

Level 3 Advanced Technical Diploma in Plumbing (450) (8202- 35)

October 2017 Version 2.0

Guide to the examination

Who is this document for?

This document has been produced for centres who offer **City & Guilds Level 3 Advanced Technical Diploma in Plumbing (450)**. It gives all of the essential details of the qualification's external assessment (exam) arrangements and has been produced to support the preparation of candidates to take the exam/s.

The document comprises of four sections:

1. **Details of the exam.** This section gives details of the structure, length and timing of the exam.
2. **Content assessed by the exam.** This section gives a summary of the content that will be covered in each exam and information of how marks are allocated to the content.
3. **Guidance.** This section gives guidance on the language of the exam, the types of questions included and examples of these, and links to further resources to support teaching and exam preparation.
4. **Further information.** This section lists other sources of information about this qualification and City & Guilds Technical Qualifications.

1. Details of the exam

External assessment

City & Guilds Technical qualifications have been developed to meet national policy changes designed to raise the rigour and robustness of vocational qualifications. These changes are being made to ensure our qualifications can meet the needs of employers and Higher Education. One of these changes is for the qualifications to have an increased emphasis on external assessment. This is why you will see an external exam in each of our Technical qualifications.

An external assessment is an assessment that is set and/or marked by the awarding organisation (ie externally). All City and Guilds Technical qualifications include an externally set and marked exam. This must be taken at the same time by all candidates who are registered on a particular qualification. We produce an exam timetable each year. This specifies the date and time of the exam so you can plan your delivery, revision and room bookings/PC allocation in plenty of time.

The purpose of this exam is to provide assurance that all candidates achieving the qualification have gained sufficient knowledge and understanding from their programme of study and that they can independently recall and draw their knowledge and understanding together in an integrated way. Whilst this may not be new to you, it is essential that your learners are well prepared and that they have time to revise, reflect and prepare for these exams. We have produced a Teaching, Learning, and Assessment guide that is you should refer to alongside the present document ([Teaching, Learning and Assessment Guide](#)). If a learner does not pass the exam at their first attempt, there is only one opportunity to resit the exam, so preparation is essential.

Exam requirements of this qualification

- **Plumbing** – Theory Exam (2 hours 15 minutes)

The exam is graded and a candidate must achieve at least a Pass grade in order to be awarded the qualification. (In addition to the exam, a synoptic assignment must also be completed and passed). You can find full details of the synoptic assignment in the *Qualification Handbook* and the *Synoptic Assessment Guide* – please see the link to the qualification page at the end of this document.

When does the exam take place?

The exam is offered on two fixed dates in March and June. The exact dates will be published at the start of the academic year in the *Assessments and Exam Timetable*

<http://www.cityandguilds.com/delivering-our-qualifications/exams-and-admin>.

At the start of the programme of study, in order to effectively plan teaching and exam preparation, centres should know when the exam will be taking place and allocate teaching time accordingly. Section 2 of this document gives a summary of the content that needs to be covered in order to prepare learners for the exam and full details of this are given in the *Qualification Handbook*.

Form of exam

The exam for this qualification can be taken either on paper (8202-535) or online (8202-035).

Can candidates resit the exam?

Candidates may resit the exam once only. If a candidate fails the exam both on the first attempt and when resitting it, that candidate has failed the qualification and cannot achieve it in that academic year.

How the exam is structured

Each exam has a total of 60 marks and is made up of:

- approximately 16-20 short answer questions
- 1 extended response question.

Short answer questions are used to confirm **breadth of knowledge and understanding**.

The extended response question is to allow candidates to demonstrate **higher level and integrated understanding** through written discussion, analysis and evaluation. This question also ensures the exam can differentiate between those learners who are 'just able' and those who are higher achieving.

More details about and examples of question types are given in Section 3 of this document.

Assessment Objectives

The exams are based on the following set of assessment objectives (AOs). These are designed to allow the candidate's responses to be assessed across the following three categories of performance:

- **Recollection** of knowledge.
- **Understanding** of concepts, theories and processes.
- **Integrated application** of knowledge and understanding.

In full, the assessment objectives covered by the exam for this qualification are:

| Assessment objective | Mark allocation (approx %) |
|--|----------------------------|
| <i>The candidate..</i> | |
| AO1 Recalls knowledge from across the breadth of the qualification | 33% |
| AO2 Demonstrates understanding of concepts, theories and processes from a range of learning outcomes. | 52% |
| AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes. | 15% |

Booking and taking the exam

All assessments for City & Guilds Technical Exams must be booked through Walled Garden. There is a deadline for booking exams, synoptic assessments and any other centre marked assessments, please refer to the time line to check these dates.

The exam must be taken under the supervision of an invigilator who is responsible for ensuring that it is conducted under controlled conditions. Full details of the conditions under which the exam must be taken can be found in the Joint Council for Qualifications (JCQ) document, [Instructions for Conducting Examinations \(ICE\)](#).

Special consideration

Candidates who are unable to sit the exam owing to temporary injury, illness or other indisposition at the scheduled time may qualify for special consideration. This is a post-examination adjustment that can, in certain circumstances, be made to a candidate's final grade. The Joint Council for Qualifications' guide to the special consideration process can be found at www.jcq.org.uk.

To make a request for special consideration, please contact: policy@cityandguilds.com

Access arrangements

Access arrangements are arrangements that allow candidates with particular requirements, disabilities or temporary illness to take assessments, where appropriate, using their normal way of working. The Joint Council for Qualifications document, *Access Arrangements and Reasonable Adjustments* gives full details and can be downloaded [here](#).

For further information and to apply for access arrangements please see:

[Access arrangements - When and how applications need to be made to City & Guilds](#)
[Applying for access arrangements on the Walled Garden](#)

2. Content assessed by the exam

Plumbing

The exam assesses:

- **Unit 331: Cold water system planning and design**
- **Unit 332: Hot water system planning and design**
- **Unit 333: Central heating system planning and design**
- **Unit 334: Sanitation system planning and design**
- **Unit 335: Environmental technology systems**

Each exam assesses a sample of the content of these units. This means that a single exam will **not** cover 100% of the unit content. The full range of content will be assessed over a number of examination series. Details of the coverage of a particular exam paper will **not** be released in advance of the exam itself. Centres should **not** make assumptions about what will be assessed by a particular exam based on what has been covered on previous occasions. In order to be fully prepared for the exam, learners **must** be ready to answer questions on **any** of the content outlined below.

The table below provides an overview of how the qualification's Learning Outcomes are covered by each exam and the number of **marks** available per Learning Outcome (ie **not** the number of *questions* per Learning Outcome). In preparing candidates for the exam, we recommend that centres take note of the number of marks allocated to Learning Outcomes and to assign teaching and preparation time accordingly.

In preparing candidates for the exam, centres should refer to the Qualification Handbook which gives full details of each Learning Outcome.

The following is a summary of only that qualification content which is assessed by the exam and **not** a summary of the full content of the qualification.

| Unit | Learning outcome | Topics | Number of marks per section |
|---|---|--|-----------------------------|
| 331 Cold water system planning and design | L01 Know the legislation relating to the installation and maintenance of cold water systems | 1.1: Cold water system legislation 1.2: Notification requirements | 15 |
| | L02 Understand cold water system layouts | 2.1: Layout features for multi-storey dwellings 2.2: Components of systems in multi-storey dwellings 2.3: Water for single occupancy dwellings | |

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|--|--|--|----|
| | | 2.4: Components for single occupancy dwellings 2.5: Specialist components for cold water systems | |
| | LO3 Understand requirements for backflow protection in plumbing systems | 3.1: Terminology 3.2: Non-mechanical backflow prevention 3.3: Mechanical backflow prevention 3.4: Preventing cross connection | |
| | LO4 Apply design techniques for cold water systems | 4.1: Information sources 4.2: Taking measurements 4.3: Calculating component size | |
| 332 Hot water system planning and design | LO1 Understand hot water systems and their layout requirements | 1.1: Types of hot water supply system 1.2: Design temperatures 1.3: System components 1.4: Safety devices | 10 |
| | LO2 Use design techniques for hot water systems | 2.1: Factors affecting hot water systems 2.2: Information sources 2.3: Calculating system requirements 2.4: Installation requirements | |
| 333 Central heating system planning and design | LO1 Understand types of central heating system and their layout requirements | 1.1: Zoning requirements 1.2: Control systems 1.3: Underfloor heating 1.4: Multiple boiler installations | 10 |
| | LO2 Use design techniques for central heating systems | 2.1: Factors affecting design 2.2: Principles of heat loss and gain | |

| | | | |
|---|---|---|----------|
| 334 Sanitation system planning and design | LO1 Understand types of sanitation system and their layout requirements | 1.1: Above ground drainage and sanitation systems 1.2: Sanitary facilities and equipment 1.3: Foul tanks | 10 |
| | LO2 Understand design techniques for sanitation and rainwater systems | 2.1: Selecting sanitation systems and appliances 2.2: Designing sanitary pipework systems 2.3: Rainwater systems components | |
| 335 Environmental technology systems | LO1 Understand operating principles of micro-renewable energy and water conservation technologies | 1.1: Heat producing micro-renewable energy 1.2: Water conservation | 6 |
| | LO2 Understand the installation requirements relating to micro-renewable energy and water conservation technologies | 2.1: Factors influencing installation of systems 2.2: Permitted developments 2.3: Building regulations and building standards | |
| | LO3 Compare benefits and limitations associated with micro-renewable energy and water conservation technologies | 3.1: Benefits of systems 3.2: Limitations of systems | |
| Total marks for sections: | | | 51 marks |
| Integration across units*: | | | 9 marks |
| Total marks for exam: 60 Marks | | | |

* *Integration across units.* These marks relate to Assessment Objective 4. These marks are awarded to differentiate between levels of performance by candidates taking the exam. The marks are given for how well a candidate has applied their knowledge, understanding and skills from across the units that make up the qualification in an integrated way to meet the requirements of the exam questions.

3. Guidance

Vocabulary of the exam: use of 'command' verbs

The exam questions are written using 'command' verbs. These are used to communicate to the candidate the type of answer required. Candidates should be familiarised with these as part of their exam preparation.

The following guidance has been produced on the main command verbs used in City & Guilds Technicals exams.

A more detailed version of this table, which also includes the command verbs used in the assignments is published in *City & Guilds Technical Qualifications Teaching, Learning and Assessment* guide.

| Command verb | Explanation and guidance |
|--|--|
| Analyse | Study or examine a complex issue, subject, event, etc in detail to explain and interpret, elements, causes, characteristics etc |
| Calculate | Work out the answer to a problem using mathematical operations |
| Compare (... and contrast) (or describe the similarities/differences) | Consider and describe the similarities (and differences) between two or more features, systems, ideas, etc |
| Define | Give the meaning of, technical vocabulary, terms, etc. |
| Describe | Give a detailed written account of a system, feature, etc (..the effect of...on...) the impact, change that has resulted from a cause, event, etc (..the process..) give the steps, stages, etc |
| Differentiate between | Establish and relate the characteristic differences between two or more things, concepts, etc |
| Discuss | Talk/write about a topic in detail, considering the different issues, ideas, opinions related to it |
| Distinguish between | Recognise and describe the characteristic differences between two things, or make one thing seem different from another |
| Evaluate | Analyse and describe the success, quality, benefits, value, etc (of an end product, outcome, etc) |
| Explain | Make (a situation, idea, process, etc) clear or easier to understand by giving details (..how..) Give the stages or steps, etc in a process, including relationships, connections, etc between these and causes and effects. |
| Give example(s) illustrate/ | Use examples or images to support, clarify or demonstrate, an explanation, argument, theory, etc |

| | |
|-------------------------|--|
| Give a rationale | Provide a reason/reasons/basis for actions, decisions, beliefs, etc |
| Identify | Recognise a feature, usually from a document, image, etc and state what it is |
| Justify | Give reasons for, make a case for, account for, etc decisions, actions, conclusions, etc, in order to demonstrate why they suitable for or correct or meet the particular circumstances, context |
| Label | Add names or descriptions, indicating their positions, on an image, drawing, diagram, etc |
| List | Give as many answers, examples, etc as the question indicates (candidates are not required to write in full sentences) |
| Name | Give the (technical) name of something |
| Propose | Present a plan, strategy, etc (for consideration, discussion, acceptance, action, etc). |
| Select | Choose the best, most suitable, etc, by making careful decisions |
| State | Give the answer, clearly and definitely |
| Summarise | Give a brief statement of the main points (of something) |

Question types

The following explains, and gives examples of, types of questions used in City & Guilds Technical exams. In preparing candidates to take the exam, it is recommended that you familiarise them with the requirements of each question type so that they can be effective and make best use of the time available when sitting the exam.

- An effective candidate will gauge the type and length of response required from the question and the number of marks available (which is given for each question on the exam paper).
- Short answer questions may not require candidates to write in complete sentences. Extended response questions will require a more developed response.
- Candidates should read the exam paper before attempting to answer the questions and should allocate time proportionate to the number of marks available for each question or section.

| Question type | Example question | Mark Scheme |
|---|---|--|
| Short answer questions - Knowledge | To enable adequate service and maintenance, state three locations where service valves should be fitted. (3 marks) | Answers may include; - On every cold feed or distribution pipe from a cold water storage system. (1 mark) - On every hot distributing pipe where it is not possible to fit a valve on the cold feed pipe. (1 mark) - Immediately before any float operated valve. (1 mark) |
| Short answer questions - Understanding | Explain how to minimise risks when carrying out jointing techniques (2 marks) | Any 2 marks from below; Using correct PPE (1 mark) and heat protective equipment (1 mark) . Ensuring area is well lit and well ventilated (1 mark) wearing suitable protective gloves apply flux form joint and apply only sufficient heat to enable joint to be formed (1 mark) and allow to cool to prevent risk of burns (1 mark) store soldering equipment away from the direct working area (1 mark). |

Extended response questions

Extended response questions are those that require the candidate to write a longer written response using sentences and paragraphs. These usually require candidates to discuss, explain, etc. a topic in some detail. The question is often based on a short case study, scenario or other prompt. The level of detail should be gauged from the question and the number of marks available.

Example question

Discuss factors that would influence the selection of hot water and heating systems. **(9 marks)**

Mark scheme

Indicative content

- Customer's needs/requirements
- Building lay out and features/plans drawings and specifications
- Fuel available
- Occupancy and purpose
- Availability and suitability of environmental technologies
- Appliance and component location
- System type
- Energy efficiency
- Cost
- Legislation
- Statutory regulations
- Manufacturers technical instructions

Band 1 (1 – 3 marks)

Largely descriptive response. Shows a limited understanding of hot water and heating selection and limited understanding of influencing factors. Limited or no knowledge of technical component terminology. Lacks clarity and structure.

Example band 1 response

The first thing to consider is what the customer want from the hot water and heating system do they live in a large house and have a high demand for hot water. Next, you need to look at the cost of the system and consider with the customer can they afford the system. New systems need to be energy efficient and you need to consider if it possible to use renewable energy systems such as solar power or Heat Pumps in the property if the layout will allow or if it be best to use traditional supplies such as gas or Oil burning appliances. In some locations, you will need to check the manufactures instructions and regulations to see if you can fit the new appliances.

Band 2 (4 – 6 marks)

More detailed response describes factors and explains consequences. Shows a good understanding of hot water and heating selection and good understanding of influencing factors. Good knowledge of technical component terminology and shows clarity and structure in arguments.

Example band 2 response

The first thing to consider is what the customer needs from the hot water and heating system. Do they live in a large house or have a large number of occupants and have a high demand for hot water, this will lead in the selection of hot water types as a combi boiler although will provide constant hot water may not provide the flow required in the home.

Next, you need to look at the cost of the system and consider with the customer can they afford the system, for example, underfloor heating throughout the property will provide an excellent modern form of heating but will require room to put the cylinder and manifold and is costly to install compared to traditional steel radiators.

All new heating and hot water systems need to be energy efficient and in most cases, you need to install a SEDBUK band A boiler. You need to consider if it possible to use renewable energy systems such as solar power or Heat Pumps in the property. Does the layout of the property have a south facing large roof to allow solar panels to be fitted to provide the hot water or maybe the garden is big enough to fit a ground source heat pump or if it be best to use traditional supplies such as gas or Oil burning systems.

In most areas of the country, it is possible to fit renewable energy supplies to a property but you would need to check the current legislation and make sure the place isn't in a heritage area. Whichever installation is decided upon before you can install it you will need to check the manufacturer's instructions and regulations to see if you can fit the new appliances for example you need to make sure it is not to close to a window or door opening.

Band 3 (7 – 9 marks)

Specific detail, examples to show evaluation of factors impact. Shows an excellent understanding of hot water and heating selection and thorough understanding of influencing factors. Extensive knowledge of technical component terminology and shows clarity and structure in. Awareness of the relative effect of their selection will characterise candidates at the top of this level.

Example band 3 response

One of the first things to consider is the types of system that would be viable for the customer, for example, do they want a combi boiler or a traditional system or maybe even an unvented system. To establish this the first thing to do with the customer is discuss what the customer needs from the hot water and heating system. For example is the property a large house or have a large number of occupants needing a high demand for hot water.

This information will enable the selection of hot water types as for example, although a combi boiler will provide constant hot water it may not provide the flow required in the home to run a number of showers at the same time and therefore an unvented system would be a better recommendation.

Discussions with the customer need to take place as to the potential cost of different types of system, for example, underfloor heating throughout the property will provide an excellent modern form of heating with low-level temperatures controllable throughout the home. However, this type of system may also require the physical space to put an unvented hot water cylinder and manifold and the cost to install this contemporary system is expensive compared to traditional steel radiators.

In order to comply with current legislation all new heating and hot water systems need to be energy efficient and in most cases, you need to install a SEDBUK band A boiler.

There is a wide range of renewable technologies that can also be considered to help ensure a property complies with the energy efficiency legislation and discussions with the customer need to be taken to consider if it possible to use renewable energy systems such as solar power or Heat Pumps in the property. Considerations such as does the layout of the property have a south facing roof to allow solar panels to be fitted at their optimal performance to provide an efficient system or maybe the garden has enough surface area to fit a ground source heat pump.

If it is not possible to provide a cost effective renewable system it be best to use traditional supplies such as gas or Oil burning systems.

When considering planning permission in most areas of the country, it is possible to fit renewable energy supplies to a property but you would need to check the current legislation to make sure the location is not in a heritage area or place of natural beauty. Manufacturer's instructions and current regulations should always be adhered to whichever installation is decided. The fluing arrangements of the appliances need to be confirmed for example you need to make sure it is not too close to a window or door opening.

Examination technique

Candidates with a good understanding of the subject being assessed can often lose marks in exams because they lack experience or confidence in exams or awareness of how to maximise the time available to get the most out of the exam. Here is some suggested guidance for areas that could be covered in advance to help learners improve exam performance.

Before the exam

Although candidates cannot plan the answers they will give in advance, exams for Technical qualifications do follow a common structure and format. In advance of taking the exam, candidates should:

- be familiar with the structure of the exam (ie number and type of questions).
- be aware of the amount of time they have in total to complete the exam.
- have a plan, based on the exam start and finish time for how long to spend on each question/section of the exam.
- be aware of how many marks are available for each question, how much they should expect to write for each question and allow most time for those questions which have the most marks available.

At the start of the exam session

At the start of the exam, candidates:

- should carefully read through the instructions before answering any questions.
- may find it helpful, where possible, to mark or highlight key information such as command words and number of marks available on the question paper.
- identify questions which require an extended written answer and those questions where all or part of the question may be answered by giving bullets, lists etc rather than full sentences.

Answering the questions

Candidates do not have to answer exam questions in any particular order. They may find it helpful to consider, for example:

- tackling first those questions which they find easiest. This should help them get into the 'flow' of the exam and help confidence by building up marks quickly and at the start of the exam.
- tackling the extended answer question at an early stage of the exam to make sure they spend sufficient time on it and do not run out of time at the end of the exam.

Candidates should avoid wasting time by repeating the question either in full or in part in their answer.

Candidates should **always** attempt every question, even questions where they may be less confident about the answer they are giving. Candidates should be discouraged however, from spending too long on any answer they are less sure about and providing answers that are longer and give more detail than should be necessary in the hope of picking up marks. This may mean they have less time to answer questions that they are better prepared to answer.

Extended answer questions

Before writing out in full their answer to extended questions, candidates may find it helpful to identify the key requirements of the question and jot down a brief plan or outline of how they will answer it. This will help clarify their thinking and make sure that they don't get 'bogged down' or provide too much detail for one part of the question at the expense of others.

Towards the end of the exam

Candidates should always set aside time at the end of the exam to read back through and review what they have written in order to make sure this is legible, makes sense and answers the question in full.

If a candidate finds they are running out of time to finish an answer towards the end of the exam, they should attempt to complete the answer in abbreviated or note form. Provided the content is clear and relevant, examiners will consider such answers and award marks where merited.

Further guidance on preparing candidates to take the exam is given in the City & Guilds publication, [Technical Qualifications, Teaching, Learning and Assessment](#) which can be downloaded free of charge from City & Guilds website.

4. Further information

For further information to support delivery and exam preparation for this qualification, centres should see:

City & Guilds

Qualification homepage: <https://www.cityandguilds.com/qualifications-and-apprenticeships/building-services-industry/electrical-installation/8202-technical-in-building-services-engineering> which includes:

- Qualification handbook
- Synoptic Assignment
- Sample assessments

Technical Qualifications, Resources and Support: www.cityandguilds.com/techbac/technical-qualifications/resources-and-support

Joint Council for Qualifications

Instructions for Conducting Examinations: <http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>