

City & Guilds Level 2 Rail Engineering Operative Knowledge (6497-02)

Version 1.1 (March 2021)

Qualification Handbook

Qualification at a glance

Subject area	Rail Engineering
Entry requirements	N/A
Assessment types	Centre Devised Assignment
Grading	Pass / Merit / Distinction
Approvals	Automatic approval, full qualification approval.
Support materials	Assignment Guides
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	GLH	TQT	City & Guilds qualification number	Ofqual accreditation number
City & Guilds Level 2 Diploma in Rail Engineering Operative Knowledge	270	300	6497-02	603/0846/1

Version and date	Change detail	Section
1.1 March 2021	Title Access arrangements and special considerations Developing centre devised assessments document	All 2 4
1.0 December 2016	Initial version	All

Contents

Qualification at a glance	2
Contents	3
1 Introduction	4
Total Qualification Time	6
2 Centre requirements	7
Approval	7
Resource requirements	7
Learner entry requirements	8
Age restrictions	8
Access to assessment and special consideration	8
3 Delivering the qualification	9
Initial assessment and induction	9
Support materials	9
4 Assessment	10
Summary of assessment methods	10
5 Units	12
Structure of the units	12
Unit 201 Working in the rail engineering industry	13
Unit 202 Engineering technology principles	16
Unit 203 Rail Engineering	18
Appendix 1 Relationships to other qualifications	21
Appendix 2 Sources of general information	22
Appendix 3 Useful contacts	24

1 Introduction

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

Area	Description
Who is the qualification for?	These qualifications are aimed at learners aged 16 and above who would like to develop the knowledge and skills that are relevant to a Rail Engineering Operative or a Rail Engineering Technician, either as part of their Apprenticeship or as full time students. Through these qualifications, learners will be introduced to the Rail Engineering Industry and will be able to make an informed decision about what discipline they would like to undertake further training on to take their career forward.
What does the qualification cover?	<p>The railways are a key part of the UK's transport infrastructure for commuting, leisure and business travel, as well as freight services. Rail Engineers are responsible for the safe construction, installation, maintenance and renewal of the railways to provide a safe and reliable railway for customers.</p> <p>These qualifications enable learners to undertake core learning across all areas and specialise in their discipline of choice. The main rail engineering areas covered within these qualifications are: track (including minor works), overhead line, electrification, signalling, telecommunications and traction & rolling stock.</p>
What opportunities for progression are there?	<p>Upon completion of these qualifications learners will have been provided with the self-confidence and motivation to take advantage of the many opportunities for progression and development within the industry, such as:</p> <ul style="list-style-type: none">• Carrying out further training in the following areas: track renewals, track maintenance, traction and rolling stock, electrification construction, electrification maintenance and signal and telecommunications.• Go into employment by taking up a Rail Engineering Competence qualification as part of an Apprenticeship to become a competent Rail Engineering Operative or Rail Engineering Technician.

Area	Description
Who did we develop the qualification with?	<p>Improve their leadership and management skills by taking higher level qualifications through the Institute of Leadership and Management.</p> <p>This qualification has been developed in collaboration with the Rail Engineering trailblazer group which is led by organisations from the industry including: Transport for London, Network Rail, Alstom Transport Services, Amey, Babcock, Carillion, DB Schenker Rail UK, DEG Signalling, First Group, Hitachi Europe, HS2, MGB Engineering, National Express (c2c Ltd), Siemens, Signalling Solutions, Southwest Trains, Telent Technology Services Ltd, VolkerRail, National Skills Academy for Rail, Eurostar, Merseyrail and Virgin East Coast.</p>
Is it part of an apprenticeship framework or initiative?	<p>These qualifications have been developed as part of the new Apprenticeships for Rail Engineering Operatives and Rail Engineering Technicians which will replace the following SASE frameworks, at Levels 2 and 3:</p> <ul style="list-style-type: none"> <li>• Rail Infrastructure Engineering <li>• Rail Engineering Overhead Line Construction <li>• Rail Traction and Rolling Stock Engineering

City & Guilds Level 2 Diploma in Rail Engineering Operative Knowledge

Structure

Learners should cover 201, 202 and 203 as mandatory

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

Mandatory

201	Working in the rail engineering industry	90
202	Engineering technology principles	90
203	Rail Engineering	90

Total Qualification Time

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

Title and level	GLH	TQT
City & Guilds Level 2 Diploma in Rail Engineering Operative Knowledge	270	300

2 Centre requirements

Approval

Centres approved for the Level 2 Certificate in Rail Engineering Underpinning Knowledge (7597-01) which have been active since the beginning of 2015 have been automatically approved for this qualification and can register candidates.

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

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

Resource requirements

Resources

Centres can use specifically designed areas within a centre to assess, for example, the installation of specialised electrical systems, alignment and setting up of electric motors and driven devices (pumps, compressors, generators). The equipment, systems and machinery must meet industrial standards and be capable of being used under normal working conditions, for example electric motors must have a method of applying sufficient power and not be connected up to show movement.

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, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Internal 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.

Full details and guidance on the internal and external quality assurance requirements and procedures are provided in the *Centre Manual – Supporting Customer Excellence*, which can be found on the centre support pages of www.cityandguilds.com. This document also explains the tasks, activities and responsibilities of quality assurance staff.

Learner entry requirements

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

Age restrictions

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

Access to assessment and special consideration

Learners can have access to all forms of equipment and software that constitute their normal way of working, provided that these do not affect the reliability or validity of assessment outcomes or give the learner an assessment advantage over other learners undertaking the same or similar assessments. For more 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
Centre Devised Assessment Materials	www.cityandguilds.com

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, Learning Assistant, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: www.cityandguilds.com/eportfolios.

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate. Recording forms are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.

4 Assessment

Summary of assessment methods

Candidates must:

- successfully complete one assignment for each unit

Available assessments/assignments

City & Guilds has written guidance for centres to write their own assessments/assignments.

City & Guilds has developed a template which tutors/assessors can use to write their own assignments.

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.

For this qualification, RPL is allowed and is not sector specific.

Grading of Qualification

The Rail Engineering Apprenticeship Employer Group has taken the decision to grade this qualification Pass/Merit/Distinction, through the aggregation of the individual unit assessments graded Pass/Merit/Distinction.

Grading can be of use both as a motivational tool within the learning environment and also to learners presenting evidence of their knowledge to prospective employers.

All assessments must be achieved at a minimum of Pass for the qualification to be awarded. All assessments are graded Pass/Merit/Distinction and contribute equally to the overall qualification grade.

Centres will need to calculate the qualification grade as follows:

- Centres will mark and grade each graded assessment using the grading criteria in the **Developing Centre Devised Assessments** document provided by City & Guilds.
- The grade achieved by a learner will need to be converted into points as follows:

Individual assessment grade	Grade points
Pass	4
Merit	6
Distinction	8

Grade points for each assessment need to be added together and the overall qualification grade determined using the following conversion table:

Total grade points	Overall qualification grade
12-14	Pass
16-20	Merit
22-24	Distinction

5 Units

Structure of the units

These units each have the following:

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

Centres must deliver the full breadth of the range. Specialist equipment or commodities may not be available to all centres, so centres should ensure that their delivery covers their use. This may be covered by a practical demonstration (e.g. video). For the practical assessments for this qualification, centres should ensure that there are sufficient resources to complete the task but are not required to use all the equipment or commodities in the range.

Unit 201

Working in the rail engineering industry

Unit level:	Level 2
Credit value:	10
GLH:	90

Learning outcome

The learner will:

- 1 Know rail engineering health and safety workplace requirements

Assessment criteria

The learner can:

- 1.1 Define the current health and safety regulations applicable to rail engineering activities
 - 1.2 Define employers responsibilities to comply with health and safety in terms of provision in the workplace
 - 1.3 Describe how health and safety is applied within rail engineering organisations, to include:
 - legislation
 - regulation
 - rail industry procedures
 - individual organisational safety requirements
-

Learning outcome

The learner will:

- 2 Know effective means of workplace communications

Assessment criteria

The learner can:

- 2.1 Describe the communications systems used in the rail engineering workplace to include:
 - oral
 - written
 - electronic eg phones, radios, multimedia devices, warning systems
 - IT based
 - 2.2 Describe the roles and responsibilities of relevant departments and personnel within a rail engineering organisation
-

- 2.3 Describe the terminology, standards, and templates used when communicating technical information
 - 2.4 List a range of sources of engineering information relevant to job role
 - 2.5 State where certification is required before working can commence
 - 2.6 Describe the need to understand and adhere to corporate policies on ethics, equality and diversity
 - 2.7 Describe the approach to be taken when seeking advice or guidance in the workplace
-

Learning outcome

The learner will:

- 3 Contribute to work in the rail engineering environment

Assessment criteria

The learner can:

- 3.1 Describe how to work effectively within an engineering workplace displaying the conduct/behaviours expected
- 3.2 Explain the importance of time management in meeting project/work deadlines.
- 3.3 Describe the importance of innovation and continuous improvement when applied to rail engineering
- 3.4 Describe how to deal with and how to avoid conflict situations
- 3.5 Function effectively within a workplace team
- 3.6 Describe the various fault finding techniques that can be used, and how they are applied, may include:
 - half-split
 - input-to-output
 - emergent sequence
 - physical checks
 - equipment self-diagnostics
 - visual inspection
- 3.7 Describe how quality assurance and quality management are used to ensure rail engineering workplace outputs are fit for purpose and meet customer expectations

Learning outcome

The learner will:

- 4 Know how the UK rail sector works commercially

Assessment criteria

The learner can:

- 4.1 Describe how the UK rail system works commercially in relation to:
 - the railway infrastructure
 - the role of regulation/regulators
 - financially (including funding, franchising, sustainability)
 - the role of train and freight operating companies (TOCs and FOCs)
 - contractually (including SLA's, implications)
- 4.2 Explain the role of the customer in the rail industry in relation to:
 - meeting customer expectations (end to end journey)
 - Service Level Agreements (contractual obligations to the customer)
 - contingency planning to avoid disruption to the customer

Unit 202

Engineering technology principles

Unit level	Level 2
Credit value:	10
GLH:	90

Learning outcome

The learner will:

- 1 Know the requirements of materials used in engineering

Assessment criteria

The learner can:

- 1.1 List materials for common rail engineering applications
 - 1.2 Describe how materials are obtained for use in rail engineering activities
-

Learning outcome

The learner will:

- 2 Know the properties of engineering materials used in rail engineering

Assessment criteria

The learner can:

- 2.1 Describe physical, mechanical and electrical properties of materials in relation to
 - hardness
 - toughness
 - strength
 - elasticity
 - plasticity
 - ductility
 - malleability
 - brittleness
 - conductivity/resistivity
 - dielectric strength
 - expansion/contraction
-

Learning outcome

The learner will:

- 3 Apply analytical methods to rail engineering mathematical applications

Assessment criteria

The learner can:

- 3.1 Apply appropriate degree of accuracy to express numbers
- 3.2 Describe tolerances in terms of limits of size
- 3.3 Perform calculations to determine the area of basic shapes
- 3.4 Perform calculations to determine the surface area of compound shapes
- 3.5 Perform calculations to determine the surface area of regular shape solids
- 3.6 Perform calculations to determine the volume of regular shapes
- 3.7 Apply Pythagoras' theorem to right angled triangle problems
- 3.8 Interpret straight line graphs using given data
- 3.9 Apply multiple prefix and suffix symbols appropriately

Learning outcome

The learner will:

- 4 Apply analytical methods to rail engineering electrical science applications

Assessment criteria

The learner can:

- 4.1 Recognise the basic theory of electricity
- 4.2 Perform simple calculations using the basics of electricity
- 4.3 Use Ohms law to calculate resistors in series and parallel circuits
- 4.4 Identify lines of flux within magnetic fields
- 4.5 Recognise the relationship between conductors, current, magnetic fields and relative movement
- 4.6 Describe both AC and DC currents and the advantages and disadvantages of both when applied in a rail environment
- 4.7 Apply principles to determine simple electrical circuit problems

Unit 203

Rail Engineering

Unit level:	Level 2
Credit value:	10
GLH:	90

Learning outcome

The learner will:

- 1 Use safe and effective working practices

Assessment criteria

The learner can:

- 1.1 Adhere to the general rules for safe working practices in a rail engineering maintenance, construction or renewals environment
- 1.2 Describe hazards associated with rail engineering maintenance, construction or renewals activities, that may include
 - DC currents, in third and fourth rail
 - working under or close to ole wires
 - crushing
 - train strike
 - working on or near open track
 - possessions
 - release of stored energy (mechanical and electrical)
 - switching, isolation & earthing of plant equipment
- 1.3 Interpret information from health and safety sources
- 1.4 Describe different maintenance, construction or renewals activities that are used when working on rail engineering equipment
- 1.5 Describe the procedures for cleaning work areas following a spillage or leakage
- 1.6 Describe the diagnostic fault location techniques used during rail engineering maintenance, construction or renewals activities
- 1.7 Describe the methods and techniques used to dismantle and reassemble rail engineering assets
- 1.8 Describe the information required when completing a report relating to maintenance, construction or renewals activities

Learning outcome

The learner will:

- 2 Understand drawing and specifications

Assessment criteria

The learner can:

- 2.1 Describe the purpose of the engineering drawings and specifications used in rail engineering
 - 2.2 Interpret engineering drawings or specifications using current rail engineering standards
 - 2.3 Describe the checks taken to ensure correct revision / issue of drawing or specifications
 - 2.4 Apply the technical information contained within drawings or specifications
-

Learning outcome

The learner will:

- 3 Select working methods, tools and equipment for routine maintenance activities

Assessment criteria

The learner can:

- 3.1 Explain how you would plan for a maintenance, construction or renewals activity for a mechanical/electrical asset
 - 3.2 Select appropriate tools and equipment to undertake planned maintenance, construction or renewals activities
 - 3.3 Describe the safe set up of equipment to support safe working
 - 3.4 Demonstrate safe manual handling techniques
 - 3.5 Describe the safe lifting and moving of materials, components and equipment
 - 3.6 Describe the types of and correct methods for using maintenance, construction or renewals tools and equipment
 - 3.7 Describe why tools and equipment are calibrated and how the calibration is controlled in terms of ensuring compliance
 - 3.8 Select and apply the correct type of fasteners used in rail engineering activities
 - 3.9 Describe sequential tightening and why it is applied
 - 3.10 Explain the function of a torque wrench and how it is applied to tightening fasteners
-

Learning outcome

The learner will:

- 4 Carry out a maintenance activity using dismantling/assembly techniques for rail engineering assets

Assessment criteria

The learner can:

- 4.1 Utilise resources including the correct handling, storage of tools, materials and equipment, to include:
 - tools
 - test equipment
 - materials
 - consumables
 - plan
 - communications equipment
- 4.2 Use dismantling techniques when working on a rail engineering asset
- 4.3 Perform engineering measurement and alignment using suitable equipment
- 4.4 Replace life determined items in line with manufacturers data ensuring the asset is not contaminated during the replacement
- 4.5 Use reassembly techniques when working on a rail engineering asset
- 4.6 Assist with function tests or inspection and complete sign off of work
- 4.7 Restore the work area after rail engineering activities including the identification and disposal or reuse of waste
- 4.8 Assist with the completion of documentation following maintenance activities

Appendix 1 Relationships to other qualifications

Links to other qualifications

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

Literacy, language, numeracy and ICT skills development

This qualification can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales – see www.cityandguilds.com/esw

Appendix 2 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.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues.

Specifically, the document includes sections on:

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

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

- NVQ Code of Practice (2006)

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

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

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

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

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification.

Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates

- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Appendix 3 Useful contacts

UK learners

General qualification information

E: learnersupport@cityandguilds.com

International learners

General qualification information

E: intcg@cityandguilds.com

Centres

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

E: 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

International awards

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

E: 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

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: business@cityandguilds.com

Publications

Logbooks, Centre documents, Forms, Free literature

Every effort has been made to ensure that the information contained in this publication is true and correct at the time of going to press. However, City & Guilds' products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time. City & Guilds cannot accept liability for loss or damage arising from the use of information in this publication.

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: feedbackandcomplaints@cityandguilds.com

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

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.

Copyright

The content of this document is, unless otherwise indicated, © The City and Guilds of London Institute and may not be copied, reproduced or distributed without prior written consent. However, approved City & Guilds centres and candidates studying for City & Guilds qualifications may photocopy this document free of charge and/or include a PDF version of it on centre intranets on the following conditions:

- centre staff may copy the material only for the purpose of teaching candidates working towards a City & Guilds qualification, or for internal administration purposes
- candidates may copy the material only for their own use when working towards a City & Guilds qualification

The Standard Copying Conditions (see the City & Guilds website) also apply.

Please note: National Occupational Standards are not © The City and Guilds of London Institute. Please check the conditions upon which they may be copied with the relevant Sector Skills Council.

Published by City & Guilds, a registered charity established to promote education and training

City & Guilds

1 Giltspur Street

London EC1A 9DD

www.cityandguilds.com
