

# Customer Information Sheet

## Air, Ground Source and Design Heat Pumps

### NICEIC Package Includes:

Training Materials, Powerpoint, Assessment Materials

Code	Core Assessments	Practical provisions
HPFC	Unit 1 Foundation Core (Installation & Maintenance of Heat Pumps)	See pages 13 - 16 of Guidance Doc.
ASHP	Unit 2 Installation & Maintenance of Air Source Heat Pumps	
GSHP	Unit 3 Installation & Maintenance of Ground Source Heat Pumps	
HPSD-01	Unit 4 Heat Pump System Design (LTHWS Only)	
HPSD-02	Unit 4 Heat Pump System Design (ASHP)	
HPSD-03	Unit 4 Heat Pump System Design (GSHP)	

### Introduction

The NICEIC Certification heat pump package has undergone a complete review with improvements added.

The changes reflect the introduction of revised standards, changes in technology, requirements of technical competencies, liaison with industry stakeholder and feedback from our customers. This has led to review and update for both the training and assessment suite of materials. It was also an ideal opportunity to review the current NICEIC Certification "On-Site-Guide" publication for heat pumps in support of the training and assessment package.

The objective for reviewing the NICEIC Certification heat pump training and assessment package was primarily to offer coherent knowledge, understanding and application for the design, installation, commissioning, handover and maintenance of both air and ground source heat pumps and their heat emitter systems. Explaining the physics behind the operation of heat pumps, their component parts and how they function is a key requirement for the delivery methodology. The learner will experience a training and assessment environment that will require a comprehensive set of delivery techniques from the provider to assure the required level of understanding.

The target population expectation for the programme is, for example, existing fossil fuel, heating, plumbing, mechanical, ventilation and electrical engineers who are already holding the required utility sector prerequisite qualifications and experience.

The subject matter delivery will require a level of understanding for the ancillary equipment connected to a heat pump for extracting low grade renewable heat from the external environment for use to heat domestic properties, as well as the domestic hot water demand.

### Unit 1: ASHP & GSHP Core Foundation

Unit 1 is a mandatory unit that all learner candidates must undertake. Unit 1 is for those individuals who require to be trained, assessed and if successful deemed competent as an installation and maintenance engineer for ASHP or GSHP, or both. Once Unit 1 is attained the learner candidate can progress to the pathways of ASHP, GSHP and/or Design. Learner candidates applying for only the design competence (Unit 4) shall also complete the training and assessment for Unit 1.

The knowledge, understanding and performance criteria for "Unit" 1 training and assessment is based on a foundation level over a broad range. Unit 1 will touch on air source and ground source principles to include a minimal content of design.

Unit 1 consists of training and assessment to include:

- Vapour compression systems and system components.
- Different types of heat pump categories and recognising their individual heat source.
- The requirements of the current fluorinated greenhouse gases regulations.
- The performance factors in relation to selecting, installing and commissioning.
- How to use manufacturer's product data to select heat pump units.
- The typical mean water temperature when designing hydraulic emitter circuits.
- The typical annual operating hours and limitations for a heat pump.
- The different types of heat pump requirements for domestic hot water provision.
- Hot water cylinders, types, volumes, operating parameters, risks and sizing.
- Types of hydraulic heating system emitters, layouts and sizing for heat pump systems.
- Heat pump standards, sizing, rating, flow rates, flow temperatures and circulators.
- Buffer vessels, purpose, operation, application, configuration and sizing.
- The common components and control systems for heat pump units and emitter systems.
- Pre-installation checks for heat pump installations and hydraulic emitters circuits.
- The requirements to avoid undue noise and/or vibration transmission from heat pumps.
- Requirements where brine circuit pipework passes through the external building fabric.
- Charging and flushing requirements for hydraulic systems.
- The conditions required to implement commissioning activities for heat pump systems.
- Testing and commissioning.
- The pre-handover checks that need to be carried out for a heat pump system installation.
- Generic health, safety and environment.
- The legislation governing the installation of heat pumps.

Training shall be engaging and interactive and include an appropriate level of practical demonstrations and performance. Training shall be evaluated by the learner attaining the required standard of theory and practical assessments, the required standard is 100%.

N.B. The duration may be reduced when combined with other pathway units as duplication of generic criteria will be removed.

## **Unit 2: ASHP (Installation & Maintenance)**

Unit 2 is for learner candidates who are applying to be trained, assessed and if successful deemed competent as an installation and maintenance engineer for ASHP systems having already attained the requirements for Unit 1. The knowledge, understanding and performance criteria for "Unit" 2 training and assessment is specifically for the installation, commissioning, handover and maintenance of ASHP and associated heat emitter systems. Unit 2 will deliver the training and assess the learner for the knowledge, understanding and application of a specified type and range of air source units and systems.

Unit 2 consists of expanding the training and assessment criteria to include:

- Vapour compression systems and system components.
- ASHP Monobloc, split, monovalent, bivalent, hybrid, space heating and hot water.
- Heat load, flow rates, flow temperatures, emitters, cylinders, differentials and calculations.
- Performance factors, permissions, planning, site considerations and environment.
- Manufacturer's instructions, siting, structure, clearances, neighbours and restrictions.
- Components, controls, equipment, application and principles of operation.
- Production of condensation, methods of dispersal, normal operation and defrost mode.
- Installation standards, parameters and engineering techniques.
- Hydraulic heat emitter systems, types, configurations, zones, circulators and applications.
- Standard requirements and restrictions for hot water provision.
- Expanding on the use and sizing of buffer vessels in system design.
- Heat emitter pipe sizing, flow rates, temperatures and pump selection.
- Installation requirements for insulation of external pipework.
- The requirements for testing and commissioning.
- The requirements for handover.
- The requirements for regular servicing and fault diagnostics.
- Generic health, safety and environment.
- The legislation governing the installation of heat pumps.

Training shall be engaging and interactive and include an appropriate level of practical demonstrations and performance

Training shall be evaluated by the learner attaining the required standard of theory and practical assessments, the required standard is 100%.

N.B. The duration may be reduced when combined with other pathway units as duplication of generic criteria will be removed.

### **Unit 3: GSHP (Installation & Maintenance)**

Unit 3 is for learner candidates who are applying to be trained, assessed and if successful deemed competent as an installation and maintenance engineer for GSHP systems having already attained the requirements for Unit 1. The knowledge, understanding and performance criteria for "Unit" 3 training and assessment is specifically for the installation, commissioning, handover and maintenance of GSHP and associated heat emitter systems. This unit also covers the different type of ground heat exchangers that can be used depending on the environment for the proposed installation. Unit 3 will deliver the training and assess the learner for the knowledge, understanding and application of a specified type and range of ground source units, collectors and heat emitter systems.

Unit 3 consists of expanding the training and assessment criteria to include:

- The different principles of operation and application of ground source collectors.
- Collector types, closed, open, horizontal, vertical, slinky, compact, ground water, etc.
- Brine pumps for collector circuits, transfer fluids and transfer principles to evaporators.
- GSHP unit vapour compression systems and system components.
- Monovalent, bivalent, hybrid systems and the considerations for external temperatures.
- Collector selection, ground conditions, specific heat capacity and annual operating hours.
- Collector materials, sizes, jointing, trenches, boreholes, dimensions and backfill.
- Protecting collectors from mechanical damage, effects of thermal transfer and balancing.
- Proximity to other services, buildings and clearances.
- Charging, flushing, purging, equipment, flow rates, transfer fluid and pressure testing.
- Antifreeze, concentrations, biocides, sampling, standard methods of work and equipment.
- Hydraulic heat emitter systems, types, configurations, zones, circulators and applications.
- Expanding on the use and sizing of buffer vessels in system design.
- Heat emitter pipe sizing, flow rates, temperatures and pump selection.
- Heat load, flow rates, flow temperatures, emitters, cylinders, differentials and calculations.
- Performance factors, permissions, planning, site considerations and environment.
- Manufacturer's instructions, siting, structure, clearances, neighbours and restrictions.
- GSHP unit components, controls, equipment, application and principles of operation.
- Installation standards, parameters and engineering techniques.
- Standard requirements and restrictions for hot water provision.
- Installation requirements for insulation of external pipework.
- The requirements for testing and commissioning.
- The requirements for handover.
- The requirements for regular servicing and fault diagnostics.
- Generic health, safety and environment.
- The legislation governing the installation of heat pumps.

Training shall be engaging and interactive and include an appropriate level of practical demonstrations and performance.

Training shall be evaluated by the learner attaining the required standard of theory and practical assessments, the required standard is 100%.

N.B. The duration may be reduced when combined with other pathway units as duplication of generic criteria will be removed.

## Unit 4: Heat Pump System Design

Unit 4 is for learner candidates who are applying to be trained, assessed and if successful deemed competent for the design of ASHP systems or GSHP systems, or both having already attained the requirements for Unit 1.

The knowledge and understanding criteria for “Unit” 4 training and assessment is specific to system design and includes the learning and assessment for low temperature heating and hot water systems (LTHWS) as part of the design package.

Unit 4 pathway is more complex in structure as it has 3 sub-elements for design. Each of these sub elements has its own training and evaluation criteria and are listed as follows:

### Unit 4: Heat Pump System Design (LTHWS)

This is a mandatory sub-element for design. All learner candidates applying for ASHP design and/or GSHP design must complete this training and assessment criteria, if not already holding the award. The criteria is specific to hydraulic heat emitter system design, low temperature heating and hot water systems and heat loss calculations for dwellings using the methodologies contained within the Domestic Heating Design Guide (CIBSE).

### Unit 4: Heat Pump System Design (ASHP & GSHP)

All learner candidates applying for ASHP design and/or GSHP design must complete this training and assessment criteria. The training and assessment criteria is mostly generic to both disciplines in relation to the MIS-3005-D standard requirements.

### Unit 4: Heat Pump System Design (GSHP)

This unit training and assessment criteria is specific to GSHP design and relates mainly to the GSHP unit requirements for selection, the ground collector type, the selection and sizing of the ground collector and the principles of operation of the ground collector. The criteria again is specific to the methodologies contained within MIS-3005-D, MGD-007 and other supporting reference material.

## Candidate Pre-requisites

- N/SVQ Level 2/3 or Equivalent. Examples Include: Plumbing, Heating & Ventilation (Domestic/Non-Domestic/Commercial Installation), Oil Fired Technical Services and Gas Installation & Maintenance.
- Alternatively, heating installers with “3-years” minimum experience installing wet central heating systems, evidenced either by manufacturer course certification, Gas Safe Register, OFTEC, MCS or HETAS registration.

In addition to the above, the following certification must be held by the learner or included as part of the training course package, assessed and certificated on successful attainment:

- Low Temperature Heating & Hot Water Systems (LTHWS See Installers Only), Energy Efficiency (EE), Un-Vented Domestic Hot Water Storage Systems (UVHW) & Water Regulations (WR).

## Certificate of Competence

A certificate of Competence will be issued if a candidate can meet the requirements laid down within this document. Certificates of Competence will be valid for the time period specified on it.

## Guidance Doc. Theory Provisions

	Initial
The classroom or resource room shall be in a suitable and quiet location.	✓
Adequate space and layout that befits and encourages a conducive learning environment.	✓
Appropriate space between learners when undertaking tests (1 metre).	✓
A clock should be in full view.	✓
Adequate lighting levels (minimum 500 lux) must be provided.	✓
Adequate heating and environmental comfort levels.	✓
Teaching aids to include NICEIC On-Site-Guides and normative documents.	✓
Teaching aids to include NICEIC power-point presentations.	✓
Teaching aids to include flip charts, pen boards, projectors and reference materials.	✓
Classroom risk assessed for health, safety and environment conformance.	✓

## Guidance Doc. Practical Provisions

The assessment area must simulate a real working environment, i.e. an environment in which real work activities take place under real working conditions in keeping with real commercial situations. The assessment task must be undertaken using fit-for-purpose tools and equipment, full-size components. The physical resources and practical assessment facilities must be maintained in a fit for purpose condition and updated as directed by NICEIC certification. It is recommended that this guidance be used in conjunction with setting up the facility.

Each provider will be unique in the way it presents its practical provision and as a result the programme guides and presentations may not be ideally tailored with regard to the provider's style of delivery. It is acceptable for the sequence of course content to be delivered in a way that "suits" the actual provision/layout at an individual providers' facility. However, such changes must be minimal and any major alterations made only with the written permission of NICEIC Certification.

### Practical Provisions Air Source Heat Pumps

	Initial
The practical training/assessment requires provision of electrical, gas and water services.	✓
Sufficient quantity and range of heat pump installations and equipment.	✓
An installed and fully operational ASHP (Floor Mounted, Wall Mounted).	✓
This installation shall be configured to accommodate training and assessment conditions.	✓
Additional portable rig is a recommendation for training sessions.	✓
Appropriate flexible hoses and isolating valves.	✓
Correctly installed pressure gauges, drain valves, air vents and auto-bypass.	✓
An appropriate buffer vessel.	✓
If not packaged and included with the heat pump, a microprocessor/controller.	✓
Weather compensation system.	✓
Pressure relief valve.	✓
Electrical simulated supply (domestic) to include MCB and rotary isolation unit (lockable).	✓
An installed and fully operational heat emitter system.	✓
Emitter system can be (Wall Mounted or a Mobile Rig).	✓
Emitter system expansion vessel.	✓
Emitter system can be radiators, underfloor system, fan assisted or a combination.	✓
Manifolds and/or low loss headers where appropriate.	✓
Control systems, for example, thermostats, zone control valves etc.	✓
Emitter system pipework shall be configured as reversed return.	✓
Appropriate domestic hot water cylinder as part of a package or remote.	✓
PRV and pressure gauge arrangement.	✓
Filling, flushing and pressure testing valve arrangement.	✓
Filling and flushing equipment (a separate rig can be used for demonstrating equipment).	✓
Flexible base kit per following image or equivalent.	✓
Appropriate test equipment to check flow / return temperatures (differential thermometer).	✓
Containers with various glycol concentrates (suggest 2 minimum, 4 maximum).	✓
Refractometer for checking samples.	✓
A means of calibrating the refractometer (distilled water).	✓

Equipment for heat exchanger fins (cleaning brushes for example).	✓
Suitable TB118a electrical safe isolation test kit.	✓
Suitable safe to touch equipment (volt-stick).	✓
See NICEIC Certification ETFGE programme for equipment/ test rig provisions.	✓
See NICEIC Certification ETFGE programme for demonstrating safe isolation.	✓
Lock-Off devices and labelling.	✓
Manufacturer requirements for Biocides, Glycols, Inhibitors and Cleansing.	✓

## Practical Provisions Ground Source Heat Pumps

The practical training/assessment requires provision of electrical, gas and water services.	✓
Sufficient quantity and range of heat pump installations and equipment.	✓
An installed and fully operational GSHP (Floor Mounted).	✓
This installation shall be configured to accommodate training and assessment conditions.	✓
Additional portable rig is a recommendation for training sessions.	✓
Collector, header, manifolds and valves configured for flushing, purging and testing.	✓
Appropriate filling, flushing, purging and pressure testing equipment.	✓
Heating system rig (can be mobile, floor or wall mounted) incorporating simulated collector coil.	✓
Ground source heat pump unit connected to real or simulated heat distribution system (can be radiators or underfloor) incorporating:	✓
Expansion vessel.	✓
Pressure relief valve (3 bar).	✓
Pressure gauge.	✓
Heat pump cylinder (recommended).	✓
Ground source collector circuit (part coil on rig) connected to manifold.	✓
Filling and flushing valve set in readiness for connecting to filling and flushing pump.	✓
Filling and flushing pump kit.	✓
Appropriate equipment to check flow and return temperatures (digital thermometer kit).	✓
Heat pump control system (microprocessor, thermostats and sensor package).	✓
Containers with various glycol concentrates (suggest 2 minimum, 4 maximum).	✓
Refractometer for checking samples.	✓
A means of calibrating the refractometer (distilled water).	✓
Suitable TB118a electrical safe isolation test kit.	✓
Suitable safe to touch equipment (volt-stick).	✓
See NICEIC Certification ETFGE programme for equipment/ test rig provisions.	✓
See NICEIC Certification ETFGE programme for demonstrating safe isolation.	✓
Lock-Off devices and labelling.	✓
Manufacturer requirements for Biocides, Glycols, Inhibitors and Cleansing.	✓