

REGULATED QUALIFICATION FRAMEWORK (RQF)

LOGIC CERTIFICATION LIMITED (LCL)

QUALIFICATION SPECIFICATION

- **LCL LEVEL 3 AWARDS IN THE INSTALLATION AND MAINTENANCE OF HEAT PUMP SYSTEM (NON REFRIGERANT CIRCUITS) - 600/7730/X (C00/0519/6)**

() Qualification in Wales recognition for funding number*

1.0 Area and scope of competence:

Know the health and safety risks and safe systems of work associated with air and ground source 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 air and ground source 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 air and ground source heat pump systems, the preparatory work required for heat pump installations and the requirements to install, commission and hand over of air and ground source heat pump systems.

The objective of this qualification is for learners to demonstrate they are competent in accordance with legislation, regulations and industry standards;

2.0 Qualification Framework

2.1 This qualification comprises of 4 mandatory Units; (see section 4.-0)

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating
<u>Know the requirements to install, commission and handover heat pump systems</u> Y/602/3054	LCL-R3023	Knowledge	3	1
<u>Install, commission and handover heat pump systems</u> D/602/3072	LCL-R3020	Performance	3	1
<u>Know the requirements to inspect, service and maintain heat pump systems</u> F/602/3078	LCL-R3021	Knowledge	3	1
<u>Inspect, service and maintain heat pump systems</u> L/602/3083	LCL-R3022	Performance	3	1

2.2 Qualification Structure:

- **LCL LEVEL 3 AWARDS IN THE INSTALLATION AND MAINTENANCE OF HEAT PUMP SYSTEM (NON REFRIGERANT CIRCUITS) (600/7730/X)**

- 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 **4**

3.0 Unit Grading Structure:

The grading structure for the Units within the Qualification is that the learner is required to achieve a result of **Pass** to be awarded credit for each Unit.

4.0 Unit Specification:

Know the Requirements to Install, Commission and Handover Heat Pump Systems (non-refrigerant circuits)

<p>Learning Outcome 01. The learner will know the health and safety risks and safe systems of work associated with heat pump system (non-refrigerant circuits) installation work.</p> <p>Assessment Criteria – The learner can:</p>	<p>Assessment Method</p>	<p>Assessment Location</p>
<p>1.1 Confirm which aspects of heat pump installation work pose risk of:</p> <ul style="list-style-type: none"> • electrocution/electric shock • burns • toxic poisoning personal injury though component/equipment handling. 	<p>WRMC</p>	<p>AC</p>
<p>1.2 Confirm safe systems of work for heat pump installation work in relation to prevention of:</p> <ul style="list-style-type: none"> • electrocution/electric shock • burns • toxic poisoning • personal injury though component/equipment handling. 	<p>WRMC</p>	<p>AC</p>
<p>Learning Outcome 02. The learner will know the requirements of the relevant regulations/ standards relating to practical installation, testing and commissioning activities for heat pump installation work.</p> <p>Assessment Criteria – The learner can:</p>	<p>Assessment Method</p>	<p>Assessment Location</p>
<p>2.1 Interpret building regulation/building standards guidance documentation as relevant to heat pump installation work to identify the requirements in relation to:</p> <ul style="list-style-type: none"> • 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 • physical installation requirements • energy conservation • testing and commissioning requirements • compliance certification. 	<p>WQMC</p>	<p>AC</p>

<p>2.2 Interpret industry recognised water regulation/byelaw guidance documentation as relevant to heat pump installation work to identify the requirements in relation to:</p> <ul style="list-style-type: none"> • the physical installation of the system • energy conservation • safe operation • testing and commissioning requirements. 	WQMC	AC
<p>2.3 State the requirements of the current fluorinated greenhouse gases regulations in relation to:</p> <ul style="list-style-type: none"> • the competence of personnel installing heat pumps where the refrigerant circuit has been assembled and tested by the product manufacturer • the competence of personnel installing heat pumps where the refrigerant circuit is to be assembled and tested in the location where the heat pump is to be installed and operated • the competence of personnel undertaking leakage checking on heat pump refrigerant circuits • the competence of personnel undertaking recovery of fluorinated greenhouse gases from heat pump refrigerant circuits. 	WQMC	AC

Learning Outcome 03. The learner will know the purpose and operational characteristics of heat pump unit and heat pump system components.	Assessment Method	Assessment Location
<p>Assessment Criteria – The learner can:</p> <p>3.1 Confirm the purpose and operational characteristics of the following components:</p> <ul style="list-style-type: none"> • evaporator • low pressure switch • compressor • high pressure switch • condenser • dryer/receiver • sight glass • expansion valve • expansion valve phial • refrigerant four way valve • brine pump • emitter circuit electro-mechanical valves • fan coil • integrated buffer tank • ground loop heat exchanger. 	WQMC	AC
<p>3.2 Confirm how the vapour compression refrigerant circuit within a heat pump unit operates.</p>	WQMC	AC

Learning Outcome 04. The learner will know the different types of heat pump units and system arrangements for hydraulic emitter circuits. Assessment Criteria – The learner can:	Assessment Method	Assessment Location
4.1 Recognise the following heat source/heat sink heat pump packages that can be deployed with a hydraulic ‘heat sink’ emitter circuit: <ul style="list-style-type: none"> • outside air/water • exhaust air/water • brine (closed loop)/water • water (open loop)/water • DX (closed loop)/water. 	WQMC	AC
4.2 Identify the different types of heat pump unit within the categories: <ul style="list-style-type: none"> • ground source – packaged (indoor) • ground source – packaged (outdoor) • air source - external air, packaged (indoor) • air source - external air, packaged (outdoor) • air source - external air, internal heat pump unit with brine circuit between fan coil unit and heat pump unit. 	WQMC	AC
4.3 Confirm the meaning of the terms: <ul style="list-style-type: none"> • monovalent system • bivalent system. 	WQMC	AC
4.4 Identify the following monovalent hydraulic emitter circuits: <ul style="list-style-type: none"> • 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. 	WQMC	AC
4.5 Identify the following parallel bivalent hydraulic emitter circuits that incorporate a secondary heat source other than an immersion heater: <ul style="list-style-type: none"> • 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. 	WQMC	AC
4.6 Confirm the arrangements for connecting buffer tanks: <ul style="list-style-type: none"> • in series • in parallel. 	WQMC	AC
Learning Outcome 05. The learner will know the fundamental principles of heat pump selection and system design that are common to both air and ground source heat pumps. Assessment Criteria – The learner can:	Assessment Method	Assessment Location

5.1 Confirm the meaning of the term 'Coefficient of Performance'.	WQMC	AC
5.2 Confirm the relationship between Coefficient of Performance and the: <ul style="list-style-type: none"> • heat pump input temperature • heat pump emitter temperature. 	WQMC	AC
5.3 Confirm the effect that ambient temperature can have on: <ul style="list-style-type: none"> • coefficient of performance • heat pump output. 	WQMC	AC
5.4 Confirm the meaning of the term 'Seasonal Performance Factor'.	WQMC	AC
5.5 Identify the factors that can affect the Seasonal Performance Factor	WQMC	AC
5.6 Confirm the meaning of the term 'System Efficiency'.	WQMC	AC
5.7 Identify the factors that can affect the 'System Efficiency'.	WQMC	AC
5.8 Confirm why achieving minimum heat loss from the building is particularly important when designing a heat pump system.	WQMC	AC
5.9 State the effect that oversizing of a heat pump has on: <ul style="list-style-type: none"> • system performance/efficiency • heat pump operation. 	WQMC	AC
5.10 State the effect that undersizing of a heat pump has on: <ul style="list-style-type: none"> • system performance/efficiency • heat pump operation. 	WQMC	AC
5.11 Confirm how to identify heat pump hydraulic flow rate requirements.	WQMC	AC
5.12 Confirm how to use manufacturer's data to select heat pump units: <ul style="list-style-type: none"> • output charts • other data. 	WQMC	AC
5.13 Confirm the meaning of the term 'bivalent points' in relation to heat pump output charts.	WQMC	AC
5.14 Confirm how 'bivalent points' are used to determine auxiliary heat requirements.	WQMC	AC
5.15 Confirm how heat pump output capacity is affected by: <ul style="list-style-type: none"> • heat pump input temperature • heat pump output temperature. 	WQMC	AC
5.16 Identify the suitability of the following types of hydraulic heating system emitter for suitability with heat pump systems: <ul style="list-style-type: none"> • underfloor heating • fan assisted convector heaters • standard panel radiators 	WQMC	AC

5.17 State the typical mean water temperature recommended when designing a hydraulic emitter circuit that incorporates: <ul style="list-style-type: none"> • underfloor heating • fan assisted convector heaters • standard panel radiators. 	WQMC	AC
5.18 Confirm how correction factors are used to determine panel radiator output requirements in relation to mean water temperature and room temperature difference (degrees centigrade).	WQMC	AC
5.19 Confirm the potential benefits of including a buffer tank in the system design.	WQMC	AC
5.20 Identify the potential disadvantages of including a buffer tank in the system design.	WQMC	AC
5.21 Confirm the typical allowance in litres (l) per kilowatt (kW) of heat pump output that would be allowed for sizing a buffer tank when there is no requirement for heat during compressor 'off' periods.	WQMC	AC
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.	WQMC	AC
5.23 State the typical annual operating hours for a heat pump that is being used for: <ul style="list-style-type: none"> • heating only • heating and domestic hot water. 	WQMC	AC
5.24 State how heat pump annual operating hours may vary in relation to the: <ul style="list-style-type: none"> • type of building • geographical location of the installation. 	WQMC	AC

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.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
6.1 Identify the following brine filled heat pump collector circuit configurations: <ul style="list-style-type: none"> • ground 'closed' loop horizontal • ground 'closed' loop compact collector • ground 'closed' loop slinky • ground 'closed' loop vertical borehole • lake 'closed' loop • vertical borehole closed' loop. 	WQMC	AC

<p>6.2 Confirm the requirements of horizontal 'closed' loop brine filled hydraulic heat pump collector circuits in relation to:</p> <ul style="list-style-type: none"> • 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. 	WQMC	AC
<p>6.3 Confirm the typical requirements of vertical borehole 'closed' loop brine filled hydraulic heat pump collector circuits in relation to:</p> <ul style="list-style-type: none"> • 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. 	WQMC	AC
<p>6.4 Identify the typical components required in relation to:</p> <ul style="list-style-type: none"> • loop single circuit 'closed' loop collector circuits • multi-circuit 'closed' collector circuits • brine circuits between outside air source units and internal heat pump units. 	WQMC	AC
<p>6.5 Confirm the typical layout of components in relation to:</p> <ul style="list-style-type: none"> • single circuit collector circuits • multi-circuit collector circuits • brine circuits between outside air source units and internal heat pump units. 	WQMC	AC
<p>6.6 Confirm which factors determine the year round energy available in Watts (W) per m² of ground area.</p>	WQMC	AC
<p>6.7 Confirm 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).</p>	WQMC	AC
<p>6.8 Confirm how the specific heat extraction capacity (in W/m² for horizontal/vertical trench collectors and W/m for vertical borehole collectors) of the ground collector circuit can be affected by the:</p> <ul style="list-style-type: none"> • ground conditions/soil types • type of backfill material • geographical location – ground rest temperature • ground loop configuration • annual heat pump operating hours. 	WQMC	AC

6.9 Confirm how the total ground area (m ²) requirements for horizontal collector loops is determined using the following data: <ul style="list-style-type: none"> refrigeration capacity (kW) specific extraction output (W/m²). 	WQMC	AC
6.10 Confirm how the pipe length (m) requirement for a horizontal 'loop' collector circuit is determined using the following data: <ul style="list-style-type: none"> total ground area (m²) collector loop pipe spacing (m). 	WQMC	AC
6.11 Confirm how the pipe length (m) requirement for a 'slinky' collector circuit is determined using the following data: <ul style="list-style-type: none"> total ground area (m²) centre to centre spacing of the slinky collector (m). 	WQMC	AC
6.12 Confirm how the typical collector length (m) requirement for a vertical borehole collector circuit is determined using the following data: <ul style="list-style-type: none"> heat pump refrigeration capacity (kW) ground condition annual heat pump operating hours. 	WQMC	AC
6.13 Confirm how a collector circuit brine pump size (Kg/h) is determined using the following data: <ul style="list-style-type: none"> design flow rate brine viscosity heat pump refrigeration capacity (kW) specific thermal capacity of brine (kJ/kg) temperature difference between brine circuit flow and return pipework (degrees centigrade). 	WQMC	AC

Learning Outcome 07. The learner will know the layouts of 'open loop' water filled heat pump collector circuits.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
7.1 Identify the following 'open loop' water filled heat pump collector circuit configurations: <ul style="list-style-type: none"> ground 'open' loop vertical borehole lake 'open' loop. 	WQMC	AC

Learning Outcome 08. The learner will know the fundamental design considerations and principles that are specific to air source heat pumps.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
8.1 Identify the factors that need to be considered when selecting and positioning air source heat pump fan coil units in relation to: <ul style="list-style-type: none"> operating noise (including the potential effect on neighbouring properties) air turbulence during operation. 	WQMC	AC

8.2 Identify the design options to provide for the defrost cycle for an air source heat pump.	WQMC	AC
8.3 Confirm how to size a buffer tank to provide for an air source heat pump defrost cycle.	WQMC	AC

Learning Outcome 09. The learner will know the preparatory work required for heat pump installation work.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
9.1 Confirm the common requirements of pre-installation checks for air or ground source heat pump unit installations connected to hydraulic emitters circuits in relation to: <ul style="list-style-type: none"> • 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 • the suitability of the building structure in relation to the proposed installation. 	WQMC	AC
9.2 Confirm the pre-installation checks that are specific to the positioning of fan coil units.	WQMC	AC

Learning Outcome 10. The learner will know the requirements to install and test heat pump systems (non-refrigerant circuits).	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
10.1 Confirm the requirements for moving and handling heat pump units to avoid damage to the unit.	WQMC	AC
10.2 Confirm the requirements to avoid undue noise and/or vibration transmission from the heat pump unit to the building structure during the operation of the heat pump.	WQMC	AC
10.3 Identify the requirements where brine circuit pipework passes through the external building fabric in relation to: <ul style="list-style-type: none"> • provision for movement • protection against freezing • prevention of water ingress. 	WQMC	AC

10.4 Confirm the charging and flushing requirements for closed loop collector circuits in relation to: <ul style="list-style-type: none"> • purging of air and installation debris • addition of antifreeze protection and suitable biocides • checking flow rates. 	WQMC	AC
10.5 State what equipment is needed for system charging and flushing.	WQMC	AC
10.6 Confirm the hydraulic test requirements for: <ul style="list-style-type: none"> • closed loop collector circuits • hydraulic emitter circuits. 	WQMC	AC

Learning Outcome 11. The learner will understand the requirements to commission heat pump system installations (non-refrigerant circuits).	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
11.1 Confirm the conditions that are required to implement commissioning activities for ground source heat pump systems.	WQMC	AC
11.2 Confirm the commissioning requirements for ground source heat pump systems in relation to: <ul style="list-style-type: none"> • setting of mechanical controls • setting of electrical controls and temperature sensors • functional tests. 	WQMC	AC
11.3 Confirm the conditions that are required to implement commissioning activities for air source heat pump systems.	WQMC	AC
11.4 Confirm the commissioning requirements for air source heat pump systems in relation to: <ul style="list-style-type: none"> • setting of mechanical controls • setting of electrical controls and temperature sensors • functional tests. 	WQMC	AC

Learning Outcome 12. The learner will understand the requirements to handover heat pump system installations.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
12.1 Confirm the pre-handover checks that need to be carried out for a ground source heat pump system installation.	WQMC	AC
12.2 Confirm the industry handover procedures for a ground source heat pump system installation in relation to the: <ul style="list-style-type: none"> • provision of written information • provision of diagrammatic information • provision of verbal information/demonstration relating to system operation and use. 	WQMC	AC
12.3 Confirm the pre-handover checks that need to be carried out for an air source heat pump system installation.	WQMC	AC

<p>12.4 Confirm the industry handover procedures for an air source heat pump system installation in relation to the:</p> <ul style="list-style-type: none"> • provision of written information • provision of diagrammatic information • provision of verbal information/demonstration relating to system operation and use. 	WQMC	AC
---	------	----

Install, Commission and Handover Heat Pumps (Non-Refrigerant Circuits)

<p>Performance Assessments <i>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.</i></p> <p>Workplace Performance Assessments. <i>Work place performance assessments must be undertaken with the learner being directly supervised by a competent person.</i></p>
<p>It is the responsibility of the assessor to ensure that;</p> <ul style="list-style-type: none"> • 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.

<p>Learning Outcome 01. The learner will plan and prepare for the installation of heat pumps (non-refrigerant circuits).</p> <p>Assessment Criteria – The learner can:</p>	<p>Assessment Method</p>	<p>Assessment Location</p>
<p>1.1 Undertake pre-installation checks for a heat pump installation to include checks relating to:</p> <ul style="list-style-type: none"> • authorisation for the work to proceed • the availability of appropriate access to all required work areas • the availability and collation of all relevant information • verification of the suitability of the proposed location of the fan coil unit (air source heat pumps only) • verification that the collector circuit is appropriate to the heat pump rating (ground source heat pumps only) • verification that the heat pump rating is suitable for the emitter circuit load (heating and/or heating and hot water) • verification of the suitability of the proposed location of the heat pump unit • verification that the emitter circuit design or existing installation is 	OP	WP or RWE

<p>compatible with the proposed heat pump installation.</p> <ul style="list-style-type: none"> • verification that the buffer tank size (where relevant) is appropriate • verification of the suitability of the availability of a suitable electrical input service • the proposed siting of key internal system components • the suitability of the building structure in relation to the • proposed installation. 		
1.2 Confirm that the tools, materials and equipment required for the installation work are available and are in a safe usable condition.	OP	WP or RWE

Learning Outcome 02. The learner will install air and ground source heat pump units (non-refrigerant circuits).	Assessment Method	Assessment Location
Assessment Criteria– The learner can:		
2.1 Install in accordance with manufacturer’s guidance, regulatory requirements and industry recognised procedures an air source heat pump to include as a minimum the connection of the heat pump unit to the hydraulic emitter circuit.	OP	WP or RWE
2.2 Install in accordance with manufacturer’s guidance, regulatory requirements and industry recognised procedures a ground source heat pump to include as a minimum the connection of the heat pump unit to the collector circuit.	OP	WP or RWE

Learning Outcome 03. The learner will test and commission a ground source heat pump installation (non-refrigerant circuits).	Assessment Method	Assessment Location
Assessment Criteria– The learner can:		
3.1 Prepare a ground source heat pump system for testing and commissioning to include checks/actions to confirm : <ul style="list-style-type: none"> • 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. 	OP	WP & RWE
3.2 Test the collector circuit for hydraulic soundness using appropriate test equipment in accordance with manufacturer’s guidance, regulatory requirements and industry recognised procedures.	OP	WP or RWE
3.3 Identify the commissioning requirements for the installation in relation to: <ul style="list-style-type: none"> • the system/component manufacturer(s) requirements • system design/specification requirements • the client/end user requirements • statutory regulations and/or industry recognised procedures. 	OP	WP or RWE
3.4 Commission the installation in accordance with manufacturer’s guidance, design requirements, client's requirements and statutory requirements	OP	WP or RWE

and/or industry recognised procedures.		
3.5 Complete relevant documentation to record the commissioning activities.	OP	WP or RWE

Learning Outcome 04. The learner will test and commission an air source heat pump installation (non-refrigerant circuits).	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
4.1 Prepare an air source heat pump system for testing and commissioning to include checks/actions to confirm : <ul style="list-style-type: none"> • 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. 	OP	WP or RWE
4.2 Identify the commissioning requirements for the installation in relation to: <ul style="list-style-type: none"> • the system/component manufacturer(s) requirements • system design/specification requirements • the client/end user requirements • statutory regulations and/or industry recognised procedures. 	OP	WP or RWE
4.3 Commission the installation in accordance with manufacturer’s guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures.	OP	WP or RWE

Learning Outcome 05. The learner will handover an air <u>or</u> ground source heat pump installation.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
5.1 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.	OP	WP or RWE
5.2 Explain and demonstrate to the end user the operation and use of the system using manufacturer’s guidance and industry agreed handover procedures.	OP	WP or RWE
5.3 Identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements.	OP	WP or RWE
5.4 Obtain acceptance by the end user of the system according to the industry agreed handover procedures.	OP	WP or RWE
5.5 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.	OP& LE	WP or RWE

Know The Requirements to Inspect, Service and Maintain Heat Pump System Installations (Non-Refrigerant Circuits).

Learning Outcome 01. The learner will know the requirements for the non-refrigerant circuit routine service and maintenance of heat pump system installations.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
1.1 Confirm which documentation needs to be available to enable routine service and maintenance work on heat pump system installations.	WQMC	AC
1.2 Confirm typical routine service and maintenance requirements for an air source heat pump installation in relation to: <ul style="list-style-type: none"> • visual inspection requirements • cleaning of components • checking of system water content • functional tests. 	WQMC	AC
1.3 Confirm typical routine service and maintenance requirements for a ground source heat pump installation in relation to: <ul style="list-style-type: none"> • visual inspection requirements • cleaning of components • checking of system water content • functional tests. 	WQMC	AC
1.4 Confirm the industry requirements for the recording and reporting of routine service and maintenance work on heat pump system installations.	WQMC	AC
1.5 State the action(s) to take in the event of a failure or suspected failure of the refrigerant circuit and/or a suspected refrigerant circuit defect.	WQMC	AC

Learning Outcome 02. The learner will know how to diagnose faults in heat pump system installations.	Assessment Method	Assessment Location
Assessment Criteria – The learner can:		
2.1 Confirm the information that needs to be available to enable fault diagnosis.	WQMC	AC
2.2 Confirm the work action and sequences required to diagnose the following faults: <ul style="list-style-type: none"> • 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. 	WQMC	AC

Learning Outcome 03. The learner will know how to rectify non-refrigerant circuit faults in heat pump system installations. Assessment Criteria – The learner can:	Assessment Method	Assessment Location
3.1 Confirm the work action and sequences required to rectify the following faults: <ul style="list-style-type: none"> • 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. 	WQMC	AC

Inspect, Service and Maintain Heat Pump Installations (non-refrigerant circuits)

Learning Outcome 01. The learner will undertake the non-refrigerant circuit routine service and maintenance of an air source heat pump system installation Assessment Criteria – The learner can:	Assessment Method	Assessment Location
1.1 Obtain the relevant information required to enable the work to be undertaken.	OP & LE	WP or RWE
1.2 Undertake a visual service and maintenance inspection of an air source heat pump installation to include checks in relation to: <ul style="list-style-type: none"> • 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. 	OP	WP or RWE
1.3 Undertake routine servicing of relevant components an air source heat pump installation to include checks in relation to: <ul style="list-style-type: none"> • checking for protection of the system water against freezing • cleaning and lubrication of system components • adjustment of system controls. 	OP	WP or RWE

1.4 Undertake routine service and maintenance functional tests on a air source heat pump installation to confirm: <ul style="list-style-type: none"> • safe operation • efficient operation • the correct functioning of system components/controls • no undue noise or vibration. 	OP	WP or RWE
1.5 Complete the relevant service and maintenance records in accordance with industry recognised procedures.	OP & LE	WP or RWE

Learning Outcome 02. The learner will undertake the non-refrigerant circuit routine service and maintenance of a ground source heat pump system installation.	Assessment Method	Assessment Location
Assessment Criteria– The learner can:		
2.1 Obtain the relevant information required to enable the work.	OP & LE	WP or RWE
2.2 Undertake a visual service and maintenance inspection of a ground source heat pump installation to include checks in relation to: <ul style="list-style-type: none"> • 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. 	OP	WP or RWE
2.3 Undertake routine servicing of relevant components a ground source heat pump installation to include checks in relation to: <ul style="list-style-type: none"> • checking for protection of the system water against freezing • cleaning and lubrication of system components • adjustment of system controls. 	OP	WP or RWE
2.4 Undertake routine service and maintenance functional tests on a ground source heat pump installation to confirm: <ul style="list-style-type: none"> • safe operation • efficient operation • the correct functioning of system components/controls • no undue noise or vibration. 	OP	WP or RWE
2.5 Complete the relevant service and maintenance records in accordance with industry recognised procedures.	OP & LE	WP or RWE

Learning Outcome 03. The learner will undertake non-refrigerant circuit fault diagnosis work on an air <u>or</u> ground source heat pump system installation. Assessment Criteria– The learner can:	Assessment Method	Assessment Location
3.1 Obtain the relevant information required to enable the fault rectification work.	OP	WP & RWE
3.2 Identify the cause of a minimum of FOUR separate faults from the following list: <ul style="list-style-type: none"> • 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. 	OP	WP & RWE
3.3 Agree with the relevant person(s) fault rectification procedures for the faults identified.	OP	WP & RWE

Learning Outcome 04. The learner will undertake non-refrigerant circuit fault rectification work on an air <u>or</u> ground source heat pump system installation Assessment Criteria– The learner can:	Assessment Method	Assessment Location
4.1 Obtain the relevant information required to enable the fault rectification work.	OP	WP & RWE
4.2 Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work.	OP	WP & RWE
4.3 Take relevant precautionary actions to minimize the risk of injury to self or others during the fault rectification work.	OP	WP & RWE
4.4 Rectify a minimum of TWO separate faults from the following list: <ul style="list-style-type: none"> • 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. 	OP	WP & RWE
4.5 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.	OP	WP & RWE

5.0 National Occupational Standard:

This qualification has a direct relationship with the National Occupational Standards for the areas of work.

6.0 Target Groups:

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

1. Preparing for employment, new entrants to the occupation
2. Confirming occupational competence and or obtaining a licence to practice
3. 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 Descriptor Level 3.

Knowledge descriptor:

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:

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.

- 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:

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

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

Learners must complete all 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.

None

11.0 The knowledge, skills and understanding which will be assessed as part of the qualification.

The knowledge, skills and understanding which will be assessed as part of the qualification are detailed in the assessment and examination specification for each unit.

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

The method of any assessment and any associated requirement relating to it are detailed in the assessment and examination specification for each unit.

12.1 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 IET Wiring Regulations
- MIS 3005 Heat Pump Systems

12.2 Performance Assessment Facilities and Equipment (*see centre guidance / facility check list*)

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 the assessment and examination specification for each unit.

14.0 Specimen assessment materials.

None

15.0 Specified levels of attainment

Learners must satisfy all Assessment Criteria for all Learning Outcomes within the Unit.

Learners must achieve;

- A mark of 75% per question or more to pass the short response written examinations for the qualification to be awarded.
- A mark of 100% to pass the multiple choice examinations for the qualification to be awarded.
- Satisfy **all** performance assessment criteria for the qualification to be awarded.

16.0 Other information

SSAs: 5.2 Building and Construction

Qualification Availability: Shared

Qualification Review Date: 31st December 2021

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.*

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 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.*

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.*

WQMC – *Written Question Multi-Choice; multi-choice questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be able to answer multi-choice questions using reference to appropriate industry normative or informative sources.*

WQSR – *Written Question Short Response; Short response written questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be able to answer short response questions using reference to appropriate industry normative or informative sources*