REGULATED QUALIFICATION FRAMEWORK (RQF)

QUALIFICATION SPECIFICATION

LCL Awards Level 3 Award in the Installation and Maintenance of Heat Pumps Systems (Non-refrigerant Circuits)

1. Objective:

The qualification covers both Air and Ground Source Heat Pumps it allows learners to continue to learn, develop and practise the skills required for employment within the renewable sector. Know the health and safety risks and safe systems of work associated with heat pump systems, the requirements of regulations and standards relating to the installation, testing and commissioning of heat pump systems, the purpose and operational characteristics of heat pump system components, the different types of heat pump systems and the arrangements for hydraulic emitter circuits, the principles of heat pump selection and system design the design factors and principles relating to heat pump systems, the preparatory work required for heat pump installations and the requirements to install, commission and hand over heat pump systems.

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

2. Qualification Framework:

The qualification comprises of 4 mandatory Units;

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating
Know the requirements to install, commission and handover heat pump systems	LCL-R3023	Knowledge	3	2
Install, commission and handover heat pump systems	LCL-R3020	Performance	3	1
Know the requirements to inspect, service and maintain heat pump systems	LCL-R3021	Knowledge	3	1
Inspect, service and maintain heat pump systems	LCL-R3022	Performance	3	1

Qualification Structure:

- **LCL Awards Level 3 Award in the Installation and Maintenance of Heat Pump Systems (Non-Refrigerant Circuit)**
- QAN **– 600/7730/X**
- QW **– C00/0519/6**
- The Guided Learning Hours (GLH) are **35 hours**
- The Total Qualification Time (TQT) is **45 hours**
- The total credit required to achieve the qualification is **5**

3. Unit Grading Structure:

The learner is required to successfully achieve a pass in each unit for this qualification to be awarded.

4. Unit specification:

Know the Requirements to Install, Commission and Handover Heat Pump Systems (non-refrigerant circuits)
Assessment Method {XAMS}

Learning Outcome 01: The learner will know the health and safety risks and safe systems of work associated with heat pump systems.

The learner will demonstrate knowledge of:

1.01 Which aspects of heat pump installation work pose risk of:
- electrocution/electric shock
- burns
- toxic poisoning
- personal injury though component/equipment handling

1.02 The safe systems of work for heat pump installation work in relation to the prevention of:
- electrocution/electric shock
- burns
- toxic poisoning
- personal injury though component/equipment handling

Learning Outcome 02: The learner will know the requirements of regulations and standards relating to the installation, testing and commissioning of heat pump systems.

The learner will demonstrate knowledge of:

2.01 Which building regulation and building standards guidance documents are relevant to heat pump installation work in particular relating to:
- maintaining the structural integrity of the building
- maintaining the fire-resistant integrity of the building
- the prevention of moisture ingress (building water tightness)

- notification of work requirements
- installation requirements
- energy conservation
- testing and commissioning requirements
- compliance certification

2.02 Which water regulation and byelaw guidance documents are relevant to heat pump installation work in particular in relation to:
- the installation of the system
- energy conservation
- the safe operation of the system
- testing and commissioning of the system

2.03 The requirements of the fluorinated greenhouse gases regulations in relation to the competence of personnel:
- installing heat pumps where the refrigerant circuit has been assembled and tested by the manufacturer
- installing heat pumps where the refrigerant circuit is to be assembled and tested in the location where the heat pump is to be installed
- undertaking leakage checking on heat pump refrigerant circuits
- undertaking recovery of fluorinated greenhouse gases from heat pump refrigerant circuits

Learning Outcome 03: The learner will know the purpose and operational characteristics of heat pump system components.

The learner will demonstrate knowledge of:

3.01 The purpose and operation of the following heat pump system components:
- Evaporator
- low pressure switch
- compressor
- high pressure switch
- condenser
- dryer/receiver
- sight glass
- expansion valve
- expansion valve phial
- refrigerant four-way valve
- emitter circuit electro-mechanical valves
- fan coil
- integrated buffer tank
- heat transfer fluid pump
- ground loop heat exchanger

3.02 How the vapour compression refrigerant circuit within a heat pump unit operates.

Learning Outcome 04: The learner will know the different types of heat pump systems and the arrangements for hydraulic emitter circuits.

The learner will demonstrate knowledge of:

4.01 Different types of heat pump system:
- outside air/water
- exhaust air/water
- Heat Transfer Fluid (closed loop)/water
- water (open loop)/water

4.02 Identify the different types of heat pump unit within the categories:
- ground source – packaged (indoor)
- ground source – packaged (outdoor)
- air source - external air, internal heat pump unit with heat transfer fluid circuit between fan coil unit and heat pump unit.

4.03 The meaning of:
- monovalent system
- bivalent system

4.04 Identify the following monovalent hydraulic emitter circuits:
- heating only
- heating with buffer tank
- heating with buffer tank and indirect stored domestic hot water
- heating with buffer tank and indirect stored domestic hot water with solar coil
- heating with thermal store

4.05 Identify the following parallel bivalent hydraulic emitter circuits which incorporate a secondary heat source other than an immersion heater:
- heating with buffer tank
- heating with buffer tank and indirect stored domestic hot water
- heating with buffer tank and indirect stored domestic hot water with solar coil
- heating with buffer tank and thermal store

4.06 The requirements for connecting buffer tanks:
- in series
- in parallel

Learning Outcome 05: The learner will know the principles of heat pump selection and system design.

The learner will demonstrate knowledge of:

5.01 The meaning of the Seasonal Coefficient of Performance (SCoP).

5.02 The relationship between Seasonal Coefficient of Performance and the:
- heat pump input temperature
- heat pump emitter temperature

5.03 The effect that ambient temperature can have on:
- coefficient of performance
- heat pump output

5.04 The meaning of the Seasonal Coefficient of Performance (SCoP).

5.05 The factors that can affect the Seasonal Coefficient of Performance.

5.06 The meaning of System Efficiency.

5.07 The factors that can affect the 'System Efficiency'.
5.08 Why achieving minimum heat loss from the building is important when designing a heat pump system.
5.09 The effect that oversizing of a heat pump has on:
- system efficiency
- operation

5.10 The effect that under-sizing of a heat pump has on:
- system efficiency
- operation

5.11 How to identify heat pump hydraulic flow rate requirements.
5.12 How to use manufacturer's data to select heat pump units.
- output charts
- other data

5.13 The meaning of bivalent points.
5.14 How bivalent points are used to determine auxiliary heat requirements
5.15 How heat pump output capacity is affected by:
- heat pump input temperature
- heat pump output temperature

5.16 The suitability of the following types of hydraulic heating system emitters for use with heat pump systems:
- underfloor heating
- fan assisted convector heaters
- panel radiators

5.17 The typical mean water temperature recommended when designing a hydraulic emitter circuit that incorporates:
- underfloor heating
- fan assisted convector heaters
- panel radiators

5.18 How correction factors are used to determine emitter output requirements in relation to mean water temperature and room temperature difference.
5.19 The advantages and disadvantages of including a buffer tank in the system design.
5.20 The method of determining the size of a monovalent heat pump system.
5.21 The typical annual operating hours for a heat pump that is being used for:
- heating only
- heating and domestic hot water

5.22 Confirm using available external temperature, heat load and system flow temperature data, the required size (heat output in kW) of a heat pump to be connected to a hydraulic heat emitter circuit using a monovalent system design.
5.23 Why heat pump annual operating hours vary.
5.24 State how heat pump annual operating hours may vary in relation to the:
- type of building
- geographical location of the installation.

Learning Outcome 06: The learner will know the fundamental design principles for ground source 'closed loop' heat pump collector circuit design, component sizing and installation.

The learner will demonstrate knowledge of:

6.01 the following heat transfer fluid filled heat pump collector circuit configurations:
- ground 'closed' loop horizontal
- ground 'closed' loop compact collector
- ground 'closed' loop slinky
- ground 'closed' loop vertical borehole
- lake 'closed' loop
- vertical borehole open loop.

6.02 the requirements of horizontal 'closed' loop heat transfer fluid filled hydraulic heat pump collector circuits in relation to:
- suitable pipework materials
- below ground jointing
- protection against frost damage
- protection against mechanical damage
- separation distances to avoid thermal interference
- separation distances from other services and adjacent buildings
- achieving balanced loop/collector circuits.

6.03 the typical requirements of vertical borehole 'closed' loop heat transfer fluid filled hydraulic heat pump collector circuits in relation to:
- suitable pipework materials
- below ground jointing
- protection against frost damage
- protection against mechanical damage
- separation distances to avoid thermal interference
- separation distances from other services and adjacent buildings
- achieving balanced loop/collector circuits.

6.04 the typical components required in relation to:
- loop single circuit 'closed' loop collector circuits
- multi-circuit 'closed' collector circuits
- heat transfer fluid circuits between outside units and internal heat pump units.

6.05 the typical layout of components in relation to:
- single circuit collector circuits
- multi-circuit collector circuits
- heat transfer fluid circuits between outside units and internal heat pump units.

6.06 which factors determine the year-round energy available in Watts (W) per m^2 of ground area.

6.07 how to determine the energy requirement (refrigeration capacity) from the ground loop (kW) using the total heat pump capacity (kW) and the electrical energy input rating (kW).

6.08 how the specific heat extraction capacity (in W/m^2 for horizontal/vertical trench collectors and W/m for vertical borehole collectors) of the ground collector circuit can be affected by the:
- ground conditions/soil types
- type of backfill material
- geographical location – ground rest temperature
- ground loop configuration
- annual heat pump operating hours.

6.09 how the total ground area (m^2) requirements for horizontal collector loops are determined using the following data:
- refrigeration capacity (kW)
- specific extraction output (W/m^2).

6.10 how the pipe length (m) requirement for a horizontal 'loop' collector circuit is determined using the following data:
- total ground area (m^2)
- collector loop pipe spacing (m).

6.11 how the pipe length (m) requirement for a 'slinky' collector circuit is determined using the following data:
- total ground area (m^2)
- centre to centre spacing of the slinky collector (m).

6.12 how the typical collector length (m) requirement for a vertical borehole collector circuit is determined using the following data:
- heat pump refrigeration capacity (kW)
- ground condition
- annual heat pump operating hours.

6.13 how a collector circuit heat transfer fluid pump size (Kg/h) is determined using the following data:
- design flow rate
- heat transfer fluid viscosity
- heat pump refrigeration capacity (kW)
- specific thermal capacity of heat transfer fluid (kJ/kg)
- temperature difference between heat transfer fluid circuit flow and return pipework (degrees centigrade).

Learning Outcome 07: The learner will know the layouts of 'open loop' water filled heat pump collector circuits.

The learner will demonstrate knowledge of:

7.01 the following 'open loop' water filled heat pump collector circuit configurations:
- GROUND 'open' loop vertical borehole
- lake 'open' loop.

Learning Outcome 08: The learner will know the requirements to install, commission and hand over air source heat pump systems.

The learner will demonstrate knowledge of:

8.01 factors to be considered in selecting and positioning an air source heat pump in relation to its:
- fan coil unit.
  - operating noise (including the potential effect on neighbouring properties)
  - air turbulence during operation.

8.02 options available to provide a defrost cycle for a heat pump.

8.03 requirements for sizing a buffer tank to provide for a heat pump defrost cycle.

Learning Outcome 09: The learner will know the preparatory work required for heat pump installations.

The learner will demonstrate knowledge of:

9.01 pre-installation checks for heat pump systems connected to hydraulic emitter circuits.
- authorisation for the work to proceed
- the availability and collation of all relevant information
- verification of the suitability of the hydraulic emitter circuit for connection to the heat pump unit
- verification that the heat output capacity of the heat pump unit is matched to the required proportional contribution of the total building heat load
- verification that the buffer tank sizing is correct
- the availability of appropriate access to all required work areas
- the availability and condition of a suitable electrical input service
- adequate provision for the siting of key internal system components

9.02 pre-installation checks that are specific to the positioning of fan coil units.

Learning Outcome 10: The learner will know the preparatory work required for heat pump installations.

The learner will demonstrate knowledge of:

10.01 requirements for moving and handling heat pump units to avoid damage to the unit.

10.02 installation requirements where heat transfer fluid circuit pipework passes through the external building fabric in relation to:
- provision for movement
- protection against freezing
- prevention of water ingress

10.03 requirements for flushing and treating hydraulic heat emitter circuits.

10.04 hydraulic test requirements for hydraulic emitter circuits.
- purging of air and installation debris
- addition of antifreeze protection and suitable biocides
- checking flow rates.

10.05 equipment is needed for system charging and flushing

10.06 hydraulic test requirements for hydraulic emitter circuits.
- closed loop collector circuits
- hydraulic emitter circuits.

Learning Outcome 11: The learner will understand the requirements to commission heat pump system installations (non-refrigerant circuits).

The learner will demonstrate knowledge of:

11.01 the conditions that are required to implement commissioning activities for ground source heat pump systems.

11.02 Confirm the commissioning requirements for ground source heat pump systems in relation to:
- setting of mechanical controls
- setting of electrical controls and temperature sensors
- functional tests.

11.03 the conditions that are required to implement commissioning activities for air source heat pump systems.

11.04 the commissioning requirements for air source heat pump systems in relation to:

- setting of mechanical controls
- setting of electrical controls and temperature sensors
- functional tests.

Learning Outcome 12: The learner will understand the requirements to commission heat pump system installations (non-refrigerant circuits).

The learner will demonstrate knowledge of:

12.01 the pre-handover checks that need to be carried out for a ground source heat pump system installation.

12.02 the industry handover procedures for a ground source heat pump system installation in relation to the:

- provision of written information
- provision of diagrammatic information
- provision of verbal information/demonstration relating to system operation and use.

12.03 the pre-handover checks that need to be carried out for an air source heat pump system installation.

12.04 the industry handover procedures for an air source heat pump system installation in relation to the:

- provision of written information
- provision of diagrammatic information
- provision of verbal information/demonstration relating to system operation and use.

Install, Commission and Handover Heat Pumps Systems (Non-Refrigerant Circuits)
Assessment method {OP}

Performance Assessments
Where this assessment is conducted in full or in part, either in the work place or a simulated Realistic Work Environment (RWE), the performance assessment must be carried out using installations that will enable the learner to demonstrate competence to install, inspect, test, commission and handover to the end user a heat pump (non-refrigerant circuit), and associated components covered by this assessment and that the assessment will enable the Unit's performance and knowledge assessment criteria to be met.

Workplace Performance Assessments.
Work place performance assessments must be undertaken with the learner being directly supervised by a competent person.

It is the responsibility of the assessor to ensure that;

- The assessment being undertaken by the learner is carried out in accordance with the requirements of prevailing legislation and normative standards at the time of assessment.
- A risk assessment has been carried out by the learner and that the assessment has taken into account and mitigated potential or actual risks either before or during the assessment.
- The supervising engineer holds valid certificates of competence in the areas of work being undertaken by the learner.
- Confirmation has been given by the responsible person of the property for the work to be carried out.

Learning Outcome 01: The learner will be able to plan and prepare for the installation of heat pump systems.

The learner will be able to:

1.01 undertake pre-installation checks on heat pump systems which include:

- the authorisation for the work to proceed
- the availability of appropriate access to all work areas
- the availability and collation of relevant information
- confirmation of the suitability of the proposed location of the fan coil unit
- conformation that the collector circuit is appropriate to the heat pump rating (ground source heat pumps only)
- confirmation that the heat pump rating is suitable for the design load
- confirmation of the suitability of the proposed location of the heat pump unit
- confirmation that the emitter circuit design or existing installation is compatible with the proposed heat pump installation.
- confirmation that the buffer tank size (where relevant) is appropriate
- confirmation of a suitable electrical input service
- the proposed siting of internal system components
- the suitability of the building structure in relation to the proposed installation

1.02 confirm that tools, materials and equipment required for the installation work are available and are in a safe usable condition.

Learning Outcome 02: The learner will be able to install heat pump systems.

The learner will be able to:

2.01. install the heat pump to the hydraulic emitter circuit in accordance with manufacturer's instructions, regulatory requirements and industry recognised procedures.

2.02. install a ground source heat pump to include as a minimum the connection of the heat pump unit to the collector circuit in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures

Learning Outcome 03: The learner will be able to test and commission heat pump systems.

The learner will be able to:

3.01. prepare a ground source heat pump system for testing and commissioning which includes checks and actions to confirm:

- compliance with the system design and specification
- compliance with system/component manufacturer requirements
- the suitability of the electrical supply circuit
- the system is ready for flushing of installation debris
- the system is ready for filling and venting the hydraulic circuits
- the system is ready for adding protection against freezing
- the client requirements are met
- the system is compliant with statutory regulations and/or industry recognised procedures

3.02. commission the system in accordance with manufacturer's instructions, design specification, client's and statutory requirements and industry recognised procedures.

3.03. identify the commissioning requirements for the installation in relation to:

- the system/component manufacturer(s) requirements
- system design/specification requirements
- the client/end user requirements
- statutory regulations and/or industry recognised procedures.

3.04. commission the installation in accordance with manufacturer's guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures.

3.05. complete relevant documentation to record the commissioning activities.

Learning Outcome 04: The learner will be able to test and commission an air source heat pump installation (non-refrigerant circuits).

The learner will be able to:

4.01 prepare an air source heat pump system for testing and commissioning to include checks/actions to confirm:

- compliance with the system design and specification
- compliance with system/component manufacturer requirements
- the suitability of electrical supply circuit arrangements
- correct flushing the system of installation debris
- correct filling and venting the hydraulic circuits
- protection of the system against freezing.

4.02 identify the commissioning requirements for the installation in relation to:

- the system/component manufacturer(s) requirements
- system design/specification requirements
- the client/end user requirements
- statutory regulations and/or industry recognised procedures.

4.03 commission the installation in accordance with manufacturer's guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures.

Learning Outcome 05: The learner will be able to handover a ground source heat pump installation.

The learner will be able to:

5.01 undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturer's guidance, the system design/specification, client's requirements, regulatory requirements and/or industry recognised requirements.

5.02 explain and demonstrate to the end user the operation and use of the system using manufacturer's guidance and industry agreed handover procedures.

5.03 identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements.

5.04 obtain acceptance by the end user of the system according to the industry agreed handover procedures.

5.05 ensure that all relevant handover documentation is correctly completed and recorded in the appropriate information systems and passed to the end user in accordance with manufacturer's guidance and industry recognised procedures.

Know the Requirements to Inspect, Service and Maintain Heat Pump System Installations (Non-Refrigerant Circuits).
Assessment method {XAMS}

Learning Outcome 01: The learner will know the requirements for the non-refrigerant circuit routine service and maintenance of heat pump system installations.

The learner will demonstrate knowledge of:

1.01. the documentation to be available to inspect, service and maintain heat pump systems.
1.02. the inspection, service and maintenance requirements for heat pump systems.
- visual inspection requirements
- cleaning of components
- checking of system water content
- functional tests.

1.03. the industry requirements for recording the outcomes of inspection, service and maintenance of heat pump systems.
- visual inspection requirements
- cleaning of components
- checking of system water content
- functional tests.

1.04. the action(s) to be taken in the event of a failure or suspected failure of the refrigerant circuit and/or a suspected refrigerant circuit defect.
1.05. state the action(s) to be taken in the event of a failure or suspected failure of the refrigerant circuit and/or a suspected refrigerant circuit defect.

Learning Outcome 02: The learner will know how to diagnose and rectify defects and malfunctions in heat pump systems.

The learner will demonstrate knowledge of:

2.01 the information to be available to enable fault diagnosis and rectification of system defects and malfunction.
2.02 the sequence of actions to enable diagnosis and rectification of heat pump system defects and malfunctions.
- heat pump low pressure trip/alarm activated by a collector circuit malfunction
- heat pump high pressure trip/alarm activated by an emitter circuit malfunction
- poor or no collector circuit performance
- Insufficient heat output to emitter circuit
- domestic hot water heat up is satisfactory but space heating is not operating
- system noise and/or vibration.

Learning Outcome 03: The learner will know how to rectify non-refrigerant circuit faults in heat pump system installations.

The learner will demonstrate knowledge of:

3.01 the work action and sequences required to rectify the following faults:
- heat pump low pressure trip/alarm activated by a collector circuit malfunction

- heat pump high pressure trip/alarm activated by an emitter circuit malfunction
- poor or no collector circuit performance
- insufficient heat output to emitter circuit
- domestic hot water heat up is satisfactory but space heating is not operating
- system noise and/or vibration.

Inspect, Service and Maintain Heat Pump Installations (non-refrigerant circuits)
Assessment method {OP}

Learning Outcome 01: The learner will be able to undertake inspection, service and maintenance of heat pump systems.

The learner will be able to:

1.01 obtain the relevant information required to enable the work to be undertaken.
1.02 undertake an inspection of a heat pump system to include checks in relation to:
- compliance with manufacturer's installation instructions
- compliance with statutory regulations
- condition of system components including cleanliness:
- the system fluid levels
- the system pressure levels
- the settings of electrical controls and temperature sensors
- leakage and/or dampness
- positioning of system components
- quality, condition and positioning of pipework insulation
- the provision of information and safety labels
- the security of fixing of system components

1.03 undertake servicing of heat pump systems in accordance with manufacturer's instructions including:
- checking for protection of the system water against freezing
- cleaning, adjustment and lubrication of system components and controls

1.04 undertake service and maintenance functional tests on heat pump systems to include:
- safe operation
- efficient operation
- the function of system components/controls
- noise or vibration levels

1.05 complete service and maintenance records.

Learning Outcome 02: The learner will be able to undertake the non-refrigerant circuit routine service and maintenance of a ground source heat pump system installation.

The learner will be able to:

2.01 obtain the relevant information required to enable the work.
2.02 undertake a visual service and maintenance inspection of a ground source heat pump installation to include checks in relation to:
- compliance with manufacturer's installation instructions
- compliance with statutory regulations
- condition of system components including cleanliness

- checking the system fluid levels
- checking the system pressure levels
- checks to ensure that electrical controls and temperature sensors are set correctly
- leakage and/or dampness
- correct positioning of system components
- pipework insulation is of the correct grade, in good condition and is firmly in place
- provision of information and safety labels
- security of fixing of system components.

2.03 undertake routine servicing of relevant components a ground source heat pump installation to include checks in relation to:

- checking for protection of the system water against freezing
- cleaning and lubrication of system components
- adjustment of system controls.

2.04 undertake routine service and maintenance functional tests on a ground source heat pump installation to confirm:

- safe operation
- efficient operation
- the correct functioning of system components/controls
- no undue noise or vibration.

2.05 complete the relevant service and maintenance records in accordance with industry recognised procedures.

Learning Outcome 03: The learner will be able to undertake non-refrigerant circuit fault diagnosis work on an air or ground source heat pump system installation.

The learner will be able to:

3.01 obtain the information required to enable fault diagnosis and rectification to be undertaken.

3.02 identify the cause of a minimum of **FOUR** separate faults from the following list:

- heat pump low pressure trip/alarm activated by a collector circuit malfunction
- heat pump high pressure trip/alarm activated by an emitter circuit malfunction
- poor or no collector circuit performance
- insufficient heat output to emitter circuit
- domestic hot water heat up is satisfactory but space heating is not operating
- system noise and/or vibration

3.03 advise the client of the cause of the malfunction and the actions required to rectify.

3.04 take precautionary actions to prevent unauthorised use of the system prior to or during fault rectification.

3.05 take precautionary actions to minimize the risk of injury to self or others during fault rectification.

3.06 undertake post-rectification functional tests in accordance with manufacturer's instructions.

Learning Outcome 04: The learner will be able to undertake non-refrigerant circuit fault diagnosis work on an air or ground source heat pump system installation.

The learner will be able to:

4.01 obtain the relevant information required to enable the fault rectification work.

4.02 take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work.

4.03 take relevant precautionary actions to minimize the risk of injury to self or others during the fault rectification work.

4.04 rectify a minimum of **TWO** separate faults from the following list:

- heat pump low pressure trip/alarm activated by a collector circuit malfunction
- heat pump high pressure trip/alarm activated by an emitter circuit malfunction
- poor or no collector circuit performance
- insufficient heat output to emitter circuit
- domestic hot water heat up is satisfactory but space heating is not operating
- system noise and/or vibration.

4.05 undertake post-rectification functional tests in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures to confirm that the system is in a safe, functional and efficient condition.

5 National Occupational Standard:

The Units used in this qualification have a direct relationship with the National Occupational Standards for the areas of work contained within.

6 RQF Descriptor Level 3.

Knowledge descriptor: *(the holder can)*

- *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 holder can)*

- 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.

7 Prior qualifications, knowledge, skill or understanding which the learner is required to have before taking this qualification. (Pre-requisites)

- N/SVQ Level 2/3 in Plumbing or equivalent earlier certification that provides evidence of competence;

or

- N/SVQ Level 2/3 in Heating and Ventilating (Domestic Installation) or equivalent earlier certification that provides evidence of competence;

or

- N/SVQ Level 2/3 in Heating and Ventilating (Industrial and Commercial Installation) or equivalent earlier certification that provides evidence of competence;

or

- N/SVQ Level 2/3 in Oil-Fired Technical Services or equivalent earlier certification that provides evidence of competence;

or

- N/SVQ Level 2/3 in Gas Installation and Maintenance or equivalent earlier certification that provides evidence of competence.

In addition, if not included in the above current certification in relation to:

- Water Regulations/Water Byelaws (WRAS or equivalent)
- Energy Efficiency for Domestic Heating

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

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

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

None

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

Manufacturer's Installation and Commissioning Instructions
Building Regulations Approved Document Part L
Water Regulations
BS 7671 18th Edition IET Wiring Regulations
MIS 3005 Heat Pump Systems
MCS Domestic Heat Pumps "*A Best Practise Guide*"

11 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.

12 Planned exemptions

None

13 Specimen assessment materials.

None

14 Specified levels of attainment

Learners must pass all the mandatory units for the qualification to be awarded.

15 Other information

None

Assessment and Examination Terminology

AC – ***Approved Centre****; an examination conducted either at the approved centre or a location approved by the centre, using staff approved by the centre to conduct the examination.*

CB – ***Closed Book****. Learners will be prohibited from using any industry normative or informative documents.*

CE – ***Customer Evidence****; evidence provided by a customer in the form of a written witness statement confirming a competent performance by the learner. That evidence may also be provided by an employing supervisor or manager of the learner. Witness statements that relate to a technical competence will only be accepted from a person auditable technically competent in that particular activity to provide the statement.*

IK – ***Inferred Knowledge****; inferred knowledge is assessed as part of a performance assessment by a centre approved assessor. To deem the learner as having sufficient knowledge the learner must satisfactorily pass the performance assessment.*

LE – ***Learner Evidence****; learner generated evidence is for example documented recordings of readings, calculations or the production of a risk assessment or other procedural document.*

MC – ***Multiple Choice****; set by the awarding organisation and administered and marked locally or electronically. Learners will be able to answer multi-choice questions using reference to appropriate industry normative or informative sources.*

XAMS – **on-line** / e-assessment: a secure web-based assessment system using multiple choice, multiple response and selective response questions.

OP – ***Observed Performance****; the assessment of a learner's performance by an approved assessor either in the learner's work place or at the approved centre or a location approved by the centre.*

OQ – ***Oral Questions****; oral questions may be asked by an assessor as part of a performance assessment or knowledge examination to confirm the understanding of the criteria by the learner*.

PA – ***Performance Assessment****; a performance assessment conducted either in the learner's work place or at the approved centre or a location approved by the centre.*

RWE – ***Realistic Work Environment****; an area at the approved centre or a location approved by the centre which replicates and has the features of a Work Place. The learner must not be permitted to be familiar with the simulated environment prior to undertaking assessment*.

WP – ***Work Place****; is the naturally occurring environment in which the learner works, typically that would be in a customer's premise where work is being paid for by the customer*.

This unit is restricted to Logic Certification Ltd *t/as* ***LCL Awards***

SSAs: 5.2 Construction Review Date 31st Dec 2021