



MCS Company Scheme Criteria for:

Gas Absorption and Adsorption Heat Pump Nominated Technical Persons Criteria

DRAFT Consultation Document

This document shows the Competence Criteria required to be met by a company undertaking the type of work detailed above.



These competencies have been identified from the current Qualifications Credit Units (QCF) devolved from the National Occupational Standards (NOS) to cover the range of work a Nominated Technical Person (NTP) working in the scope identified on the front page would normally undertake.

Anybody holding:

1. An approved Heat Pump Assessment Certificate covering the scope of work

Is likely to have met with all of the criteria presented within this document.

An Experienced Workers Route (EWR) will cover all the competencies outlined if taken in support of a EWR covering the same detail as titled on this document.

A full list of Qualifications that have been deemed to have met this criteria can be found at <http://www.microgenerationcertification.org/> along with access to EWR providers.

Please note anybody who has achieved the assessment without holding the correct mandatory Pre-requisites are likely to have to demonstrate further compliance against this company criteria.

Criteria Presentation

The criteria shown below in the following tables has been purposely presented in one of five categories:

1. Health and Safety – HS
2. Technical Skills – TS
3. Soft Skills – SS
4. Other – OT
5. Additional Information - AD

Where any box is blank these are intentionally blank.

By presenting the criteria within this format, it allows evidence to be collated for the Experienced Workers Route (EWR) options of evidencing compliance with the criteria.



Health and Safety Skills			
No.	Objective	No.	Criteria
13	Know the health and safety risks and safe systems of work associated with heat pump system installation work (non-refrigerant circuits)	1	Confirm which aspects of heat pump installation work pose risk of:
		2	Electrocution/electric shock
		3	Burns
		4	Toxic poisoning
		5	Personal injury through component/equipment handling

Technical Skills			
No.	Objective	No.	Criteria
1	Plan and prepare for the installation of heat pumps (non-refrigerant circuits)	1	Undertake pre-installation checks for a heat pump installation to include checks relating to:
		2	Authorisation for the work to proceed
		3	The availability of appropriate access to all required work areas
		4	The availability and collation of all relevant information
		5	Verification of the suitability of the proposed location of the fan coil unit (air source heat pumps only)
		6	Verification that the collector circuit is appropriate to the heat pump rating (ground source heat pumps only)
		7	Verification that the heat pump rating is suitable for the emitter circuit load (heating and/or heating and hot water)
		8	Verification of the suitability of the proposed location of the heat pump unit
		9	Verification that the emitter circuit design or existing installation is compatible with the proposed heat pump installation.
		10	Verification that the buffer tank size (where relevant) is appropriate
		11	Verification of the suitability of the availability of a suitable electrical input service
		12	The proposed siting of key internal system components
		13	The suitability of the building structure in relation to the proposed installation
		14	Confirm that the tools, materials and equipment required for the installation work are available and are in a safe usable condition.
2	Install air and ground source heat pump units (non-refrigerant circuits)	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



		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
3	Test and commission a ground source heat pump installation (non-refrigerant circuits)	1	Prepare a ground source heat pump system for testing and commissioning to include checks/actions to confirm :
		2	Compliance with the system design and specification
		3	Compliance with system/component manufacturer requirements
		4	The suitability of electrical supply circuit arrangements
		5	Correct flushing the system of installation debris
		6	Correct filling and venting the hydraulic circuits
		7	Protection of the system against freezing
		8	Test the collector circuit for hydraulic soundness using appropriate test equipment in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures
		9	Identify the commissioning requirements for the installation in relation to:
		10	The system/component manufacturer(s) requirements
		11	System design/specification requirements
		12	The client/end user requirements
		13	Statutory regulations and/or industry recognised procedures
		14	Commission the installation in accordance with manufacturer's guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures
		15	Complete relevant documentation to record the commissioning activities
4	Test and commission an air source heat pump installation (non-refrigerant circuits)	1	Prepare an air source heat pump system for testing and commissioning to include checks/actions to confirm :
		2	Compliance with the system design and specification
		3	Compliance with system/component manufacturer requirements
		4	The suitability of electrical supply circuit arrangements
		5	Correct flushing the system of installation debris
		6	Correct filling and venting the hydraulic circuits
		7	Protection of the system against freezing
		8	Identify the commissioning requirements for the installation in relation to:
		9	The system/component manufacturer(s) requirements
		10	System design/specification requirements
		11	The client/end user requirements



		12	Statutory regulations and/or industry recognised procedures
		13	Commission the installation in accordance with manufacturer's guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures
5	Handover an air or ground source heat pump installation	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	Explain and demonstrate to the end user the operation and use of the system using manufacturer's guidance and industry agreed handover procedures
		3	Identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements
		4	Obtain acceptance by the end user of the system according to the industry agreed handover procedures
		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
6	Know the requirements for the non-refrigerant circuit routine service and maintenance of heat pump system installations	1	Confirm which documentation needs to be available to enable routine service and maintenance work on heat pump system installations
		2	Confirm typical routine service and maintenance requirements for an air source heat pump installation in relation to:
		3	Visual inspection requirements
		4	Cleaning of components
		5	Checking of system water
		6	Content
		7	Functional tests
		8	Confirm typical routine service and maintenance requirements for a ground source heat pump installation in relation to:
		9	Visual inspection requirements
		10	Cleaning of components
		11	Checking of system water
		12	Content
		13	Functional tests
		14	Confirm the industry requirements for the recording and reporting of routine service and maintenance work on heat pump system installations



		15	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
7	Know how to diagnose faults in heat pump system installations	1	Confirm the information that needs to be available to enable fault diagnosis
		2	Confirm the work action and sequences required to diagnose the following faults:
		3	Heat pump low pressure
		4	Trip/alarm activated by a
		5	Collector circuit malfunction
		6	Heat pump high pressure
		7	Trip/alarm activated by an
		8	Emitter circuit malfunction
		9	Poor or no collector circuit
		10	Performance
		11	Insufficient heat output to
		12	Emitter circuit
		13	Domestic hot water heat up is
		14	Satisfactory but space heating is
		15	Not operating
8	Know how to rectify non-refrigerant circuit faults in heat pump system installations	1	Confirm the work action and sequences required to rectify the following faults:
		2	Heat pump low pressure
		3	Trip/alarm activated by a
		4	Collector circuit malfunction
		5	Heat pump high pressure
		6	Trip/alarm activated by an
		7	Emitter circuit malfunction
		8	Poor or no collector circuit
		9	Performance
		10	Insufficient heat output to
		11	Emitter circuit
		12	Domestic hot water heat up is
		13	Satisfactory but space heating is
		14	Not operating
9	Undertake the non-refrigerant circuit routine service and maintenance of an air source heat pump system installation	1	Obtain the relevant information required to enable the work
		2	Undertake a visual service and maintenance inspection of an air source heat pump installation to include checks in relation to:
		3	Compliance with manufacturer's installation instructions



		4	Compliance with statutory regulations		
		5	Condition of system components including cleanliness		
		6	Checking the system fluid levels		
		7	Checking the system pressure levels		
		8	Checks to ensure that electrical controls and temperature sensors are set correctly		
		9	Leakage and/or dampness		
		10	Correct positioning of system components		
		11	Pipework insulation is of the correct grade, in good condition and is firmly in place		
		12	Provision of information and safety labels		
		13	Security of fixing of system components		
		14	Undertake routine servicing of relevant components an air source heat pump installation to include checks in relation to:		
		15	Checking for protection of the system water against freezing		
		16	Cleaning and lubrication of system components		
		17	Adjustment of system controls		
		18	Undertake routine service and maintenance functional tests on an air source heat pump installation to confirm:		
		19	Safe operation		
		20	Efficient operation		
		21	The correct functioning of system components/controls		
		22	No undue noise or vibration		
		23	Complete the relevant service and maintenance records in accordance with industry recognised procedures		
		10	Undertake the non-refrigerant circuit routine service and maintenance of an ground source heat pump system installation	1	Obtain the relevant information required to enable the work
				2	Undertake a visual service and maintenance inspection of an ground source heat pump installation to include checks in relation to:
				3	Compliance with manufacturer's installation instructions
		4	Compliance with statutory regulations		
		5	Condition of system components including cleanliness		
		6	Checking the system fluid levels		
		7	Checking the system pressure levels		
		8	Checks to ensure that electrical controls and temperature sensors are set correctly		
		9	Leakage and/or dampness		
		10	Correct positioning of system components		
		11	Pipework insulation is of the correct grade, in good condition and is firmly in place		
		12	Provision of information and safety labels		
		13	Security of fixing of system components		



		14	Undertake routine servicing of relevant components a ground source heat pump installation to include checks in relation to:
		15	Checking for protection of the system water against freezing
		16	Cleaning and lubrication of system components
		17	Adjustment of system controls
		18	Undertake routine service and maintenance functional tests on a ground source heat pump installation to confirm:
		19	Safe operation
		20	Efficient operation
		21	The correct functioning of system components/controls
		22	No undue noise or vibration
		23	Complete the relevant service and maintenance records in accordance with industry recognised procedures
11	Undertake non-refrigerant circuit fault diagnosis work on an air or ground source heat pump system installation	1	Obtain the relevant information required to enable the fault diagnosis work
		2	Identify the cause of a minimum of four separate faults from the following list:
		3	Heat pump low pressure trip/alarm activated by a collector circuit malfunction
		4	Heat pump high pressure trip/alarm activated by an emitter circuit malfunction
		5	Poor or no collector circuit performance
		6	Insufficient heat output to emitter circuit
		7	Domestic hot water heat up is satisfactory but space heating is not operating
		8	System noise and/or vibration
		9	Agree with the relevant person(s) fault rectification procedures for the faults identified
12	Undertake non-refrigerant circuit fault rectification work on an air or ground source heat pump system installation	1	Obtain the relevant information required to enable the fault rectification work
		2	Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work
		3	Take relevant precautionary actions to minimize the risk of injury to self or others during the fault rectification work
		4	Rectify a minimum of two separate faults from the following list:
		5	Heat pump low pressure trip/alarm activated by a collector circuit malfunction
		6	Heat pump high pressure trip/alarm activated by an emitter circuit malfunction
		7	Poor or no collector circuit performance
		8	Insufficient heat output to emitter circuit



		9	Domestic hot water heat up is satisfactory but space heating is not operating
		10	System noise and/or vibration
		11	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.
14	Know the requirements of relevant regulations/standards relating to practical installation, testing and commissioning activities for heat pump installation work	1	Interpret building regulation/building standards guidance documentation as relevant to heat pump installation work to identify the requirements in relation to:
		2	Maintaining the structural integrity of the building
		3	Maintaining the fire resistant integrity of the building
		4	The prevention of moisture ingress (building water tightness)
		5	Notification of work requirements
		6	Physical installation requirements
		7	Energy conservation
		8	Testing and commissioning requirements
		9	Compliance certification
		10	Interpret industry recognised water regulation/byelaw guidance documentation as relevant to heat pump installation work to identify the requirements in relation to:
		11	The physical installation of the system
		12	Energy conservation
		13	Safe operation
		14	Testing and commissioning requirements
		15	State the requirements of the current fluorinated greenhouse gases regulations in relation to:
		16	The competence of personnel installing heat pumps where the
		17	Refrigerant circuit has been assembled and tested by the product manufacturer
		18	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
		19	The competence of personnel undertaking leakage checking on heat pump refrigerant circuits
		20	The competence of personnel undertaking recovery of fluorinated greenhouse gases from heat pump refrigerant circuits
15	Know the purpose and operational characteristics of heat pump unit and heat pump system components	1	Confirm the purpose and operational characteristics of the following components:
		2	Evaporator
		3	Low pressure switch
		4	Compressor



		5	High pressure switch
		6	Condenser
		7	Dryer/receiver
		8	Sight glass
		9	Expansion valve
		10	Expansion valve phial
		11	Refrigerant four way valve
		12	Brine pump
		13	Emitter circuit electro-mechanical valves
		14	Fan coil
		15	Integrated buffer tank
		16	Ground loop heat exchanger
		17	Confirm how the vapour compression refrigerant circuit within a heat pump unit operates
16	Know the different types of heat pump units and system arrangements for hydraulic emitter circuits	1	Recognise the following heat source/heat sink heat pump packages that can be deployed with a hydraulic 'heat sink' emitter circuit:
		2	Outside air/water
		3	Exhaust air/water
		4	Brine (closed loop)/water
		5	Water (open loop)/water
		6	DX (closed loop)/water
		7	Identify the different types of heat pump unit within the categories:
		8	Ground source – packaged (indoor)
		9	Ground source – packaged (outdoor)
		10	Air source - external air, packaged (indoor)
		11	Air source - external air, packaged (outdoor)
		12	Air source - external air, internal heat pump unit with brine circuit between fan coil unit and heat pump unit
		13	Confirm the meaning of the terms:
		14	Monovalent system
		15	Bivalent system
		16	Identify the following monovalent hydraulic emitter circuits:
		17	Heating only
		18	Heating with buffer tank
		19	Heating with buffer tank and indirect stored domestic hot water
		20	Heating with buffer tank and indirect stored domestic hot water with solar coil
		21	Heating with thermal store



		22	Identify the following parallel bivalent hydraulic emitter circuits that incorporate a secondary heat source other than an immersion heater:
		23	Heating with buffer tank
		24	Heating with buffer tank and indirect stored domestic hot water
		25	Heating with buffer tank and indirect stored domestic hot water with solar coil
		26	Heating with buffer tank and thermal store
		27	Confirm the arrangements for connecting buffer tanks:
		28	In series
		29	In parallel
17	Know the fundamental principles of heat pump selection and system design that are common to both air and ground source heat pumps	1	Confirm the meaning of the term 'coefficient of performance'
		2	Confirm the relationship between coefficient of performance and the:
		3	Heat pump input temperature
		4	Heat pump emitter temperature
		5	Confirm the effect that ambient temperature can have on:
		6	Coefficient of performance
		7	Heat pump output
		8	Confirm the meaning of the term 'seasonal performance factor'
		9	Identify the factors that can affect the seasonal performance factor
		10	Confirm the meaning of the term 'system efficiency'
		11	Identify the factors that can affect the 'system efficiency'
		12	Confirm why achieving minimum heat loss from the building is particularly important when designing a heat pump system
		13	State the effect that oversizing of a heat pump has on:
		14	System performance/efficiency
		15	Heat pump operation
		16	State the effect that under sizing of a heat pump has on:
		17	System performance/efficiency
		18	Heat pump operation
		19	Confirm how to identify heat pump hydraulic flow rate requirements
		20	Confirm how to use manufacturer's data to select heat pump units:
		21	Output charts
		22	Other data
		23	Confirm the meaning of the term 'bivalent points' in relation to heat pump output charts



		24	Confirm how 'bivalent points' are used to determine auxiliary heat requirements
		25	Confirm how heat pump output capacity is affected by:
		26	Heat pump input temperature
		27	Heat pump output temperature
		28	Identify the suitability of the following types of hydraulic heating system emitter for suitability with heat pump systems:
		29	Underfloor heating
		30	Fan assisted convector heaters
		31	Standard panel radiators
		32	State the typical mean water temperature recommended when designing a hydraulic emitter circuit that incorporates:
		33	Underfloor heating
		34	Fan assisted convector heaters
		35	Standard panel radiators
		36	Confirm how correction factors are used to determine panel radiator output requirements in relation to mean water temperature and room temperature difference (degrees centigrade)
		37	Confirm the potential benefits of including a buffer tank in the system design
		38	Identify the potential disadvantages of including a buffer tank in the system design
		39	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
		40	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
		41	State the typical annual operating hours for a heat pump that is being used for:
		42	Heating only
		43	Heating and domestic hot water
		44	State how heat pump annual operating hours may vary in relation to the:
		45	Type of building
		46	Geographical location of the installation
18	Know the fundamental design principles for ground source 'closed loop' heat pump collector circuit	1	Identify the following brine filled heat pump collector circuit configurations:
		2	Ground 'closed' loop horizontal
		3	Ground 'closed' loop compact collector



design, component sizing and installation	4	Ground 'closed' loop slinky
	5	Ground 'closed' loop vertical borehole
	6	Lake 'closed' loop
	7	Vertical borehole closed' loop
	8	Confirm the requirements of horizontal 'closed' loop brine filled hydraulic heat pump collector circuits in relation to:
	9	Suitable pipework materials
	10	Below ground jointing
	11	Protection against frost damage
	12	Protection against mechanical damage
	13	Separation distances to avoid thermal interference
	14	Separation distances from other services and adjacent buildings
	15	Achieving balanced loop/collector circuits
	16	Confirm the typical requirements of vertical borehole 'closed' loop brine filled hydraulic heat pump collector circuits in relation to:
	17	Suitable pipework materials
	18	Below ground jointing
	19	Protection against frost damage
	20	Protection against mechanical damage
	21	Separation distances to avoid thermal interference
	22	Separation distances from other services and adjacent buildings
	23	Achieving balanced loop/collector circuits
	24	Identify the typical components required in relation to:
	25	Single circuit 'closed' loop collector circuits
	26	Multi-circuit 'closed' loop collector circuits
	27	Brine circuits between outside air source units and internal heat pump units
	28	Confirm the typical layout of components in relation to:
	29	Single circuit collector circuits
	30	Multi-circuit collector circuits
	31	Brine circuits between outside air source units and internal heat pump units
	32	Confirm which factors determine the year round energy available in watts (w) per m ² of ground area
	33	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)
	34	Confirm 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:
		35	Ground conditions/soil types
		36	Type of backfill material
		37	Geographical location – ground rest temperature
		38	Ground loop configuration
		39	Annual heat pump operating hours
		40	Confirm how the total ground area (m ²) requirements for horizontal collector loops is determined using the following data:
		41	Refrigeration capacity (kw)
		42	Specific extraction output (w/m ²)
		43	Confirm how the pipe length (m) requirement for a horizontal ‘loop’ collector circuit is determined using the following data:
		44	Total ground area (m ²)
		45	Collector loop pipe spacing (m)
		46	Confirm how the pipe length (m) requirement for a ‘slinky’ collector circuit is determined using the following data:
		47	Total ground area (m ²)
		48	Centre to centre spacing of the slinky collector (m)
		49	Confirm how the typical collector length (m) requirement for a vertical borehole collector circuit is determined using the following data:
		50	Heat pump refrigeration capacity (kw)
		51	Ground condition
		52	Annual heat pump operating hours
		53	Confirm how a collector circuit brine pump size (kg/h) is determined using the following data:
		54	Design flow rate
		55	Brine viscosity
		56	Heat pump refrigeration capacity (kw)
		57	Specific thermal capacity of brine (kj/kg)
		58	Temperature difference between brine circuit flow and return pipework (degrees centigrade)
19	Know the layouts of ‘open loop’ water filled heat pump collector circuits	1	Identify the following ‘open loop’ water filled heat pump collector circuit configurations:
		2	Ground ‘open’ loop vertical borehole
		3	Lake ‘open’ loop
20	Know the fundamental design considerations and principles that are specific to air source heat pumps	1	Identify the factors that need to be considered when selecting and positioning air source heat pump fan coil units in relation to:
		2	Operating noise (including the potential effect on neighbouring properties)



		3	Air turbulence during operation
		4	Identify the design options to provide for the defrost cycle for an air source heat pump
		5	Confirm how to size a buffer tank to provide for an air source heat pump defrost cycle
21	Know the preparatory work required for heat pump installation work	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:
		2	Authorisation for the work to proceed
		3	The availability and collation of all relevant information
		4	Verification of the suitability of the hydraulic emitter circuit for connection to the heat pump unit
		5	Verification that the heat output capacity of the heat pump unit is matched to the required proportional contribution of the total building heat load
		6	Verification that the buffer tank sizing is correct
		7	The availability of appropriate access to all required work areas
		8	The availability and condition of
		9	A suitable electrical input
		10	Service
		11	Adequate provision for the siting
		12	Of key internal system
		13	Components
		14	The suitability of the building
		15	Structure in relation to the ...
		17	Proposed installation
		18	Confirm the pre-installation checks that are specific to the positioning of fan coil units
22	Know the requirements to install and test heat pump systems (non-refrigerant circuits)	1	Confirm the requirements for moving and handling heat pump units to avoid damage to the unit
		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
		3	Identify the requirements where brine circuit pipework passes through the external building fabric in relation to:
		4	Provision for movement
		5	Protection against freezing
		6	Prevention of water ingress
		7	Confirm the charging and flushing requirements for closed loop collector circuits in relation to:
		8	Purging of air and installation debris
		9	Addition of antifreeze protection and suitable biocides



		10	Checking flow rates
		11	State what equipment is needed for system charging and flushing
		12	Confirm the hydraulic test requirements for:
		13	Closed loop collector circuits
		14	Hydraulic emitter circuits
23	Understand the requirements to commission heat pump system installations (non-refrigerant circuits)	1	Confirm the conditions that are required to implement commissioning activities for ground source heat pump systems
		2	Confirm the commissioning requirements for ground source heat pump systems in relation to:
		3	Setting of mechanical controls
		4	Setting of electrical controls and temperature sensors
		5	Functional tests
		6	Confirm the conditions that are required to implement commissioning activities for air source heat pump systems
		7	Confirm the commissioning requirements for air source heat pump systems in relation to:
		8	Setting of mechanical controls
		9	Setting of electrical controls and temperature sensors
		10	Functional tests
24	Understand the requirements to handover heat pump system installations	1	Confirm the pre-handover checks that need to be carried out for a ground source heat pump system installation
		2	Confirm the industry handover procedures for a ground source heat pump system installation in relation to the:
		3	Provision of written information
		4	Provision of diagrammatic information
		5	Provision of verbal information/demonstration relating to system operation and use
		6	Confirm the pre-handover checks that need to be carried out for an air source heat pump system installation
		7	Confirm the industry handover procedures for an air source heat pump system installation in relation to the:
		8	Provision of written information
		9	Provision of diagrammatic information
		10	Provision of verbal information/demonstration relating to system operation and use

Soft Skills			
No.	Objective	No.	Criteria
Intentionally Blank			



Other			
No.	Objective	No.	Criteria
Intentionally Blank			

Additional Guidance	
Intentionally Blank	

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