City & Guilds Level 3 Diploma in Electrical Installations (Buildings and Structures) (2365-03)

Version 1.12 (April 2025)

Qualification Handbook

Qualification at a glance

Subject area	5.2 Building Construction
City & Guilds number	2365
Age group approved	16+
Entry requirements	Level 3
Assessment	Multiple choice examination, Practical Demonstration/Assignment
Grading	Pass/Fail
Approvals	Full approval required
Support materials	Sample assessments, Assignment Guides, Smartscreen
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds qualification number	Regulatory reference number	GLH	TQT
Level 3 Diploma in Electrical Installation (Buildings and Structures)	2365-03	600/5499/2	480	520

Version and date	Change detail	Section
1.1 Aug 2012	Correction of Assessment information	Assessment
1.2 Sept 2012	Amended information on where to obtain assessments. Added unit aim to unit 301. Amended the roles and opportunities for progression sections in the range for learning outcome one for unit 308.	Assessment Units
1.3 March 2013	Unit 301- LO4 - AC4.2 – amended typing error – now reads 'identify typical disadvantages'	Units
1.4 July 2017	Review and update to the following units and assessments 201, 302,303, 304 and 305	Units and Assessments
1.5 October 2017	Test specification for test 623 completed. Test duration for test 623, 624 and 625 amended Range added to unit 201, LO4.	Units and Assessments
1.6 January 2018	Greater clarity on permitted materials and pass mark added for unit 301	Test specifications
1.7 March 22	TQT clarification and highlighted CG added to front cover and amended address on rear	Page 2 & 6 Front and rear cover
1.8 September 2023	Compliance checks and removal of images.	throughout
1.9 June 2024	Update of Quality Assurance Statement	Centre Requirements
1.10 October 2024	Inclusion of IQA section	Page 9
1.11 January 2025	Handbook transferred to latest version of the template. The section on Quality Assurance has been updated and sections on Inclusion and diversity, and Sustainability have been added.	All
1.12 April 2025	Test information for 612 corrected.	Test specification

Contents

1 Introduction

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

Area	Description
Who is the qualification for?	This qualification is for those individuals who want to work as electricians in the building services engineering sector. This qualification does **not** make candidates fully qualified electricians (see Appendix 2).
What does the qualification cover?	This qualification allows candidates to learn, develop and practise the skills required for employment and/or career progression in the electrotechnology sector. See Appendix 2 for further information.
What opportunities for progression are there?	It allows candidates to progress into employment, although **not** as a fully qualified electrician, or to the following City & Guilds qualifications: • Level 3 NVQ in Electrotechnical Services • Level 3 Diploma in Electrotechnical Technology • Level 3 Award in the Initial Verification and Certification of Electrical Installations • Level 3 Award in the Periodic Inspection, Testing and Certification of Electrical Installations Level 4 Award in Design and Verification of Electrical Installations
Is it part of an apprenticeship framework or initiative?	N/A

Structure

To achieve the City & Guilds **Level 3 Diploma in Electrical Installation (Buildings and Structures)**, learners must achieve **52** credits from the mandatory units.

Unit accreditation number	City & Guilds unit number	Unit title	Credit Value	Level	GLH
Mandatory units:					
Learners must achieve all **seven** mandatory units.					
T/503/9669	201	Health and safety in building services engineering	3	2	26
K/602/3138	301	Understand the fundamental principles and requirements of environmental technology systems	2	3	15
A/503/9950	302	Principles of electrical science	12	3	111
F/503/9951	303	Electrical installations: fault diagnosis and rectification	9	3	84
R/503/9954	304	Electrical Installations: inspection, testing and commissioning	12	3	110
K/503/9958	305	Electrical systems design	12	3	114
K/504/0253	308	Career awareness in building services engineering	2	3	20

Total Qualification Time (TQT)

Total Qualification Time (TQT) is the number of notional hours which represents an estimate of the total amount of time that could reasonably be expected for a learner to demonstrate the achievement of the level of attainment necessary for the award of a qualification.

TQT consists of the following two elements:

1) the number of hours that an awarding organisation has assigned to a qualification for guided learning
2) an estimate of the number of hours a learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by – but, unlike guided learning, not under the immediate guidance or supervision of – a lecturer, supervisor, tutor or other appropriate provider of education or training.

Title and level	GLH	TQT
Level 3 Diploma in Electrical Installation (Buildings and Structures).	480	520

2 Centre requirements

Approval

Full approval

To offer this qualification, new centres will need to gain both centre and qualification approval. Please refer to the document **Centre Approval Process: Quality Assurance Standards** for further information.

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

Resource requirements

Centre staffing

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

- be occupationally competent or technically knowledgeable in the area(s) for which they are delivering training and/or have experience of providing training (this knowledge must be to the same level as the training being delivered)
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Continuing professional development (CPD)

Centres are expected to support their staff in ensuring that their knowledge remains current of the occupational area and of best practice in delivery, mentoring, training, assessment and quality assurance, and that it takes account of any national or legislative developments.

Quality assurance

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

Standards and rigorous quality assurance are maintained by the use of:

- Internal quality assurance
- City & Guilds external quality assurance.

In order to carry out the quality assurance role, Internal Quality Assurers must

- have appropriate teaching and vocational knowledge and expertise
- have experience in quality management/internal quality assurance
- hold or be working towards an appropriate teaching/training/assessing qualification
- be familiar with the occupation and technical content covered within the qualification.

External quality assurance for the qualification will be provided by City & Guilds EQA process. EQAs are appointed by City & Guilds to approve centres, and to monitor the assessment and internal quality assurance carried out by centres. External quality assurance is carried out to ensure that assessment is valid and reliable, and that there is good assessment practice in centres.

The role of the EQA is to:

- provide advice and support to centre staff
- ensure the quality and consistency of assessments and marking/grading within and between centres by the use of systematic sampling
- provide feedback to centres and to City & Guilds.

Learner entry requirements

As part of the assessment for this qualification, learners should already hold the Level 2 Diploma in Electrical Installations (Buildings and Structures) (2365-02) or equivalent in order to complete the qualification satisfactorily.

Without evidence of formal qualifications, candidates must demonstrate adequate prior knowledge and experience to ensure they have the potential to gain the qualification.

Age restrictions

This qualification is approved for learners aged 16 or above.

Access arrangements and reasonable adjustments

City & Guilds has considered the design of this qualification and its assessments in order to best support accessibility and inclusion for all learners. We understand however that individuals have diverse learning needs and may require reasonable adjustments to fully participate. Reasonable adjustments, such as additional time or alternative formats, may be provided to accommodate learners with disabilities and support fair access to assessment.

Access arrangements are adjustments that allow candidates with disabilities, special educational needs, and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

The Equality Act 2010 requires City & Guilds to make reasonable adjustments where a disabled person would be at a substantial disadvantage in undertaking an assessment.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the JCQ access arrangements and reasonable adjustments and Access arrangements - when and how applications need to be made to City & Guilds for more information. Both are available on the **City & Guilds website**

3 Delivering the qualification

Initial assessment and induction

An initial assessment of each learner should be made before the start of their programme to identify:

- if the learner has any specific training needs
- support and guidance they may need when working towards their qualifications
- any units they have already completed or credit they have accumulated which is relevant to the qualification
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the learner fully understands the requirements of the qualification, their responsibilities as a learner and the responsibilities of the centre. This information can be recorded on a learning contract.

Inclusion and diversity

City & Guilds is committed to improving inclusion and diversity within the way we work and how we deliver our purpose which is to help people and organisations develop the skills they need for growth.

More information and guidance to support centres in supporting inclusion and diversity through the delivery of City & Guilds qualifications can be found here:

Inclusion and diversity | City & Guilds (cityandguilds.com)

Sustainability

City & Guilds are committed to net zero. Our ambition is to reduce our carbon emissions by at least 50% before 2030 and develop environmentally responsible operations to achieve net zero by 2040 or sooner if we can. City & Guilds is committed to supporting qualifications that support our customers to consider sustainability and their environmental footprint.

More information and guidance to support centres in developing sustainable practices through the delivery of City & Guilds qualifications can be found here:

Our Pathway to Net Zero | City & Guilds (cityandguilds.com)

Centres should consider their own carbon footprint when delivering this qualification and consider reasonable and practical ways of delivering this qualification with sustainability in mind. This could include:

- reviewing purchasing and procurement processes (such as buying in bulk to reduce the amount of travel time and energy, considering and investing in the use of components that can be reused, instead of the use of disposable or single use consumables)

- reusing components wherever possible
- waste procedures (ensuring that waste is minimised, recycling of components is in place wherever possible)
- minimising water use and considering options for reuse/salvage as part of plumbing activities wherever possible.

Support materials

The following resources are available for this qualification:

Description	How to access
Sample assessments	www.cityandguilds.com
Assignment guides	www.cityandguilds.com
SmartScreen	www.smartscreen.co.uk

4 Assessment

Assessment of the qualification

Candidates must:

- successfully complete assessments for each mandatory unit

Table below lists the different assessment methods for each unit

Assessment types			
Unit	**Title**	**Assessment method**	**Where to obtain assessment materials**
201	Health and safety in building services engineering	Practical Assignment (211) Externally set assignment, locally marked and externally verified City & Guilds on-line multiple choice test (601) These assessments cover the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden. On-line test available for booking on the Walled Garden
301	Understand the fundamental principles and requirements of environmental technology systems	City & Guilds on-line multiple choice test (301) The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** On-line test available for booking on the Walled Garden.
302	Principles of Electrical Science	Written Assignment (612) Externally set assignment, locally marked and externally verified The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden
303	Electrical installations: fault diagnosis and rectification	Practical Assignment (613) Externally set assignment, locally marked and externally verified. City & Guilds on-line multiple choice test (623) These assessments cover the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden. On-line test available for booking on the Walled Garden.

304	Electrical Installations: Inspection, Testing and Commissioning	Practical Assignment (614) Externally set assignment, locally marked and externally verified City & Guilds on-line multiple choice test (624) These assessments cover the knowledge and practical requirements of the unit and assess all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden. On-line test available for booking on the Walled Garden.
305	Electrical Systems Design	Practical Assignment (615) Externally set assignment, locally marked and externally verified City & Guilds on-line multiple choice test (625) These assessments cover the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden. On-line test available for booking on the Walled Garden.
308	Career awareness in building services engineering	Practical Assignment (308) Externally set assignment, locally marked and externally verified The assessment covers the knowledge and practical requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	**www.cityandguilds.com** 2365 webpage. Password available on the Walled Garden.

Assessment strategy

City & Guilds has written the following assignments to use with this qualification:

- live assignments that can be downloaded from the City & Guilds website
- sample papers that can be downloaded from the City & Guilds website.

Time constraints

The following must be applied to the assessment of this qualification:

Candidates must finish their assessment within 24 months.

Accreditation of prior learning (APL)

Guidance on APL between this qualification and the 2357 qualification will be available on the website by the start of November 2012.

Test specifications

The way the knowledge is covered by each test is laid out in the tables below:

Test: 601 Health and safety in building services engineering

Assessment method: e-volve online multiple choice test

Duration: 40 minutes

Permitted materials: closed book and non-programmable calculator

Graded: Pass/Fail

Pass mark: the pass mark for this examination is set at approx. 60%

Test: 2365-601	**Duration: 40 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
201	01 Understand how relevant legislation applies in the work place	**4**	**16**
	02 Understand the procedures for dealing with Environmental and Health and Safety situations in the work environment	**6**	**24**
	03 Understand the procedures for establishing a safe working environment	**7**	**28**
	04 Understand the requirements for identifying and dealing with hazards in the work environment	**8**	**32**
	Total	**25**	**100%**

Test: 301 Understand the fundamental principles and requirements of environmental technology systems

Assessment method: e-volve online multiple choice test

Duration: 75 minutes

Permitted materials: closed book and non-programmable calculator

Graded: Pass/Fail

Pass mark: the pass mark for this examination is set at approx. 60%

Test: 2365-301	**Duration: 75 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
301	01 Know the fundamental working principles of micro-renewable energy and water conservation technologies	**10**	**37**
	02 Know the fundamental requirements of building location/building features for the potential to install micro-renewable and water conservation systems to exist	**9**	**33**
	03 Know the fundamental regulatory requirements relating to micro-renewable energy and water conservation technologies	**4**	**15**
	04 Know the typical advantages and disadvantages of micro-renewable energy and water conservation technologies	**4**	**15**
	Total	**27**	**100%**

Test: 612 Principles of Electrical Science

Assessment method: Written Assignment

Duration: 120 minutes

Permitted materials: closed book and non-programmable calculator

Grade boundaries: Will be approximately

Pass 50%

Merit:65%

Distinction: 80%

*Although candidates are able to achieve a merit or a distinction within this individual unit, this can only be reflected as a pass within this diploma. However, the merit or distinction grade can be carried over to the 5357-03 equivalent unit Electrical Scientific Principles and Technologies.

Test: 2365-612	**Duration: 120 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
302	01 Understand electrical supply systems	**6**	**23**
	02 Understand how different electrical properties can affect electrical circuits, systems and equipment	**8**	**31**
	03 Understand the operating principles and applications of DC machines and AC motors	**4**	**15**
	04 Understand the operating principles of electrical components	**3**	**11**
	05 Understand the principles and applications of electrical lighting systems	**3**	**11**
	06 Understand the principles and applications of electrical heating	**2**	**8**
	Total	**26**	**100%**

Test: 623 Electrical Installations: Fault Diagnosis and Rectification

Assessment method: e-volve online multiple choice test

Duration: 60 minutes

Permitted materials: closed book and non-programmable calculator

Graded: Pass/Fail

Pass mark: the pass mark for this examination is set at approx. 60%

Test: 2365-623	**Duration: 60 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
303	01 Understand the health and safety requirements relevant to fault diagnosis	**3**	**10**
	02 Understand the importance of reporting and communication in fault diagnosis	**2**	**7**
	03 Understand the nature and characteristics of electrical faults	**6**	**20**
	04 Understand the fault diagnosis procedure	**10**	**33**
	05 Understand the procedures and techniques for correcting electrical faults	**9**	**30**
	Total	**30**	**100%**

Test: 624 Electrical Installations: Inspection, Testing and Commissioning

Assessment method: evolve online multiple choice test

Duration: 80 minutes

Permitted materials: closed book and non-programmable calculator

Graded: Pass/Fail

Pass mark: the pass mark for this examination is set at approx. 60%

Test: 2365-624	**Duration: 80 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
304	01Understand the requirements for completing the safe isolation of electrical circuits and installations	**6**	**17**
	02 Understand the requirements for initial verification of electrical installations	**2**	**6**
	03 Understand the requirements for completing the inspection of electrical installations prior to their being placed into service	**Assessed by assignment**	
	04 Understand the requirements for the safe testing and commissioning of electrical installations	**8**	**23**
	05 Understand the requirements for testing before circuits are energised	**7**	**20**
	06 Understand the requirements for testing energised installations	**10**	**28**
	07 Understand the requirements for the completion of electrical installation certificates and associated documentation	**2**	**6**
	Total	**35**	**100%**

Test: 625 Electrical Systems design

Assessment method: e-volve online multiple choice test

Duration: 70 minutes

Permitted materials: IET on-site and non-programmable calculator

Graded: Pass/Fail

Pass mark: the pass mark for this examination is set at approx. 70%

Test: 2365-625	**Duration: 40 minutes**		
Unit	**Outcome**	**Number of questions**	**Percentage %**
305	1 Understand how to prepare for the installation of wiring systems	**5**	**17**
	2 Understand the applications of wiring systems	**9**	**30**
	3 Understand the practices and procedures for carrying out electrical work	**8**	**26**
	6 Understand protection against overcurrent	**5**	**17**
	7 Understand electrical systems and circuits	**3**	**10**
	Total	**30**	**100%**

5 Units

Structure of the units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- health and safety requirements
- learning outcomes, which are comprised of a number of ssessment criteria
- range statements
- notes for guidance, where applicable
- supporting information

Guidance for delivery of the units

This qualification comprises a number of **units**. A unit describes what is expected of a competent person in particular aspects of their job.

Each **unit** is divided into **learning outcomes** which describe in further detail the skills and knowledge that a candidate should possess.

Each **learning outcome** has a set of **assessment criteria** (performance and knowledge and understanding) which specify the desired criteria that must be satisfied before an individual can be said to have performed to the agreed standard.

Range statements define the breadth or scope of a learning outcome and its assessment criteria by setting out the various circumstances in which they are to be applied.

Unit 201 Health and safety in building services engineering

Level:	2
GLH:	26
Credit value:	3
UAN:	T/503/9669
Aim:	This combination unit provides learners with the essential health and safety knowledge and skills to demonstrate best practice in a business services engineering environment or sector. The unit provides learners with an awareness of relevant legislation and should underpin all business services engineering activities learners take part in.
Health and safety:	Health and safety behaviour learned in this mandatory unit should be displayed in all arenas.

Learning outcome
The learner will: 1. Understand how relevant legislation applies in the workplace
Assessment criteria
The learner can: 1. identify **roles** and responsibilities with regard to **current relevant Health and Safety legislation** 2. identify roles and responsibilities with regard to current relevant **environmental legislation**

Range

Roles:

- Employers
- Employees
- Organisations
- Clients.

Relevant Health and Safety 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
- Control of Asbestos at Work Regulations.

Relevant Environmental legislation:

- Control of Asbestos at Work Regulations
- Environmental Protection Act
- The Hazardous Waste Regulations
- Pollution Prevention and Control Act
- Control of Pollution Act
- The Control of Noise at Work Regulations
- The Waste Electrical and Electronic Equipment Regulations.

Learning outcome

The learner will:

2. Understand the procedures for dealing with Environmental and Health and Safety situations 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 actions to be taken in situations which exceed their level of responsibility for Health and Safety in the workplace
4. specify **appropriate responsible persons** to whom Health and Safety and welfare related matters should be reported.
5. describe the **ways in which the environment may be affected by work activities**
6. specify the current **requirements and good working practices** for processing waste on site
7. explain why it is important to report any hazards to the environment that arise from work procedures

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 • RIDDOR reporting procedure **Appropriate responsible persons:** • Employer • Employees • Customer/client • Safety officers • Health & Safety executive/inspectors • Trades union representative • Environmental health officers **Effect of work activities:** • Land contamination • Air pollution • Pollution of water courses **Requirements and good working practices:** • Recycling • Hazardous waste • Landfill

Learning outcome
The learner will: 3. Be able to demonstrate and 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 that should be taken to remove or minimise risks before deciding PPE is needed 3. state the purpose of PPE 4. specify the appropriate protective clothing and equipment that is required for identified work tasks 5. state the first aid facilities that must be available in the work area in accordance with Health and Safety regulations 6. explain why it is important not to misuse first aid equipment/supplies and to replace first aid supplies once used 7. describe and demonstrate safe practices and **procedures** for the use of **equipment and materials** in the working environment 8. specify and demonstrate the procedures for ensuring electrical systems are safe to work on 9. state the **implications** of: a. carrying out safe isolation procedures b. not carrying out safe isolation procedures.

Range
Procedures: • Responsible persons • Competent persons • Safe isolation procedures • Permits to work • Selection and checking correct power tools, hand tools or portable electrical equipment **Equipment and materials:** • Access equipment (PASMA requirements) • Portable power tools (eg cartridge gun, drills, grinders) • Tools and materials storage facilities • Dangerous substances (eg cutting compounds and adhesives) • Ladders • Use of mobile scaffold towers • Use of signs and guarding **Implications:** • Self • Others • Building systems

Learning outcome
The learner will: 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 electrical 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** (inferred through practical) 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, maintenance 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 • Bacteria: Weil's disease • Use of signs to warn of hazards **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

In the delivery of this unit emphasis shall be made to the learner on the necessity to keep up to date with the latest standards, technologies and practices which relate to and affect the topics covered in this unit. This is then in keeping with good engineering practice.

Unit 201 Health and safety in building services engineering

Supporting information

Guidance

Electrical equipment

Includes power tools, lights etc

Safe Isolation Procedure

Recommend referring to JIB Safe Isolation Procedure

On Site

Where reference to ‘on site’ is made in this unit, the intention is that this covers building sites and domestic sites.

It is recommended that assessors cover employee rights in relation to Health & Safety.

This First Aid element of this unit is not intended to replicate a full First Aid course but to give learners the underpinning knowledge to understand the types of injuries they may come across in a workplace.

Unit 301 Understand the fundamental principles and requirements of environmental technology systems

Level:	3
GLH:	15
Credit value:	2
UAN:	K/602/3138
Aim:	This knowledge unit provides learning in the fundamental working principles along with regulatory requirement relating to renewable energy. Be able to distinguish the potential type of building features that will meet the requirements to install renewable energy water conservation along with typical advantages and disadvantages.
Health and safety:	Healthy and safety behaviour learned in mandatory unit 201 should be displayed in all arenas.

Learning outcome
The learner will: 1. Know the fundamental working principles of micro-renewable energy and water conservation technologies
Assessment criteria
The learner can: 1.1 Identify the fundamental working principles for each of the following • heat producing micro-renewable energy technologies: • solar thermal (hot water) • ground source heat pump • air source heat pump • biomass 1.2 Identify the fundamental working principles for each of the following electricity producing micro-renewable energy technologies: • solar photovoltaic • micro-wind • micro-hydro 1.3 Identify the fundamental working principles of the following co-generation technologies:

- micro-combined heat and power (heat-led)

1.4 Identify the fundamental working principles for each of the following water conservation technologies:

- rainwater harvesting
- greywater re-use.

Learning outcome
The learner will: 2. Know the fundamental requirements of building location/building features for the potential to install micro-renewable energy and water conservation systems to exist
Assessment criteria
The learner can: 2.1 Clarify the fundamental requirements for the potential to install a solar water heating system to exist 2.2 Clarify the fundamental requirements for the potential to install a solar photovoltaic system to exist 2.3 Clarify the fundamental requirements for the potential to install a ground source heat pump system to exist 2.4 Clarify the fundamental requirements for the potential to install an air source heat pump system to exist 2.5 Clarify the fundamental requirements for the potential to install a biomass system to exist 2.6 Clarify the fundamental requirements for the potential to install a micro wind system to exist 2.7 Clarify the fundamental requirements for the potential to install a micro hydro system to exist 2.8 Clarify the fundamental requirements for the potential to install a micro-combined heat and power (heat led) system to exist 2.9 Clarify the fundamental requirements for the potential to install a rain water harvesting/greywater re-use system to exist.

Learning outcome
The learner will: 3. Know the fundamental regulatory requirements relating to micro-renewable energy and water conservation technologies
Assessment criteria
The learner can: 3.1 Confirm what would be typically classified as ‘permitted development’ under town and country planning (environmental impact) regulations in relation to the deployment of the following technologies: • solar thermal (hot water) • solar photovoltaic • ground source heat pump • air source heat pump • micro-wind • biomass • micro-hydro • micro-combined heat and power (heat-led) • rainwater harvesting • greywater re-use 3.2 Confirm which sections of the current building regulations/building standards apply in relation to the deployment of the following technologies: • solar thermal (hot water) • solar photovoltatic • ground source heat pump • air source heat pump • micro-wind • biomass • micro-hydro • micro-combined heat and power (heat-led) • rainwater harvesting • greywater re-use.

Learning outcome
The learner will: 4. Know the typical advantages and disadvantages associated with micro-renewable energy and water conservation technologies
Assessment criteria
The learner can: 4.1 Identify typical advantages associated with each of the following technologies: • solar thermal (hot water) • solar photovoltaic • ground source heat pump • air source heat pump • micro-wind • biomass • micro-hydro • micro-combined heat and power (heat-led) • rainwater harvesting • greywater re-use 4.2 Identify typical disadvantages associated with each of the following technologies: • solar thermal (hot water) • solar photovoltaic • ground source heat pump • air source heat pump • micro-wind • biomass • micro-hydro • micro-combined heat and power (heat-led) • rainwater harvesting • greywater re-use.

Unit 302 Principles of Electrical Science

Level:	3
GLH:	111
Credit value:	12
UAN:	A/503/9950
Aim:	The aim of this unit is to enable the candidate to understand the principles of electrical science related to AC theory, machines, devices and systems. This understanding is applied when designing wiring systems for clients and fault diagnosis.
Health and safety:	Health and safety behaviour learned in mandatory unit 201 should be displayed in all arenas.

Learning outcome
The learner will: 1 Understand electrical supply systems
Assessment criteria
The learner can: 1. describe how electricity is generated and transmitted for domestic and industrial/commercial consumption 2. specify the **features and characteristics** of a generation and transmission system 3. state the basic operating principles of **other sources** of electricity 4. describe the main characteristics of: a. single phase electrical supplies b. three phase electrical supplies c. three phase and neutral supplies d. sub-station transformers. 5. identify types of transformers 6. describe the **operating principles, applications and limitations** of transformers 7. determine by calculation and measurement: a. primary and secondary voltages b. primary and secondary current c. kVA rating of a transformer.

Range
Features and characteristics: • Power Stations • Fossil fuels • Hydro • Nuclear • Super-grid and standard grid system • Transformers • Transmission voltages • Distribution voltages • Sub-stations • Above and below ground distribution. **Other sources:** • Batteries, cells or UPS systems • Solar power (thermal and photovoltaic) • Wind energy • Wave energy • Micro hydro • Combined Heat and Power (CHP) including micro-CHP. **Operating principles, applications and limitations:** • Iron loss • Copper loss • Relationship between current and voltage • Primary and secondary windings • Step up and step-down transformers.

Learning outcome
The learner will: 2 Understand how different electrical properties can affect electrical circuits, systems and equipment
Assessment criteria
The learner can: 1. explain the relationship between resistance, inductance, capacitance and impedance 2. determine **electrical quantities** in alternating current circuits 3. explain the relationship between kW, kVAr, kVA and power factor 4. calculate power factor 5. explain what is meant by power factor correction 6. specify methods of power factor correction 7. determine the neutral current in a three-phase and neutral supply and why systems should be balanced 8. calculate values of voltage and current in star and delta connected systems

Range
Electrical quantities: • Resistance • Inductance • Inductive reactance • Capacitance • Capacitive reactance • Impedance

Learning outcome
The learner will: 3 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 **AC motors** 3. state the basic types, applications and limitations of **AC motors** 4. describe the basic operating principles, limitations and applications of **motor control**

Range
DC machines: • Series • Shunt • Compound **AC motors:** • Single phase AC motors (induction, capacitor start, split phase, universal, synchronous) • Three phase AC motors (induction; wound-rotor). **Motor control:** • Direct-on-line • Star-Delta • Rotor-resistance • Soft-start • Variable frequency.

Learning outcome
The learner will: 4 Understand the operating principles of electrical components
Assessment criteria
The learner can: 1. specify the main types and operating principles of **electrical components**

Range

Electrical components:
• Contactors
• Relays
• Solenoids
• Over-current protection devices:
  ○ Fuses (HRC, cartridge and re-wireable)
  ○ Circuit-breakers
  ○ RCBOs.
• RCDs

Learning outcome
The learner will: 5. Understand the principles and applications of electrical lighting systems
Assessment criteria

The learner can:
1. explain the basic principles of illumination and state the applications of:
  a. inverse square law
  b. cosine law
  c. lumen method.
2. explain the operating principles, types, limitations and applications of **luminaires**

Range

Luminaires:
• General Lighting Service (GLS):
  ○ Tungsten
  ○ Halogen.
• Discharge lighting:
  ○ Low and high pressure mercury vapour
  ○ Low and high pressure sodium vapour
  ○ Metal halide.
• Energy saving (such as compact fluorescent lamps)
• LED

Learning outcome
The learner will: 6.Understand the principles and applications of electrical heating
Assessment criteria
The learner can: 1. explain the basic principles of electrical space heating and electrical water heating 2. explain the operating principles, types, limitations and applications of **electrical space and water heating appliances and components**

Unit 303 Electrical installations: fault diagnosis and rectification

Level:	3
GLH:	84
Credit value:	9
UAN:	F/503/9951
Aim:	The unit is designed to enable learners to understand how to carry out fault diagnosis and rectification of complex electrical systems safely and in accordance with regulatory requirements, with an emphasis on period inspection scenarios. Learners will also develop the skills to apply their understanding of fault diagnosis in simulated environments
Health and safety:	Health and safety behaviour learned in mandatory unit 201 should be displayed in all arenas.

Learning outcome
The learner will: 1. Understand the Health and Safety requirements relevant to fault diagnosis
Assessment criteria
The learner can: 1. state the dangers of electricity in relation to fault diagnosis work 2. identify the **Health and Safety requirements** relevant to diagnosing and correcting electrical faults in electrical systems and equipment 3. specify **safe working procedures** that should be adopted for completion of fault diagnosis and correction work.

Range

Health and Safety requirements

- 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

Safe working procedures

- Effective communication with others, i.e. people on the premises, customers etc.
- Use of barriers
- Positioning of notices
- Safe isolation
- Use of equipment to GS 38

Learning outcome

The learner will:

2. Understand the importance of reporting and communication in fault diagnosis

Assessment criteria

The learner can:

1. describe the documentation relevant to fault diagnosis
2. state the **implications** of the fault diagnosis for customers and clients
3. explain the **communication requirements** relevant to fault diagnosis

Range

Implications

- Loss of circuits
- Equipment

Communication requirements

- Informing relevant persons about information on electrical fault diagnosis and correction work
- Why it is important to provide relevant persons with information on fault diagnosis and correction work clearly, courteously and accurately
- Explain why relevant people need to be kept informed during completion of fault correction work:
    - Other workers/colleagues
    - Customers/clients
    - Representatives of other services

Learning outcome
The learner will: 3.Understand the nature and characteristics of electrical faults
Assessment criteria
The learner can: 1. identify types, causes and consequences of **electrical faults** 2. describe typical types of faults and their likely **locations in wiring systems** and equipment.

Range

Electrical faults

- Loss of supply
- Low voltage/voltage drop
- Component/equipment malfunction/failure
- Operation of overload or fault current devices
- Arcing - loose connection
- High resistance - loose connection
- Transient voltages - lighting strike
- Excess current - overload
- Insulation failure - deterioration, mechanical damage
    - Short-circuit
    - Open Circuit
    - Earth fault
- Signal faults

Locations in wiring systems

- Wiring Systems
- Terminations and connections
- Equipment/accessories (switches, luminaires, switchgear and control equipment)
- Instrumentation/metering

Learning outcome
The learner will: 4. Understand the fault diagnosis procedure
Assessment criteria
The learner can: 1. state precautions that must be taken when carrying out fault diagnosis with regard to **particular locations, equipment and circumstances** 2. explain the **logical stages** of fault diagnosis. 3. select the appropriate **test instrument/s** for fault diagnosis work 4. describe how **test instruments** are confirmed to be fit for purpose and functioning correctly 5. specify an appropriate and logical procedures for carrying out fault diagnosis **tests** 6. analyse and determine if **test** results are acceptable

Range
Particular locations, equipment and circumstances: • Lone working • Hazardous areas • Fibre-optic cabling • Electro-static discharge (friction, induction, separation) • Electronic devices (damage by over voltage) • IT equipment (eg. shutdown, damage) • High frequency or capacitive circuits • Presence of batteries (eg. lead acid cells, connecting cells) • Additional sources of energy • Time controlled devices **Logical stages:** • Identification of symptoms • Collection and analysis of data • Use of sources/types of information such as BS 7671, Certificates/Reports, Installation Specifications, drawings/diagrams, manufacturer's information and operating instructions • Maintenance records • Experience (personal and of others) i.e. speaking to operators/customers to determine nature/characteristics of the fault • Checking and testing (eg. supply, protective devices) • Interpreting results/information • Fault correction • Functional testing • Restoration • Test equipment in accordance with HSE guidance document GS 38 **Test instrument/s:** • Voltage indicator

- Low resistance ohm meter
- Insulation resistance testers
- EFLI and PFC tester
- RCD tester
- Tong tester/clamp on ammeter
- Phase sequence tester
- Dead testing
- Live testing

Tests:

- Continuity
- Insulation resistance
- Polarity
- Earth fault loop impedance
- RCD operation
- Current and voltage measurement
- Phase sequence
- Functional testing/checking

Learning outcome
The learner will: 5. Understand the procedures and techniques for correcting electrical faults
Assessment criteria
The learner can: 1. identify **factors** which can affect repair or replacement of equipment 2. specify the procedures for **verifying** that the fault has been corrected suitably for the situation using technical analysis. 3. state the methods to ensure the safe disposal of any waste and that the work area is left in a safe and clean condition

Range
Factors: • Cost • Availability of replacement parts, resources and staff • Down time (planning) • Legal and personal responsibility (eg. contracts, warranties, relevant personnel) • Access to systems and equipment • Provision of emergency or stand by supplies • Client demand (continuous supply, out of hours working) **Verifying:** • Functional testing/checking • Continuity • Insulation resistance • Polarity • Earth fault loop impedance • RCD operation • Current and voltage measurement/ checking presence of supply • Phase sequencing

Learning outcome
The learner will: 6. Perform fault diagnosis
Assessment criteria
The learner can: 1. follow safe working procedures 2. evaluate and apply appropriate fault diagnosis **methods** and techniques 3. diagnose electrical faults using engineering decision and evaluation of symptoms and findings 4. recommend the appropriate action/s to correct the fault

Range
Methods: • Logical stages of fault diagnosis • Identification of symptoms • Collection and analysis of data • Use of sources/types of information - circuit schedule etc. • installation specifications, drawings/diagrams, • Determining nature/characteristics of the fault with discussion with 'customer' (lecturer) • Checking and testing • Interpreting results/information • Functional testing

Unit 304 Electrical Installations: Inspection, Testing and Commissioning

Level:	3
GLH:	110
Credit value:	12
UAN:	R/503/9954
Aim:	The unit is designed to enable learners to understand how to carry out inspection and testing of complex electrical systems safely and in accordance with regulatory requirements. Learners will also develop the skills to apply their understanding in simulated environments
Health and safety:	Health and safety behaviour learned in mandatory unit 201/501 should be displayed in all arenas.

Learning outcome
The learner will: 1. Understand the requirements for completing the safe isolation of electrical circuits and installations
Assessment criteria
The learner can: 1. state the **requirements** of the Electricity at Work Regulations for the safe inspection of electrical systems and equipment 2. specify the appropriate **procedure** for completing safe isolation 3. state the **reasons** for carrying out safe isolation 4. state the **implications** of carrying out safe isolation 5. state the **implications** of not carrying out safe isolation 6. identify the **Health and Safety requirements** which apply when inspecting, testing and commissioning electrical installations and circuits

Range

Requirements:
In terms of:

- Those carrying out the work
- Those using the premises during the inspection.

Procedure:
Carrying out safe working practices:

- 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
- Suitable testing methods
- Selecting locking devices for securing isolation
- Warning notices
- Appropriate sequence for isolating circuits.

Reasons: In relation to:

- The inspector
- Other personnel
- Customers/clients
- Public
- Building systems.

Implications: In relation to:

- The inspector
- Other personnel
- Customers/clients
- Public
- Building systems (removal of supply).

Health and Safety requirements:

- 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.

Learning outcome
The learner will: 2. Understand the requirements for initial verification of electrical installations
Assessment criteria
The learner can: 1. state the purpose of the Initial Verification of electrical installations 2. state the requirements of the initial verification 3. identify the **relevant documents** associated with the inspection, testing and commissioning of an electrical installation 4. specify the information that is required by the inspector to conduct the initial verification of an electrical installation

Range
Relevant documents: • Electricity at Work Regulations • BS 7671 • IET Guidance Note 3 • HSE Guidance

Learning outcome
The learner will: 3. Understand the requirements for completing the inspection of electrical installations prior to their being placed into service
Assessment criteria
The learner can: 1. select appropriate items to be checked during the inspection process 2. identify human senses appropriate for initial verification 3. state how the senses can be used during the inspection process 4. specify the **requirements for the inspection** of electrical installations 5. specify the requirements for the inspection to include: a. special installations and locations as identified in Part 7 of BS 7671 b. IP Classification of equipment.

Range
Requirements for the inspection: • Earthing conductors • Earth electrodes • Circuit protective conductors • Main and supplementary protective bonding conductors • Devices for isolation and switching • Type and rating of overcurrent protective devices • Type and rating of RCDs and RCBOs • Barriers and Enclosures • Containment systems (Steel and Plastic) • Cables • Conductors and terminations • Electrical accessories

Learning outcome
The learner will: 4. Understand the requirements for the safe testing and commissioning of electrical installations
Assessment criteria
The learner can: 1. state the tests to be carried out on an electrical installation in accordance with the BS 7671 and IET Guidance Note 3 2. identify the appropriate instrument for each test to be carried out in terms of: a. The instrument is fit for purpose b. Identifying the correct scale or setting. 3. specify the requirements for the safe use of instruments to be used for testing and commissioning, to include: a. Checks required to prove that test instruments are safe and functioning correctly b. The requirements for test leads and probes must comply with HSE Guidance GS38 c. The need for instruments to be regularly checked and calibrated. 4. explain why it is necessary for test results to comply with standard values 5. state the actions to be taken in the event of unsatisfactory results being obtained 6. explain why testing is carried out in the sequence specified in BS 7671 and IET Guidance Note 3

Learning outcome
The learner will: 5. Understand the requirements for testing before circuits are energised
Assessment criteria
The learner can: 1. state why it is necessary to verify continuity to include: a. protective bonding conductors b. circuit protective conductors c. ring final circuit conductors. 2. state the methods for verifying continuity to include: a. protective conductors b. ring final circuit conductors. 3. explain **factors that affect conductor resistance values** 4. specify the **procedures** for completing insulation resistance testing 5. state the effects on insulation resistance values that the following can have: a. cables connected in parallel b. variations in cable length. 6. explain why it is necessary to verify polarity 7. state the procedures for verifying polarity

Range
Factors that affect conductor resistance values: • Cables connected in parallel • Variations in cable length • Variations in conductor cross sectional area. **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 • Identifying typical voltage sensitive devices • Particular requirements for testing where there are voltage sensitive devices and/or surge protection devices installed.

Learning outcome
The learner will: 6. Understand the requirements for testing energised installations
Assessment criteria
The learner can: 1. state the procedures for confirming polarity of the incoming supply 2. specify the methods for measuring earth electrode resistance to include: a. installations forming part of a TT system b. generators and transformers. 3. describe **common earth fault loop paths** 4. state the **methods for verifying protection** by automatic disconnection of supply 5. identify the requirements for the measurement of prospective fault current 6. specify the methods for **determining** prospective **fault current** 7. verify the suitability of protective devices for prospective fault currents 8. specify the methods for testing the correct operation of residual current devices 9. state the reasons for verifying phase sequence 10. state the methods used to verify phase sequence 11. state the need for functional testing 12. identify items which require functional testing 13. state the appropriate **procedures for dealing with clients** during the commissioning and certification process

Range
Common earth fault loop paths: • TT • TN-S • TN-C-S **Methods for verifying protection:** • The measurement of the external earth fault loop impedance (Ze) and the system earth fault loop • Impedance (Zs) • Establishing Ze by enquiry • Calculation of the value of Zs from given information • Comparing measured Zs values with the maximum tabulated figures as specified in BS 7671 including the application of the correction factor **Requirements for determining fault current:** • Single phase installations • Three phase installations **Procedures for dealing with clients:** • Ensuring the safety of others during the work activities • Keeping clients informed during the process • Labelling electrical circuits, systems and equipment that are still to be commissioned • Providing clients with all the appropriate documentation upon work completion

Learning outcome
The learner will: 7. Understand the requirements for the completion of electrical installation certificates and associated documentation
Assessment criteria
The learner can: 1. explain the purpose of certification and associated **documentation** 2. state the information that must be contained on initial verification **documentation** 3. describe the certification process for a completed installation 4. identify the responsibilities of different relevant personnel in relation to the completion of the certification process 5. explain the requirements for the recording and retention of completed initial verification documentation in accordance with the BS 7671

Range
• **Documentation:** • An Electrical Installation Certificate • A Minor Electrical Installation Works Certificate • Schedule of Inspections • Schedule of Test results

Learning outcome
The learner will: 8. Be able to confirm safety of system and equipment prior to completion of inspection, testing and commissioning
Assessment criteria
The learner can: 1. carry out safe isolation procedures in accordance with regulatory requirements 2. comply with the Health and Safety requirements of themselves and others within the work location during the initial verifications process 3. check the safety of electrical systems prior to the commencement of inspection, testing and commissioning

Learning outcome
The learner will: 9. Be able to carry out inspection of electrical installations prior to them being placed into service
Assessment criteria
The learner can: 1. identify a safe system of work appropriate to the work activity 2. carry out an initial inspection of an electrical installation in accordance with the requirements of BS 7671 and IET Guidance Note 3 3. complete a Schedule of Inspections in accordance with BS 7671 and IET Guidance Note 3 based on engineering evaluation of the installation to be verified

Learning outcome
The learner will: 10. Be able to test electrical installations prior to them being placed into service
Assessment criteria
The learner can: 1. select the test instruments and their accessories for tests to include: a. continuity b. insulation resistance c. polarity d. earth electrode resistance e. earth fault loop impedance f. prospective fault current g. RCD operation h. phase sequence i. functional testing 2. evaluate the appropriate tests suitable for the installation to be verified 3. carry out tests in accordance with BS 7671, IET On-site Guide and Guidance notes 3 to include: a. continuity including: i. main protective bonding conductors ii. circuit protective conductors iii. Ring Final Circuits b. insulation resistance c. polarity d. external earth fault loop impedance (Ze) e. system earth fault loop impedance (Zs) f. prospective fault current g. RCD operation including additional protection h. phase sequence i. functional testing 4. confirm compliance by evaluating and verifying test results 5. complete appropriate documentation in accordance with the BS 7671 and IET Guidance Note 3 including:

a. electrical Installation Certificate b. schedule of Inspections c. schedule of Test results

Learning outcome
The learner will: 11. Be able to commission electrical systems and equipment
Assessment criteria
The learner can: 1. clarify the commissioning procedures with relevant persons 2. carry out the commissioning of circuits, accessories and equipment to confirm functionality

Unit 305 Electrical Systems Design

Level:	3
GLH:	110
Credit value:	12
UAN:	K/503/9958
Aim:	This unit provides the learner with the understanding of electrical systems design using design techniques and determining system requirements. It also provides learners with the understanding needed to plan work programmes and contractual implications of electrical design
Health and safety:	Health and safety behaviour learned in mandatory unit 201 should be displayed in all arenas.

Learning outcome
The learner will: 1. Understand how to prepare for the installation of wiring systems
Assessment criteria
The learner can: 1. Describe how to plan and implement: a. work allocations b. duties of operatives for whom they are responsible c. coordination with other services and personnel 2. identify **relevant sources of information** which will inform electrical work 3. describe the **actions required** to ensure that electrical work sites are correctly prepared in terms of Health and Safety considerations 4. state why it is important to check for any pre-existing damage to **customer/client property** prior to commencement of any work activity 5. explain how to check for any pre-existing damage to **customer/client property**: a. equipment and components b. building décor and floor finishes. 6. state the actions that should be taken if pre-existing damage to customer/client property is identified 7. specify methods for protecting the fabric and structure of the property before and during electrical work

Range
Relevant 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. • Materials schedule • Bar charts • Spread sheets • Critical Path Analysis **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. • Provision of safe storage facilities **Customer/client property:** • Building wall/floor fabric

Learning outcome
The learner will: 2. Understand the applications of wiring systems
Assessment criteria
The learner can: 1. explain the constructional features, applications, advantages and limitations of **electrical cables** 2. explain the **characteristics** of **containment, support and wiring systems** used in electrical installations 3. determine the size of conduit and trunking as appropriate to the size and number of cables 4. describe the **factors** which affect the selection of **wiring systems, associated equipment and enclosures.** 5. Assess and select suitable wiring systems and equipment appropriate to the situation and use

Range

Electrical cables:

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

Characteristics:

- Constructional features
- Applications
- Advantages
- Limitations

Containment, support and wiring systems:

- Conduit (PVC and Metallic)
- Trunking (PVC and Metallic)
- Cable Tray
- Cable Basket
- Ladder systems
- Ducting
- Modular wiring systems
- Busbar systems and Power track

Factors:

- Building
- Utilisation
- Environment
- Cost

Wiring systems and equipment:

- 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
- Escape routes

Learning outcome
The learner will: 3. Understand the practices and procedures for carrying out electrical work
Assessment criteria
The learner can: 1. state the procedures for selecting and safely using appropriate hand tools, power tools and adhesives for electrical 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 5. assess and specify the installation methods and procedures to ensure that in accordance with the installation specification and statutory and non-statutory regulations: a. wiring systems, enclosures, cables and components are securely fixed and installed b. a wiring system's mechanical integrity is maintained c. no damage to the wiring system or its components has occurred 6. specify methods and techniques for restoring the building fabric

Range
Criteria: • Load bearing capacity • Fabric of structure • Environmental considerations • Aesthetic considerations

Learning outcome
The learner will: 4. Understand the characteristics and applications of supply systems and consumer's equipment
Assessment criteria
The learner can: 1. explain the characteristics and applications of **earthing arrangements** 2. explain the characteristics and applications of **supply systems** 3. specify the arrangements for electrical installations and systems with regard to provision for a. isolation and switching b. overcurrent protection c. earth fault protection

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

Learning outcome
The learner will: 4. Understand earthing and protection
Assessment criteria
The learner can: 1. explain the purpose of earthing and protective conductors 2. identify extraneous and exposed conductive parts 3. describe the requirements and measures for protection against electric shock 4. state the maximum disconnection time for different types of circuit 5. explain the earth fault loop path and earth fault loop impedance 6. specify requirements and applications of functional earthing 7. select suitably sized protective conductors in accordance with BS 7671

Learning outcome
The learner will: 6.Understand protection against overcurrent
Assessment criteria
The learner can: 1. identify types of and reasons for **overcurrent** 2. explain the operating principles, applications and limitations of **protective devices** 3. identify fault current capacities of devices 4. outline the need for discrimination between protective devices

Range
Overcurrent: • Short circuits • Earth Faults • Overloads **Protective devices:** • Fuses • CBs • RCDs/RCBOs, circuit overload and short-circuit protection • (BS3036, re-wireable, BS1361/2 cartridges, BS88 HBC)

Learning outcome
The learner will: 7.Understand electrical systems and circuits
Assessment criteria
The learner can: 1. describe the characteristics of standard **electrical circuits** 2. outline the key characteristics of particular **electrical systems and circuits** and the applications of these circuits and systems

Range
Electrical circuits: • Lighting circuits • Socket outlet circuits • Supplies to fixed equipment **Electrical systems and circuits:** • Distribution systems (sub mains) • Environmental control/building energy management systems • Emergency Lighting • Security systems – Fire Alarm/Prevention; Unlawful Entry; Emergency Lighting • UPS • Closed Circuit TV, communication and data transmission systems • Machine control • Heating control

Learning outcome
The learner will: 8. Understand the electrical design procedure
Assessment criteria
The learner can: 1. state the purpose of diversity factors 2. select suitable current using equipment giving consideration to energy efficiency and relevant codes of practice for sustainability 3. determine the maximum demand (of an installation) after the application of diversity 4. determine the design current 5. select a suitably rated protective device 6. establish the installation method reference 7. determine appropriate rating factors 8. determine the minimum cross-sectional area of live conductors taking into consideration current carrying capacity and voltage drop 9. establish if the voltage drop is acceptable 10. verify if the disconnection times have been achieved 11. evaluate thermal constraints 12. interpret the requirements of **sources of information** in the design of an installation

Range
Sources of information: • BS 7671 • Guidance notes • Other relevant standards

Unit 308 Career awareness in building services engineering

Level:	3
GLH:	20
Credit value:	2
UAN:	K/504/0253
Aim:	This unit will introduce learners to the concept of planning for own career development and setting goals to help realise plans. Learners will investigate the different crafts that make up Building Services Engineering. Learners are required to compile documents to support career plans including Curriculum Vitaes and personal statements. The unit is designed to demonstrate to learners that there are many optional career pathways including becoming highly skilled in own craft or exploring supervisory responsibilities.

Learning outcome
The learner will: 1. Understand how to plan for careers in building services engineering
Assessment criteria
The learner can: 1.1 Identify **resources** to support career planning 1.2 Describe **elements** of career planning 1.3 Describe **documents** to support career development 1.4 Explain the **principles** of goal setting 1.5 Describe how to set **goals** 1.6 Define the different **roles** in building services engineering 1.7 Explain **opportunities for progression** within building services engineering.

Range
Resources Internet, publications, professional bodies/organisations, educational support and guidance, independent research, mentors, networking, job descriptions, role models, job centres, recruitment agencies, awarding organisations **Elements** Goal setting, qualifications, Curriculum Vitae (CV), person specification, aspirations, work experience, SWOT analysis **Documents** Curriculum Vitae (CV), personal statement, portfolio, cover letter, references, business plans **Principles** SMART targets, SWOT analysis **Goals** Short, medium, lon **Roles** Installation electrician, heating and ventilation service and maintenance engineer, plumber, heating and ventilation engineer, refrigeration engineer, maintenance electrician, ductwork installer, air-conditioning engineer **Opportunities for progression** Supervisor, manager, business owner, highly skilled in craft, sideways moves to different crafts, assessor/trainer, designer, surveyor, estimator, apprenticeship, engineer, director **Types** Contract work, private, consultancy, sub-contractor, casual labour

Learning outcome
The learner will: 2. Understand the requirements to become a qualified operative in building services engineering
Assessment criteria
The learner can: 2.1 Describe **specific requirements** for career choices in building services engineering 2.2 Identify the **areas** in building services which run competent person schemes 2.3 Define the **term competent person scheme (CPS)** 2.4Identify the renewal requirements for being part of competent person schemes 2.5 Describe the **consequences** of not being part of the competent person scheme when working in building services engineering

Range
Specific requirements Qualifications, experience, competency, legal **Areas** Gas, hot water, cold water, electrical, air conditioning, solid fuel, environmental technologies, oil **Term competent person scheme (CPS)** To enable self-certification of own work carried out **Consequences** Fines, imprisonment, loss of license to practice, injury

Appendix 1 Relationships to other qualifications

Links to other qualifications
This qualification has connections to the:

Level 2 Diploma in Electrical Installations (Buildings and Structures) (2365)
Level 2 NVQ in Plumbing and Heating (6189)
Level 3 NVQ in Plumbing and Heating (6189)
Level 3 NVQ in Electrotechnical Services (2357)
Level 2 NVQ in Heating and Ventilating (6188)
Level 3 NVQ in Heating and Ventilating (6188)
Level 2 NVQ in Refrigeration and Air Conditioning (6087)
Level 3 NVQ in Refrigeration and Air Conditioning (6087)
Level 2 Diploma in Plumbing Studies (6035)
Level 3 Diploma in Plumbing Studies (6035)
Level 2 Diploma in Heating and Ventilating (7188)
Level 3 Diploma in Heating and Ventilating (7188)
Level 2 Diploma in Refrigeration, Air Conditioning and Heat Pump Systems (7189)
Level 3 Diploma in Refrigeration, Air Conditioning and Heat Pump Systems (7189)

Literacy, language, numeracy and ICT skills development
This qualification can develop skills that can be used in the following qualifications:

Functional Skills (England) – see www.cityandguilds.com/functionalskills
Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
Essential Skills Wales – see www.cityandguilds.com/esw

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Appendix 2 Disclaimer

This document must be completed by the candidate and the tutor as part of the qualification induction.

You have been enrolled on the **Level 3 Diploma in Electrical Installations (Buildings and Structures) (2365-03).** This is a qualification that tests both practical and knowledge based skills in a realistic working environment. When you have successfully completed this qualification you will be at an **Improver/Electrician's Mate** level.

In order to fully qualify as an Electrician you will need to fully meet the performance criteria as laid down in the National Occupational Standards put together by Summit Skills, the Sector Skills Council. This is covered in the City and Guilds 2357 Level 3 NVQ Diploma in Electrotechnical Technology.

Your tutor/assessor will be able to explain how you may progress onto the City and Guilds 2357 Level 3 NVQ Diploma in Electrotechnical Technology. **However, you should be aware that the relevant performance units will need to be carried out in industry.** Completion of the 2357 will enable you to apply to join an industry graded or competent person's scheme.

I can confirm that as part of my induction the above statement has been explained and I understand that completing the City and Guilds Level 3 Diploma in Electrical Installations (Buildings and Structures) (2365-03) qualification <u>will not make me a fully qualified Electrician.</u>

Candidate _____ Date _____

Tutor _____ Date-_____

Appendix 3 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centre document library** on **www.cityandguilds.com** or click on the links below:

Centre Handbook: Quality Assurance Standards

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on:

- centre quality assurance criteria and monitoring activities
- administration and assessment systems
- centre-facing support teams at City & Guilds/ILM
- centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the centre contract.

Centre Assessment: Quality Assurance Standards

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre-assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.

It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre assessments.

Access arrangements: When and how applications need to be made to City & Guilds provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **Centre document library** also contains useful information on such things as:

- conducting examinations
- registering learners
- appeals and malpractice.

Useful contacts

Please visit the **Contact us** section of the City & Guilds website.

City & Guilds

For over 140 years, we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life-changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments and credentials that lead to jobs and meet the changing needs of industry.

We partner with our customers to deliver work-based learning programmes that build competency to support better prospects for people, organisations and wider society. We create flexible learning pathways that support lifelong employability because we believe that people deserve the opportunity to (re)train and (re)learn again and again – gaining new skills at every stage of life, regardless of where they start.

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