City & Guilds Level 3 NVQ Diplomas in Electrotechnical Technology (2357)

July 2024 (Version 5.10)

Qualification Handbook

Qualification at a glance

Subject area	Electrical Installation and Maintenance
City & Guilds number	2357
Age group approved	16+
Entry requirements	n/a
Assessment	Assignments, multiple-choice online tests, portfolio and observation
Grading	Pass/fail
Approvals	Automatic, fast track
Support materials	Sample assessments, Smartscreen, Assessment guides, Logbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Ofqual number	GLH	TQT
City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment)	2357-13/91	501/2232/0	726	1040
City & Guilds Level 3 NVQ Diploma in Electrotechnical Services (Electrical Maintenance)	2357-23/92	501/1624/1	714	1030

Version/date	Change detail	Section
1.2 Sep 2011	Added test specifications	0
1.3 March 2012	Amended knowledge units' assessment to 'assignments and tests'	1.1
1.3 March 2012	Short answer questions removed from 'Summary of assessment methods'. 'Short answer questions' replaced with 'assignment' as assessment method for Unit 309	4.1
1.3 March 2012	Added No. of questions and % for Test 2 Unit 305	4.4
1.3 March 2012	Units 302 and 321 'a knowledge assignment' replaced with 'an assignment' under 'Assessment' heading.	5 Units
1.3 March 2012	Wording 'covering practical skills and underpinning knowledge' deleted from sentence under 'Assessment' heading for units 304, 306, 307 308, 322 & 323. Sentence now becomes 'This unit will be assessed by an assignment'.	5 Units
2.0 June 2012	Replacing Test Specification table for unit 305, previous version was incorrect. Updating permitted reference materials information.	4.4 Test specification
2.0 June 2012	Updating permitted reference materials information.	4.4
3.0 July 2012	Updating permitted reference materials information for unit 305.	4.4
3.1 Aug 2012	Inserted permitted reference materials titles for Unit 305	4.4
3.2 Nov 2012	Inserted RPL routes	4.6
3.3 Nov 2012	Inserted extra column indicating which complex to register RPL candidates	4.6
3.4 July 2013	Removed learning outcomes 5-12 listed in the test specification for unit 309	4.4 Test specification
4.0 Jan 2014	Amended total credits for 2357-23 from 104 to 103	Section 1
4.1 April 2014	Update link to National Electrical Training (NET) for AM2 assessment materials	4 Assessment
5.1 Sep 2014	Unit 107 duration amended to 80 minutes	4.4 Test Spec
5.2 Jan 2015	Added calculator info to evolve specs	4.4 Test Spec
5.3 July 2015	Added 725 to 705 assessment method units	Assessment
5.4 July 2016	Assessment requirement changes in units 315 and 316 as per updated strategy City & Guilds Group statement updated Phone numbers removed	Assessment Page 2 Useful contacts

5.5 Sep 2017	Added TQT and GLH details Deleted QCF	Throughout
5.6 July 2018	Assessment 018 added to reflect 18th Edition Wiring Regulations Details of how to claim certification for 2391 and 2382 added	Assessment Appendix 1
5.7 May 2021	Details on the unit requirements for 18th Edition Wiring Regulations updated to reflect full unit requirements	Assessment Appendix 1
5.8 Feb 2022	GLH and TQT added for the 2357-13/91. City & Guilds added to qualification title.	Qualification at a glance Section 1 Throughout
5.9 May 2022	Assessment 2357-022 added to reflect 18th Edition Wiring Regulations Amendment 2. Details of how to claim certification for 18th Edition Wiring Regulations updated to reflect Amendment 2 (2022) assessment update. Formatting, hyperlinks and template updated where applicable. City & Guilds added to qualification titles.	Assessment Appendix 1 Throughout Throughout
5.10 July 2024	Update of Quality Assurance Statement	Center Requirements

Contents

1 Introduction

This document tells you what you need to do to deliver the qualifications:

Area	Description
Who are the qualifications for?	They meet the needs of learners in England, Wales and Northern Ireland who want to work as an electrician, installing systems and equipment, in buildings, structures and the environment within the electrotechnical industry.
What do the qualifications cover?	They allow candidates to learn, develop and practise the skills required for employment and/or career progression in the electrotechnical sector.
What will learners be able to do?	The qualifications contribute knowledge, understanding, and practical skills regarding Installing Electrotechnical Systems and Equipment. Once candidates have learnt the required skills and knowledge, they will demonstrate their occupational competence in the workplace within these qualifications.
Are the qualifications part of a framework or initiative?	They are part of the SummitSkills Electrotechnical Apprenticeship framework.
Why has the qualification been developed?	They provide a nationally recognised qualification for the electrotechnical industry. They replace the City & Guilds Levels 2 and 3 Certificates in Electrotechnical Technology (2330) and the City & Guilds Level 3 NVQ in Electrotechnical Services (2356).

Qualification structure

To achieve the **City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment) (2357-13/91**) learners must achieve **104** credits from the units below, **all** of which are mandatory.

Methods of Assessment

Knowledge Units	**Assignments and tests**
Performance Units	Practical activities in the workplace or as appropriate in simulated conditions
Combination Units	Practical activities/assignments in simulated conditions.

Unit accreditation number	Unit number	Unit title	Mandatory / optional for full qualification	Credit value
H/602/2523	601	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Mandatory	6
M/602/2525	602	Understanding environmental legislation, working practices and the principles of environmental technology systems	Mandatory	4
J/602/2532	603	Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)	Mandatory	6
A/602/2561	604	Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment	Mandatory	8
T/602/2560	605	Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment	Mandatory	10
J/602/2563	606	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	Mandatory	9
D/602/2567	607	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	8

R/602/2579	608	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	6
A/602/2589	609	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	Mandatory	12
R/602/2596	311	Applying Health and Safety legislation and working practices (Installing and maintaining electrotechnical systems and equipment)	Mandatory	3
H/602/2599	312	Applying environmental legislation, working practices and the principles of environmental technology systems	Mandatory	3
K/602/2605	313	Overseeing and organising the work environment (Electrical installation)	Mandatory	3
R/602/2792	315	Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment	Mandatory	6
H/602/2828	316	Terminating and connecting conductors, cables and flexible cords in electrical systems	Mandatory	4
K/602/2703	317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	6
M/602/2704	318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	Mandatory	6
R/602/2503	399	Electrotechnical Occupational competence (AM2)	Mandatory	4

To achieve the **City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Services (Electrical Maintenance) (2357-23/92**) learners must achieve **103** credits from the units below, **all** of which are mandatory.

Methods of Assessment

Knowledge Units	**Assignments and tests**
Performance Units	Practical activities in the workplace or as appropriate in simulated conditions
Combination Units	Practical activities/assignments in simulated conditions.

Unit accreditation number	Unit number	Unit title	Mandatory / optional for full qualification	Credit value
H/602/2523	601	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Mandatory	6
M/602/2525	602	Understanding environmental legislation, working practices and the principles of environmental technology systems	Mandatory	4
J/602/2563	606	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	Mandatory	9
D/602/2567	607	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	8
R/602/2579	608	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	6
A/602/2589	609	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	Mandatory	12
R/602/2596	311	Applying Health and Safety legislation and working practices (Installing and Maintaining Electrotechnical Systems and Equipment)	Mandatory	3
H/602/2599	312	Applying environmental legislation, working practices and the principles of environmental technology systems	Mandatory	3

K/602/2605	313	Overseeing and organising the work environment (Electrical Installation)	Mandatory	3
H/602/2828	316	Terminating and connecting conductors, cables and flexible cords in electrical systems	Mandatory	4
K/602/2703	317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	6
M/602/2704	318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	Mandatory	6
M/602/2542	321	Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance)	Mandatory	6
J/602/2594	322	Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment	Mandatory	8
T/602/2591	323	Understanding the practices and procedures for maintaining electrotechnical systems and equipment	Mandatory	8
L/602/2709	332	Plan and prepare to maintain electrotechnical systems and equipment	Mandatory	3
A/602/2706	333	Maintain electrotechnical systems and equipment	Mandatory	4
R/602/2503	399	Electrotechnical Occupational Competence (AM2)	Mandatory	4

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment)	726	1040
City & Guilds Level 3 NVQ Diploma in Electrotechnical Services (Electrical Maintenance)	714	1030

Opportunities for progression

On completion of these qualifications, candidates may progress into employment or to the following City & Guilds qualifications:

- Level 2 Certificate in Fundamental Inspection, Testing and Initial Verification (2392)
- Level 2 Award in Environmental Technology System Awareness (2399-01)
- Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment) (2357-13/91)
- Level 3 NVQ Diploma in Electrotechnical Services (Electrical Maintenance) (2357-23/92)
- Level 3 Certificate for Inspection, Testing and Management of Electrical Equipment (2377)
- Level 3 Certificate in the Requirements for Electrical Installations (2382)
- Level 3 Certificate in the Certification of Electrical Installations (Inspection, Testing and Certification of Electrical Installations) (2391)
- Level 3 Certificate in the Certification of Electrical Installation (Design, Erection and Verification of Electrical Installations) (2391)
- Level 3 Certificate in the Building Regulations for Electrical Installations in Dwellings (2393)
- Level 3 Award in the Installation of Small Scale Solar Photovoltaic Systems (2399-11)
- Level 3 Award in the Installation and Maintenance of Small Scale Solar Photovoltaic Systems (2399-12)
- Level 4 Higher Professional Diploma in Building Services Engineering (4467).

Support materials

City & Guilds also provides the following publications and resources specifically for these qualifications:

Description	How to access
Assessment guides	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
Assessment packs	
Practice tests	
Candidate logbook	
SmartScreen	**www.smartscreen.co.uk**

2 Centre requirements

This section outlines the approval processes for Centres to offer these qualifications and any resources that Centres will need in place to offer the qualifications including qualification-specific requirements for Centre staff.

Centres already offering City & Guilds qualifications in this subject area

Centres that are currently approved for all of the City & Guilds Levels 2 and 3 Certificates in Electrotechnical Technology (2330) and the City & Guilds Level 3 NVQ in Electrotechnical Services (2356) will be eligible for automatic approval. No action will be required by the centre to obtain approval.

Centres approved to offer just the City & Guilds Levels 2 and 3 Certificates in Electrotechnical Technology (2330) **or** the City & Guilds Level 3 NVQ in Electrotechnical Services (2356) may apply for approval for these qualifications using the **fast track approval form**, available from the City & Guilds website. This also applies to centres that combine with other centres to deliver the current apprenticeship (2330 and 2356).

Centres may apply to offer the new qualification using the fast track form if they meet all of the approval criteria specified in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After this time, the qualification is subject to the **standard** Qualification Approval Process. It is the centre's responsibility to check that fast track approval is still current at the time of application.

City & Guilds reserves the right to insist on full qualification approval if there have been quality issues within a centre or if there have been substantial staff changes at the centre.

No simulated practical assessment must take place until after the first successful EQA visit. New centres must use the **standard** Qualification Approval Process.

Resource requirements

Physical resources and site agreements

It is acceptable for centres to use specially designated areas within a centre to teach practical skills and to assess the simulated practical assignments within the knowledge units. The equipment, systems and machinery must meet current industrial standards and be capable of being used under normal working conditions and must fully meet the requirements set in each City & Guilds practical assignment guide.

For the **performance units** the majority of evidence must be generated from a real working environment. This is an environment in which real work activities take place under real working conditions in keeping with real commercial situations

Simulation can take place in those rare circumstances where the opportunities to collect naturally occurring evidence are limited or absent and the learner lacks evidence for completion of the unit. However, this scenario is anticipated to be rare in relation to the qualifications and the units to which this strategy applies given the inherent flexibility of the evidence-gathering process. Where simulation does take place, it must be in a realistic working environment.

A simulated environment in which simulated activities take place must replicate a real working environment. The criteria for which must be to supply fit-for-purpose tools, equipment, full-size components, realistic deadlines and other commercial requirements.

Simulation **must take** place for industry identified key-safety critical aspects of the qualification as listed in and their relevant associated units. A key-safety critical aspect is defined by SummitSkills as 'any 'technical' activity with the potential to harm/damage personnel/property if carried out incorrectly'. The activities that will be undertaken demonstrating competence in these areas are contained within each industry's 'Assessment of Occupational Competence' arrangement and this must **not** be undertaken before the learner has demonstrated sufficient technical expertise, knowledge, skill and maturity. The key-safety critical aspects for these qualifications are listed below:

- Safe isolation
- Termination and connection
- Inspection, testing and commissioning
- Risk assessments and safe working practices
- Diagnosing and correcting faults.

Human resources

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be technically competent in the area[s] for which they are delivering training and/or have experience of providing training. This knowledge must be at least to the same level as the training being delivered
- hold appropriate qualifications as detailed in this handbook
- have recent relevant experience in the specific area they will be assessing
- be occupationally knowledgeable in the areas of installing electrotechnical systems and equipment for which they are delivering training. This knowledge must be at least to the same level as the training being delivered
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal quality assurer, but must never internally quality assure their own assessments. The specific Assessor and IQA requirements, as set by the Sector Skills Council SummitSkills are detailed below.

Assessors

Assessors **must:**

- Be working towards or have achieved A1 or A2 Standards and continue to practice to those standards or;
- Have achieved D32 or D33 or TQFE/TQSE and possess CPD evidence of practicing to A1 or A2 Standards or;
- Have other suitable "equivalent assessor qualifications" endorsed by SummitSkills, which apply the principles of the A1/A2 Standards.

Assessor occupational competence

Have verifiable relevant industry experience and current knowledge of industry working practices and techniques relevant to the occupational working area. This verifiable evidence must be **at or above the level being assessed** and include one or more of the following:

- a relevant qualification. Assessors must either be able to demonstrate that they are registered and up-to-date with their registration with an appropriate approved industry registration body (at the relevant occupational level and grade) **or** have one or more of a relevant occupational qualification (see example list below) to ensure that they can be regarded as occupational competent in terms of assessing or quality assuring the relevant qualifications, and units therein.
- NVQs/SVQs at the appropriate level or their equivalents in the Qualifications and Credit Framework:
    - Electrotechnical Services (Installation - Buildings & Structures)
    - Electrotechnical Services (Electrical Maintenance)
    - Electrotechnical Services (Installing Highway Electrical Systems)
    - Electrotechnical Services (Installing Structured Cabling Systems)
    - Electrotechnical Panel Building

NOTE: Assessors and IQAs who have relevant qualifications pre-NVQ and post-NVQ which are **not** competence-based **must** provide verifiable evidence that they are occupationally competent. This evidence **must** demonstrate that the assessor/IQA has up-to-date knowledge of the industry/occupation (for which the assessment is taking place), its settings, legislative and regulatory requirements, codes of practice and guidance.

For particular units/qualifications the verifiable evidence may need to be above the level of the unit/qualification being assessed. Where applicable this requirement will be detailed in the 'Additional Information' pertaining to specific units/qualifications.

Assessment of competence-based units/qualifications for electrotechnical occupations will require assessors **to have the relevant qualification** that certifies their competence in key technical areas pertinent to the completion of the unit/qualification.

This occupational competence must include up-to-date knowledge of each industry (for which the assessment is taking place), its settings, legislative and regulatory requirements, codes of practice and guidance.

Assessor Continuing Professional Development

The occupational competence of assessors must be updated on a regular basis and be periodically reconfirmed via continuing professional development (CPD) via the assessment centres and quality assured by City & Guilds.

It is the responsibility of each assessor 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.

Internal Quality Assurers (IQA) Role and Responsibilities

The SSC SummitSkills considers the main focus of IQAs to be the quality assurance of assessment procedures. The IQA is also required to have a minimum of occupational experience evidenced by having a Building Services Engineering sector related qualification or proven sector competence/experience plus access to relevant 'occupational expertise' to enable them to conduct their role as IQA appropriately. This evidence and access to 'occupational expertise' is externally quality assured by City & Guilds.

Internal Quality Assurers

Internal Quality Assurers **must** be working towards or have achieved the V1 Standard and continue to practice to that standard; or have achieved D34 and possess CPD evidence of practicing to the V1 Standard and demonstrate an understanding of the assessment process.

IQA Continuing Professional Development

The occupational experience of IQAs must be updated on a regular basis and be periodically reconfirmed via continuing professional development (CPD) via the assessment centres and quality assured by City & Guilds.

It is the responsibility of each IQA 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.

Where **'Expert Witnesses'** are used in the assessment process identified above they must be:

- Sector competent individuals who can attest to the learner's performance in the workplace.
- It is not necessary for expert witnesses to hold an assessor qualification, as a qualified assessor must assess the performance evidence provided by an expert witness
- Evidence from expert witnesses must meet the tests of validity, reliability, authenticity and sufficiency
- Expert witnesses will need to demonstrate:
    - They have relevant current knowledge of industry working practices and techniques
    - That they have no conflict of interest in the outcome of their evidence.

Quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Quality assurance includes initial centre approval, qualification approval and the centre's own internal procedures for monitoring quality. Centres are responsible for internal quality assurance and City & Guilds is responsible for external quality assurance. All external quality assurance processes reflect the minimum requirements for verified and moderated assessments, as detailed in the Centre Assessment Standards Scrutiny (CASS), section H2 of Ofqual's General Conditions. For more information on both CASS and City and Guilds Quality Assurance processes visit: the What is CASS? and Quality Assurance Standards documents on the City & Guilds website.

Candidate entry requirements

Candidates should not be entered for a qualification of the same type, content and level as that of a qualification they already hold.

There are no formal entry requirements for candidates undertaking these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully

SummitSkills, the SSC, expects candidates to undertake the 'knowledge' units within these qualifications, before undertaking the equivalent occupational performance unit, to ensure the candidate has all of the knowledge and skills required to attempt to demonstrate their skills in the workplace. For example, the expectation is that a candidate should achieve 2357-601 before undertaking 2357-311. Specific details regarding which 'knowledge' units **must** be undertaken before the 'performance' units are undertaken are found in the 'notes for guidance' for each unit.

The Electrotechnical Occupational Competence (AM2) (2357-399) must **not** be undertaken before the learner has demonstrated sufficient technical expertise, knowledge, skill and maturity.

As part of the assessment for these qualifications, candidates must have, or have the potential to obtain access to a real work setting where they can demonstrate practical occupational competence to the requirements of the units, consistently over time.

Age restrictions

Candidates must be 16 or over. These qualifications are not approved for use by candidates under the age of 16, and City & Guilds cannot accept any registrations for candidates in this age group.

Other legal considerations

All legal requirements related to the subject matter must be met by candidates and centres.

3 Course design and delivery

Initial assessment and induction

Centres will need to make an initial assessment of each candidate prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification.

The initial assessment should identify any:

- specific training needs the candidate has, and the support and guidance they may require when working towards their qualification. This is sometimes referred to as diagnostic testing
- units the candidate has already completed, or credit they have accumulated which is relevant to the qualification they are about to begin.

City & Guilds recommends that centres provide an induction programme to ensure the candidate fully understands the requirements of the qualification they will work towards, their responsibilities as a candidate, and the responsibilities of the centre. It may be helpful to record the information on a learning contract.

City & Guilds are providing optional practice tests for the assessments within these qualifications. These may aid centres and candidates in determining the learner's readiness to undertake the assessment.

Recommended delivery strategies

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

The SSC SummitSkills expect knowledge units to be completed before performance units are undertaken by the candidate. Please see the Notes for Guidance section in each performance unit for more details. Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their candidates
- satisfies the requirements of the qualification.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualification. This might include the following:

- literacy, language and/or numeracy
- personal learning and thinking
- personal and social development
- employability.

Where applicable, this could involve enabling the candidate to access relevant qualifications covering these skills.

For further information to assist with the planning and development of the programme, please refer to the following:

- City & Guilds Electrotechnical logbooks
- SmartScreen.

4 Assessment

Summary of assessment methods

City & Guilds provides the following assessments:

- On-demand testing using multiple-choice questions (e-assessment)
- Assignments (practical and written) available from the 2357 webpage (passwords for approved centres available via City & Guilds Walled Garden 2357 page).

City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment) (2357-13/91)

Unit	Title	Assessment Method	Where to obtain assessment materials
601	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Assignment 2357-601. City & Guilds online multiple-choice test (2357-301). The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
602	Understanding environmental legislation, working practices and the principles of environmental technology systems	Assignment 2357-602. City & Guilds online multiple-choice test (2357-102). The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
603	Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)	Assignment 2357-603. The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
604	Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment	Assignment 2357-604. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
605	Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment	**Option 1:** Assignment 2357-605. City & Guilds online multiple-choice test 2357-305. The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured. **Or to be able to claim wiring regulations BS7671 candidates must achieve:**	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
		Option 2: Assignment 2357-705/725. and **17th Edition:** City & Guilds online multiple-choice test 2357-006. **OR** **Option 3:** Assignment 2357-705/725 and **18th Edition:** City & Guilds online multiple- choice test 2357-018. **OR** **Option 4:** Assignment 2357-705/725 and **18th Edition Amendment 2 (2022):** City & Guilds online multiple-choice test 2357-022. On completion of the full qualification, centres will be able to claim a full 2382 certificate for their candidates. (See Appendix 1 for further details). Externally set assignment, locally marked and externally quality assured.	

Unit	Title	Assessment Method	Where to obtain assessment materials
606	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	Assignment 2357-606. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
607	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	Assignment 2357-607. City & Guilds online multiple-choice test 2357-107. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
608	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	Assignment 2357-608. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
609	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	Assignment 2357-609. City & Guilds multiple-choice test 2357-309. The assessments cover the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
311	Applying Health and Safety legislation and working practices (Installing and Maintaining Electrotechnical Systems and Equipment)	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
312	Applying environmental legislation, working practices and the principles of environmental technology systems	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
313	Overseeing and organising the work environment (Electrical Installation)	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**

Unit	Title	Assessment Method	Where to obtain assessment materials
315	Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
316	Terminating and connecting conductors, cables and flexible cords in electrical systems	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
399	Electrotechnical Occupational Competence	This unit (commonly known as the AM2) must be assessed at an approved NET centre.	Please contact National Electrical Training (NET) **www.netservices.org.uk/am2/**

City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Services (Electrical Maintenance) (2357-23/92)

Unit	Title	Assessment Method	Where to obtain assessment materials
601	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Assignment 2357-601. City & Guilds multiple-choice test (2357-301). The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
602	Understanding environmental legislation, working practices and the principles of environmental technology systems	Assignment 2357-602. City & Guilds multiple-choice test (2357-102). The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
606	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	Assignment 2357-606. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
607	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	Assignment 2357-607. City & Guilds multiple-choice test (2357-107). The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
608	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	Assignment 2357-608. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
609	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	Assignment 2357-609 City & Guilds multiple-choice test 2357-309. The assessments cover the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
311	Applying Health and Safety legislation and working practices (Installing and Maintaining Electrotechnical Systems and Equipment)	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
312	Applying environmental legislation, working practices and the principles of environmental technology systems	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
313	Overseeing and organising the work environment (Electrical Installation)	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
316	Terminating and connecting conductors, cables and flexible cords in electrical systems	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**

Unit	Title	Assessment Method	Where to obtain assessment materials
317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
321	Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance)	Assignment 2357-321 The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
322	Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment	Assignment 2357-322. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.

Unit	Title	Assessment Method	Where to obtain assessment materials
323	Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment	Assignment 2357-323. The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit. Externally set assignment, locally marked and externally quality assured.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden.
332	Plan and prepare to maintain electrotechnical systems and equipment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit.	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
333	Maintain electrotechnical systems and equipment	This unit will be assessed via observation and the development of a portfolio in a work-based environment and will be assessed to the assessment criteria set out in the unit	**www.cityandguilds.com** Navigate to Building Services Industry, Electrical Installation, Electro Technical Technology 2357 Passwords available on Walled Garden. Alternatively, centres may wish to use approved e-portfolio, with more details available at **www.cityandguilds.com/e-portfolios.**
399	Electrotechnical Occupational Competence	This unit (commonly known as the AM2) must be assessed at an approved NET centre.	Please contact National Electrical Training (NET) **www.netservices.org.uk/am2/**

Important note

The safe isolation practical assessment is a requirement for the following units:

- 2357-322
- 2345-323
- 2357-606
- 2357-607
- 2357-608

This assessment only has to be successfully passed by the candidate **once**. It is in each of the above assessments as there is no set requirement for candidates to undertake the 'knowledge' units in any particular order and for candidates who undertake individual units. Candidates can take this assessment again after passing it once if, given the critical nature of

the task, they feel it would be useful to do so. This decision would need to follow assessment planning discussions with their assessor, but there is **no** mandatory requirement for them to do so and City & Guilds centres cannot insist on the safe isolation practical assessment being taken again after it has been successfully passed once.

Time constraints

The following time constraints must be applied to the assessment of these qualifications:

- Candidates must be assessed within the lifespan of the qualification.
- All assessments must take no longer than the stated time limit to complete, where maximum time limits apply. Centre staff should guide candidates to ensure excessive evidence gathering is avoided. Centres finding that assignments are taking longer, should contact the EQA for guidance.
- All assignments must be completed and assessed within the candidate's period of registration. Centres should advise candidates of any internal timescales for the completion and marking of individual assignments.

Assignments

All assignments are available on the 2357 section of **www.cityandguilds.com** dedicated to these qualifications. The password to access these materials are available to approved centres on the Walled Garden. Assessment materials **must** only be accessed by centre staff who have been formally appointed to securely handle assessments.

Evidence requirements

The evidence requirements and City & Guilds assessment strategy for these qualifications has been designed within the confines of the SSC SummitSkills 'Consolidated Assessment Strategy for Units and Qualifications of 'Occupational Competence' in the Qualifications and Credit Framework (England, Northern Ireland and Wales) for the Building Services Engineering Sector' (April 2010 v2.1a (06.10.)

There are three types of units within these qualifications:

- Knowledge units that give the learner the opportunity to demonstrate their knowledge and understanding of identified topics and subject areas. There are some formal practical assessments within these units. In addition, SummitSkills expect for some units, candidates' knowledge to be consolidated by the use of "Practical Support Learning" activity in simulated conditions. The 'notes for guidance' section in each unit will detail where this is expected.
- Performance units that give the learner the opportunity to demonstrate they have the practical skills that are in keeping with the relevant National Occupational Standards for identified activities.
- Independent Assessment unit, the structure of which must not be a part of the learner's working or training environment and will provide facilities for assessment in keeping with the industry arrangements. Therefore, the learner will be independently assessed by an independent assessor in keeping with an industry determined specification.

'Knowledge' units (2357-601-303a, 606-609, 321-323) must be undertaken in line with the City & Guilds assessment strategy for each unit as detailed in this handbook.

The environment in which the evidence and the quantity of evidence for **Performance Units** (2357-311-313, 316-318, 332-333) must be assessed, i.e. sourced from the real working environment or simulated conditions, will be detailed in the 'Additional Requirements' for each Performance Unit. This could be applicable to all the Learning Outcomes in the unit or particular Learning Outcomes.

Evidence that is sourced from the real working environment for **Performance Units** must be naturally occurring and can be generated by:

- Direct observation of performance in the workplace by a qualified assessor and/or testimony from an expert witness subject to the activity being assessed. **This will be the primary source of evidence.**
- Candidate's reflective account of performance.
- Work plans and work-based products e.g. diagrams, drawings, specifications, customer testimony, authorised & authenticated photographs/images and audiovisual records of work completed.
- Evidence from prior achievements that demonstrably match the requirements of the Performance Unit.
- Witness testimony.

Meeting the assessment requirements of **Performance Units** will need initial discussions and assessment planning between the learner and Assessor, as an essential activity to identify opportunities to assess real working environment evidence, gaps that need to be filled or opportunities to recognise the prior achievement of the learner.

Competence must be demonstrated **consistently over a period of time and on more than one occasion**. Unless specifically stated otherwise within the unit, there is no stipulation what that period of time might be as this is a decision for the Assessor. Based on their own professional judgement Assessors must be capable of identifying when competence has been demonstrated by the learner.

Learners should not be put forward for the independent assessment unit (2357-399) an **'Assessment of Occupational Competence',** the Electrotechnical Occupational Competence unit (2357-399), until they are **deemed ready to be assessed as competent**. This underpins the assumption that the learner has sufficient technical expertise, knowledge, skill and maturity to meet the expectancies of employers in terms of 'Occupational Competence'. This unit is widely known and often referred to as the AM2.

Unit 2357-399 must only be assessed at a NET approved centre and all assessments must meet the criteria stated by NET. Please contact NET for more details.

Test specifications

The test specifications for the units are below:

Test: Unit 301
Duration: 40 minutes
Conditions: Closed book, no reference materials permitted. A non-programmable calculator is permitted.

Outcome	No. of questions	%
1. understand how relevant Health and Safety legislation applies in the workplace	2	10
2. understand the procedures for dealing with Health and Safety in the work environment	7	35
3. understand the procedures for establishing a safe working environment	5	25
4. understand the requirements for identifying and dealing with hazards in the work environment.	6	30
Total	**20**	**100**

Test: Unit 102
Duration: 70 minutes
Conditions: Closed book, no reference materials permitted. A non-programmable calculator is permitted.

Outcome	No. of questions	%
1. understand the environmental legislation, working practices and principles which are relevant to work activities	9	29
2. understand how work methods and procedures can reduce material wastage and impact on the environment	3	10
3. understand how and where environmental technology systems can be applied.	19	61
Total	**31**	**100**

Test: Unit 305

Duration: 45 minutes

Conditions: Open book. The following are permitted reference material for this Unit 305 test: A non-programmable calculator is permitted.

- IET Wiring Regulations Seventeenth Edition BS7671:2008 (2015) ISBN: 978-1-84919-269-9

Outcome	No. of questions	%
7. know the regulatory requirements which apply to the installation of wiring systems, associated equipment and enclosures	15	100
Total	**15**	**100**

Further guidance on the test specifications for Unit 305 Outcome	No. of questions	% weighting
07.01 Specify the main requirements of the following topics in accordance with the current version of the IEE wiring regulations and describe how they impact upon the installation of wiring systems, associated equipment and enclosures:		
07.01.01 Protection against electric shock	3	20
07.01.02 Protection against fire/flammable/explosive atmospheres.	2	13
07.01.03 Selection and erection of wiring systems, associated equipment and enclosures	4	27
07.01.04 Isolation and switching	2	13
07.01.05 Special locations	4	27
Total	**15**	**100**

Test: Unit 006

Duration: 120 minutes

Conditions: Open book. The following are permitted reference material for this Unit 006: A non-programmable calculator is permitted.

- IET Wiring Regulations Seventeenth Edition BS7671:2008 (2015) ISBN: 978-1-84919-269-9

Outcome	No. of questions	%
1. understand the scope, object and fundamental principles of BS7671.	4	6
2. understand the definitions used within BS7671.	2	4
3. understand how to assess the general characteristics of electrical installations	6	10
4. understand requirements of Protection for safety for electrical installations	15	25
5. Understand the requirements for Selection and erection of equipment for electrical installations	14	24
6. Understand the requirements of Inspection and testing of electrical installations	4	6
7. Understand the requirements of special installations or locations as identified in BS 7671.	10	16
8. Understand the information contained within the appendices of BS7671.	5	9
Total	**60**	**100**

Test: Unit 018

Duration: 120 minutes

Conditions: Open book. The following are permitted reference material for this Unit 018: A non-programmable calculator is permitted.

- IET Wiring Regulations Eighteenth Edition BS7671:2018

Outcome	No. of questions	%
1. Understand the scope, object and fundamental principles of BS7671.	4	7%
2. Understand the definitions used within BS7671.	2	3%
3. Understand how to assess the general characteristics of electrical installations	6	10%
4. Understand requirements of protection for safety for electrical installations	15	25%
5. Understand the requirements for selection and erection of equipment for electrical installations	14	23%
6. Understand the requirements of inspection and testing of electrical installations	4	7%
7. Understand the requirements of special installations or locations as identified in BS 7671.	10	17%
8. Understand the information contained within the appendices of BS7671.	5	8%
Total	**60**	**100**

Test: Unit 022

Duration: 120 minutes

Conditions: Open book. The following are permitted reference material for this unit: A non-programmable calculator is permitted.

- IET Wiring Regulations Eighteenth Edition BS7671: 2018 (2022)

Outcome	No. of questions	%
1. Understand the scope, object and fundamental principles of BS7671.	4	7%
2. Understand the definitions used within BS7671.	2	3%
3. Understand how to assess the general characteristics of electrical installations	6	10%
4. Understand requirements of protection for safety for electrical installations	15	25%
5. Understand the requirements for selection and erection of equipment for electrical installations	14	23%
6. Understand the requirements of inspection and testing of electrical installations	4	7%
7. Understand the requirements of special installations or locations as identified in BS 7671.	7	12%
8. Understand the information contained within Part 8 and the appendices of BS7671.	8	13%
Total	**60**	**100**

Test: Unit 107

Duration: 80 minutes

Conditions: A non-programmable calculator is permitted, closed book, no reference materials permitted. A non-programmable calculator is permitted.

Outcome	No. of questions	%
1. Understand the principles, regulatory requirements and procedures for completing the safe isolation of an electrical circuit and complete electrical installations in preparation for inspection, testing and commissioning	7	17.5
2. Understand the principles and regulatory requirements for inspecting, testing and commissioning electrical systems, equipment and components	2	5
3. Understand the regulatory requirements and procedures for completing the inspection of electrical installations	31	77.5
Total	**40**	**100**

Test : Unit 309
Duration: 60 minutes
Conditions: Candidates will require a non-programmable calculator for this assessment. No reference materials are permitted.

Outcome	No. of questions	%
1. understand mathematical principles which are appropriate to electrical installation, maintenance and design work	2	7
2. understand standard units of measurement used in electrical installation, maintenance and design work	6	20
3. understand basic mechanics and the relationship between force, work, energy and power	7	23
4. understand the relationship between resistance, resistivity, voltage, current and power	15	50
Total	**30**	**100**

Recording forms

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, **Learning Assistant**, an easy-to-use and secure tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: **www.cityandguilds.com/e-portfolios.**

City & Guilds has developed a logbook specifically designed to meet the needs of candidates and assessors for these qualifications. This can be found on **www.cityandguilds.com**, navigate to **Building Services Industry, Electrical Installations, 2357.**

Although it is expected that new centres will use these forms, centres may devise or customise alternative forms, which must be approved for use by the EQA before they are used.

Recognition of Prior Learning (RPL)

Recognition of Prior Learning (RPL) recognises the contribution a person's previous experience could contribute to a qualification. RPL is allowed and is sector specific.

City & Guilds, with the agreement of SummitSkills has identified the connections to the **2357-13 City & Guilds Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings and Structures)** from the 2330 City & Guilds Certificate in Electrotechnical Technology, to enable candidates that have completed their technical certificate to progress onto these qualifications, without having to repeat assessment of content they have already undertaken. The amount of coverage differs depending on whether the candidate has undertaken one level, or both levels of 2330.

Candidates that have started the 2356 City & Guilds Level 3 NVQ in Electrotechnical Services and wish to transfer to these qualifications will find that they have evidence which may present opportunities for APL on the performance units.

Candidates, who have successfully undertaken either level 2 or levels 2 and 3 of the City & Guilds certificate in electrotechnical technology, will be exempt from certain units and only have to undertake the units as detailed below:

NQF Qualification	Additional Requirements for Achievement Of Electrotechnical Qualification	Which complex to register candidates on
City & Guilds level 2 Certificate in Electrotechnical Technology 2330-01 (if undertaking 2357-13/91)	**Installation (2357-13/91):** 2357-602 (ELTK02) 2357-303 (ELTK03) 2357-607 (ELTK06) 2357-608 (ELTK07), and 2357-609 (ELTK08) plus all performance units (2357-311-313, 315-318), and AM2 (2357-399).	2357-34
City & Guilds levels 2 and 3 Certificate in Electrotechnical Technology 2330-01 and 2330-07 (if undertaking 2357-13/91)	**Installation (2357-13/91):** 2357-602 (ELTK02) plus all performance units (2357-311-313, 315-318), and AM2 (2357-399).	2357-34

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications. For example, units within a qualification may be similar in content to units in the NQF qualification which the candidate may have already undertaken and this may present opportunities for RPL.

Recognition of Prior Learning (RPL) recognises the contribution a person's previous experience could contribute to a qualification. RPL is allowed and is sector specific.

City & Guilds, with the agreement of SummitSkills has identified the connections to the **Level 3 Diplomas in Electrotechnical Technology (2357))** from the 2330 City & Guilds Certificate in Electrotechnical Technology, to enable candidates that have completed their technical certificate to progress onto these qualifications, without having to repeat assessment of

content they have already undertaken. The amount of coverage differs depending on whether the candidate has undertaken one level, or both levels of 2330.

Candidates that have started the 2356 City & Guilds Level 3 NVQ in Electrotechnical Services and wish to transfer to these qualifications will find that they have evidence which may present opportunities for APL on the performance units.

Candidates, who have successfully undertaken either level 2 or levels 2 and 3 of the City & Guilds certificate in electrotechnical technology, will be exempt from certain units and only have to undertake the units as detailed below:

NQF Qualification	Additional Requirements For Achievement Of Electrotechnical Qualification	Which complex to register candidates on
City & Guilds level 2 Certificate in Electrotechnical Technology 2330-02 (if undertaking 2357-23/92)	**Maintenance (2357-23/92):** 2357-602 (ELTK02) 2357-603 (ELTK03) 2357-607 (ELK6 2357-607 (ELTK06) 2357-608 (ELTK07) 2357-609 (ELTK08) 2357-322 (ELTK09a), and 2357-323 (ELTK09.) plus **all** performance units (2357-311-313, 316-318, 322-323) plus all performance units (2357-311-313, 316-318, 332-333), and AM2 (2357-399).	2357-35
City & Guilds levels 2 and 3 Certificate in Electrotechnical Technology 2330-02 and 2330-08 (if undertaking 2357-23/92)	**Maintenance (2357-23/92):** 2357-602 (ELTK02) 2357-322 (ELTK09a) and 2357-323 (ELTK09.) plus all performance units (2357-311-313, 316-318, 332-333, and AM2 (2357-399).	2357-35

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications. For example, units within a qualification may be similar in content to units in the NQF qualification which the candidate may have already undertaken and this may present opportunities for RPL.

Centres wishing to RPL there candidates should register on the following routes:

- 2357-34 (installation route) equivalent to 2357-13
- 2357-35 (maintenance route) equivalent to 2357-23.

5 Units

Structure of units

The units are written in a standard format and comprise the following:

- City & Guilds reference number
- SummitSkills unit reference number (in brackets)
- unit accreditation number
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by the Sector Skills Council, SummitSkills
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

Summary of units

City & Guilds unit	Title	Unit number (UAN)	Credits
601	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	H/602/2523	6
602	Understanding environmental legislation, working practices and the principles of environmental technology systems	M/602/2525	4
603	Understanding the practices and procedures for overseeing and organising the work environment (Electrical installation)	J/602/2532	6
604	Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment	A/602/2589	8
605	Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment	T/602/2560	10
606	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	J/602/2563	9

City & Guilds unit	Title	Unit number (UAN)	Credits
607	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	D/602/2567	8
608	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	R/602/2579	6
609	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	A/602/2589	12
311	Applying Health and Safety legislation and working practices (Installing and maintaining electrotechnical systems and equipment)	R/602/2596	3
312	Applying environmental legislation, working practices and the principles of environmental technology systems	H/602/2599	3
313	Overseeing and organising the work environment (Electrical Installation)	K/602/2605	3
315	Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment	R/602/2792	6
316	Terminating and connecting conductors, cables and flexible cords in electrical systems	H/602/2828	4
317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	K/602/2703	6
318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	M/602/2704	6
321	Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance)	M/602/2542	6
322	Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment	J/602/2594	8
323	Understanding the practices and procedures for maintaining electrotechnical systems and equipment	T/602/2591	8
332	Plan and prepare to maintain electrotechnical systems and equipment	L/602/2709	3
333	Maintain electrotechnical systems and equipment	A/602/2706	4
399	Electrotechnical occupational competence	R/602/2503	4

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Level: **3**
Credit value: **6**
UAN: **H/602/2523**

Unit aim
This unit is designed to enable learners to understand Health and Safety legislation, practices and procedures associated when installing and maintaining electrotechnical systems and equipment. Its content is the knowledge needed by a learner to underpin the application of Health and Safety legislation, practices and procedures.

Learning outcomes
There are **four** learning outcomes to this unit. The learner will:
1. understand how relevant Health and Safety legislation applies in the workplace
2. understand the procedures for dealing with Health and Safety in the work environment
3. understand the procedures for establishing a safe working environment
4. understand the requirements for identifying and dealing with hazards in the work environment.

Guided learning hours
It is recommended that **54** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed by:
- An assignment (2357-601)
- An online multiple-choice test (2357-301)

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Outcome 1 Understand how relevant Health and Safety legislation applies in the workplace

Assessment Criteria

The learner can:

1. specify their own roles and responsibilities and those of others with regard to current **relevant legislation**
2. specify particular Health and Safety risks which may be present and the requirements of current health and safety legislation for the range of electrotechnical **work operations.**

Range

Relevant legislation:

- The Health and Safety at Work Act
- The Electricity at Work Regulations
- 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
- Display Screen Equipment at Work Regulations
- Control of Asbestos at Work Regulations

Work operations:

- Preparation and planning
- Installation
- Termination and connection
- Inspection, testing and commissioning
- Fault diagnosis and rectification
- Maintenance

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Outcome 2 Understand the procedures for dealing with Health and Safety in the work environment

Assessment Criteria

The learner can:

1. state the procedures that should be followed in the case of accidents which involve injury, including requirements for the treatment of electric shock/electrical burns
2. specify **appropriate procedures** which should be followed when emergency situations occur in the workplace
3. state the limitations of their responsibilities in terms of Health and Safety in the workplace
4. state the actions to be taken in situations which exceed their level of responsibility for Health and Safety in the workplace
5. state the procedures that should be followed in accordance with the relevant Health and Safety regulations for reporting health, safety and/or welfare issues in the workplace.
6. specify **appropriate responsible persons** to whom health and safety and welfare related matters should be reported.

Range

Appropriate procedures:

- Procedures for summoning emergency services
- Information that emergency services require
- Alarm and evacuation procedures
- Designated escape routes
- Fire fighting procedures
- Application of first aid

Appropriate responsible persons:

- Employer
- Employees
- Customer/client
- Safety officers
- Health & Safety executive/inspectors
- Trades union representative
- Environmental health officers

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Outcome 3 Understand the procedures for establishing a safe working environment

Assessment Criteria

The learner can:

1. state the procedure for producing risk assessments and method statements in accordance with their level of responsibility
2. describe the **procedures** for working in accordance with provided, pre determined.
3. describe the procedures that should be taken to remove or minimise risks before deciding PPE is needed
4. state the purpose of PPE
5. specify the appropriate protective clothing and equipment that is required for identified work tasks
6. state the first aid facilities that must be available in the work area in accordance with health and safety regulations
7. explain why it is important not to misuse first aid equipment/supplies and to replace first aid supplies once used
8. describe safe practices and procedures in the **working environment.**

Range

Procedures:

- Risk assessments
- Method statements
- Safe systems of work

Working environment:

- Access equipment (PASMA requirements)
- Portable power tools (eg cartridge gun, drills, grinders)
- Signs and guarding
- Tools and materials storage facilities
- Dangerous substances, eg cutting compounds and adhesives

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Outcome 4 Understand the requirements for identifying and dealing with hazards in the work environment

Assessment Criteria

The learner can:

1. identify warning signs for the seven main groups of hazardous substance, as defined by The Chemical (Hazard Information and Packaging for Supply) Regulations (CHIP)
2. define what is meant by the term hazard in relation to Health and Safety legislation in the workplace
3. identify **specific hazards** associated with the installation and maintenance of electrotechnical systems and equipment
4. describe **situations** which can constitute a hazard in the workplace
5. explain practices and procedures for addressing **hazards in the work place**
6. identify the correct type of fire extinguisher for a particular type of fire
7. explain situations **where asbestos may be encountered**
8. specify the procedures for dealing with the suspected presence of asbestos in the workplace.

Range

Specific hazards:

- Electric shock (direct and indirect contact)
- Burns
- Fires
- Explosions

Situations:

- Temporary electrical supplies
- Trailing leads/cables
- Slippery or uneven surfaces
- Presence of dust and fumes
- Handling and transporting equipment or materials
- Contaminants and irritants
- Fire
- Working at height
- Hazardous malfunctions of equipment
- Improper use and storage of tools and equipment

Hazards in the workplace:

- Temporary electrical supplies
- Trailing leads/cables
- Slippery or uneven surfaces
- Presence of dust and fumes
- Handling and transporting equipment or materials
- Contaminants and irritants
- Fire
- Working at height
- Hazardous malfunctions of equipment
- Improper use and storage of tools and equipment

Where asbestos may be encountered:

- In decorative finishes (aertex, plaster, floor tiles)
- In accessories (flash guards and matting in fuse carriers and on distribution board covers)
- In insulation storage compartments, vessels and pipework

Unit 601 Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (ELTK 01)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of ‘Practical Support Learning’ activity in simulated conditions.

Unit 602 Understanding environmental legislation, working practices and the principles of environmental technology systems (ELTK 02)

Level: **3**
Credit value: **4**
UAN: **M/602/2525**

Unit aim

This unit is designed to enable learners to understand environmental legislation, working practices and the principles of environmental technology systems. Its content is the knowledge needed by a learner to underpin the application of skills and working practices appropriate to relevant legislation and systems.

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. understand the environmental legislation, working practices and principles which are relevant to work activities
2. understand how work methods and procedures can reduce material wastage and impact on the environment
3. understand how and where environmental technology systems can be applied.

Guided learning hours

It is recommended that **36** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 2, 4 and 9.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, Summit Skills.

Assessment

This unit will be assessed by

- An assignment (2357-602).
- An online multiple-choice test (2357-102)

Unit 602 Understanding environmental legislation, working practices and the principles of environmental technology systems (ELTK 02)

Outcome 1 Understand the environmental legislation, working practices and principles which are relevant to work activities

Assessment Criteria

The learner can:

1. specify the **current, relevant legislation** for processing waste
2. describe what is meant by the term environment
3. describe the ways in which the environment may be **affected by work activities**
4. identify and interpret the requirements for electrical installations as outlined in relevant sections of the Building Regulations and the Code for Sustainable Homes
5. state materials and products that are classed as:
    - hazardous to the environment
    - recyclable.
6. describe the organisational procedures for processing materials that are classed as:
    - hazardous to the environment
    - recyclable.

Range

Current, relevant legislation:

- Environmental Protection Act
- The Hazardous Waste Regulations
- Pollution Prevention and Control Act
- Control of Pollution Act
- The Control of Noise at Work Regulations
- Packaging (Essential Requirements) Regulations
- Environment Act
- The Waste Electrical and Electronic Equipment Regulations

Affect of work activities:

- Land contamination
- Air pollution
- Pollution of water courses

Unit 602 Understanding environmental legislation, working practices and the principles of environmental technology systems (ELTK 02)

Outcome 2 Understand how work methods and procedures can reduce material wastage and impact on the environment

Assessment Criteria

The learner can:

1. state installation methods that can help to reduce material wastage
2. explain why it is important to report any hazards to the environment that arise from work procedures
3. specify environmentally friendly materials, products and procedures that can be used in the installation and maintenance of electrotechnical systems and equipment.

Unit 602 Understanding environmental legislation, working practices and the principles of environmental technology systems (ELTK 02)

Outcome 3 Understand how and where environmental technology systems can be applied

Assessment Criteria

The learner can:

1. describe the fundamental operating principles of **environmental technology systems**
2. state the applications and limitations of **environmental technology systems**
3. state the Local Authority Building Control requirements which apply to the installation of environmental technology systems.

Range

Environmental technology systems:

- Solar photovoltaic
- Wind energy generation (Micro and macro)
- Micro hydro generation
- Heat pumps
- Combined heat and power (CHP) including micro CHP
- Grey water recycling
- Rainwater harvesting
- Biomass heating
- Solar thermal hot water heating

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Level: **3**
Credit value: **6**
UAN: **J/602/2532**

Unit aim

This unit is designed to enable learners to understand practices and procedures for overseeing and organising the work environment for the installation of electrotechnical systems and equipment. Its content is the knowledge needed by a learner to underpin the application of skills for overseeing and organising the work environment.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. understand the types of technical and functional information that is available for the installation of electrotechnical systems and equipment
2. understand the procedures for supplying technical and functional information to relevant people
3. understand the requirements for overseeing Health and Safety in the work environment
4. understand the requirements for liaising with others when organising and overseeing work activities
5. understand the requirements for organising and overseeing work programmes
6. understand the requirements for organising the provision and storage of resources that are required for work activities.

Guided learning hours

It is recommended that **56** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT5 and 6.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by an assignment (2357-603).

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 1 Understand the types of technical and functional information that is available for the installation of electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. specify **sources of technical and functional information** which apply to electrotechnical installations
2. interpret **technical and functional information and data**
3. identify and **interpret technical and functional information relating to electrotechnical product or equipment**
4. describe the work site requirements and procedures in terms of:
    - services provision
    - ventilation provision
    - waste disposal procedures
    - equipment and material storage
    - health and safety requirements
    - access by personnel
5. identify equipment and systems that are compatible to site operations and requirements.

Range

Sources of technical and functional information:

- Manufacturer information and data
- Supplier information and data
- Information from their employing organisation
- Installation specifications
- Client/customer specifications
- Specifications, drawings and diagrams

Technical and functional information and data:

- Manufacturer information and data
    - Materials
    - Components
    - Equipment
    - Measuring and test instruments
- Supplier information and data
    - Materials
    - Components
    - Equipment
    - Measuring and test instruments
- Information from their employing organisation

- Installation specifications
- Client/customer specifications
- Specifications, drawings and diagrams
- Records and certificates for -
    - Inspection
    - Testing
    - Installation completion

Technical and functional information and data relating to electrotechnical product or equipment:

- operation
- controls
- settings
- adjustments

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 2 Understand the procedures for supplying technical and functional information to relevant people

Assessment Criteria

The learner can:

1. state the limits of their responsibility for supplying technical and functional information to **others**
2. specify organisational policies/procedures for the handover and demonstration of electrotechnical systems, products and equipment, including requirements for confirming and recording handover
3. state the appropriateness of different customer relations methods and procedures
4. identify methods of providing technical and function information appropriate to the needs of **others**
5. explain the importance of ensuring that:
    - information provided is accurate and complete
    - information is provided clearly, courteously and professionally
    - copies of information provided are retained
    - the installation, on completion, functions in accordance with the specification, is safe and complies with industry standards.
6. describe methods for checking that relevant persons have an adequate understanding of the technical and non-technical information provided, including appropriate Health and Safety information.

Range

Others:

- Clients
- Customers
- Major contractors
- Other services
- Site managers

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 3 Understand the requirements for overseeing Health and Safety in the work environment

Assessment Criteria

The learner can:

1. state the applicable Health and Safety requirements with regard to overseeing the work of others
2. state the **procedures** for:
    - interpreting risk assessments
    - applying method statements
    - monitoring changing conditions in the workplace
    - complying with site organisational procedures
    - managing Health and Safety on site
    - organising the safe and secure storage of tools and materials.

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 4 Understand the requirements for liaising with others when organising and overseeing work activities

Assessment Criteria

The learner can:

1. describe techniques for the communication with others for the purpose of:
    - motivation
    - instruction
    - monitoring
    - co-operation
2. describe **methods** of determining the competence of operatives for whom they are responsible
3. specify their role in terms of:
    - responsibility for other staff
    - liaison with their employer
    - communication with **others**
4. identify appropriate methods for communicating with and responding to **others**
5. specify procedures for re-scheduling work to co-ordinate with changing conditions in the workplace and to coincide with other trades
6. clarify organisational procedures for completing the documentation that is required during work operations.

Range

Methods:

- Checking competency cards (e.g. CSCS cards, JIB cards)
- Checking technical qualifications
- Written references from previous employers
- Informal monitoring of performance on site
- Competent Person Scheme Registration

Others:

- Customers
- Clients
- Site managers
- Major Contractors (where appropriate)
- Sub-contractors (where appropriate)
- Other services
- The public

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 5 Understand the requirements for organising and overseeing work programmes

Assessment Criteria

The learner can:

1. describe how to **plan**:
    - work allocations
    - duties of operative for whom they are responsible
    - coordination with other services and personnel
2. specify procedures for carrying out work activities that will:
    - maintain the safety of the work environment
    - maintain cost effectiveness
    - ensure compliance with the programmes of work
3. identify the **industry standards** that are relevant to activities carried out during the installation of electrotechnical systems and equipment, including the **current editions**
4. identify within the scope of the work programme and operations their responsibilities
5. identify how to determine the estimated time required for the completion of the work required taking into account **influential factors**
6. state the possible consequences of not;
    - completing work within the estimated time
    - meeting the requirements of the programme of work
    - using the specified materials
    - installing materials and equipment as specified
7. specify methods of producing and illustrating **work programmes.**

Range

Current editions of industry standards:

- Management of Health and Safety regulations
- Health & Safety at Work Act
- Electricity at Work regulations
- Construction design and management
- BS 7671 requirements for electrical installations
- BS EN graphical symbols
- Employment Rights Act
- Data Protection Act
- Disability Discrimination Act
- Race Relations Act
- Sex Discrimination Act
- Human Rights Act

Influential factors:

- The deployment and availability of suitable personnel
- The delivery and availability of equipment, components and material
- Weather conditions
- Work to be completed by other services
- Specification variations

Work programmes:

- Bar charts
- Spread sheets
- Critical Path Analysis

Unit 603 Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation) (ELTK03)

Outcome 6 Understand the requirements for organising the provision and storage of resources that are required for work activities

Assessment Criteria

The learner can:

1. interpret the installation specification and work programme to identify resource requirements for the following:
    - materials
    - components
    - plant
    - vehicles
    - equipment
    - labour
    - tools
    - measuring and test instruments
2. interpret the material schedule to confirm that materials available are:
    - the right type
    - fit for purpose
    - in the correct quantity
    - suitable for work to be completed cost efficiently
3. specify the storage and transportation requirements for all materials required in the work location
4. specify procedures to ensure the safe and effective storage of materials, tools and equipment in the work location.

Unit 604 Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (ELTK04a)

Level: **3**
Credit value: **8**
UAN: **A/602/2561**

Unit aim

This unit is designed to enable learners to understand the principles associated with planning the installation of electrotechnical equipment and systems in buildings, structures and the environment and the selection of material, components and equipment. Its content is the knowledge needed by a learner to underpin the application of skills in the planning and selection of materials, equipment for completing an electrical installation in accordance with a specification.

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. understand the characteristics and applications of consumer supply systems
2. understand the principles of internal and external earthing arrangements for electrical installations for buildings, structures and the environment
3. understand the principles for selecting cables and circuit protection devices
4. understand the principles and procedures for selecting wiring systems, equipment and enclosures.

Guided learning hours

It is recommended that **76** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT6, 7 and 8.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by an assignment (2357-604).

Unit 604 Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (ELTK04a)

Outcome 1 Understand the characteristics and applications of consumer supply systems

Assessment Criteria

The learner can:

1. explain the characteristics and applications of **consumer supply systems**
2. specify the arrangements for electrical installations and systems with regard to provision for:
    - isolation and switching
    - overcurrent protection
    - earth fault protection.

Range

Consumer supply systems

- Earthing arrangements:
    - TN-S
    - TNC-S
    - TN-C
    - TT
    - IT
- Supply systems:
    - Single phase
    - Three phase
    - Three phase and neutral

Unit 604 Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (ELTK04a)

Outcome 2 Understand the principles of internal and external earthing arrangements for electrical installations for buildings, structures and the environment

Assessment Criteria

The learner can:

1. explain the key principles relating to earthing and bonding
2. explain the **key principles** relating to the protection of electrical systems
3. explain the operating principles, applications and limitations of **protective devices**
4. specify what is meant by the **terms** relating to earthing and the function of earth protection:
    - earth fault loop impedance
    - protective Multiple Earthing (PME).

Range

Key principles:

- Automatic disconnection and the implications of exposed and extraneous conductive parts within a building forming a circuit to the mass of earth or Main Earthing Terminal (MET) under fault conditions
- The basic principles of shock protection, circuit overload and short-circuit protection:
    - Maximum disconnection times for different types of circuit
    - Discrimination between protective devices
    - Fault current capacities of devices

Protective devices:

- RCDs/RCBOs
- Fuses (BS3036, re-wireable, BS1361/2 cartridges, BS88 HBC)
- CBs (thermal, magnetic and combined tripping)

Unit 604 Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (ELTK04a)

Outcome 3 Understand the principles for selecting cables and circuit protection devices

Assessment Criteria

The learner can:

1. explain how external influences can affect the choice of wiring systems and enclosures
2. state the current ratings for different circuit protection devices
3. specify and apply the procedure for selecting appropriate over current protection devices
4. state what is meant by diversity factors and explain how a circuits maximum demand is established after diversity factors are applied
5. specify and apply the **procedure** for selecting a suitably sized cable
6. determine the size of conduit and trunking as appropriate to the size and number of cables to be installed.

Range

Procedure:

- Calculating the current demand of single and three phase circuits
- Selecting a protective device
- Applying factors for –
    - Grouping
    - Thermal insulation
    - Ambient temperature
    - Installation condition or protective device type
- Establishing the installation method
- Selecting a suitably sized cable
- Checking voltage drop is not excessive
- Determining circuit disconnection times, as relevant, R1 + R2, Ze and Zs
- Considering thermal constraints

Unit 604 Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (ELTK04a)

Outcome 4 Understand the principles and procedures for selecting wiring systems, equipment and enclosures

Assessment Criteria

The learner can:

1. state the criteria for correctly selecting wiring systems, equipment and enclosures as appropriate for **systems**

Range

Systems:

- lighting systems
- power systems (final circuits)
- distribution systems (sub mains)
- environmental control/building management systems
- emergency management systems
- security systems – Fire Alarm/Prevention; Unlawful Entry; Emergency Lighting
- Closed Circuit TV, communication and data transmission systems

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Level: **3**
Credit value: **10**
UAN: **T/602/2560**

Unit aim

This unit is designed to enable learners to understand and interpret the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment. Its content is the knowledge needed by a learner to underpin the application of skills of preparing and installing electrotechnical systems and equipment.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. understand the procedures, practices and statutory and non statutory regulatory requirements for preparing work sites for the installation of wiring systems and associated equipment
2. understand the procedures for checking the work location prior to the commencement of work activities
3. understand the practices, procedures and regulatory requirements for completing the safe isolation of electrical circuits and complete electrical installations
4. understand the types, applications and limitations of wiring systems and associated equipment
5. understand the procedures for selecting and using, tools, equipment and fixings for the installation of wiring systems, associated equipment and enclosures
6. understand the practices and procedures for installing wiring systems, associated equipment and enclosures
7. know the regulatory requirements which apply to the installation of wiring systems, associated equipment and enclosures.

Guided learning hours

It is recommended that **96** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT7, 8 and 9.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed by:

Option 1
- 2357-605 (assignment) and 2357-305 (online multiple-choice test)

Or to be able to claim **wiring regulations BS7671** candidates must achieve either:

Option 2
- 2357-705 (assignment) and 2357-006 (online multiple-choice test) (**17th edition**)
  OR
- 2357-725 (assignment) and 2357-006 (online multiple-choice test) (**17th edition**)

Option 3
- 2357-705 (assignment) and 2357-018 (online multiple-choice test) (**18th edition**)
  OR
- 2357-725 (assignment) and 2357-018 (online multiple-choice test) (**18th edition**)

Option 4
- 2357-705 (assignment) and 2357-022 (online multiple-choice test) (**18th edition amendment 2 (2022)**)
  OR
- 2357-725 (assignment) and 2357-022 (online multiple-choice test) (**18th edition amendment 2 (2022)**)

On completion of the full qualification, centres will be able to claim a full 2382 certificate for their candidates. (See Appendix 1 for further details).

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 1 Understand the procedures, practices and statutory and non statutory regulatory requirements for preparing work sites for the installation of wiring systems and associated equipment

Assessment Criteria

The learner can:

1. explain the Health and Safety requirements and legal duties of employers and employees in establishing a safe working environment
2. interpret relevant **sources of information** which will inform installation work
3. specify the **actions required** to ensure that electrical installation work sites are correctly prepared in terms of Health and Safety considerations.

Range

Sources of information:

- Statutory documents
- Codes of practice
- British standards
- Site drawings
- Installation specifications – wiring diagrams; fitting and fixing dimensions/drawings; technical data
- Manufacturer's instructions

Actions required:

- Provision for safe access and egress
- Checking immediate work location for potential hazards as appropriate to property, personnel and livestock
- Know the requirements for the completion of a risk assessment
- Confirm that appropriate risk assessments and method statements have been produced

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 2 Understand the procedures for checking the work location prior to the commencement of work activities

Assessment Criteria

The learner can:

1. state the **preparations** that should be completed before electrical installation work starts
2. explain how to check for any **pre-existing damage to** customer/client property and state why it is important to do this prior to commencement of any work activity
3. state the actions that should be taken if pre-existing damage to customer/client property is identified
4. specify methods for protecting the fabric and structure of the property before and during installation work.

Range

Preparations:

- Interpretation of specifications to produce accurate material and equipment requisites
- Identification and selection of material, equipment and components compatible to installation specification
- Confirmation of site readiness for installation including considerations of building structures and fabric
- Confirmation that tools, equipment and instruments are fit for purpose
- Confirmation of secure site storage for tools, equipment, materials and components
- Identification of suitable access equipment
- Identification of suitable lifting equipment
- Identification of suitable installation, fixing and fitting methods
- Identification of points in the installation programme where co-ordination with other trades and personnel may be necessary

Pre-existing damage to:

- Building wall/floor fabric
- Equipment and components
- Building décor and floor finishes

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 3 Understand the practices, procedures and regulatory requirements for completing the safe isolation of electrical circuits and complete electrical installations

Assessment Criteria

The learner can:

1. specify and undertake the correct procedure for completing safe isolation with regard to:
    - carrying out safe working practices
    - correct identification of circuit(s) to be isolated
    - identifying suitable points of isolation
    - selecting correct test and proving instruments in accordance with relevant industry guidance and standards
    - correct testing methods
    - selecting locking devices for securing isolation
    - correct warning notices
    - correct sequence for the safe-isolation of an electrical circuit and complete electrical installation.
2. state the implications of carrying out safe isolations to:
    - other personnel
    - customers/clients
    - public
    - building systems (loss of supply).
3. state the implications of not carrying out safe isolation to:
    - self
    - other personnel
    - customers/clients
    - public
    - building systems (presence of supply).

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 4 Understand the types, applications and limitations of wiring systems and associated equipment

Assessment Criteria

The learner can:

1. state the constructional features, applications, advantages and limitations of **types of cable**
2. state the constructional features, applications, advantages and limitations of **types of cable and conductor containment systems**
3. describe how **environmental factors** can affect the selection of wiring systems, associated equipment and enclosures
4. state the types of wiring systems and associated equipment used for:
    - lighting systems
    - power systems (final circuits)
    - distribution systems (sub mains)
    - environmental control/building management systems
    - emergency management systems
    - security systems – fire alarm/prevention; unlawful entry; emergency lighting
    - closed circuit TV, communication and data transmission systems.

Range

Types of cable:

- Thermosetting insulated cables including flexes
- Single and multicore thermoplastic (PVC) and thermosetting insulated cables
- PVC/PVC flat profile cable
- MICC (with and without PVC sheath)
- SWA cables (PILC, XLPE, PVC)
- Armoured/braided flexible cables and cords
- Data cables
- Fibre optic cable
- Fire resistant cable

Types of cable and conductor containment systems

- Conduit (PVC and metallic)
- Trunking (PVC and metallic)
- Cable tray
- Cable basket

- Ladder systems
- Ducting
- Modular wiring systems
- Busbar systems and Powertrack

Environmental factors:

- Ambient temperature
- Effect of moisture on insulation
- Corrosive substances
- UV rays
- Damage by animals
- Mechanical stress and vibration damage
- Aesthetic considerations
- Exposure to the elements

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 5 Understand the procedures for selecting and using, tools, equipment and fixings for the installation of wiring systems, associated equipment and enclosures

Assessment Criteria

The learner can:

1. state the procedures for selecting and safely using appropriate hand tools, power tools and adhesives for electrical installation work
2. state the procedures for selecting and safely using equipment for measuring and marking out for wiring systems, equipment and enclosures
3. state the criteria for selecting and safely using tools and equipment for fixing and installing wiring systems, associated equipment and enclosures
4. state the criteria for selecting and safely using fixing devices for wiring systems, associated equipment and enclosures, giving consideration to
    - load bearing capacity
    - fabric of structure
    - environmental considerations
    - aesthetic considerations.

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 6 Understand the practices and procedures for installing wiring systems, associated equipment and enclosures

Assessment Criteria

The learner can:

1. specify and apply the installation methods and procedures to ensure that in accordance with the installation specification and statutory and non-statutory regulations:
    - wiring systems, enclosures, cables and components are securely fixed and installed
    - a wiring system's mechanical integrity is maintained
    - no damage to the wiring system or its components has occurred.
2. specify methods and techniques for restoring the building fabric.

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Outcome 7 Know the regulatory requirements which apply to the installation of wiring systems, associated equipment and enclosures

Assessment Criteria

The learner can:

1. specify the main requirements of the following topics in accordance with the current version of the IEE wiring regulations and describe how they impact upon the installation of wiring systems, associated equipment and enclosures**:**
    - selection and erection of wiring systems, associated equipment and enclosures
    - isolation and switching
    - protection against fire
    - protection against electric shock
    - special locations.
    - segregation.
    - flammable/explosive atmospheres.

Unit 605 Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (ELTK04)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of 'Practical Support Learning' activity in simulated conditions.

Unit 606 Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems (ELTK05)

Level: **3**
Credit value: **9**
UAN: **J/602/2563**

Unit aim

This unit is designed to enable learners to understand and interpret the principles, practices and legislation associated with the termination and connection of conductors, cables and cords in electrotechnical systems. Its content is the knowledge needed by a learner to underpin the application of skills for terminating and connecting conductors, cables and cords in electrotechnical systems in accordance with statutory and non-statutory regulations/requirements.

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. understand the principles, regulatory requirements and procedures for completing the safe isolation of electrical circuits and complete electrical installations
2. understand the regulatory requirements and procedures for terminating and connecting conductors, cables and flexible cords in electrical wiring systems and equipment
3. understand the procedures and applications of different methods of terminating and connecting conductors, cables, and flexible cords in electrical wiring systems and equipment.

Guided learning hours

It is recommended that **86** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT7, 8, 9 and 23.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by an assignment (2357-606).

Unit 606 Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems (ELTK05)

Outcome 1 Understand the principles, regulatory requirements and procedures for completing the safe isolation of electrical circuits and complete electrical installations

Assessment Criteria

The learner can:

1. state the implications of carrying out safe isolations to:
    - other personnel
    - customers/clients
    - public
    - building systems (loss of supply)
2. state the implications of not carrying out safe isolations to:
    - self
    - other personnel
    - customers/clients
    - public
    - building systems (presence of supply)
3. specify and undertake the correct procedure for completing safe isolation with regard to:
    - carrying out safe working practices
    - correct identification of circuit(s) to be isolated
    - identifying suitable points of isolation
    - selecting correct test and proving instruments in accordance with relevant industry guidance and standards
    - correct testing methods
    - selecting locking devices for securing isolation
    - correct warning notices
    - correct sequence for the safe-isolation of an electrical circuit and complete electrical installation.

Unit 606 Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems (ELTK05)

Outcome 2 Understand the regulatory requirements and procedures for terminating and connecting conductors, cables and flexible cords in electrical wiring systems and equipment

Assessment Criteria

The learner can:

1. identify and interpret appropriate **sources of relevant information** for the termination and connection of conductors, cables and flexible cords in electrical wiring systems and equipment
2. specify organisational procedures for reporting variations to the installation specification
3. describe methods and procedures appropriate to the installation environment to ensure the safe and effective termination and connection of conductors, cables and flexible cords in electrical **wiring systems and equipment**.

Range

Sources of relevant information:

- Statutory documents
- Codes of practice
- British standards
- IEE wiring regulations
- Manufacturers' instructions
- Installation specifications

Wiring systems and equipment:

- Thermosetting insulated cables including flexes
- Single and multicore thermoplastic (PVC) and thermosetting insulated cables
- PVC/PVC flat profile cable
- MICC (with and without PVC sheath)
- SWA cables (PILC, XLPE, PVC)
- Armoured/braided flexible cables and cords
- Data cables
- Fibre optic cable
- Fire resistant cable

Unit 606 Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems (ELTK05)

Outcome 3 Understand the procedures and applications of different methods of terminating and connecting conductors, cables, and flexible cords in electrical wiring systems and equipment

Assessment Criteria

The learner can:

1. explain the advantages, limitations and applications of the following **connection methods:**
    - screw
    - crimped
    - soldered
    - non screw compression
2. describe the procedures for proving that terminations and connections are electrically and mechanically sound
3. explain the consequences of terminations not being electrically and mechanically sound in terms of:
    - high resistance joints
    - corrosion and erosion
4. specify the **Health and Safety requirements** appropriate to terminating and connecting conductors, cables and flexible cords in electrical wiring systems and equipment
5. interpret and apply the techniques and methods for the safe and effective termination and connection of:
    - thermosetting insulated cables including flexes
    - single and multicore thermoplastic (PVC) and thermosetting insulated cables
    - PVC/PVC flat profile cable
    - MICC (with and without PVC sheath)
    - SWA cables (PILC, XLPE, PVC)
    - armoured/braided flexible cables and cords
    - data cables
    - fibre optic cable
    - fire resistant cable.

Range

Health and Safety requirements:

- Selection and use of tools
- PPE
- Risk assessment
- Reporting of unsafe situations

- Adherence to relevant statutory and non-statutory regulations

Unit 606 Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems (ELTK05)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of ‘Practical Support Learning’ activity in simulated conditions.

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Level: 3
Credit value: 8
UAN: D/602/2567

Unit aim

This unit is designed to enable learners to understand principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical 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 for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. understand the principles, regulatory requirements and procedures for completing the safe isolation of an electrical circuit and complete electrical installations in preparation for inspection, testing and commissioning
2. understand the principles and regulatory requirements for inspecting, testing and commissioning electrical systems, equipment and components
3. understand the regulatory requirements and procedures for completing the inspection of electrical installations
4. understand the regulatory requirements and procedures for the safe testing and commissioning of electrical installations
5. understand the procedures and requirements for the completion of electrical installation certificates and related documentation.

Guided learning hours

It is recommended that **78** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT24, 25 and 26.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by

- An assignment (2356-607)
- An online multiple-choice test (2357-107)

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Outcome 1 Understand the principles, regulatory requirements and procedures for completing the safe isolation of an electrical circuit and complete electrical installations in preparation for inspection, testing and commissioning

Assessment Criteria

The learner can:

1. state the requirements of the Electricity at Work Regulations 1989 for the safe inspection of electrical systems and equipment, in terms of those carrying out the work and those using the building during the inspection
2. specify and undertake the **correct procedure** for completing safe isolation
3. state the implications of carrying out safe isolations to
   - other personnel
   - customers/clients
   - public
   - building systems (loss of supply).
4. state the implications of not carrying out safe isolations to
   - self
   - other personnel
   - customers/clients
   - public
   - building systems (presence of supply).
5. identify all Health and Safety requirements which apply when inspecting, testing and commissioning electrical installations and circuits including those which cover:
   - 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.

Range

Correct procedure:

- Carrying out safe working practices
- Correct identification of circuit(s) to be isolated
- Identifying suitable points of isolation
- Selecting correct test and proving instruments in accordance with relevant industry guidance and standards
- Correct testing methods
- Selecting locking devices for securing isolation
- Correct warning notices
- Correct sequence for isolating circuits

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Outcome 2 Understand the principles and regulatory requirements for inspecting, testing and commissioning electrical systems, equipment and components

Assessment Criteria

The learner can:

1. state the purpose of and requirements for initial verification and periodic inspection of electrical installations
2. identify and interpret the requirements of the **relevant documents** associated with the inspection, testing and commissioning of an electrical installation
3. specify the information that is required to correctly conduct the initial verification of an electrical installation in accordance with the IEE wiring regulations and IEE Guidance Note 3.

Range

Relevant documents:

- Electricity at Work Regulations 1989
- IEE wiring regulations
- IEE Guidance Note 3

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Outcome 3 Understand the regulatory requirements and procedures for completing the inspection of electrical installations

Assessment Criteria

The learner can:

1. identify the items to be checked during the inspection process for given electrotechnical systems and equipment, and their locations as detailed in the IEE wiring regulations
2. state how human senses (sight, touch etc) can be used during the inspection process
3. state the items of an electrical installation that should be inspected in accordance with IEE Guidance Note 3
4. specify the requirements for the inspection of the following:
    - earthing conductors
    - circuit protective conductors
    - protective bonding conductors:
        - main bonding conductors
        - supplementary bonding conductors
    - isolation
    - type and rating of overcurrent protective devices.

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Outcome 4 Understand the regulatory requirements and procedures for completing the inspection of electrical installations

Assessment Criteria

The learner can:

1. state the tests to be carried out on an electrical installation in accordance with the IEE wiring regulations and IEE Guidance Note 3
2. identify the correct instrument for the test to be carried out in terms of:
   - the instrument is fit for purpose
   - identifying the right scale/settings of the instrument appropriate to the test to be carried out
3. specify the **requirements** for the safe and correct use of instruments to be used for testing and commissioning
4. explain why it is necessary for test results to comply with standard values and state the actions to take in the event of unsatisfactory results being obtained
5. explain why testing is carried out in the exact order as specified in the IEE wiring regulations and IEE Guidance Note 3
6. state the reasons why it is necessary to verify the continuity of circuit protective conductors, earthing conductors, bonding conductors and ring final circuit conductors
7. specify and apply the methods for verifying the continuity of circuit protective conductors and ring final circuit conductors and interpreting the obtained results
8. state the effects that cables connected in parallel and variations in cable length can have on insulation resistance values
9. interpret and apply the **procedures** for completing insulation resistance testing
10. explain why it is necessary to verify polarity
11. interpret and apply the procedures for testing to identify correct polarity
12. specify and apply the methods for measuring earth electrode resistance and correctly interpreting the results
13. identify the earth fault loop paths for the following systems:
    - TN-S
    - TN-C-S
    - TT
14. state the **methods** for verifying protection by automatic disconnection of the supply
15. specify the methods for determining prospective fault current
16. specify the methods for testing the correct operation of residual current devices (RCDs)
17. state the methods used to check for the correct phase sequence
18. explain why having the correct phase sequence is important
19. state the need for functional testing and identify items which need to be checked
20. specify the methods used for verification of voltage drop

21. state the cause of volt-drop in an electrical installation
22. state the **appropriate procedures** for dealing with customers and clients during the commissioning and certification process.

Range

Requirements:

- Checks required proving that test instruments and leads are safe and functioning correctly
- The need for instruments to be regularly checked and calibrated and that this be done in accordance with the requirements of the IEE wiring regulations and other relevant guidance documents (HSE guidance document GS38)

Procedures:

- 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

Systems:

- TN-S
- TN-C-S
- TT

Methods:

- The measurement of the earth fault loop impedance (Zs) and external impedance (Ze)
- Establishing Ze from enquiry
- Calculate the value of Zs from given information
- Comparing Zs and the maximum tabulated figures as specified in the IEE wiring regulations

Appropriate procedures:

- Ensuring the safety of customers and clients during the completion of work activities
- Keeping customers and clients informed during the process
- Labelling electrical circuits, systems and equipment that is yet to be commissioned
- Providing customers and clients with all appropriate documentation upon work completion

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Outcome 5 Understand the procedures and requirements for the completion of electrical installation certificates and related documentation

Assessment Criteria

The learner can:

1. explain the purpose of and relationship between:
    - an electrical installation certificate
    - a minor electrical installation works certificate
    - schedule of inspections
    - schedule of test results
2. state the information that must be contained within:
    - an electrical installation certificate
    - a minor electrical installation works certificate
    - schedule of inspections
    - schedule of test results
3. describe the certification process for a completed installation and identify the responsibilities of different relevant personnel in relation to the completion of the certification process
4. explain the procedures and requirements, in accordance with the IEE wiring regulations, IEE Guidance Note 3 and where appropriate customer/client requirements for the recording and retention of completed:
    - electrical installation certificates
    - minor electrical installation works certificates
    - schedule of inspections
    - schedule of test results

Unit 607 Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (ELTK06)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of 'Practical Support Learning' activity in simulated conditions.

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Level: **3**
Credit value: **6**
UAN: **R/602/2579**

Unit aim

This unit is designed to enable learners to understand principles, practices and legislation associated with diagnosing and correcting electrical faults in electrotechnical 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 electrotechnical systems and equipment in buildings, structures and the environment.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. understand the principles, regulatory requirements and procedures for completing the safe isolation of electrical circuits and complete electrical installations
2. understand how to complete the reporting and recording of electrical fault diagnosis and correction work
3. understand how to complete the preparatory work prior to fault diagnosis and correction work
4. understand the procedures and techniques for diagnosing electrical faults
5. understand the procedures and techniques for correcting electrical faults.

Guided learning hours

It is recommended that **58** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT25, 27 and 28.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by an assignment (2357-608).

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Outcome 1 Understand the principles, regulatory requirements and procedures for completing the safe isolation of electrical circuits and complete electrical installations

Assessment Criteria

The learner can:

1. specify and undertake the **correct procedure** for completing the safe isolation of an electrical circuit
2. state the implications of carrying out safe isolations to:
    - other personnel
    - customers/clients
    - public
    - building systems (loss of supply)
3. state the implications of not carrying out safe isolations to:
    - self
    - other personnel
    - customers/clients
    - public
    - building systems (presence of supply)
4. identify all Health and Safety requirements which apply when diagnosing and correcting electrical faults in electrotechnical systems and equipment including those which cover:
    - 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.

Range

Correct procedure:

- Assessment of safe working practices
- Correct identification of circuits to be isolated
- The selection of suitable points of isolation
- The selection of correct test and proving instruments in accordance with relevant industry guidance and standards
- The use of correct testing methods
- The selection of locking devices for securing isolation

- The use of correct warning notices
- The correct sequence for isolating circuits

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Outcome 2 Understand how to complete the reporting and recording of electrical fault diagnosis and correction work

Assessment Criteria

The learner can:

1. state the procedures for reporting and recording information on electrical fault diagnosis and correction work
2. state the procedures for informing relevant persons about information on electrical fault diagnosis and correction work and the completion of relevant documentation
3. explain why it is important to provide relevant persons with information on fault diagnosis and correction work clearly, courteously and accurately.

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Outcome 3 Understand how to complete the preparatory work prior to fault diagnosis and correction work

Assessment Criteria

The learner can:

1. specify **safe working procedures** that should be adopted for completion of fault diagnosis and correction work
2. interpret and apply the **logical stages** of fault diagnosis and correction work that should be followed
3. identify and describe common **symptoms of electrical faults**
4. state the causes of the following types of fault:
    - high resistance
    - transient voltages
    - insulation failure
    - excess current
    - short-circuit
    - open circuit
5. specify the types of faults and their likely locations in:
    - wiring systems
    - terminations and connections
    - equipment/accessories (switches, luminaries, switchgear and control equipment)
    - instrumentation/metering
6. state the special precautions that should be taken with regard to the following:
    - lone working
    - hazardous areas
    - fibre-optic cabling
    - electro-static discharge (friction, induction, separation)
    - electronic devices (damage by over voltage)
    - IT equipment (e.g. shutdown, damage)
    - high frequency or capacitive circuits
    - presence of batteries (e.g. lead acid cells, connecting cells).

Range

Safe working procedures:

- Effective communication with others in the work area
- Use of barriers
- Positioning of notices
- Safe isolation

Logical stages:

- Identification of symptoms
- Collection and analysis of data
- Use of sources/types of information such as the IEE Wiring Regulations, Installation Certificates, Installation Specifications, drawings/diagrams, manufacturer's information and operating instructions
- Maintenance records
- Experience (personal and of others)
- Checking and testing (eg supply, protective devices)
- Interpreting results/information
- Fault correction
- Functional testing
- Restoration

Symptoms of electrical faults:

- Loss of supply
- Low voltage
- Operation of overload or fault current devices
- Component/equipment malfunction/failure
- Arcing

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Outcome 4 Understand the procedures and techniques for diagnosing electrical faults

Assessment Criteria

The learner can:

1. state the dangers of electricity in relation to the nature of fault diagnosis work
2. describe how to identify supply voltages
3. select the correct **test instruments** (in accordance with HSE guidance document GS 38) for fault diagnosis work
4. describe how to confirm test instruments are fit for purpose, functioning correctly and are correctly calibrated
5. state the appropriate documentation that is required for fault diagnosis work and explain how and when it should be completed
6. explain why carrying out fault diagnosis work can have implications for customers and clients
7. specify and undertake the procedures for carrying out the following tests and their relationship to fault diagnosis:
    - continuity
    - insulation resistance
    - polarity
    - earth fault loop impedance
    - RCD operation
    - current and voltage measurement
    - phase sequence
8. identify whether test results are acceptable and state the actions to take where unsatisfactory results are obtained.

Range

Test instruments:

- Voltage indicator
- Low resistance ohm meter
- Insulation resistance testers
- EFLI and PFC tester
- RCD tester
- Tong tester/clamp on ammeter
- Phase sequence tester

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Outcome 5 Understand the procedures and techniques for correcting electrical faults

Assessment Criteria

The learner can:

1. identify and explain **factors** which can affect fault correction, repair or replacement
2. specify the procedures for functional testing and identify **tests** that can verify fault correction.
3. state the appropriate documentation that is required for fault correction work and explain how and when it should be completed
4. explain how and why **relevant people** need to be kept informed during completion of fault correction work
5. specify the methods for restoring the condition of **building fabric**
6. state the methods to ensure the safe disposal of any waste and that the work area is left in a safe and clean condition.

Range

Factors:

- Cost
- Availability of replacement parts, resources and staff
- Down time (planning)
- Legal and personal responsibility (eg contracts, warranties, relevant personnel)
- Access to systems and equipment
- Provision of emergency or stand by supplies
- Client demand (continuous supply, out of hours working)

Tests

- Continuity
- Insulation resistance
- Polarity
- Earth fault loop impedance
- RCD operation
- Values of current and voltage
- Phase sequencing

Relevant people:

- Other workers/colleagues
- Customers/clients
- Representatives of other services

Building fabric:

- Brickwork
- Plastering
- Decorative finishings
- Supporting structures

Unit 608 Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (ELTK07)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of 'Practical Support Learning' activity in simulated conditions.

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Level: **3**
Credit value: **12**
UAN: **A/602/2589**

Unit aim

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 electrotechnical systems and equipment.

Learning outcomes

There are **12** learning outcomes to this unit. The learner will:

1. understand mathematical principles which are appropriate to electrical installation, maintenance and design work
2. understand standard units of measurement used in electrical installation, maintenance and design work
3. understand basic mechanics and the relationship between force, work, energy and power
4. understand the relationship between resistance, resistivity, voltage, current and power
5. understand the fundamental principles which underpin the relationship between magnetism and electricity
6. understand electrical supply and distribution systems
7. understand how different electrical properties can effect electrical circuits, systems and equipment
8. understand the operating principles and applications of DC machines and AC motors
9. understand the operating principles of different electrical components
10. understand the principles and applications of electrical lighting systems
11. understand the principles and applications of electrical heating
12. understand the types, applications and limitations of electronic components in electrotechnical systems and equipment.

Guided learning hours

It is recommended that **106** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT8-29, 29, 23 and 33.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by:

- An assignment (2357-609)
- An online multiple-choice test (2357-309)

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 1 Understand mathematical principles which are appropriate to electrical installation, maintenance and design work

Assessment Criteria

The learner can:

1. identify and apply appropriate **mathematical principles** which are relevant to electrotechnical work tasks.

Range

Mathematical principles:

- Fractions and percentages
- Algebra
- Indices
- Powers of 10
- Transposition
- Triangles and trigonometry
- Statistics

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 2 Understand standard units of measurement used in electrical installation, maintenance and design work

Assessment Criteria

The learner can:

1. identify and use internationally recognised **(SI) units of measurement** for general variables
2. identify and determine **values of basic SI units** which apply specifically to electrical variables
3. identify appropriate electrical instruments for the measurement and calculation of different **electrical values**.

Range

(SI) Units of measurement:

- Length
- Area
- Volume
- Mass
- Density
- Time
- Temperature
- Velocity

Values of basic SI units:

- Resistance
- Resistivity
- Power
- Frequency
- Current
- Voltage
- Energy
- Impedance
- Inductance and inductive reactance
- Capacitance and capacitive reactance
- Power factor
- Actual power
- Reactive power
- Apparent power

Electrical values:

- Resistance
- Power
- Frequency
- Current
- Voltage
- Energy
- Impedance

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 3 Understand basic mechanics and the relationship between force, work, energy and power

Assessment Criteria

The learner can:

1. specify what is meant by mass and weight
2. explain the principles of basic mechanics as they apply to levers, gears and pulleys
3. describe the main principles of the following and their inter-relationships:
    - force
    - work
    - energy (kinetic and potential)
    - power
    - efficiency
4. calculate values of electrical energy, power and efficiency.

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 4 Understand the relationship between resistance, resistivity, voltage, current and power

Assessment Criteria

The learner can:

1. describe the basic principles of electron theory
2. identify and differentiate between materials which are good conductors and insulators
3. state the types and properties of different electrical cables
4. describe what is meant by resistance and resistivity in relation to electrical circuits
5. explain the relationship between current, voltage and resistance in parallel and series D.C. circuits
6. calculate the values of current, voltage and resistance in parallel and series D.C. circuits
7. calculate values of power in parallel and series D.C. circuits
8. state what is meant by the term voltage drop in relation to electrical circuits
9. describe the chemical and thermal effects of electrical currents.

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 5 Understand the fundamental principles which underpin the relationship between magnetism and electricity

Assessment Criteria

The learner can:

1. describe the magnetic effects of electrical currents in terms of:
    - production of a magnetic field
    - force on a current-carrying conductor in a magnetic field
    - electromagnetism
    - electromotive force
2. describe the basic principles of generating an A.C. supply in terms of:
    - a single-loop generator
    - sine-wave
    - frequency
    - EMF
    - magnetic flux
3. explain how **characteristics of a sine-wave** affect the values of A.C. voltage and current.

Range

Characteristics of a sine-wave:

- Root Mean Square (RMS) values
- Average value

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 6 Understand electrical supply and distribution systems

Assessment Criteria

The learner can:

1. describe how electricity is generated and transmitted for domestic and industrial/commercial consumption
2. specify the **features and characteristics** of a generation and transmission system
3. explain how electricity is generated from **other sources**
4. describe the main characteristics of:
    - single phase electrical supplies
    - three phase electrical supplies
    - three phase and neutral supplies
    - Earth-fault loop path
    - star and delta connections
5. describe the **operating principles, applications and limitations** of transformers
6. state the different types of transformer that are used in electrical supply and distribution networks
7. determine by calculation and measurement:
    - primary and secondary voltages
    - primary and secondary current
    - kVA rating of a transformer.

Range

Features and characteristics:

- Power Stations:
    - fossil fuel
    - hydro
    - oil
    - nuclear
- Super-grid and standard grid system
- Transformers
- Transmission voltages
- Sub-stations
- Above and below ground distribution

Other sources:

- Batteries and cells
- Solar power (thermal and photovoltaic)
- Wind energy
- Wave energy
- Micro hydro
- Ground source heat pumps
- Combined heat and power (CHP) including micro CHP

Operating principles, applications and limitations:

- Relationship between current and voltage
- Primary and secondary windings
- Transformer types
- Step up and step down transformers

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 7 Understand how different electrical properties can effect electrical circuits, systems and equipment

Assessment Criteria

The learner can:

1. explain the relationship between resistance, inductance, capacitance and impedance
2. calculate unknown values of resistance, inductance, inductive reactance, capacitance, capacitive reactance and impedance
3. explain the relationship between kW, kVAr, kVA and power factor
4. calculate power factor
5. explain what is meant by power factor correction and load balancing (neutral current)
6. specify methods of power factor correction
7. determine the neutral current in a three-phase and neutral supply
8. calculate values of voltage and current in star and delta connected systems.

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 8 Understand the operating principles and applications of DC machines and AC motors

Assessment Criteria

The learner can:

1. state the basic types, applications and describe the operating principles of **DC machines**
2. describe the operating principles of:
    - single phase AC motors (capacitor start, induction start, universal)
    - three phase AC motors (squirrel cage; wound-rotor)
    - inverter motor/variable frequency drive
    - synchronous motors
3. state the basic types, applications and limitations of:
    - single phase AC motors (capacitor start, induction start, universal)
    - three phase AC motors (squirrel cage; wound-rotor)
    - inverter motor/variable frequency drive
    - synchronous motors
4. describe the operating principles, limitations and applications of **motor control**

Range

DC machines:

- Series
- Shunt
- Compound

Motor control:

- Direct-online
- Star-Delta
- Rotor-resistance
- Soft-start
- Variable frequency

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 9 Understand the operating principles of different electrical components

Assessment Criteria

The learner can:

1. specify the main types and operating principles of the following electrical components:
    - contactors
    - relays
    - solenoids
    - over-current protection devices:
        - Fuses (HRC, cartridge and re-wireable)
        - Circuit-breakers
    - RCDs
    - RCBOs
2. describe how the following components are applied in electrical systems/equipment and state their limitations:
    - contactors
    - relays
    - solenoids
    - over-current protection devices:
        - Fuses (HRC, cartridge and re-wireable)
        - Circuit-breakers.
    - RCDs
    - RCBOs.

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 10 Understand the principles and applications of electrical lighting systems

Assessment Criteria

The learner can:

1. explain the basic principles of illumination and state the applications of:
    - inverse square law
    - cosine law
    - lumen method
2. explain the operating principles, types , limitations and applications of **luminaires.**

Range

Luminaires:

- General Lighting Service (GLS)
    - Tungsten
    - Halogen
- Mercury vapour
    - Low pressure
    - High pressure
    - Metal halide
- Sodium vapour
    - Low pressure
    - High pressure
- Energy saving (such as compact fluorescent lamps)
- LED

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 11 Understand the principles and applications of electrical heating

Assessment Criteria

The learner can:

1. explain the basic principles of electrical space heating and electrical water heating
2. explain the operating principles, types, limitations and applications of **electrical space and water heating appliances and components.**

Range

Electrical space and water heating appliances and components:

- Immersion heaters
- Storage heaters
- Convector heaters
- Under floor heating
- Controls, timers and programmers for heating systems

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Outcome 12 Understand the types, applications and limitations of electronic components in electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. describe the function and application of electronic components that are used in **electrotechnical systems**
2. state the basic operating principles and applications of **electronic components.**

Range

Electrotechnical systems:

- Security alarms
- Telephones
- Dimmer switches
- Heating/boiler controls
- Motor control

Electronic components:

- Capacitors
- Resistors
- Rectifiers
- Diodes
- Thermistors
- Diacs
- Triacs
- Transistors
- Thyristors
- Invertors

Unit 609 Understanding the electricalprinciples associated with the design, building, installation and maintenance of electrical equipment and systems (ELTK08)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of ‘Practical Support Learning’ activity in simulated conditions as appropriate.

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Level: **3**
Credit value: **3**
UAN: **R/602/2596**

Unit aim
This unit is designed to enable learners to develop the skills and apply the relevant knowledge associated with Health and Safety legislation, practices and procedures when installing and maintaining electrotechnical systems and equipment.

Learning outcomes
There are **four** learning outcomes to this unit. The learner will:
1. be able to apply relevant Health and Safety legislation in the workplace
2. be able to assess the work environment for hazards and identify remedial actions in accordance with Health and Safety legislation
3. be able to apply methods and procedures to ensure work on site is in accordance with Health and Safety legislation
4. be able to apply procedures to deal with and report Health and Safety in accordance with Health and Safety legislation.

Guided learning hours
It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed within the workplace.

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Outcome 1 Be able to apply relevant Health and Safety legislation in the workplace

Assessment Criteria

The learner can:

1. identify which workplace Health and Safety procedures are relevant to the working environment and comply with their duties and obligations as defined by current legislation and organisational procedures
2. produce a risk assessment and method statement in accordance with organisational procedures and the limits of their responsibility
3. work within the requirements of:
    - risk assessments
    - method statements
    - safe systems of work.

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Outcome 2 Be able to assess the work environment for hazards and identify remedial actions in accordance with Health and Safety legislation

Assessment Criteria

The learner can:

1. identify unsafe situations and conditions and take remedial actions
2. assess the work environment and revise work practices accordingly to take into account hazards which could cause harm, including the handling of potentially hazardous:
    - materials
    - tools
    - equipment.
3. identify any hazards which may present a high risk and report their presence to relevant persons who have overall responsibility for Health and Safety in the workplace
4. apply measures to control Health and Safety hazards in accordance with the limits of their capabilities and job responsibility
5. select and use correct personal protective equipment and protection measures to ensure the health and safety of themselves and others in the work environment.

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Outcome 3 Be able to apply methods and procedures to ensure work on site is in accordance with Health and Safety legislation

Assessment Criteria

The learner can:

1. demonstrate personal conduct and behaviour around the workplace, to ensure that the Health and Safety of themselves and others is not endangered
2. apply procedures to ensure the safe use, maintenance and storage of tools, plant and equipment as stipulated in:
    - workplace policies (company and site)
    - supplier information
    - manufacturer's instructions
3. comply with hazard warning, mandatory instruction and prohibition notices
4. apply procedures to ensure the safety of the work location through the correct use of guards and notices
5. use access equipment correctly.

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Outcome 4 Be able to apply procedures to deal with and report Health and Safety in accordance with Health and Safety legislation

Assessment Criteria

The learner can:

1. demonstrate the correct **procedures** to follow in the event of injury to themselves or others.

Range

Procedures:

- Application of basic first aid procedures
- Notification of emergency services
- Reporting of incidents

Unit 311 Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment) (ELTP01)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the unit:

- Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment) (2357-601/ELTK01).

Evidence requirements

Learning Outcomes 1 to 4:

Auditable evidence sourced from a real working environment must be provided to illustrate that, the learner has demonstrated on two separate occasions they can apply Health and Safety legislation and working practices when Installing and Maintaining Electrotechnical Systems and Equipment in accordance with approved industry practices, statutory and non-statutory regulations and the assessment criteria for each of the learning outcomes.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-399 (ELT OC1)).

Unit 312 Applying environmental legislation, working practices and the principles of environmental technology systems (ELTP02)

Level: **3**
Credit value: **3**
UAN: **H/602/2599**

Unit aim

This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate they can apply environmental legislation, working practices and interpret the principles of environmental technology systems in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. be able to apply environmental legislation, working practices and principles for electrotechnical services
2. be able to apply work methods and procedures to reduce material wastage and the impact of work activities on the work environment
3. be able to supply information on environmental technology systems in the work location.

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 2, 4 and 9.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed within the workplace.

Unit 312 Applying environmental legislation, working practices and the principles of environmental technology systems (ELTP02)

Outcome 1 Be able to apply environmental legislation, working practices and principles for electrotechnical services

Assessment Criteria

The learner can:

1. demonstrate workplace procedures for the safe handling, storage and disposal of hazardous materials and products, in accordance with any of the following:
    - Environmental Protection Act
    - the Hazardous Waste Regulations
    - Pollution Prevention and Control Act
    - Control of Pollution Act
    - the Control of Noise at Work Regulations
    - Packaging (Essential Requirements) Regulations
    - Environment Act
    - The Waste Electrical and Electronic Equipment Regulations
2. demonstrate work practices and procedures which are in accordance with the requirements for electrical systems and equipment as specified in the relevant sections of the Building Regulations and the Guide for Sustainable Homes
3. demonstrate appropriate organisational procedures for reporting environmental hazards.

Unit 312 Applying environmental legislation, working practices and the principles of environmental technology systems (ELTP02)

Outcome 2 Be able to apply work methods and procedures to reduce material wastage and the impact of work activities on the work environment

Assessment Criteria

The learner can:

1. demonstrate prefabrication and installation methods which can help to reduce material wastage
2. identify and use environmentally friendly materials, products and procedures for the installation and maintenance of electrotechnical systems and equipment.

Unit 312 Applying environmental legislation, working practices and the principles of environmental technology systems (ELTP02)

Outcome 3 Be able to supply information on environmental technology systems in the work location

Assessment Criteria

The learner can:

1. provide information on the operational requirements and benefits of **environmental technology systems.**

Range

Environmental technology systems:

- Solar photovoltaic
- Wind energy
- Micro hydro
- Heat pumps
- Combined heat and power (CHP) including micro CHP
- Grey water recycling
- Rainwater harvesting
- Biomass heating
- Solar thermal hot water heating

Unit 312 Applying environmental legislation, working practices and the principles of environmental technology systems (ELTP02)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the units:

- Understanding environmental legislation, working practices and the principles of environmental technology systems (2357-602/ELTK02).
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-609/ELTK08).

Evidence requirements

Learning Outcomes 1 and 2 – Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can apply environmental legislation, working practices appropriate to the installation of electrotechnical systems and equipment.

Learning Outcome 3 - Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can interpret and supply information on the operating principles of the identified environmental technology systems.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-399/ELT OC1.)

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Level: **3**
Credit value: **3**
UAN: **K/602/2605**

Unit aim
This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate they can implement practices and procedures for overseeing and organising the work environment for the installation of electrotechnical systems and equipment.

Learning outcomes
There are **six** learning outcomes to this unit. The learner will:
1. be able to provide relevant people with technical and functional information for work on electrical systems and equipment
2. be able to oversee Health and Safety during work on electrical systems and equipment
3. be able to co-ordinate liaison with other relevant persons during work activities
4. be able to organise and oversee work activities and operations
5. be able to organise a programme for working on electrical systems and equipment
6. be able to organise the resource requirements for work on electrical systems and equipment.

Guided learning hours
It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT5 and 6.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed within the workplace.

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 1 Be able to provide relevant people with technical and functional information for work on electrical systems and equipment

Assessment Criteria

The learner can:

1. identify the relevant people (such as customers/ clients) that need to be supplied with technical and functional information
2. identify any **additional information** that may also be required
3. liaise with relevant people to determine the information they require to ensure that systems, equipment or components can be operated safely and effectively
4. identify appropriate technical and functional information that is required for the work activity
5. provide information in a timely, courteous and professional manner in accordance with organisational procedures.

Range

Additional information:

- Health and Safety information
- Isolation procedures for products/equipment in case of emergencies
- Appropriate person's address or contact details for further advice or help

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 2 Be able to oversee Health and Safety during work on electrical systems and equipment

Assessment Criteria

The learner can:

1. produce risk assessments and method statements, to cover their own work and others working the area (colleagues and other operatives) in accordance with their level of responsibility
2. follow procedures to confirm that work is being completed in accordance with Health and Safety legislation and industry standards.

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 3 Be able to co-ordinate liaison with other relevant persons during work activities

Assessment Criteria

The learner can:

1. comply with approved procedures to ensure effective co-ordination with other workers/contractors, including steps to resolve issues which are outside the scope of their job role
2. apply communication techniques that are clear, accurate and appropriate to the situation.

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 4 Be able to organise and oversee work activities and operations

Assessment Criteria

The learner can:

1. organise operatives by allocating duties and responsibilities to make the best use of their competence
2. monitor the work of operatives to ensure it is in accordance with:
    - industry working practices
    - programme of work
    - health and Safety requirements
    - cost effectiveness
3. apply the correct procedures when a non compliance is identified during the completion of work activities.

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 5 Be able to organise a programme for working on electrical systems and equipment

Assessment Criteria

The learner can:

1. produce a programme of work from the work specification, including requirements for the following:
    - estimate of the amount of time required for completion of the work
    - liaison with other trades where necessary
2. communicate with others clearly and concisely
3. identify situations when it is necessary to liaise with other relevant parties to resolve issues which are outside the scope of their job role.

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Outcome 6 Be able to organise the resource requirements for work on electrical systems and equipment

Assessment Criteria

The learner can:

1. demonstrate procedures for organising provision of **resources**
2. demonstrate procedures for confirming that materials available are:
    - the right type
    - fit for purpose
    - in the correct quantity
    - suitable for work to be completed cost efficiently.
3. apply procedures to ensure that resources are delivered on time and confirm that they are undamaged at the point of delivery
4. demonstrate procedures which ensure the safe and effective storage of materials, tools and equipment in the work location.

Range

Resources:

- Materials
- Components
- Plant
- Equipment
- Labour
- Tools
- Measuring and test instruments

Unit 313 Overseeing and organising the work environment (electrical installation) (ELTP03)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the unit:

- Understanding the practices and procedures for overseeing and organising the work environment for the installation of electrotechnical systems and equipment (2357-603/ELTK 03).

Evidence requirements

Learning Outcomes 1 to 6 - Auditable evidence sourced from a real working environment must be provided to illustrate that, the learner has demonstrated on two separate occasions they can implement practices and procedures for overseeing and organising the work environment for the installation of electrotechnical systems and equipment in accordance with the assessment criteria for each of the learning outcomes.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence unit (2357-399/ELT OC1).

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Level: **3**
Credit value: **6**
UAN: **R/602/2792**

Unit aim

This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to plan, prepare and install wiring systems and associated equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. be able to prepare the working environment for the installation of wiring systems, enclosures and associated equipment
2. be able to correctly interpret appropriate information for the installation of wiring systems, enclosures and associated equipment
3. be able to confirm that planned work is in accordance with the installation specification
4. be able to confirm the electrical supply is in accordance with the installation specification
5. be able to measure and mark-out the fixing and fitting locations for wiring systems, wiring-enclosures and equipment in accordance with current relevant statutory and non statutory regulations
6. be able to fit and fix wiring systems, wiring enclosures and associated equipment safely in accordance with the installation specification
7. be able to confirm any variations to the installation specification or planned programme of work.

Guided learning hours

It is recommended that **12** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 2, 7, 8 and 9.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed within the workplace.

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 1 Be able to prepare the working environment for the installation of wiring systems, enclosures and associated equipment

Assessment Criteria

The learner can:

1. ensure the Health and Safety of themselves and others within the work location
2. identify and use suitable personal protective equipment throughout the completion of work activities
3. complete **preparatory work** for the installation of electrical systems, enclosures and associated equipment.

Range

Preparatory work:

- Interpretation of installation specifications to produce material and equipment requisites
- Identification and selection of material, equipment and components which are compatible with the installation specification
- Identification of suitable methods, procedures and practices
- Confirmation of site readiness for installation work to begin
- Confirmation of secure site storage facilities for tools, equipment, materials and components
- Confirmation that safe isolation has been carried out (if appropriate) in accordance with regulatory requirements
- Completion of a risk assessment

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 2 Correctly interpret appropriate information for the installation of wiring systems, enclosures and associated equipment

Assessment Criteria

The learner can:

1. use **information and documentation** that is current and relevant to the work required
2. use **documentation** to confirm that materials and equipment is of the correct quantity and is free from damage.

Range

Information and documentation:

- Installation specifications
- Work schedules
- Work programmes
- Regulatory documents (including current version of the IEE Wiring Regulations and relevant guidance notes)
- Method statements
- Manufacturer's instructions

Documentation:

- Materials schedules
- Plant and equipment schedules
- Operating instructions
- Tools and instruments

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 3 Confirm that planned work is in accordance with the installation specification

Assessment Criteria

The learner can:

1. use appropriate procedures to record:
    - contract variations
    - site instructions
    - site events/diary.
2. demonstrate that authorisation has been obtained from the **relevant person(s)** prior to commencement of the work
3. produce a record of any pre work damage or defects to existing equipment or building features, and report to the relevant person (customer; client; site manager; line manager).

Range

Relevant person(s):

- Other workers
- Customers/clients
- Public (if appropriate)

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 4 Confirm the electrical supply is in accordance with the installation specification

Assessment Criteria

The learner can:

1. verify the compatibility of the electrical supply to the requirements of the installation specification
2. identify the earthing arrangement for the electrical installation.

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 5 Measure and mark-out the fixing and fitting locations for wiring systems, wiring-enclosures and equipment in accordance with current relevant statutory and non statutory regulations

Assessment Criteria

The learner can:

1. ensure that the planned locations for the wiring system(s) and its associated equipment are compatible with other site services requirements
2. use different measuring and marking out techniques which are appropriate to the wiring system, wiring enclosure and/or associated equipment that is being installed
3. ensure that the planned locations are visually acceptable and in accordance with the installation specification.

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 6 Fit and fix wiring systems, wiring enclosures and associated equipment safely in accordance with the installation specification

Assessment Criteria

The learner can:

1. produce a planned programme of work for the fitting and fixing of wiring systems, wiring enclosures and associated equipment in accordance with:
    - a safe system of work
    - co-ordination with other site services
    - relevant regulations (e.g. IEE Wiring Regulations; building regulations)
    - installation specification
    - manufacturers' instructions
2. install the following in accordance with the IEE Wiring Regulations, the installation specification and agreed planned programme of work:
    - thermosetting insulated cables including flexes
    - single and multicore thermoplastic (PVC) and thermosetting insulated cables*
    - PVC/PVC flat profile cable*
    - MICC (with and without PVC sheath)
    - SWA cables (PILC, XLPE, PVC)*
    - armoured/braided flexible cables and cords
    - data cables
    - fibre optic cable
    - fire resistant cable*

    *Evidence must be provided as a minimum for these cables

3. install the following in accordance with the IEE Wiring Regulations, the installation specification and agreed planned programme of work:
    - conduit (PVC and metallic)*
    - trunking (PVC and metallic)*
    - cable tray*
    - cable basket
    - ladder systems
    - ducting
    - modular wiring systems
    - Busbar systems and Powertrack

    * Evidence must be provided as a minimum for these five wiring systems and enclosures

4. determine the cable carrying capacity of conduit, trunking and ducting in accordance with the IEE Wiring Regulations and the installation specification

5. install the following types of electrical equipment and accessories, in accordance with the IEE Wiring Regulations, the installation specification, manufacturers' instructions and the agreed planned programme of work:
    - isolators and switches
    - socket-outlets
    - distribution-boards
    - consumer units.
    - earthing fault and over current protective devices
    - luminaires
    - control equipment
    - data socket outlets
    - auxiliary equipment (e.g. heating/water system components)
6. dispose of unwanted material and equipment in accordance with site procedures and statutory requirements.

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Outcome 7 Confirm any variations to the installation specification or planned programme of work

Assessment Criteria

The learner can:

1. confirm that, where variations to the installation specification and/or work programme have been identified, appropriate action has been taken after agreement of relevant persons (e.g. Customer; Client; Site Manager)
2. verify that that the completed system meets specified requirements in terms of ensuring that components and equipment of the correct type, fit for purpose and are installed in accordance with the IEE Wiring Regulations, the installation specification and, as appropriate, with manufacturer instructions.

Unit 315 Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment (ELTP04)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the units:

- Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment (2357-604/ELTK4a)
- Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (2357-605/ELTK4)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-609/ELTK08).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.
- Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can competently.
- Interpret installation specifications to produce material and equipment requisites.
- Identify and select material, equipment and components which are compatible with the installation specification.
- Identify suitable methods, procedures and practices for the installation of electrical systems, enclosures and associated equipment.
- Confirm site readiness for installation work to begin.
- Confirm secure site storage facilities for tools, equipment, materials and components.

Learning Outcomes 2 to 7 – Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can prepare and install wiring systems and associated equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations and the assessment criteria for each of the learning outcomes.

All assessment activities must enable the learner to demonstrate that they understand and can apply the relevant requirements, as appropriate, of:

- the Electricity at Work Regulations (1989)
- the current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

- Management of Health & Safety at Work Regulations
- Reporting of Injuries, Diseases & Dangerous Occurrences Regulations
- Provision & Use of Work Equipment Regulations
- Manual Handling Operations Regulations
- Personal Protective Equipment at Work Regulations
- Work at Height Regulations
- Control of Substances Hazardous to Health Regulations
- Control of Asbestos at Work Regulations.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-339/ELT OC1).

Unit 316 Terminating and connecting conductors, cables and flexible cords in electrical systems (ELTP05)

Level: **3**
Credit value: **4**
UAN: **H/602/2828**

Unit aim

This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to terminate and connect conductors, cables and flexible cords in electrical systems in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. be able to confirm safety of system prior to completion of any termination and connection in accordance with statutory and non statutory regulations
2. be able to terminate and connect conductors, cables and flexible cords in electrical wiring systems and equipment
3. be able to confirm that terminations and connections are safe and free from defects in accordance with statutory and non statutory regulations.

Guided learning hours

It is recommended that **eith** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 7, 9, 23.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed within the workplace.

Unit 316 Terminating and connecting conductors, cables and flexible cords in electrical systems (ELTP05)

Outcome 1 Be able to confirm safety of system prior to completion of any termination and connection in accordance with statutory and non statutory regulations

Assessment Criteria

The learner can:

1. carry out safe isolation safe isolation of electrical circuits and complete electrical installations in accordance with regulatory requirements
2. ensure the Health and Safety of themselves and others within the work location in terms of:
    - selection and use of tools
    - PPE
    - risk assessment
    - reporting of unsafe situations
    - adherence to relevant statutory and non-statutory regulations.
3. check the safety of electrical systems and equipment prior to the completion of termination and connections in terms of:
    - presence of supply
    - mechanical soundness.

Unit 316 Terminating and connecting conductors, cables and flexible cords in electrical systems (ELTP05)

Outcome 2 Be able to terminate and connect conductors, cables and flexible cords in electrical wiring systems and equipment

Assessment Criteria

The learner can:

1. terminate and connect **conductors, cables and flexible cords** in accordance with the installation specification, manufacturer instructions and IEE Wiring Regulations
2. connect to **electrical equipment and accessories**, in accordance with the installation specification, manufacturer instructions and IEE Wiring Regulations
3. terminate and connect conductors, cables and cords using the following techniques**:**
    - Screwing.
    - Crimping.
    - Soldering.
    - Non-screw compression.

Range

Conductors, cables and flexible cords:

- Thermosetting insulated cables including flexes
- Single and multicore thermoplastic (PVC)* and thermosetting insulated cables
- PVC/PVC flat profile cable*
- MICC (with and without PVC sheath)
- SWA cables (PILC, XLPE, PVC)*
- Armoured/braided flexible cables and cords
- Data cables
- Fibre optic cable
- Fire resistant cable*

*Evidence must be provided as a minimum

Electrical equipment and accessories:

- Socket-outlets
- Distribution-boards
- Consumer units
- Luminaires
- Electric motors and their control equipment
- Circuit Breakers
- Earthing terminals
- Control panels
- Data socket outlets
- Auxiliary equipment (eg heating system components)

Unit 316 Terminating and connecting conductors, cables and flexible cords in electrical systems (ELTP05)

Outcome 3 Be able to confirm that terminations and connections are safe and free from defects in accordance with statutory and non statutory regulations

Assessment Criteria

The learner can:

1. ensure that terminations and connections are electrically and mechanically sound
2. complete the necessary identification of cables, conductors and flexible cords in accordance with regulatory requirements and organisational procedures
3. dispose of unwanted material and equipment in accordance with site procedures and statutory requirements.

Unit 316 Terminating and connecting conductors, cables and flexible cords in electrical systems (ELTP05)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the knowledge and understanding as detailed in the unit:

- Understanding the principles, practices and legislation for the termination and connection of conductors, cables and flexible cords in an electrotechnical system (2357-316/ELTK05).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.

Learning Outcomes 2 and 3 – Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can terminate and connect all the identified conductors and cables in accordance with the assessment criteria for each of the learning outcomes.

All assessment activities must enable the learner to demonstrate that they understand and can apply the relevant requirements, as appropriate, of:

- the Electricity at Work Regulations (1989)
- the current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)
- Management of Health & Safety at Work Regulations
- Reporting of Injuries, Diseases & Dangerous Occurrences Regulations
- Provision & Use of Work Equipment Regulations
- Manual Handling Operations Regulations
- Personal Protective Equipment at Work Regulations
- Work at Height Regulations
- Control of Substances Hazardous to Health Regulations
- Control of Asbestos at Work Regulations

Occupational competence

To demonstrate ‘Occupational Competence’ the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-399/ELT OC1).

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Level: **3**
Credit value: **6**
UAN: **K/602/2703**

Unit aim
This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to inspect, test, commission and certify electrotechnical systems and equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes
There are **four** learning outcomes to this unit. The learner will:

1. be able to confirm safety of the system and equipment prior to completion of inspection, testing and commissioning in accordance with statutory and non statutory regulations
2. be able to inspect electrotechnical systems and equipment
3. be able to test electrotechnical systems and equipment
4. be able to commission electrotechnical systems and equipment.

Guided learning hours
It is recommended that **12** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 4, 24, 25 and 26.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed within the workplace.

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Outcome 1 Be able to confirm safety of the system and equipment prior to completion of inspection, testing and commissioning in accordance with statutory and non statutory regulations

Assessment Criteria

The learner can:

1. carry out safe isolation procedures in accordance with regulatory requirements for electrical installations
2. ensure the Health and Safety of themselves and others within the work location during inspection, testing and commissioning
3. check the safety of electrical systems prior to the commencement of inspection, testing and commissioning.

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Outcome 2 Be able to inspect electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. assess whether the safe system of work is appropriate to the work activity
2. carry out a visual inspection in accordance with the requirements of the installation specification, the IEE Wiring Regulations and IEE Guidance Note 3, that includes:
    - the installation methods of wiring systems and equipment
    - the selection of conductors, cables and cords
    - the selection of protective and isolation devices
    - routing and identification/labelling of conductors, cables and flexible cords
    - presence of means of earthing
    - presence of protective conductors and bonding
    - isolation
    - type and rating of over current protective devices
3. complete a schedule of inspections in accordance with the IEE Wiring Regulations and IEE Guidance Note 3.

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Outcome 3 Be able to test electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. select the test instruments and their accessories for **tests**
2. carry out **tests** in accordance with the installation specification and the IEE Wiring Regulations and manufacturer's instructions
3. verify test results and report all findings to **relevant persons**, as appropriate
4. complete in accordance with the IEE Wiring Regulations and IEE Guidance Note 3:
    - Electrical installation certificates
    - Minor electrical installation works certificates
    - Schedules of inspections
    - Schedules of test results
5. conform in accordance with the IEE Wiring Regulations and IEE Guidance Note 3, and where appropriate customer/client requirements to the procedures and requirements for the recording and retention of completed:
    - Electrical installation certificates.
    - Minor electrical installation works certificates
    - Schedules of inspections
    - Schedules of test results

Range

Tests:

- continuity
- insulation resistance
- polarity
- earth fault loop impedance
- prospective fault current
- RCD operation
- phase sequence
- functional testing

Relevant persons:

- Representatives of other services/colleagues
- Customers/clients

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Outcome 4 Be able to commission electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. clarify the commissioning procedures with **relevant persons** on site
2. carry out the commissioning of circuits, equipment and components to confirm functionality, fit for purpose and safety in accordance with:
    - the installation specification
    - IEE Wiring Regulations
    - manufacturer's instructions
    - maintenance schedules
    - Health and Safety requirements
3. demonstrate to the customer/client that the operation of the circuits, equipment and components are in accordance with the installation specification and customer/client requirements
4. complete the handover of electrotechnical systems and equipment to relevant persons including the provision of accurate and complete documentation regarding the completed inspection, testing, commissioning and customer satisfaction.

Range

Relevant persons:

- Representatives of other services/colleagues
- Customers/clients

Unit 317 Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment (ELTP06)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the units:

- Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment (2357-607/ELTK06)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-609/ELTK08).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.

Learning Outcomes 2 to 4 – Auditable evidence sourced from a real working environment and/or simulated conditions must be provided to illustrate that, the learner has demonstrated on two separate occasions they can apply the principles and follow the procedures for the inspecting, testing, commissioning and certifying of electrotechnical systems and equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations and the assessment criteria for each of the learning outcomes.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-399/ELT OC1).

Unit 318 Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment (ELTP07)

Level: **3**
Credit value: **6**
UAN: **M/602/2704**

Unit aim

This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to diagnose and correct electrical faults in electrical systems and equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. be able to confirm safety of the system and equipment prior to diagnosing and correcting electrical faults in accordance with statutory and non statutory regulations
2. be able to carry out procedures to identify faults on electrical systems and equipment
3. be able to correct faults on electrical systems and equipment.

Guided learning hours

It is recommended that **12** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 4, 27 and 28.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed within the workplace.

Unit 318 Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment (ELTP07)

Outcome 1 Be able to confirm safety of the system and equipment prior to diagnosing and correcting electrical faults in accordance with statutory and non statutory regulations

Assessment Criteria

The learner can:

1. carry out safe isolation procedures in accordance with regulatory requirements for electrical installations
2. ensure the Health and Safety of themselves and others within the work location during inspection, testing and commissioning
3. select and use appropriate warning notices and barriers
4. check the safety of electrical systems prior to the commencement of diagnosing and correcting electrical faults.

Unit 318 Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment (ELTP07)

Outcome 2 Be able to carry out procedures to identify faults on electrical systems and equipment

Assessment Criteria

The learner can:

1. use effective methods of communication to ascertain clear and detailed information about reported faults and any components which require replacing
2. identify and use appropriate system specification documents which relate to the electrotechnical systems and equipment being worked upon
3. report information about potential disruption that may be a consequence of fault diagnosis and correction work to **relevant people**
4. assess the safe working practices which apply in the working environment to confirm that it is safe for fault identification work to take place
5. perform suitable diagnostic tests on the installed electrotechnical systems to successfully identify **faults**
6. use **appropriate methods** for locating faults on electrical systems and equipment
7. use **appropriate tools and instruments** correctly to complete fault diagnosis work
8. confirm test instruments are fit for purpose, functioning correctly and are correctly calibrated.

Range

Relevant people:

- Other workers/colleagues
- Customers/clients

Faults:

- Loss of supply
- Overload
- Short-circuit and earth fault
- Transient voltage
- Loss of phase/line
- Incorrect phase rotation
- High resistance joints
- Component, accessory or equipment faults

Appropriate methods:

- Procedures and sequences – logical approach
- Safe working practices
- Interpretation of data

Appropriate tools and instruments:

- Voltage indicator
- Low resistance ohm meter
- Insulation resistance testers
- EFLI and PFC tester
- RCD tester
- Tong tester/clamp on ammeter
- Phase sequence tester

Unit 318 Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment (ELTP07)

Outcome 3 Be able to correct faults on electrical systems and equipment

Assessment Criteria

The learner can:

1. confirm appropriate repairs, removals and replacements and their implications with relevant people including:
   - other workers/colleagues
   - customers/clients
   - representatives of other services
2. perform fault correction procedures correctly and safely using appropriate tools, equipment and material
3. perform the removal and replacement of components and associated equipment from electrotechnical systems to ensure:
   - ease of access to enable future maintenance
   - accordance with:
     - relevant regulations
     - manufacturer's instructions
     - organisational procedures
4. apply appropriate procedures to ensure electrotechnical systems, equipment and components are left safe, in accordance with industry regulations, if the fault cannot be corrected immediately
5. perform appropriate inspection and testing procedures to confirm that systems, equipment and components are functioning correctly after completion of fault correction work
6. record test results and other appropriate information regarding the fault correction work clearly and accurately and report to relevant people, such as:
   - Other workers/colleagues
   - Customers/clients
   - Representatives of other services.

Unit 318 Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment (ELTP07)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the relevant knowledge and understanding as detailed in the units:

- Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment (2357-608/ELTK07)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-609/ELTK08).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.

Learning Outcomes 2 to 4 – Auditable evidence sourced from a real working environment and/or simulated conditions must be provided to illustrate that, the learner has demonstrated on two separate occasions they can apply the principles and follow the procedures for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment in accordance with approved industry practices, statutory and non-statutory regulations and the assessment criteria for each of the learning outcomes.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2357-399/ELT OC1).

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Level: **3**
Credit value: **6**
UAN: **M/602/2542**

Unit aim
This unit is designed to enable learners to understand practices and procedures for overseeing and organising the work environment for the maintenance of electrotechnical systems and equipment. Its content is the knowledge needed by a learner to underpin the application of skills for overseeing and organising the work environment.

Learning outcomes
There are **six** learning outcomes to this unit. The learner will:
1. understand the types of technical and functional information that is available when maintaining electrotechnical systems and equipment
2. understand the procedures for supplying technical and functional information to relevant people
3. understand the requirements for overseeing Health and Safety in the work environment
4. understand the requirements for liaising with others when organising and overseeing work activities
5. understand the requirements for organising and overseeing work programmes
6. understand the requirements for organising the provision and storage of resources that are required for work activities.

Guided learning hours
It is recommended that **56** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT5 and 6.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed by an assignment (2357-321).

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 1 Understand the types of technical and functional information that is available when maintaining electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. specify **sources of technical and functional information** which apply to electrotechnical installations
2. interpret technical and functional information and data from:
    - manufacturer information and data
    - supplier information and data
    - information from their employing organisation
    - installation specifications
    - client/customer specifications
    - specifications, drawings and diagrams
    - records and certificates for:
        - inspection
        - testing
        - installation completion (when appropriate)
        - maintenance logs
3. identify and interpret technical and functional information relating to electrotechnical products or equipment:
    - operation
    - controls
    - settings
    - adjustments
4. describe the work site requirements and procedures in terms of:
    - services provision
    - ventilation provision
    - waste disposal procedures
    - equipment and material storage
    - Health and Safety requirements
    - access by personnel
5. identify equipment and systems that are compatible to site operations and requirements.

Range

Sources of technical and functional information:

- Manufacturer information and data
- Supplier information and data
- Information from their employing organisation
- Maintenance schedules/specifications
- Client/customer specifications
- Specifications, drawings and diagrams

Information and data:

- Materials
- Components
- Equipment
- Measuring and test instruments

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 2 Understand the procedures for supplying technical and functional information to relevant people

Assessment Criteria

The learner can:

1. state the limits of their responsibility for supplying technical and functional information to **others**
2. specify organisational policies/procedures for the handover and demonstration of electrotechnical systems, products and equipment, including requirements for confirming and recording handover
3. state the appropriateness of different customer relations methods and procedures
4. identify methods of providing technical and functional information appropriate to the needs of **others**
5. explain the importance of ensuring that:
    - information provided is accurate and complete
    - information is provided clearly, courteously and professionally
    - copies of information provided are retained
    - the electrotechnical system and equipment functions in accordance with the specification, is safe and complies with industry standards
6. describe methods for checking that relevant persons have an adequate understanding of the technical and non-technical information provided, including appropriate Health and Safety information.

Range

Others

- Clients
- Customers
- Major contractors
- Service and operating personnel
- Site managers

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 3 Understand the requirements for overseeing Health and Safety in the work environment

Assessment Criteria

The learner can:

1. state the applicable Health and Safety requirements with regard to overseeing the work of others
2. state the procedures for:
    - interpreting risk assessments
    - applying method statements
    - monitoring changing conditions in the workplace
    - complying with site organisational procedures
    - managing Health and Safety on site
    - organising the safe and secure storage of tools and materials.

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 4 Understand the requirements for liaising with others when organising and overseeing work activities

Assessment Criteria

The learner can:

1. describe techniques for the communication with others for the purposes of:
    - motivation
    - instruction
    - monitoring
    - co-operation
2. describe **methods of determining the competence** of operatives for whom they are responsible
3. specify their role in terms of:
    - responsibility for other staff
    - liaison with their employer
    - communication with:
        - customers
        - clients
        - site managers
        - major contractors (where appropriate)
        - sub-contractors (where appropriate)
        - service and operating personnel
        - the public
4. identify appropriate methods for communicating with and responding to **others**
5. specify procedures for re-scheduling work to co-ordinate with changing conditions in the workplace and to coincide with other trades
6. clarify organisational procedures for completing the documentation that is required during work operations.

Range

Methods of determining the competence:

- Checking competency cards (eg CSCS cards, JIB cards)
- Checking technical qualifications
- Written references from previous employers
- Informal monitoring of performance on site
- Competent Person Scheme registration

Others:

- Customers
- Clients
- Site managers
- Major contractors (where appropriate)
- Sub-contractors (where appropriate)
- Service and operating personnel
- The public

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 5 Understand the requirements for organising and overseeing work programmes

Assessment Criteria

The learner can:

1. describe how to plan
    - work allocations
    - duties of operative for whom they are responsible
    - coordination with other services and personnel.
2. specify procedures for carrying out work activities that will:
    - maintain the safety of the work environment
    - maintain cost effectiveness
    - ensure compliance with the programmes of work.
3. identify the **industry standards** that are relevant to activities carried out during the maintenance of electrotechnical systems and equipment
4. identify within the scope of the work programme and operations their responsibilities
5. identify how to determine the estimated time required for the completion of the work required taking into account **influential factors**
6. state the possible consequences of not:
    - completing work within the estimated time
    - meeting the requirements of the programme of work
    - using the specified materials
    - replacing/installing materials and equipment as specified.
7. specify **methods** of producing and illustrating work programmes.

Range

Industry standards:

Current editions of:

- Management of Health and Safety Regulations.
- Health & Safety at Work Act.
- Electricity at Work Regulations.
- Construction Design and Management
- BS 7671 Requirements for Electrical Installations.
- BS EN Graphical Symbols.
- Employment Rights Act.
- Data Protection Act
- Disability Discrimination Act.
- Race Relations Act.
- Sex Discrimination Act.
- Human Rights Act.

Influential factors:

- The deployment and availability of suitable personnel.
- The delivery and availability of equipment, components and material.
- Weather conditions.
- Work to be completed by other services.
- Specification variations.

Methods:

- Bar charts.
- Spread sheets.
- Critical path analysis.

Unit 321 Understanding the practices and procedures for overseeing and organising the work environment (electrical maintenance) (ELTK 03a)

Outcome 6 Understand the requirements for organising the provision and storage of resources that are required for work activities

Assessment Criteria

The learner can:

1. interpret the maintenance schedule/specification and work programme to identify resource requirements for the following:
    - materials
    - components
    - plant
    - equipment
    - labour
    - tools
    - measuring and test instruments
2. interpret the material schedule to confirm that materials available are:
    - the right type
    - fit for purpose
    - in the correct quantity
    - suitable for work to be completed cost efficiently
3. specify the storage and transportation requirements for all materials required in the work location
4. specify procedures to ensure the safe and effective storage of materials, tools and equipment in the work location.

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Level: **3**
Credit value: **8**
UAN: **J/602/2594**

Unit aim
This unit is designed to enable learners to understand the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment. Its content is the knowledge needed by a learner to underpin the application of skills of to maintain electrotechnical systems and equipment.

Learning outcomes
There are **four** learning outcomes to this unit. The learner will:
1. understand the principles, regulatory requirements and procedures for preparing work sites for the maintenance of electrotechnical systems and equipment
2. understand the procedures for checking the work location prior to the commencement of work activities
3. understand how to determine client requirements for the maintenance of electrical systems and equipment
4. understand how to determine work requirements for the maintenance of electrical systems and equipment.

Guided learning hours
It is recommended that **76** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT7, 8 and 16.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed by an assignment (2357-322).

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Outcome 1 Understand the principles, regulatory requirements and procedures for preparing work sites for the maintenance of electrotechnical systems and equipment

Assessment Criteria

The learner can:

1. state the appropriate requirements of **regulations** that are applicable to electrotechnical maintenance work activities
2. specify the actions required to ensure that electrical maintenance work sites are correctly prepared in terms of **Health and Safety considerations**
3. specify the **requirements for preparing and reviewing the work location** prior to commencement of maintenance work activities
4. identify personal protective equipment appropriate to the work activity being carried out
5. confirm that tools and equipment are fit for purpose and (where appropriate) are correctly calibrated.

Range

Regulations:

- Provision and Use of Work Equipment Regulations
- Electricity at Work Regulations
- Health and Safety at Work Act
- Current version of the IEE Wiring Regulations
- Memorandum of Guidance on the Electricity at Work Regulation 1989

Health and Safety considerations:

- Provision for safe access and egress
- Checking immediate work location for potential hazards as appropriate to property, plant, machinery, personnel and livestock
- Confirm that appropriate risk assessments and method statements have been produced

Requirements for preparing and reviewing the work location:

- Identification of specifications for maintenance, including: drawings, diagrams (circuit and wiring), maintenance schedules/specifications, data charts, manufacturer's manuals, servicing records/running logs, flow charts, standard maintenance time records
- Organisation of a work plan, including: definition of task; planned shut downs/isolations; safety precautions (provision for release of stored and latent energy); permits to work, organising tools, equipment and spare parts; documentation; communication with relevant parties; time/cost effectiveness
- Identification and selection of safe isolation methods for: electrical systems and pressurised systems (ie hydraulic, compressed air, water, gas)

- Identification and selection of methods to safely secure work areas including: fences, barriers, screens and warning signs
- Identification and selection of suitable: hand and power tools (110V ac or battery operated); portable and fixed lifting equipment; access equipment
- Provision for safe storage of tools, equipment and materials

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Outcome 2 Understand the procedures for checking the work location prior to the commencement of work activities

Assessment Criteria

The learner can:

1. state the **preparations** that should be completed before electrical maintenance work starts
2. explain how to check for any pre-existing damage to **client property** and state why it is important to do this prior to commencement of any work activity
3. state the actions that should be taken if pre-existing damage to customer/client property, plant or machinery is identified
4. specify methods for protecting the fabric and structure of property, plant or machinery before and during maintenance work.

Range

Preparations:

- Interpretation of specifications and maintenance schedules to produce accurate material and equipment requisites
- Identification and selection of material, equipment and components compatible to specification or maintenance schedule
- Confirmation of site readiness for maintenance work including considerations of building structures and fabric
- Confirmation that tools, equipment and instruments are fit for purpose
- Confirmation of secure site storage for tools, equipment, materials and components
- Identification of suitable access equipment
- Identification of suitable lifting equipment
- Identification of suitable work methods
- Identification of points in the maintenance programme where co-ordination with other trades and personnel may be necessary

Client property:

- Building wall/floor fabric
- Plant and machinery
- Equipment and components
- Building décor and floor finishes

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Outcome 3 Understand how to determine client requirements for the maintenance of electrical systems and equipment

Assessment Criteria

The learner can:

1. interpret site drawings, plans, maintenance schedules/specifications and the work location to determine client requirements
2. interpret appropriate **sources of information** when determining client requirements
3. evaluate possible proposals to determine how well they meet:
    - client requirements
    - site structures and features
    - industry requirements
4. identify methods of presenting information to clients to agree and proceed with a plan of work
5. state the process and implications that a change in work plans can have in terms of:
    - health and safety
    - cost
    - time
    - progress
    - authorisation
6. identify that proposed replacement systems or components comply with industry requirements and where appropriate, give alternative system options which take account of environment and efficiency.

Range

Sources of information:

- Statutory documents
- Codes of practice
- British standards

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Outcome 4 Understand how to determine work requirements for the maintenance of electrical systems and equipment

Assessment Criteria

The learner can:

1. state the characteristics of different types of **electrical maintenance activities**
2. specify the importance of:
    - agreeing start dates, finish dates and timings
    - procedures for agreeing variations to the maintenance specification or schedule
3. define the specific range of **job information** that is required for maintenance work
4. state how specific job information can be used to help develop work proposals
5. specify the replacement/re-fitting requirements for components within maintained **electrical systems and equipment**
6. state appropriate methods for determining the size and specification /type of components to be used when maintaining electrical systems and equipment
7. interpret drawings and maintenance schedules /specifications to calculate **resources required** to complete electrical maintenance work
8. identify the implications that different working conditions could have on equipment and components in an electrical installation.

Range

Electrical maintenance activities:

- Planned preventative
- Breakdown
- Monitored
- Non-routine maintenance

Job information:

- Statutory documents
- Codes of practice
- British standards
- Manufacturer's specifications
- Legal requirements for maintenance:
    - Common law requirements
    - Specific legal requirements (plant/equipment in scope to include: lifts, hoists,
    - cranes, cradle systems; electrical equipment in stated premises)
    - Implied legal requirements (portable appliance testing, boiler plant above 150kW)

Electrical systems and equipment:

Systems:

- Three-line four wire distribution systems
- ELV and LV single and multiphase circuits
- Lighting systems
- Heating and ventilating systems
- Air conditioning and refrigeration systems
- Drive systems
- Security systems
- Earthing systems
- Data communication
- PV supplies

Equipment:

- Electrical plant, components and accessories
- Motors and starters
- Switchgear and distribution panels
- Control systems and components
- Luminaires and lamps
- Drive systems

Resources required:

- Materials for plant, equipment and components for use within maintenance programmes – thermoplastic, thermosetting (rubber compounds), fibre glass sleeving, varnish (shellac), ceramics, metals (conductors, structural), solvents
- Tools and equipment: Hand tools; power tools (110V ac or battery operated); portable and fixed lifting equipment; access equipment; rotating, positioning and straightening devices; jacking devices and rams; trolleys/hand operated trucks

Unit 322 Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment (ELTK 09a)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of ‘Practical Support Learning’ activity in simulated conditions as appropriate.

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Level: **3**
Credit value: **8**
UAN: **T/602/2591**

Unit aim

This unit is designed to enable learners to understand the practices and procedures for maintaining electrotechnical systems and equipment. Its content is the knowledge needed by a learner to underpin the application of skills of to maintain electrotechnical systems and equipment.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. understand the practices, procedures and regulatory requirements for completing the safe isolation of an electrical installation in whole or in part
2. understand the characteristics and applications of consumer supply systems
3. understand the specific Health and Safety requirements for the completion of maintenance activities on electrical systems and equipment
4. understand the principles, regulatory requirements and procedures for completing maintenance work activities on electrical systems, components and equipment
5. understand the procedures and documentary systems which underpin work required to maintain electrical systems and equipment.

Guided learning hours

It is recommended that **76** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT7, 8 and 16.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by an assignment (2357-323).

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Outcome 1 Understand the practices, procedures and regulatory requirements for completing the safe isolation of an electrical installation in whole or in part

Assessment Criteria

The learner can:

1. specify and undertake the **correct procedure** for completing safe isolation
2. state the implications of carrying out safe isolations to:
    - other personnel
    - clients
    - public
    - building systems (loss of supply).
3. state the implications of not carrying out safe isolations to:
    - self
    - other personnel
    - clients
    - public
    - building systems (loss of supply).

Range

Correct procedure:

- Carrying out safe working practices
- Correct identification of circuit(s) to be isolated
- Identifying suitable points of isolation
- Selecting correct test and proving instruments in accordance with relevant industry guidance and standards
- Correct testing methods
- Selecting locking devices for securing isolation
- Correct warning notices
- Correct sequence for isolating circuits

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Outcome 2 Understand the characteristics and applications of consumer supply systems

Assessment Criteria

The learner can:

1. explain the characteristics and applications of **systems**
2. specify the arrangements for electrical installations and systems with regard to provision for:
    - isolation and switching
    - overcurrent protection
    - earth fault protection.

Range

Systems:

- Earthing arrangements:
    - TN-S
    - TNC-S
    - TN-C
    - TT
    - IT
- Supply systems:
    - Single phase
    - Three phase
    - Three phase and neutral

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Outcome 3 Understand the specific Health and Safety requirements for the completion of maintenance activities on electrical systems and equipment

Assessment Criteria

The learner can:

1. state the procedures for carrying out an assessment of risks and implementing safe systems of work for the completion of maintenance activities
2. identify the appropriate Health and Safety regulations which apply to work activities, and the persons who are legally responsible for Health and Safety
3. state how to:
    - select and use appropriate tools and equipment for specific maintenance jobs, including:
        - Hand tools
        - Power tools (110V ac or battery operated)
        - Portable and fixed lifting equipment
        - Access equipment
        - Rotating, positioning and straightening devices
        - Jacking devices and rams
        - Trolleys and hand operated trucks
    - select and use appropriate materials for specific maintenance jobs, including:
        - Materials for plant, equipment and components for use within maintenance programmes – thermoplastic, thermosetting (rubber compounds), fibre glass sleeving, varnish (shellac), ceramics, metals (conductors, structural), solvents
4. identify inappropriate work practices and state the implications if such practices are employed.

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Outcome 4 Understand the principles, regulatory requirements and procedures for completing maintenance work activities on electrical systems, components and equipment

Assessment Criteria

The learner can:

1. identify and interpret appropriate **sources of information** relevant to maintenance activities
2. interpret diagrams, drawings, maintenance schedules and specifications to identify the replacement/re-fitting **requirements** of wiring systems and equipment as applicable to maintenance procedures
3. state the work methods and procedures for completing maintenance activities for the following:
    - systems:
        - three-line four wire distribution systems
        - ELV and LV single and multiphase circuits
        - lighting systems
        - heating and ventilating systems
        - air conditioning and refrigeration systems
        - drive systems
        - security systems
        - earthing systems
        - data communication
    - equipment:
        - electrical plant, components and accessories
        - motors and starters
        - switchgear and distribution panels
        - control systems and components
        - contactors
        - power transmission mechanisms
        - luminaires and lamps; drive systems
4. state the requirements for completing appropriate corrective actions/repairs when **problems** are identified.

Range

Sources of information:

- Statutory documents
- Codes of practice
- British standards (including current version of IEE wiring regulations)
- Maintenance schedules
- Manufacturer's guidance documents

Requirements:

- Cables:
    - Thermosetting insulated cables including flexes
    - Single and multicore thermoplastic (PVC) and thermosetting insulated cables
    - PVC/PVC flat profile cable
    - MICC (with and without PVC sheath)
    - SWA cables (PILC, XLPE, PVC)
    - Armoured/braided flexible cables and cords
    - Data cables
    - Fibre optic cable
    - Fire resistant cable
- Equipment:
    - Electrical plant, components and accessories
    - Motors and starters
    - Switchgear and distribution panels
    - Control systems and components
    - Contactors
    - Power transmission mechanisms
    - Luminaires and lamps
    - Drive Systems

Problems:

- When it is appropriate to carry out repairs
- The advantages and limitations of repair against component replacement
- Responsibilities for making decisions regarding repairs that are required
- Approved procedures for the completion of repairs
- Likely implications for relevant parties of carrying out effective repairs

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Outcome 5 Understand the procedures and documentary systems which underpin work required to maintain electrical systems and equipment

Assessment Criteria

The learner can:

1. state the reasons why it is necessary to undertake regular inspection, adjustment and replacement of different electrical systems and equipment
2. specify the **documentary processes and procedures** that are necessary for electrical maintenance work.

Range

Documentary processes and procedures:

- Workplace requirements for, and the importance of:
    - Documenting information
    - Reporting findings and variations from the maintenance schedule
- Procedures for the completion of necessary maintenance documentation – including appropriate organisational or external quality assurance systems

Unit 323 Understanding the practices and procedures for maintaining electrotechnical systems and equipment (ELTK 09)

Notes for guidance

Practical support learning activity

Given the safety-critical nature of this topic it is a requirement that learners will have their knowledge consolidated by the use of Practical Support Learning activity in simulated conditions as appropriate.

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Level: **3**
Credit value: **3**
UAN: **L/602/2709**

Unit aim

This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to plan and prepare to maintain electrotechnical systems and equipment in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS 7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. be able to carry out an initial review of the work location
2. be able to confirm that all appropriate job information is available for use
3. be able to use job information to determine work requirements
4. be able to comply with appropriate authorisation and reporting procedures which apply when completing initial site inspections
5. be able to confirm that planned work meets client requirements.

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry EL7, 8 and 16.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed within the workplace.

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Outcome 1 Be able to carry out an initial review of the work location

Assessment Criteria

The learner can:

1. conduct a risk assessment of the work location and record **factors** which may impact upon the work
2. identify and apply procedures to ensure the Health and Safety of themselves and others within the work location for the duration of maintenance activities
3. identify and use, appropriate personal protective equipment throughout the completion of work preparation activities
4. complete **preparatory work** for the maintenance of electrical systems and equipment.

Range

Factors:

- Identification of suitable access equipment
- Identification of suitable lifting equipment
- Identification of suitable installation, fixing and fitting methods
- Safe isolation procedures
- Environmental considerations
- Consideration of other trades and personnel
- Switchgear requirements

Preparatory work:

- Identification of specifications for maintenance, including: drawings, diagrams (circuit and wiring), maintenance schedules/specifications, data charts, manufacturer's manuals, servicing records/running logs, flow charts, standard maintenance time records
- Organisation of a work plan, including: definition of task; planned shut downs/isolations; safety precautions (provision for release of stored and latent energy); permits to work, organising tools, equipment and spare parts; documentation; communication with relevant parties; time/cost effectiveness
- Identification and selection of safe isolation methods for: electrical systems and pressurised systems (i.e. hydraulic, compressed air, water, gas)
- Identification and selection of methods to safely secure work areas including: fences, barriers, screens and warning signs
- Identification and selection of suitable: hand and power tools (110V ac or battery operated); portable and fixed lifting equipment; access equipment
- Provision for safe storage of tools, equipment and materials

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Outcome 2 Be able to confirm that all appropriate job information is available for use

Assessment Criteria

The learner can:

1. identify **job information and documentation** that is current and relevant to the work required
2. identify **relevant paperwork** which can be used to confirm that materials and equipment is of the correct quantity and is free from damage.

Range

Job information and documentation:

- Maintenance schedules and specifications
- Maintenance programmes
- Regulatory documents (including current version of the IEE Wiring Regulations)
- Method statements
- Manufacturer's instructions
- Certificates of competency
- Permits to work

Relevant paperwork:

- Materials schedules
- Plant and equipment schedules
- Operating instructions

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Outcome 3 Be able to use job information to determine work requirements

Assessment Criteria

The learner can:

1. use job information and documentation to ensure that the following is fit for purpose:
    - instruments
    - equipment
    - tools
    - data
2. use job information to determine the points in the work process where liaison with/co-ordination of work with other persons will be necessary and record the necessary details
3. demonstrate that job information on key aspects of the work has been issued to **relevant people**.

Range

Relevant people:

- Other workers/colleagues
- Clients

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Outcome 4 Be able to comply with appropriate authorisation and reporting procedures which apply when completing initial site inspections

Assessment Criteria

The learner can:

1. demonstrate that authorisation has been obtained from the **relevant person(s)** prior to commencement of the work, to ensure safe working practices
2. produce a record of any pre work damage or defects to existing equipment, plant, machinery or building features, and report to job supervisor or line manager.

Range

Relevant person(s):

- Other workers/colleagues
- Clients

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Outcome 5 Be able to confirm that planned work meets client requirements

Assessment Criteria

The learner can:

1. use **appropriate resources** to record:
    - client requirements
    - site instructions.
2. demonstrate that proposed replacement systems or components comply with industry requirements
3. demonstrate that the client has agreed to the proposed work and given permission for work to commence.

Unit 332 Plan and prepare to maintain electrotechnical systems and equipment (ELTP 09a)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the knowledge and understanding as detailed in the unit 'Understanding the practices and procedures for planning and preparing to maintain electrotechnical systems and equipment' (2357-322/ELTK09a).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.

Learning Outcomes 2 and 3: Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can plan and prepare to maintain electrotechnical systems and equipment in accordance with the assessment criteria for each of the learning outcomes.

All assessment activities must enable the learner to demonstrate that they understand and can apply the relevant requirements, as appropriate, of:

- the Electricity at Work Regulations (1989)
- the current edition of BS 7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)
- Management of Health & Safety at Work Regulations
- Reporting of Injuries, Diseases & Dangerous Occurrences Regulations
- Provision & Use of Work Equipment Regulations
- Manual Handling Operations Regulations
- Personal Protective Equipment at Work Regulations
- Work at Height Regulations
- Control of Substances Hazardous to Health Regulations
- Control of Asbestos at Work Regulations.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2367-399/ELT OC1).

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Level: **3**
Credit value: **4**
UAN: **A/602/2706**

Unit aim
This unit is designed to enable the learner to develop the skills required, and apply the associated knowledge, in order that they are able to demonstrate the competence required to maintain electrotechnical systems and equipment in accordance with approved industry practices, statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS 7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)

Learning outcomes
There are **five** learning outcomes to this unit. The learner will:

1. be able to confirm safety of system prior to completion of maintenance in accordance with statutory and non statutory regulations
2. be able to apply procedures to locate electrical systems and equipment to be maintained
3. be able to apply procedures to select and use appropriate tools, equipment and materials for maintenance work activities
4. be able to apply procedures to complete maintenance procedures on electrical systems and equipment
5. be able to liaise with relevant persons regarding the completion of maintenance activities.

Guided learning hours
It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards
Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT 7, 8 and 16.

Support of the unit by a sector or other appropriate body
This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment
This unit will be assessed within the workplace.

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Outcome 1 Be able to confirm safety of system prior to completion of maintenance in accordance with statutory and non statutory regulations

Assessment Criteria

The learner can:

1. carry out safe isolation procedures in accordance with regulatory requirements for electrical installations
2. ensure the Health and Safety of themselves and others within the work location
3. check the safety of electrical systems prior to the commencement of inspection, testing and commissioning.

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Outcome 2 Be able to apply procedures to locate electrical systems and equipment to be maintained

Assessment Criteria

The learner can:

1. interpret maintenance schedules and specifications to accurately identify and locate electrical systems and equipment that is to be worked upon
2. use maintenance instructions to locate correct wiring systems and components that are to be worked upon.

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Outcome 3 Be able to apply procedures to select and use appropriate tools, equipment and materials for maintenance work activities

Assessment Criteria

The learner can:

1. select appropriate **tools, equipment and materials for maintenance work**
2. use tools, equipment and materials selected for maintenance work, safely and correctly, following:
    - workplace procedures
    - supplier's instructions
    - health and safety requirements.

Range

Tools, equipment and materials for maintenance work:

Tools and equipment:

- Hand tools
- Power tools (110V ac or battery operated)
- Portable and fixed lifting equipment
- Access equipment
- Rotating, positioning and straightening devices
- Jacking devices and rams
- Trolleys and hand operated jacks

Material:

- Materials for specific use within maintenance programmes -
    - Thermoplastics
    - Thermosetting (rubber compounds)
    - Fibre glass sleeving
    - Varnish (shellac)
    - Ceramics
    - Metals (conductors and structural)
    - Solvents

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Outcome 4 Be able to apply procedures to complete maintenance procedures on electrical systems and equipment

Assessment Criteria

The learner can:

1. select maintenance procedures which comply with:
    - manufacturer's instructions
    - industry approved practices
    - maintenance schedules and specifications

   and that are appropriate for the type of maintenance activity being undertaken (planned preventative, breakdown, monitored)
2. complete documented maintenance procedures on at least five **electrical systems** and at least five **items of electrical equipment**
3. use suitable testing methods to evaluate the performance of all replaced and adjusted electrical systems and equipment, during and on completion of maintenance activities
4. complete all maintenance work activities within the timescale agreed with the client.

Range

Electrical systems:

- Three-line four wire distribution systems
- ELV and LV single and multiphase circuits
- Lighting systems
- Heating and ventilating systems
- Air conditioning and refrigeration systems
- Drive systems
- Security systems
- Earthing systems
- Data communication systems

Items of electrical equipment:

- Electrical plant, components and accessories
- Motors and starters
- Switchgear and distribution panels
- Control systems and components
- Contactors
- Power transmission mechanisms
- Luminaires and lamps

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Outcome 5 Be able to liaise with relevant persons regarding the completion of maintenance activities

Assessment Criteria

The learner can:

1. advise relevant person(s) clearly regarding the potential consequences of carrying out effective repairs
2. identify situations when maintenance activities vary from the agreed schedule and where expected delays in the completion of maintenance work are expected, and notify the **relevant person(s)** of all implication regarding the changes as appropriate
3. complete maintenance records clearly and accurately and submit them to relevant person(s) in an appropriate, agreed format

Range

Relevant person(s):

- Other workers/colleagues
- Clients

Unit 333 Maintain electrotechnical systems and equipment (ELTP 09)

Notes for guidance

Unit entry requirements

Prior to undertaking this unit a learner must provide auditable evidence that they have the knowledge and understanding as detailed in the unit 'Understanding the practices and procedures for maintaining electrotechnical systems and equipment' (2357-323/ELTK09).

Evidence requirements

Learning Outcome 1:

- Authorised confirmation that the learner has had involvement and experience in safe-isolation procedures as relevant on two separate occasions.
- Auditable evidence must be provided that the learner has demonstrated that they have competently undertaken a risk assessment on two separate occasions.

Learning Outcomes 2 and 3 – Auditable evidence sourced from a real working environment must be provided to illustrate that the learner has demonstrated on two separate occasions they can plan and prepare to maintain electrotechnical systems and equipment in accordance with the assessment criteria for each of the learning outcomes.

All assessment activities must enable the learner to demonstrate that they understand and can apply the relevant requirements, as appropriate, of:

- the Electricity at Work Regulations (1989)
- the current edition of BS 7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)
- Management of Health & Safety at Work Regulations
- Reporting of Injuries, Diseases & Dangerous Occurrences Regulations
- Provision & Use of Work Equipment Regulations
- Manual Handling Operations Regulations
- Personal Protective Equipment at Work Regulations
- Work at Height Regulations
- Control of Substances Hazardous to Health Regulations
- Control of Asbestos at Work Regulations.

Occupational competence

To demonstrate 'Occupational Competence' the learner will need to fulfil the requirements of the relevant competence-based qualification this unit is a part of, which includes the successful completion of the Electrotechnical Occupational Competence Unit (2399-399/ELT OC1).

Unit 399 Electrotechnical occupational competence (ELT OC1)

Level: **3**
Credit value: **4**
UAN: **R/602/2503**

Unit aim

This unit is designed to enable learners to demonstrate 'Electrotechnical occupational competence' in accordance with approved industry practices and the current statutory and non-statutory regulations:

- The Electricity at Work Regulations (1989)
- The current edition of BS7671 Wiring Regulations
- Health & Safety Act (1974)
- Building Regulations (2000)
- Management of Health & Safety at Work Regulations
- Reporting of Injuries, Diseases & Dangerous Occurrences Regulations
- Provision & Use of Work Equipment Regulations
- Manual Handling Operations Regulations
- Personal Protective Equipment at Work Regulations
- Work at Height Regulations
- Control of Substances Hazardous to Health Regulations
- Control of Asbestos at Work Regulations

The outcomes and the assessment criteria of this unit underpin the electrotechnical industry's competence requirements for qualified operatives in an installation or maintenance role.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. be able to interpret specifications, drawings and diagrams
2. be able to undertake risk assessments
3. be able to carry out the safe isolation of electrical circuits and complete electrical installations
4. be able to plan and prepare to install, terminate and connect wiring systems
5. be able to complete the installation, termination and connection of wiring systems in accordance with industry requirements
6. be able to complete the visual inspection, initial verification and certification of an electrical installation
7. be able to complete the testing and certification of an electrical installation in accordance with industry requirements
8. be able to diagnose, and recommend how to rectify, electrical faults in an electrical installation in accordance with industry requirements.

Guided learning hours

It is recommended that **six** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

Learners achieving the outcomes of this unit will have demonstrated that they are competent in accordance with the National Occupational Standards (NOS) for the Electrotechnical Industry ELT1, 2, 4, 7, 8, 9, 23 to 28.

Support of the unit by a sector or other appropriate body

This unit is endorsed by the SSC for Building Services Engineering, SummitSkills.

Assessment

This unit will be assessed by:

- a knowledge assessment at a NET approved AM2 centre
- a simulated practical exercise at a NET approved AM2 centre.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 1 Be able to interpret specifications, drawings and diagrams

Assessment Criteria

The learner can:

1. interpret specifications and technical data for the installation of:
    - protective earthing systems
    - a ring final circuit
    - a general lighting circuit
    - a control system for a three-phase motor
    - a central heating/sustainable energy system
    - a safety service circuit
    - a data cabling system
    - a three-phase socket-outlet.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 2 Be able to undertake risk assessments

Assessment Criteria

The learner can:

1. review safe working practices
2. undertake a risk assessment
3. complete risk assessment documentation in accordance with organisational procedures.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 3 Be able to carry out the safe isolation of electrical circuits and complete electrical installations

Assessment Criteria

The learner can:

1. locate correct means of isolation
2. Follow correct procedures for the isolation of electrical circuit(s) and complete electrical installations
3. isolate circuit (s) in correct sequence
4. select correct test and measuring instruments
5. correctly test for the presence of an electrical supply.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 4 Be able to plan and prepare to install, terminate and connect wiring systems

Assessment Criteria

The learner can:

1. In accordance with an installation specification select the correct cables, accessories, equipment, components and protective devices for the installation of:
    - protective earthing systems
    - a ring final circuit
    - a general lighting circuit
    - the control of a three-phase motor
    - a central heating/sustainable energy system
    - a safety service circuit
    - a data cabling system
    - a three-phase socket-outlet.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 5 Be able to complete the installation, termination and connection of wiring systems in accordance with industry requirements

Assessment Criteria

The learner can:

1. in accordance with an installation specification install, terminate and connect cables, accessories, equipment, components and protective devices for the installation of:
    - protective earthing systems
    - a ring final circuit
    - a general lighting circuit
    - the control of a three-phase motor
    - a central heating/sustainable energy system
    - a safety service circuit
    - a data cabling system
    - a three-phase socket-outlet.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 6 Be able to complete the visual inspection, initial verification and certification of an electrical installation

Assessment Criteria

The learner can:

1. comply with correct procedures
2. record relevant findings on correct documentation.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 7 Be able to complete the testing and certification of an electrical installation in accordance with industry requirements

Assessment Criteria

The learner can:

1. select and use the correct measuring instruments
2. confirm instruments function accurately
3. measure the continuity of protective conductors
4. measure the continuity of ring final circuit conductors
5. measure the insulation resistance of the installation and its circuits
6. confirm the polarity of the installation's electrical outlets and components
7. determine the installation's Earth Fault-Loop Impedance (EFLI)
8. determine the installation's Prospective Fault Current (PFC)
9. carry out functional tests on the installation's equipment and components
10. complete the correct documentation in accordance with statutory and non-statutory regulations.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Outcome 8 Be able to diagnose, and recommend how to rectify, electrical faults in an electrical installation in accordance with industry requirements

Assessment Criteria

The learner can:

1. undertake an assessment of risk accordingly
2. carry out safe isolation in the correct sequence as appropriate to fault diagnosis procedures
3. select and use correctly, fit for purpose tools, equipment and instruments
4. carry out relevant checks and preparations
5. locate faults from given information
6. state how the identified faults can be rectified.

Unit 399 Electrotechnical occupational competence (ELT OC1)

Notes for guidance

To undertake this unit, learners must provide auditable formal evidence that they have the relevant electrotechnical knowledge, understanding, experience and skills at the appropriate level that enables them to carry out the assessment activities effectively and safely as prescribed for each learning outcome.

This unit **must** only be assessed in a National Electrotechnical Training (NET) approved centre. All criteria set by NET must be met full and continuously for each assessment. NET, rather than City & Guilds, should be contacted regarding any queries regarding the delivery and/or assessment for this unit (2357-399).

As with all assessments, the candidate's result for this unit must be submitted to City & Guilds on the Walled Garden to allow for certification.

Appendix 1 Relationships to other qualifications

Links to other qualifications and frameworks

These qualifications will be contained within the SummitSkills Apprenticeship framework. Please visit SummitSkills website **www.summitskills.org.uk** for more details.

City & Guilds offers a series of CPD qualifications for the Electrotechnical industry for qualified candidates to progress onto upon completion of these qualifications. Please see the Progression Opportunities (section 1.2 of this handbook) for more details.

These qualifications have connections to the following within the electrical suite offered by City & Guilds:

- 2382
- 2391

2382 Requirements for Electrical Installations

17th Edition (BS7671: 2008 (2015))

To gain certification for Level 3 Award in the Requirements for Electrical Installations BS7671: 2008 (2015), candidates must have achieved the assessment 5357-006 and have been certificated against either 2357-13, 2357-44, 2357-46 or 2357-91.

Centres can then register candidates onto the 2382-73 and claim the certification module 2382-902 which will generate this certificate.

18th Edition (BS7671: 2018)

To gain certification for Level 3 Award in the Requirements for Electrical Installations BS 7671:2018, candidates must have achieved the assessment 2357-018 (BS7671 2018) and 2357-705 or 2357-725 and have been certificated 2357-13, 2357-44, 2357-46 or 2357-91.

Centres can then register candidates onto the 2382-78 and claim the certification module 2382-918 which will generate this certificate.

18th Edition Amendment 2 (BS7671: 2018 (2022))

To gain certification for City & Guilds Level 3 Award in the Requirements for Electrical Installations BS 7671:2018 (2022), candidates must have achieved the assessment 2357-022 (BS7671 2018 (2022)) and 2357-705 or 2357-725 and have been certificated against 2357-13, 2357-44, 2357-46 or 2357-91.

Centres can then register candidates onto the 2382-82 and claim the certification module 2382-922 which will generate this certificate.

2391 Electrical Inspection and Testing

To gain certification for Level 3 Award in Initial Verification of Electrical Installations, candidates must have achieved the assessments 2357-107 and 2357-607 and have been certificated against 2357-13, 2357-34, 2357-35 or 2357-91.

Centres can then register candidates onto 2391-71 and claim the certification module 2391-901 which will generate this certificate.

Literacy, language, numeracy and ICT skills development

These qualifications includes opportunities to develop and practise many of the skills and techniques required for success in the following qualifications:

- Functional Skills (England) – see **www.cityandguilds.com/functionalskills**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales – see **www.cityandguilds.com/esw**

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the ***Centre Document Library*** on ***www.cityandguilds.com*** or click on the links below:

Quality Assurance Standards: Centre Handbook

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on

- Centre quality assurance criteria and monitoring activities
- Administration and assessment systems
- Centre-facing support teams at City & Guilds / ILM
- Centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the Centre Contract.

Quality Assurance Standards: Centre Assessment

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.

It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements, or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre-assessments.

Access arrangements - When and how applications need to be made to City & Guilds provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

This ***Centre Document Library*** also contains useful information on such things as:

- Conducting examinations
- Registering learners
- Appeals and malpractice

Useful contacts

- Please visit the Contact Us section of the City & Guilds website, ***Contact us***

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people, organisations and economies develop their skills for growth. We work with education providers, employers and governments in over 100 countries across the world to help people, businesses and economies grow by shaping skills systems and supporting skills development.

The Group is made up of City & Guilds, ILM, Kineo, The Oxford Group, Gen2, and Intertrain. Together we set the standard for professional and technical education and corporate learning and development around the world.

Copyright

Published by City & Guilds, a registered charity established to promote education and training

City & Guilds of London Institute
Giltspur House
5-6 Giltspur Street
London
EC1A 9DE

cityandguildsgroup.com