

# **Level 3 Advanced Technical Extended Diploma in Land-Based Engineering (0171-016/0171-516)**

**Part of 0171-38**

**June 2019 Version 2.0**

**Guide to the examination**

Version and date	Change detail	Section
V 2-0 – 18 October 2019	Level 3 third retake opportunity guidance added	1. Details of the exam

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## Who is this document for?

This document has been produced for centres who offer **City & Guilds** Level 3 Advanced Technical Extended Diploma in Land-Based Engineering. 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 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

- **Level 3 Land based Engineering** – Theory exam (1) (2 hours).

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 or 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 (0171-516) or online (0171-016).

## Can candidates resit the exam?

Candidates who have failed an exam or wish to retake it in an attempt to improve their grade, can do so **twice**. The third and final retake opportunity applies to Level 3 only. The best result will count towards the final qualification. If the candidate fails the exam three times then they will fail the qualification.

## How the exam is structured

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

- approximately 8-12 short answer questions;
- 1 extended response question.

Multiple choice and 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>	
A01 <b>Recalls knowledge</b> from across the breadth of the qualification	20%
A02 <b>Demonstrates understanding</b> of concepts, theories and processes from a range of learning outcomes.	60%
A04 <b>Applies knowledge, understanding and skills</b> from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	20%

## **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](http://www.jcq.org.uk).

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

The exam assesses:

- **Unit 354: Repair Land-based Vehicle Systems**
- **Unit 355: Repair Land-based Electric Systems**
- **Unit 356: Test Land-based Electronic Systems**
- **Unit 357: Repair Land-based Hydraulic 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
354 Repair Land-based Vehicle Systems	LO1 Understand land-based vehicle systems.	1.1 The function and working principles of land-based braking systems. 1.2 The function and working principles of land-based steering systems.	12
355 Repair Land-based Electric Systems	LO1 Understand land-based electric systems and components.	1.1 Electric principles (units, symbols, calculations, etc). 1.2 Sources of electric energy 1.3 The function and working principles of electric components. 1.4 How to design and build electric systems (circuits). 1.5 The function and use of electric test equipment.	12

356 Test Land-based Electronic Systems	LO1 Understand land-based electronic systems.	1.1 Electronic system applications in land-based equipment. 1.2 Basic electronic principles and components. 1.3 Types of electronic signals. 1.4 How electronic signals are generated, communicated and received (in an engine management system). 1.5 The role of an oscilloscope in fault diagnosis. 1.6 The role of a scan tool in fault diagnosis.	12
357 Repair Land-based Hydraulic Systems	LO1 Understand land-based hydraulic systems and components.	1.1 Hydraulic principles (units, calculations, etc). 1.2 The function and working principles of hydraulic components. 1.3 The design, layout and application of hydraulic systems (circuits). 1.4 The function and use of hydraulic test equipment.	12
		Total marks for sections:	48 marks
		Integration across units*:	12 marks
<b>Total marks for exam:</b>			<b>60 Marks</b>

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

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

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## 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:

#### Short answer questions (restricted response)

These are questions which require candidates to give a brief and concise written response. The number of marks available will correspond to the number of pieces of information/examples and the length of response required by the question.

### Example question:

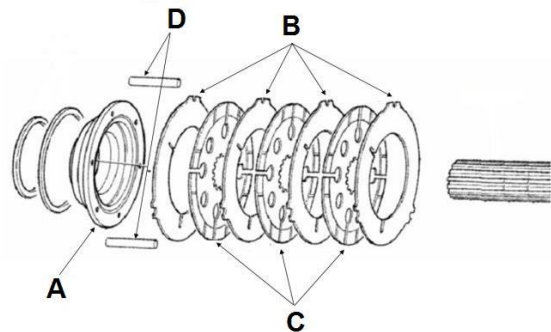


Figure 1

Identify the components labelled A, B and C in Figure 1 (3 marks)

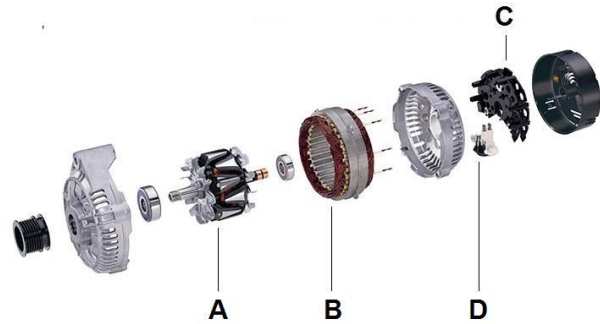
#### Answer

- 1 mark for each of the following, up to 3 marks:
- A – Piston
  - B – Counter plates / intermediate discs
  - C – Friction discs / friction plates

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### Structured Response Questions

These are questions that have more than one part (eg a), b), etc.). The overall question is made up of linked, short answer questions which move the candidate through the topic in a structured way. For example, the question will usually start with a 'recall'/'state'/'describe' question followed by an 'explain' to draw out understanding of the topic. They usually have a shared introductory 'stem', and the number of marks may increase through the question.



a) Identify the components labelled A, B and C in Figure 2. (3 marks)

b) Describe what may result from a fault of component D in Figure 2. (4 marks)

### Answer

a) 1 mark for each of the following, up to 3 marks:

A – Rotor  
B – Stator  
C – Rectifier

b) 1 mark for each of the following, up to 4 marks:

- Battery not charging
- Overcharging of the battery/overheating of the battery
- Loss of electrolyte
- Light failure/damaged electrical components
- Generation of fault codes
- Battery charge warning light remains illuminated

### **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.

Poor lifting performance has been reported on a tractor-mounted front loader, which incorporates an electro-hydraulic valve block. Records show that the tractor and loader have not been serviced in accordance with the manufacturer's guidelines.

Discuss the preparation stages, resources and steps required to carry out a full diagnostic assessment.

(12 marks)

### **Indicative content**

#### Preparation:

- Further discussion with operator
- Verification of symptoms
- Access technical specifications/documentation

#### Resources:

- Pressure and flow gauges
- Temperature gauge
- Multi-meter
- Spill pads
- Oil draining equipment
- Filters
- Correct specification of hydraulic oil
- PPE
- Cleaning resources (e.g. clean rags)
- Checks for serviceability

#### Steps:

- Check for visible damage or leaks
- Check oil level
- Check oil condition
- Replace filters
- Pressure and flow in accordance with manufacturer's specification
- Ensure clean connectors and fittings
- Check voltage to solenoid
- Check resistance across coil of solenoid
- Check solenoid operation
- Check manual override if applicable
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### **Band 1 (1-4 marks)**

The candidate has failed to propose many of the appropriate preparation, resources and steps required. The candidate has provided minimal rationale as to why they have proposed any preparation, resources and steps required. The candidate's response may have frequently strayed from focusing on the relevant hydraulic and electrical components. The candidate will not

have suggested any expected outcomes of their proposed diagnostic steps.

**Example answer:**

Start with asking the customer what hydraulic oil they put in, as the wrong oil can cause damage due to poor lubrication qualities.

In the oil, start with testing the oil reservoir to check for dirt, quality of oil and whether water could have got in. Large particles in the water can jam or damage the electromagnetic valve block. This could be checked by stripping the valve block or testing the pressure internally. The next step would be to attach pressure gauges and ensure the pressure relief isn't blowing out at a pressure too low as this would not support a good lifting performance as there isn't enough pressure to lift loader with speed. If the gauges are not reading correctly to manufacturer's specifications, then they would need to adjust to that. Hydraulic pump could be tested as it would be one of the main causes of the problem. If a fault was in the pump it may be still covered in the manufacturer's warranty.

**Band 2 (5-8) marks)**

The candidate has proposed some appropriate preparation, resources and steps required, in a mostly workable sequence. The candidate has occasionally provided reasons why they have proposed the preparation, resources and steps required. The candidate has largely focused on the relevant hydraulic and electrical components, but may have strayed into discussing irrelevant components. The candidate is unlikely to have suggested expected outcomes of their proposed diagnostic steps.

**Example answer:**

To test this system you need to start with the oil as it may have contaminants in it or not have its starting qualities and additives. Lines and filters should then be checked. Ensure no oil is leaking or being allowed through due to dirty filter. I would also check pressure relief valves to make sure none are open and don't allow pressure to build up.

The next fault that may be found is in the pump. The pump may be worn, leaking or may have been installed incorrectly. This won't give flow to produce pressure. The next plan is to check the valve block. You need to check the hoses are

fitted properly and that there are no cracks in the block. The internals of the valve may be at fault so check that they are in a full working order. The electrical control should also be checked, so you need to check solenoids, sensors, the program used and wiring to make sure no signals are corrupt.

The rams should be inspected to make sure all seals are still in good condition and ensure the surface of the piston are not damaged. All pipes should be inspected for blockages. The hydraulic should also be examined to make sure that there are no bubbles, water or that it hasn't been over heated in any way.

### **Band 3 (9-12 marks)**

The candidate has proposed a broad range of appropriate preparation, resources and steps required, and in a logical sequence. The candidate has provided clear reasons why they have proposed the preparation, resources and steps required. The candidate has remained focused on the relevant hydraulic and electrical components. The candidate has (where applicable) suggested expected outcomes of their proposed diagnostic steps.

### **Example answer:**

Firstly, I would discuss the fault with the customer prior to conducting the work. Before arriving at the job, I would ensure that I have all the necessary tools and equipment to conduct this type of task. This could include, service manuals, correct specification of hydraulic oil, spill pads and rags, correct PPE, hydraulic pressure and flow testing equipment that is within calibration, multimeter that again is within calibration and new hydraulic filters. On arrival, I would verify the fault by testing the machine. Once tested I would conduct a thorough visual inspection of all hydraulic components looking for any leaks and signs of damage or wear. I would then check the hydraulic oil level and condition looking for any signs of water ingress or aeration of the oil. I would then replace the hydraulic oil filters due to their low cost and re-test the machine. Next, I would conduct a pressure and flow test of the hydraulic system comparing results against manufacturer's specification. This test would be repeated across multiple spool valves to differentiate between spool valve and hydraulic pump failures. This test would also indicate correct adjustment of the system pressure relief

valves. I would then load the front loader (if possible) and raise it. I would leave it in the raised position whilst observing for any movement, this could help to indicate any internal system leakages. If no movement is observed, I would then check the solenoids for correct operation. I would check the resistance across the coil of the solenoid, voltage input and correct negative/earth using a multimeter. If the spool valves had a manual override, I would operate them to help differentiate between electrical and mechanical failures of the system. I would then remove the hydraulic cylinders in order to check cylinder seals and piston for damage and/or wear, this could cause internal leakage causing the fault indicated.



## 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: <http://www.cityandguilds.com/qualifications-and-apprenticeships/land-based-services/agriculture/0171-technical-in-agriculture-and-landbased-engineering#tab=information> which includes:

- Qualification handbook
- Synoptic Assignment
- Sample assessments

*Technical Qualifications, Resources and Support: [cityandguilds.com/techbac/technical-qualifications/resources-and-support](http://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>*