

# **City & Guilds**

## **Level 1 Award in Introduction to Electric and Hybrid Vehicle High Energy Systems**

### **(7290-01)**

June 2022 Version 1.1

**Qualification Handbook**

## Qualification at a glance

<b>Subject area</b>	Automotive
<b>City &amp; Guilds number</b>	7290-01
<b>Age group approved</b>	16+
<b>Entry requirements</b>	None
<b>Assessment</b>	Online multiple-choice test
<b>Approvals</b>	Fast track or full approval required
<b>Support materials</b>	Sample test materials SmartScreen
<b>Registration and certification</b>	Consult the Walled Garden/Online Catalogue for last dates

<b>Title and level</b>	<b>City &amp; Guilds number</b>	<b>Qualification number</b>
City & Guilds Level 1 Award in Introduction to Electric and Hybrid Vehicle High Energy Systems	7290-01	610/0078/6

Version	Date	Change detail	Section
V1.0	Feb 2022	Document created	All
V1.1	June 2022	Resource requirements - revised	2 – Centre Requirements
		Quality Assurance – new section added	
		Access arrangements and special considerations – new section added	
		Reference to recording forms – removed Support materials – dates removed	3- Delivering the qualification
		Time constraints – further information added on time constraints related to MCQ test and practical assessment	4 – Assessment
		Grading – new section added	5 – Grading
		Unit availability, unit structure and unit delivery guidance information added	6 - Units
		Sources of general information – updated information/links to current regulatory references	Appendix 1
		Useful contacts and back page – revised information	Useful contacts and back page

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# 1 Introduction

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

Area	Description
Who is the qualification for?	<p>This qualification is for people who require the knowledge to work safely on or near electric vehicles but <b>do not work</b> on the vehicle's high voltage system.</p> <p>Examples of individuals employed in the following job roles may find this qualification useful: body shop technicians, auto glazing technicians, vehicle fast-fit technicians, sales staff, cleaners/valeters or vehicle fitters.</p> <p>This qualification does not deem someone competent to maintain, service or repair an electric vehicle's high voltage systems and their components.</p>
What does the qualification cover?	<p>This qualification covers safe working practices and essential knowledge of the hazards associated with electric vehicles and the precautions to follow to avoid these.</p>
What opportunities for progression are there?	<p>This qualification allows candidates to progress on to the following City &amp; Guilds qualifications:</p> <p>7290-02 - City &amp; Guilds Level 2 Award in Safe Maintenance of Electric and Hybrid Vehicles.</p> <p>7290-72 - City &amp; Guilds Level 2 Award in Hazard Management of Electric and Hybrid Vehicles</p>
Who did we develop the qualification with?	<p>This qualification has been developed using the National Occupational Standards as set by automotive industry experts.</p>

## Structure

### Level 1 Award in Introduction to Electric and Hybrid Vehicle High Energy Systems

City & Guilds unit number	Unit title	GLH
<b>Mandatory</b>		
601	Knowledge of Carrying Out Non-High Voltage Operations On, Near or With an Electric Vehicle	8

## Total Qualification Time

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

TQT is comprised of the following two elements:

- 1) The number of hours which an awarding organisation has assigned to a qualification for Guided Learning.
- 2) An estimate of the number of hours a Learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by - but, unlike Guided Learning, not under the Immediate Guidance or Supervision of - a lecturer, supervisor, tutor or other, appropriate provider of education or training.

Title and level	GLH	TQT
City & Guilds Level 1 Award in Introduction to Electric and Hybrid Vehicle High Energy Systems	8	10

## 2 Centre requirements

### Approval

If your Centre is approved to offer the qualification 4290-70 or 4290-71, you can apply for the new qualification approval using the **fast-track approval form**, available from the City & Guilds website. Centres should use the fast-track form if:

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

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

To offer this qualification, new centres will need to gain both centre and qualification approval. Please refer to **City & Guilds Centre Approval Process Quality Assurance Standards document** for further information, see **Centre Document Library**.

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

### Resource requirements

#### Centre staffing

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

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

Centre staff may undertake more than one role, e.g., tutor and assessor or internal verifier, but cannot internally verify their own assessments.

### 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. For more detail on this visit the **Quality Assurance Standards** documents on the City & Guilds website.

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

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

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

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

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

The role of the EQA is to:

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

## **Learner entry requirements**

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

## **Age restrictions**

City & Guilds cannot accept any registrations for candidates under 16 as these qualifications are not approved for under 16s.

## **Access arrangements and special considerations**

For information on how to apply for access arrangements please refer to ***How and when to apply for access arrangements and special consideration (cityandguilds.com)***

### 3 Delivering the qualification

#### Initial assessment and induction

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

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

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

#### Support materials

The following resources are available for these qualifications:

Description	How to access
MCQ sample assessment	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a>
Learning Assistant	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a>
SmartScreen	<a href="http://www.smartscreen.co.uk">www.smartscreen.co.uk</a>

## 4 Assessment

### Assessment of the qualification

Candidates must:

- successfully complete the following mandatory unit: 601.

### Summary of assessment methods

Candidates must successfully complete the multiple-choice questions.

Assessment Types			
Unit	Title	Assessment method	Where to obtain assessment materials
601	Knowledge of Carrying out Non-High Voltage Operations On, Near or With an Electric Vehicle	Multiple-choice questions	Examinations provided on e-volve

### Assessment strategy

The knowledge will be assessed by multiple-choice questions for the essential knowledge criteria.

### Time constraints

#### Multiple-choice online tests

The multiple-choice online test should be scheduled for candidates only once the Knowledge unit delivery for the associated test is complete and candidates are ready to take the assessment. The test should be sat under invigilated examination conditions, as defined by the JCQ: <http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>.

Candidates must complete their assessments within their registration period.

### Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification.

RPL is not allowed for this qualification.

## Test specifications

The way the knowledge is covered by the multiple-choice question test is laid out in the table below:

### Unit 601: Knowledge of Carrying out Non-High Voltage Operations On, Near or With an Electric Vehicle

Duration: 45 minutes

LO number	Learning Outcome	Number of questions
1	Understand the operational differences between electric and non-electric vehicles, and know how to identify the different types of electric vehicles	7
2	Understand the importance of adhering to health and safety legislation, regulations, guidelines and workplace procedures and know how to work safely around electric vehicles	5
3	Understand the hazards associated with working on or around electric vehicles	3
<b>Total</b>		<b>15</b>

The grade boundary for this test will be approximately:

Pass: 60%, 9 marks.

This boundary may be subject to slight variation to ensure fairness should any variations in the difficulty of the test be identified.

## 5 Grading

### **Grading of individual assessments**

All the assessments within this qualification are graded at a Pass only.

### **Grading of qualification**

The overall grading of this qualification is Pass/Fail only.

Candidates must achieve a Pass in:

- Unit 601 Multiple-choice online test
- to achieve a Pass in the full qualification.

## 6 Units

### Availability of units

All of the units can be found in this document.

### Structure of the units

The units each have the following:

- City & Guilds reference number
- Title
- Level
- Guided learning hours (GLH)
- Unit aim
- Assessment type
- Learning outcomes, which are comprised of a number of assessment criteria

Centres must deliver the full breadth of the range within the units.

### Guidance for delivery of the units

This qualification is comprised of one **unit**. A unit describes what is expected of a competent person in particular aspects of his/her job.

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

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

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

## Unit 601

# Knowledge of Carrying Out Non-High Voltage Operations On, Near or With an Electric Vehicle

<b>Level:</b>	Level 1
<b>GLH:</b>	8
<b>Relationship to NOS:</b>	EV01: carry out non high voltage operations on, near or with an electric vehicle
<b>Aim:</b>	<p>To be able to identify and name the types of electric vehicles and the high voltage components fitted, and be able to state the legislation and understand the hazards associated with working around high voltage vehicles. Know how to identify the different types of charging systems, and how to safely charge electric vehicles.</p> <p>This unit is for people who work on, near or with electric vehicles but do not work on the vehicle's high voltage system.</p>
<b>Assessment type:</b>	Multiple-choice online test

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### Essential Knowledge

### Learning outcomes

The learner will:

1. Understand the operational differences between electric and non-electric vehicles, and know how to identify the different types of electric vehicles
2. Understand the importance of adhering to health and safety legislation, regulations, guidelines and workplace procedures and know how to work safely around electric vehicles
3. Understand the hazards associated with working on or around electric vehicles

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## Learning outcome:

The learner will:

1. Understand the operational differences between electric and non-electric vehicles, and know how to identify the different types of electric vehicles

## Assessment criteria

The learner must know:

- 1.1 the **differences** between an **electric vehicle** and a non-electric vehicle
- 1.2 how to identify **electric vehicles** and their type
- 1.3 how to identify and locate high voltage electrical **components** in an **electric vehicle**
- 1.4 the function of high voltage **components**
- 1.5 how to identify the **types of charging systems** associated with **electric vehicles**
- 1.6 the methods of **sourcing information** related to electric vehicles
- 1.7 how to use and interpret **technical information** on **electric vehicles**

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## Range

- 1.1 **Differences** between
  - a) Internal combustion engines
  - b) Starting systems
  - c) Charging systems
  - d) Regenerative braking
  - e) Layouts
  - f) Badging / logos
  - g) Components
- 1.1-1.5 **Electric vehicle(s)**
  - a) Pure (PEV) / battery electric vehicle (BEV)
  - b) Extended range (ER-EV)
  - c) Range extended (RE-EV)
  - d) Fuel cell (FCEV)
  - e) Hybrid (HEV)
  - f) Plug-in hybrid (PHEV)
  - g) Mild hybrid
- 1.3-1.4 **Components**
  - a) High voltage batteries
  - b) Low voltage batteries
  - c) Inverter
  - d) High voltage cables
  - e) DC-to-DC convertor
  - f) Fuel cell
  - g) Charging equipment and cables
  - h) Motor generators

- 1.4            **Types of charging systems**
- a) Plugs / sockets (AC-to-DC)
  - b) Trickle charging (3 pin socket)
  - c) AC charging
  - d) DC charging (charging station)
  - e) Combined charging systems
  - f) Hybrid self-charging systems
- 1.6            **Sources of information**
- a) Manufacturer or vehicle technical information
  - b) Job cards
  - c) Equipment manufacturer's websites
- 1.7            **Technical information on**
- a) Charging socket type and location
  - b) Location of high voltage components
  - c) Location of low voltage batteries
  - d) Connecting an auxiliary power source
  - e) Battery range / capacity
  - f) Dashboard symbols

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## Learning outcome:

The learner will:

2. Understand the importance of adhering to health and safety legislation, regulations, guidelines and workplace procedures and know how to work safely around electric vehicles

## Assessment criteria

The learner must know:

- 2.1 current **health and safety legislation, industry codes of practice** or **guidelines** relevant to working on, near or with **electric vehicles**
- 2.2 the **personal protective equipment** required when working on or around **electric vehicles**
- 2.3 the importance of ensuring a **safe working environment**
- 2.4 the **workplace procedures** for working safely around **electric vehicles**
- 2.5 how to **safely operate** an **electric vehicle**
- 2.6 how to safely work around **high voltage components**
- 2.7 the precautionary measures necessary when using plug-in charging equipment and how to use charging systems safely
- 2.8 workplace procedures that must be followed in the event of **emergencies**

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## Range

- 2.1           **Health and safety legislation, industry codes of practice, guidelines**
- a) Health and safety at work act
  - b) Electrical equipment regulations
  - c) Electricity at work regulations
  - d) Regulation No 100 of the Economic Commission for Europe of the United Nations (UNECE): 'High Voltage means the classification of an electric component or circuit, if it's working voltage is > 60 V and ≤ 1500 V DC or > 30 V and ≤ 1000 V AC'
  - e) HSE guidelines
- The latest relevant legislation should be referred to.

- 2.1, 2.2,  
2.4, 2.5           **Electric vehicle(s)**
- a) Pure (PEV) / battery electric vehicle (BEV)
  - b) Extended range (ER-EV)
  - c) Range extended (RE-EV)
  - d) Fuel cell (FCEV)
  - e) Hybrid (HEV)
  - f) Plug-in hybrid (PHEV)
  - g) Mild hybrid

- 2.2           **Personal protective equipment**
- a) Overalls
  - b) Foot protection
  - a) Gloves (correctly rated)
  - c) Eye protection

2.3 **Safe working environment**

- a) Signage
- b) Barriers
- c) Cordoning
- d) Secure key box
- e) Spill kit
- f) Warning labels

2.4 **Workplace procedures for**

- a) Ensuring that the vehicle has been made safe as appropriate to the work you are carrying out
- b) Referring/reporting problems when working with electric vehicles
- c) Recording and reporting work carried out on electric vehicles

2.5 **Safely operate** procedures include

- a) Ensure vehicle is in ready mode
- b) Check for warning symbols on dashboard
- c) Check for system displays and messages
- d) Check surroundings before moving off
- e) Awareness that an engine may start at any time on a hybrid vehicle

2.6 **High voltage components**

- a) Batteries
- b) Capacitors
- c) Invertor
- d) DC-to-DC convertor
- e) Motors (AC/traction)
- f) Cabling
- g) Air conditioning compressor

2.8 **Emergencies**

- a) Electric shock
  - b) Fire
  - c) Flood
  - d) Chemical leakage
-

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### Learning outcome:

The learner will:

3. Understand the hazards associated with working on or around electric vehicles

### Assessment criteria

The learner must know:

- 3.1 the **hazards** associated with **high voltage components**
- 3.2 the **hazards** associated with **electric vehicles** when exposed to extreme temperatures, vehicle impact and other adverse conditions
- 3.3 the health **implications** of strong magnetic fields and electrical conductivity through the human body

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### Range

- |          |   |
|----------|---|
| 3.1, 3.2 | <b>Hazards</b> <ol style="list-style-type: none"><li>a) Fire / thermal runaway</li><li>b) Explosion</li><li>c) Arc flash</li><li>d) Gases/fumes</li><li>e) Chemicals</li><li>f) Electric shock</li><li>g) Dangerous voltage retention in components even when vehicle is switched off</li></ol>           |
| 3.1      | <b>High voltage components</b> <ol style="list-style-type: none"><li>a) Batteries</li><li>b) Capacitors</li><li>c) Invertor</li><li>d) DC-to-DC convertor</li><li>e) Motors (AC/traction)</li><li>f) Cabling</li><li>g) Air conditioning compressor</li></ol>   |
| 3.2      | <b>Electric vehicle(s)</b> <ol style="list-style-type: none"><li>a) Pure (PEV) / battery electric vehicle (BEV)</li><li>b) Extended range (ER-EV)</li><li>c) Range extended (RE-EV)</li><li>d) Fuel cell (FCEV)</li><li>e) Hybrid (HEV)</li><li>f) Plug-in hybrid (PHEV)</li><li>g) Mild hybrid</li></ol> |
| 3.3      | <b>Implications</b> <ol style="list-style-type: none"><li>a) Cardiac arrest</li><li>b) Muscle, nerve and tissue damage</li><li>c) Thermal burns</li><li>d) Medical equipment damage including pacemakers</li></ol>  |

## 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 **[Centre Document Library](http://www.cityandguilds.com)** on **[www.cityandguilds.com](http://www.cityandguilds.com)** or click on the links below:

### **Quality Assurance Standards: Centre Handbook**

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

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

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

### **Quality Assurance Standards: Centre Assessment**

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

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

Any centre-based assessments must be carried out in line with our Centre Assessment Standards Scrutiny (CASS) Strategy which can be found on **[www.cityandguilds.com](http://www.cityandguilds.com)**.

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

The **Centre Document Library** also contains useful information on such things as:

- Conducting examinations
- Registering learners
- Appeals and malpractice
- Reasonable adjustments



## Useful contacts

Please visit the Contact Us section of the City & Guilds website, [Contact us](#)

## City & Guilds

For almost 150 years we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments and credentials that lead to jobs and meet the changing needs of industry.

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

The City & Guilds community of brands includes Gen2, ILM, Intertrain, Kineo and The Oxford Group.

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