

# Level 2 Technical Certificate in Electrical Installation (8202-20)

Version 1.7 (April 2024)

**Qualification Handbook Technicals**

## Qualification at a glance

|   |  |
|---|--|
| <b>Industry area</b>                                      | Electrical Installation  |
| <b>City &amp; Guilds number</b>                           | 8202-20  |
| <b>Age group</b>  | 16-18 (Key Stage 5) and 19+  |
| <b>Entry requirements</b>                                 | Centres must ensure that any pre-requisites stated in the <i>What is this qualification about?</i> section are met.  |
| <b>Assessment</b>   | <p>To gain this qualification, candidates must successfully achieve the following assessments:</p> <ul style="list-style-type: none"> <li>• One externally set, externally moderated assignment</li> <li>• One externally set, externally marked exam, sat under examination conditions</li> </ul> |
| <b>Additional requirements to gain this qualification</b> | Employer involvement in the delivery and/or assessment of this qualification is essential for all candidates and will be externally quality assured.   |
| <b>Grading</b>  | Pass/Merit/Distinction/Distinction*  |
| <b>Approvals</b>  | This qualification requires full centre and qualification approval   |
| <b>Support materials</b>                                  | <p>Sample assessments<br/>           Guidance for delivery<br/>           Guidance on use of marking grids</p>   |
| <b>Registration and certification</b>                     | Registration and certification of this qualification is through the Walled Garden, and is subject to end dates.  |
| <b>External quality assurance</b>                         | This qualification is externally quality assured by City & Guilds, and its internally marked assignments are subject to external moderation. There is no direct claims status available for this qualification.  |

| Title and level  | GLH | TQT | City & Guilds qualification number | Ofqual accreditation number |
|--|-----|-----|------------------------------------|-----------------------------|
| Level 2 Technical Certificate in Electrical Installation | 360 | 600 | 8202-20                            | 603/0228/8                  |

| Version and Date   | Change Detail  | Section   |
|--------------------|--|---|
| June 2017 V1.1     | Addition of the examination paper based module number  | 1. Introduction – Assessment requirements and employer involvement<br>5. Assessment<br>5. Assessment – exam Specification<br>7. Grading – Awarding grades and reporting results |
|                    | Removal of AO 6-8 from Synoptic Assignments  | 5. Assessment – Assessment Objectives   |
|                    | Addition of Provisional Grade Boundaries for the Synoptic Assignment   | 7. Grading  |
|                    | Revised Exam Specification, Exam Duration and AO weightings  | 5. Assessment – Exam Specification  |
|                    | Branding Changes   | Throughout  |
| November 2017 V1.2 | Revised Exam Specification – change to AO weighting  | 5. Assessment – Exam Specification  |
| January 2018 V1.3  | Revised Exam Specification – duration corrected  | 5. Assessment – Exam Specification  |
| May 2019 V1.4      | Amended references to BS88-2 fuses   | Topics 2.1 and 2.2  |
| February 2021 V1.5 | Amended range under Topic 1.1 to correct to HSE and to remove additional row of Control of Asbestos Work Regulations | Unit 201  |
| April 2022 V1.6    | Clarified permitted assessment materials   | 5. Assessment   |
| April 2024 V1.7    | Update of Quality Assurance Statement  | Centre Requirements   |

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# 1 Introduction

## What is this qualification about?

The following purpose is for the **City & Guilds Level 2 Technical Certificate in Electrical Installation**.

| Area   | Description   |
|--|---|
| <b>OVERVIEW</b>  |   |
| Who is the qualification for?  | This qualification is for you if you are a 16-19 year old learner, who wishes to work as an electrician in the building services industry. It has been designed to deliver a high level of occupational skills and provide a platform from which to progress through further into an apprenticeship programme or into employment. This route at Level 2 is a step towards becoming a competent electrician.   |
| What does the qualification cover?   | <p>The qualification will help you gain an understanding of the skills required within the electrotechnical sector. You will cover compulsory aspects such as:</p> <ul style="list-style-type: none"><li>• Scientific Principles</li><li>• Installation of wiring systems and enclosures</li><li>• Electrical Installations Technology</li></ul> <p>Centres and providers work with local employers who will contribute to the knowledge and delivery of training. Employers will provide demonstrations and talks on the industry and where possible work placements will also be provided by the employers. This practically based training is ideal preparation for gaining employment in the electrotechnical industry or specialist further study.</p> |
| <b>WHAT COULD THIS QUALIFICATION LEAD TO</b>   |   |
| Will the qualification lead to employment, and if so, in which job role and at what level? | This technical qualification focuses on the development of knowledge and practical skills needed for working in the electrotechnical industry, which will prepare you to enter an electrotechnical apprenticeship programme or progress onto the level 3 Advanced Diploma in Electrical Installation. On completion of the Apprenticeship, the learner will be recognised by the industry as competent as an installation or maintenance electrician.   |
| Why choose this qualification over similar qualifications?                                 | This qualification is aimed at learners who are not yet employed in the electrotechnical industry but wish to learn the skills needed to progress further, and help them embark   |

| Area | Description |
|------|-------------|
|------|-------------|

on an electrotechnical apprenticeship programme.

Will the qualification lead to further learning?

This qualification prepares you for an electrotechnical apprenticeship programme, which fully qualifies you to work as an electrician. The apprenticeship will give you an understanding of suitable on-site skills and further knowledge required to work in the electrical industry. Once qualified, there are many further specific and specialised qualifications enhancing skills within the industry, such as electrical design, inspection and testing, appliance safety and environmental technology systems.

| WHO SUPPORTS THIS QUALIFICATION |  |
|---------------------------------|--|
|---------------------------------|--|

Employer/Higher Education Institutions

The IET is one of the world’s largest Engineering institutions with over 167,000 members in 127 countries. As the leading institution within the Electrotechnical sector, the IET supports this qualification for young people to progress into the Electrotechnical industry. The IET has worked with City & Guilds as part of its development process to scope out the qualification. The IET is satisfied that the content meets both the Institution’s needs as a leading professional body in this sector and those of the people taking it who are preparing for a career within the industry.

## Qualification structure

For the **Level 2 Technical Certificate in Electrical Installation** the teaching programme must cover the content detailed in the structure below

| City & Guilds unit number | Unit title | GLH |
|---------------------------|------------|-----|
|---------------------------|------------|-----|

### Mandatory Units

|     |  |     |
|-----|--|-----|
| 201 | Health and Safety and Industry Practices | 60  |
| 202 | Electrical Science                       | 90  |
| 203 | Electrical Installation                  | 150 |
| 204 | Electrical Technology                    | 60  |

### Total Qualification Time (TQT)

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 |
|--|-----|-----|
| Level 2 Technical Certificate in Electrical Installation | 360 | 600 |

### Assessment requirements and employer involvement

To achieve the **Level 2 Technical Certificate in Electrical Installation** candidates must successfully complete **both** mandatory assessment components.

| Component number | Title   |
|------------------|---|
| <b>Mandatory</b> |   |
| 021              | Level 2 Electrical Installation – Synoptic assignment |
| 020 or 520       | Level 2 Electrical Installation – Theory exam         |

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

### Employer involvement

| Component number | Title                |
|------------------|----------------------|
| <b>Mandatory</b> |                      |
| 820              | Employer involvement |



## 2 Centre requirements

### Approval

New centres will need to gain centre approval. Existing centres who wish to offer this qualification must go through City & Guilds' full Qualification Approval Process. There is no fast track approval for this qualification. Please refer to the City & Guilds website for further information on the approval process: [www.cityandguilds.com](http://www.cityandguilds.com)

### Resource requirements

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

#### *Centre staffing*

Staff delivering these qualifications must be able to demonstrate that they meet the following requirements:

- be occupationally competent at or above the level they are delivering
- hold a relevant trade qualification and/or having registration with a relevant trade organisation as 'Approved tradesperson' status or Eng-Tech status
- be able to deliver across the breadth and depth of the content of the qualification being taught
- have recent relevant teaching and assessment experience in the specific area they will be teaching, or be working towards this
- demonstrate continuing CPD.

#### *Physical resources*

Centres must be able to demonstrate that they have access to the equipment and technical resources required to deliver this qualifications and their assessments.

#### *Internal Quality Assurance*

Internal quality assurance is key to ensuring accuracy and consistency of tutors and markers. Internal Quality Assurers (IQAs) monitor the work of all tutors involved with a qualification to ensure they are applying standards consistently throughout assessment activities. IQAs must have, and maintain, an appropriate level of technical competence and be qualified to make both marking and quality assurance decisions through a teaching qualification or recent, relevant experience.

### Quality assurance

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

## **Learner entry requirements**

Centres must ensure that all learners have the opportunity to gain the qualification through appropriate study and training, and that any prerequisites stated in the "*What is this qualification about?*" section are met when registering on this qualification.

### ***Age restrictions***

These qualifications are approved for learners aged 16-18, 19+.

## 3 Delivering technical qualifications

### Initial assessment and induction

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

- if the learner has any specific learning or training needs
- support and guidance they may need when working towards their qualifications
- 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.

### Employer involvement

Employer involvement is essential to maximise the value of each learner's experience. Centres are required to involve employers in the delivery of technical qualifications at Key Stage 5 and/or their assessment, for every learner. This must be in place or planned before delivery programmes begin in order to gain qualification approval. See Employer involvement for more detail.

### Support materials

The following resources are available for these qualifications:

| Description                      | How to access   |
|----------------------------------|---|
| Sample assessments               | Available on the qualification pages on the City & Guilds Website:<br><b><a href="http://www.cityandguilds.com">www.cityandguilds.com</a></b> |
| Guidance for delivery            |   |
| Guidance on use of marking grids |   |

## 4 Employer involvement

Employer involvement is a formal component of Key Stage 5 Technical qualifications. It does not contribute to the overall qualification grading, but is a mandatory requirement that all learners must meet. As such it is subject to external quality assurance by City & Guilds.

Department for Education (DfE) requirements state:

*Employer involvement in the delivery and/or assessment of technical qualifications provides a clear 'line of sight' to work, enriches learning, raises the credibility of the qualification in the eyes of employers, parents and students and furthers collaboration between the learning and skills sector and industry.*

*[Technical qualifications] must:*

- *require all students to undertake meaningful activity involving employers during their study; and*
- *be governed by quality assurance procedures run by the awarding organisation to confirm that education providers have secured employer involvement for every student.*

Extract from: *Vocational qualifications for 16 to 19 year olds, 2017 and 2018 performance tables: technical guidance for awarding organisations, paragraphs 89-90*

City & Guilds will provide support, guidance and quality assurance of employer involvement.

### Qualification approval

To be approved to offer City & Guilds Technicals, centres must provide an Employer Involvement planner and tracker showing how every learner will be able to experience meaningful employer involvement, and from where sufficient and suitable employer representatives are expected to be sourced.

Centres must include in their planner a sufficient range of activities throughout the learning programme that provide a range of employer interactions for learners. Centres must also plan contingencies for learners who may be absent for employer involvement activities, so that they are not disadvantaged.

As part of the approval process, City & Guilds will review this planner and tracker. Centres which cannot show sufficient commitment from employers and/or a credible planner and tracker will be given an action for improvement with a realistic timescale for completion. **Approval will not be given** if employer involvement cannot be assured either at the start of the qualification, or through an appropriate plan of action to address this requirement before the learner is certificated.

### Monitoring and reporting learner engagement

Employer involvement is a formal component of this qualification and is subject to quality assurance monitoring. Centres must record evidence that demonstrates that each learner has been involved in meaningful employer based activities against the mandatory content before claiming the employer involvement component for learners.

Centres must record the range and type of employer involvement each learner has experienced and submit confirmation that all learners have met the requirements to City & Guilds. If a centre cannot provide evidence that learners have met the requirements to achieve the component, then the learner will not be able to achieve the overall Technical Qualification.

## Types of involvement

Centres should note that to be eligible, employer involvement activities **must** relate to one or more elements of the mandatory content of this qualification.

As the aim of employer involvement is to enrich learning and to give learners a taste of the expectations of employers in the industry area they are studying, centres are encouraged to work creatively with local employers.

Employers can identify the areas of skills and knowledge in their particular industry that they would wish to see emphasised for learners who may apply to work with them in the future. Centres and employers can then establish the type of input, and which employer representative might be able to best support these aims.

To be of most benefit this must add to, rather than replace the centre's programme of learning.

Some examples of meaningful employer involvement are listed below. Employer involvement not related to the mandatory element of the qualification, although valuable in other ways, does not count towards this element of the qualification.

The DfE has provided the following examples of what does and does not count as meaningful employer involvement, as follows<sup>1</sup>:

### ***The following activities meet the requirement for meaningful employer involvement:***

- *students undertake structured work-experience or work-placements that develop skills and knowledge relevant to the qualification;*
- *students undertake project(s), exercises(s) and/or assessments/examination(s) set with input from industry practitioner(s);*
- *students take one or more units delivered or co-delivered by an industry practitioner(s). This could take the form of master classes or guest lectures;*
- *industry practitioners operate as 'expert witnesses' that contribute to the assessment of a student's work or practice, operating within a specified assessment framework. This may be a specific project(s), exercise(s) or examination(s), or all assessments for a qualification.*

*In all cases participating industry practitioners and employers must be relevant to the industry sector or occupation/occupational group to which the qualification relates.*

### ***The following activities, whilst valuable, do not meet the requirement for meaningful employer involvement:***

- *employers' or industry practitioners' input to the initial design and content of a qualification;*
- *employers hosting visits, providing premises, facilities or equipment;*
- *employers or industry practitioners providing talks or contributing to delivery on employability, general careers advice, CV writing, interview training etc;*
- *student attendance at career fairs, events or other networking opportunities;*
- *simulated or provider-based working environments eg hairdressing salons, florists, restaurants, travel agents, small manufacturing units, car servicing facilities;*
- *employers providing students with job references.*

## Types of evidence

For each employer involvement activity, centres are required to provide evidence of which learners undertook it, e.g. a candidate attendance register. The types of additional evidence required to support a claim for this component will vary depending on the nature of the involvement. E.g. for a guest lecture it is expected that a synopsis of the lecture and register would be taken which each

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<sup>1</sup> Based on Technical and applied qualifications for 14-19 year olds Key stage 4 and 16 to 19 performance tables from 2019: technical guidance for awarding organisations, August 2016

learner and the guest speaker will have signed; expert witnesses will be identified and will have signed the relevant assessment paperwork for each learner they have been involved in assessing; evidence of contribution from employers to the development of locally set or adapted assignments.

### **Quality assurance process**

As the employer involvement component is a requirement for achieving the KS5 Technical qualifications, it is subject to external quality assurance by City & Guilds at the approval stage and when centres wish to claim certification for learners.

Evidence will be validated by City & Guilds before learners can achieve the employer involvement component. Where employer involvement is not judged to be sufficient, certificates cannot be claimed for learners.

### **Sufficiency of involvement for each learner**

It is expected that the centre will plan a range of activities that provide sufficient opportunities for each learner to interact directly with a range of individuals employed in the related industry. Centres must also provide contingencies for learners who may be absent for part of their teaching, so they are not disadvantaged. Any absence that results in a learner missing arranged activities must be documented. Where learners are unable to undertake all employer involvement activities due to temporary illness, temporary injury or other indisposition, centres should contact City & Guilds for further guidance.

### **Live involvement**

Learners will gain most benefit from direct interaction with employers and/or their staff; however the use of technology (e.g. the use of live webinars) is encouraged to maximise the range of interactions. Where learners are able to interact in real time with employers, including through the use of technology, this will be classed as 'live involvement'.

It is considered good practice to record learning activities, where possible, to allow learners to revisit their experience and to provide a contingency for absent learners. This is not classed as live involvement however, and any involvement of this type for a learner must be identified as contingency.

### **Timing**

A learner who has not met the minimum requirements cannot be awarded the component, and will therefore not achieve the qualification. It is therefore important that centres give consideration to scheduling employer involvement activities, and that enough time is allotted throughout delivery and assessment of the qualification to ensure that requirements are fully met.

## 5 Assessment

### Summary of assessment methods and conditions

| Component numbers | Assessment method   | Description and conditions  |
|-------------------|---------------------|---|
| 021               | Synoptic assignment | <p>The synoptic assignment is <b>externally set, internally marked and externally moderated</b>. The assignment requires candidates to identify and use effectively, in an integrated way, an appropriate selection of skills, techniques, concepts, theories, and knowledge from across the whole content area. Candidates will be judged against the Assessment Objectives</p> <p>Assignments will be released to centres as per dates indicated in the Assessment and Examination timetable published on our website</p> <p>Centres will be required to maintain the security of all live assessment materials until assessment windows are open. Assignments will therefore be password protected and released to centres through a secure method.</p> <p>There will be one opportunity within each academic year to sit the assignment. Candidates who fail the assignment will have <b>one</b> re-sit opportunity. The re-sit opportunity will be in the next academic year, and will be the assignment set for that academic year once released to centres. If the re-sit is failed, the candidate will fail the qualification.</p> <p>Please note that for externally set assignments City &amp; Guilds provides guidance and support to centres on the marking and moderation process.</p> |

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| Component numbers | Assessment method      | Description and conditions   |
|-------------------|------------------------|--|
| 020/520           | Externally marked exam | <p>This exam is <b>externally set and externally marked</b>, and can be taken either online through City &amp; Guilds' computer-based testing platform (020), or as a paper based exam (520)</p> <p>The exam is designed to assess candidate's depth and breadth of understanding across the mandatory content in the qualification at the end of the period of learning, and will be sat under invigilated examination conditions. See JCQ requirements for details: <a href="http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations">http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations</a></p> <p>The exam specification shows the coverage of this exam across the qualification content.</p> <p>Candidates who fail the exam at the first sitting will have <b>one</b> opportunity to re-sit. If the re-sit is failed the candidate will fail the qualification as a whole, and cannot achieve the qualification within that academic year.</p> |

## What is synoptic assessment?

Technical qualifications are based around the development of a toolkit of knowledge, understanding and skills that an individual needs in order to have the capability to work in a particular industry or occupational area. Individuals in all technical areas are expected to be able to apply their knowledge, understanding and skills in decision making to solve problems and achieve given outcomes independently and confidently.

City & Guilds technical qualifications require candidates to draw together their learning from across the qualification to solve problems or achieve specific outcomes by explicitly assessing this through the synoptic assignment component.

In this externally set, internally marked and externally moderated assessment the focus is on bringing together, selecting and applying learning from across the qualification rather than demonstrating achievement against units or subsets of the qualification content. The candidate will be given an appropriately levelled, substantial, occupationally relevant problem to solve or outcome to achieve. For example this might be in the form of a briefing from a client, leaving the candidate with the scope to select and carry out the processes required to achieve the client's wishes, as they would in the workplace.

Candidates will be marked against assessment objectives (AOs) such as their breadth and accuracy of knowledge, understanding of concepts, and the quality of their technical skills as well as their ability to use what they have learned in an integrated way to achieve a considered and high quality outcome.



## How the assignment is synoptic for this qualification

The typical assignment brief could be to install a cable and wiring system. Candidates will need to draw on skills and understanding developed across the qualification content in order to consider the specific requirements of a system and the related electrical principles before carrying out their tasks. This will include the ability to plan for the tasks and apply the appropriate practical and hand skills to carry out the task such as marking out, cutting cables and use of tools and equipment. Candidates will also demonstrate they are following health and safety regulations at all times by drawing upon their knowledge of legislation and regulations.

## Exam for stretch, challenge and integration

The exam draws from across the mandatory content of the qualification, using:

- **Multiple choice questions** to confirm breadth of knowledge and understanding.
- **Multiple choice applied knowledge and understanding questions**, giving candidates the opportunity to demonstrate higher level, integrated understanding through application, analysis and evaluation.

## Assessment objectives

The assessments for this qualification are set against a set of assessment objectives (AOs) which are used across all City & Guilds Technicals to promote consistency among qualifications of a similar purpose. They are designed to allow judgement of the candidate to be made across a number of different categories of performance.

Each assessment for the qualification has been allocated a set number of marks against these AOs based on weightings recommended by stakeholders of the qualification. This mark allocation remains the same for all versions of the assessments, ensuring consistency across assessment versions and over time.

The following table explains all AOs in detail, including weightings for the synoptic assignments. In some cases, due to the nature of a qualification's content, it is not appropriate to award marks for some AOs. Where this is the case these have been marked as N/A. Weightings for exams (AOs 1, 2 and 4 only) can be found with the exam specification.

| Assessment objective  | Typical expected evidence of knowledge, understanding and skills   | Approximate weighting |
|---|--|-----------------------|
| <b>AO1</b> Recalls knowledge from across the breadth of the qualification.  | Identification of materials and equipment and PPE. Sources of information that support electrical installation. Roles and responsibilities.  | 10%                   |
| <b>AO2</b> Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification. | Explanation and considerations of different installation techniques of wiring systems and supports, electrical accessories and termination methods. Interpretation of drawings and scales. | 20%                   |
| <b>AO3</b> Demonstrates technical skills from across the breadth of the qualification.                                  | Use of PPE, hand tools and following RAMS. Application of mathematical units and geometry and the installation of containment systems, wiring systems and accessories.                     | 40%                   |

| Assessment objective   | Typical expected evidence of knowledge, understanding and skills   | Approximate weighting |
|--|--|-----------------------|
| <b>A04</b> Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes. | Applying knowledge and understanding to a particular scenario/ problem, attention to health and safety across all tasks, justifying decisions/approaches taken eg materials, techniques, adapting practice to meet contextual challenges, reflects on circuit principles whilst carrying out practical work. | 20%                   |
| <b>A05</b> Demonstrates perseverance in achieving high standards and attention to detail while showing an understanding of wider impact of their actions.            | Attending to detail in drawings and documentation and accuracy during work including working within tolerances. Checking that work area is clean and tidy.   | 10%                   |

### Permitted materials

| Subject                     | Assessment no. | Assessment type                             | Assessment time               | Permitted materials        |
|-----------------------------|----------------|---|-------------------------------|----------------------------|
| L2 Theory Test              | 020/520        | MC test either on E-volve (online) or paper | 120 minutes                   | IET on-site guide; BS 7671 |
| Level 2 Synoptic Assignment | 021            | Synoptic assignment                         | Subject to assignment version | Any relevant resource      |

## Exam specification

AO weightings per exam

| Assessment objective  | 020/520 weighting (approx. %) |
|---|-------------------------------|
| <b>AO1</b> Recalls knowledge from across the breadth of the qualification.  | 42%                           |
| <b>AO2</b> Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.   | 38%                           |
| <b>AO4</b> Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purpose. | 20%                           |

The way the exam covers the content of the qualification is laid out in the table below.

**Assessment type:** Multiple-choice exam

**Assessment conditions:** Invigilated examination conditions\*

**Grading:** Pass/Merit/Distinction

| 020/520 | Duration: 2 hours                        |                 |            |
|---------|--|-----------------|------------|
| Unit    | Title                                    | Marks available | Weighting  |
| 201     | Health and Safety and Industry Practices | 4               | 7          |
| 202     | Electrical Science                       | 18              | 30         |
| 203     | Electrical Installation                  | 12              | 20         |
| 204     | Electrical Technology                    | 14              | 23         |
| n/a     | Applied Knowledge and Understanding      | 12              | 20         |
|         | <b>Total</b>                             | <b>60</b>       | <b>100</b> |

\*These exams are sat under invigilated examination conditions, as defined by the JCQ:  
<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>.

Entry for exams can be made through the City & Guilds Walled Garden.

## 6 Moderation and standardisation of assessment

City & Guilds' externally set assignments for technical qualifications are designed to draw from across the qualifications' content, and to contribute a significant proportion towards the learner's final qualification grade. They are subject to a rigorous external quality assurance process known as external moderation. This process is outlined below. For more detailed information, please refer to 'Marking and moderation - Technicals centre guidance' available to download on the City & Guilds website.

It is vital that centres familiarise themselves with this process, and how it impacts on their delivery plan within the academic year.

### Supervision and authentication of internally assessed work

The Head of Centre is responsible for ensuring that internally assessed work is conducted in accordance with City & Guilds' requirements.

City & Guilds requires both tutors and candidates to sign declarations of authenticity. If the tutor is unable to sign the authentication statement for a particular candidate, then the candidate's work cannot be accepted for assessment.

### Internal standardisation

For internally marked work<sup>2</sup> the centre is required to conduct internal standardisation to ensure that all work at the centre has been marked to the same standard. It is the Internal Quality Assurer's (IQA's) responsibility to ensure that standardisation has taken place, and that the training includes the use of reference and archive materials such as work from previous years as appropriate.

### Internal appeal

Centres must have an internal process in place for candidates to appeal the marking of internally marked components, ie the synoptic assignment and any optional unit assignments. This must take place before the submission of marks for moderation. The internal process must include candidates being informed of the marks (or grades) the centre has given for internally assessed components, as they will need these to make the decision about whether or not to appeal.

Centres cannot appeal the outcome of moderation for individual candidates, only the moderation process itself. A request for a review of the moderation process should be made to [appeals@cityandguilds.com](mailto:appeals@cityandguilds.com).

### Moderation

Moderation is the process where external markers are standardised to a national standard in order to review centre marking of internally marked assessments. These markers are referred to as 'moderators'. Moderators will mark a representative sample of candidates' work from every centre. Their marks act as a benchmark to inform City & Guilds whether centre marking is in line with City & Guilds' standard.

Where moderation shows that the centre is applying the marking criteria correctly, centre marks for the whole cohort will be accepted.

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<sup>2</sup> For any internally assessed optional unit assignments, the same process must be followed where assessors must standardise their interpretation of the assessment and grading criteria.

Where moderation shows that the centre is either consistently too lenient or consistently too harsh in comparison to the national standard, an appropriate adjustment will be made to the marks of the whole cohort, retaining the centre's rank ordering.

Where centre application of the marking criteria is inconsistent, an appropriate adjustment for the whole cohort may not be possible on the basis of the sample of candidate work. In these instances a complete remark of the candidate work may be necessary. This may be carried out by the centre based on feedback provided by the moderator, or carried out by the moderator directly.

Moderation applies to all internally marked assignments. Following standardisation and marking, the centre submits all marks and candidate work to City & Guilds via the moderation platform. The deadline for submission of evidence will be available on Walled Garden. See the *Marking and moderation - Technicals Centre Guidance* document for full details of the requirements and process.

In most cases candidate work will be submitted directly to the moderator for moderation. This includes written work, photographic and pictorial evidence, or video and audio evidence. For some qualifications there will be a requirement for moderators to visit centres to observe practical assessments being undertaken. This will be for qualifications where the assessment of essential learner skills can only be demonstrated through live observation. The purpose of these visits is to ensure that the centre is assessing the practical skills to the required standards, and to provide the moderators with additional evidence to be used during moderation. These visits will be planned in advance with the centre for all relevant qualifications.

### **Post-moderation procedures**

Once the moderation process has been completed, the confirmed marks for the cohort are provided to the centre along with feedback from the moderator on the standard of marking at the centre, highlighting areas of good practice, and potential areas for improvement. This will inform future marking and internal standardisation activities.

City & Guilds will then carry out awarding, the process by which grade boundaries are set with reference to the candidate evidence available on the platform.

### **Centres retaining evidence**

Centres must retain assessment records for each candidate for a minimum of three years. To help prevent plagiarism or unfair advantage in future versions, candidate work may not be returned to candidates. Samples may however be retained by the centre as examples for future standardisation of marking.

## 7 Grading

### Awarding individual assessments

Individual assessments will be graded, by City & Guilds, as pass/merit/distinction where relevant. The grade boundaries for pass and distinction for each assessment will be set through a process of professional judgement by technical experts. Merit will usually be set at the midpoint between pass and distinction. The grade descriptors for pass and distinction, and other relevant information (eg archived samples of candidate work and statistical evidence) will be used to determine the mark at which candidate performance in the assessment best aligns with the grade descriptor in the context of the qualification's purpose. Boundaries will be set for each version of each assessment to take into account relative difficulty.

Please note that as the Merit grade will usually be set at the arithmetical midpoint between pass and distinction, there are no descriptors for the Merit grade for the qualification overall.

### Grade descriptors

#### To achieve a pass, a candidate will be able to

- Demonstrate the knowledge and understanding required to work in the occupational area, its principles, practices and legislation.
- Describe some of the main factors impacting on the occupation to show good understanding of how work tasks are shaped by the broader social, environmental and business environment it operates within.
- Use the technical industry specific terminology used in the industry accurately.
- Demonstrate the application of relevant theory and understanding to solve non-routine problems.
- Interpret a brief for complex work related tasks, identifying the key aspects, and showing a secure understanding of the application of concepts to specific work related tasks.
- Carry out planning which shows an ability to identify and analyse the relevant information in the brief and use knowledge and understanding from across the qualification (including complex technical information) to interpret what a fit for purpose outcome would be and develop a plausible plan to achieve it.
- Achieve an outcome which successfully meets the key requirements of the brief.
- Identify and reflect on the most obvious measures of success for the task and evaluate how successful they have been in meeting the intentions of the plan.
- Work safely throughout, independently carrying out tasks and procedures, and having some confidence in attempting the more complex tasks.

#### To achieve a distinction, a candidate will be able to

- Demonstrate the excellent knowledge and understanding required to work to a high level in the occupational area, its principles, practices and legislation.
- Analyse the impact of different factors on the occupation to show deep understanding of how work tasks are shaped by the broader social, environmental, and business environment it operates within.
- Demonstrate the application of relevant theory and understanding to provide efficient and effective solutions to complex and non-routine problems.

- Analyse the brief in detail, showing confident understanding of concepts and themes from across the qualification content, bringing these together to develop a clear and stretching plan, that would credibly achieve an outcome that is highly fit for purpose.
- Achieve an outcome which shows an attention to detail in its planning, development and completion, so that it completely meets or exceeds the expectations of the brief to a high standard.
- Carry out an evaluation in a systematic way, focussing on relevant quality points, identifying areas of development/ improvement as well as assessing the fitness for purpose of the outcome.

### Awarding grades and reporting results

The overall qualification grade will be calculated based on aggregation of the candidate's achievement in each of the assessments for the mandatory units, taking into account the assessments' weighting. The **Level 2 Technical Certificate in Electrical Installation** will be reported on a four grade scale: Pass, Merit, Distinction, Distinction\*.

All assessments **must** be achieved at a minimum of Pass for the qualification to be awarded. Candidates who fail to reach the minimum standard for grade Pass for an assessment(s) will not have a qualification grade awarded and will not receive a qualification certificate.

The approximate pass grade boundary(ies) for the synoptic assignment in this qualification are:

| Synoptic Assignment | Pass Mark (%) |
|---------------------|---------------|
| 021                 | 38            |

Please note that each synoptic assignment is subject to an awarding process before final grade boundaries are confirmed.

The contribution of assessments towards the overall qualification grade is as follows:

| Assessment method         | Grade scale | % contribution |
|---------------------------|-------------|----------------|
| Synoptic Assignment (021) | X/P/M/D     | 60%            |
| Exam (020/520)            | X/P/M/D     | 40%            |

Both synoptic assignments and exams are awarded (see 'Awarding individual assessments', at the start of Section 7, above), and candidates' grades converted to points. The minimum points available for each assessment grade is listed in the table below. A range of points between the Pass, Merit and Distinction boundaries will be accessible to candidates. For example a candidate that achieves a middle to high Pass in an assessment will receive between 8 and 10 points, a candidate that achieves a low to middle Merit in an assessment will receive between 12 and 14 points. The points above the minimum for the grade for each assessment are calculated based on the candidate's score in that assessment.

| Assessment method         | Pass | Merit | Distinction |
|---------------------------|------|-------|-------------|
| Synoptic Assignment (60%) | 6    | 12    | 18          |
| Theory Exam (40%)         | 6    | 12    | 18          |

The candidate's points for each assessment are multiplied by the % contribution of the assessment and then aggregated. The minimum points required for each qualification grade are as follows:

| Qualification Grade | Minimum points |
|---------------------|----------------|
| Distinction*        | 20.5           |
| Distinction         | 17             |
| Merit               | 11             |
| Pass                | 6              |

Candidates achieving Distinction\* will be the highest achieving of the Distinction candidates.



## 8 Administration

Approved centres must have effective quality assurance systems to ensure valid and reliable delivery and assessment of qualifications. Quality assurance includes initial centre registration by City & Guilds and the centre's own internal procedures for monitoring quality assurance procedures.

Consistent quality assurance requires City & Guilds and its associated centres to work together closely; our Quality Assurance Model encompasses both internal quality assurance (activities and processes undertaken within centres) and external quality assurance (activities and processes undertaken by City & Guilds).

For this qualification, standards and rigorous quality assurance are maintained by the use of:

- internal quality assurance
- City & Guilds external moderation.

In order to carry out the quality assurance role, Internal Quality Assurers (IQAs) must have and maintain an appropriate level of technical competence and have recent relevant assessment experience. For more information on the requirements, refer to *Section 2: Centre requirements* in this handbook.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following procedures are followed:

- suitable training of staff involved in the assessment of the qualification to ensure they understand the process of marking and standardisation
- completion by the person responsible for internal standardisation of the Centre Declaration Sheet to confirm that internal standardisation has taken place
- the completion by candidates and supervisors/tutors of the record form for each candidate's work.

### External quality assurance

City & Guilds will undertake external moderation activities to ensure that the quality assurance criteria for this qualification are being met. Centres must ensure that they co-operate with City & Guilds staff and representatives when undertaking these activities.

City & Guilds requires the Head of Centre to

- facilitate any inspection of the centre which is undertaken on behalf of City & Guilds
- make arrangements to receive, check and keep assessment material secure at all times,
- maintain the security of City & Guilds confidential material from receipt to the time when it is no longer confidential and
- keep completed assignment work and examination scripts secure from the time they are collected from the candidates to their dispatch to City & Guilds.

### Enquiries about results

The services available for enquiries about results include a review of marking for exam results and review of moderation for internally marked assessments.

For further details on enquiries and appeals process and for copies of the application forms, please visit the **appeals page** of the City & Guilds website at [www.cityandguilds.com](http://www.cityandguilds.com).

### Re-sits and shelf-life of assessment results

Candidates who have failed an assessment or wish to re-take it in an attempt to improve their grade, can re-sit assessments **once only**. The best result will count towards the final qualification. See guidance on individual assessment types in Section 5.

### Factors affecting individual learners

If work is lost, City & Guilds should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. Centres should use the JCQ form, JCQ/LCW, to inform City & Guilds Customer Services of the circumstances.

Learners who move from one centre to another during the course may require individual attention. Possible courses of action depend on the stage at which the move takes place. Centres should contact City & Guilds at the earliest possible stage for advice about appropriate arrangements in individual cases.

### Malpractice

Please refer to the City & Guilds guidance notes *Managing cases of suspected malpractice in examinations and assessments*. This document sets out the procedures to be followed in identifying and reporting malpractice by candidates and/or centre staff and the actions which City & Guilds may subsequently take. The document includes examples of candidate and centre malpractice and explains the responsibilities of centre staff to report actual or suspected malpractice. Centres can access this document on the City & Guilds website.

Examples of candidate malpractice are detailed below (please note that this is not an exhaustive list):

- falsification of assessment evidence or results documentation
- plagiarism of any nature
- collusion with others
- copying from another candidate (including the use of ICT to aid copying), or allowing work to be copied
- deliberate destruction of another's work
- false declaration of authenticity in relation to assessments
- impersonation.

These actions constitute malpractice, for which a penalty (eg disqualification from the assessment) will be applied.

Where suspected malpractice is identified by a centre after the candidate has signed the declaration of authentication, the Head of Centre must submit full details of the case to City & Guilds at the earliest opportunity. Please refer to the form in the document *Managing cases of suspected malpractice in examinations and assessments*.

### Access arrangements and special consideration

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.

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: <http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments>

### *Special consideration*

We can give special consideration to candidates who have had a temporary illness, injury or indisposition at the time of the examination. Where we do this, it is given after the examination.

Applications for either access arrangements or special consideration should be submitted to City & Guilds by the Examinations Officer at the centre. For more information please consult the current version of the JCQ document, *A guide to the special consideration process*. This document is available on the City & Guilds website: <http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments>

## Unit 201 Health and Safety and Industry Practices

|                    |         |
|--------------------|---------|
| <b>Unit level:</b> | Level 2 |
| <b>GLH:</b>        | 60      |

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### What is this unit about?

The purpose of this unit is for learners to gain a knowledge and understanding of the practices and procedures employed to maintain safe working environments and to prepare learners for the real working environment improving employability.

Learners will be introduced to the legislation, management systems and procedures used on construction sites in order to reduce risk. This unit also introduces learners to the practical skills needed when using plant and equipment on site. This unit also provides learners with an understanding of environmental legislation and industry practices to maximise protection of the environment. In addition, this unit gives an opportunity for learners to understand the structure of organisations including the roles of persons on a construction site and what they are responsible for.

Learners should consider the following questions as a starting point to this unit:

What laws affect electrical installation work?

Why is site safety management important?

How is safe isolation performed?

Why is it important to protect the environment during construction work?

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### Learning outcomes

In this unit, learners will be able to

- 1 Know what legislation, regulations, laws and guidance documents are associated with the electrical industry.
- 2 Use equipment on a construction site
- 3 Follow safety procedures, practices and policies on construction sites
- 4 Carry out electrical safety procedures and practices
- 5 Understand environmental protection
- 6 Know the structure and roles of individuals and organizations within the construction industry

## Scope of content

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### Learning outcome

- 1 Know what legislation, regulations, laws and guidance documents are associated with the electrical industry.
- 

### Topics

- 1.1 Statutory and non-statutory
- 1.2 Roles and responsibilities

Although an in-depth knowledge is not expected of all legislation within the range, learners are expected to know what the particular legislation covers, who is responsible and their responsibilities along with whether it is statutory or non-statutory.

#### Topic 1.1

Statutory:

- 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
- 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.

Non-Statutory:

- BS 7671
- IET Guidance
- HSE Guidance Publications
- Codes of Practice.

#### Topic 1.2

Roles and responsibilities in relation to health and safety:

- Employer
- Employees
- Organisations
- Clients.

---

## Learning outcome

2 Use equipment on a construction site

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### Topics

2.1 Use access equipment

2.2 Use Personal Protective Equipment (PPE)

2.3 Use power tools

#### Topic 2.1

Safe use different types of access equipment including all necessary pre checks prior to use:

- steps
- ladders
- mobile scaffold towers
- platforms.

#### Topic 2.2

Use different types of common PPE:

- footwear
- pads
- harness
- suits
- gloves
- high visibility clothing
- eyewear
- respiratory
- ear wear
- headgear.

#### Topic 2.3

Perform user checks of power tools in line with the IET code of practice for in service inspection and testing of electrical equipment. The purpose of basic protection and common causes of its failure must be considered:

- voltage
- rating
- class
- casings
- leads
- plugs
- batteries

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## Learning outcome

3 Follow safety procedures, practices and policies on construction sites

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### Topics

- 3.1 Produce Risk Assessments and Method Statements (RAMS)
- 3.2 Types of accident reporting
- 3.3 Principles of fire safety
- 3.4 Manual handling principles
- 3.5 Types of signage used on a construction site
- 3.6 Procedures for common hazardous materials
- 3.7 Procedures for dealing with asbestos found in the work place
- 3.8 Site safety management

Learners are not expected to identify hazards at this level. They must however be capable of adapting generic risk assessments where hazards are identified and amend these to suit a given environment and task.

#### Topic 3.1

Risk assessment principles:

- HSE five steps to completing risk assessments
- young person's risk assessment
- completing method statements.

#### Topic 3.2

Types of accident reporting:

- RIDDOR
- emergency services
- site procedures.

#### Topic 3.3

Causes and prevention of fire and procedures to follow along with equipment that is used:

- fire triangle
- emergency procedures
- types of fire extinguishers
- classes of fire.

#### Topic 3.4

Principles of and techniques for manual handling, and the consequences of not following:

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- lifting technique
- load.

### **Topic 3.5**

Types of signage:

- safety
- welfare
- information.

### **Topic 3.6**

Types of hazardous materials:

- adhesives
- resins
- acids
- fuels/oil.

Procedures for handling COSHH materials:

- use
- storage
- packaged signage.

### **Topic 3.7**

Procedures for dealing with asbestos:

- exposure situations
- procedure if suspected.

### **Topic 3.8**

Types of routine site safety management:

- common site rules
- orientation
- prohibition areas
- access and egress
- known hazards.

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## **Learning outcome**

4 Carry out electrical safety procedures and practices

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## **Topics**

- 4.1 Safe isolation procedures
- 4.2 Construction site supplies
- 4.3 Perform safe isolation



Learners are expected to follow industry procedures for the full isolation process across a range of circuits and know the different types of supplies that are commonly used on a construction site.

#### **Topic 4.1**

Full isolation procedure for:

- installations
- circuits
- equipment
- single phase
- three phase.

#### **Topic 4.2**

Types of supplies:

- site lighting
- site power
- charging stations
- supply arrangement.

#### **Topic 4.3**

Carry out safe isolation for single phase:

- installations
- circuits
- equipment.

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### **Learning outcome**

5 Understand environmental protection

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### **Topics**

5.1 Types of waste management and disposal

5.2 Reporting of hazardous waste

5.3 Type of pollution

#### **Topic 5.1**

Types of waste management and disposal:

- recycling
- landfill
- WEEE
- hazardous waste disposal.

## Topic 5.2

Methods of identifying and reporting hazardous materials:

- asbestos
- lead
- acids
- PCB's
- mercury.

## Topic 5.3

Different types of pollution:

- land contamination
- air contamination
- noise
- light.

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## Learning outcome

6 Know the structure and roles of individuals and organizations within the construction industry

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## Topics

- 6.1 Types of site personnel
- 6.2 Client and representatives
- 6.3 Relationships in the contract structure
- 6.4 Role of industry bodies

## Topic 6.1

Roles within the site hierarchy structure:

- Site manager
- Safety officer
- Structural engineer
- Supervisors
- Co-workers.

## Topic 6.2

Roles of client and representatives:

- Architect
- Quantity surveyor
- Clerk of works
- Local authority representatives.

## Topic 6.3

The relationship between site representatives:

- Client
- Main contractor
- sub-contractor
- trades.

#### **Topic 6.4**

Roles of industry bodies:

- Institutes
- CERTSURE
- Electrical Safety First
- JIB.

### **Guidance for delivery**

Whilst learners are not expected to have an in-depth knowledge of all legislation within the range, they are expected to know what the particular legislation covers, who is responsible and whether the legislation is statutory or non-statutory. Knowledge of how regulations are created under an Act of Parliament then maintained by departments or organisations is also relevant as it helps learners to understand where to look for updated regulations later in their careers as well as participate in public consultation exercises.

This unit should be delivered using a range of classroom and practical activities. Practical activities should include demonstration and use of access equipment, power tools and safe isolation procedures. Learners are not expected to be able to erect tower scaffolding although this element is at the discretion of the centre and their policy regarding PASMA.

Learners are expected to be able to demonstrate full isolation as well as having a full understanding of the reason for this procedure. This critical skill must be developed and employed across many activities utilised within this qualification. Centres are expected to provide candidates with the opportunities and resources to practice the procedure in all situations shown in the range.

Within this unit, learners will be introduced to the systems employed on sites to reduce risk. Whilst learners are not expected to be fully able to plan and prepare these systems, they will need to interpret and adjust to suit the locality. Having a knowledge of how these systems are implemented will underpin this. Learners need to be prepared for the real working environment and so should be familiar with all site procedures, common hazards and routine safety management. This should further be promoted when undertaking all activities within this qualification.

Where protection of the environment is concerned, learners need to be aware of the need to separate and process waste at source in order to reduce landfill and contamination. Having a good understanding of how all waste is dealt with promotes good practice including hazardous waste and its effects. Knowledge of pollution and its impact, as well as reduction methods also helps to promote a good ethos and protect the environment. Centres should consider utilising the knowledge of experts in this field including opportunities to visit waste processing facilities if appropriate.

As many of the activities in this qualification require learners to demonstrate safe working techniques, and apply what they have learned in unit 201 across all the other units in the qualification, it is advised that the first five learning outcomes of this unit are delivered early in the curriculum. The final learning outcome is less safety critical and is intended to provide learners with an understanding of organisation and site hierarchy. Knowing the roles of individuals and organisations improves the flow of information which in turn leads to safe and efficient working environments.

## Unit 202 Electrical Science

|                    |         |
|--------------------|---------|
| <b>Unit level:</b> | Level 2 |
| <b>GLH:</b>        | 90      |

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### What is this unit about?

The purpose of this unit is for learners to develop an understanding of the fundamental science theories and principles that underpin electrical circuit and their operation. You will cover a wide range of electrical and electronic components and will gain understanding of their functions and purpose. You will also develop understanding of how to determine many circuit values and parameters, by theory that will allow you to apply them in physical practice. Your learning will reflect current industry knowledge commonly used by electrical personnel in industry. The unit will provide the knowledge and understanding to enable you to be confident in completing fundamental circuit calculations.

Learners should consider the following questions as a starting point to this unit:

What is electricity?

How does a motor work?

How is electricity measured?

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### Learning outcomes

In this unit, learners will be able to

- 1 Apply mathematical principles
- 2 Understand direct current principles
- 3 Understand electromagnetic principles
- 4 Understand electronic components

## Scope of content

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### Learning outcome

- 1 Apply mathematical principles
- 

### Topics

- 1.1 Units of measurement
- 1.2 Work with equations
- 1.3 Work with geometry

Learners must be able to interpret and perform calculations using a range of numeric quantities represented as a base value by using indices or engineering notation.

#### Topic 1.1

Units of physical measurement to include:

- International system of units (SI) and any associated formulas:
  - o Length
  - o Area
  - o Volume
  - o Weight
  - o Density
  - o Energy
  - o Force
  - o Work
  - o Power
- Other properties:
  - o Speed
  - o Velocity
  - o Acceleration
- Numeric quantities:
  - o Nano
  - o Pico
  - o Micro
  - o Milli
  - o Kilo
  - o Mega
  - o Giga
  - o Tera.

#### Topic 1.2

Carry out calculations:

- Algebra:
  - o Symbols
  - o Transposition

- o Formulae
- o Linear equations
- Trigonometry
- Pythagoras theory.

### Topic 1.3

Carry out physical quantity calculations:

- Area
  - o Square
  - o Rectangle
  - o Circles
  - o Triangles
- Volume
  - o Cube
  - o Cuboid
  - o Cylinder.

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### Learning outcome

2 Understand direct current principles

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### Topics

- 2.1 Electron theory
- 2.2 Properties of an electrical circuit
- 2.3 Principles of an electrical circuit
- 2.4 Measurement of electrical circuits

### Topic 2.1

The structure of an atom:

- Atomic components
- Charge.

### Topic 2.2

International System of units (SI) for electrical circuits and associated formulas:

- Current
- Voltage
- Resistance
- Charge
- Power.

Insulators:

- Types
- Application

- Temperature effects.

Conductors:

- Types
- Application
- Temperature effects.

Electrical quantities:

- Coulomb
- Ampere
- Potential difference
- Resistance
- Resistivity.

Sources of electromotive force (e.m.f.):

- Chemical
- Magnetic
- Thermal.

Current flow:

- Conventional
- Electron.

### **Topic 2.3**

Principles of circuits:

- Series
- Parallel
- Ohms Law
- Power.

### **Topic 2.4**

Types of Instruments and connection arrangements:

- Voltmeter
- Ammeter
- Ohmmeter
- Wattmeter.

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## **Learning outcome**

3 Understand electromagnetic principles

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## **Topics**

3.1 Principles of magnetism

3.2 Conductors in magnetic fields

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### 3.3 Principles of electrical generation

### 3.4 Transformer principles

Learners will need to develop a basic understanding of alternating current (a.c.). Learners must have a knowledge of how an a.c. sinewave is produced using a simple alternator and the properties of a sine wave. Learners must be able to determine values of induced emf and values of force produced by simple machines.

#### **Topic 3.1**

Magnetic properties and units (SI) and associated formulas:

- Magnetic flux
- Flux density.

Magnetic fields associated with:

- Permanent magnets
- Current carrying conductors
- Solenoids.

Types of magnets:

- Permanent
- Electromagnet.

Effects of magnetism:

- attraction
- repulsion.

#### **Topic 3.2**

Effects of conductors:

- Calculations of force exerted
- Flemings rules.

Applications of magnetic force:

- Relay
- Solenoid.

#### **Topic 3.3**

Units of induction (SI):

- Henry.

Principles of single loop a.c. alternator:

- Principle of operation
- Production of a sine wave
- Generated e.m.f. calculations.

Properties of a sinewave:

- Peak value
- Peak to peak value
- Periodic time
- Frequency
- RMS
- Average.

### **Topic 3.4**

Principles of operation:

- Mutual induction.

Construction:

- Windings
- Ratios
- Core types.

Function:

- Step-up
- Step-down.

Losses:

- Copper
- Iron.

Applications:

- Power distribution
- Voltage conversion
- Current measurement.

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### **Learning outcome**

4 Understand electronic components

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### **Topics**

4.1 Operating principles of components

4.2 Applications and uses of components

Learners must know common components from symbols and the basic function of each component and how this is applied in simple electronic circuits.

### **Topic 4.1**

Identification, basic operation and symbols for the following:

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- Resistor
- Capacitor
- Thermistor
- LDR
- Diode
- Signal diode
- Zener diode
- Light emitting diode (LED)
- Photo diode
- Transistor
- Diac
- Triac.

#### **Topic 4.2**

Simple applications of where components are used:

- Voltage rectification
- Signal amplification
- Circuit control
- Dimming
- Soft start
- Current limiting
- Indication
- Sensor.

## Guidance for delivery

This unit underpins knowledge across the entire qualification and delivery of this unit should be paced throughout the curriculum. The application of mathematics for knowledge and application of other units, as well as further learning outcomes within this unit, is essential as a basis for learning.

Learners must be able to apply their knowledge and understanding when working on a range of electrical circuits. Although content will be delivered in a classroom environment, it is important that learners can relate this knowledge and understanding to actual practical situations and tasks in other units and throughout the qualification. Each learning outcome in this unit can be contextualised by relating the principles to real examples such as the magnetic effects that are utilised in circuit breakers.

Many of the mathematic principles within learning outcome one must be related to their application such as, as one simple example for each principle,

Using multiples and sub-multiples when using measuring instrument ranges

Using algebra to solve unknown values using the information available

Using trigonometry as a means of surveying as well as electrical quantities

Using area and volume to calculate material quantities and for calculating heating/lighting requirements

Learning through demonstration is encouraged for learning outcomes two and three as well as demonstrating this theoretical subject using a range of commonly used practical circuits. Learning can be reinforced whilst learners are carrying out basic testing of circuits within the workshop environment.

Whilst learning outcome four is intended for learners to understand the range of common electronic components, centres are encouraged to devise a practical activity using components from the range to create a simple electronic device. The skills used to create this would suit some of the topics covered in other units, especially soldering connections and terminations.

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, demonstrations, seminar presentations, videos/DVDs, research using the internet or library resources and use of tutors with relevant and appropriate industrial experience are all suitable.

## Unit 203 Electrical Installation

|                    |         |
|--------------------|---------|
| <b>Unit level:</b> | Level 2 |
| <b>GLH:</b>        | 150     |

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### What is this unit about?

The purpose of this unit is for learners to develop the knowledge and understanding, together with the practical skills, needed to select, install and terminate a wide range of wiring, containment and management systems used in electrical installation work. This unit introduces learners to the core craft practical skills including the correct, safe and efficient use of hand and power tools. Learners will also develop skills in cutting, forming and fitting a wide range of cable containment systems. Learners will also gain knowledge and practical skills using a wide range of cables including the applications, advantages and limitations of each cable type.

Learners can be introduced to this unit by being asked the following questions:

What cable is best suited to harsh locations?

Which cable support would best suit escape routes?

How is trunking formed to go round corners?

---

### Learning outcomes

In this unit, learners will be able to

- 1 Use tools commonly used in electrical installation practices
- 2 Erect cable containment/management systems used in electrical installation
- 3 Install wiring systems and supports used in electrical installation activities
- 4 Install accessories and terminate using a range of connections

## Scope of content

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### Learning outcome

- 1 Use tools commonly used in electrical installation practices
- 

### Topics

- 1.1 Use tools for electrical installation

Learners must develop skills and techniques to safely and efficiently select and use the full range of tools used by electricians.

#### Topic 1.1

Common hand tools used to:

- Form
- Fabricate
- Cut
- Fix
- Strip
- Terminate
- Tighten
- Compress
- Grip
- Punch
- File
- Hold
- Mark.

Power tools:

- Drills
- Saws
- Chase cutters
- Types of drill bit.

Measurement and marking tools:

- Spirit level
- Water level
- Laser level
- Chalk-line
- Tape measure
- Rule
- Measuring wheel
- Range finder
- Square.

---

## Learning outcome

2 Erect cable containment/management systems used in electrical installation

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### Topics

2.1 Selection of systems used in installation work

2.2 Types of forming/fabricating

2.3 Selecting fixings

2.4 Install systems

#### Topic 2.1

Factors that influence selection of containment/management systems:

- Capacity
- Suitability
- External influences
  - o Environment
  - o Utilisation
  - o Building.

#### Topic 2.2

Types of forming/fabricating:

- Bends
- Sets
- Junctions.

#### Topic 2.3

Factors that influence selection fixings:

- Support brackets/rods
- Fixing systems
- Load bearing
- Aesthetics
- Protection
- Building fabric.

#### Topic 2.4

Install the following containment/management systems:

- Conduit/ducting (PVC and metallic)
- All types of trunking (PVC and metallic)
- Tray
- Basket
- Ladder.

---

## Learning outcome

3 Install wiring systems and supports used in electrical installation activities

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### Topics

3.1 Factors affecting the selection of wiring systems

3.2 Types of support methods and application

3.3 Techniques for installing wiring components

3.4 Install wiring systems and supports

#### Topic 3.1

Consider factors that affect selection:

- Aesthetics
- Cost
- Installation methods
- Longevity
- External influences.

#### Topic 3.2

Types of support methods:

- Clip
- Cleat
- Protection against premature collapse
- Tie
- Catenary
- Buried
- Support distances.

#### Topic 3.3

Different types of installation techniques:

- Forming
- Drawing in
- Dressing.

#### Topic 3.4

Install the following wiring components:

- Non-sheathed
- Sheathed
- Single-core
- Multi-core
- Flat-profile
- Armoured
- Flexible



- Fire retardant
- Data
- Signal
- Communication.

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## Learning outcome

4 Install accessories and terminate using a range of connections

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## Topics

4.1 Factors that affect selection of accessories

4.2 Install accessories

4.3 Carry out connections

### Topic 4.1

Consider factors that affect selection:

- Load
- Suitability
- External influences
  - o Environment
  - o Utilisation
  - o Building.

### Topic 4.2

Install different accessories:

- Switchgear
- Control gear
- Switches
- Socket-outlets
- Luminaires
- Luminaire couplers
- Current-using equipment
- Clamps
- Wiring connection box
- Busbar.

### Topic 4.3

Types of connections to be installed:

- Screw
- Clamp
- Compression
- Solder
- Insulation displacement
- Compact lever.

### **Guidance for delivery**

It is important for learners to apply practical skills in a workshop environment. Learners must have access to a wide range of tools and plant commonly used in electrical installation activities.

Learners must be able to develop the skills required to measure, cut and form the full range of wiring containment and management systems shown in the range. Fabrications should be both site fabrications and manufactured.

Learners must be given an opportunity to fix equipment to a range of building structures and fabrics such as timber, brick, block, plaster, ceramic, plasterboard, steel supports and concrete.

A good application of industry guidance is also essential, such as relevant tables given in the IET On-site Guide or Students Guide. Learners must be encouraged to use these tables when forming bends in cables and supporting cables as well as simple selection of cable cross-sectional area based on length and protective device ratings.

Tutors are encouraged to utilise a wide range of techniques for delivery such as demonstration, videos/visual support, manufacturer's instructions and catalogues as well as textbooks and guides. This unit is also ideal for peer support from fellow learners such as critique and appraisal. Learners must reinforce learning through activity throughout this unit.

The learning outcomes in this unit are not sequential and it is expected that learners will develop skills across many learning outcomes whilst undertaking one of a variety of tasks. Centres may use the City and Guilds learner task manual or develop their own task

## Unit 204 Electrical Technology

|                    |         |
|--------------------|---------|
| <b>Unit level:</b> | Level 2 |
| <b>GLH:</b>        | 60      |

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### What is this unit about?

The purpose of this unit is for learners to develop the knowledge and understanding to be able to plan effective electrical circuits and installations to cost effectively meet the needs and requirements of both clients and industry standards.

The unit introduces the learners to design procedures for circuits and protection against electric shock. Learners will cover the fundamental procedures to ensure systems are installed safely and efficiently.

Learners should consider the following questions as a starting point to this unit:

How is electricity produced?

Are there any regulations that need to be followed that apply to electrical work?

How is electricity kept safe?

What is the purpose of a fuse?

---

### Learning outcomes

In this unit, learners will be able to

- 1 Understand how electricity is supplied and the characteristics of consumer's equipment
- 2 Understand isolation and protection
- 3 Understand automatic disconnection of supply
- 4 Understand the principles of final circuits
- 5 Understand technical information
- 6 Understand requirements for obtaining and providing client information

---

## Learning outcome

- 1 Understand how electricity is supplied and the characteristics of consumer's equipment
- 

## Topics

- 1.1 Generation, transmission and distribution of electricity
- 1.2 Electrical intake arrangements
- 1.3 Features of consumer units/distribution boards
- 1.4 Types of earthing arrangements

### Topic 1.1

Methods of generating electricity for distribution:

- Gas
- Coal
- Oil
- Wind
- Wave
- Hydro
- Photo-voltaic.

Transmission voltages:

- 400 kV
- 275 kV
- 132 kV.

Distribution voltages:

- 33 kV
- 11 kV
- 400 V
- 230 V.

Electrical transmission and distribution network and the purpose of the equipment used in that network:

- Pylons
- Sub-stations
- Transformers.

### Topic 1.2

Arrangements for electrical installations for an incoming supplies up to 100 A single phase:

- Distributors cut-out
- Electricity meter
- Meter tails
- Electricity isolator switch.

### Topic 1.3

Constructional features of consumer units and distribution boards including:

- Double pole isolators
- Protection against overload
- Protection against overload
- Additional protection against electric shock
- Fault protection
- Consumer unit assembly material.

### Topic 1.4

Characteristics of common earthing arrangements including:

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

---

## Learning outcome

2 Understand isolation and protection

---

## Topics

- 2.1 Types of protection devices
- 2.2 Purpose of discrimination/selectivity devices
- 2.3 Purpose of isolation and switching

Learners will not be expected to understand and use BS 7671 although it is encouraged that learners are introduced to it in conjunction with information contained within the IET On-site Guide or the IET Students Guide to the IET Wiring Regulations.

### Topic 2.1

Characteristics of protective devices:

- Fuses (BS 88-2, BS 88-3, BS 88-6, BS 3036)
- CBs
- RCD
- RCBO.

### Topic 2.2

Discrimination/selectivity of the following devices:

- Fuses (BS 88-2, BS 88-3, BS 88-6, BS 3036)
- CBs
- RCD
- RCBO.

### Topic 2.3

Purpose of isolation and switching in circuits including the provision of:

- Isolation
- Functional switching
- Emergency switching
- Switching off for mechanical maintenance.

---

### Learning outcome

3 Understand automatic disconnection of supply

---

### Topics

- 3.1 Principles of basic protection
- 3.2 Principles of fault protection
- 3.3 Purpose of earthing and bonding
- 3.4 Types of conductive parts
- 3.5 Types of earth fault paths

### Topic 3.1

Types Basic Protection:

- Insulation
- Barriers and enclosures.

Purpose of basic protection:

- Prevent electric shock through contact with live parts
- Associated risk factors
  - o Environment
  - o Location.

### Topic 3.2

The purpose of fault protection:

- Prevent electric shock under fault conditions.
- Protect cables and equipment.

Maximum disconnection times for circuits including:

- TN Circuits:
  - o Final circuits
  - o Distribution circuits
- TT Circuits:
  - o Final circuits
  - o Distribution circuits.

### Topic 3.3

Purpose of earthing:

- Earthing conductor
- Circuit protective conductor.

Purpose of bonding:

- Main protective bonding
- Supplementary equipotential bonding.

### Topic 3.4

Types of conductive parts:

- Exposed:
  - o Steel conduit
  - o Steel trunking
  - o Steel tray
  - o Metal accessories
  - o Metallic equipment
- Extraneous:
  - o Metallic service pipes (gas, oil, water)
  - o Steel duct work
  - o Structural steel.

### Topic 3.5

Types of component parts of the earth fault loop path:

- $Z_s$
- $Z_e$
- $R_1$
- $R_2$
- Main earthing terminal (MET)
- Suppliers earth return path.

---

## Learning outcome

- 4 Understand the principles of final circuits
- 

## Topics

- 4.1 Arrangements of final circuits  
4.2 Factors that affect load capacity  
4.3 Factors and requirements of voltage drop

Learners will not be expected to understand and use BS 7671 although it is encouraged that learners are introduced to it in conjunction with information contained within the IET On-site Guide or the IET Students Guide to the IET Wiring Regulations.

## Topic 4.1

Standard circuits:

- Lighting circuits
  - o One way
  - o Two way
  - o Intermediate
- Sockets outlet circuits
  - o Ring final
  - o Radial
- Supplies to fixed equipment
  - o Water and space heaters
  - o Cookers
  - o Showers
- SELV lighting.

## Topic 4.2

Factors affecting load capacity in final circuits:

- Design current
- Nominal rating of protective device
- Selection in accordance with IET On-site guide or student's guide.

## Topic 4.3

Factors that affect voltage drop:

- Circuit length
- Load
- Cross-sectional area of conductor.

Requirements of voltage drop:

- Lighting circuits
- Power circuits.

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## Learning outcome

5 Understand technical information

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## Topics

- 5.1 Guidance publications used for electrical installation
- 5.2 Regulations that apply to electrical systems
- 5.3 Manufacturer's information to support planning of electrical activities
- 5.4 Drawings used to plan electrical activities
- 5.5 Symbols and scales used in electrical documents



Learners do not require an in-depth understanding of publications listed in 5.2 but must have an understanding of where, in the installation process, these publications apply and how they are applied in regions of the United Kingdom.

### **Topic 5.1**

Types of guidance publications associated with the installation of electrical systems:

- IET On-Site Guide
- IET Guidance Notes
- HSE Guidance
- The Electricians Guide to Good Electrical Practice.

### **Topic 5.2**

Types of regulations that apply to electrical systems:

- Electricity at work regulations
- BS 7671
- Building regulations.

### **Topic 5.3**

Data contained in manufacturer's information used to plan electrical activities:

- Data sheets
- Installation instructions
- Product warranties.

### **Topic 5.4**

Information contained on drawings used to plan electrical activities:

- Plans/layout drawings
- Schematic plans
- Wiring diagrams
- Circuit diagrams
- Block diagrams.

### **Topic 5.5**

Types of symbols used in the following

- layout drawings
- building plans
- Schematic diagrams
- Wiring diagrams.

Types of commonly used scales:

- 1:1
- 1:10
- 1:50
- 1:100

- 1:500

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## Learning outcome

6 Understand requirements for obtaining and providing client information

---

## Topics

6.1 Types of financial information

6.2 Types of handover information

### Topic 6.1

Types of financial information:

- Estimates
- Quotations
- Payment schedules
- Invoice statements
- Cancellation rights.

### Topic 6.2

Types of handover information:

- Design philosophy statement
- As fitted drawings
- Product user instructions
- Maintenance schedules
- Building Regulations approvals
- Electrical test information
- Energy performance certification.

### **Guidance for delivery**

It is important that the learners have a full understanding of the underpinning knowledge of each of the topics. Although most of the content will be delivered in a classroom environment, it is important that learners have the opportunity to relate this knowledge and understanding to other units when candidates are in actual workshop situations, practical tasks and applications.

Trips to visitors centres located within power stations is to be encouraged to help an understanding of outcome one. Tutors are also encouraged to organise guest speakers from local distribution network operators to further enhance understanding of the electricity supply process. Information contained in the IET on-site guide and students guide is suitable as a resource for learning at this level.

Outcomes two, three and four require an understanding of circuit construction, protection and isolation. This will be reinforced through practical tasks throughout this qualification where the learner is working with the component parts that constitute a fully effective and safely functioning installation.

It is expected that learners use manufacture's website and catalogues to become familiar with a wide range of materials and products that are currently available.

Outcome five will require an understanding of the different types of technical information available to help plan and design electrical installations. It is important that the learner is introduced to BS 7671 and become familiar with the IET on-site guide or students guide. The use of large scale printed plans, layout drawings and wiring diagrams is required.

Outcome six deals with client information and the use of paperwork used by local electrical contractors would benefit the learners to see how they deal with the process of costing through to handover for different projects. The use of guest speakers from within the industry, such as representatives from either NICEIC or NAPIT, will also help the learners achieve an understanding of this critical part of electrical contracting.

## Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on [www.cityandguilds.com](http://www.cityandguilds.com).

### **City & Guilds Centre Manual**

This document provides guidance for organisations wishing to become City & Guilds approved centres, as well as information for approved centres delivering City & Guilds qualifications. It covers the centre and qualification approval process as well as providing guidance on delivery, assessment and quality assurance for approved centres.

It also details the City & Guilds requirements for ongoing centre and qualification approval, and provides examples of best practice for centres. 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 and malpractice
- complaints and appeals
- equal opportunities
- data protection
- management systems
- maintaining records
- internal quality assurance
- external quality assurance.

### **Our Quality Assurance Requirements**

This document explains the requirements for the delivery, assessment and awarding of our qualifications. All centres working with City & Guilds must adopt and implement these requirements across all of their qualification provision. Specifically, this document:

- specifies the quality assurance and control requirements that apply to all centres
- sets out the basis for securing high standards, for all our qualifications and/or assessments
- details the impact on centres of non-compliance

Our Quality Assurance Requirements document encompasses the relevant regulatory requirements of the following documents, which apply to centres working with City & Guilds:

- Ofqual's General Conditions of Recognition

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

- **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 e-assessments.

## Useful contacts



### UK learners

General qualification information

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

### International learners

General qualification information

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

### Centres

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

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

### Single subject qualifications

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

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

### International awards

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

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

### Walled Garden

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

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

### Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

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

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## City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people and organisations to develop their skills for personal and economic growth. Made up of City & Guilds, City & Guilds Kineo, The Oxford Group and ILM, we work with education providers, businesses and governments in over 100 countries.

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