert who is independent of the apprentice and their employer
- Another member independent of the apprentice and their employer with appropriate electrical technical experience or a representative from a professional body.

The employer or training provider will provide the venues for all assessments, including settings for the Practical Observation which must be suitably equipped to allow the apprentice to attempt all aspects of the Practical Observation. The employer or training provider will provide all

necessary tools and equipment for the apprentice.

The employer or training provider will adequately prepare apprentices for the end-point assessments and will ensure the Practical Observation evidence for each apprentice is submitted to EUIAS prior to end-point assessment at an agreed date.

Retake and resit information

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.

The apprentice cannot achieve higher than a pass for the EPA element that they have had to retake. 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. The retake **must only** be carried out after one month has elapsed since the first scheduled date of the EPA element. EUIAS will provide feedback to the employer and or training provider and agree an action plan for the apprentice.

Weightings and Overall Grading

Each assessment method is marked separately and awarded either a fail, pass or distinction.

The final grade will be determined by collective performance in the three assessment tools in the end-point assessment. Grades from individual assessment methods are combined in the following way to determine the overall grade awarded for the EPA.

Knowledge Assessment	Technical Interview	Practical Observation	Overall Grade
Fail	Any grade	Any grade	Fail
Any grade	Fail	Any grade	Fail
Any grade	Any grade	Fail	Fail
Pass	Pass	Pass	Pass
Distinction	Pass	Pass	Pass
Pass	Distinction	Pass	Pass
Pass	Pass	Distinction	Pass
Distinction	Distinction	Pass	Pass
Distinction	Pass	Distinction	Pass
Pass	Distinction	Distinction	Distinction
Distinction	Distinction	Distinction	Distinction

The percentage for the Knowledge Assessment is based on marks achieved for the short answer question paper. The marks for both the Practical Observation and the Technical Interview are based on the number and level of criteria achieved.

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 5.1 – The Knowledge Assessment

- Introduction
- Knowledge Assessment Criteria
- Knowledge Assessment Grading

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

Introduction

The Knowledge Assessment consists of 20 scenario based short answer questions. The scenarios are based on the four topic areas identified below in Table 1. The test has five questions for each of these four topic areas and tests both safety critical elements and technical breadth/depth of understanding. The four topic areas are equally weighted, and each area contributes 40/160 marks.

There is one safety critical question for each of the four topic areas. Apprentices will need to provide a correct answer for all safety critical questions to achieve a pass. A correct answer is deemed to be one where the apprentice has achieved 5 out of 8 marks as a minimum.

The practice test supplied as part of this document illustrates the format and style of the assessment.

Knowledge Assessment Criteria

The criteria that are covered in the Knowledge Assessment are listed below. In each assessment, questions will cover each of the areas; not every aspect of every area will be covered in every assessment. Refer to Section 4 for amplification and guidance.

Table 1

KSB	Number of questions
TK1 a comprehensive understanding of UK electrical power systems	5
TK5 protection, control and telemetry equipment and the impact on the electrical network of its operation	5
TK8 high voltage electrical network operations and topologies	5
TK10 the application of Electricity Supply Standards, regulations and policies	5

Knowledge Assessment Grading

This component is graded as follows:

Grade	Mark
Fail	< 104 marks OR At least one safety critical question failed
Pass	104 – 143 marks Plus All safety critical questions passed
Distinction	144 - 160 marks Plus All safety critical questions passed

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.

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 5.2 – The Technical Interview

- Introduction
- Assessment Requirements
- Grading the Technical Interview
- Indicative Grading Criteria

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

Introduction

During the Technical Interview process each apprentice will be interviewed on the content of their work log which will contain evidence from the more complex work activities which they have undertaken during their on-programme work period. The work log is compiled throughout the apprenticeship and finalised during the end-point period. The work log should contain written accounts of activities that have been completed and referenced against the relevant skills, knowledge and behaviours of their job role as identified in Table 2 below. The work log should be supported by relevant evidence, such as photographs, work instructions, safety documentation, project plans and reports. Progress review documentation should also be included.

The interview discussion will cover the relevant knowledge, skills and supporting behaviours through the use of the standardised questions provided for each of the relevant elements which support the scenario being discussed. Where necessary, additional questioning may be conducted by the technical expert to probe further into the detail of the topic area and activities being discussed. Wherever possible the interviewers questioning will be contextualised to the apprentice's job role and the specific work activities they are presenting from their work log.

Assessment Requirements

The interview will be conducted by a technical expert accompanied by an independent assessor. The technical expert and independent assessor will be appointed by EUIAS. It must be conducted in a quiet and private environment where any distractions to the interview can be minimised. The technical interview will typically last 2 hours, but no more than 3 hours. The interview will cover the knowledge, skills and behaviours in relation to the following four specific skill topic areas:

1. Undertakes testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment
2. 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
3. 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
4. Ensures that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system.

Using each topic area as the basis for the interview, the apprentice should present evidence to demonstrate how they have developed their skills, knowledge and behaviours for each scenario being discussed. The criteria are listed below in Table 2. The interviewer will record the apprentice's achievement against the requirements of the criteria across the four topic areas.

It is important that the apprentice is completely familiar with the criteria in Table 2. Refer to Section 4 for amplification and guidance.

Table 2

KSB	Available points	
	Pass	Distinction*
Core Technical Knowledge	**70 points awarded if all Pass criteria are achieved**	
TK1 a comprehensive understanding of UK electrical power systems		**2**
TK2 The application and operation of system plant & equipment		**2**
TK3 Fault analysis methods and how to interpret results		**2**
TK4 How high voltage power generation, transmission and distribution plant & equipment operates		**2**
TK5 Protection, control and telemetry equipment and the impact on the electrical network of its operation		**2**
TK6 Commissioning and testing procedures & processes on high voltage apparatus		**2**
TK7 Failure mode(s) of plant and equipment, their impact on the electrical network and the required remedial actions		**2**
TK8 High voltage electrical network operations and topologies		**2**
TK9 High voltage safe systems of work and risk management		**2**
TK10 The application of the UK power standards, regulations and policies		**2**
TK11 The type and application of test equipment used for commissioning purposes		**2**
Core Skills		
S1 Applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant & equipment		**1**
S2 Demonstrate application of safe working practices in line with company processes and legislative requirements		**1**
S3 Use of a wide range of test equipment to confirm the suitability of the high voltage plant for conformity and operational service		**1**
S5 Prepares and checks technical reports		**1**
PL1 Undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment		**1**
PR1 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		**1**

KSB	Available points	
	Pass	Distinction*
PR2 Use appropriate 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		**1**
PR3 Ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system		**1**
B4 Problem solving: pro-actively identifies and solves problems, within personal area of expertise, by using a logical and systematic approach		**1**
B5 Methodical: identifies and applies procedures and processes as appropriate to the situation		**1**

*The maximum Distinction marks indicated are awarded for achievement of a skill. If the skill is not achieved at Distinction level, 0 marks are awarded for the Distinction criterion.

In advance of the interview the apprentice will receive information about how the interview will work and some guidance for the work log. The apprentice should use the guidance to help detail examples of evidence of application of skills, knowledge and behaviours typically drawn from work activities.

The interview will be subject to moderation by EUIAS.

Grading the Technical Interview

The apprentice can achieve a Pass, Distinction or Fail.

There will be a maximum of 100 marks available for the Technical Interview.

A Pass grade will be recommended in cases where the apprentice demonstrates competence for all the criteria listed in Table 2.

The addition of Distinction points can only be recommended against elements where a Pass has already been achieved. A Distinction grading will be recommended in cases where the minimum Distinction mark of 85 is reached.

Marks will be awarded using the scores indicated in Table 2 above.

Overall scores and grades are awarded as follows:

Fail	Pass	Distinction
0-69 marks	**70-84 marks**	**85-100 marks**

Indicative Grading Criteria

The following criteria are indicative of the criteria the assessor will be looking for when the apprentice takes part in the Technical Interview.

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
TK1 A comprehensive understanding of electrical power systems	*All the pass criteria must be achieved by providing evidence which demonstrates:* A comprehensive knowledge of the relevant Company's electrical power system, network relevant to their work projects and job role How they have applied their knowledge when planning their protection and commissioning projects ensuring compliance with Company policies How they have applied their knowledge to influence, support their decisions during their protection and commissioning projects How they have used their knowledge to make contingency plans for their protection and commissioning projects	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A comprehensive knowledge and **detailed understanding** of the Company's electrical power network relevant to their work projects and job role and **how it influences protection designs** How they have applied their knowledge to make protection, commissioning **proposals which have led to improved efficiencies and operations** How they have used their knowledge to **challenge and report identified non-compliance** with the relevant Company engineering policies How they have **conducted analysis of the network design to support** their protection and commissioning operations
TK2 Detailed understanding of the application/operation of relevant plant &	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the application,	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
equipment	operation of the relevant plant and equipment involved in their work projects and job role How they used their knowledge of the application, operation of plant & equipment to influence the planning of their protection and commissioning projects How they have applied their knowledge to conduct operations on relevant plant and equipment during their protection and commissioning projects The process they would follow to gain further technical information, specifications about plant and equipment if required	**understanding** of the application, operation of the relevant plant and equipment involved in their work projects, job role and **its interaction with the wider network** How they have applied their knowledge of plant and equipment to make protection, commissioning **proposals which have led to improved efficiencies and operations** How they have used their knowledge of plant and equipment **to challenge and report identified non-compliance** with the relevant Company engineering policies How they have **researched the operation of plant, equipment to support** their protection and commissioning operations
TK3 Fault analysis methods in order to interpret results	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant fault analysis methods used in relation to their work projects and job role How they have applied critical thinking to determine which fault analysis method/s to use during their work projects and job role They have taken ownership of their fault analysis work, and where relevant those	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough technical understanding** of the relevant fault analysis methods in relation to their work projects and job role Ability to **use appropriate engineering theories and principles to justify** their fault analysis approach **to achieve successful outcomes**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	affected by the work How they have taken a systematic and logical approach to apply a range of fault analysis procedures to solve problems during their work projects and job role How they interpreted the results of their fault analysis to identify and implement solutions to resolve engineering problems	Ability to **compare and analyse the differing** fault analysis methods **to ensure the optimum method is chosen** How they have used their knowledge of fault analysis to **identify issues and influence operational changes** which have **led to an improved performance**
TK4 How high voltage power generation, transmission and distribution plant and equipment operates	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's electrical network layout, configuration relevant to their work projects and job role A detailed knowledge of the Company's high voltage plant and equipment and how it operates relevant to their work projects and job role How they used their knowledge of the plant & equipment to influence the planning of their protection and commissioning projects How they have applied their knowledge to conduct operations on relevant plant and equipment during their protection and commissioning projects	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough understanding** of the Company's electrical network design **and operating parameters** How they have **applied** their knowledge of plant and equipment to make protection, commissioning **proposals which have led to improved efficiencies and operations** How they have **used** their knowledge of plant and equipment **to challenge and report identified non-compliance** with the relevant Company engineering policies How they have **researched the operation** of plant and equipment to support their protection and commissioning operations

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
TK5 Understands protection, control and telemetry equipment and the impact on the electrical network of its operation	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the protection and control equipment used on the network which are relevant to their work projects and job role A detailed knowledge of the telemetry equipment used on the network which is applicable to their work projects and job role and the impact of its use on the network How they have used their knowledge to influence, support the planning of their protection and commissioning work projects How they have used their knowledge to influence their decisions when conducting their protection and commissioning work	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough technical understanding** of the protection and control equipment used on the network which are relevant to their work projects and job role A detailed knowledge and **thorough technical understanding** of the telemetry equipment used on the network which is relevant to their work projects and job role How they have **used appropriate engineering theories and principle**s to make **suggestions**, **proposals** which have led to an **improved system and network performance** How they have used their knowledge **to appropriately challenge and report identified non-compliance** with the relevant Company engineering policies
TK6 Understands commissioning and testing procedures & processes	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant Company commissioning and testing procedures and processes which are relevant to their work projects and job role How they have used their knowledge of the	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough technical understanding** of the relevant Company commissioning procedures and processes which are relevant to their work projects and job role

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	relevant Company commissioning and testing processes, procedures to plan and conduct their work projects and job role How they have applied their knowledge to influence, support their decisions during their commissioning and testing operations How they have used their knowledge to identify and resolve problems during their commissioning and testing operations	A detailed knowledge and **thorough technical understanding** of the relevant Company testing procedures and processes which are relevant to their work projects and job role How they have **used** their knowledge of relevant commissioning and testing procedures **to make suggestions which have influenced or led to an improved performance** How they have used their knowledge to appropriately **to challenge and report identified non-compliance** with the relevant Company engineering policies
TK7 Understands failure mode(s) of plant and equipment and the impact on the electrical network and the knowledge to identify required remedial actions	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the symptoms, causes of plant and equipment failure which is relevant to their work projects and job role A detailed knowledge of the potential impact on the wider network of plant, equipment failure which is relevant to their work projects and job role How they have used their knowledge of plant and equipment failure to support their protection, commissioning decisions in their work projects and job role	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough technical understanding** of the symptoms, causes of plant and equipment failure which is relevant to their work projects and job role A detailed knowledge and **thorough technical understanding** of the potential impact of plant and equipment failure which is relevant to their work projects and job role How they have **analysed** plant, equipment failure **to implement remedial action/s** in their work projects and job role

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	How they have used their knowledge of plant and equipment failure to implement remedial action/s in their work projects and job role	How they have **applied** the correct engineering theories and principles **to take remedial actions** which have **achieved successful outcomes**
TK8 Understands high voltage electrical network operations and topologies	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant Company high voltage electrical network operations and procedures relevant to their work projects and job role A detailed knowledge of the roles and responsibilities of the persons involved in high voltage electrical network operations A detailed knowledge of the relevant Company high voltage topologies (network symbols and layout) used during their work projects How they have used their knowledge of high voltage electrical network operation, topologies to plan and conduct their work projects	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed **technical** knowledge of the relevant Company high voltage electrical network operations and procedures relevant to their work projects and job role How they have **applied** their knowledge of network operations **to make proposals** which have **led to improved operational efficiencies and performance** How they have **applied** their knowledge of network topologies (network layout) **to make proposals** which have **led to improved operational efficiencies and performance** How they have **conducted analysis of the network design** to identify issues and solve problems which have to **led to improved network efficiencies**
TK9 Understands high voltage safe systems of work and risk management	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant Company	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **thorough**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	safe systems of work and risk management procedures relevant to their work projects and job role A detailed knowledge of the roles and responsibilities of the persons involved in implementing and maintaining safe systems of work relevant to their work projects and job role A detailed knowledge of the Company processes and procedures for identifying and managing risk relevant to their work projects and job role How they have used their knowledge of safe systems of work and risk management procedures to plan and conduct their work projects	**understanding** of the relevant Company safe systems of work and risk management procedures relevant to their work projects and job role How they have **applied their knowledge** of safe systems of work **to make proposals** which have **led to improved safety performance** How they have **applied their knowledge o**f risk management **to make proposals** which have **led to improved safety performance** They used their knowledge of safe systems of work and risk management procedures to **challenge unsafe behaviour and practices using appropriate techniques**
TK10 Understands the application of Electricity Supply Standards, regulations and policies	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's regulatory obligations and how they influence their own work projects and job role A detailed knowledge of the Electricity Supply Regulations and how they have applied them when planning, conducting their work projects and job role A detailed knowledge of the Company policies	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed and **thorough knowledge** of the business's regulatory obligations and the impact they have on the Company's **strategic planning** A detailed and **thorough knowledge** of the Electricity Supply Regulations and the impact they have on the Company's **strategic planning**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	which are relevant to their work projects, job role and how they have applied them when planning and conducting their work How they have used their knowledge of the regulatory requirements when planning and conducting their work projects	How have used their knowledge **to propose, implement solutions** which have led to an **improved regulatory performance** How they have **gathered and analysed** relevant information in order to identify, implement workable solutions to support and meet regulatory requirements
TK11 Understands test equipment to select appropriate equipment for commissioning	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant test equipment and procedures required for commissioning A detailed knowledge of the test results, parameters for commissioning plant, systems relevant to their work projects and job role How they have conducted testing procedures and processes relevant to their work projects and job role in a logical and methodical manner Ability to correctly interpret and record, present the test results gained in a clear and concise manner from the testing conducted	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **technical understanding** of the relevant test equipment and the test procedures required for their work projects and job role A detailed knowledge and **technical understanding** of the relevant test results and parameters and the **causes / implications of not achieving the expected results** How they have used appropriate engineering theories and principles to **analyse test results** to gain a **deeper understanding** of the equipment and system being commissioned How they have used the results gained to **identify and solve technical issues** which has led to a **successful outcome**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
S1 Applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant & equipment	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant Company engineering and analytical processes during both normal and abnormal conditions on high voltage plant & equipment Ability to apply the relevant Company engineering operations on high voltage plant, equipment during both normal and abnormal work situations and conditions Ability to apply the relevant Company analytical processes when conducting work on high voltage plant. equipment in a logical and methodical manner How they have developed clear plans for dealing with contingencies which may occur during normal and abnormal work situations How they have used a systematic and logical approach to pro-actively solve problems during normal and or abnormal work situations and conditions	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* Ability to **take the lead and organise and control engineering operations** on high voltage plant, equipment during both normal and abnormal work situations Ability to **make suggestions for improvement** which support, enhance the outcome of the work activity Ability to **accurately and confidentially describe the rationale** for their operations and can **justify** the actions they have taken Ability to **use the appropriate engineering theories and principles** to **technically explain the operations undertaken**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
S2 Demonstrate application of safe working practices in line with company processes and legislative requirements	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the relevant Company safe working practices, process's and legislative requirements relevant to their work projects and job role Ability to plan and organise the relevant Company safe working practices, process's and legislative requirements relevant to their work project and job role Ability to take ownership of the operations and apply the relevant Company safe working practices and process's using a logical and systematic approach How they have taken personal responsibility for the safety of themselves and others under their control or affected by their operations How they have monitored and maintained a safe working environment and taken action where necessary to maintain this condition	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge and **through understanding** of the relevant Company safe working practices, process's and legislative requirements relevant to their work activity Ability to **assess the impact** of safety related problems and **seek out and solve their root cause(s)** Ability to **challenge unsafe working practices** using appropriate techniques to effectively **resolve issues and situations** Ability to make **suggestions** which **significantly improve, rectify the safety arrangements and conditions** for the work being conducted
S3 Uses a range of appropriate test equipment to confirm the suitability of the	*All the pass criteria must be achieved by providing evidence which demonstrates:*	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:*

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
high voltage plant for conformity and operational service	A detailed knowledge of the relevant Company high voltage test equipment and the procedure(s) for use, relevant to their work projects and job role Ability to use different types of test equipment to confirm the suitability of high voltage plant, equipment for conformity and suitability for operational service Ability to take ownership of the operations and apply testing procedures and processes in a planned and methodical manner Ability to correctly interpret the test results gained from their testing operations and present, record the test information gained in a clear and concise manner Ability to use test information to make informed decisions and solve problems by using a logical and systematic approach	A detailed **technical** knowledge and **understanding** of the relevant test equipment and the test procedures required for their work projects and job role Ability to **gather and analyse test information** to support their course of action and **assess the impact in different approaches**. Ability to use the **appropriate engineering theories and principles** to **technically explain** the testing operations undertaken Ability to **assess** the impact of problem situations and **pro-actively identify and solve problems**
S5 Prepares and checks technical reports	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company reporting methods and processes relevant to their work projects and job role Ability to produce and check technical reports in a methodical manner to record and inform the	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* **Ability to analyse and interpret complex technical information** from engineering diagrams, specifications and use it to **produce clear and accurate reports** Ability to **communicate complex technical**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	business of their work projects Ability to present technical information from their reports in a clear and effective manner to sufficient depth for the audience A clear understanding of the Company process for reporting, amending incorrect and inaccurate technical information identified during their work activities	**information** contained in their reports in a clear and understandable manner Ability to **pro-actively identify and solve problems** with engineering diagrams, drawings by **using a logical and systematic approach** Ability to **accurately capture i**n their reports their actions on plant and equipment and **justify** the actions / and approach taken
PL1 Undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's testing, commissioning and maintenance activities on electrical power systems relevant to their work projects and job role Ability to methodically conduct testing procedures in line with Company procedures on electrical power systems relevant to their work projects and job role Ability to methodically conduct commissioning procedures in line with Company procedures on electrical power systems relevant to their work projects and job role Ability to methodically conduct maintenance procedures in line with Company procedures on electrical power systems relevant to their work	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed **technical** knowledge of the Company's testing, commissioning and maintenance activities relevant to their work projects and job role which **demonstrates excellent levels of understanding** in all areas Ability to **accurately and confidently describe the impact and effect of their actions** on the plant, equipment and electricity network as a whole and can **provide justification** for their course of action during their work projects Ability to **use and describe the appropriate engineering theories and principles** underpinning their projects and can j**ustify their approach taken to achieve successful outcomes**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	projects and job role Ability to take ownership of their work and the work of others to achieve successful outcomes Ability to methodically solve problems by using a logical and systematic approach Ability to communicate effectively and provide internal and or external stakeholders with relevant information when required	Ability to **proactively take the lead** and **methodically resolve the root cause of problems** by using a logical and systematic approach
PR1 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	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's injection testing procedures on electrical power systems relevant to their work projects and job role Ability to methodically conduct injection testing procedures in line with Company procedures on electrical power systems relevant to their work projects and job role Ability to follow Company procedures to systematically interpret the test results gained Ability to use the results gained to make informed decisions on the actions to take Ability to take ownership of their work and the	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed **technical** knowledge of the Company's injection testing procedures relevant to their work projects and job role which demonstrates **excellent levels of understanding** Ability to **accurately and confidently describe the impact / effect of their actions** on the equipment / network being tested and can provide **justification** for their course of action during their work projects Ability to **use and describe** the appropriate engineering theories and principles underpinning their activities and can **justify their approach** taken to achieve successful

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	work of others to achieve successful outcomes Ability to methodically solve problems by using a logical and systematic approach Ability to communicate effectively and provide internal and or external stakeholders with relevant information when required	outcomes Ability to **proactively take the lead** and **methodically resolve the root cause of problems** by using a logical and systematic approach
PR2 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 electromechanical relays	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's protection and control settings on equipment, electrical networks relevant to their work projects and job role Ability to methodically test and verify protection and control settings on equipment, electrical networks relevant to their work projects and job role Ability to methodically ensure correct installation and operation of microprocessor and numerical based protection on equipment, electrical networks relevant to their work projects and job role Ability to correctly interpret and use the results gained to make informed decisions on the actions to take	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed **technical** knowledge of the Company's injection testing procedures relevant to their work projects and job role which demonstrates **excellent levels of understanding** Ability to **accurately and confidently describe the impact / effect of their actions** on the equipment, network being tested and can **provide justification** for their course of action during their work projects Ability to use and describe the **appropriate engineering theories and principles** underpinning their activities and can **justify their approach** taken to achieve **successful outcomes** Ability to **proactively take the lead and methodically resolve the root cause** of

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	Ability to take ownership of their work and the work of others to achieve successful outcomes Ability to methodically solve problems by using a logical and systematic approach Ability to communicate effectively and provide internal and or external stakeholders with relevant information when required	problems by using a logical and systematic approach
PR3 Ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system	*All the pass criteria must be achieved by providing evidence which demonstrates:* A detailed knowledge of the Company's protection systems and how they interface with the associated high voltage equipment relevant to their work projects and job role Ability to methodically interface operations on high voltage equipment, electrical systems relevant to their work projects and job role Ability to methodically check and confirm correct interface on high voltage equipment, electrical systems relevant to their work projects and job role Ability to correctly interpret and use the results gained to make informed decisions on the actions to take Ability to take ownership of their work and the	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A detailed **technical** knowledge of the Company's protection systems and interfaces with the associated high voltage equipment relevant to their work projects and job role which demonstrates excellent levels of understanding Ability to **accurately and confidently describe the impact, effect of their actions** on the equipment, system being worked on and can provide **justification for their course of action** during their work projects Ability to use and describe the **appropriate engineering theories and principles** underpinning their activities and can **justify their approach** taken to achieve successful outcomes Ability to **proactively take the lead and**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	work of others to achieve successful outcomes Ability to methodically solve problems by using a logical and systematic approach Ability to communicate effectively and provide internal and or external stakeholders with relevant information when required	**methodically resolve the root cause of problems** by using a logical and systematic approach

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 5.3 – The Practical Observation

- Introduction
- Assessment Requirements
- Grading the Technical Interview
- Indicative Grading Criteria

Introduction

Following the completion of the Knowledge Assessment and the Technical Interview and within the final 6 months of their apprenticeship, each apprentice will be assessed by a technical expert completing a practical activity in a working environment. 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.

The Practical Observation for the role of an EPPPC Engineer will involve each apprentice being observed carrying out a range of activities which typically include the installation, testing and commissioning of protection systems to prove the integrity of power system plant and equipment.

Assessment Requirements

Each observation will provide the opportunity for the apprentice to synoptically demonstrate their core skills, knowledge and behaviours. These typically will 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.

Each apprentice will be assessed on EACH of the specific skill requirements shown overleaf.

Table 3

KSB	Available points	
	Pass	Distinction*
Core Skills	**70 points awarded if all Pass criteria are achieved**	
CS1 applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant & equipment		2
CS2 demonstrate application of safe working practices in line with company processes and legislative requirements		2
CS3 uses a range of appropriate test equipment to confirm the suitability of the high voltage plant for conformity and operational service		2
CS4 accurately reads and interprets a wide range of engineering diagrams and drawings		2
CS6 effectively communicate with others to confirm that the tests meet the required standards/specifications		2
Skill-specific activities		
PL1 undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment		5
PR1 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		5
PR2 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		5
PR3 ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system		5
Behaviours**		
B1 team working: safely working as a member of a team to achieve required outcomes within time, cost, quality and budget constraints		
B2 interpersonal skills: able to relate to people at all levels and take others' views into account to ensure the best possible outcome		
B3 communication: confident and effective communicator both verbally and in writing ensuring that all parties understand		
B4 problem solving: pro-actively identifies and solves problems, within personal area of expertise, by using a logical and systematic approach		
B5 methodical: identifies and applies procedures and processes as appropriate to the situation		
B6 ownership: takes personal responsibility for the work of themselves and others under their control		

*The maximum Distinction marks indicated are awarded for achievement of a skill. If the skill is not achieved at Distinction level, 0 marks are awarded for the Distinction criterion

**The Core Behaviours listed above are a component part of the EPPPCE Standard and a crucial factor when assessing competent performance. To avoid the necessity of assessing each behaviour in isolation EUIAS have integrated each behaviour into the relevant skill element of the Practical Observation assessment criteria. This means that each behaviour will be assessed within the context of the appropriate skill element, providing a more holistic and effective assessment approach.

During the practical observation process each apprentice will be observed by a technical expert undertaking practical activities in a working environment. EUIAS will appoint a technical expert who, due to the specialised nature of the work, may be from within the apprentice's own organisation or someone known to the apprentice. The technical expert conducting the assessment may be required to personally supervise the apprentice, for example when working on live equipment. Therefore, the technical expert will hold the appropriate safety rule authorisation to undertake the activities being undertaken and will be authorised by the organisation that owns the premises where the observation is being conducted.

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 technical expert may, if required, ask follow-up questions to probe for further clarification as necessary.

The technical expert for the observation will present the observation outcomes to the final decision panel. The final decision panel will assign the mark for the practical observation. A maximum of 100 marks are available to contribute towards the overall grade.

Grading the Practical Observation

The apprentice can achieve a Pass, Distinction or Fail.

There will be a maximum of 100 marks available for the Practical Observation.

The decision to recommend an element Fail will result where an apprentice fails to meet any one or more of the elements Pass criteria. This may occur for any element criteria where the apprentice demonstrates a series of minor poor performance issues or alternatively where the apprentice infringes any critical safety issues such as any deviation from the company safety rules or operational procedures. In cases where the apprentice makes an error that is likely to cause harm to themselves or others or where serious damage is likely to be caused the technical expert will intervene immediately to stop the action and the assessment will be terminated.

A Pass grade will be recommended in cases where the apprentice demonstrates competence for all the criteria listed in Table 3.

The addition of Distinction points can only be recommended against elements where a Pass has already been achieved. A Distinction grading will be recommended in cases where the minimum Distinction mark of 85 is reached.

Marks will be awarded using the scores indicated in Table 3 above.

Overall scores and grades are awarded as follows:

Fail	Pass	Distinction
0-69 marks	**70-84 marks**	**85-100 marks**

Indicative Grading Criteria

The following criteria are indicative of the criteria the assessor will be looking for when the apprentice carries out the Practical Observation.

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
Core Skill Activities		
S1 applies appropriate engineering and analytical processes to both normal and abnormal conditions on high voltage power generation, transmission or distribution plant and equipment	*All the pass criteria must be achieved by providing evidence which demonstrates:* A working knowledge of the relevant Company engineering processes which are applicable to both normal and abnormal work situations / conditions Ability to choose and follow the appropriate policy and procedure to achieve the engineering objectives required for the activity Ability to apply an organised and analytical approach to achieve the engineering objectives required for the activity Ability to identify and apply procedures and processes as appropriate to the situation A clear plan for dealing with contingencies which could occur during normal / abnormal work situations Ability to take personal responsibility for their own work activities and others under their control	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge and **understanding** of the relevant Company engineering processes which are applicable to both normal and abnormal work situations / conditions Ability to make **suggestions for improvement** which support / enhance the outcome of the work activity Ability to **challenge / question processes** which may adversely affect the effectiveness of the work activity Ability to **assess the impact of different approaches** and **analyse information** to support their course of action

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
S2 demonstrate application of safe working practices in line with company processes and legislative requirements	*All the pass criteria must be achieved by providing evidence which demonstrates:* A working knowledge of the relevant Company safe working practices / process's and legislative requirements relevant to their work activity Ability to identify and apply the appropriate safety policy and procedure and choose the appropriate course of action depending on the work activity / situation How they have taken personal responsibility for the safety of themselves and others under their control How they can work safely to achieve required work outcomes within time, cost, quality and budget constraints How they regularly monitor / check the work activity / environment and take action when necessary to maintain a safe working environment	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed** knowledge of the relevant Company safe working practices / process's and legislative requirements relevant to their work activity Ability to **assess the impact of** safety related problems and **seek out and solve** their root cause/s Ability to **challenge** unsafe working practices using appropriate techniques to effectively resolve issues / situations Ability to make **suggestions** which **significantly improve** / rectify the safety arrangements / conditions for the work being conducted
S3 uses a range of appropriate test equipment to confirm the suitability of the high voltage plant for conformity and operational service	*All the pass criteria must be achieved by providing evidence which demonstrates:* A working knowledge of the relevant test equipment and the test procedures required for the testing operation/s being undertaken Ability to follow the appropriate Company testing policy and procedure. and choose the appropriate course of action depending on the situation	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge and **understanding** of the relevant test equipment and the test procedures required for the work activity Ability to take a **pro-active lead** in accepting **additional responsibility / autonomy** to improve the work process

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	Ability to select and safely use a minimum of **TWO** different types of test equipment on electrical plant / apparatus for the work being undertaken Ability to correctly interpret the test results gained from the operations being conducted Ability to present test information gained in a clear and concise manner to sufficient depth for the audience Ability to identify and apply testing procedures and processes as in a planned and methodical manner Ability to take ownership and personal responsibility for the work of themselves and others under their control	Ability to **gather and analyse test information** to support their course of action and **assess the impact** in different approaches Ability to **assess the impact of** problem situations and **solve the root causes** of problems
S4 accurately reads and interprets a wide range of engineering diagrams and drawings	*All the pass criteria must be achieved by providing evidence which demonstrates:* A core knowledge of the range of engineering diagrams and drawings available within their Company and their specific use / purpose How they have used technical engineering diagrams and drawings to plan and organise their work activity Ability to present technical information in a clear and concise manner to sufficient depth for the audience	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed** knowledge of the range of engineering diagrams and drawings available within their Company and explain their specific use and purpose Ability to analyse and **interpret complex** technical information from engineering diagrams and drawings to plan and organise their work activity Ability to transmit **difficult technical** information to others in an understandable manner

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	Ability to analyse and use engineering diagrams / drawings to methodically apply procedures and processes for their work activity Ability to communicate information in a confident and effective manner ensuring that all relevant parties understand A clear understanding of the Company process for reporting / amending incorrect / inaccurate information identified in engineering diagrams and drawings	Ability to **pro-actively** identify and **solve problems** with engineering diagrams / drawings by using a logical and systematic approach
S6 effectively communicate with others to confirm that the tests meet the required standards/specifications	*All the pass criteria must be achieved by providing evidence which demonstrates:* Ability to identify the relevant internal / external stakeholders and the information they need to be given for confirmation of their testing Ability to confidently and effectively communicate both verbal and written information ensuring that all relevant parties understand the information given Ability to present all information to others in a clear and concise manner and listen and respond to queries / questions Ability to ensure that recipient/s understand any critical safety / technical information and confirms their understanding where necessary	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* Ability to transmit **difficult technical** information in an understandable manner Ability to **prioritise activities** to meet objectives and communicate progress to others Ability to **consult and involve** the appropriate people to **capitalise on different skills, perspectives, experience and knowledge** to confirm testing Ability through positive relationships to actively **address conflict** with positive outcomes

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	Ability to take personal responsibility and ownership for confirmation of their testing operations	
Skill-Specific Activities		
PL1 undertake testing, commissioning and maintenance activities on electrical power systems and equipment. This could include transformers, switchgear, conductors, battery systems and ancillary equipment	*All the pass criteria must be achieved by providing evidence which demonstrates:* A core knowledge of the company testing, commissioning and maintenance procedures relevant to the electrical systems / equipment relevant to their work activity A clear plan of action to undertake their work operations in a logical manner which considers the resources required for the work Ability to competently follow the appropriate policy / procedure and implement their work plan to achieve their objectives Ability to competently deliver their work objectives to meet the agreed deadlines / timescales Ability to recognise and define potential problems and identifies and solve them in a step by step logical way, where necessary Ability to take ownership and personal responsibility for the work of themselves and others under their control during the work activity	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge of the Company testing, commissioning and maintenance procedures of systems / equipment relevant to their work activity Ability to **consult and involve** the appropriate people to **capitalise on different skills, perspectives, experience and knowledge** to confirm testing Ability to **assess the impact o**f different approaches and is able to **gather and analyse** information to support their decisions / course of action Ability to seek out and attempt to solve the root causes of problems and **make suggestions for improvement**

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
PR1 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	*All the pass criteria must be achieved by providing evidence which demonstrates:* A core knowledge and understanding of the method and purpose of functionality and injection testing on the high voltage equipment being worked on A clear plan of action to undertake their testing operations in a logical manner which considers the resources required for the testing operations Ability to inspect and use the test / injection equipment in accordance with the Company polices / manufacturer's instructions Ability to identify and apply testing / injection procedures in a methodical manner as appropriate to the situation Ability to gather and interpret the test / injection results gained to meet the objectives of the testing operation Ability to record / report the test / injection results gained to meet Company requirements / standards	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge and understanding of the range and purpose of functionality and injection testing on the high voltage equipment being worked on Ability to **gather and analyse** technical test data to **inform their actions** or change their approach Ability to communicate / transmit **difficult** technical information in an understandable manner to relevant persons Ability to seek out and attempt to solve the root causes of problems and **make suggestions for improvement**
PR2 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	*All the pass criteria must be achieved by providing evidence which demonstrates:* A core knowledge of the purpose and operation of the microprocessor / numerical based protection being worked on	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge of the purpose and operation of microprocessor / numerical based protection being worked on and its effect relevant to the network

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	A core knowledge of the relevant test procedures and control settings used to verify the correct operation of the protection equipment being worked on Ability to choose and follow the correct methods and procedures to practically achieve the installation / testing of protection equipment Ability to methodically apply the correct methods and procedures to verify the correct control settings / operation of the protection equipment Ability to correctly gather and interpret the test results obtained to inform their actions for the protection system being worked on Ability to communicate progress to others by recording / reporting the outcome of their installation / testing operations in accordance with Company policies and procedures	A **detailed technical** knowledge and **understanding** of the relevant test procedures and control settings used to verify the correct operation of the protection equipment being worked on Ability to **assess the impact of different approaches** to the installation / testing operations Ability to **gather and analyse** technical information to support their course of action
PR3 ensure that protection systems interface correctly with the associated high voltage equipment and, where necessary, coordinates effectively with the wider high voltage system	*All the pass criteria must be achieved by providing evidence which demonstrates:* A core knowledge of how the protection system being worked on interfaces with the associated high voltage equipment and the wider network A core knowledge of the relevant test procedures and equipment used to verify the correct interface of the protection equipment with the system Ability to choose and follow the correct methods and procedures to practically achieve the testing /	*A minimum of 2 criteria must be achieved by providing evidence which demonstrates:* A **detailed technical** knowledge of how the protection system being worked on interfaces with the associated high voltage equipment and the wider network Ability to transmit **difficult technical** information in an understandable manner

Standard	Indicative Pass Criteria	Indicative Distinction Criteria
	verification of the protection system being worked on Ability to methodically apply the correct methods and procedures to verify the correct interface of the protection system being worked on Ability to recognise and tackle technical issues in a step by step logical and methodical way and achieve an effective resolution Ability to communicate progress to others by recording / reporting the outcome of their protection operations in accordance with Company policies and procedures	Ability to **assess the impact** of technical interface problems and seek out and attempt to solve the root causes of problems to achieve a solution Ability to **consult** with others to **capitalise on different skills, perspectives, experience and knowledge to resolve issues**

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 6 – Practice Assessments and guidance

- Knowledge Assessment
- Practice Knowledge Assessment (in Section 7)
- Guidance for setting up a practice Practical Observation
- Guidance for setting up a practice Technical Interview

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

The Knowledge Assessment

Guidance for preparing for the Knowledge Assessment

While on-programme, the employer and or training provider should brief the apprentice on the areas to be assessed by the Knowledge Assessment, as detailed in Section 5.1. It is good practice to identify the areas within the learning programme where the relevant knowledge is delivered and ensuring that apprentices are aware that elements from each of these criteria might come up in the test.

The Knowledge Assessment is aligned to the standard rather than a specific job role that the apprentice may be doing. The questions have been written to reflect the Electrical Power Protection and Plant Commissioning Engineer role as a whole and are not focussed on specific plant, machinery, or employer-specific processes.

In readiness for end-point assessment, the apprentice should complete the sample test, which is included as an Annex to this specification. This should be undertaken in advance of the Knowledge Assessment, with enough time to mark the assessment, and provide feedback to learners.

For maximum effect, ensure the test is taken in exam conditions similar to those that will be experienced in a live test.

Technical Interview

Guidance for preparing for the Technical Interview

The purpose of the Technical Interview is to allow the apprentice to demonstrate how they have combined their skills, technical knowledge and behaviours in order to carry out their occupational role effectively and safely.

The practice interview should be based around the work log evidence provided for the specific skills identified for the apprentice's job role as detailed in Section 5.2, table 2.

A practice interview should be scheduled before the live end-point assessment and with enough time to provide feedback for the apprentice to learn from. A period of two weeks or more is recommended, depending on the circumstances. The key is that the apprentice has time to act on the feedback they get at the end of the practice session.

A tutor or supervisor should play the part of the assessor carrying out the interview, asking the questions in a 'live test environment'. A period of at least 2 hours should be set aside. The assessment should be conducted in a quiet and private environment where any distractions to the interview can be minimised, for example a meeting room. The tutor or supervisor should record their assessment of the apprentice's performance, using the grading descriptions in Section 5.2 as a guide.

The questions should be based on the following four specific skill topic areas:

- Undertake testing, commissioning and maintenance activities on electrical power systems and equipment
- Undertakes functionality testing and the injection of currents and voltages into high voltage equipment and their associated protection and control systems
- Uses appropriate test equipment to verify protection and control settings and ensure

the correct installation

- Ensure that protection systems interface correctly with the associated high voltage equipment.

The tutor or supervisor must:

- prepare some interview questions around the work that the apprentice has been doing.
- use various questioning techniques to confirm the depth of knowledge and or range of skills
- record the Technical Interview or provide a clear narrative if the interview was not recorded. The narrative must describe the apprentices' responses to the questions and capture the depth and breadth of the apprentice's response
- ensure the apprentice has provided evidence in their responses to cover all the relevant elements of the standard
- provide feedback to the apprentice focussing on any areas of the standard missed, or where appropriate, to give guidance on achieving the pass or distinction grades.

The apprentice should be prepared to:

- complete a work log
- discuss evidence of their work as recorded in the work log. The report should have examples of job-related tasks so the interview panel can determine the role the apprentice had taken on to complete the work and understand if and how they overcame any challenges or barriers that were faced to complete the job.

Practical Observation

Guidance for setting up a Practical Observation

The practical observation should be designed by the apprentice's employer to assess a broad range of the higher order skills, knowledge and behaviours developed over the period of the apprenticeship. The work activities observed should be carefully selected to provide coverage for the range of Specific Skill activities identified in Section 5, Table 3.

The assessment must be conducted in a realistic work situation that reflects the typical hazards and risks of the work environment.

At appropriate times during the practice assessment the tutor or supervisor carrying out the observation should conduct questioning to confirm knowledge and understanding of the topic area. Each apprentice must be asked a range of industry devised questions, for the activity being observed, with further follow up questions being asked where required. These questions should be contextualised to the apprentice's job role and the specific work activity being observed. To prepare the apprentice for this aspect of the practice practical observation, we recommend developing some open-ended questions which focus on the rationale for each part of the task.

The tutor or supervisor carrying out the observation of the practice assessment should record their assessment of how the apprentice performed and provide feedback to the apprentice with guidance on what to do to improve their performance, taking note of the grading descriptors for pass and distinction in Section 5. The tutor or supervisor should take into consideration core behaviours demonstrated by the apprentice which have been built into the relevant criteria.

L3 EPA Electrical Power Protection and Plant Commissioning Engineer

EPA Specification Section 7 – Supporting Documents and Guidance

- Gateway Eligibility Report
- Practice Knowledge Assessment, with Answer Scheme

Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: enquiries@euias.co.uk

Help Desk telephone: 0121 713 8310

EUIAS End-point Assessment for Electrical Power Protection and Plant Commissioning Engineer Gateway Eligibility Report

(Standard Version: ST0157 version 1; Assessment Plan Version: ST0157AP02)

Apprentice's details

Apprentice's name:	Apprentice's job title:
Name of Employer:	Name of Training provider:
Employer representatives present:	Training provider representatives present:
Apprenticeship start date:	Apprenticeship on-programme end date:
Gateway meeting date:	
Has the apprentice taken any part of the end-point assessment for this apprenticeship standard with any other End Point Assessment Organisation?	Y / N
If "Yes" please give details:	

Eligibility requirements:

The apprentice must confirm their achievement of the following:

Eligibility requirement	Achieved by the apprentice? Y/N	Evidence (scans of certificates MUST be included)
Achieved English Level 2		
Achieved Maths Level 2		

Gateway Eligibility Declaration

The apprentice, the employer and the training provider must sign this form to confirm that they understand and agree to the following:

1. The apprentice has completed the required on-programme elements of the apprenticeship and is ready for end-point assessment with EUIAS
2. The apprentice will only submit their own work as part of end-point assessment
3. All parties agree that end-point assessment evidence may be recorded and stored by EUIAS for quality assurance purposes
4. The apprentice has been on-programme for a minimum duration of 365 days
5. The apprentice has achieved the mathematics and English requirements as detailed in this document
6. The apprentice, if successful, gives permission for EUIAS to request the apprenticeship certificate from the ESFA who issue the certificate on behalf of the Secretary of State
7. The apprentice has been directed to the EUIAS Appeals Policy and Complaints Policy
8. The employer/training provider has given the EUIAS at least three months' notice of requesting this EPA for this apprentice
9. If the Gateway Eligibility Report is not completed in full, meeting all requirements, and submitted to EUIAS, the end-point assessment cannot take place

Signed on behalf of the employer (print name):	Signature:	Date:
Signed on behalf of the training provider (print name):	Signature:	Date:
Apprentice's name (print):	Signature:	Date:

EUIAS use only:	
EUIAS Sign off:	
Comments/actions:	

Electrical Power Protection and Plant Commissioning Engineer

SAMPLE Practice Assessment
covering Distribution and Transmission Voltages

Knowledge Assessment Details

The live assessment consists of 20 short answer questions with 5 questions for each of the 4 topic areas shown below. Each of these topic areas will contain 1 **safety critical question.**

The 4 topic areas are as follows:

1. A comprehensive understanding of electrical power systems

2. Understands protection, control and telemetry equipment and the impact on the electrical network of its operation

3. Understands high voltage electrical network operations and topologies

4. Understands the application of Electricity Supply Standards, regulations and policies

The live assessment has a maximum duration of 2 hours 30 minutes. Consequently, each topic area should take approximately 30 – 35 minutes to complete with each short answer question taking approximately 6 minutes to answer. You are advised to start with the safety critical questions and spend more time on them if required. Not passing a safety critical question will result in an overall fail.

Each topic area is marked out of 40 marks.

To attain a Pass, the apprentice must:

- Score at least 65% (104 marks)
- Must achieve 5 marks in each of the four safety-critical questions.

To attain a Distinction, the apprentice must meet the Pass criteria AND:

- Score at least 90% (144 marks)

- **DO NOT DETACH**
- Spare paper for to use for calculations or working out

Section 1: A comprehensive understanding of electrical power systems

Practice Q1

a) i) Draw a simple diagram of a ring power circuit. [1 mark]

ii) Draw a simple diagram of a radial power circuit. [1 mark]

b) i) Describe the design principles of ring power circuits. [2 marks]

ii) Describe the design principles of radial power circuits. [2 marks]

c) i) Identify one **advantage** of a radial power circuit. [1 mark]

ii) Identify one **disadvantage** of a radial power circuit. [1 mark]

Total 8 marks

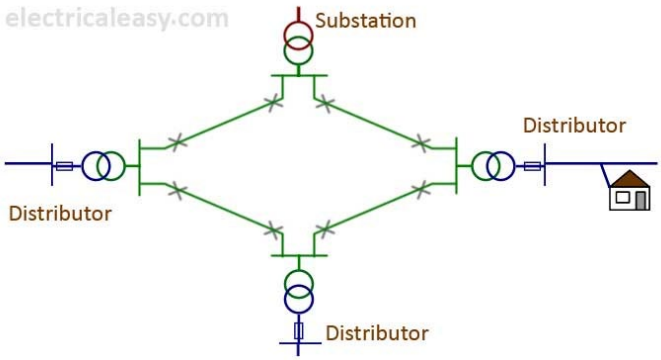
	Mark	Max
a)		**2**
b)		**4**
c)		**2**
Total		**8**

Mark Scheme:

Q1

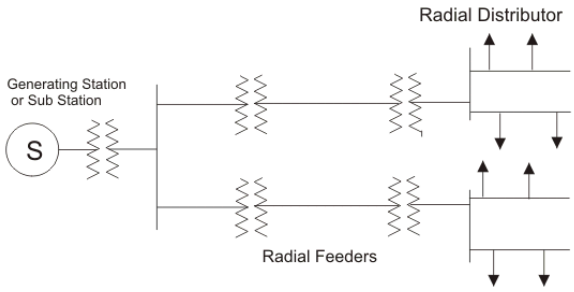
a) i) **A simple diagram** demonstrating the design principles of ring circuits (1 mark)

Note: this diagram is for assessors only. The diagram provided by the apprentice will be simpler.



ii) **A simple diagram** demonstrating the design principles of radial circuits (1 mark)

Note: this diagram is for assessors only. The diagram provided by the apprentice will be simpler.



b) i) **A technical description of design principles of ring circuits,** 1 mark each to a maximum 2 marks:

5. Designed to make a ring of the main circuit with more than one potential feed (1 mark)
6. Provides ability to feed from either direction in the circuit (1 mark)
7. Provides ability to make open / interconnection points in the circuit (1 mark)

ii) **A technical description of design principles of radial circuits,** 1 mark each to a maximum 2 marks:

8. Designed to make a single feed linear circuit (1 mark)
9. Provides ability to feed from either direction in the circuit (1 mark)
10. Provides ability to make open / interconnection points in the circuit (1 mark)

c) i) **Identification of one advantage of a radial circuit,** 1 mark:

11. Reduced costs of construction and maintenance as only a single supply (1 mark)

12. Simpler fault-finding process because only a single one direction supply (1 mark)

13. Cost effective option for supplies to remote locations (1 mark)

ii) **Identification of one disadvantage of a radial circuit,** 1 mark:

14. Limited network flexibility for the restoration / isolation of customer supplies as no option to backfeed (1 mark)

15. Potentially takes longer to restore supplies and more customers adversely affected as whole feed must be isolated (1 mark)

These answers are not exhaustive, and all submitted responses should be considered on their merit.

Section 2: Understands protection, control and telemetry equipment and the impact on the electrical network of its operation

Practice Q2

a) Describe the purpose of voltage transformers (VT) found in power substations. [2 marks]

b) Explain the typical process which occurs when a voltage transformer (VT) is activated by a fault on the network. [4 marks]

You may use a diagram to support your explanation.

Note: Full marks can be achieved without a diagram.

c) List **two** types of voltage transformer (VT) found in power substations. [2 marks]

Total 8 marks

	Mark	Max
a)		**2**
b)		**4**
c)		**2**
Total		**8**

Mark Scheme:

Q2

a) **Technical description of purpose of voltage transformers (VT) in a power substation,** 1 mark each to maximum 2:

16. To reduce the voltage to a manageable level for the equipment being used (1 mark)

17. To monitor and control the transformer automatic voltage regulating relay (AVR) which controls the tap changer (1 mark)

18. To supply power to volt meters and watt meters (1 mark)

b) **Technical explanation of the process which occurs when a voltage transformer (VT) is activated by a fault,** 1 mark each to maximum 4:

19. Voltage transformers can be used to measure the residual voltage (1 mark) of a three-phase system (1 mark) during single phase faults (1 mark)

20. During normal operating conditions, the sum of the three-phase voltage (1 mark) is zero but in case of single-phase fault, the condition changes (1 mark) and a residual voltage is produced (1 mark)

21. Suitable diagram to support explanation (1 mark)

c) **Types of voltage transformer (VT) listed**, 1 mark each to maximum 2:

22. Capacitor VT (1 mark)

23. Single Phase VT (1 mark)

24. Inductive VT (1 mark)

These answers are not exhaustive, and all submitted responses should be considered on their merit.

Section 3: Understands high voltage electrical network operations and topologies

Practice Q3 This question is safety critical

Transmission systems employ Delayed Auto-Reclose (DAR) technology and distribution systems employ Auto-Reclose (AR) technology.

a) State the purpose of the Auto-Reclose system, relevant to your network. [1 mark]

b) Explain a typical cycle of operation of the Auto-Reclose system, relevant to your network. [6 marks]

You may use a diagram to support your explanation.

Note: Full marks can be achieved without a diagram.

c) Identify one **advantage** that Auto-Reclose technology provides. [1 mark]

Total 8 marks

	Mark	Max
a)		**1**
b)		**6**
c)		**1**
Total		**8**

Mark Scheme:

Q3

a) **The purpose of DAR or AR,** 1 mark:

To provide fast and efficient network protection (1 mark)

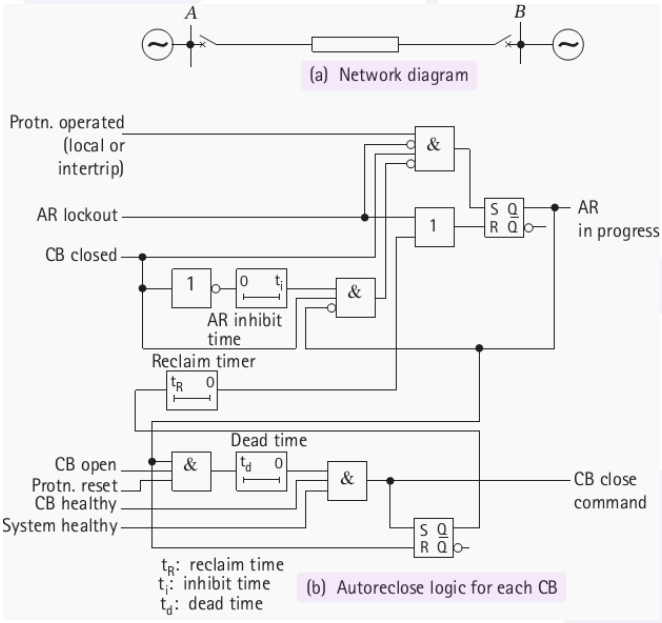
b) **Explanation of a typical cycle of operation,** 1 mark each to a maximum 6:

In the example below, if it were decided to charge the line initially from station A, the dead time in the auto-reclose relay at A would be set at, say, 5 seconds (1 mark), while the corresponding timer in the auto-reclose relay at B would be set at, say, 15 seconds (1 mark). The circuit breaker at A would then reclose after 5 seconds (1 mark) provided that voltage monitoring relays at A indicated that the busbars were alive (1 mark) and the line dead (1 mark).

With the line recharged (1 mark), the circuit breaker at B would then reclose with a synchronism check (1 mark), after a 2 second delay imposed by the synchronism check relay element (1 mark).

If for any reason the line fails to 'deadline charge' from end A (1 mark), reclosure from end B would take place after 15 seconds (1 mark). The circuit breaker at A would then be given the opportunity to reclose with a synchronism check (1-mark).

1 mark for suitable diagram [diagram may be simple or may include information about a typical cycle of operation which can be awarded marks as identified above]



c) **Advantage that Auto-Reclose technology provides,** 1 mark each to a maximum of 1**:**

25. To prevent loss of power (1 mark)
26. To detect temporary or permanent faults (1 mark)
27. To provide quick and efficient restoration of supplies (1 mark)
28. Simplifies control circuits in comparison with single-phase schemes (1 mark)
29. Delayed auto-reclosing improves the chances of a reclosure being successful in comparison to the case of high-speed reclosing (1 mark)

These answers are not exhaustive, and all submitted responses should be considered on their merit.

Section 4: Understands the application of Electricity Supply Standards, regulations and policies

Practice Q4

The Electricity at Work Regulations 1989 apply to all electrical systems and equipment and require precautions to be taken against the risk of death or personal injury from electricity in work activities.

a) Describe the general requirements of Regulation 11 relating to the means of protection from excess current. [7 marks]

b) Identify **one** of the specified conditions, stated in Regulation 14, which must be met before live work could be considered on or near live conductors. [1 mark]

Total 8 marks

	Mark	Max
a)		**7**
b)		**1**
Total		**8**

Mark Scheme:

Q4

a) **Description of Regulation 11 requirements for the protection of electrical systems from excess current,** 1 mark for each requirement to a maximum 7 marks:

The regulations require that systems and parts of systems be protected against the effects of short circuits and overloads if these would result in currents which would otherwise result in danger.

30. The regulations state the means of protection is likely to be in the form of fuses or circuit breakers controlled by relays (1 mark), or it may be provided by some other means capable of interrupting the current or reducing it to a safe value (1 mark)

31. That a means of preventing danger to be provided in anticipation of excess current (1 mark)

32. That in principle, every main circuit should be protected at its origin (1 mark), i.e. at the source end of the circuit (1 mark)

33. That when considering a means of protection, consideration must be given to a number of factors, including:

- the nature of the circuits (1 mark)
- type of equipment to be protected (1 mark)
- the short-circuit energy available in the supply (the fault level) (1 mark)
- the nature of the environment (1 mark)
- whether the system is earthed or not (1 mark)

b) **Regulation 14 requirements which must be met before live work could be considered on or near live conductors,** to a maximum 1:
Identification of one of the following principles.

34. it is unreasonable in all the circumstances for it to be dead (1 mark)

35. it is reasonable in all the circumstances to be at work on or near it while it is live (1 mark)

36. suitable precautions, including where necessary the provision of suitable protective equipment (1 mark), are taken to prevent injury (1 mark)

These answers are not exhaustive, and all submitted responses should be considered on their merit.