

# **City & Guilds Level 2 Diploma in Electrical Installations (Buildings and Structures) (2365-02)**

March 22 Version 1.9



## Qualification at a glance

<b>Subject area</b>	<b>Electrotechnical</b>
<b>City &amp; Guilds number</b>	2365-02
<b>Age group approved</b>	16+
<b>Entry requirements</b>	None
<b>Assessment</b>	By online test/practical assignment
<b>Fast track</b>	Available
<b>Support materials</b>	Qualification handbook Assessment Task Manual TextBook available June 2013 Smartscreen available February 2013
<b>Registration and certification</b>	Consult the Walled Garden/Online Catalogue for last dates

<b>Title and level</b>	<b>City &amp; Guilds number</b>	<b>GLH</b>	<b>GLH</b>	<b>Accreditation number</b>
Level 2 Diploma in Electrical Installation (Buildings and Structures)	2365-02	454	490	600/5498/0

<b>Version and date</b>	<b>Change detail</b>	<b>Section</b>
1.1 Aug 2012	Correction of Assessment information	<b>Assessment</b>
1.2 Sept 2012	Amended information on where to obtain assessments	<b>Assessment</b>
1.3 Sept 2012	Amended typing error in unit aim for unit 201.	<b>Unit</b>
1.4 Feb 2013	Added Appendix 3 – Normative references for use in open book examinations	
1.5 Feb 2013		
1.6 July 2017	Review and update to the following units: 201 and 202	<b>Units and Assessment</b>
1.7 October 2017	Test duration for unit 210 amended to 40 minutes. Permitted material added to all test specifications. Range added to LO 4 in unit 201	<b>Unit and Assessment</b>
1.8 October 2019	Amended the Unit accreditation number for 210	<b>Structure</b>

1.9 March 2022	TQT clarification and highlighted CG added to front cover and amended address on rear	Pages 2 and 6 Front cover and rear
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# 1 Introduction

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

<b>Area</b>	<b>Description</b>
Who is the qualification for?	For candidates who want to work as electricians in the building services engineering sector. This qualification does <b>not</b> make candidates fully qualified electricians (see Appendix 2).
What does the qualification cover?	It 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 <b>not</b> as a fully qualified electrician, or to the following City & Guilds qualifications: <ul style="list-style-type: none"><li>• Level 3 Diploma in Electrical Installation (Buildings and Structures)</li><li>• Level 3 Diploma in Electrotechnology</li><li>• Level 3 Award in the Initial Verification and Certification of Electrical Installations</li><li>• Level 3 Award in the Periodic Inspection, Testing and Certification of Electrical Installations.</li></ul>

## Structure

To achieve the **Level 2 Diploma in Electrical Installations (Buildings and Structures)**, learners must achieve **49** credits from the mandatory units available.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Level	GLH
T/503/9669	201	Health and safety in building services engineering	3	2	26
R/503/9937	202	Principles of electrical science	10	2	89
Y/503/9938	203	Electrical installations technology	12	2	115
R/503/9940	204	Installation of wiring systems and enclosures	21	2	196
J/602/2482	210	Understand how to communicate with others within building services engineering	3	2	28

## Total Qualification Time

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

Title and level	GLH	TQT
<b>Level 2 Diploma in Electrical Installations (Buildings and Structures),</b>	454	490



## 2 Centre requirements

### Approval

#### Centres already offering City & Guilds qualifications

If your Centre is approved to offer the **2330 Certificate in Electrotechnical Technology** you can apply for the new **Level 2 Diploma in Electrical Installations (Buildings and Structures) (2365-02)** approval using the **fast track approval form**, available from the City & Guilds website.

Centres should use the fast track form if:

- there have been no changes to the way the qualifications are delivered, and
- they meet all of the approval criteria in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After 12 months, the Centre will have to go through the standard Qualification Approval Process. The centre is responsible for checking that fast track approval is still current at the time of application.

#### Centres NOT already offering City & Guilds qualifications

To offer this qualification, new centres will need to gain both centre and qualification approval. Please refer to the *Centre Manual - Supporting Customer Excellence* for further information.

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

### Resource requirements

#### Physical resources and site agreements

Centres can use specially designated areas within a centre to develop practical skills and to assess the simulated practical assignments. The equipment, systems and machinery must meet industrial standards and be capable of being used under normal working conditions.

## 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
- hold appropriate qualifications detailed in this handbook
- have recent relevant experience in the specific area they are assessing
- be able to demonstrate occupational competence in the areas of the Building Services Engineering (BSE) for which they are delivering training and/or assessment. This competence must be at a level equal to, or above, the level of training being delivered and must include current knowledge and skills of each industry (for which the assessment is taking place), its techniques, settings, legislative and regulatory requirements, codes of practice and guidance
- have credible experience of providing training and/or assessment.

Centre staff may undertake more than one role, eg tutor and assessor or internal quality assurer, but must never verify their own assessments.

### Assessors must;

- hold, or be working towards TAQA (A1/A2 – D32/33 updated) standards and continue to practice to these standards and possess CPD evidence of personally maintaining these standards, or
- have other suitable equivalent assessor qualifications endorsed by the Sector Skills Council and/or the Awarding Organisation.

### Assessor Occupational Competence

For the purposes of this qualification, occupational competence will be deemed to have been demonstrated by the verifiable evidence of **one, preferably more**, of the following:

- **a relevant sector** qualification equal to or at a level above the training and/or assessment being delivered. Where earlier forerunner qualifications are held eg City and Guilds Craft or Advanced Craft Certificated, the assessor must demonstrate through CPD evidence a thorough knowledge of the qualification standards that they meet the required criteria
- **an up-to-date CPD record including relevant CPD qualifications.** 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 or have one or more relevant occupational qualifications to demonstrate that they can be regarded as occupationally competent in terms of assessing or verifying the qualification and the unit contained
- **a verifiable CV** of industry experience and current knowledge of industry practice and techniques relevant to the occupational area in which they assess. This verifiable evidence must be **at or above the level being assessed**
- a thorough **knowledge and understanding** of the qualification standards and requirements



### **Assessor continuing professional development (CPD)**

The occupational competence of assessors must be updated on a regular basis and be periodically reconfirmed via CPD evidence and quality assured by City and Guilds.

It is the responsibility of the assessor to make use of opportunities for CPD such as industry conferences and events, access to trade publications and journals, SSC and professional/Trade Association events, at least on an annual basis to enhance and upgrade their professional development and technical knowledge.

It is imperative that evidence records of these CPD opportunities/occasions are maintained and retained in a verifiable CPD record.

### **Guidance note**

Where questions arise about the occupational competence/qualification of an individual/trainer/assessor, these should be referred to the centre's Qualifications Adviser for a decision. The Qualification Adviser may decide to refer the decision to the Portfolio/Group Portfolio Consultant for further consideration.

### **Candidate entry requirements**

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully.

### **Age restrictions**

This qualification is approved for learners 16+.

### **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.



## 3 Delivering the qualification

### Initial assessment and induction

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

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualification
- 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 candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Induction should also be used to ensure that candidates are aware that this qualification does **not** make them qualified electricians. **All candidates must complete a declaration confirming their understanding. This declaration can be found in Appendix 2.**

### Support materials

The following resources are available for this qualification:

Description	How to access
Level 2 Assessment Task Manual	City and Guilds website
Text Book	Available from May 2013
Smartscreen	Available from January 2013



## 4 Assessment

### Assessment of the qualification

Unit Number	Unit Title	Assessment method	Where to obtain assessment materials
201	Health and safety in building services engineering	<p>Practical Assignment (211)</p> <p>City and Guilds on-line multiple choice test (601)</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 <b>www.cityandguilds.com</b> and navigate to the 2365 webpage. Password available on the Walled Garden.</p> <p>Test available for booking on the Walled Garden</p>
202	Principles of Electrical Science	<p>City and Guilds on-line multiple choice test (602)</p> <p>The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p>	<p>Test available for booking on the Walled Garden</p>
203	Electrical Installations Technology	<p>City and Guilds on-line multiple choice test (203)</p> <p>The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.</p>	<p>Test available for booking on the Walled Garden</p>
204	Installation of wiring systems and enclosures	<p>Practical Assignment</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 <b>www.cityandguilds.com</b> and navigate to the 2365 webpage. Password available on the Walled Garden</p>

210	Understand how to communicate with others within building services engineering	City and Guilds on-line multiple choice test  The assessment covers the knowledge requirements of the unit and assesses all learning outcomes to verify coverage of the unit.	Test available for booking on the Walled Garden
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## 4.1 Test Specifications

**Test:** Unit 601 Health and safety in building services engineering

**Duration:** 40 minutes

**Grade boundaries:** Pass is approximately 60%

**Permitted Materials:** Closed book

Non-programmable calculator

<b>Unit</b>	<b>Outcome</b>	<b>Number of questions</b>	<b>%</b>
601	01 Understand how relevant legislation applies in the work place	<b>4</b>	<b>16</b>
	02 Understand the procedures for dealing with Environmental and Health and Safety situations in the work environment	<b>6</b>	<b>24</b>
	03 Understand the procedures for establishing a safe working environment	<b>7</b>	<b>28</b>
	04 Understand the requirements for identifying and dealing with hazards in the work environment	<b>8</b>	<b>32</b>
	<b>Total</b>	<b>25</b>	<b>100</b>

**Test:** Unit 602 Principles of electrical science

**Duration:** 90 minutes

**Grade boundaries:** pass is approximately 50%

**Permitted Materials:** Closed book

Non-programmable calculator

<b>Unit</b>	<b>Outcome</b>	<b>Number of questions</b>	<b>%</b>
602	01 Understand mathematical principles which are appropriate to electrical installation, maintenance and design work	<b>2</b>	<b>5</b>
	02 Understand standard units of measurement used in electrical installation, maintenance and design work	<b>5</b>	<b>13</b>
	03 Understand basic mechanics and the relationship between force, work, energy and power	<b>7</b>	<b>18</b>
	04 Understand the relationship between resistance, resistivity, voltage current and power	<b>15</b>	<b>37</b>
	05 Understand the fundamental principles which underpin the relationship between magnetism and electricity	<b>7</b>	<b>17</b>
	06 Understand the types, applications and limitations of electronic components in electrotechnical systems and equipment	<b>4</b>	<b>10</b>
	<b>Total</b>	<b>40</b>	<b>100</b>

**Test:** Unit 203 Electrical installations technology

**Duration:** 75 minutes

**Grade boundaries:** pass is approximately 60%

**Permitted Materials:** IET On-site Guide  
Non-programmable calculator

<b>Unit</b>	<b>Outcome</b>	<b>Number of questions</b>	<b>%</b>
203	01 Know implications of electrical industry regulations	3	8
	02 Know how to obtain technical information	5	12
	03 Know wiring systems of electrical installations	15	38
	04 Know requirements earthing systems	9	22
	05 Know how electricity is supplied	5	12
	06 Know requirements for different types of micro-renewable energies	3	8
	<b>Total</b>	<b>40</b>	<b>100</b>

**Test:** Unit 210 Understand how to communicate with others within building services engineering

**Duration:** 40 minutes

**Grade boundaries:** pass is approximately 60%

**Permitted Materials:** Closed book  
Non-programmable calculator

<b>Unit</b>	<b>Outcome</b>	<b>Number of questions</b>	<b>%</b>
210	01 Know the members of the construction team and their role within the building services industry	5	25
	02 Know how to apply information sources in the building services industry	9	45
	03 Know how to communicate with others in the building services industry	6	30
	<b>Total</b>	<b>20</b>	<b>100</b>



## 5 Availability of units

The following units can also be obtained from The Register of Regulated Qualifications: <http://register.ofqual.gov.uk/Unit>

### Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- guided learning hours
- unit aim
- health and safety requirements
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance, where applicable.



## Unit 201

## Health and safety in building services engineering

<b>UAN:</b>	<b>T/503/9669</b>
<b>Level:</b>	Level 2
<b>Credit value:</b>	3
<b>GLH:</b>	26
<b>Aim:</b>	This combination unit provides learners with the essential health & 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.
<b>Health and safety:</b>	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**

<b>Range</b>
<p><b>Roles:</b></p> <ul style="list-style-type: none"> <li>• Employers</li> <li>• Employees</li> <li>• Organisations</li> <li>• Clients.</li> </ul> <p><b>Relevant Health and Safety legislation:</b></p> <ul style="list-style-type: none"> <li>• The Health and Safety at Work Act</li> <li>• The Electricity at Work Regulations</li> <li>• The Management of Health and Safety at Work Regulations</li> <li>• Workplace (Health and Safety and Welfare) Regulations</li> <li>• Control of Substances Hazardous to Health (COSHH) Regulations</li> <li>• Working at Height Regulations</li> <li>• Personal Protective Equipment at Work Regulations</li> <li>• Manual Handling Operations Regulations</li> <li>• Provision and Use of Work Equipment Regulations</li> <li>• Control of Asbestos at Work Regulations.</li> </ul> <p><b>Relevant Environmental legislation:</b></p> <ul style="list-style-type: none"> <li>• Control of Asbestos at Work Regulations</li> <li>• Environmental Protection Act</li> <li>• The Hazardous Waste Regulations</li> <li>• Pollution Prevention and Control Act</li> <li>• Control of Pollution Act</li> <li>• The Control of Noise at Work Regulations</li> <li>• The Waste Electrical and Electronic Equipment Regulations.</li> </ul>

<b>Learning outcome</b>
<p>The learner will:</p> <ol style="list-style-type: none"> <li>2. Understand the procedures for dealing with Environmental and Health and Safety situations in the work environment</li> </ol>
<b>Assessment criteria</b>
<p>The learner can:</p> <ol style="list-style-type: none"> <li>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</li> <li>2. specify <b>appropriate procedures</b> which should be followed when emergency situations occur in the workplace</li> <li>3. state the actions to be taken in situations which exceed their level of responsibility for Health and Safety in the workplace</li> <li>4. specify <b>appropriate responsible persons</b> to whom Health and Safety and welfare related matters should be reported.</li> <li>5. describe the <b>ways in which the environment may be affected by work activities</b></li> <li>6. specify the current <b>requirements and good working practices</b> for processing waste on site</li> </ol>

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.

<b>Learning outcome</b>
The learner will: 4. Understand the requirements for identifying and dealing with hazards in the work environment
<b>Assessment criteria</b>
The learner can: <ol style="list-style-type: none"> <li>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)</li> <li>2. define what is meant by the term hazard in relation to Health and Safety legislation in the workplace</li> <li>3. identify <b>specific hazards</b> associated with the installation and maintenance of electrical systems and equipment</li> <li>4. describe <b>situations</b> which can constitute a hazard in the workplace</li> <li>5. explain practices and procedures for addressing <b>hazards in the work place</b> (inferred through practical)</li> <li>6. identify the correct type of fire extinguisher for a particular type of fire</li> <li>7. explain situations <b>where asbestos may be encountered</b></li> <li>8. specify the procedures for dealing with the suspected presence of asbestos in the workplace</li> </ol>

<b>Range</b>
<p><b>Specific hazards:</b></p> <ul style="list-style-type: none"> <li>• Electric shock (direct and indirect contact)</li> <li>• Burns</li> <li>• Fires</li> <li>• Explosions.</li> </ul> <p><b>Situations:</b></p> <ul style="list-style-type: none"> <li>• Temporary electrical supplies</li> <li>• Trailing leads/cables</li> <li>• Slippery or uneven surfaces</li> <li>• Presence of dust and fumes</li> <li>• Handling and transporting equipment or materials</li> <li>• Contaminants and irritants</li> <li>• Fire</li> <li>• Working at height</li> <li>• Hazardous malfunctions of equipment</li> <li>• Improper use, maintenance and storage of tools and equipment.</li> </ul> <p><b>Hazards in the workplace:</b></p> <ul style="list-style-type: none"> <li>• Temporary electrical supplies</li> <li>• Trailing leads/cables</li> <li>• Slippery or uneven surfaces</li> <li>• Presence of dust and fumes</li> <li>• Handling and transporting equipment or materials</li> <li>• Contaminants and irritants</li> <li>• Fire</li> <li>• Working at height</li> </ul>

- Hazardous malfunctions of equipment
- Improper use and storage of tools and equipment
- Bacteria: Weil's disease.

**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.
- Use of signs to warn of hazards

# Unit 201      Health and safety in building services engineering

## Supporting information

### 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.

This unit is assessed by **two** mandatory components (211) Assignment and (601) online evolve test.

<b>UAN:</b>	<b>R/503/9937</b>
<b>Level:</b>	Level 2
<b>Credit value:</b>	10
<b>GLH:</b>	89
<b>Aim</b>	The aim of this unit is to enable the candidate to know the basic principles of electrical science. This knowledge provides the foundation for electrical installations which can be applied when designing wiring systems for clients and when inspection and testing electrical installations.
<b>Health and safety:</b>	Health and safety behaviour learned in mandatory unit 201/501 should be displayed in all arenas.

<b>Learning outcome</b>
The learner will: 1. Understand mathematical principles which are appropriate to electrical installation, maintenance and design work
<b>Assessment criteria</b>
The learner can: 1. identify and apply appropriate <b>mathematical principles</b> which are relevant to electrical work tasks

<b>Range</b>
<b>Mathematical principles:</b> <ul style="list-style-type: none"> <li>• Fractions and percentages</li> <li>• Algebra</li> <li>• Indices</li> <li>• Transposition</li> <li>• Triangles and trigonometry</li> <li>• Statistics.</li> </ul>



<b>Learning outcome</b>
The learner will: 2. Understand standard units of measurement used in electrical installation, maintenance and design work
<b>Assessment criteria</b>
The learner can: 1. identify and use internationally recognised base and derived <b>(SI) units of measurement</b> 2. identify and determine values of base and derived SI units which apply specifically to <b>electrical quantities</b> 3. identify appropriate electrical instruments for the measurement of different <b>electrical quantities</b>

<b>Range</b>
<p><b>(SI) Units of measurement for:</b></p> <ul style="list-style-type: none"> <li>• Length</li> <li>• Area</li> <li>• Volume</li> <li>• Mass</li> <li>• Density</li> <li>• Time</li> <li>• Temperature</li> <li>• Velocity.</li> </ul> <p><b>Electrical quantities (SI units):</b></p> <ul style="list-style-type: none"> <li>• Resistance</li> <li>• Resistivity</li> <li>• Power</li> <li>• Frequency</li> <li>• Current</li> <li>• Voltage</li> <li>• Energy</li> <li>• Impedance</li> <li>• Inductance and inductive reactance</li> <li>• Capacitance and capacitive reactance</li> <li>• Power factor.</li> </ul> <p><b>Electrical quantities (measurement):</b></p> <ul style="list-style-type: none"> <li>• Resistance</li> <li>• Power</li> <li>• Current</li> <li>• Voltage</li> <li>• Energy.</li> </ul>

<b>Learning outcome</b>
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The learner will:  
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:
  - a. force
  - b. work
  - c. energy (kinetic and potential)
  - d. power
  - e. efficiency.
4. calculate values of mechanical energy, power and efficiency

**Range**

**Levers:**

- class I
- class II
- class III

**Learning outcome**

The learner will:  
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 distinguish between materials which are good conductors and insulators
3. describe what is meant by resistance and resistivity in relation to electrical circuits
4. explain the relationship between current, voltage and resistance in parallel and series D.C. circuits
5. calculate the values of current, voltage and resistance in parallel and series D.C. circuits
6. calculate values of power in parallel and series D.C. circuits
7. state what is meant by the term voltage drop in relation to electrical circuits
8. describe the chemical and thermal effects of electric currents

**Learning outcome**

<p>The learner will:</p> <p>5. Understand the fundamental principles which underpin the relationship between magnetism and electricity</p>
<p><b>Assessment criteria</b></p> <p>The learner can:</p> <ol style="list-style-type: none"> <li>1. describe the effects of magnetism in terms of attraction and repulsion</li> <li>2. state the difference between magnetic flux and flux density</li> <li>3. describe the magnetic effects of electrical currents in terms of:             <ol style="list-style-type: none"> <li>a. production of a magnetic field</li> <li>b. force on a current-carrying conductor in a magnetic field</li> <li>c. electromagnetism</li> <li>d. electromotive force.</li> </ol> </li> <li>4. describe the basic principles of generating an A.C. supply in terms of:             <ol style="list-style-type: none"> <li>a. a single-loop generator</li> <li>b. sine-wave</li> <li>c. frequency</li> <li>d. EMF</li> <li>e. magnetic flux.</li> </ol> </li> <li>5. identify the <b>characteristics of sine-waves</b></li> </ol>

<p><b>Range</b></p> <p><b>Characteristics of a sine-wave:</b></p> <ul style="list-style-type: none"> <li>• Root Mean Square (RMS) value</li> <li>• Average value</li> <li>• Peak to peak value</li> <li>• Periodic time</li> <li>• Frequency</li> <li>• Amplitude.</li> </ul>
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<b>Learning outcome</b>
The learner will: 6. Understand the types, applications and limitations of electronic components in electrical systems and equipment
<b>Assessment criteria</b>
The learner can: 1. describe the function and application of electronic components that are used in <b>electrical systems</b> 2. state the basic operating principles of <b>electronic components and devices</b>

<b>Range</b>
<p><b>Electrical systems:</b></p> <ul style="list-style-type: none"> <li>• Security alarms</li> <li>• Telephones</li> <li>• Dimmer switches</li> <li>• Heating/boiler controls</li> <li>• Motor control</li> <li>• Wireless control systems.</li> </ul> <p><b>Electronic components and devices:</b></p> <ul style="list-style-type: none"> <li>• Capacitors</li> <li>• Resistors</li> <li>• Rectifiers</li> <li>• Diodes</li> <li>• Zener</li> <li>• LED</li> <li>• photo</li> <li>• Thermistors</li> <li>• Diacs</li> <li>• Triacs</li> <li>• Transistors</li> <li>• Thyristors</li> <li>• Invertors.</li> </ul>

### Supporting information

#### 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.

This unit is assessed by **one** mandatory component (602) evolve test.

## Unit 203      Electrical installations technology

<b>UAN:</b>	<b>Y/503/9938</b>
<b>Level:</b>	Level 2
<b>Credit value:</b>	12
<b>GLH:</b>	115
<b>Aim:</b>	The purpose of this knowledge unit is for the candidate to gain knowledge of the underpinning principles and industry standards and requirements of electrical installation technology. They will know about sources of information and the types of information they provide about wiring systems. They will also know about earthing systems and the installation of wiring systems.
<b>Health and safety:</b>	Health and safety behaviour learned in mandatory unit 201/501 should be displayed in all arenas.

<b>Learning outcome</b>
The learner will: 1. Know implications of electrical industry regulations
<b>Assessment criteria</b>
The learner can: 1.1 Identify statutory regulations 1.2 Identify non statutory regulations/guidance 1.3 State implications of statutory regulations 1.4 State implications of non-statutory regulations.

<b>Range</b>
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**Statutory regulations**

HASAWA, EAWR, ESQCR, PUWER, COSHH, CDM, Manual Handling, PPE, Noise at Work, Environmental Act, DDA, Equal Opportunities.

**Non statutory regulations/guidance**

BS7671, On-Site Guide, Unite Union Book, Guidance Notes, Codes of Practice.

**Implications**

Prosecution, fine, imprisonment, prohibition notices, improvement notices, dismissal, injury, death, loss of earnings, lost clients, loss of reputation.

<b>Learning outcome</b>
The learner will: 2. Know how to obtain technical information
<b>Assessment criteria</b>
The learner can: 2.1 State purpose of different <b>sources</b> of technical information 2.2 Recognise different <b>drawing types</b> 2.3 Recognise <b>symbols</b> used in drawings 2.4 Convert scale from drawings to actual dimensions.

<b>Range</b>
<p><b>Sources</b> Specifications (to select correct materials), drawings (provide technical information on wiring systems), BS7671 On-Site Guide, Unite Union Book, manufacturers data, Guidance Notes (install in accordance with regulations), client's needs.</p> <p><b>Drawing types</b> As fitted drawings, circuit diagrams, block diagrams, schematics, wiring diagrams, bar charts.</p> <p><b>Symbols</b> Switching (one way, two way, intermediate, pull, switched socket outlets, unswitched socket outlets, fused connection units, switched fused connection units) lighting points (fluorescent, incandescent, LED, wall), cooker control unit, consumer control unit, integrated meter, fuse, circuit breaker.</p>



<b>Learning outcome</b>
The learner will: 3. Know wiring systems of electrical installations
<b>Assessment criteria</b>
The learner can: <b>3.1</b> Describe principles of operation of different <b>circuit types</b> <b>3.2</b> Identify <b>wiring systems</b> for different <b>environments</b> <b>3.3</b> Determine minimum current carrying capacity of live conductors for given <b>installation conditions</b> <b>3.4</b> State <b>applications</b> of different types of <b>protective devices</b> <b>3.5</b> Identify purpose of <b>specialised</b> equipment for installing <b>wiring systems</b> <b>3.6</b> Calculate spacing factor of <b>wiring enclosures</b> .

<b>Range</b>
<p><b>Circuit types</b> Lighting, power and heating, alarm and emergency systems, data communications, control circuits, ring final, radial.</p> <p><b>Wiring systems</b> Cable tray, cable trunking, cable conduit, ladder racking, thermoplastic multi-core, flat profile, SWA, MICC, Fire resistant, thermoplastic single-core, support methods and requirements, component parts.</p> <p><b>Environments</b> Domestic, commercial, hazardous, industrial installation, agricultural.</p> <p><b>Installation conditions</b> <math>I_b</math> <math>I_n</math> <math>I_z</math> <math>I_t</math> <math>C_a</math> <math>C_c</math> <math>C_f</math>, <math>C_g</math> <math>C_i</math> voltage drop Methods of Installation</p> <p><b>Applications</b> Domestic, commercial, hazardous, industrial installation, agricultural, load characteristic.</p> <p><b>Protective devices</b> Fuses (BS88 (gM, gG), BS3036,), circuit breaker BSEN60898 Types B, C and D, RCD BSEN 61008, RCBO BSEN 61009 Types B, C and D.</p> <p><b>Specialised</b> Conduit and tray benders, stocks, dies, formers.</p> <p><b>Wiring enclosures</b> Conduit, trunking.</p>

**Learning outcome**

The learner will:

4. Know requirements earthing systems

**Assessment criteria**

The learner can:

**4.1** Identify different types of **earthing systems**

**4.2** Identify **component parts** of Automatic Disconnection of Supply (ADS)

**4.3** Identify exposed conductive parts

**4.4** Identify extraneous conductive parts

**4.5** Identify **component parts** of an earth loop impedance path.

**Range****Earthing systems**

TT, TN-S, TN-C-S.

**Component parts**

CPC, main protective bonding conductor, supplementary equipotential bonding conductor, earthing conductor, protective devices, earth electrode.

**Exposed conductive parts**

Steel conduit, steel trunking, steel tray, steel enclosures of wiring systems, metal accessories, metallic equipment.

**Extraneous conductive parts**

Metallic service pipes (gas, oil, water), steel duct work, structural steel.

**Component parts**

$Z_s$ ,  $Z_e$ ,  $R_1$ ,  $R_2$ , main earthing terminal (MET), supplier's earth return path.

**Learning outcome**

The learner will:

5. Know how electricity is supplied

**Assessment criteria**

The learner can:

**5.1** Identify **methods** of generating electricity for distribution

**5.2** Identify transmission voltages

**5.3** Identify distribution voltages

**5.4** State the **component parts** of the electrical distribution network.

**Range****Methods**

Coal, oil, biomass, wind, wave, hydro, nuclear, photo-voltaic, gas, micro-generation.

**Transmission voltages**

400 kV, 275 kV, 132 kV.

**Distribution voltages**

33 kV, 11 kV, 400/230 V.

**Component parts**

Sub-stations, pylons, power stations, cables, insulators, transformers.

**Learning outcome**

The learner will:

6. Know requirements for different types of micro-renewable energies

**Assessment criteria**

The learner can:

6.1 Describe types of micro-renewable energies

6.2 Identify **requirements** for installation of micro-renewable energies

**6.3** Identify advantages and disadvantages of **micro-renewable energies.**

**Range**

**Micro-renewable energies**

Solar thermal (hot water), ground source heat pump, air source heat pump, biomass, solar photovoltaic, micro-wind, micro-hydro, micro-combined heat and power (heat led), rainwater harvesting, greywater re-use.

**Requirements**

Legal, regulatory, location.

## Unit 204

## Installation of wiring systems and enclosures

<b>UAN:</b>	<b>R/503/9940</b>
<b>Level:</b>	Level 2
<b>Credit value:</b>	21
<b>GLH:</b>	196
<b>Aim:</b>	This practical unit will develop in learners the skills required to install wiring systems to recognised standards. Learners will learn to use tools and materials effectively in completing well defined tasks for electrical installations. In addition to learning to install systems, learners will also develop skills to inspect and test wiring systems.
<b>Health and safety:</b>	Health and safety behaviour learned in mandatory unit 201/501 should be displayed in all arenas.

<b>Learning outcome</b>
The learner will: 1. Know tools used to install wiring systems
<b>Assessment criteria</b>
The learner can: 1.1 Identify <b>hand tools</b> for different tasks 1.2 Identify <b>power tools</b> for different tasks 1.3 Describe <b>safety checks</b> used for tools.

<b>Range</b>
<b>Hand tools</b> Rules, levels, gauges, plumb lines, cable cutters, screwdrivers, wire strippers, knife, files, reamers, wrenches, hammer, saws.
<b>Power tools</b> Drill, hammer drill, pillar drill, electric screwdriver.
<b>Safety checks</b> Check safe to use, correct speed setting, correct attachments, attached correctly, guards in place, correct PPE, best performance (sharp).

<b>Learning outcome</b>
The learner will: 2. Know how to prepare for installing wiring systems
<b>Assessment criteria</b>
The learner can: 2.1 Identify possible <b>hazards</b> in the workspace 2.2 Identify <b>PPE</b> for different tasks 2.3 Select access equipment.

<b>Range</b>
<b>Hazards</b> Circuit isolation, safe working practices, risk assessment/method statement.
<b>PPE</b> Hard hat, safety glasses, safety shoes, gloves, ear defenders, protective work wear.
<b>Access Equipment</b> Ladders, platforms, hop up.

<b>Learning outcome</b>
The learner will: 3. Be able to install wiring systems
<b>Assessment criteria</b>
The learner can: 3.1 Select materials from drawings 3.2 Mark out dimensions on work areas from drawings 3.3 Fix accessories to dimensions from drawings 3.4 Install wiring systems and supports <b>3.5 Terminate wiring systems</b> 3.6 Maintain safe working practices 3.7 Use JIB safe isolation procedures.

<b>Range</b>
<b>Wiring Systems</b> Single and multicore thermoplastic cable, Fire resistant cable, data cable, multicore armoured cable, cable tray, cable conduit (steel and PVC), cable trunking.

<b>Learning outcome</b>
The learner will: 4. Be able to bond mains services to main earthing terminal
<b>Assessment criteria</b>
The learner can: 4.1 Identify cable sizes 4.2 Terminate cables 4.3 Connect bonding clamps 4.4 Test continuity.

<b>Learning outcome</b>
The learner will: 5. Be able to inspect a 'dead electrical installation.
<b>Assessment criteria</b>
The learner can: 5.1 Verify that wiring systems conform to IET standards.

<b>Learning outcome</b>
The learner will: 6. Be able to test a dead electrical installation
<b>Assessment criteria</b>
The learner can: 6.1 Test continuity of protective conductor 6.2 Test ring final circuit 6.3 Test insulation resistance 6.4 Test polarity <b>6.5 Test functionality</b> 6.6 Record test results.

<b>Range</b>
<b>Functionality</b> Of switches and devices by movement, by continuity test Live under supervision.

## Unit 210

## Understand how to communicate with others within building services engineering

<b>UAN:</b>	<b>J/602/2482</b>
<b>Level:</b>	Level 2
<b>Credit value:</b>	3
<b>GLH:</b>	28
<b>Aim:</b>	This knowledge unit provides learning in the development and continued maintenance of effective working relationships in the building services industry associated with work in dwellings, industrial and commercial premises and for private and contract type clients.

**Learning outcome**

The learner will:

1. Know the members of the construction team and their role within the building services industry

**Assessment criteria**

The learner can:

- 1.1 Identify the key roles of the site management team:

- architect
- project manager/clerk of works
- structural engineer
- surveyor
- building services engineer
- quantity surveyor
- buyer
- estimator
- contracts manager
- construction manager.

- 1.2 Identify the key roles of the individuals that report to the site management team:

- sub contractors
- site supervisor
- trade supervisor
- trades:
  - bricklayer
  - joiner
  - plasterer
  - tiler
  - electrician
  - H&V fitter
  - gas fitter
  - decorator
  - ground workers

- 1.3 Identify the key roles of site visitors:

- building control inspector
- water inspector
- HSE inspector
- electrical services inspector.



**Learning outcome**

The learner will:

2. Know how to apply information sources in the building services industry

**Assessment criteria**

The learner can:

- 2.1 Identify the types of statutory legislation and guidance information that applies to working in the industry:
  - legislation
    - data protection
    - equal opportunities
    - health & safety
    - employment
  - regulations
  - british standards
  - codes of practice
  - manufacturer guidance:
    - installation instructions
    - service & maintenance instructions
    - user instructions
- 2.2 Identify the purpose of information that is used in the workplace:
  - job specifications
  - plans/drawings
    - work programmes
  - delivery notes
  - time sheets
  - policy documentation – health & safety, environmental, customer service
- 2.3 Identify the purpose of information given to customers:
  - quotations
  - estimates
  - invoices/statements
  - statutory cancelation rights
  - handover information
- 2.4 State the importance of company policies and procedures that affect working relationships:
  - company working policies/procedures:
    - behaviour
    - timekeeping
    - dress code
    - contract of employment
  - limits to personal authority:
    - apprentices
    - level 2 qualified staff
    - level 3 qualified staff
  - supervisor and management responsibilities.

<b>Learning outcome</b>
The learner will: 3. Know how to communicate with others in the building services industry
<b>Assessment criteria</b>
The learner can: 3.1 Identify suitable communication methods for use in work situations: <ul style="list-style-type: none"> <li>• oral communication</li> <li>• written communication: <ul style="list-style-type: none"> <li>○ e-mail</li> <li>○ fax</li> <li>○ letter</li> </ul> </li> </ul>
3.2 Define methods of effective communication for people with: <ul style="list-style-type: none"> <li>• physical disabilities</li> <li>• learning difficulties</li> <li>• language differences: <ul style="list-style-type: none"> <li>○ dialects</li> <li>○ accents</li> <li>○ foreign and second language issues</li> </ul> </li> </ul>
3.3 State the actions to take to deal with conflicts between: <ul style="list-style-type: none"> <li>• customers and operatives</li> <li>• co-workers</li> <li>• supervisors and operatives</li> </ul>
3.4 State the effects that poor communication may have on an organisation: <ul style="list-style-type: none"> <li>• between operatives</li> <li>• between operatives and management</li> <li>• • company to customer.</li> </ul>



## Appendix 1 Relationships to other qualifications

### Links to other qualifications

This qualification has connections to the:

- Level 3 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](http://www.cityandguilds.com/functionalskills)
- Essential Skills (Northern Ireland) – see [www.cityandguilds.com/essentialskillsni](http://www.cityandguilds.com/essentialskillsni)
- Essential Skills Wales – see [www.cityandguilds.com/esw](http://www.cityandguilds.com/esw)



## 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 2 Diploma in Electrical Installations (Buildings and Structures) (2365-02)**. 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 2 Diploma in Electrical Installations (Buildings and Structures) (2365-02) qualification will not make me a fully qualified Electrician.**

Candidate \_\_\_\_\_ Date \_\_\_\_\_

Tutor \_\_\_\_\_ Date \_\_\_\_\_



## Appendix 3 Normative references for use in open book examinations

203 Electrical Installations Technology

- IET On-Site Guide (BS 7671: 2008)

## Appendix 4 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).

***Centre Manual - Supporting Customer Excellence*** 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, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

***Our Quality Assurance Requirements*** encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

***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:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for GOLA/e-volve assessments.

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## Useful contacts

<b>UK learners</b> <b>General qualification information</b>	<b>T: +44 (0)844 543 0033</b> <b>E: learnersupport@cityandguilds.com</b>
<b>International learners</b> General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: <b>intcg@cityandguilds.com</b>
<b>Centres</b> Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <b>centresupport@cityandguilds.com</b>
<b>Single subject qualifications</b> 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: <b>singlesubjects@cityandguilds.com</b>
<b>International awards</b> 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: <b>intops@cityandguilds.com</b>
<b>Walled Garden</b> Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <b>walledgarden@cityandguilds.com</b>
<b>Employer</b> Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: <b>business@cityandguilds.com</b>
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