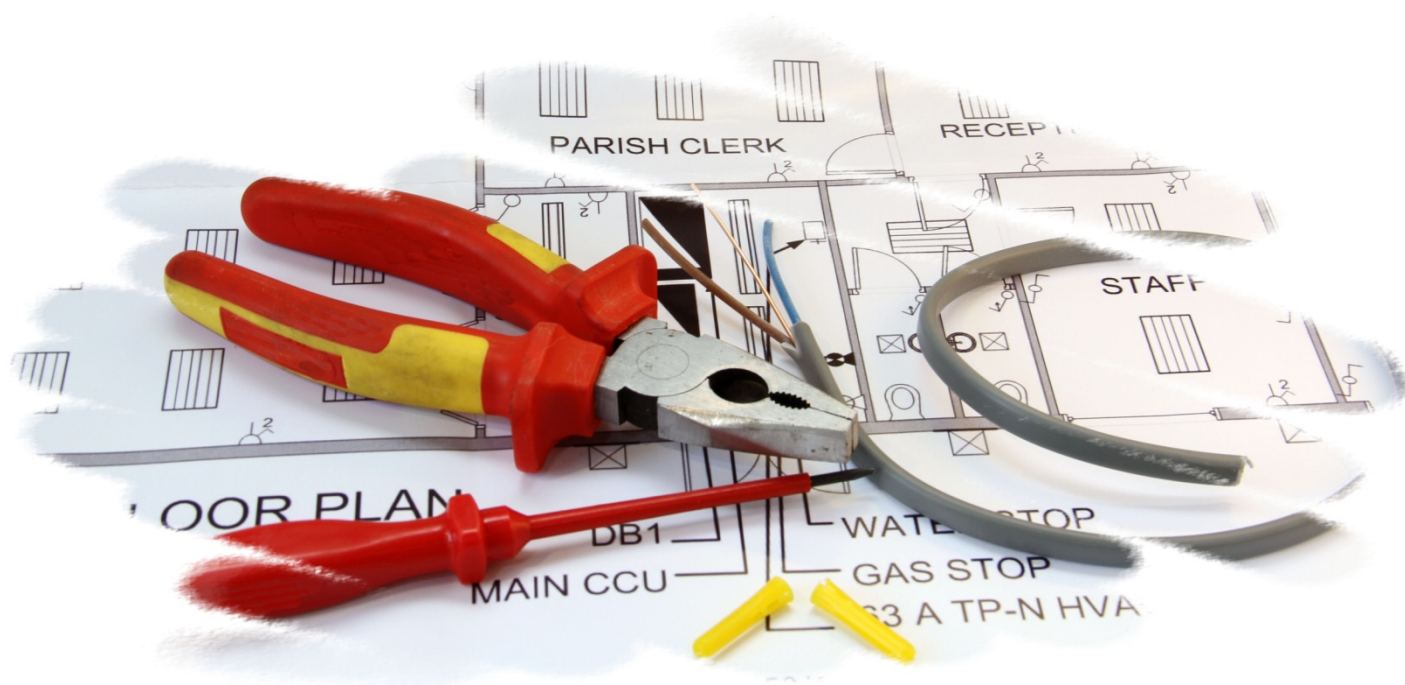


# Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment) (2357-13 / 91)

**Qualification handbook for centres**

Qualification accreditation number: 501/2232/0



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

**Qualification handbook for centres**



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# 1 Introduction to the qualification

This document contains the information that centres need to offer the following qualification:

<b>Qualification title and level</b>	Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings, Structures and the Environment)
<b>City &amp; Guilds qualification number</b>	2357-13 / 91
<b>Qualification accreditation number</b>	TBC
<b>Last registration date</b>	31/07/2015
<b>Last certification date</b>	31/07/2018

<b>This qualification...</b>
... meets 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.
... allows candidates to learn, develop and practise the skills required for employment and/or career progression in the electrotechnical sector.
... contributes 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 this qualification.
... is part of the SummitSkills Electrotechnical Apprenticeship framework.
... provides a nationally recognised QCF qualification for the electrotechnical industry. This qualification replaces the City & Guilds Levels 2 and 3 Certificates in Electrotechnical Technology (2330) and the City & Guilds Level 3 NVQ in Electrotechnical Services (2356.)

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## 1.1 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.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit number</b>	<b>Unit title</b>	<b>Mandatory/ optional for full qualification</b>	<b>Credit value</b>
H/602/2523	2357-301	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Mandatory	6
M/602/2525	2357-302	Understanding environmental legislation, working practices and the principles of environmental technology systems	Mandatory	4
J/602/2532	2357-303	Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)	Mandatory	6
A/602/2561	2357-304	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	2357-305	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/6022/563	2357-306	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	Mandatory	9
D/6022/567	2357-307	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

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit number</b>	<b>Unit title</b>	<b>Mandatory/ optional for full qualification</b>	<b>Credit value</b>
R/6022/579	2357-308	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/6022/589	2357-309	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	Mandatory	12
R/6022/596	2357-311	Applying Health and Safety legislation and working practices (Installing and Maintaining Electrotechnical Systems and Equipment)	Mandatory	3
H/6022/599	2357-312	Applying environmental legislation, working practices and the principles of environmental technology systems	Mandatory	3
K/6022/605	2357-313	Overseeing and organising the work environment (Electrical Installation)	Mandatory	3
R/6022/792	2357-315	Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment	Mandatory	6
H/6022/828	2357-316	Terminating and connecting conductors, cables and flexible cords in electrical systems	Mandatory	4
K/6022/703	2357-317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	Mandatory	6
M/6022/704	2357-318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	Mandatory	6
R/602/2503	2357-399	ELECTROTECHNICAL OCCUPATIONAL COMPETENCE (AM2)	Mandatory	4

## 1.2 Opportunities for progression

On completion of this qualification 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 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.)

## 1.3 Qualification support materials

City & Guilds also provides the following publications and resources specifically for this qualification:

Description	How to access
Assessment guide (for approved centres) (one per unit.)	<a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> (and navigate to the 2357 webpage.) Password available on Walled Garden.
Practical assessment guide for unapproved centres	<a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> (and navigate to the 2357 webpage.)
Promotional materials	<a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> (and navigate to the 2357 webpage.)
Fast track approval forms/generic fast track approval form	<a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> (and navigate to the 2357 webpage.)
Candidate logbook	Walled Garden (TL012357) More information is available at <a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a>
SmartScreen	<a href="http://www.smartscreen.co.uk">www.smartscreen.co.uk</a>
Practice tests	<a href="http://www.cityandguilds.com/gola/practicetests">www.cityandguilds.com/gola/practicetests</a>
Exam Success	<a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a>
Frequently Asked Questions	<a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> (and navigate to the 2357 webpage.)

## 2 Centre requirements

This section outlines the approval processes for Centres to offer this qualification 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 this qualification 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 EV visit.

New centres must use the **standard** Qualification Approval Process.

## 2.1 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 industries '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 this qualification 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 this qualification 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 verifier, but must never internally verify their own assessments. The specific Assessor and Internal Verifier requirements, as set by the Sector Skills Council SummitSkills are detailed below.

## Assessors and internal verifiers

### 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.

### 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 verifying 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 verifiers 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/verifier 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 Verifiers (IV)**

### **IV Role and Responsibilities**

The SSC SummitSkills considers the main focus of IVs to be the quality assurance of assessment procedures. The IV 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 internal verifier appropriately. This evidence and access to “occupational expertise” is quality assured by the Awarding Organisation

### **Internal verifiers 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

### **IV Continuing Professional Development**

The occupational experience of IVs 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 IV 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.

## 2.2 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 this qualification. 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 this qualification, 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 2357-301 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 this qualification, 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.

This qualification is 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

### 3.1 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 GOLLA assessments within this qualification. These may aid centres and candidates in determining the learners readiness to undertake the GOLLA assessment.

### 3.2 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

### 4.1 Summary of assessment methods

City & Guilds provides the following assessments:

- Online, on-demand testing using multiple choice questions (GOLA)
- Assignments (practical and written) available from the 2357 webpage (passwords for approved centres available via City & Guilds Walled Garden 2357 page.)
- Short-answer questions available from the 2357 webpage (passwords for approved centres available via City & Guilds Walled Garden 2357 page.)

Unit No.	Title	Assessment Method	Where to obtain assessment materials
2357-301	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	Assignment 2357-101.  City & Guilds GOLA on-line 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 verified.	Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage. Password available on Walled Garden.
2357-302	Understanding environmental legislation, working practices and the principles of environmental technology systems	Assignment 2357-302.  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 verified.	Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage. Password available on Walled Garden.
2357-303	Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)	Assignment 2357-303  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 verified.	Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage. Password available on Walled Garden.

<b>Unit No.</b>	<b>Title</b>	<b>Assessment Method</b>	<b>Where to obtain assessment materials</b>
2357-304	Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment	<p>Assignment 2357-304.</p> <p>The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>
2357-305	Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment	<p>Assignment 2357-105.</p> <p>City &amp; Guilds GOLA on-line multiple choice test 2357-305.</p> <p>The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>
2357-306	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	<p>Assignment 2357-306.</p> <p>The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>
2357-307	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	<p>Assignment 2357-307.</p> <p>The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>

Unit No.	Title	Assessment Method	Where to obtain assessment materials
2357-308	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	<p>Assignment 2357-308.</p> <p>The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>
2357-309	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	<p>Short answer test 2357-109.</p> <p>City &amp; Guilds GOLA Online multiple choice test 2357-309.</p> <p>The assessments cover the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to <a href="http://www.cityandguilds.com/electrotech">www.cityandguilds.com/electrotech</a> and navigate to the 2357 webpage.</p> <p>Password available on Walled Garden.</p>
2357-311	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>
2357-312	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>

Unit No.	Title	Assessment Method	Where to obtain assessment materials
2357-313	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>
2357-315	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>
2357-316	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>
2357-317	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.	<p>The City &amp; Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b></p> <p>Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b>.</p>

Unit No.	Title	Assessment Method	Where to obtain assessment materials
2357-318	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.	The City & Guilds 2357 logbook can be purchased from the Walled Garden. More details are contained here: <b><a href="http://www.cityandguilds.com/publications">www.cityandguilds.com/publications</a></b>  Alternatively centres may wish to use approved e-portfolio, with more details available at <b><a href="http://www.cityandguilds.com/eportfolios">www.cityandguilds.com/eportfolios</a></b> .
2357-399	ELECTROTECHNICAL OCCUPATIONAL COMPETENCE	This unit (commonly known as the AM2) must be assessed at an approved NET centre.	Please contact National Electrical Training (NET) <b><a href="http://www.net-works.org.uk/am2.asp">http://www.net-works.org.uk/am2.asp</a></b>

### Important note

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

- 2357-305 (assignment 2357-105)
- 2357-306
- 2357-307 and;
- 2357-308.

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 this qualification:

- 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 external verifier 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.

## 4.2 Assignments

All assignments are available on the 2357 section of **[www.cityandguilds.com](http://www.cityandguilds.com)** dedicated to this qualification. 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.

### 4.3 Evidence requirements

The evidence requirements and City & Guilds assessment strategy for this 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 this qualification:

- Knowledge units that gives 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 gives 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 (2357-301-309) 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, 315-318) 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.

#### 4.4 Test specifications

The test specification for the units are available on the City & Guilds website. Please go to [www.cityandguilds.com/electrotech](http://www.cityandguilds.com/electrotech) and navigate to the 2357 webpage.

#### 4.5 Recording forms

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

City & Guilds endorses several ePortfolio systems. Further details are available at:  
**[www.cityandguilds.com/eportfolios](http://www.cityandguilds.com/eportfolios)**.

City & Guilds has developed a logbook specifically designed to meet the needs of candidates and assessors for this qualification; *Logbook for Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Buildings and Structures) (2357-13)* (stock code TL012357). Centres can purchase this logbook, from the Walled Garden, City & Guilds website or by contacting the City & Guilds publications department. More details are contained here:  
[www.cityandguilds.com/publications](http://www.cityandguilds.com/publications)

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 external verifier, before they are used.



## 4.6 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 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 this qualification, 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 Level 3 NVQ in Electrotechnical Services and wish to transfer to this qualification 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:

<b>NQF Qualification</b>	<b>Additional Requirements For Achievement Of QCF Electrotechnical Qualification</b>
City & Guilds level 2 Certificate in Electrotechnical Technology 2330-01 (if undertaking 2357-13 / 91)	<b>Installation (2357-13 / 91):</b> 2357-302 (ELTK02) 2357-303 (ELTK03) 2357-307 (ELTK06) 2357-308 (ELTK07), and 2357-309 (ELTK08) plus all performance units (2357-311-313, 315-318), and AM2 (2357-399).
City & Guilds levels 2 and 3 Certificate in Electrotechnical Technology 2330-01 and 2330-07 (if undertaking 2357-13 / 91)	<b>Installation (2357-13 / 91):</b> 2357-302 (ELTK02) plus all performance units (2357-311-313, 315-318), and AM2 (2357-399).

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 QCF 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.

## 5 Units

### Availability of units

The units for this qualification follow.

The learning outcomes and assessment criteria are also viewable on the National Database of Accredited Qualifications (NDAQ) **[www.accreditedqualifications.org.uk](http://www.accreditedqualifications.org.uk)**

### Structure of units

The units in this qualification 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 number	Title	QCF unit number	Credits
2357-301	Understanding Health and Safety legislation, practices and procedures (Installing and maintaining electrotechnical systems and equipment)	H/602/2523	6
2357-302	Understanding environmental legislation, working practices and the principles of environmental technology systems	M/602/2525	4
2357-303	Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)	J/602/2532	6
2357-304	Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment	A/6022/589	8
2357-305	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
2357-306	Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems	J/6022/563	9
2357-307	Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment	D/6022/567	8
2357-308	Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment	R/6022/579	6
2357-309	Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems	A/6022/589	12
2357-311	Applying Health and Safety legislation and working practices (Installing and Maintaining Electrotechnical Systems and Equipment)	R/6022/596	3
2357-312	Applying environmental legislation, working practices and the principles of environmental technology systems	H/6022/599	3
2357-313	Overseeing and organising the work environment (Electrical Installation)	K/6022/605	3
2357-315	Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment	R/6022/792	6
2357-316	Terminating and connecting conductors, cables and flexible cords in electrical systems	H/6022/828	4
2357-317	Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment	K/6022/703	6

<b>City &amp; Guilds unit number</b>	<b>Title</b>	<b>QCF unit number</b>	<b>Credits</b>
2357-318	Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment	M/6022/704	6
2357-399	ELECTROTECHNICAL OCCUPATIONAL COMPETENCE	R/602/2503	4

# **2357-301 (ELTK 01) Understanding Health and Safety legislation, practices and procedures (installing and maintaining electrotechnical systems and equipment)**

**Level: 3**

**Credit value: 6**

**NDAQ number: 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 be able to:

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:

- A knowledge assignment (2357-101.)
- An on-line multiple choice GOLA test (2357-301).

### 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.

## 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.

## 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 (e.g. cartridge gun, drills, grinders).
- Signs and guarding.
- Tools and materials storage facilities.
- Dangerous substances, e.g. cutting compounds and adhesives.



## 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.

## 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.

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## Unit 302 (ELTK 02)

## Understanding environmental legislation, working practices and the principles of environmental technology systems

**Level:** 3

**Credit value:** 4

**NDAQ number:** 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 be able to:

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, SummitSkills.

### Assessment

This unit will be assessed by an assignment (2357-302).

## 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.

## 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.

## 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 303 (ELTK03)

## Understanding the practices and procedures for overseeing and organising the work environment (Electrical Installation)

**Level:** 3

**Credit value:** 6

**NDAQ number:** 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 be able to:

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 (2357-303).

## 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.

## 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.

## 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.

## 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.

## 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.



## 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.

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## Unit 304 (ELTK04a)

# Understanding the principles of planning and selection for the installation of electrotechnical equipment and systems in buildings, structures and the environment

**Level:** 3

**Credit value:** 8

**NDAQ number:** 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 be able to:

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 covering practical skills and underpinning knowledge (2357-304).

## 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.

## 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).

### 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,  $R1 + R2$ ,  $Z_e$  and  $Z_s$ .
- Considering thermal constraints.

## 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.

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## Unit 305 (ELTK04)

# Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 10

**NDAQ number:** 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 be able to:

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:

- A knowledge and practical assignment (2357-105).
- An on-line multiple choice GOLA test (2357-305).

## 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.

## 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.

## 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).

## 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.

## 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.

## 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.



## 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.

## 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 306 (ELTK05)

## Understanding the principles, practices and legislation for the termination and connection of conductors, cables and cords in electrical systems

**Level:** 3

**Credit value:** 9

**NDAQ number:** 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 be able to:

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 covering practical skills and underpinning knowledge (2357-306).

## 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.

## 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.

## 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.

## 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.

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## Unit 307 (ELTK06)

## Understanding principles, practices and legislation for the inspection, testing, commissioning and certification of electrotechnical systems and equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 8

**NDAQ number:** 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 be able to:

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 covering practical skills and underpinning knowledge (2356-307)

## 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.

## 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.

## 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.

## 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 ( $Z_s$ ) and external impedance ( $Z_e$ ).
- Establishing  $Z_e$  from enquiry.
- Calculate the value of  $Z_s$  from given information.
- Comparing  $Z_s$  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.

## 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.

## 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 308 (ELTK07)

## Understanding the principles, practices and legislation for diagnosing and correcting electrical faults in electrotechnical systems and equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 6

**NDAQ number:** 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 be able to:

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 covering practical skills and underpinning knowledge (2357-308).

## 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.

## 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.

## 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 (e.g. 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.

### 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.

### 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 (e.g. 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.

## 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 309 (ELTK08)

# Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems

**Level:** 3

**Credit value:** 12

**NDAQ number:** 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 **twelve** learning outcomes to this unit. The learner will be able to:

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:

- A short answer knowledge test (2357-109).
- An on-line multiple choice GOLA test (2357-309).

## 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.

## 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.

## 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.

## 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.

## 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.

**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.

## 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.

## 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-on-line.
- Star-Delta.
- Rotor-resistance.
- Soft-start.
- Variable frequency.

### 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.

### 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.

### 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.

## 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.

## 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 (ELTP01)

## Applying Health and Safety legislation and working practices (installing and maintaining electrotechnical systems and equipment)

**Level:** 3

**Credit value:** 3

**NDAQ number:** 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 be able to:

1. apply relevant Health and Safety legislation in the workplace
2. assess the work environment for hazards and identify remedial actions in accordance with Health and Safety legislation
3. apply methods and procedures to ensure work on site is in accordance with Health and Safety legislation
4. 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.

## Outcome 1

## 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.

## Outcome 2

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.

## Outcome 3

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.

## Outcome 4

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.

# 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) (2357-301 / 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 (ELTP02)

## Applying environmental legislation, working practices and the principles of environmental technology systems

**Level:** 3

**Credit value:** 3

**NDAQ number:** 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 be able to:

1. apply environmental legislation, working practices and principles for electrotechnical services
2. apply work methods and procedures to reduce material wastage and the impact of work activities on the work environment
3. 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.

## Outcome 1

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.



## Outcome 2

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.

## Outcome 3

## 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.

# 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 (2357-302 / ELTK02).
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-309 / 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.)

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## Unit 313 (ELTP03)

## Overseeing and organising the work environment (electrical installation)

**Level:** 3

**Credit value:** 3

**NDAQ number:** 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 be able to:

1. provide relevant people with technical and functional information for work on electrical systems and equipment
2. oversee Health and Safety during work on electrical systems and equipment
3. co-ordinate liaison with other relevant persons during work activities
4. organise and oversee work activities and operations
5. organise a programme for working on electrical systems and equipment
6. 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.

## Outcome 1

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.

## Outcome 2

## 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.

## Outcome 3

## 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.



### **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.

### **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.

## Outcome 6

## 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.

# 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 (2357-303 / 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 (ELTP04)

## Planning, preparing and installing wiring systems and associated equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 6

**NDAQ number:** 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 be able to:

1. prepare the working environment for the installation of wiring systems, enclosures and associated equipment
2. correctly interpret appropriate information for the installation of wiring systems, enclosures and associated equipment
3. confirm that planned work is in accordance with the installation specification
4. confirm the electrical supply is in accordance with the installation specification
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
6. fit and fix wiring systems, wiring enclosures and associated equipment safely in accordance with the installation specification
7. 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.

## Outcome 1

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.

## 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.

## 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).



## 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.

## 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.

## 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.
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.
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.

## 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 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.

# 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 (2357-304 / ELTK4a)
- Understanding the practices and procedures for the preparation and installation of wiring systems and electrotechnical equipment in buildings, structures and the environment (2357-305 / ELTK4)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-309 / 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).

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## Unit 316 (ELTP05)

## Terminating and connecting conductors, cables and flexible cords in electrical systems

**Level:** 3

**Credit value:** 4

**NDAQ number:** 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 be able to:

1. confirm safety of system prior to completion of any termination and connection in accordance with statutory and non statutory regulations
2. terminate and connect conductors, cables and flexible cords in electrical wiring systems and equipment
3. 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 **8** 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.

## Outcome 1

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.

## Outcome 2

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.

#### 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 (e.g. heating system components).

## Outcome 3

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.

# 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).

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## Unit 317 (ELTP06)

# Inspecting, testing, commissioning and certifying electrotechnical systems and equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 6

**NDAQ number:** 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 be able to:

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

## Outcome 1

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.



### 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.

### 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.

## Outcome 4

## 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.

# 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 (2357-307 / ELTK06)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-309 / 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 (ELTP07)

## Diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment

**Level:** 3

**Credit value:** 6

**NDAQ number:** 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 be able to:

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

## Outcome 1

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.

### 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.

## Outcome 3

## 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
    - o relevant regulations
    - o manufacturer's instructions
    - o 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.



# 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 (2357-308 / ELTK07)
- Understanding the electrical principles associated with the design, building, installation and maintenance of electrical equipment and systems (2357-309 / 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).

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## Unit 399 (ELT OC1)

## Electrotechnical Occupational Competence

**Level:** 3

**Credit value:** 4

**NDAQ number:** 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 be able to:

1. interpret specifications, drawings and diagrams
2. undertake risk assessments
3. carry out the safe isolation of electrical circuits and complete electrical installations
4. plan and prepare to install, terminate and connect wiring systems
5. complete the installation, termination and connection of wiring systems in accordance with industry requirements
6. complete the visual inspection, initial verification and certification of an electrical installation
7. complete the testing and certification of an electrical installation in accordance with industry requirements
8. diagnose, and recommend how to rectify, electrical faults in an electrical installation in accordance with industry requirements.

### Guided learning hours

It is recommended that 6 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.

### **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.

### **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.

## Outcome 3

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.

### 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.



## Outcome 5

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.

## Outcome 6

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.

## Outcome 7

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.

## Outcome 8

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.

# Notes for guidance

## Unit entry requirements

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.

## Evidence requirements

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 candidates result for this unit must be submitted to City & Guilds on the Walled Garden to allow for certification.

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## Relationships to other qualifications

### Links to other qualifications and frameworks

This qualification will be contained within the SummitSkills Apprenticeship framework. Please visit SummitSkills website **[www.summitskills.org.uk](http://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 this qualification. Please see the Progression Opportunities (section 1.2 of this handbook) for more details.

### Literacy, language, numeracy and ICT skills development

This qualification 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](http://www.cityandguilds.com/functionalskills)**
- Essential Skills (Northern Ireland) – see **[www.cityandguilds.com/essentialskillsni](http://www.cityandguilds.com/essentialskillsni)**
- Essential Skills Wales.

There might also be opportunities to develop skills and/or portfolio evidence if candidates are completing any Key Skills alongside this qualification.

Any Key Skills evidence will need to be separately assessed and must meet the relevant standard.

## Appendix 1 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 **Centres and Training Providers homepage** on [www.cityandguilds.com](http://www.cityandguilds.com).

### ***Providing City & Guilds qualifications – a guide to centre and qualification approval***

contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

***Ensuring quality*** contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:

- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

***Access to Assessment & Qualifications*** 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.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- ***Walled Garden***  
Find out how to register and certificate candidates on line
- ***Qualifications and Credit Framework (QCF)***  
Contains general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- ***Events***  
Contains dates and information on the latest Centre events
- ***Online assessment***  
Contains information on how to register for GOLA assessments.



## Useful contacts

### UK learners

General qualification information

T: +44 (0)844 543 0033

E: [learnersupport@cityandguilds.com](mailto:learnersupport@cityandguilds.com)

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### International learners

General qualification information

T: +44 (0)844 543 0033

F: +44 (0)20 7294 2413

E: [intcg@cityandguilds.com](mailto:intcg@cityandguilds.com)

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### Centres

Exam entries, Registrations/enrolment, Certificates, Invoices, Missing or late exam materials, Nominal roll reports, Results

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: [centresupport@cityandguilds.com](mailto:centresupport@cityandguilds.com)

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### Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

F: +44 (0)20 7294 2404 (BB forms)

E: [singlesubjects@cityandguilds.com](mailto:singlesubjects@cityandguilds.com)

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### International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: [intops@cityandguilds.com](mailto:intops@cityandguilds.com)

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### Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, GOLLA, Navigation, User/menu option, Problems

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: [walledgarden@cityandguilds.com](mailto:walledgarden@cityandguilds.com)

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### Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

T: +44 (0)121 503 8993

E: [business\\_unit@cityandguilds.com](mailto:business_unit@cityandguilds.com)

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### Publications

Logbooks, Centre documents, Forms, Free literature

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that City & Guilds provides, email: [feedbackandcomplaints@cityandguilds.com](mailto:feedbackandcomplaints@cityandguilds.com)

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