

Qualification Specification

EAL Level 3 Technical Occupational Entry in Electrical Installation and Maintenance (Diploma)

Qualification Number: 610/3907/X

Issue 1

Table of Contents

1.0 About EAL	2
2.0 Introduction to the Qualification	3
3.0 Qualification Structure	5
4.0 Centre and Qualification Approval.....	6
5.0 Profiles and Requirements	7
6.0 Assessment.....	10
7.0 Quality Control of Assessments	20
8.0 Unit Content.....	21
Appendix 1: Centre Examination Specifications	72
Appendix 2: Learner Registration and Certification.....	75

1.0 About EAL

For over fifty years, EAL has been the specialist awarding organisation for engineering, manufacturing, building services and related sectors. Developed to the highest technical standards, our qualifications reflect ever-changing industry and regulatory needs. We support the providers of our qualifications with an unparalleled level of service to ensure that learners are well prepared to take the next step in their journeys, whether study, an apprenticeship or work.

Through industry partnerships with EAL Centres and training providers, decades of experience supporting our core sectors, and our role as part of the Enginuity Group, we have built unrivalled knowledge and understanding of employer skills needs. As a result, EAL's skills solutions, including apprenticeship End-Point Assessment, External Quality Assurance and qualifications are respected and chosen by employers to deliver real lifelong career benefits for all our learners. That's why in the last ten years, 1.2 million people across the UK have taken EAL qualifications.

1.1 Equal Opportunities and Diversity

EAL expects its Centres to enable learners to have equal access to training and assessment for qualifications in line with equalities legislation. Further details can be located in the EAL Equal Opportunities and Diversity Policy.

1.2 Customer Experience and Feedback

Customer Experience is a fundamental part of EAL's commitment to you. EAL aims to ensure that all customers receive a high-quality efficient service. We are always interested in feedback and if you have any comments or feedback on our qualifications, products or services, please contact the Customer Experience team:

EAL Customer Experience
Tel: +44 (0)1923 652 400
Email: Customer.Experience@eal.org.uk

2.0 Introduction to the Qualification

What is this qualification?

This qualification is for adults only (19+) and aligns with the knowledge, skills, and behaviours (KSBs) in the Installation Electrician and Maintenance Electrician apprenticeship standard in England.

It will not make the learner industry competent in electrical installation work but will facilitate progression into the occupation by providing potential employers with reliable evidence of the learner's attainment against the Installation Electrician and Maintenance Electrician apprenticeship standard.

It is intended to form part of an engaging course of learning for adult learners and provide occupational entry so that learners can progress with further learning and training into employment and completion of the apprenticeship standard including the AM2S assessment.

Who is this qualification for?

Adults (19+) who wish to pursue a career in the electrotechnical sector but have not yet secured an apprenticeship.

What does this qualification cover?

This qualification comprises of units that reflect the knowledge, skills, and behaviours in the Installation Electrician and Maintenance Electrician apprenticeship standard.

Please refer to Section 3: Qualification Structure for the units included in this qualification.

2.1 Support for this Qualification

This qualification:

- is regulated at Level 3
- is supported by employers from the electrotechnical engineering sector
- forms part of recognised route to help adults into employment in the industry.

2.2 Progression Opportunities

Learners who complete this qualification will be able to demonstrate to potential employers their commitment and achievement against the knowledge, skills, and behaviours in the Installation Electrician and Maintenance Electrician occupational standard, thus enhancing employability prospects. This will also enable learners to progress to the recognised sector apprenticeship and work toward becoming an industry-recognised electrician. Learners can further progress to undertake qualifications such as:

- EAL qualifications in inspection and testing
- EAL Level 3 Award in the In-Service Inspections and Testing of Electrical Equipment (PAT)
- EAL Level 4 Award in the Design and Verification of Electrical Installations.

Further information can be obtained from the EAL Website or alternatively contact:

EAL Customer Experience
Tel: +44 (0)1923 652 400
Email: Customer.Experience@eal.org.uk

2.3 Qualification Support Materials

The following materials are available for this qualification:

- **Assessor Pack:** which contains all relevant assessor guidance relating to the delivery and assessment and marking schemes for the holistically assessed practical assessments and design assignment
- **Learner Assessment Pack:** which contains the holistically assessed practical and design assessments, assessment checklists and all associated guidance for learners
- ***Practice Examinations:** for the externally set and marked on-screen Examination.

*The practice examination is available to schedule online as per externally set and marked examinations.

All materials can be accessed by EAL registered Centres from the EAL Website:

www.eal.org.uk

2.2 Achievement of the Qualification

This qualification is gained when all the assessments have been achieved. The Centre will then be able to apply for the learner's Certificate.

3.0 Qualification Structure

3.1 Rule of Combination

This qualification will be obtained by the learner once they have successfully completed the **SEVEN** mandatory units.

This qualification has 440 guided learning hours (GLH) and a Total Qualification Time (TQT) of 484.

Mandatory Units:

EAL Code	Unit Title	GLH	Ofqual Code
TE3-01	Health, Safety and Environmental Considerations	20	M/651/0958
TE3-03	Practices and Procedures for Planning and Overseeing Electrical Work Activities	15	R/651/0959
TE3-04	Design and Installation Practices and Procedures	170	A/651/0960
TE3-06	Practices and Procedures for Inspection, Testing and Commissioning	60	D/651/0961
TE3-07	Practices and Procedures for Fault for Diagnosis and Rectification	20	H/651/0963
TE3-08	Electrical Scientific Principles	120	F/651/0962
18ED3-02	Understand the Requirements for Electrical Installations	35	K/650/1450

4.0 Centre and Qualification Approval

Centres wishing to run the qualifications will need to comply with the Qualification Manual and EAL's Centre recognition criteria for these qualifications upon accreditation and launch. Centres must also put in place the appropriate physical and human resources and administration systems to effectively run the qualifications. Please refer to Section 5 for the requirements of Centre staff involved in the delivery of the qualifications.

For existing EAL Centres to put the qualification on your Centre remit:

- To add these qualifications to your Centre qualification remit, create and complete a qualification approval application form in Smarter Touch and submit to EAL

For non EAL Centres to gain Centre approval to run the qualification:

- Please contact the EAL Customer Experience Department, who will be delighted to hear from you:

EAL Customer Experience
Tel: +44 (0)1923 652 400
Email: Customer.Experience@eal.org.uk

5.0 Profiles and Requirements

5.1 Staff Responsible for Registering and Certification of Learners

Centres are required to appoint a suitable member of staff who can take responsibility for registering learners onto qualifications, submitting entries for assessments to EAL, and taking receipt of external assessment procedures (if appropriate). They may also be responsible for applying to EAL for learner certificates. The role may be undertaken by the same person who undertakes quality assurance.

5.2 Teaching Staff

Tutor / trainers involved with the delivery of the knowledge units must demonstrate an understanding of the topics / technical content in this qualification. As a minimum they must have achieved a relevant technical qualification to at least Level 3 which covers the key topics in this qualification.

Examples of evidence for this are: City & Guilds Level 2 plus Level 3 Certificates in Electrical Installation Part One and Part Two or EAL L3 Diploma in Electrotechnical Services. Other electrical engineering qualifications such as OND, or HNC/D etc. An example of not meeting this requirement is by only holding a L2 VRQ or a L3 Award – as clearly this person has not demonstrated technical / academic ability to the level of the qualification being delivered.

Tutor / Trainers of practical work should in addition to the above be technically skilled for their instruction. This can be evidenced for example through a CV, JIB grading at an appropriate grade, membership of an institution e.g., EngTech; TMIT.

All tutor / trainers must hold (or be working toward) a recognised teaching qualification (to a minimum of L3 standard), such as the Level 3 Award in Education and Training.

Tutors / trainers must be able to demonstrate evidence of being up to date with the electrical industry. This can be evidenced for example by either accessing trade publications, undertaking updates to wiring regulations or other courses of learning, attending networking events relevant to this qualification and / or attending industry events.

5.3 Learners

There are no formal academic entry requirements for the qualification; however, Centres should ensure that learners have the potential to achieve the qualification. Learners must have the minimum levels of literacy and numeracy to complete the learning outcomes and assessments.

Centres should make learners with particular requirements aware of the content of the qualification, and they should be given every opportunity to successfully complete the qualification. EAL will consider any reasonable suggestions for, and from, those with disabilities that would help them to achieve the learning outcomes without compromising the standards required.

Age Restrictions

Learners must be at least 19 years old.

5.4 Assessors

The Centre MUST provide EAL with the names of any tutors, trainers or other individuals who will undertake internal assessment, so that these can be approved prior to them carrying out an assessment role.

Internal assessors **must**:

- Have knowledge and understanding of the assessment criteria they are assessing
- Have knowledge and understanding of the qualification structure, content and assessment components
- Understand the assessment process.

It is a **recommendation** that assessors will:

- Have a minimum of two years' experience in assessment (e.g. within an N/SVQ or teaching/training environment)
or
- Be working towards an appropriate assessment qualification, such as the 'Level 3 Award in Assessing Vocationally Related Achievement'
or
- Hold an appropriate assessment qualification (as above)

Assessor continuing professional development

It is the responsibility of each assessor to identify and make use of opportunities for Continuing Professional Development (CPD), such as industry conferences, access to trade journals, and Professional Body / Trade Association events, at least on an annual basis to enhance and upgrade their professional development and technical knowledge.

It is imperative that records are kept of all such CPD opportunities / occasions and that they provide evidence of cascading such technical knowledge and industry intelligence to all relevant colleagues.

5.5 Internal Quality Assurers

This relates to staff undertaking internal verification / moderation of assessment. The Centre MUST provide EAL with the names of any tutors, trainers or other individuals who will undertake internal quality assurance so that these can be approved prior to them carrying out this role.

The main focus of internal quality assurance for these qualifications is:

- The quality assurance of assessment procedures, including standardisation of assessment practice across different assessors within the Centre
- Internal standardisation of marking and moderation of learner grade awarded.

Internal quality assurance staff **must**:

- Be familiar with the occupation(s) covered by the qualification
- Have knowledge and understanding of the qualification structure and content
- Understand the assessment process and the role of quality assurance.

It is a **recommendation** that the quality assurance staff will:

- Have experience in quality management / internal verification
or
- Hold an appropriate qualification, such as the ‘Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice, or the ‘Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice’.

Continuing professional development of internal quality assurance staff

It is the responsibility of each internal quality assurance staff member to identify and make use of opportunities for CPD, such as industry conferences, access to trade journals, and SSC and Professional Body / Trade Association events, at least on an annual basis to enhance and upgrade their professional development and technical knowledge. It is imperative that records are kept of all such CPD opportunities / occasions and that they provide evidence of cascading such technical knowledge and industry intelligence to all relevant colleagues.

5.6 Staff Invigilating On-screen Examinations

Members of staff with responsibility for invigilating on-screen Examinations must know, understand, and comply with the Procedures for Conducting the Exam Component within EAL Qualifications’ (EAF 1), which are published by EAL. These members of staff must also:

- Have experience in conducting and controlling exam sessions
or
- Be supervised by an individual experienced in conducting and controlling exam sessions.

Note: A tutor / trainer who has prepared the learners for the subject of the exam must not be the sole supervisor at any time during an exam for that subject(s).

6.0 Assessment

The following table indicates the assessment components that are included in the qualification and for each component:

- Who is responsible for setting and marking the component
- How the component is quality assured

Assessment component	Set by	Marked by	Method of quality assurance	
			Internal	External
On-screen Examination ¹	EAL	EAL	Examination invigilation	Verification and continuous monitoring via EQA visits
Centre marked Holistic assessment ² (practical/design)	EAL	Centre	On-going standardisation within the Centre (Including moderation)	Verification and continuous monitoring via EQA visits

¹ Refer to Section 6.1 External Assessments (On-screen Examination).

² Refer to Section 6.2 Internal Holistic Assessments (EAL Set and Centre Marked).

The learner must pass ALL assessments to achieve the qualification.

The learner must pass **ALL** assessments to achieve the qualification. A summary showing the assessment requirements for the qualification is shown in this table:

EAL Code	Unit Title	On-screen Examination	Centre Marked Practical/Knowledge
TE3-01	Health, Safety and Environmental Considerations	Exam 1 (open book, learners will require the IET On-Site Guide and BS 7671)	Holistic Assessment (Practical)
TE3-03	Practices and Procedures for Planning and Overseeing Electrical Work Activities		Holistic Assessment (Design)
TE3-04	Design and Installation Practices and Procedures		Holistic Assessment (Design)
TE3-06	Practices and Procedures for Inspection, Testing and Commissioning		Holistic Assessment (Practical)
TE3-07	Practices and Procedures for Fault for Diagnosis and Rectification		Holistic Assessment (Practical)
TE3-08	Electrical Scientific Principles	Exam 2 (closed book)	N/A
18ED3-02	Understand the Requirements of Electrical Installations BS 7671:2018 (2022)	Exam 3 (Wiring Regulations open book - BS 7671 only)	N/A

6.1 External Assessments (On-screen Examination)

A specification for the examination, indicating the number of questions to be set for each learning outcome is provided in Appendix 1.

Key Points

Component	Series	Assessment type	Assessment window
Exam 1	First series	Multiple choice exam	First week in February – last week in March
	Resit 1 series	Multiple choice exam	First 2 weeks of May
	Resit 2 series	Multiple choice exam	First 2 weeks of July
Exam 2	First series	Multiple choice exam	First week in February – last week in March
	Resit 1 series	Multiple choice exam	First 2 weeks of May

	Resit 2 series	Multiple choice exam	First 2 weeks of July
Exam 3	First series	Multiple choice exam	First week in February – last week in March
	Resit 1 series	Multiple choice exam	First 2 weeks of May
	Resit 2 series	Multiple choice exam	First 2 weeks of July

- Arrangements must be made for learners to complete the external assessment between the **first week in February and the last week in March**
- The examination must be undertaken by the learner under controlled examination conditions in accordance with EAL's Procedures for Conducting the Exam Component within EAL Qualifications' (EAF 1)
- The EAL co-ordinator within the Centre will assume responsibility for liaison and correspondence regarding the external assessment component
- Centres will be sampled, and EAL will carry out audits to ensure examinations are delivered in accordance with EAL published procedures
- For the first series assessment window, EAL will release results **6 weeks / 30 working days from the last day of the assessment window**
- For the resit series assessment windows, EAL will release results **6 weeks / 30 working days from the first day of the assessment window**

Assessment objectives are used to set the level of thinking skills being assessed within the level 3 context, including knowledge, understanding and application of knowledge and understanding. Our approach to assessment objectives is designed to complement the purpose of the qualification and align with the occupational levels' guidance provided by the regulator.

Each unit within the setting specification (Appendix 1) has a set number of questions. Across the questions, there is a question writing requirement to meet a defined coverage of each assessment objective so that the following assessment objective profile is met across the full range of assessment questions, as shown in the table below:

Assessment Objective	MCQ Coverage
AO1 Knowledge of the principles, processes and procedures	25%
AO 2 Understanding of the principles, processes and procedures	50%
AO3 Application of understanding of the principles, processes and procedures	25%

Resitting on-screen Examinations

Learners who fail to pass will be permitted to resit the examination after feedback and appropriate tuition have taken place.

The learner will be allowed a maximum of two resit opportunities (three attempts in total). Learners who fail to achieve after three attempts will be required to re-register on the qualification.

The resit for externally set and marked examinations will be subject to the current published charges.

Resit scheduling

Learners will be permitted to resit within the following arrangements:

Resit 1:

- EAL will open the window for the first resit scheduling opportunity during the **first two weeks of May**
- Arrangements must be made for learners to complete the first resit Multiple Choice Exam external assessment

Resit 2:

- EAL will open the window for the first resit scheduling opportunity during the **first two weeks of July**
- Arrangements must be made for learners to complete the second resit Multiple Choice Exam external assessment

Practice examination

In January of academic year 1 (following the launch of the qualification), EAL will make available an onscreen practice exam. This can be accessed via EAL's Surpass Exam System. The practice exam is not part of the formal assessment arrangements and will therefore NOT count towards the qualification.

6.2 Internal Holistic Assessment (EAL Set and Centre Marked)

Internal holistic assessment both knowledge and practical are a form of controlled internal assessment marked by the Centre. General information regarding conducting controlled internal assessment can be found in the document 'EAL Guidance for Controlled Internal Assessment marked by the Centre' with specific guidance referenced from or contained within this qualification specification.

Internal holistic assessment includes the practical and design assessments. These assessments are set by EAL and marked by members of the delivery team at the Centre (see profiles of markers in Section 5). All assessment decisions are then subject to internal standardisation and external quality assurance.

Holistic assessment involves collecting and evaluating evidence that demonstrates achievement of the learning outcomes / criteria. They are accompanied by marking criteria / assessment checklists and other materials to ensure that the markers are consistent in their approach to assessment across learners.

Centres are responsible for ensuring that Centre-marked assessments are suitably controlled to ensure that assessment decisions are valid and reliable, and that work submitted for assessment by learners is prepared and produced independently, without assistance from others, and free of plagiarism.

Specific Guidance - Controlled internal assessment marked by the Centre

Assessor packs

Assessor packs contain relevant information for Centre staff to use as reference / guidance. These documents must not be shared with the learner as they may contain confidential information for Centre staff only.

Learner assessment packs

Learner assessment packs contain instructions relating to the practical assessment and design assessment. Learners will require access to these documents when they are ready to be assessed. Assessors should issue the learner assessment packs to the learner, together with any Centre devised practical assessment task or tasks which have been developed based on the assessment specification provided by EAL. These documents must be controlled by the assessor and provided to the learner as and when required but not retained by the learner. All assessment documentation must be retained by the assessor and/ or internal quality assurer within the controlled environment, unless where otherwise specified. Learners must be appropriately supervised when undertaking the practical assessment and design assessment. The level of supervision must be sufficient to safeguard the learners' health and safety, and ensure the evidence generated is attributable to the learner.

Electronic systems and records

Interactive word-based versions of the learner assessment pack and design assessments are available through on-line publications. Where an electronic system is used to administer the electronic versions of the learner assessment pack and /or design assessment, the system used **must** operate with the necessary controls in the same manner as that described under 'Learner assessment packs' i.e., no assessment documentation should be left with the learners to have uncontrolled access etc. Any electronic system that is used **must** prevent the unauthorised sharing of assessment documentation by learners i.e., via email etc. Where electronic systems with the necessary controls are used, evidence such as learner reports and completed design assessment answers may be uploaded or embedded within the system.

E-portfolio systems are generally NOT considered appropriate for delivering / administering internal assessments electronically. E-portfolio systems may be used to track learner attainment, record assessment outcomes and feedback. The following elements from the assessor and learner assessment packs may be replicated/uploaded to an e-portfolio system:

- Assessor pack: learning outcomes, assessment criteria, assessment specification to include the assessment criteria.
- Learner assessment pack: record of achievement for the knowledge assessment, assessment specification to include the assessment criteria, assessment checklist for the practical assessment and assessment feedback.

It is the responsibility of the internal quality assurer (IQA) for the qualification in advance to verify the electronic system's functionality and to agree the systems capabilities with regards to the control of qualification documentation before first use and to quality assure what has been uploaded/embedded is accurate and fit for purpose.

In relation to this qualification, evidence should generally not be uploaded to an e-portfolio system without the necessary controls but may reference to what the evidence is, and where

this is located. Where electronic or e-portfolio systems are used, the system must be capable of capturing auditable electronic declarations of authenticity, learner and assessor sign off or the electronic equivalent.

About the holistic assessment

Component	Series	Assessment type	Assessment window
Controlled holistic practical assessment	First series	Practical assessment	February - June
	Retake series	Practical assessment	February - July
Holistic design assessment	First series	Design assessment	February - June
	Retake series	Design assessment	February - July

Learners are required to complete the holistic assessment for this qualification between **the first week in February and the last day in June. Retakes must be completed by the last day in July.**

These assessments assess holistically the knowledge and skills of a range of assessment criteria from across the qualification. The instructions provided within the assessment documentation will specify the time allowed to complete the assessment, the type of evidence that is expected, and other requirements, as appropriate. The design assessment has accompanying marking criteria.

A detailed Assessment Checklist is provided for the practical assessments by EAL, which must be held securely in accordance with EAL procedures and adhered to by all assessors.

Delivery of the assessment will be subject to rigorous internal standardisation (including moderation).

Setting a deadline for completing the Centre marked assessment

The Centre must specify a due date when learners must complete the holistic assessment. The due date must fall within the designated period (see above) and be communicated clearly to learners. In setting the due date, consideration should be given to ensuring that:

- Learners have a realistic period of time in which to complete the assessment, taking into consideration the specified number of hours and any possible limitations on access to equipment, materials, etc.
- Sufficient time will be available for marking, moderation and external verification after the due date has passed
- Contingency arrangements need to be made in the event of learner absence and in extreme cases centres are advised to make a request for special consideration and / or reasonable adjustment.

Resources

Access to resources should be limited to those that are appropriate to the tasks to be completed as part of the assessment, taking into account any requirement for learners to select appropriate tools and materials, if this is specified in the assessment criteria.

The nature of the holistic practical assessment is “open book”. This dictates that access to the internet may be a requirement but will be appropriately restricted in order for learners to access (e.g.) programming manuals, maintenance manuals, relevant formulas, etc. Centres will need to ensure access to unauthorised electronic or wi-fi enabled devices, such as laptops, mobile phones, mobile watches, etc. is restricted. This is to ensure confidentiality of all assessments. EAL recommends that all learner’s unauthorised electronic devices and wi-fi enabled devices, such as mobile phones/watches, are collected by the supervisor at the start of each session.

Learners should be provided with the flexibility to be able to move in the allocated workshop space from one station to another.

Supervision

Learners are not required to be directly supervised under high control conditions with invigilators and high-profile codes of conduct rules on display for learners to adhere to. However, there needs to be sufficient levels of supervision to enable the learner's work to be authenticated (e.g. by delivery staff). This measure will ensure that the progress of the response, at each stage of the development, to the assessment task the learner submits is their own.

The assessor will ensure that interactions between learners are kept to a minimum and are solely for the purpose of accessing the required facilities. At no time should learners be discussing information directly or indirectly related to the assessment.

Learner collaboration

Learners must complete and evidence their work individually.

Advice and Feedback from Assessors

Assessors may review learners' work and provide oral and / or written advice at a general level and, subsequently, allow learners to progress with their tasks. General advice of this nature does not need to be recorded or considered when the work is being assessed.

Assessors should not give any assistance which goes beyond general advice, for example:

- provide detailed specific advice on how to deliver any aspect of what is being assessed in the assessment criteria
- give detailed feedback on production mistakes which limits learners' opportunities to show initiative themselves
- intervene personally to improve the product outcome.

Assessors must not provisionally assess work (e.g. conduct a formative assessment) and then allow the learner to revise it. Failure of centre staff to adhere to this may constitute malpractice.

Completion and submission

Any material evidence and other supporting information submitted by learners for the holistic assessment will be detailed in the Learner Assessment Pack.

Late submission

Learners must complete their assessments and hand in all relevant materials to the Centre by the due date. Any request to extend the submission date must be considered in accordance with EAL's policy for Special Consideration.

Assessment decisions and annotation

Assessors are responsible for making assessment decisions of work, in accordance with the assessment criteria detailed in the relevant specification and guidance documents. Assessor annotation should be used to provide evidence to indicate how and why assessment decisions have been made. This will facilitate the standardisation of assessment decisions within the centre and enable the moderator to check that assessment decisions are in line with the assessment criteria.

Grading the holistic assessment

Centre assessors should allocate a grade for the holistic assessment for each learner using the relevant Assessment Checklist and guidance documents provided. No other sources of information should be used to make judgments about the quality and sufficiency of the evidence.

All materials should be retained securely and confidentially by the Centre, in accordance with EAL policy.

All materials should be retained securely and confidentially by the Centre, in accordance with EAL policy.

Retaking Internal Holistic Assessments

Learners who fail to achieve a pass in any specific area of the assessments will be permitted a retake opportunity after feedback and appropriate tuition have taken place.

The learner will be allowed a maximum of two retake opportunities (three attempts in total) for each section within the Assessment Checklist. Learners who fail to achieve after three attempts, will be required to re-register on the qualification.

All assessment documents that pass or refer must be recorded and retained by the Centre and made available on request.

Standardisation of Holistic Assessment

Members of the internal quality assurance team at the Centre have an important role to play in ensuring that Centre marked assessment is standardised. In particular, they should work with tutor / assessors to ensure that the correct procedures are being followed at all times, and to ensure that assessment decisions taken by different assessors are consistent, fair and reliable. Key activities will include:

- Meeting with tutor / assessors (individually and collectively) throughout the course to discuss quality assurance and standardisation issues and provide support and guidance where needed
- Observing tutor / assessors and giving them feedback to help improve their assessment technique
- Sampling learner evidence across different learner cohorts to ensure that appropriate standards have been met
- Arranging cross-marking of learner work to compare results and agree benchmarks

In addition, once all learners have undertaken and completed the holistic assessment and marking has been carried out, internal moderation should be undertaken by a nominated member of the quality assurance team. This will involve checking a sample of learner's work to:

- Ensure that assessors have been consistent in their use of the Assessment Checklist
- Ensure that grades have been allocated fairly and consistently for all learners
- Check the authenticity of learner evidence
- If appropriate, agree changes to grades where anomalies have been detected

Centres / Organisations must have a moderation process in place to ensure that the assessing of internal assessments is both valid and reliable, through which adjustments to results are made and recorded accordingly. This ensures that the assessment process remains current and standards are consistently applied.

Internal moderation should be based on a sample of at least 25% of learners who have completed the holistic assessment and cover all assessors who have been involved in grading decisions. The sample should include any borderline cases that have been

identified for review by assessors. If there are fewer than 5 learners who have completed the holistic assessment, then all learners' work should be moderated.

Where inconsistencies or other discrepancies are identified, or where there is a disagreement on the grades allocated for particular learners, the level of sampling should be increased. All supporting records should include the comparison of assessment decisions from a representative sample of assessments including purposely highlighting where adjustments were necessary.

The outcomes from internal moderation of holistic assessment, including any proposed changes to allocated grades, should be recorded and made available to the External Quality Assurer.

Centres must maintain an assessment and feedback record for each learner, which details the evidence evaluated against the outcomes and the feedback given to the learner. The record will form part of the Learner Assessment Pack. These records must be available to the External Quality Assurer.

Centres / Organisations can utilise EAL's IQA documents to support their moderation activities, which can be obtained through Smarter Touch.

Further guidance on holistic assessment is provided within the Assessor Pack.

Learners must achieve ALL components for the qualification to be awarded. If learners are unsuccessful in one or more of the assessment components, then the overall result for the qualification will be 'referred' and a certificate will not be awarded.

7.0 Quality Control of Assessments

There are two major activities in which EAL interacts with the Centre in relation to the External Quality Control of Assessment for this qualification. These are:

- Recognition: When a Centre decides to offer the qualification, the EAL External Quality Assurer (EQA) ensures that the Centre is suitably equipped and prepared for delivery and assessment.
- Engagement: Throughout the ongoing delivery of the qualification EAL, through monitoring and other mechanisms will review the quality and consistency of assessment and internal quality assurance and recommend actions to address issues of concern.

Recognition

In granting approval, EAL, normally through its EQAs, will ensure that the prospective Centre:

- Meets any procedural requirements specified by EAL
- Has sufficient and appropriate physical and staff resources
- Meets relevant health and safety and / or equality and access requirements
- Has a robust plan for the delivery, assessment, and QA for the qualifications (including, where appropriate, scope for involving employers).

EAL may decide to visit the Centre to view the evidence provided.

Engagement

EAL, through EQA Engagement and other mechanisms will ensure that:

- A strategy is developed and deployed for the ongoing monitoring of the Centre – this will be based on an active risk assessment of the Centre, and will include details of the learner, assessor and internal quality assurer's sampling strategy and the rationale behind this
- The Centre's internal quality assurance processes are effective in learner assessment
- Outcomes of internal assessment are verified, through sampling, to ensure standards are being maintained
- Sanctions are applied to a Centre where necessary and that corrective actions are taken by the Centre and monitored by the EQA
- Reviews of EAL's external auditing arrangements are undertaken

8.0 Unit Content

Unit: TE3-01 Health, Safety and Environmental Considerations

GLH: 20

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- In all of these activities, Electricians must understand and apply health and safety and environmental regulations, guidance notes and relevant codes of practice

Unit description

This unit will provide learners with an understanding of the relevant health and safety legislation, practices and procedures when installing and maintaining electrical systems and equipment. The knowledge covered in this unit underpins the practical application of health and safety legislation, practices, and procedures.

Learners will appreciate in this unit the importance of health and safety and the need to follow company policies and site rules.

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
1. Know how relevant legislation applies in the workplace	1.1 Identify roles and responsibilities with regard to current relevant Health and Safety legislation	<p>Cover:</p> <ul style="list-style-type: none">• The Health and Safety at Work Act• Construction Design Management Regulations (Roles)• The Electricity at Work Regulations (key: regulations 4, 16, and 29, and how EAWR supports BS 7671)• The Management of Health and Safety at Work Regulations• Workplace (Health and Safety and Welfare) Regulations• Control of Substances Hazardous to Health (COSHH) Regulations• Working at Height Regulations• Personal Protective Equipment at Work Regulations• Manual Handling Operations Regulations• Provision and Use of Work Equipment Regulations• Control of Asbestos at Work Regulations <p>Cover the importance of health and safety (and site inductions), and the need to follow company policies and site rules. Why these policies and rules are in place.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Know how relevant legislation applies in the workplace	1.2	Identify roles and responsibilities with regard to current relevant environmental legislation	<p>Cover:</p> <ul style="list-style-type: none">• Control of Asbestos at Work Regulations• Environmental Protection Act• The Hazardous Waste Regulations• Pollution Prevention and Control Act• Control of Pollution Act• The Control of Noise at Work Regulations• The Waste Electrical and Electronic Equipment Regulations

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
2. Understand the procedures for dealing with environmental and health and safety situations in the work environment	2.1 Explain factors which can constitute a hazard in the workplace	<p>Cover:</p> <ul style="list-style-type: none">• Asbestos (in decorative finishes, in electrical equipment, and insulation)• Electricity• Working at heights• Equipment hazards• Working environment hazards (including trip/slips dust and fumes)• Fire• Chemical substances and mixtures (and clp labelling)• Occupied dwellings (inc. Occupants with mental health conditions, alcohol / drug dependencies, dangerous pets). Recognition that tenants may prevent access to the premises.• Lone working• Bacteria (Weil's disease) <p>Learners will appreciate in this learning outcome (and unit) the importance of health and safety and the need to follow company policies and site rules.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
2. Understand the procedures for dealing with environmental and health and safety situations in the work environment	2.2 State the procedures that should be followed in the case of <ul style="list-style-type: none">• Accidents which involve injury• Emergency situations.	<p>Cover appropriate procedures:</p> <ul style="list-style-type: none">• Procedures for summoning emergency services• Information that emergency services require• Alarm and evacuation procedures• Designated escape routes• Fire-fighting procedures• Application of first aid <p>Requirements for reporting of health and safety and welfare related matters and the RIDDOR reporting procedure.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the procedures for dealing with environmental and health and safety situations in the work environment	2.3	Describe how the environment may be affected by work activities	<p>Cover:</p> <ul style="list-style-type: none">• Land contamination• Air pollution• Noise pollution• Pollution of water courses <p>Include coverage of correct disposal of fluorescent and CFL lamps.</p>
3. Be able to establish a safe working environment	3.1	Produce a risk assessment and method statements in accordance with own level of responsibility	<p>Cover:</p> <p>Proficiently carrying out health and safety planning activities in a for a practical context and embedding safe working in practical work in the assessments.</p>
	3.2	Demonstrate the safe practices and procedures for the use of equipment and materials	<p>Selecting PPE and protective clothing. Being able to follow safe systems of work, and completion of method statement and risk assessment documentation.</p>

Unit: TE3-03 Practices and Procedures for Planning and Overseeing Electrical Work Activities

GLH: **15**

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- Oversee and organise the work environment

Unit description

This unit is designed to enable learners to understand the practices and procedures used when planning electrical installation and maintenance work activities. Its content is the knowledge needed by a learner to underpin the application of skills for overseeing and organising the work environment.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the requirements for liaising with others when organising and overseeing work activities	1.1	Describe techniques and methods for the communication with others for the purpose of co-operation and teamwork, motivation, and coordination of work	Cover: How to communicate with public, clients, occupiers, trades, and contractors. The importance of teamwork and cooperation to builds strong employee relationships, raise productivity achieve goals, and create an enjoyable work environment.
	1.2	Identify roles and responsibilities with regard to current relevant employment legislation	Cover: Employment Rights Act, Data Protection Act, Equality Act, Human Rights Act.
	1.3	Describe methods of determining competence	Cover: How to check competency through industry cards (including CSCS / ECS card, JIB card). Checking qualifications. Knowing how to check competency of the enterprise being part of a CPS scheme, and an awareness of the roles and responsibilities of a QS. Knowing the importance of Continuing Professional Development (CPD) and proven experience in work being undertaken, checking references from previous employers. Informal monitoring of performance on site.
	1.4	Describe customer service principles	Cover: Customer service principles consisting of having good product knowledge, building trust, meeting timescales, using good communication, honesty, and integrity. How to communicate to the client in all stages of the project, and the importance of this during the handover (link to inspection and testing) i.e., explaining how the installation operates (lighting

			and heating controls etc.). The benefits of having excellent customer service.
--	--	--	--

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
2. Understand the requirements for organising and overseeing work	2.1 Describe how to plan and implement work allocations including coordination with other services and personnel	Cover: How to plan and implement work in typical installations and premises through planning and scheduling work activities, and communicating, and implementing work, and overcoming problems. Interactions and sequences of trades. Also poses an awareness that Higher Risk Buildings (HRBs) have enhanced requirements. Ensuring work is carried out safely.
	2.2 Explain how the work completion time is estimated taking into account influential factors	Cover: Influential factors: deployment and availability of suitable personnel, the delivery and availability of equipment, components and material, weather conditions, the work to be completed by other services, and specification variations. Sequence of work, and task dependencies, critical path network.
	2.3 Interpret the installation specification and work programme to identify resource requirements.	Cover: How to interpret specifications and work programmes, to select resources, and when they will be required. Awareness of procuring resources, just in time ordering, and holding an inventory. Awareness of Modern methods of Construction (MMC) e.g., prefab buildings and 'plug and play'.

	2.4	Specify procedures for re-scheduling work to co-ordinate with changing conditions in the workplace and to coincide with other trades or client's requirements	Cover: Procedures for communication with other trades and client when work requires to be rescheduled. Awareness of sequence of work, and impact to changes – such as from client's specification, updated drawings, weather, resource shortages. What is meant by float time.
Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the requirements for organising and overseeing work	2.5	State the possible consequences of not: <ul style="list-style-type: none"> • Completing work within the estimated Time • Meeting the requirements of the Project • Using the specified materials • Installing materials and equipment as specified 	Cover: Impact to the deliverable, and own reputation, and recognising potential consequences. Recognising the importance of project time, cost, and quality.
	2.6	Specify documentation that is required during work operations or contracts	Cover: Estimates, quotation, tender, variation order, purchase order, daywork sheets, timesheets, site diary, requisitions delivery notes. Related documentation from Building regulation approval and planning permission.
3. Understand the management and use of data and information	3.1	Interpret types of information and data sources used within construction and building services projects	Cover: Product data, manufacturer's specifications, client's specifications, Common Data Environment, BIM, Gantt charts, critical path networks, certification and commissioning data, test data schedules, condition reports, and carbon emissions.

	3.2	State methods of data management to maintain confidentiality	Cover: Methods of managing data, and in accordance with Data Protection Act.
4. Be able to organise own work	4.1	Organise the resources required	Cover: Organisation involved when planning to carry out electrical installation / maintenance work.
	4.2	Carry out effective planning	

Unit: TE3-04 Design and Installation Practices and Procedures

GLH: 170

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- Understand and apply the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems
- Understand and apply the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment
- Understand and apply the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment
- Electricians must understand and apply health and safety and environmental regulations, guidance notes and relevant codes of practice

Unit description

This unit enables the learner to develop the skills and associated knowledge and understanding in the design, preparation and installation of wiring systems and associated equipment electrical installations in accordance with approved industry practices, and statutory and non-statutory regulations. These include: The Electricity at Work Regulations and BS 7671, Health and Safety at Work etc. Act, Building Regulations, Approved Documents, and

other standards that effect the design, installation and performance of electrical installations.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the applications of wiring systems	1.1 Explain the characteristics and requirements of electrical cables including their: <ul style="list-style-type: none"> • Connections • Terminations 	<p>Cover: Constructional features, applications, advantages, and limitations of:</p> <ul style="list-style-type: none"> • Single and multicore cables and flexible cables: thermoplastic (PVC), and thermosetting insulated. • PVC/PVC flat profile cable • MICC • SWA • Armoured/braided flexible cables, • Data cables including PoE • Fibre optic cable • Fire resistant cable • DC cabling • Split concentric • Cable glands <p>The requirements for the safe and effective termination and connection methods for cables and conductors. Torque settings of tools, tightening torque (N.m) of terminals, and stripping lengths of conductors. Consequences of inadequate termination and connection of conductors (e.g. high resistance, overheating, circuit failure, and fire).</p> <p>The various terminal types. Screw, crimped, non-screw compression, compact lever and insulation displacement.</p> <p>Include coverage of cables used for EV charging equipment E.g. (Doncaster cables 'EV ultra'). Awareness of cables in accordance with British/Harmonised Standards and BASEC approval of cables.</p>	



Part of the
Enginuity Group

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the applications of wiring systems	<p>1.2 Explain the characteristics and requirements of:</p> <ul style="list-style-type: none"> • Containment and wiring systems • Wiring support methods 	<p>Cover: Constructional features, applications, advantages, and limitations. Characteristics of containment, support and wiring systems, cover: metallic / PVC conduit, metallic / PVC trunking, cable basket, cable tray, ladder systems, ducting, modular wiring systems, busbar systems and powertrack; clips, cleats, and saddles. Maintaining earth continuity of metallic systems. PVC/PVC Flat profile as a wiring system. Determining the size of conduit and trunking as appropriate to the size and number of cables. Support distances in line with industry guidance and regulations (IET On-Site Guide, BS 7671). Product marking of equipment (such as UKCA and awareness of counterfeited equipment (inc. cables).</p>	
	<p>1.3 Describe the factors which affect the selection of wiring systems, associated equipment and enclosures</p>	<p>Cover: Factors including building utilisation, environment, and cost.</p>	
	<p>1.4 Select suitable wiring systems and equipment appropriate to the situation and use</p>	<p>Cover: Lighting control systems, final circuits, distribution circuits, fire detection and alarm systems; unlawful entry and emergency lighting, access, wired or wireless surveillance systems, communication, and data transmission systems, escape routes, electric vehicle charging circuits and equipment, solar PV and battery systems.</p>	

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the practices and procedures for carrying out electrical work	2.1	<p>State how to select and safely use:</p> <ul style="list-style-type: none"> • Tools and equipment, • Adhesives 	<p>Cover:</p> <p>Tools, and equipment for typical electrical work: hand tools, power tools. measuring and marking out equipment.</p>
	2.2	State how to measure and mark out positions for wiring systems and equipment	<p>Cover:</p> <p>Measuring and marking out techniques, including use of a fixed datum, and FFL; using laser and spirit levels, chalk lines, referencing drawings, and applying industry techniques.</p>
	2.3	State the criteria for selecting and safely using fixing devices for wiring systems, associated equipment and enclosures	<p>Cover:</p> <p>Load bearing capacity, fabric of structure, environmental considerations, and aesthetic considerations.</p>
	2.4	Specify the installation methods and procedures to ensure the installation meets the specification and statutory and non-statutory regulations	<p>Cover:</p> <p>Compliance with building regulations and requirements when installing systems such as:</p> <ul style="list-style-type: none"> • Ensuring that wiring systems, enclosures, cables and components are securely fixed and installed • Ensuring that a wiring system's mechanical integrity is maintained • Ensuring that measures are taken to minimise the risk of damage to the wiring system and components • Meeting requirements for protected escape routes • Impact to the fire risk assessment when installing in existing buildings (such as hmos, high rise residential, and communal areas of flats)

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the practices and procedures for carrying out electrical work	2.5	Specify methods and techniques for restoring the building fabric	Cover: Building fabric, include coverage of plaster, foam fillers, masonry, stud walls, ceilings, insulation, fire compartments, fire resistance ratings, historic building techniques (e.g., lath and plaster).
	2.6	Describe how to maintain fire and acoustic protection	Cover: Building Regulations and Approved Documents B and E. Include coverage for downlighters and trunking. Fire sealing, there are free guides available including ESF Best Practice Guide number 5.
3. Understand the characteristics and applications of supply systems and consumer's equipment	3.1	Explain the characteristics and applications of earthing arrangements	Cover: TN-S, TNC-S, and TT. Cover neutral current diversion appearing on earthing systems. Awareness only of other earthing systems in BS 7671 (such as IT in an operating theatre).

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
3. Understand the characteristics and applications of supply systems and consumer's equipment	3.2	Explain the characteristics and applications of supply systems	<p>Cover:</p> <ul style="list-style-type: none">• Single phase• Three phase• Three phase and neutral
	3.3	Specify the arrangements for electrical installations and systems with regard to provision for isolation, switching, protection and control	<p>Cover:</p> <ul style="list-style-type: none">• Isolation and switching• Overcurrent protection• Earth fault protection• Arc fault detection• Surge protection• Dc isolators <p>Refer to requirements of BS 7671, and IET On-Site Guide.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
4. Understand earthing and protection	4.1	Explain the purpose of earthing and protective conductors	<p>Cover: Requirements of IET On-Site Guide, and BS 7671. Ensure learners become conversant with requirements, and the purpose of these conductors.</p>
	4.2	Identify extraneous and exposed conductive parts	<p>Exposed-conductive-part. Conductive part of equipment which can be touched, and which is not normally live, but which can become live under fault conditions. Metallic parts of the wiring systems such as steel conduit and trunking. Metal switch plates, metallic consumer control unit. Metal appliance casing such as a cooker, washing machine.</p> <p>Extraneous-conductive-part: A conductive part liable to introduce a potential, generally earth potential, and not forming part of the electrical installation.</p> <p>Examples of extraneous-conductive-parts are metallic installation pipes, metallic gas installation pipes, other installation pipe work, for example, heating oil, structural steelwork of the building where rising from the ground, lightning protection systems.</p> <p>Awareness of how to test for an extraneous conductive part.</p>
	4.3	Describe the requirements and measures for protection against electric shock	<p>Cover: Requirements of IET On-Site Guide, and BS 7671.</p>
	4.4	State the maximum disconnection time for different types of circuit	
	4.5	Explain the earth fault loop path and earth fault loop impedance	
	4.6	Specify requirements and applications of functional earthing.	

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
4. Understand earthing and protection	4.7	Select suitably sized protective conductors in accordance with BS 7671	Cover: Requirements of Chapter 54 of BS 7671.
5. Understand protection against electrical faults	5.1	Identify types of and reasons for overcurrent	Cover: Short circuits, earth faults, and overloads, and typical reasons for these occurring.
	5.2	Explain the applications and limitations of protective devices	Cover: <ul style="list-style-type: none"> • CBs • Fuses (BS 3036 semi-enclosed, BS 1362 cartridge, BS 88) • RCDs and RCBOs • AFDDs • SPDs
	5.3	Identify fault current capacities of devices	Cover: Identifying fault current capacities of devices, and why this capacity is important for safety and correct function.
	5.4	Describe the need for selectivity between protective devices	Cover: Requirements of BS 7671. Arrangement of devices for back up protection. Also cover selectivity between RCDs.
6. Understand electrical systems and circuits	6.1	Describe the characteristics of standard electrical circuits	Cover: Lighting, socket outlets (ring and radial) and supplies to fixed equipment. To the requirements of the IET On-Site Guide. An awareness of older wiring systems and practices.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
6. Understand electrical systems and circuits	6.2 Outline the key characteristics of particular electrical systems and circuits and the applications of these circuits and systems		Cover: Distribution systems (sub mains), lateral mains and BNO, environmental control/building energy management systems, emergency lighting, security systems – fire alarms, unlawful entry; emergency lighting, UPS, CCTV, communication, and data transmission systems. Machine control, heating control, communication and data transmission systems (broadband, wired networks and WI-FI); wireless controls, electric vehicle charging circuits and equipment, electrical accessibility aids (e.g. stair lifts, hoists / person lifters, assisted living technologies, and person alert systems). IoT and operation of app-based controls. Lighting controls and protocols including ‘DALI and ‘KNX’.
7. Install wiring systems and equipment	7.1 Carry out the appropriate preparations for electrical installation		Cover: How to plan to carry out practical work. Sequence of activities.
	7.2 Select the appropriate tools and equipment for the electrical installation		Cover through producing a materials, tools and equipment list.
	7.3 Follow safe working procedures		Cover: Adopting PPE, keeping a safe work area. Restoring work area afterwards.
	7.4 Use the appropriate tools safely		Cover: Using tools in a safe manner. Returning after use.
	7.5 Install wiring and associated equipment and components accurately to the specification		Learners will have to effectively mark up the work area/bay to install wiring systems and equipment. (I.e., marking up from a fixed datum line to facilitate accuracy). They will then proceed to install materials to the specification. Checking work during

			installation and on completion. Adjusting approach and problem solving as needed.
--	--	--	---

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
7. Install wiring systems and equipment	7.6	<p>Apply the techniques and methods for the safe and effective termination and connection of cables.</p> <ul style="list-style-type: none"> • Flexible cables • Single and multicore cables • Pvc/pvc flat profile cable • SWA cables • Data cables • Fire performance cable 	<p>Cover:</p> <ul style="list-style-type: none"> • Screw • Crimped • Non-screw compression • Compact lever • Insulation displacement <p>Connecting circuits and systems accurately to the specification. Ensuring terminations and connections are electrically and mechanically sound.</p>
	7.7	Maintain a tidy and safe work area	<p>Cover:</p> <p>Disposal of waste in accordance with recycling practice.</p>
8. Understand the electrical design procedure	8.1	State the purpose of diversity factors	<p>Cover:</p> <p>Appreciation of factors and how they apply.</p>
	8.2	Select suitable current using equipment giving consideration to energy efficiency and relevant codes of practice for sustainability	<p>Cover:</p> <p>Utilisation of low energy equipment including low energy lighting and related controls.</p>
	8.3	Determine the maximum demand (of an installation) after the application of diversity	<p>Cover:</p> <p>Application of the IET On-Site Guide.</p>
	8.4	Determine the design current	<p>Cover:</p> <p>Single and three phase circuits.</p>
	8.5	Select a suitably rated protective device	<p>Cover:</p> <p>Application of BS 7671 for a range of typical scenarios.</p>
	8.6	Establish the installation method reference	
	8.7	Determine appropriate rating factors	

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
8. Understand the electrical design procedure	8.8	Determine the minimum cross-sectional area of live conductors taking into consideration current carrying capacity and voltage drop	Cover: Application of BS 7671 for a range of typical scenarios.
	8.9	Establish if the voltage drop is acceptable	Cover: Application of BS 7671 for a range of typical scenarios.
	8.10	Verify if the disconnection times have been achieved	Cover: How to determine R1 + R2 and Zs, and verification against BS 7671.
	8.11	Evaluate thermal constraints	Cover: Application of the adiabatic formula.
	8.12	Interpret the requirements of sources of information that support electrical installation and design work	Cover: Interpretation of sources of information to help design typical installations: British Standards such as BS 7671, Guidance Notes and On-site guide, building regulations and approved documents, Construction Design and Management (CDM) Regulations, relevant BEAMA guides, technical data, manufacturer's instructions, and other relevant standards. Circuit chart and schedules. BIM output data. Site drawings, installation specifications, wiring diagrams; fitting and fixing dimensions / drawings.

Unit: TE3-06 Practices and Procedures for Inspection, Testing and Commissioning

GLH: **60**

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- Understand and apply the principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment

Unit description

This unit is designed to enable learners to understand principles, practices and legislation for the initial verification and periodic inspection of electrical installations with statutory and non-statutory regulations and requirements. Its content is the knowledge needed by a learner to underpin the application of skills for the inspection, testing, commissioning and certification of electrical installations.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the requirements for completing the safe isolation of electrical circuits and installations	1.1	State the requirements of the electricity at work regulations for the safe inspection of electrical systems and equipment	<p>Cover:</p> <ul style="list-style-type: none"> • Those carrying out the work • Those using the premises during the inspection <p>Refer to the relevant parts of the Electricity at Work Regulations 1989, and the Memorandum of guidance on the Electricity at Work Regulations 1989 (HSR25).</p>
	1.2	Specify the appropriate procedure for completing safe isolation	<p>Cover:</p> <p>Best Practice Guide Number 2 by Electrical Safety First. Includes effects to building systems, and loads (e.g., chillers / freezers), due to the removal of the supply. Cover parallel supplies.</p>
	1.3	Recognise the implications of not carrying out safe isolation	<p>Cover:</p> <p>How it relates to the safety of: The inspector, other personnel, customers / clients, and the public. Legal implications.</p>
	1.4	Identify the health and safety requirements which apply when inspecting, testing and commissioning electrical installations and circuits	<p>Cover:</p> <ul style="list-style-type: none"> • Working in accordance with risk assessments / permits to work / method statements • Safe use of tools and equipment • Safe and correct use of measuring instruments • Provision and use of PPE • Reporting of unsafe situations • Detecting possible diverted neutral currents • Refer to the General Requirements given in IET Guidance Note 3

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the requirements for the inspection of electrical installations	2.1	State the purpose and requirements of the inspection of electrical installations	<p>Cover:</p> <ul style="list-style-type: none"> Initial verification Periodic Inspection (including sampling, extent and limitations, condition report codes and situations requiring reporting) <p>Include:</p> <p>Inspection and testing for initial verification carried out at different stages as per Regulation 641.1 Refer to Chapter 64 of BS 7671 and Section 3 of GN3. Refer to the latest edition of BS 7671 and IET Guidance Note 3 (General requirements). See relevant parts of Part 6. Refer to Section 511 - Compliance with standards. Also to ensure installation meets the specification. Ensure no danger occurs to any person or livestock and property is not damaged. Compare the inspection and testing results with the design criteria. Section 2.1 of GN3 including frequency of inspections etc. Cover Section 1.2 and 3.1 of GN3.</p>
	2.2	Identify the relevant documents associated with the with the inspection and testing	<p>Cover:</p> <ul style="list-style-type: none"> Electricity at Work Regulations BS 7671 IET Guidance Note 3 IET On-site Guide HSE Guidance <p>Stress: what they are and how they apply.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
2. Understand the requirements for the inspection of electrical installations	2.3	Specify the information that is required by the inspector to conduct the inspection of an electrical installation	Cover: Initial verification, and periodic Inspection. Refer to the latest edition of BS 7671 and IET Guidance Note 3. Regulation 642.2, Section 131, The general characteristics required by Sections 311 to 313. Information required by Regulation 514.9.1 (diagrams, charts, circuit schedules). And as applicable (for a PIR): previous inspection and test results, and the extent and limitations of the report.
3. Understand the requirements for completing the inspection of electrical installations prior to their being placed into service	3.1	Select appropriate items to be checked during the inspection process	Cover: As listed in Items to be checked as per BS 7671 and IET Guidance Note 3. Typical examples to be covered for a range of installations and environments. Inspection is carried out at different stages as per Regulation 641.1.
	3.2	Recognise utilisation of human senses during the inspection process	Typical examples to be covered.
	3.3	Specify the requirements for the inspection of electrical installations as detailed in the guidance for inspection in BS 7671	Refer to the complete list of items in Section 642, and GN3. Ensure learners understand the meaning, requirements and relevance of items to verified. Ensure coverage of Appendix 13: Escape routes and fire protection (see supporting information in IET Guidance Note 3). Cover IP Ratings.

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
4. Understand the requirements for the safe testing and commissioning of electrical installations	4.1 State the tests to be carried out on an electrical installation in accordance with the BS 7671 and IET Guidance Note 3	Refer to Section 643 and Guidance Note 3. The need for instruments to be regularly checked and calibrated, to ensure they are safe to use and are accurate. The need for instruments to comply with the requirements of the current edition of BS 7671, e.g., test voltage.
	4.2 Identify the appropriate instrument for each test to be carried out in terms of: <ul style="list-style-type: none">• The instrument is fit for purpose• Identifying the correct scale or setting	
	4.3 Specify the requirements for the safe use of instruments to be used for testing and commissioning	To include: <ul style="list-style-type: none">• Checks required to prove that test instruments are safe and functioning correctly• The requirements for test leads and probes must comply with hse guidance gs38• The need for instruments to be regularly checked for accuracy and are calibrated
	4.4 Explain why it is necessary for test results to comply with standard values	Cover: For safety, and correct function. Inspector to confirm the results with the installation design criteria and / or BS 7671 as appropriate. Interpreting results that although comply may have unexpected deviation from expected value.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
4. Understand the requirements for the safe testing and commissioning of electrical installations	4.5	State the actions to be taken in the event of unsatisfactory results being obtained	Refer to regulation 643.1: 'If any test indicates a failure to comply...'.
	4.6	Explain why testing is carried out in the sequence specified in BS 7671 and IET Guidance Note 3	Cover: Carried out in the sequence for safety, and validity of subsequent test. Tests may be in a different order when undertaken on an existing installation.
5. Understand the requirements for testing before circuits are energised	5.1	State why it is necessary to verify continuity to include: <ul style="list-style-type: none"> • Protective bonding conductors • Circuit protective conductors • Ring final circuit conductors 	Refer to BS 7671 and Guidance Note 3.
	5.2	State the methods for verifying continuity to include: <ul style="list-style-type: none"> • Protective conductors • Ring final circuit conductors 	Cover: Calculations shown in the three steps. Interpretation of readings from tests of ring final circuits.
	5.3	Explain factors that affect conductor resistance values	Cover: Cables connected in parallel calculations of resistances in parallel. Variations in cable length (including how length affects voltage drop) variations in conductor cross sectional area changes in temperature.

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
5. Understand the requirements for testing before circuits are energised	5.4 Specify the procedures for completing insulation resistance testing	Cover: As given in IET Publications: <ul style="list-style-type: none">• Precautions to be taken before conducting insulation resistance tests• Methods of testing insulation resistance• The required test voltages and minimum insulation resistance values for circuits operating at various voltages• Identifying typical voltage sensitive devices• Particular requirements for testing where there are voltage sensitive devices and / or surge protection devices installed
	5.5 State the effects on insulation resistance values that the following can have: <ul style="list-style-type: none">• Cables connected in parallel• Variations in cable length	Cover: <ul style="list-style-type: none">• Circuits connected in parallel will lower the overall insulation resistances (Reciprocal method when calculating)• When the cable length increases insulation resistance decreases Refer to Chapter 64 of BS 7671 Relate to leakage current and nuisance tripping of RCD's
	5.6 Explain why it is necessary to verify polarity	Cover: Requirements of BS 7671 and Guidance Note 3.
	5.7 State the procedures for verifying polarity	

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
6. Understand the requirements for testing energised installations	6.1 State the procedures for confirming polarity of the incoming supply	Cover: Requirements of BS 7671 and Guidance Note 3.
	6.2 Specify the methods for measuring earth electrode resistance to include: <ul style="list-style-type: none">• Installations forming part of a TT system• Generators and transformers	
	6.3 Describe common earth fault loop paths	Cover: TT, TN-S and TN-C-S.
	6.4 State the methods for verifying protection by automatic disconnection of supply	Cover: Requirements of BS 7671 and Guidance Note 3: <ul style="list-style-type: none">• The measurement of the external earth fault loop impedance (Z_e) and the system earth fault loop impedance (Z_s)• Establishing Z_e by enquiry• Calculation of the value of Z_s from given information• Comparing measured Z_s values with the maximum tabulated figures as specified in BS 7671 including the application of the correction factor
	6.5 Identify the requirements for the measurement of prospective fault current	Cover: Requirements of BS 7671 and Guidance Note 3.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
6. Understand the requirements for testing energised installations	6.6 Specify the methods for determining prospective fault current	Cover: Requirements for determining fault current: calculation, measurement, and enquiry for single phase and three phase installations. Being able to check devices for magnitude of fault current.	
	6.7 Verify the suitability of protective devices for prospective fault currents		
	6.8 Specify the methods for testing the correct operation of residual current devices	Cover the requirements of BS 7671 and Guidance Note 3.	
	6.9 State the reasons for verifying phase sequence		
	6.10 State the methods used to verify phase sequence		
	6.11 State the need for functional testing		
	6.12 Identify items which require functional testing	Include: Awareness of ensuring installation heating and lighting controls are operating correctly. Link to the handover process for the client and communicating to the client how these systems operate. Ensure coverage of AFDDs where they have a test button.	
	6.13 State the appropriate procedures for dealing with clients during the commissioning and certification process	Cover: <ul style="list-style-type: none">• Ensuring the safety of others during the work activities• Keeping clients informed during the process• Labelling electrical circuits, systems and equipment that are still to be commissioned• Providing clients with all the appropriate documentation upon work completion	

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
7. Understand the requirements for the completion of documentation	7.1 Recognise the requirements for certificating and associated documentation	<p>Cover:</p> <ul style="list-style-type: none">• Electrical Installation Certificate• Minor Electrical Installation Works Certificate• Electrical Installation Condition Report• Condition Report Inspection Schedule• Schedule of Inspections• Schedule of Test results• Schedule of Circuit Details <p>Refer to the model forms provided in BS 7671 and Guidance Note 3; and the notes on that reversal of the model forms. The information that must be contained on documentation. The certification process for a completed installation. The responsibilities of different relevant personnel in relation to the completion of the certification process. Recording and retention of completed documentation in accordance with BS 7671.</p> <p>The date for the first periodic inspection and test is required to be considered and recommended by the original installation designer, as part of their design.</p>

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
8. Be able to confirm safety of system and equipment prior to completion of inspection, testing and commissioning	8.1	Carry out safe isolation procedures in accordance with regulatory requirements	Cover by: Linking practical delivery as much as possible with the knowledge content in the previous learning outcomes.
	8.2	Comply with the health and safety requirements of themselves and others within the work location during the initial verifications process	Ensure health and safety procedures are followed during the delivery.
	8.3	Check the safety of electrical systems prior to the commencement of inspection, testing and commissioning	

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
9. Be able to carry out inspection of electrical installations prior to them being placed into service	9.1 Identify a safe system of work appropriate to the work activity 9.2 Carry out an initial inspection of an electrical installation in accordance with the requirements of BS 7671 and IET Guidance Note 3 9.3 Complete a Schedule of Inspections in accordance with BS 7671 and IET Guidance Note 3 based on engineering evaluation of the installation to be verified	Ensure: Learners are able to carry out an Inspection in accordance with BS 7671 and Guidance Note 3.
10. Be able to test electrical installations prior to them being placed into service	10.1 Select the test instruments and their accessories for tests to include: <ul style="list-style-type: none">• Continuity• Insulation resistance• Polarity• Earth electrode resistance• Earth fault loop impedance• Prospective fault current• RCD operation• Functional testing	

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
10. Be able to test electrical installations prior to them being placed into service	10.2 Evaluate the appropriate tests suitable for the installation to be verified		Ensure: Learners are able to carry out testing of single-phase circuits in accordance with BS 7671 and Guidance Note 3.
	10.3 Carry out tests in accordance with BS 7671, IET On-Site Guide and Guidance Note 3: <ul style="list-style-type: none"> • Continuity: main protective bonding conductors, circuit protective conductors, and ring final circuits • Insulation resistance • Polarity • External earth fault loop impedance (z_e) • System earth fault loop impedance (z_s) • Prospective fault current • RCD operation including additional protection • Functional testing 		
	10.4 Confirm compliance by evaluating and verifying test results		Cover: By verifying against BS 7671 and IET On Site Guide.
	10.5 Complete appropriate documentation in accordance with the BS 7671 and IET Guidance Note 3 including: <ul style="list-style-type: none"> • Electrical Installation Certificate, • Related schedules 		Relate to model forms within: BS 7671 and IET Guidance Note 3

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
11. Be able to commission electrical systems and equipment	11.1	Clarify the commissioning procedures with relevant persons	Include: <ul style="list-style-type: none">• Providing customers with appropriate documentation such as EIC• Handover and demonstration of equipment use• Manuals and warranties
	11.2	Carry out the commissioning of circuits, accessories and equipment to confirm functionality	

Unit: TE3-07 Practices and Procedures for Fault for Diagnosis and Rectification

GLH: 20

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- Understand and apply the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment

Unit description

This unit is designed to enable learners to understand principles, practices and legislation associated with diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment in accordance with statutory and non-statutory regulations and requirements. Its content is the knowledge needed by a learner to underpin the application of skills used for fault diagnosis and correction in electrical systems and equipment in buildings, structures and the environment.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the importance of reporting and communication in fault diagnosis	1.1	Describe the documentation relevant to fault diagnosis	Cover: <ul style="list-style-type: none"> • BS 7671 • Manufacturing instructions such as manuals • O & M manual • Previous test results
	1.2	State the implications of the fault diagnosis for customers and clients	Cover: <ul style="list-style-type: none"> • Loss of circuits and equipment • Potential safety issues
	1.3	Explain the communication requirements relevant to fault diagnosis	Cover: <ul style="list-style-type: none"> • Informing relevant persons about information on electrical fault diagnosis and correction work • Why it is important to provide relevant persons with information on fault diagnosis and correction work clearly, courteously and accurately • Why clients need to be kept informed during completion of fault correction work
2. Understand the nature and characteristics of electrical faults	2.1	State the dangers of electricity in relation to fault diagnosis work	Cover: <ul style="list-style-type: none"> • Working with or near live supplies may be necessary (Relate to Regulations 14 & 16 of the Electricity at Work Regulations) • Low levels (50mA) can be lethal. • Hazardous areas • Alternatives sources of supply • Incorporating Safe systems of work • Incorporating Safe working procedures such as using equipment compliant with GS38

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
2. Understand the nature and characteristics of electrical faults	2.2 Identify types, causes and consequences of electrical faults	<p>Cover:</p> <ul style="list-style-type: none">• Loss of supply• Low voltage / voltage drop• Component / equipment malfunction/failure• Operation of overload or fault current devices• Arcing parallel and series arcs or operation of AFDD• High resistance - loose connection• Transient voltages - lighting strike / switching• Excess current - overload and its effects• Insulation failure - deterioration, mechanical damage• Short-circuit• Open circuit• Earth fault• Signal faults• EMI
	2.3 Describe typical types of faults and their likely locations in wiring systems and equipment	<p>Cover:</p> <ul style="list-style-type: none">• Wiring systems• Terminations and connections• Equipment / accessories (switches, luminaires, switchgear and control equipment)• Instrumentation / metering

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
3. Understand the fault diagnosis procedure for single-phase electrical systems	3.1 State precautions that must be taken when carrying out fault diagnosis with regard to particular locations, equipment and circumstances	Cover: <ul style="list-style-type: none">• Lone working• Electronic devices (damage by over voltage)• Presence of batteries• Additional and alternative sources of energy• Time controlled devices
	3.2 Explain the logical stages of fault diagnosis	Cover: <ul style="list-style-type: none">• Identification of symptoms• Collection and analysis of data• Use of sources / types of information such as bs 7671, certificates / reports, installation specifications, drawings / diagrams, manufacturer's information, and operating instructions• Maintenance records (previous inspection and test documents)• Communicating with clients to determine nature/characteristics of the fault• Checking and testing (e.g., supply, protective devices)• Interpreting results / information• Fault correction• Functional testing• Restoration• All live test equipment in accordance with hse guidance document GS 38

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
3. Understand the fault diagnosis procedure for single-phase electrical systems	3.3 Select the appropriate test instrument/s for fault diagnosis work	Cover: <ul style="list-style-type: none">• Voltage indicator• Low resistance ohm meter• Insulation resistance testers• EFLI and PFC tester• RCD tester• Ammeter• Battery tester• Multi-meter (component testing)• GS38
	3.4 Describe how test instruments are confirmed to be fit for purpose and functioning correctly	
	3.5 Specify appropriate and logical procedures for carrying out fault diagnosis tests	Cover: <ul style="list-style-type: none">• Continuity• Insulation resistance• Polarity• Earth fault loop impedance• RCD operation• Current and voltage measurement• Functional testing/checking
	3.6 Determine if test results are acceptable	Cover: With reference to BS 7671 or GN3

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
4. Understand the procedures and techniques for correcting electrical faults in dwellings	4.1 Identify factors which can affect repair or replacement of equipment	Cover: <ul style="list-style-type: none">• Cost• Availability of replacement parts, and resources• Down time (planning)• Legal and personal responsibility (e.g., Contracts, warranties, relevant personnel)• Access to systems and equipment• Provision of emergency or stand by supplies
	4.2 Specify the procedures for verifying that the fault has been corrected suitable for the situation using technical analysis	Cover: <ul style="list-style-type: none">• Functional testing / checking• Continuity• Insulation resistance• Polarity• Earth fault loop impedance• RCD operation• Current and voltage measurement / checking presence of supply
	4.3 State the methods to ensure the safe disposal of any waste and that the work area is left in a safe and clean condition	

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
5. Be able to carry out fault diagnosis	5.1 Follow safe working procedures	
	5.2 Apply appropriate fault diagnosis methods and techniques	<p>Cover:</p> <ul style="list-style-type: none">• Logical stages of fault diagnosis• Identification of symptoms• Collection and analysis of data• Use of sources / types of information - circuit schedule etc.• Installation specifications, drawings / diagrams,• Determining nature / characteristics of the fault with discussion with 'customer' (lecturer)• Checking and testing• Interpreting results / information• Functional testing
	5.3 Diagnose electrical faults using engineering decision and evaluation of symptoms and findings	
	5.4 Recommend the appropriate action/s to correct faults	

Unit: TE3-08 Electrical Scientific Principles

GLH: **120**

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- Understand and apply the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems

Unit description

This unit is designed to enable learners to understand the relationship between electrical scientific principles and the competencies required of a qualified electrical operative. Its content is the knowledge needed by a learner to underpin the application of skills in the installation and maintenance of electrical systems and equipment.

It is recommended this unit is delivered holistically and throughout the learner's course of study. This will enable the embedding of electrical science and principles in the knowledge and skills within the other units within this qualification.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand mathematical principles and SI units	1.1	Apply appropriate mathematical principles	Cover: Mathematical principles which are relevant to electrical work tasks, cover: fractions and percentages, basic transposition of formula, indices (to the power of), triangles and trigonometry relating to right-angled triangles.
	1.2	Identify internationally recognised base and derived (SI) units of measurement and electrical quantities	Cover: Identification of units of measurement for: length, area, volume, mass, density, time, temperature, and velocity. Identification of units of measurement for electrical quantities: resistance, resistivity, power, frequency, current, voltage, and energy.
	1.3	Identify electrical instruments for the measurement of electrical quantities	Cover: resistance, power, current, voltage, and energy.

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
2. Understand mechanical principles	2.1 State the principles of fundamental mechanics as they apply to levers, gears and pulleys	Cover: Levers, cover: Class I, Class II, and Class III Forces, cover: shear, torsion, bending, compression, and tension.
	2.2 Describe the main mechanical principles and their inter-relationships	Cover: Force, work, energy, power, efficiency. Include difference between mass and weight when discussing force.
	2.3 Calculate values of mechanical energy, power, and efficiency	Cover: Fundamental mechanical calculations along with respective formula
3. Understand the relationship between resistance, resistivity, voltage, current and power	3.1 Describe the fundamental characteristics of an electric circuit	Cover: <ul style="list-style-type: none">• Electron theory.• Materials which are good conductors and insulators• The difference between resistance and resistivity• The chemical and thermal effects of electric currents
	3.2 Identify the relationship between electrical values in D.C. circuits	Cover: Current, voltage and resistance D.C. circuits: series and parallel circuits.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
3. Understand the relationship between resistance, resistivity, voltage, current and power	3.3	Calculate electrical values in D.C. circuits	Cover: Current, voltage and resistance, power, and resistivity D.C. circuits: series and parallel circuits.
	3.4	State what is meant by voltage drop on an electrical circuit	Cover: <ul style="list-style-type: none"> • Depriving electrical loads of working voltage • Excess cable length creates greater amount of resistance and therefore increases voltage drop • Lights may operate dimly • Rectifying by increasing size of conductor
4. Understand the relationship between magnetism and electricity	4.1	Describe the magnetic effects of electrical currents	Cover: <ul style="list-style-type: none"> • Production of a magnetic field • Force on a current-carrying conductor in a magnetic field • Electromagnetism • Electromotive force Include effects of electromagnetic interference (EMI).
	4.2	Describe the basic principles of A.C generation	Cover: Electromagnetic induction in terms of: <ul style="list-style-type: none"> • A single-loop generator • Sinewave: root mean square (rms) value, periodic time, frequency, and amplitude • EMF • Magnetic flux and flux density

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
4. Understand the relationship between magnetism and electricity	4.3	Describe the operating principles, applications, and limitations of transformers	Cover: <ul style="list-style-type: none">• Mutual induction• Iron loss, copper loss• Relationship between current and voltage and primary and secondary windings (link to 4.5)• Step up, step down, transformers• kVA rating of a transformer
	4.4	Identify types of transformers	Cover: Auto, current, voltage, and isolating.
	4.5	Determine transformer properties: <ul style="list-style-type: none">• Primary and secondary voltages• Primary and secondary current	Cover: Transformer ratio calculations on simple single-phase transformers: number of turns, voltage, current on primary and secondary sides. Relation of primary power to secondary power.

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
5. Understand the types, and applications of electrical and electronic equipment	5.1 State the function and application of electronic components that are used in electrical systems	<p>Cover: Electrical systems involving:</p> <ul style="list-style-type: none">• Fire detection and alarm systems• Solar PV systems• Lighting controls• Heating controls• Motor control• Power control of AC <p>Also, cover how DC impacts RCD selection (and operation).</p> <p>Electronic components:</p> <ul style="list-style-type: none">• Capacitor• Resistors• Rectifiers• Diodes• Thermistors• Diacs• Triacs• Transistors• Thyristors• Invertors

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
5. Understand the types, and applications of electrical and electronic equipment	5.2 Describe the operating principles and applications of kinetic energy equipment	<p>Cover: Kinetic energy equipment: DC machines: series, shunt, and compound. AC motors: <ul style="list-style-type: none"> • Single phase: split phase, induction, capacitor start-induction run, capacitor start and run, capacitor start - capacitor run, universal, synchronous • Three phase: induction, wound-rotor, and synchronous </p>	
	5.3 Describe the basic operating principles and applications of motor control	<p>Cover: Motor control: Direct-on-line, star-delta, rotor-resistance, soft-start, variable frequency.</p>	
6. Understand electrical supply systems	6.1 Specify the features and characteristics of generation, transmission and distribution systems for domestic, commercial and industrial consumption	<p>Cover: Power stations, fossil fuels, hydro, nuclear, wind, solar, super-grid and standard grid system, network energy storage (smart grid), transformers, transmission voltages, distribution voltages, substations, above and below ground distribution, and smart and dumb metering systems. Single and three phase supplies.</p>	
	6.2 State the operating principles of alternative local sources of electricity	<p>Cover: Local battery storage systems, CPS, UPS systems, solar power, micro-hydro, micro-wind, electric vehicle systems (import and export), combined heat and power (CHP) including micro CHP; inverters, and rectifiers. Cover the principles of island mode and prosumer systems.</p>	
	6.3 Describe the principles of load control / shedding	Include:	

			How smart metering systems are used to reduce demand. Load Management smart systems, load curtailment, and load management in dwellings (e.g. EV Charging).
--	--	--	---

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
7. Understand how different electrical properties can affect electrical circuits, systems, and equipment	7.1 Identify the relationship between resistance, inductance, capacitance, and impedance	Cover: Relationship in simple RLC series; and parallel circuits. The related phasor diagrams.
	7.2 Determine electrical quantities in alternating current circuits	Cover: Resistance, inductance, Inductive reactance, capacitance, capacitive reactance; Impedance and power factor.
	7.3 Identify the relationship between kW, kVAr, kVA and power factor	Cover: <ul style="list-style-type: none"> • Power Triangle • What is meant by power factor improvement.
	7.4 Specify methods of power factor improvement	Cover: <ul style="list-style-type: none"> • Bulk correction • Individual load correction • Synchronous motors
	7.5 Calculate values of voltage and current in star and delta connected systems	Cover: Line and phase voltage; and line and phase current. Neutral current (by phasor diagram) for an unbalanced start connected system.
	7.6 Identify why systems should be balanced	Cover: <ul style="list-style-type: none"> • Size of system conductors can be matched • Switchgear can cope with similar currents • Neutral current is reduced • Smaller neutral conductor can be used • Unbalanced 3 phase loads can operate safely

8. Understand the operating principles of electrical components	8.1	Explain the operating principles of electrical components	Cover: <ul style="list-style-type: none">• Relays and solenoids• Protective devices• Circuit-breakers (including types)<ul style="list-style-type: none">◦ RCBOs (including types)◦ Fuses (HRC, cartridge and semi-enclosed)◦ RCDs (including types)◦ AFDDs◦ SPDs (Including types)
--	-----	---	---

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
9 Understand the principles and applications of electrical lighting systems	9.1 Apply the basic principles of illumination	Cover: Calculations and respective formula of inverse square law and cosine law.	
	9.2 Explain the operating principles, types, limitations and applications of luminaires and lamp types	Cover: LED, general lighting service (GLS) incandescent and halogen, discharge lighting, and energy saving (such as compact fluorescent lamps).	
	9.3 Explain the key technical aspects of lighting specifications	Cover: Dimmer types and settings, cap / connection types, lumen output, beam angle, driver types, colour temperature, and efficacy. Fire rating of luminaires.	
10. Understand the principles and applications of heating systems	10.1 Explain the basic principles of electrical space heating and electrical water heating	Cover: Convection cycle, conduction, and radiation.	
	10.2 Explain the operating principles, types, limitations and applications of electrical space and water heating appliances and components	Cover: Immersion heaters, electric boiler systems, heat pumps (ground and air source), storage heaters, convector heaters, under floor heating, controls, timers and programmers for heating systems, wet system valves and control circuits including smart apps, e.g., NEST ELV / Wireless controls integrated into control circuits, 'Y' and 'S' Plan etc.	

Unit: 18ED3-02 Understand the Requirements of Electrical Installations BS 7671:2018 (2022)

GLH: 35

Relationship to the Apprenticeship Standard (England)

Maps to Standard Reference ST0152:

- In all of these activities, electricians must understand and apply the requirements of the current edition of the Wiring Regulations

Unit description

This unit gives the learner an understanding of the full content of BS 7671, and how this applies to electrical installations within its scope.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
1. Understand the scope, object and fundamental principles of BS 7671	1.1 Identify the scope of BS 7671		
	1.2 Identify the object of BS 7671		
	1.3 Identify the fundamental principles of BS 7671		
2. Understand the definitions used within BS 7671	2.1 Interpret the definitions used within BS 7671		
	2.2 Relate the definitions to the regulations and appendices of BS 7671		
3. Understand how to assess the general characteristics of electrical installations	3.1 Interpret the requirements of assessing the general characteristics of electrical installations within the scope of BS 7671		

Learning Outcomes The learner will:	Assessment Criteria The learner can:	Coverage and depth
4. Understand requirements of protection for safety for electrical installations	4.1 Identify the requirements of protection for safety within the scope of BS 7671 4.2 Interpret how this applies to electrical installations within the scope of BS 7671 to include: <ul style="list-style-type: none">• Protection against electric shock• Protection against thermal effects• Protection against overcurrent• Protection against voltage disturbances and electromagnetic disturbances	Cover: Part 4, Protection for safety.
5. Understand the requirements for selection and erection of equipment for electrical installations	5.1 Identify the requirements for selecting and erecting equipment, within the scope of BS 7671 5.2 Interpret how this applies to electrical installations within the scope of BS 7671 to include: <ul style="list-style-type: none">• Common rules• Selection and erection of wiring systems• Protection, isolation, switching, control and monitoring• Earthing arrangements and protective conductors• Other equipment• Safety services	Cover: Part 5, Selection and erection of equipment.

Learning Outcomes The learner will:	Assessment Criteria The learner can:		Coverage and depth
6. Understand the requirements of inspection and testing of electrical installations	6.1	Identify the requirements for inspection and testing	<p>Cover: Part 6, Inspection and testing. Chapter 64, Initial verification. Chapter 65, Periodic inspection and testing. Cover how the requirements of Part 6 relate to the process of inspection, testing and certificating electrical installations.</p>
	6.2	Interpret how this applies to electrical installations	
7. Understand the requirements of special installations or locations as identified in BS 7671	7.1	Identify the requirements for special installations and locations	<p>Cover: Part 7, Special installations or locations and their particular requirements. Part 7 Contains only sections (not chapters). Cover how the particular requirements of Part 7 supplement or modify the general requirements contained in other parts of the Regulations.</p>
	7.2	Interpret how these affect the general requirements of the regulations	
8. Understand the information contained within Part 8 and the appendices of BS 7671	8.1	Identify the information contained in part 8 of BS 7671	<p>Cover: Functional requirements in Part 8. Cover the normative and informative information within the appendices. Give an overview of the titles and content. Focus on appendices: 1,2,3,4,5,6,13, 15, and 17.</p>
	8.2	Identify the information in the appendices of BS 7671	
	8.3	Specify how the information contained in the appendices is used to support electrical installation activities	

Appendix 1: Centre Examination Specifications

Test 1 Electrical Technical Occupational Entry (TOE)

Units: TE3-01 Health, Safety and Environmental Considerations
TE3-03 Practices and Procedures for Planning and Overseeing Electrical Work Activities
TE3-04 Design and Installation Practices and Procedures
TE3-06 Practices and Procedures for Inspection, Testing and Commissioning
TE3-07 Practices and Procedures for Fault for Diagnosis and Rectification

Assessment Type: Multiple Choice Question (MCQ)

Open-book, learners will require the IET On-Site Guide and the current edition of BS 7671

Number of Questions: 60

Time Allowed: 120 Minutes

Non-programmable calculator permitted.

The examination will cover knowledge within each unit, as follows:

Unit Number	Title	Number of Questions
TE3-01	Health, Safety and Environmental Considerations	4
TE3-03	Practices and Procedures for Planning and Overseeing Electrical Work Activities	1
TE3-04	Design and Installation Practices and Procedures	26
TE3-06	Practices and Procedures for Inspection, Testing and Commissioning	22
TE3-07	Practices and Procedures for Fault for Diagnosis and Rectification	7
	Total:	60

NOTE: The pass mark for the examination is normally expected to be around 60%.

Test 2 Electrical Technical Occupational Entry (TOE)

Unit: TE3-08 - Electrical Scientific Principles

Assessment Type: Multiple Choice Question (MCQ)

Number of Questions: 45

Time Allowed: 90 Minutes

Non-programmable calculator permitted.

Closed book exam.

The examination will cover the knowledge learning outcomes of the unit, as follows:

Learning Outcome	Title	Number of Questions
1	Understand mathematical principles and SI units	4
2	Understand mechanical principles	2
3	Understand the relationship between resistance, resistivity, voltage, current and power	6
4	Understand the relationship between magnetism and electricity	6
5	Understand the types, and applications of electrical and electronic equipment	5
6	Understand electrical supply systems	5
7	Understand how different electrical properties can affect electrical circuits, systems, and equipment	8
8	Understand the operating principles of electrical components	3
9	Understand the principles and applications of electrical lighting systems	3
10	Understand the principles and applications of heating systems	3
Total:		60

NOTE: The pass mark for the examination is normally expected to be around 60%.

Test 3 Unit: 18ED3-02 Understand the Requirements of Electrical Installations BS 7671:2018 (2022)

Assessment Type: Multiple Choice Question (MCQ)
Open-book, learners will require the IET On-Site Guide, and the current edition of BS 7671

Number of Questions: 60

Time Allowed: 120 Minutes

Non-programmable calculator permitted.

The examination will cover the knowledge learning outcomes of the unit, as follows:

Learning Outcome	Title	Number of Questions
1	Understand the scope, object and fundamental principles of BS 7671	4
2	Understand the definitions used within BS 7671	2
3	Understand how to assess the general characteristics of electrical installations	6
4	Understand requirements of protection for safety for electrical installations	15
5	Understand the requirements for selection and erection of equipment for electrical installations	14
6	Understand the requirements for selection and erection of equipment for electrical installations	4
7	Understand the requirements of special installations or locations as identified in BS 7671	7
8	Understand the information contained within Part 8 and the appendices of BS 7671	8
	Total:	60

NOTE: The pass mark for the examination is normally expected to be around 60 %.

Appendix 2: Learner Registration and Certification

Learners must be registered with EAL on a code which relates to the qualification -this must be completed prior to assessment. Both learner registration and certification can be completed online at the EAL Website: www.eal.org.uk. For paper-based registration and certification use the appropriate forms. These are located on the EAL Website, for guidance on registration and certification please refer to the Registration and Certification User Guide. To register the learner on the chosen qualification / pathway code:

Qualification Title:	Code:
EAL Level 3 Technical Occupation Entry in Electrical Installation and Maintenance (Diploma)	610/3907/X

For further information, please contact EAL Customer Experience:

Tel: +44 (0)1923 652 400

Email: Customer.Experience@eal.org.uk

Published by:

© Excellence Achievement Learning Ltd 2025

EAL has made every effort to ensure that the information contained within this publication is accurate at the time of going to print. However, EAL products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time.

This publication has been prepared as a downloadable resource. It may be freely printed without further permission from EAL on the condition that it is used solely within the purchasing organisation and is not offered for sale in any format.