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## REGULATED QUALIFICATION FRAMEWORK (RQF)

### QUALIFICATION SPECIFICATION

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#### Intermediate Course in Ground Source Heat Pump Technology (Non-Refrigerant Circuit)

##### Objective:

The ground source heat pump course is specifically aimed at existing fossil fuel plumbing and heating engineers and giving them the necessary training to upskill their existing skills to install ground source heat pumps. The qualification allows learners to continue to learn, develop and practise the skills required for employment within the Building Engineering Services (BES) Renewable sector.

The objective of this qualification is for learners to demonstrate they know and understand the requirements of regulations and standards relating to the installation of an ground source heat pump systems, they will be able to select the correct ground source heat pump and components for connection to hydraulic emitter circuits, the principles of ground source heat pump selection, system design factors and principles relating to ground source heat pump systems, the preparatory work required for ground source heat pump installations and the requirements to install, commission, hand over and maintain an ground source heat pump systems.

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

- a. Updating occupational competence, continuous professional development and/or obtaining a licence to practice
- b. Preparing for further learning or training and/or developing knowledge and or skills in a subject area and are existing workers in the occupation seeking to extend their range of work

##### **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.

- or
- heating installers with minimum 3 years of experience installing wet central heating systems, evidenced either by manufacturer courses certification or Gas Safe Register, OFTEC, MCS or HETAS registration

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

- Low Temperature Heating and Hot water Systems in Dwellings
- Foundation Course in Heat Pump Technology
- WRAS Water Regulations/Water Byelaws or equivalent
- Domestic Hot Water Storage Systems (G3)

### **Qualification Framework:**

The qualification comprises of three mandatory units and will be covered in one day with exam and workshop assessment. The learner is required to successfully achieve a pass in each unit for this qualification to be awarded.

### **Unit Specification A: Know the requirements to size, select, install, commission and handover a ground source heat pump system (non-refrigerant circuits).**

**Learning Outcome 1.** The learner will know the purpose and operational characteristics of ground source heat pumps and their components.

The learner will demonstrate knowledge of:

1.1 Confirm the purpose and operational characteristics of the following components:

- evaporator
- compressor
- condenser
- expansion valve
- ground source
- brine pump

**Learning Outcome 2.** The learner will know the fundamental design considerations that are specific to ground source heat pumps.

The learner will demonstrate knowledge of:

2.1 Identify the factors that need to be considered when selecting a ground source heat pump in relation to:

- heat load based on a heat loss calculation, based on worst case outside temperature

- flow temperature
- emitter type
- hot water requirements
- monovalent, bivalent or hybrid systems.

2.2 Identify suitable electrical supply in relation to:

- District Network Operator (DNO) connection
- isolation switches
- fuse rating

**Learning Outcome 3.** The learner will know the fundamental design principles for ground source heat pump collector circuits, design, component sizing and installation.

The learner will demonstrate knowledge of:

3.1 Identify the different types of ground source collectors in relation to:

- horizontal ground loop
- compact collector
- slinky collector
- vertical bore hole
- lake collector
- ground water
- closed loop
- open loop

3.2 Confirm the principles of ground collector design in relation to:

- collector type used
- ground conditions and type
- specific heat capacity  $W/m^2$  of the ground
- annual heat pump operating hours

3.3 Confirm ground collector installation in relation to:

- collector type used
- suitable pipework materials
- below ground jointing
- protection of mechanical damage
- separation distances to avoid thermal transfer
- separation distances from other services and adjacent buildings
- type of backfill material
- achieving balanced collector circuits

3.4 Confirm requirements where ground collector pipework passes through the external building fabric in relation to:

- provision for movement
- protection against freezing
- prevention of water ingress
- prevention of condensation

3.5 Confirm the hydraulic test requirements closed loop ground collectors in relation to:

3.6 Confirm the requirements of charging and flushing of closed loop ground collectors relation to:

- purging air and installation debris
- addition antifreeze protection and suitable biocides
- checking flow rates
- state equipment needed for system charging and flushing
- pressure testing

**Learning Outcome 4.** The learner will know the common requirements for the installation of a ground source heat pump connected to hydraulic emitter circuits.

The learner will demonstrate knowledge of:

4.1 Identify the installation requirements for the connection to the following types of hydraulic heating system emitter:

- standard panel radiators
- underfloor heating
- fan assisted convector heaters
- fan coils
- combined systems (radiators, underfloor heating)
- multiple zones

4.2 Identify if a buffer vessel is required in the system design and correctly size.

4.3 Identify the correct pipe size requirements in relation to designed flow temperature.

4.4 Identify heat pump hydraulic flow rate requirements and circulation pump selection.

### **Unit Specification B: Commission and handover ground source heat pumps (Non-Refrigerant Circuits)**

**Learning Outcome 1.** The learner will test and commission a ground source heat pump system.

The learner will demonstrate knowledge of:

1.1 Prepare a ground 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

- pressure test collector circuit to ensure hydraulic soundness using appropriate test equipment in accordance with manufacturer's guidance, regulatory requirements, and industry recognised procedures

1.2 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.

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

1.4 Complete relevant documentation to record the commissioning activities.

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**Learning Outcome 2.** The learner will handover a ground source heat pump installation.

The learner will demonstrate knowledge of:

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2.1 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.

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

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

2.4 Obtain acceptance by the end user of the system according to the industry agreed handover procedures.

2.5 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.

### **Unit Specification C: Inspect, service and maintain ground source heat pumps (Non-Refrigerant Circuits)**

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**Learning Outcome 1.** The learner will be able to undertake the non-refrigerant circuit routine service and maintenance of a ground source heat pump system (non-refrigerant circuits).

The learner will demonstrate knowledge of:

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- 1.1 Obtain relevant documentation required to be enable a routine service and maintenance work on ground source heat pump system installations.
- 1.2 Undertake serving of a ground source heat pump in accordance with manufacturer's instructions.
- 1.3 Demonstrate knowledge of the routine servicing of relevant components of a ground source heat pump ground collector circuit installation, including checks in relation to:
  - check system fluid levels
  - check the system pressure levels
  - signs of system fluid leakage
  - check anti-freeze with suitable refractometer
  - check particle filter
  - check pressure or filling vessel
  - condition and grade of pipe insulation
  - condition of casing
  - pipe connections
  - fuse rating
- 1.4 Demonstrate knowledge of the routine servicing of a ground source heat pump connected to hydraulic emitter circuits and controls, including checks in relation to:
  - signs of system water leakage
  - heating system water pressure
  - heating system water content and makeup
  - expansion vessel size and pressure
  - pressure relief valve (PRV) operation
  - system filters
  - system bypass
  - buffer vessel if installer
  - circulation pumps
  - mechanical valves
  - condition and grade of pipe insulation
  - control unit and alarm logs
  - heating settings
  - hot water settings
  - indoor and outdoor sensors or thermostats
- 1.5 Undertake and maintenance functional tests on a ground source heat pump to include:
  - safe operation
  - efficient operation
  - the function of system components and controls
  - noise and vibration levels
- 1.6 Complete service and maintenance records.