

REGULATED QUALIFICATION FRAMEWORK (RQF)

QUALIFICATION SPECIFICATION

LCL Awards Level 3 Award in the Installation, Commissioning and Service of Commercial CO₂ refrigeration systems

1.0 Area and scope of competence:

This qualification incorporates the safe use of CO₂ high pressure refrigeration systems and is designed to meet the legal requirements of learners who work or intend to work with high pressure refrigerants.

The qualification allows learners to continue to learn, develop and practise the skills required for employment within the RACHP sector, helping to reduce direct greenhouse gas emissions by limiting the release of fluorinated and other greenhouse gases and thereby reducing the indirect greenhouse gas emissions and improving the energy efficiency of stationary refrigeration equipment.

The aim of this qualification is to provide the learner with the knowledge and skills to install, service, maintain, commission, de-commission and leak checking of RACHP equipment that contains R744 (CO₂).

The qualification covers the safe use of “Oxy-Fuel” brazing equipment used for the installation, replacement or de-commissioning of CO₂ equipment and components.

2.0 Qualification Framework:

The qualification comprises of 2 mandatory Units;

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating	GLH	TQT
Installation, Commissioning and Service Commercial CO ₂ refrigeration systems	LCL-F3005	Knowledge & Performance	3	1	6	10
Understand and carry out “Oxy fuel” brazing techniques for high pressure CO ₂ systems	LCL-F3006	Knowledge & Performance	3	1	6	10

Qualification Structure:

- LCL Awards Level 3 Award in the Installation, Commissioning and Service of Commercial CO₂ refrigeration systems (*ICSCCO2*)
- QAN 603/7760/4
- The Guided Learning Hours (GLH) are **12 hours**
- The Total Qualification Time (TQT) is **20 hours**
- The total credit required to achieve the qualification is **2**

Condition of certification:

Note: Certificates issued within this qualification are valid for a period of **5 years** from the date of issue.

3.0 Unit Grading Structure:

The learner is required to successfully pass 2 units for this qualification to be awarded.

4.0 Unit specification:

Unit LCL-R3005 Installation, Commissioning and Service Commercial CO₂ refrigeration systems. (Assessments via M/C and OP)

Learning Outcome 01: The learner will be able to plan and prepare for the installation and commissioning of commercial CO₂ refrigeration systems.
The learner will be able to:

- 1.1 Understand the properties of CO₂ R744 including:
 - State of matter, changes of states
 - Characteristics – safety classification, saturation temperature, practical limit, density and critical temperature
 - Refrigerant comparisons between HFC, HFO, HC and R744
 - Pressure temperature relationship
 - Cooling capacities comparison
 - Super critical, trans critical and sub critical
- 1.2 Produce a suitable risk assessment of the installation to identify any factors which may impact upon the work
- 1.3 Produce a suitable method statement to confirm that relevant people have been provided with job information (as appropriate) and identify points within the work process when liaison with identified relevant persons may be necessary
- 1.4 Identify manufacturers' instructions, regulations and industry standards to determine installation and commissioning requirements for systems and components.
- 1.5 Use manufacturer's instructions, regulations and industry standards to determine requirements for systems and components, including procedures to:
 - confirm that components have suitable pressure ratings for carbon dioxide systems and are suitable for use
 - confirm that fittings have suitable pressure ratings for carbon dioxide systems and are suitable for use
 - determine strength test pressure(s) from the system maximum allowable pressure(s)
 - determine tightness test pressure(s) from the system maximum allowable pressure(s)
- 1.6 Select appropriate PPE for the completion of work activities.

Learning Outcome 02: The learner will be able to carry out the installation of commercial CO₂ refrigeration systems.
The learner will be able to:

- 2.1 Identify and interpret appropriate sources of information which impact upon the installation of commercial CO₂ refrigeration pipework, systems and components, including:
 - regulatory documents
 - industry codes of practice
 - manufacturer's instructions
 - installation specification

- 2.2 Assemble and join commercial CO₂ refrigeration system components to meet the requirements of the installation specification.
- 2.3 Position and fix commercial CO₂ refrigeration system components and pipework correctly, in respect of:
 - Support spacing for pipe
 - To allow for pipework to expand and contract
 - Insulation and vapour seals
- 2.4 Confirm that system components and pipework are correctly installed in accordance with the design specification.
- 2.5 Adjust and set safety and control features as appropriate.
- 2.6 Complete procedures to remove and refit components to commercial CO₂ refrigeration systems.

Learning Outcome 03: The learner will be able to carry out the commissioning of commercial CO₂ refrigeration systems.

The learner will be able to:

- 3.1 Use manufacturer's instructions, regulations and industry standards to prepare a pre-commissioning checklist for RACHP systems:
- 3.2 Conduct the following checks on commercial CO₂ refrigeration equipment and systems:
 - visual inspection of:
 - pipework for leakage
 - pipework for adequate support
 - of insulation and vapour seals
 - for high moisture levels
 - of pressure relief valves and relief piping
- 3.3 Demonstrate procedures for testing commercial CO₂ refrigeration systems, including:
 - establishing system allowable pressure(s)
 - conducting a strength pressure test
 - conducting a tightness pressure test
- 3.4 Demonstrate procedures for charging commercial CO₂ refrigeration systems, including:
 - Evacuating a system
 - Breaking a vacuum with carbon dioxide vapour
 - Charging a system with oil
 - Charging a system with carbon dioxide liquid
- 3.5 Demonstrate commercial CO₂ refrigeration system operation to confirm that system and equipment is functioning correctly.
- 3.6 Demonstrate procedures for adjusting system operating parameters through:
 - adjusting safety and system controls
 - additional refrigerant as required
 - additional oil as required
 - safely vent CO₂, avoiding deposition "dry ice"
- 3.7 Produce documentary records to provide system users with information necessary for continuing operation of commercial CO₂ refrigeration systems, including:
 - records of:
 - refrigerant quantity added
 - refrigerant quantity removed

- oil quantity added
- oil quantity removed
- commissioning data

Learning Outcome 04: The learner will be able to carry out the de-commissioning of commercial CO₂ refrigeration systems.
The learner will be able to:

- 4.1 Produce appropriate risk assessments and method statements to ensure decommissioning activities can be completed safely.
- 4.2 Demonstrate work sequences for permanently decommissioning:
 - a complete commercial CO₂ refrigeration system
 - part of a commercial CO₂ refrigeration system
- 4.3 Describe how oil and refrigerant could be safely removed from a system and disposed of.

Unit LCL-F3006 Understand and carry out “Oxy fuel” brazing techniques for high pressure CO₂ systems (assessments via M/C and OP)

Learning Outcome 01: The learner will understand the working principles of RACHP Oxyfuel brazing processes.
The learner will demonstrate knowledge of.:

- 1.1 the working principles of all the following items of Oxyfuel brazing equipment:
 - oxyfuel, compressed inert gas cylinders
 - single and two stage regulators
 - flashback arresters
 - non-return valves
 - brazing torches
 - brazing nozzles
 - oxyfuel hoses.

Learning Outcome 02: The learner will understand the legislative and organisational procedures related to RACHP Oxyfuel brazing processes.
The learner will demonstrate knowledge of:

- 2.1 appropriate sources of health, safety information, regulations, codes of practice, industry recommendations and brazing specifications as it relates to:
 - oxyfuel, compressed inert gases
 - brazing equipment
 - brazing processes
 - materials handling
- 2.2 appropriate persons whom it may be necessary to advise, before undertaking brazing processes
- 2.3 the actions that should be taken upon completion of brazing processes in terms of:
 - quality control, check for leaks
 - appropriate documentation
- 2.4 how to perform a safe shut down of brazing equipment after completion of work operations.

Learning Outcome 03: The learner will understand how to complete preparation work for Oxyfuel brazing activities.

The learner will demonstrate knowledge of:

- 3.1 how to complete a suitable risk assessment for the completion of brazing in the work location
- 3.2 the content of a method statement for the completion of brazing processes
- 3.3 the personal protective equipment appropriate to the work activity being carried out
- 3.4 the preparation requirements for:
 - joining pipework by brazing
 - identify and test for faults on brazed pipework sections
 - commissioning method for brazed pipework sections
 - decommissioning method for brazed pipework sections
- 3.5 pipework materials and fittings required to complete brazing processes and check them for defects
- 3.6 suitable tools and equipment required to carry out brazing processes
- 3.7 the procedures for checking and maintaining brazing tools and equipment.

Learning Outcome 04: The learner will be able to complete preparation work for RACHP Oxyfuel brazing activities.

The learner will be able to:

- 4.1 Carry out a suitable risk assessment for the completion of brazing processes in the work location
- 4.2 Understand and apply a method statement for brazing to ascertain requirements for:
 - storage of materials and finished products
 - availability of service supplies
 - informing appropriate people at key stages in the brazing process
 - reporting problems
 - joining procedures
 - job instructions
 - permit to work
- 4.3 Select personal protective equipment appropriate to the work activity being carried out as per the risk assessment and method statement.
- 4.4 Select pipe and materials for brazing processes and confirm that they are appropriate for the work activity.
- 4.5 Select equipment for the completion of brazing processes and confirm that is appropriate for the work activity.
- 4.6 Confirm that preparations have been completed in line with organisational procedures and method statement.

Learning Outcome 05: The learner will understand how to connect RACHP pipework with Oxyfuel brazing.

The learner will demonstrate knowledge of:

- 5.1 interpreting engineering drawings and brazing specifications for the completion of brazing procedures.
- 5.2 the methods for setting up and using brazing equipment, including:
 - oxyfuel, compressed inert gas cylinders
 - single and two stage regulators
 - flashback arresters
 - non-return valves
 - brazing torches

- brazing nozzles
- oxyfuel hoses.

5.3 the basic principles for inspecting, testing and maintaining oxyfuel brazing equipment.

5.4 procedures for brazing the following refrigeration grade materials in accordance with industry standards:

- copper pipe, steel pipe
- bends and elbows
- tees
- copper, brass and steel couplings
- In line components including capillary fittings

5.5 the procedures for:

- checking brazed joints for compliance
- testing for defects.

Learning Outcome 06: The learner will be able to connect RACHP pipework by Oxyfuel brazing. The learner will be able to:

6.1 Complete checks to establish that:

- joint preparation
- brazing equipment
- Consumables and materials
- Confirm that the system complies with specifications and is fit for purpose

6.2 Select tools and equipment required to carry out RACHP Oxyfuel brazing of pipework with CO₂ systems and confirm they are fit for purpose.

6.3 Set up brazing equipment in accordance with industry standards and regulations.

6.4 Braze the following pipework materials to conform to assessment specifications:

- K65 copper pipe CO₂ applications
- K65 bends and elbows
- K65 tees
- K65 In line components

6.5 Confirm that equipment has been safely isolated upon completion of brazing activities.

6.6 Conduct industry approved checks and tests on brazed joints to:

- confirm compliance with assessment specification
- identify any defects
- identify any corrective actions

6.7 Complete relevant documentation including brazed joint test reports.

5.0 National Occupational Standard:

The Units used in this qualification have a direct relationship with BS EN 378 and BRA Specification of Brazing Procedures.

6.0 Target Groups:

The target groups for the qualification are those learners who are;

1. Updating occupational competence, continuous professional development and or obtaining a licence to practice

2. Preparing for further learning or training and/or developing knowledge and or skills in a subject area who are existing workers in the occupation seeking to extend their range of work

7.0 RQF Descriptor Level 3.

Knowledge descriptor: *(The learner will demonstrate knowledge of)*

- Has factual, procedural and theoretical knowledge and understanding of a subject or field of work to complete tasks and address problems that while well-defined, may be complex and non-routine.
- Can interpret and evaluate relevant information and ideas.
- Is aware of the nature of the area of study or work.
- Is aware of different perspectives or approaches within the area of study or work.

Skills Descriptor *(The learner will be able to)*

- Identify, select and use appropriate cognitive and practical skills, methods and procedures to address problems that while well defined, may be complex and non-routine.
- Use appropriate investigation to inform actions.
- Review how effective methods and actions have been.

8.0 Prior knowledge, skills or understanding which the learner is required to have before taking the qualification. (Pre-requisites)

The learner should hold a valid F-Gas category 1 or 2 certificate. To be valid, the certificate must have been issued within the previous 5 years (BESA and LCL Awards) and after 2015 for City and Guilds 2079 certificate holders.

9.0 Units which a learner must have completed before the qualification will be awarded and any optional routes.

Learners must complete 2 mandatory units before the qualification will be awarded. See Section 4.0 above.

10.0 Other requirements which a learner must have satisfied before the learner will be assessed or before the qualification will be awarded.

See Section 8.0 above.

11.0 The method of any assessment and any associated requirement relating to it.

The assessment consists of 2 on-line knowledge assessment along with a practical skills assessment

12.0 The design and delivery of the examination associated with these units are based on the following documents:

BS EN 378

IOR Safety code of Practice CO₂

IOR Safety code of practice Flammable Lower Toxicity Refrigerants (Groups A2L, A2 & A3)

F-Gas (2nd Ed) Reference Manual (ISBN: 9780992760434)

13.0 The criteria against which learners' level of attainment will be measured.

The Learning Outcomes and Assessment Criteria against which learners' level of attainment will be measured are detailed in Section 4 of this specification.

14.0 Specimen assessment materials.

F-Gas 2nd Edition Reference Manual (ISBN 9780992760434)

15.0 Specified levels of attainment

Learners must achieve a pass for the qualification to be awarded.

16.0 Other information

SSAs: 4.1 Engineering

Review Date: Dec 26