Institute for Apprenticeships & Technical Education

END-POINT ASSESSMENT PLAN FOR THE PLUMBING AND DOMESTIC HEATING TECHNICIAN APPRENTICESHIP

Apprenticeship standard reference number	Apprenticeship standard level	Integrated end-point assessment
ST0303	3	Yes – Option 1 only

Contents

Introduction and overview

This document explains the requirements for end-point assessment (EPA) for the plumbing and domestic heating technician apprenticeship. End-point assessment organisations (EPAOs) must follow this when designing and delivering the EPA.

Plumbing and domestic heating technician apprentices, their employers and training providers should read this document.

A full-time plumbing and domestic heating technician apprentice typically spends 48 months on-programme (this means in training before the gateway). The apprentice must spend at least 12 months on-programme and complete the required amount of off-the-job training in line with the apprenticeship funding rules.

The EPA should be completed within an EPA period lasting typically 6 months.

The apprentice must complete their training and meet the gateway requirements before starting their EPA. The EPA will assess occupational competence.

An approved EPAO must conduct the EPA for this apprenticeship. Employers must work with the training provider to select an approved EPAO from the apprenticeship provider and assessment register (APAR).

This is a core and options apprenticeship. An apprentice must be trained and assessed against the core and one option. The options are:

Option 1: domestic gas fired hot water heating appliances technician

Option 2: domestic air source heat pump and solar thermal systems technician

Option 3: non-domestic plumbing technician

Option 1 has an integrated qualification which means both the qualification and apprenticeship should be completed, passed and awarded during the same period. It incorporates the requirements for the Accredited Certification Scheme (ASC) and is an industry recognised and mandatory entry route for gas engineers to attain the necessary qualifications and competence required to work under the Gas Safe Register. The following qualifications apply to option 1:

- CCN1 – Core domestic gas safety
- CENWAT –Domestic gas central heating boilers and water heaters

These qualifications are integrated into the practical assessment and knowledge test. The awarding body (AB) is accountable for the integrated assessment method. They must deliver and mark the integrated assessment methods. The end-point assessment organisation (EPAO) must take responsibility for all other assessment methods in the EPA. EPAOs and ABs must work collaboratively to manage the delivery of the EPA. The EPA outcome is determined by the EPAO. The EPAO must combine the outcomes of integrated and non-integrated assessment methods to determine the apprentice's overall grade. The apprentice must apply to join the Gas Safe Register and is required to meet the requirements of gas safe registration on successful completion of the CCN1 and CENWAT qualifications. This application is not part of the EPA.

The EPA has 3 assessment methods:

Assessment method 1: knowledge test (KT) - partly integrated for option 1
· pass
· fail
· distinction

Assessment method 2: practical planning test (PPT)
· pass
· fail

Assessment method 3: practical competence test (PCT) - integrated for option 1
· pass
· fail

Assessment method 4: interview underpinned by an apprenticeship portfolio of evidence (IPE)
· pass
· fail
· distinction

Performance in the EPA will determine the overall apprenticeship standard grade of:
· pass
· fail
· distinction

EPA summary table

On-programme - typically 48 months	The apprentice must: • complete training to develop the knowledge, skills and behaviours (KSBs) outlined in this apprenticeship's standard • complete training towards English and mathematics qualifications in line with the apprenticeship funding rules • compile an apprenticeship portfolio of evidence • complete training towards the qualification listed in the plumbing and domestic heating technician apprenticeship standard The qualifications required are: • Level 3 Diploma in plumbing and domestic heating
End-point assessment gateway	The apprentice's employer must be content that the apprentice is occupationally competent. The apprentice must: • confirm they are ready to take the EPA • have achieved English and mathematics qualifications in line with the apprenticeship funding rules • have passed the Level 3 Diploma in plumbing and domestic heating • for option 1 – have completed the training, but not the assessments for the CCN1 and CENWAT qualifications For the interview underpinned by an apprenticeship portfolio of evidence, the apprentice must submit an apprenticeship portfolio of evidence. Gateway evidence must be submitted to the EPAO along with any organisation specific policies and procedures requested by the EPAO.
End-point assessment – typically 6 months	The grades available for each assessment method are below: **Assessment method 1:** knowledge test · pass

	· fail · distinction **Assessment method 2:** practical planning test · pass · fail **Assessment method 3:** practical competence test · pass · fail **Assessment method 4:** interview underpinned by an apprenticeship portfolio of evidence · pass · fail · distinction Performance in the EPA will determine the overall apprenticeship standard grade of: · pass · fail · distinction
Professional recognition	This apprenticeship aligns with: • Engineering Council (EngTech) for level 3
Re-sits and re-takes	• re-take and re-sit grade cap: pass • re-sit timeframe: typically 3 months • re-take timeframe: typically 6 months

Duration of end-point assessment period

The EPA is taken in the EPA period. The EPA period starts when the EPAO confirms the gateway requirements have been met and is typically 6 months.

The EPAO should confirm the gateway requirements have been met and start the EPA as quickly as possible.

EPA gateway

The apprentice's employer must be content that the apprentice is occupationally competent. That is, they are deemed to be working at or above the level set out in the apprenticeship standard and ready to undertake the EPA. The employer may take advice from the apprentice's

training provider, but the employer must make the decision. The apprentice will then enter the gateway.

The apprentice must meet the gateway requirements before starting their EPA.

They must:

- confirm they are ready to take the EPA
- have achieved English and mathematics qualifications in line with the apprenticeship funding rules
- have passed the Level 3 Diploma in plumbing and domestic heating
- for option 1 – have completed the training, but not the assessments for the CCN1 and CENWAT qualifications
- submit an apprenticeship portfolio of evidence for the interview underpinned by an apprenticeship portfolio of evidence

Apprenticeship portfolio of evidence requirements:
The apprentice must compile an apprenticeship portfolio of evidence during the on-programme period of the apprenticeship.

It should only contain evidence related to the KSBs that will be assessed by the interview underpinned by an apprenticeship portfolio of evidence. It will typically contain 10 discrete pieces of evidence. Evidence must be mapped against the KSBs. Evidence may be used to demonstrate more than one KSB; a qualitative as opposed to quantitative approach is suggested.
Evidence sources may include:

- workplace documentation and records, for example:
- workplace policies and procedures
- witness statements
- annotated photographs
- video clips with a maximum total duration 10 minutes; the apprentice must be in view and identifiable

This is not a definitive list; other evidence sources can be included.

The apprenticeship portfolio of evidence should not include reflective accounts or any methods of self-assessment unless this is necessary to meet the requirements for the Accredited Certification Scheme (ASC) to work under the Gas Safe Register in Option 1, as outlined in Appendix 2. Any employer contributions should focus on direct observation of performance, for example, witness statements, rather than opinions. The evidence provided should be valid and attributable to the apprentice; the apprenticeship portfolio of evidence should contain a statement from the employer and apprentice confirming this.

The EPAO should not assess the apprenticeship portfolio of evidence directly as it underpins the interview. The independent assessor should review the apprenticeship portfolio of evidence to prepare questions for the interview. They are not required to provide feedback after this review.

Gateway evidence must be submitted to the EPAO, along with any organisation specific policies and procedures requested by the EPAO.

Order of assessment methods

For option 1, the non-integrated assessment methods (paper 1 of the knowledge test, the practical planning test and the interview underpinned by an apprenticeship portfolio of evidence) must be completed before the integrated assessment methods (paper 2 of the knowledge test and the practical competence test). The rationale for the order of the assessment methods is to help ensure that apprentices complete the EPA.

For options 2 and 3 the assessment methods can be delivered in any order. The result of one assessment method does not need to be known before starting the next.

Knowledge test

Overview

In the knowledge test, the apprentice answers questions in a controlled and invigilated environment. It gives the apprentice the opportunity to demonstrate the knowledge mapped to this assessment method.

Rationale

This EPA method is being used because:

- it allows for the efficient testing of knowledge where there is a right or wrong answer
- it can be conducted remotely and administered to multiple apprentices at the same time, potentially reducing cost
- it allows for flexibility in terms of when, where and how it is taken

Delivery

The knowledge test must be structured to give the apprentice the opportunity to demonstrate the knowledge mapped to this assessment method to the highest available grade.

The test can be computer or paper based.

The apprentice must be given at least 14 days' notice of the date and time of the test.

The knowledge test is made up of two papers. Paper 1 covers the core knowledge statements for all options as outlined in the mapping and paper 2 covers the option knowledge statements as outlined in the mapping.

Paper 1 in all options will consist of:

- 60 multiple-choice questions to be completed in 120 minutes

Multiple-choice questions must have four choices, including one correct answer.

Paper 2 in option 1 is an integrated assessment method. It will consist of:

- the CC1 theory test for the core domestic gas safety qualification
- the CENWAT theory test for domestic gas central heating boilers and water heaters

The integrated assessment method forms part of the apprenticeship's EPA as well as awarding of the qualifications.

Paper 2 in option 2 will consist of:

- paper 2a assessing the knowledge relating to air source heat pumps, with 60 multiple-choice questions to be completed in 120 minutes
- paper 2b assessing the knowledge relating to thermal hot water systems with 50 multiple-choice questions to be completed in 100 minutes

Multiple-choice questions must have four choices, including one correct answer.

Paper 2 in option 3 will consist of:

- 30 multiple-choice questions to be completed in 60 minutes

Multiple-choice questions must have four choices, including one correct answer.

Test administration

The apprentice answers questions in a controlled and invigilated environment.

For paper 2 in option 1, the administration must align with the conditions set out by the AB.

For paper 1 in all options and paper 2 in options 2 and 3, the following applies:

The test is closed book which means that the apprentice cannot refer to reference books or materials whilst taking the test.

The test must be taken in the presence of an invigilator who is the responsibility of the EPAO. The EPAO must have an invigilation policy setting

out how the test must be conducted. It must state the ratio of apprentices to invigilators for the setting and allow the test to take place in a secure way.

The EPAO must verify the apprentice's identity and ensure invigilation of the apprentice for example, with 360-degree cameras and screen sharing facilities.

The EPAO is responsible for the security of the test including the arrangements for on-line testing. The EPAO must ensure that their security arrangements maintain the validity and reliability of the test.

Marking

For paper 2 in option 1, marking must align with the conditions set out by the AB.

For paper 1 in all options and paper 2 in options 2 and 3, the following applies:

The test must be marked by an independent assessor or marker employed by the EPAO. They must follow a marking scheme produced by the EPAO. Marking by computer is allowed where question types support this.

A correct answer gets 1 mark. Any incorrect or missing answers get zero marks.

The EPAO is responsible for overseeing the marking of the test.

Assessment locations

For paper 2 in option 1, the assessment location requirements must align with the conditions set out by the AB.

For paper 1 in all options and paper 2 in options 2 and 3, the following applies:

The apprentice must take the test in a suitably controlled and invigilated environment that is a quiet room, free from distractions and influence. The EPAO must check the venue is suitable.

The test could take place remotely if the appropriate technology and systems are in place to prevent malpractice.

Question and resource development

For paper 2 in option 1, the question and resource development requirements must align with the conditions set out by the AB.

For paper 1 in all options and paper 2 in options 2 and 3, the following applies:

The EPAO must develop a purpose-built assessment specification and question bank. It is recommended this is done in consultation with employers of this occupation. The EPAO should maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that questions are refined and developed to a high standard. The questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different set of questions in the case of re-sits or re-takes.

The EPAO must produce the following materials to support the test:

- independent assessor assessment materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials
    - grading guidance
    - test specification
    - sample test and mark schemes
    - live tests and mark schemes
    - question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

Grading

To achieve a pass in the knowledge test, the apprentice must pass paper 1 and paper 2. To achieve a distinction in the knowledge test, the apprentice must achieve a distinction in paper 1 and achieve a pass in paper 2.

Paper 1	Minimum score	Maximum score
Distinction	50 out of 60	60 out of 60
Pass	36 out of 60	49 out of 60
Fail	0 out of 60	35 out of 60

Option 1 (ACS) Paper 2	Minimum score	Maximum score
UKAS-approved Nationally Accredited Certification Scheme (ACS) for Gas-fitting Operatives theory test, as specified by the awarding body.		

Option 2 Paper 2a	Minimum score	Maximum score
Pass	36 out of 60	60 out of 60
Fail	0 out of 60	35 out of 60

Option 2 Paper 2b	Minimum score	Maximum score
Pass	30 out of 50	50 out of 50
Fail	0 out of 50	29 out of 50

Option 3 Paper 2	Minimum score	Maximum score
Pass	18 out of 30	30 out of 30
Fail	0 out of 30	19 out of 30

Practical planning test

Overview

In the practical planning test, the apprentice produces a design plan in a controlled and invigilated environment. It gives the apprentice the opportunity to demonstrate the knowledge and skills mapped to this assessment method.

Rationale

This EPA method is being used because:

- it allows the apprentice to demonstrate knowledge that does not lend itself to a knowledge test
- it allows for the efficient testing of knowledge and skills, using realistic scenarios
- it allows for flexibility in terms of when, where and how it is taken
- it is a holistic assessment method

Delivery

The practical planning test must be structured to give the apprentice the opportunity to demonstrate the knowledge and skills mapped to this assessment method as outlined in the grading section.

The practical planning test can be computer or paper based.

All apprentices must complete the practical planning task.

The practical planning test must take 5 hours and may be completed over two working days to make the assessment more manageable. The EPAO must manage invigilation of the apprentice during the assessment, to maintain security of the EPA, in line with their malpractice policy. This includes breaks and moving between locations.

The independent assessor must explain to the apprentice the format and timescales of the practical planning test before it starts. This does not count towards the assessment time.

Building plans are provided to the apprentice with a job specification, manufacturer's information and data, British Standards and Regulations. The apprentice is asked to complete a domestic cold and hot water system design capable of meeting a specific job specification. The apprentice will then produce a design plan incorporating the following aspects:

- design criteria
- completed fabric heat loss
- heating pipework sizing
- hot and cold water pipework sizing
- final layout plans
- materials list
- merchant order
- work programme
- risk assessment and method statement
- present calculations and information in a suitable format for quotation and tender

The apprentice must be given at least 14 days' notice of the date and time of the test.

Test administration

The practical planning test is open book which means that the apprentice can refer to reference books or materials whilst taking the test.

The following normative documents must be available for use:

- CIBSE Domestic heating design guide
- CIBSE Underfloor heating design and installation guide
- Domestic building services compliance guide
- WRAS Water regulations guide
- Building regulations (Parts G, H, L, M)
- BS 8558
- BS 806 Parts 1-5
- BS 12056 Parts 1-3
- manufacturers' technical documents

The following equipment must be made available for use:

- a calculator

The practical planning test must be taken in the presence of an invigilator who is the responsibility of the EPAO. The EPAO must have an invigilation policy setting out how the test must be conducted. It must state the ratio of apprentices to invigilators for the setting and allow the test to take place in a secure way.

The EPAO is responsible for the security of the practical planning test including the arrangements for on-line testing. The EPAO must ensure that their security arrangements maintain the validity and reliability of the test.

Marking

The practical planning test must be marked by an independent assessor or marker employed by the EPAO. Markers must have the same occupational competence and experience as an independent assessor, as defined in the internal quality assurance section.

The EPAO must develop a marking scheme based on the grading descriptors for this assessment method. The EPAO is responsible for overseeing the marking of the practical planning test. The EPAO must set the standard and maintain that standard over time.

The EPAO is responsible for overseeing the marking of the test.

Assessment location

The apprentice must take the practical planning test in a suitably controlled and invigilated environment that is a quiet room, free from distractions and influence. The EPAO must check the venue is suitable. The practical planning test could take place remotely if the appropriate technology and systems are in place to prevent malpractice.

The EPAO must verify the apprentice's identity and ensure invigilation of the apprentice for example, and not limited to, 360-degree cameras and screen sharing facilities.

Question and resource development

The EPAO must develop a purpose-built assessment specification and scenario-based question bank. It is recommended this is done in consultation with employers of this occupation.

The EPAO should maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and scenario-based question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that scenario-based questions are refined and developed to a high standard. The scenario-based questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different scenario in the case of re-sits or re-takes.

The EPAO must produce the following materials to support the practical planning test:

- independent assessor assessment materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials
    - grading guidance
    - test specification
    - sample test and mark schemes
    - live tests and mark schemes
    - scenario-based question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

Practical competence test for option 1

Overview

This is an integrated assessment method for option 1. The integrated assessment method forms part of the apprenticeship's EPA as well as the awarding of the qualification. The integrated qualifications are the practical assessments used in the:

- CCN1 – Core domestic gas safety
- CENWAT – Domestic gas central heating boilers and water heaters

The KSBs aligned to the integrated assessment method will be assessed and graded by the AB and contribute to the overall outcome of the apprenticeship and the qualification.

Rationale

This assessment method is used because it incorporates the industry recognised and mandatory entry route for gas engineers to attain the necessary requirements as part of the Accredited Certification Scheme (ASC), to work under the Gas Safe Register.

Delivery

All apprentices in option 1 must complete the required practical tasks.

The delivery of the practical competence test must align with the conditions set out by the AB for the integrated qualifications.

Assessment location

The practical competence test must take place in a suitable venue selected by the AB for the qualifications.

Resource development

The resource development requirements must align with the conditions set out by the AB for the qualifications.

Practical competence test for options 2 and 3

Overview

In a practical competence test, an independent assessor observes the apprentice completing a task or series of tasks set by the EPAO. The EPAO decides where it takes place. The assessment environment must closely relate to the apprentice's natural working environment. It gives the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method.

Rationale

This EPA method is being used because:

- it allows for a varied range of tasks to be observed, that could not be guaranteed to be achieved through a single observation in the workplace
- this is a practical role, best demonstrated through completing tasks in a realistic work setting
- it allows for consistency of activities to be completed and efficiency in scheduling
- it allows for the testing of related underpinning knowledge, skills and behaviours where an opportunity to observe them has not occurred

- it is a holistic assessment method

Delivery

The practical competence test must be structured to give the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method, as outlined in the grading section.

An independent assessor must conduct and assess the practical competence test.

The independent assessor must only observe one apprentice at a time to ensure quality and rigour. They must be as unobtrusive as possible. The EPAO must manage invigilation of the apprentice during the assessment, to maintain the integrity and security of the EPA, in line with their malpractice policy. This includes breaks and moving between locations. The independent assessor must ensure that no assistance is provided to the apprentice during the assessment.

The EPAO must give an apprentice 2 weeks' notice of the practical competence test.

The practical competence test may take place in parts but must be completed over 4 working days. A working day is typically considered to be 7.5 hours long. The reason for this split is to provide sufficient time for the apprentice to complete all the tasks.

The independent assessor must explain to the apprentice the format and timescales of the practical competence test before it starts. This does not count towards the assessment time.

Core tasks

All apprentices in option 2 and 3 must complete core tasks 1 to 3.

Core tasks 1 to 3 must take 7 hours. The independent assessor can increase the time of the practical competence test by up to 10%. This time is to allow the apprentice to complete a task or respond to a question if necessary.

The independent assessor must ask a minimum of 3 questions.

Core task 1

The apprentice will be required to complete the part installation and testing of a domestic plumbing system, incorporating:

- fabricating a domestic pipework layout
- a branch connection from a water closet (WC) and a waste pipe branch from a wash basin to a soil stack
- a hot and cold water tap connections to a wash basin

- the installation of a double panel radiator, this is also intended to demonstrate manual handling techniques
- utilising different pipework materials, for example copper, stainless steel, plastic pressure and plastic soil and waste pipe
- utilising simple jointing techniques, e.g. push fit, solvent welded
- utilising complex jointing techniques, e.g. soldered, compression, press fit
- pipe bending (Offset and Passover) techniques
- utilising brackets and fixings
- dimensional tolerances of ±2mm on the lengths and ±1°on the angles
- soundness testing
- testing the system, pressure pipework to withstand a pressure test of 3 bar for 5 minutes, soil and waste pipework must maintain an air test of 38mm water gauge for 3 minutes. Soundness testing of the soil and waste pipework to require the use of a stepladder or hop up work platform

Core task 2

The apprentice will be required to complete the installation, testing and commissioning of electrical components and electrical controls of a domestic heating and hot water system, incorporating:

- wiring a circulating pump and 2 x 2 port zone valves to a pre-installed heating and hot water system with pre-installed boiler, programmer, and wiring centre
- installing and wiring either a room thermostat or cylinder thermostat (one of which may be pre-installed)
- testing the system
- commissioning the system

Core task 3

The apprentice will be required to complete fault finding, diagnosis, repair and testing procedures, then either servicing or maintenance of a domestic hot water system, incorporating:

- finding 2 electrical faults in the system
- diagnosing the faults
- repairing the faults
- testing the system
- servicing or maintaining the system

Option 2 task 4 - domestic air source heat pump and solar thermal systems technician

All apprentices in option 2 must complete options 2 tasks 4a to 4d.

Option 2 task 4 must take 14.5 hours in total over 2 working days incorporating a 6 hours air source heat pumps practical competence test (task 4a and 4b) and a 8.5 hours solar thermal system practical competence test (tasks 4c and 4d). The independent assessor can increase the time of the practical competence test by up to 10%. This time is to allow the apprentice to complete a task or respond to a question if necessary.

The independent assessor must ask a minimum of 4 questions.

Option 2 task 4a - domestic air source heat pump system

The apprentice will be required to complete the part installation, testing, commissioning and handover of an air source heat pump system, incorporating:

- part installing the pipework for the system
- connecting an air source heat pump to a pre-installed heat distribution system either radiators, underfloor heating or both
- completing the electrical connections, as a minimum, the connection of the heat pump unit to the hydraulic emitter circuit
- testing, commissioning and handing over the system

Option 2 task 4b - domestic air source heat pump system

The apprentice will be required to complete fault finding, diagnosis, repairing and testing procedures, and then either servicing or maintenance of an air source heat pump system, incorporating:

- finding four faults, including mechanical and electrical, for example:
  - heat pump low pressure trip or alarm activated by a collector circuit malfunction
  - heat pump high pressure trip or 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
  - system vibration
- diagnosing the faults
- rectifying the faults
- testing the system
- servicing or maintaining the system

Option 2 task 4c - solar thermal system

The apprentice will be required to confirm the suitability of a building for solar thermal system installation from a given scenario and complete the part installation, testing, commissioning and handover of a solar thermal system, incorporating:

- the use of the Microgeneration Certification Scheme (MCS) Solar thermal domestic hot water energy calculator and appendix H of the Standard Assessment Procedure (SAP) to calculate the estimated annual fuel saving
- installing key system components on either a fully filled or drain back, 'active' solar thermal system to include as a minimum the positioning, fixing and connection of the following components:
    - for a fully filled system:
        - solar collector
        - expansion vessel
        - solar circulating pump
    - or for a drain back system:
        - solar collector
        - drain back vessel
        - solar circulating pump
- part installing the pipework for the system
- connecting the solar thermal collector circuit to the hot water storage and distribution system
- testing, commissioning and handing over the system

Option 2 task 4d - solar thermal system

The apprentice will be required to complete fault finding, diagnosis, repairing and testing procedures, then either servicing or maintenance of a solar thermal system, incorporating:

- finding a minimum of two faults, including mechanical and electrical faults, for example:
    - loss of system pressure without evidence of discharge
    - discharge from pressure relief valve on the solar primary circuit
    - insulation melting on solar collector circuit pipework
    - overheating of solar collector circuit
    - lack of circulation within the solar collector circuit
    - poor or no system performance
    - system noise and/or vibration
- diagnosing the faults
- rectifying the faults
- testing the system
- servicing or maintaining the system

Option 3 task 4 - **non-domestic plumbing technician**

All apprentices in option 3 must complete option 3 tasks 4a and 4b.

Option 3 task 4 must take 12 hours in total over 2 working days incorporating a 6 hours practical installation test (tasks 4a) and a 6 hours practical application test (task 4b). The independent assessor can increase the time of the practical competence test by up to 10%. This time is to allow the apprentice to complete a task or respond to a question if necessary.

The independent assessor must ask a minimum of 2 questions.

Option 3 task 4a - non-domestic plumbing technician

The apprentice will be required to complete the part installation and testing of non-domestic plumbing pipework, incorporating:

- fabricating a 28mm and 35mm diameter pipework frame, complexity to be comparable to that of a non-domestic scenario
- utilising different pipework materials, for example copper, stainless steel, low carbon steel (LCS) and plastic pressure
- utilising 6 jointing techniques, for example soldered, compression, threaded, flanged, press fit, solvent welded, crimped
- utilising brackets and fixings
- dimensional tolerances of ±2mm on the lengths and ±1°on the angles
- soundness testing
- testing the system to withstand a pressure test of 3 bar for 5 minutes

Option 3 task 4b - non-domestic plumbing technician

The apprentice will be required to complete fault finding, diagnosis, repairing and testing, then either servicing or maintenance, followed by commissioning and handover of a non-domestic plumbing system, incorporating:

- finding 2 mechanical faults on an indirect boosted cold water system and a non-domestic sanitation system with:
    - a low level Cold Water Storage Cistern (CWSC) with a low water level float switch and a Type AB air gap and weir overflow
    - a twin pump cold water booster set and accumulator
    - high level CWSC with a delayed action float operated valve
    - 3 hand basins fed directly from the booster pump and connected to a common waste pipe and soil stack
    - 3 WCs with solenoid flushing valves fed from the high level CWSC and connected to the same common soil pipe as the hand basins
- diagnosing the faults
- repairing the faults
- testing the system
- servicing or maintaining the system including:
    - setting cistern water levels
    - checking low level float switch to low level CWSC
    - checking or setting accumulator pressures
    - checking or setting pump parameters
    - checking operation of delayed action float operated valve to high level CWSC
    - checking or adjusting system and appliance flow rates
    - checking operation of WC solenoid flushing valves

    - maintenance of trap seals
    - carry out disinfection and flushing procedures
    - post notices and liaise with user
    - carry out a legionella risk assessment from a given scenario
- commissioning the system
- handing over the system

Questioning for all tasks

Questioning must occur during the practical competence test. The time for questioning is included in the overall assessment time. To remain as unobtrusive as possible, the independent assessor should ask questions during natural breaks in work rather than disrupting the apprentice's flow.

The independent assessor may use the questions from their EPAO's question bank or create their own questions in line with the EPAO's training.
The independent assessor can ask follow-up questions to clarify answers given by the apprentice. These questions are in addition to the above set number of questions for the practical competence test.
The independent assessor must make the grading decision. The independent assessor must assess the practical competence test and responses to questions holistically when deciding the grade.

The independent assessor must keep accurate records of the assessment. They must record:

- the KSBs observed
- the apprentice's answers to questions
- KSBs demonstrated in answers to questions
- the grade achieved

Assessment location

The practical competence test must take place in a simulated environment selected by the EPAO for example, the EPAO's, training provider's or employer's premises. The simulated environment must relate to the apprentice's natural work environment. Equipment and resources needed for the practical competence test must be provided by the EPAO or training provider, who can liaise with the employer to provide these.

Question and resource development

The EPAO must develop a purpose-built assessment specification and question bank. It is recommended this is done in consultation with employers of this occupation. The EPAO must maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that questions are refined and developed to a high standard. The questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different set of tasks and questions in the case of re-sits and retakes, to minimise predictability.

The EPAO must produce the following materials to support the practical competence test:

- independent assessor assessment materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials
    - grading guidance
    - question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

Interview underpinned by an apprenticeship portfolio of evidence

Overview

In the interview underpinned by an apprenticeship portfolio of evidence, an independent assessor asks the apprentice questions. It gives the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method.

The apprentice can refer to and illustrate their answers with evidence from their apprenticeship portfolio of evidence.

Rationale

This EPA method is being used because:

- it allows the apprentice to be assessed against KSBs which may not naturally occur during the practical competence test

- it is underpinned by an apprenticeship portfolio of evidence, enabling the apprentice to demonstrate the application of skills and behaviours as well as knowledge
- it allows for testing of responses where there are a number of potential answers that could not be tested through a knowledge test
- it is cost-effective

Delivery

The interview underpinned by an apprenticeship portfolio of evidence must be structured to give the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method to the highest available grade.

An independent assessor must conduct and assess the interview underpinned by an apprenticeship portfolio of evidence. The purpose of the independent assessor's questions will be to assess related underpinning KSBs.

The EPAO must give an apprentice 2 weeks' notice of the interview underpinned by an apprenticeship portfolio of evidence. The independent assessor must have at least 2 weeks to review the supporting documentation.

The apprentice must have access to their apprenticeship portfolio of evidence during the interview. The apprentice can refer to and illustrate their answers with evidence from their apprenticeship portfolio of evidence however, the apprenticeship portfolio of evidence is not directly assessed.

The following durations will apply:

Core: 15 questions in 90 minutes

Option 1: 5 questions in 45 minutes

Option 2: 5 questions in 45 minutes

Option 3: 5 questions in 45 minutes

The independent assessor can increase the time of the interview underpinned by an apprenticeship portfolio of evidence by up to 10%. This time is to allow the apprentice to respond to a question if necessary. The independent assessor must use the questions from the EPAO’s question bank. Follow-up questions are allowed where clarification is required.

The independent assessor must make the grading decision.

The independent assessor must keep accurate records of the assessment. They must record:

- the apprentice’s answers to questions
- the KSBs demonstrated in answers to questions

- the grade achieved

Assessment location

The interview underpinned by an apprenticeship portfolio of evidence must take place in a suitable venue selected by the EPAO for example, the EPAO's or employer's premises. The interview underpinned by an apprenticeship portfolio of evidence can be conducted by video conferencing. The EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided.
The interview underpinned by an apprenticeship portfolio of evidence should take place in a quiet room, free from distractions and influence.

Question and resource development

The EPAO must develop a purpose-built assessment specification and question bank. It is recommended this is done in consultation with employers of this occupation. The EPAO must maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that questions are refined and developed to a high standard. The questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different set of questions in the case of re-sits or re-takes.

The EPAO must produce the following materials to support the interview underpinned by an apprenticeship portfolio of evidence:

- independent assessor assessment materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials
    - grading guidance
    - question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

Overall EPA grading

Performance in the EPA determines the overall grade of:

- fail
- pass
- distinction

The EPAO must combine the individual assessment method grades to determine the overall EPA grade.

If the apprentice fails one assessment method or more, they will be awarded an overall fail.

To achieve an overall pass, the apprentice must achieve at least a pass in all the assessment methods.

To achieve an overall distinction, the apprentice must achieve a distinction in the interview underpinned by an apprenticeship portfolio of evidence and the knowledge test.

Grades from individual assessment methods must be combined in the following way to determine the grade of the EPA overall.

Knowledge test	Practical planning test	Practical competence test	Interview underpinned by portfolio	Overall Grading
Fail	Any grade	Any grade	Any grade	Fail
Any grade	Fail	Any grade	Any grade	Fail
Any grade	Any grade	Fail	Any grade	Fail
Any grade	Any grade	Any grade	Fail	Fail
Pass	Pass	Pass	Pass	Pass
Distinction	Pass	Pass	Pass	Pass
Pass	Pass	Pass	Distinction	Pass
Distinction	Pass	Pass	Distinction	Distinction

Re-sits and re-takes

If the apprentice fails one assessment method or more, they can take a re-sit or a re-take at their employer's discretion. The apprentice's employer needs to agree that a re-sit or re-take is appropriate. A re-sit does not need further

learning, whereas a re-take does. The apprentice should have a supportive action plan to prepare for a re-sit or a re-take.

The employer and the EPAO should agree the timescale for a re-sit or re-take. A re-sit is typically taken within 3 months of the EPA outcome notification. The timescale for a re-take is dependent on how much re-training is required and is typically taken within 6 months of the EPA outcome notification.

Where multiple assessment methods are re-sat or retaken, non-integrated assessment methods must be attempted before the integrated assessment methods. The re-sit or re-take opportunities for the integrated assessment method must fall within the typical EPA period timeframes. This is to ensure that apprentices are not disadvantaged by the assessment of qualifications being available within an assessment window occurring once a year.

Failed assessment methods must be re-sat or re-taken within a 6-month period from the EPA outcome notification, otherwise the entire EPA will need to be re-sat or re-taken in full.

For the practical competence test in option 1, please follow the resit and retake guidance set out by the AB.

For the practical competence test in options 2 and 3, only those tasks failed will need to be resat or retaken.

Re-sits and re-takes are not offered to an apprentice wishing to move from pass to a higher grade.

The apprentice will get a maximum EPA grade of pass if they need to re-sit or re-take one or more assessment methods, unless the EPAO determines there are exceptional circumstances.

Roles and responsibilities

ROLES	RESPONSIBILITIES
Apprentice	As a minimum, the apprentice should: • complete on-programme training to meet the KSBs as outlined in the occupational standard for a minimum of 12 months • complete the required amount of off-the-job training specified by the apprenticeship funding rules and as arranged by the employer and training provider • understand the purpose and importance of EPA

ROLES	RESPONSIBILITIES
	• apply for any reasonable adjustments and special considerations • prepare for and undertake the EPA including meeting all gateway requirements • ensure that all supporting evidence required at the gateway is submitted in line with this EPA plan
Employer	As a minimum, the apprentice's employer must: • select the EPAO and training provider • work with the training provider, where applicable, to support the apprentice in the workplace and to provide the opportunities for the apprentice to develop the KSBs • arrange and support off-the-job training to be undertaken by the apprentice • decide when the apprentice is working at or above the apprenticeship standard and is ready for EPA • ensure the apprentice is prepared for the EPA • ensure that all supporting evidence required at the gateway is submitted in line with this EPA plan • confirm arrangements with the EPAO for the EPA in a timely manner, including who, when, where • provide the EPAO with access to any employer-specific documentation as required for example, company policies • ensure that the EPA is scheduled with the EPAO for a date and time which allows appropriate opportunity for the apprentice to meet the KSBs • ensure the apprentice is given sufficient time away from regular duties to prepare for, and complete the EPA • ensure that any required supervision during the EPA period, as stated within this EPA plan, is in place • ensure the apprentice has access to the resources used to fulfil their role and carry out the EPA for workplace based assessments • remain independent from the delivery of the EPA • pass the certificate to the apprentice upon receipt

ROLES	RESPONSIBILITIES
EPAO	As a minimum, the EPAO must: • conform to the requirements of this EPA plan and deliver its requirements in a timely manner • conform to the requirements of the apprenticeship provider and assessment register (APAR) • conform to the requirements of the external quality assurance provider (EQAP) • understand the apprenticeship including the occupational standard, EPA plan and funding • make all necessary contractual arrangements including agreeing the price of the EPA • have third party arrangements in place with the AB to: ○ work collaboratively to manage the delivery of the EPA ○ ensure the EPA is arranged to meet the scheduling requirements set out in this EPA plan ○ to share the outcomes of the assessment methods in a timely manner • develop and produce assessment materials including specifications and marking materials, for example mark schemes, practice materials, training material for the non-integrated methods • maintain and apply a policy for the declaration and management of conflict of interests and independence. This must ensure, as a minimum, there is no personal benefit or detriment for those delivering the EPA or from the result of an assessment. It must cover: ○ apprentices ○ employers ○ independent assessors ○ any other roles involved in delivery or grading of the EPA • have quality assurance systems and procedures that ensure fair, reliable and consistent assessment and maintain records of internal quality assurance (IQA) activity for external quality assurance (EQA) purposes

ROLES	RESPONSIBILITIES
	• appoint independent, competent, and suitably qualified assessors in line with the requirements of this EPA plan • appoint administrators, invigilators and any other roles where required to facilitate the EPA • deliver induction, initial and on-going training for all their independent assessors and any other roles involved in the delivery or grading of the non-integrated assessment methods of the EPA as specified within this EPA plan. This should include how to record the rationale and evidence for grading decisions where required • conduct standardisation with all their independent assessors before allowing them to deliver an EPA, when the EPA is updated, and at least once a year • develop and provide assessment recording documentation to ensure a clear and auditable process is in place for providing assessment decisions and feedback to all relevant stakeholders • maintain and apply a policy for reasonable adjustment and special considerations for apprentices • conduct moderation across all of their independent assessors' decisions once EPAs have started according to a sampling plan, with associated risk rating of independent assessors • monitor the performance of all their independent assessors and provide additional training where necessary • develop and provide assessment recording documentation to ensure a clear and auditable process is in place for providing assessment decisions and feedback to all relevant stakeholders • use language in the development and delivery of the EPA that is appropriate to the level of the apprenticeship • arrange for the non-integrated assessment methods of the EPA to take place in a timely manner, in consultation with the employer

ROLES	RESPONSIBILITIES
	• provide information, advice, and guidance documentation to enable apprentices, employers and training providers to prepare for the EPA • confirm the gateway requirements have been met before they start the EPA for an apprentice • host and facilitate the EPA or make suitable alternative arrangements • maintain the security of the EPA including, but not limited to, verifying the identity of the apprentice, invigilation and security of materials • where the EPA plan permits assessment away from the workplace, ensure that the apprentice has access to the required resources and liaise with the employer to agree this if necessary • confirm the overall grade awarded • maintain and apply a policy for conducting appeals

Awarding body	As a minimum, the awarding body must:
	• conform to the requirements of this EPA plan and deliver its requirements in a timely manner
	• conform to the requirements of any regulators for the mandated qualification
	• understand the apprenticeship including the occupational standard, EPA plan and funding
	• confirm that they agree to the conditions of integration for the integrated assessment method, as outlined in the EPA plan
	• make all necessary contractual arrangements
	• have third party arrangements in place with the EPAO to:
	  ○ work collaboratively to manage the delivery of the EPA
	  ○ ensure the EPA is arranged to meet the scheduling requirements set out in this EPA plan
	  ○ to share the outcomes of the integrated assessment method in a timely manner
	• develop and produce assessment materials including specifications and marking materials (for example

ROLES	RESPONSIBILITIES
	mark schemes, practice materials, training material) for the integrated assessment method • have quality assurance systems and procedures that ensure fair, reliable and consistent assessment and maintain records of internal quality assurance (IQA) activity • source a suitably qualified and independent person who must administer all aspects of the integrated assessment method • provide information, advice, and guidance documentation to enable apprentices, employers and training providers to prepare for the integrated assessment method • arrange for the integrated assessment methods of the EPA to take place in a timely manner, in consultation with the employer • maintain the security of the integrated assessment method including, but not limited to, verifying the identity of the apprentice, invigilation and security of materials • maintain and apply a policy for reasonable adjustment and special considerations for apprentices • deliver the integrated assessment method in line with this EPA plan • conduct moderation of their assessors' decisions for the integrated assessment methods • monitor the performance of all their assessors and provide re-training where necessary • ensure an auditable process is in place for providing assessment decisions and feedback to all relevant stakeholders • maintain and apply a policy for conducting appeals • must give IfATE at least 6 months' notice of any changes to mandated qualifications that will impact on the delivery of the EPA
Independent assessor	As a minimum, an independent assessor must: • be independent, with no conflict of interest with the apprentice, their employer or training provider, specifically, they must not receive a personal

ROLES	RESPONSIBILITIES
	benefit or detriment from the result of the assessment • have, maintain and be able to evidence up-to-date knowledge and expertise of the occupation • have the competence to assess the EPA and meet the requirements of the IQA section of this EPA plan • understand the apprenticeship's occupational standard and EPA plan • attend induction and standardisation events before they conduct an EPA for the first time, when the EPA is updated, and at least once a year • use language in the delivery of the EPA that is appropriate to the level of the apprenticeship • work with other personnel, including other assessors where used, in the preparation and delivery of assessment methods • conduct the EPA to assess the apprentice against the KSBs and in line with the EPA plan • make final grading decisions in line with this EPA plan • record and report assessment outcome decisions • comply with the IQA requirements of the EPAO • comply with external quality assurance (EQA) requirements
Training provider	As a minimum, the training provider must: • conform to the requirements of the apprenticeship provider and assessment register (APAR) • ensure procedures are in place to mitigate against any conflict of interest • work with the employer and support the apprentice during the off-the-job training to provide the opportunities to develop the KSBs as outlined in the occupational standard • deliver training to the apprentice as outlined in their apprenticeship agreement • monitor the apprentice's progress during any training provider led on-programme learning

ROLES	RESPONSIBILITIES
	• ensure the apprentice is prepared for the EPA • advise the employer, upon request, on the apprentice's readiness for EPA • ensure that all supporting evidence required at the gateway is submitted in line with this EPA plan • not make any adaptations to aspects of the integrated assessment method • remain independent from the delivery of the non-integrated assessment methods in EPA • remain independent from the administration of the integrated assessment method.
Marker	As a minimum, the marker must: • attend induction training as directed by the EPAO • have no direct connection or conflict of interest with the apprentice, their employer or training provider, except for integrated assessment methods as outlined in the training provider roles • mark test answers in line with the EPAO's mark scheme and procedures
Invigilator	As a minimum, the invigilator must: • attend induction training as directed by the EPAO • not invigilate an assessment, solely, if they have delivered the assessed content to the apprentice • invigilate and supervise the apprentice during tests and in breaks during assessment methods to prevent malpractice in line with the EPAO's invigilation procedures • have no direct connection or conflict of interest with the apprentice, their employer or training provider; in all instances, including when the EPAO is the training provider (i.e. HEI)

Reasonable adjustments

Reasonable adjustments
The EPAO and AB must have reasonable adjustments arrangements for the EPA.

This should include:

- how an apprentice qualifies for reasonable adjustment
- what reasonable adjustments may be made

Adjustments must maintain the validity, reliability and integrity of the EPA as outlined in this EPA plan.

Special considerations

The EPAO and AB must have special consideration arrangements for the EPA.
This should include:

- how an apprentice qualifies for a special consideration
- what special considerations will be given

Special considerations must maintain the validity, reliability and integrity of the EPA as outlined in this EPA plan.

Internal quality assurance

Internal quality assurance refers to the strategies, policies and procedures that an EPAO and AB must have in place to ensure valid, consistent and reliable EPA decisions.

EPAOs and ABs for this EPA must adhere to the requirements within the roles and responsibilities table.

For the integrated assessments in option 1 (paper 2 of the knowledge test and the practical competence test), the assessor must adhere to the assessor requirements set out by the AB.

For the non-integrated assessments in option 1 (paper 1 of the knowledge test, the practical planning test and interview underpinned by an apprenticeship portfolio of evidence), the EPAO must appoint independent assessors who have:

- a minimum of a level 3 NVQ or equivalent in Plumbing and domestic heating qualification or a Gas engineering level 3 qualification which meets the requirements of the current ACS categories CCN1 and CENWAT

- a minimum of 5 years post qualification industrial experience
- evidence of continued professional development

For option 2, the EPAO must appoint independent assessors who have:

- a minimum of a level 3 NVQ or equivalent in Plumbing and domestic heating qualification which includes certification for:
    - water regulations,
    - domestic hot water storage systems,
    - warm water underfloor heating systems,
    - above ground drainage & rainwater systems
    - rainwater harvesting & greywater recycling systems
    - solar thermal and heat pump systems and heat pump technology
- a minimum of 5 years post qualification industrial experience
- evidence of continued professional development

For option 3, the EPAO must appoint independent assessors who have:

- a minimum of a level 3 NVQ or equivalent in Plumbing and domestic heating qualification which includes certification for:
    - water regulations,
    - domestic hot water storage systems,
    - warm water underfloor heating systems,
    - above ground drainage & rainwater systems
    - rainwater harvesting & greywater recycling systems
- legionella risk assessment and water systems disinfection for mechanical services certification
- a minimum of 5 years post qualification industrial experience with non-domestic plumbing systems
- evidence of continued professional development

Value for money

Affordability of the EPA will be aided by using at least some of the following:

- utilising digital remote platforms to conduct applicable assessment methods
- assessing multiple apprentices simultaneously where the assessment method permits this
- conducting assessment methods on the same day
- in option 1, integrating the requirements for gas engineers to attain the necessary qualifications and competence required to work under the Gas Safe Register

Professional recognition

This apprenticeship aligns with:

- Engineering Council (EngTech) for level 3

Mapping of KSBs to assessment methods

Knowledge test – KT
Practical planning test – PPT
Practical competence test – PCT
Interview underpinned by an apprenticeship portfolio of evidence - IPE

KNOWLEDGE	ASSESSMENT METHODS
K1: Core. The health and safety legislation, approved Codes of Practice and guidance and safe working practices applicable to work in the building services and wider construction industry.	KT paper 1 and IPE
K2: Core. The common processes and techniques used in the installation and test of plumbing and domestic heating systems (cold water systems, hot water systems, domestic wet central heating systems, sanitation systems).	KT paper 1 and PCT
K3: Core. The common processes and techniques used in the installation and test of rainwater systems.	KT paper 1 and IPE
K4: Core. Scientific and mechanical principles applicable to plumbing and domestic heating systems work.	KT paper 1
K5: Core. The roles and responsibilities of persons within the plumbing and domestic heating systems and wider construction industry.	KT paper 1
K6: Core. The legislative requirements and sources of information applicable to plumbing and domestic heating systems system installation, service and repair.	KT paper 1, PPT and IPE
K7: Core. How to communicate with customers, suppliers, co-workers and members of the public who may come into contact with the work area.	KT paper 1 and IPE

KNOWLEDGE	ASSESSMENT METHODS
K8: Core. The layout features, working principles and legislative requirements of plumbing and domestic heating systems.	KT paper 1, PPT and IPE
K9: Core. The basic factors which influence system choice for particular applications with regard to the installation of plumbing and domestic heating systems.	KT paper 1, PPT and IPE
K10: Core. The installation and testing requirements applicable to plumbing and domestic heating systems and components (cold water, hot water, central heating, sanitary appliances and pipework).	KT paper 1 and PCT
K11: Core. The installation and testing requirements applicable to rainwater systems and components.	KT paper 1 and IPE
K12: Core. The commissioning requirements applicable to plumbing and domestic heating systems and components.	KT paper 1 and IPE
K13: Core The testing and commissioning requirements applicable to electrical control systems and components.	KT paper 1 and PCT
K14: Core. The decommissioning procedures applicable to plumbing and domestic heating systems.	KT paper 1 and IPE
K15: Core. The routine service and maintenance procedures applicable to plumbing and domestic heating systems.	KT paper 1 and IPE
K16: Core. The fault finding, diagnosis and rectification procedures applicable to plumbing and domestic heating systems.	KT paper 1 and IPE
K17: Core. The procedures for sizing and selecting plumbing and domestic heating systems and components to meet customers' needs.	KT paper 1, PPT and IPE

KNOWLEDGE	ASSESSMENT METHODS
K18: Core. The legislative requirements, processes and procedures of electrical supply and control systems applicable to plumbing and domestic heating systems and work including limits to operative competence.	KT paper 1 and PCT
K19: Domestic gas fired hot water heating appliances technician. The common processes and techniques used in the installation and maintenance of natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K20: Domestic gas fired hot water heating appliances technician. The legislative requirements, approved codes of practice and guidance and sources of information applicable to the installation, service and repair of low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K21: Domestic gas fired hot water heating appliances technician. The installation requirements (including system modification and extension) applicable to low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K22: Domestic gas fired hot water heating appliances technician. The purging, testing and commissioning requirements applicable to low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K23: Domestic gas fired hot water heating appliances technician. The decommissioning procedures (including disconnection and dismantling) applicable to low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K24: Domestic gas fired hot water heating appliances technician.	KT paper 2 integrated with CCN1 and CENWAT qualifications

KNOWLEDGE	ASSESSMENT METHODS
The routine service and maintenance procedures applicable to low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	
K25: Domestic gas fired hot water heating appliances technician. The fault finding, diagnosis and rectification procedures applicable to low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	KT paper 2 integrated with CCN1 and CENWAT qualifications
K26: Domestic gas fired hot water heating appliances technician. The procedures for sizing and selecting low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input) to meet customers' needs, statutory legislation and approved codes of practice and guidance.	KT paper 2 integrated with CCN1 and CENWAT qualifications
K27: Domestic air source heat pump and solar thermal systems technician. The common processes and techniques used in the installation and maintenance of air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and PCT
K28: Domestic air source heat pump and solar thermal systems technician. The common processes and techniques used in the installation and maintenance of solar thermal systems.	KT paper 2b and PCT
K29: Domestic air source heat pump and solar thermal systems technician. The legislative requirements, approved codes of practice and guidance and sources of information applicable to the installation, service and repair of air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and PPT
K30: Domestic air source heat pump and solar thermal systems technician. The legislative requirements, approved codes of practice and guidance and sources of information applicable to the installation, service and repair of solar thermal systems.	KT paper 2b and PPT

KNOWLEDGE	ASSESSMENT METHODS
K31: Domestic air source heat pump and solar thermal systems technician. The installation requirements (including retrofit) applicable to air source heat pump (non-refrigerant circuits) systems and components.	KT paper 2a and PCT
K32: Domestic air source heat pump and solar thermal systems technician. The installation requirements (including retrofit) applicable to solar thermal systems and components.	KT paper 2b and PCT
K33: Domestic air source heat pump and solar thermal systems technician. The testing and commissioning requirements applicable to air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and PCT
K34: Domestic air source heat pump and solar thermal systems technician. The testing and commissioning requirements applicable to solar thermal systems.	KT paper 2b and PCT
K35: Domestic air source heat pump and solar thermal systems technician. The decommissioning procedures applicable to air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and IPE
K36: Domestic air source heat pump and solar thermal systems technician. The decommissioning procedures applicable to solar thermal systems.	KT paper 2b and IPE
K37: Domestic air source heat pump and solar thermal systems technician. The routine service and maintenance procedures applicable to air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and PCT
K38: Domestic air source heat pump and solar thermal systems technician. The routine service and maintenance procedures applicable to solar thermal systems.	KT paper 2b and PCT
K39: Domestic air source heat pump and solar thermal systems technician.	KT paper 2a and PCT

KNOWLEDGE	ASSESSMENT METHODS
The fault finding, diagnosis and rectification procedures applicable to air source heat pump (non-refrigerant circuits) systems.	
K40: Domestic air source heat pump and solar thermal systems technician. The fault finding, diagnosis and rectification procedures applicable to solar thermal systems.	KT paper 2b and PCT
K41: Domestic air source heat pump and solar thermal systems technician. The procedures for sizing and selecting air source heat pump (non-refrigerant circuits) systems.	KT paper 2a and PPT
K42: Domestic air source heat pump and solar thermal systems technician. The procedures for sizing and selecting solar thermal systems.	KT paper 2b and PPT
K43: Non-domestic plumbing technician. The layout features, working principles and legislative requirements of plumbing pipework (above 28mm) and non-domestic plumbing systems and appliances.	KT paper 2
K44: Non-domestic plumbing technician. The factors which influence and apply to the installation of plumbing (above 28mm) and non-domestic plumbing systems and appliances.	KT paper 2 and IPE
K45: Non-domestic plumbing technician. The installation requirements applicable to plumbing (above 28mm) and non-domestic plumbing pipework.	KT paper 2 and PCT
K46: Non-domestic plumbing technician. The installation requirements applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	KT paper 2 and IPE
K47: Non-domestic plumbing technician. The testing and commissioning requirements applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	KT paper 2 and PCT
K48: Non-domestic plumbing technician.	KT paper 2 and IPE

KNOWLEDGE	ASSESSMENT METHODS
The decommissioning procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	
K49: Non-domestic plumbing technician. The routine service and maintenance procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	KT Paper 2 and PCT
K50: Non-domestic plumbing technician. Fault finding, diagnosis and rectification procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	KT Paper 2 and PCT

SKILL	ASSESSMENT METHODS
S1: Core. Operate in a safe working manner by adhering to health and safety legislation, approved codes of practice and guidance and applying safe working practices.	IPE
S2: Core. Carry out and apply the common processes and techniques used in the installation and test of plumbing and domestic heating systems (cold water, hot water, central heating and sanitary appliances and pipework).	PCT
S3: Core Carry out and apply the common processes and techniques used in the installation and test of rainwater systems.	IPE
S4: Core. Plan tasks within plumbing and domestic heating systems industry.	PPT
S5: Core. Identify and document hazards for the plumbing and domestic heating systems work. Apply control measures.	PPT
S6: Core.	IPE

SKILL	ASSESSMENT METHODS
Carry out commission and handover procedures and techniques on plumbing and domestic heating systems (cold water, hot water, central heating, sanitary appliances and rainwater).	
S7: Core. Install, test, and commission, electrical and electrical control systems applicable to plumbing and domestic heating systems.	PCT
S8: Core. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on the non-electrical components of plumbing and domestic heating systems.	IPE
S9: Core. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on electrical and electrical control systems applicable to plumbing and domestic heating systems including industry safe isolation procedures.	PCT
S10: Core. Decommission plumbing and domestic heating systems.	IPE
S11: Core. Decommission electrical and electrical control systems applicable to plumbing and domestic heating systems.	IPE
S12: Core. Plan, size and select cold and hot systems to meet customers' needs in accordance with manufacturers' guidance, regulatory requirements and industry recognised standards and procedures.	PPT
S13: Core Plan, size and select domestic heating and rainwater systems to meet customers' needs in accordance with manufacturers' guidance, regulatory requirements and industry recognised standards and procedures.	IPE

SKILL	ASSESSMENT METHODS
S14: Domestic gas fired hot water heating appliances technician. Carry out and apply the common installation processes and techniques used in the installation and maintenance of natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input) in the workplace.	PCT integrated with CCN1 and CENWAT qualifications
S15: Domestic gas fired hot water heating appliances technician. Install, purge, test, commission and handover low pressure natural gas systems (up to 35mm R1¼) and natural gas fired hot water and central heating appliances (up to 70kW net heat input).	PCT integrated with CCN1 and CENWAT qualifications
S16: Domestic gas fired hot water heating appliances technician. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on low pressure Natural Gas systems (up to 35mm R1¼) and Natural Gas fired hot water and central heating appliances (up to 70kW net heat input).	PCT integrated with CCN1 and CENWAT qualifications
S17: Domestic gas fired hot water heating appliances technician. Decommission (including disconnection and dismantling) low pressure Natural Gas systems (up to 35mm R1¼) and Natural Gas fired hot water and central heating appliances (up to 70kW net heat input).	PCT integrated with CCN1 and CENWAT qualifications
S18: Domestic gas fired hot water heating appliances technician. Plan, size and select low pressure Natural Gas systems (up to 35mm R1¼) and Natural Gas fired hot water and central heating appliances (up to 70kW net heat input).	PCT integrated with CCN1 and CENWAT qualifications
S19: Domestic air source heat pump and solar thermal systems technician. Carry out and apply the common processes and techniques used in the installation of air source heat pump (non-refrigerant circuits) systems.	PCT
S20: Domestic air source heat pump and solar thermal systems technician.	PCT

SKILL	ASSESSMENT METHODS
Carry out and apply the common processes and techniques used in the installation of solar thermal systems.	
S21: Domestic air source heat pump and solar thermal systems technician. Test, commission and handover air source heat pump (non-refrigerant circuits) systems.	PCT
S22: Domestic air source heat pump and solar thermal systems technician. Test, commission and handover solar thermal systems.	PCT
S23: Domestic air source heat pump and solar thermal systems technician. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on air source heat pump (non-refrigerant circuits) systems.	PCT
S24: Domestic air source heat pump and solar thermal systems technician. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on solar thermal systems.	PCT
S25: Domestic air source heat pump and solar thermal systems technician. Decommission (including disconnection and dismantling) air source heat pump (non-refrigerant circuits) systems.	IPE
S26: Domestic air source heat pump and solar thermal systems technician. Decommission (including disconnection and dismantling) solar thermal systems.	IPE
S27: Domestic air source heat pump and solar thermal systems technician. Plan, size and select air source heat pump (non-refrigerant circuits) systems.	PPT
S28: Domestic air source heat pump and solar thermal systems technician. Plan, size and select solar thermal systems.	PPT

SKILL	ASSESSMENT METHODS
S29: Non-domestic plumbing technician. Carry out and apply the common processes and techniques used in the installation of plumbing (above 28mm) and non-domestic plumbing pipework.	PCT
S30: Non-domestic plumbing technician. Carry out and apply the common processes and techniques used in the installation of plumbing (above 28mm) and non-domestic plumbing systems and appliances (cold water systems, hot water systems, sanitary appliances and pipework systems and rainwater systems).	IPE
S31: Non-domestic plumbing technician. Test, commission and handover plumbing pipework (above 28mm) and non-domestic plumbing systems and appliances in the workplace. (cold water systems and sanitary appliances and pipework systems).	PCT
S32: Non-domestic plumbing technician. Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on plumbing (above 28mm) and non-domestic plumbing systems and appliances.	PCT
S33: Non-domestic plumbing technician. Decommission (including disconnection and dismantling) plumbing (above 28mm) and non-domestic plumbing systems and appliances.	IPE

BEHAVIOUR	ASSESSMENT METHODS
B1: Core. Acts professionally and ethically to collaborate with colleagues and customers.	IPE
B2: Core. Takes ownership of work within limits of own competence, knowing when to seek advice or assistance.	PCT
B3: Core.	IPE

BEHAVIOUR	ASSESSMENT METHODS
Committed to continuous professional development.	
B4: Core. Committed to keeping up to date with industry best practice.	IPE

Grading

Interview underpinned by an apprenticeship portfolio of evidence (IPE)			
Themes and KSBs mapping	**Alignment with appendices**	**Pass**	**Distinction**
Core - Health and Safety **S1**: Core Operate in a safe working manner by adhering to health and safety legislation, approved codes of practice and guidance and applying safe working practices. underpinned by: **K1**: Core The health and safety legislation, approved Codes of Practice and guidance and safe working practices applicable to work in the building services and wider construction industry.	Explain how to apply and use personal protective equipment (PPE) underpinned by: ○ understand the purpose of personal protective equipment (PPE).	Explain how they apply and use personal protective equipment (PPE) in line with regulatory requirements and company procedures. (gd47)	Explain the importance of using PPE correctly and the consequences of not doing so.
	Explain how to carry out correct manual handling. underpinned by: ○ understand procedures for manual handling.	Explain how they carry out correct manual handling in line with industry standards. (gd48)	Explain the importance of safe manual handling techniques to the individual and the business. Explain the importance of using manufacturers' instructions when using mechanical lifting aids or access equipment.
	Explain how to use mechanical lifting aids.	Explains how they use mechanical lifting aids in line with manufacturers' instructions. (gd49)	
	Explain how to use access equipment underpinned by: ○ identify safety checks to	Explain how they use access equipment in line with manufacturers' instructions. (gd50)	

	be carried out on access equipment.		
	Explain how to operate in a safe working manner by adhering to health and safety legislation, approved codes of practice and guidance and applying safe working practices.	Explains how to operate in a safe working manner by adhering to health and safety legislation, approved codes of practice and guidance and applying safe working practices. (gd69)	Explains the importance to individuals and the business of operating safely and adhering to health and safety legislation, approved codes of practice and guidance.
Core – Installation and test of domestic rainwater systems **S3**: Core Carry out and apply the common processes and techniques used in the installation and test of rainwater systems. underpinned by: **K3**: Core.	Explain how to install rainwater systems underpinned by: ○ identify working principles of rainwater systems (positioning fixing, connection and operation of components) ○ identify sources of information required when undertaking work on rainwater systems ○ identify the working principles of rainwater	Explains how to install rainwater systems in-line with manufacturer's guidance and customer requirements. (gd51)	Explains how they accommodate changes to customer requirements during installation.

The common processes and techniques used in the installation and test of rainwater systems. **K11**: Core The installation and testing requirements applicable to rainwater systems and components.	recycling systems.		
	Explain how to carry out a soundness test underpinned by: ○ apply soundness test industry requirements on rainwater systems and components ○ carry out a visual inspection of a rainwater system to confirm that it is ready to be soundness tested. And associated with: ○ carry out a visual inspection of a rainwater systems in non-domestic premises to confirm that it is ready to be soundness tested ○ carry out a soundness test to industry requirements on rainwater/gutter systems pipework and components in non-domestic premises.	Explains how to carry out a soundness test in-line with company procedures. (gd52)	None.

Core - Commissioning and handover **S6**: Core Carry out commission and handover procedures and techniques on plumbing and domestic heating systems (cold water, hot water, central heating, sanitary appliances and rainwater). underpinned by: **K12**: Core The commissioning requirements applicable to plumbing and domestic heating systems and components.	Describe how to carry out commissioning procedures for: a. cold water systems and components b. hot water systems and components c. central heating systems and components d. sanitary appliances, pipework systems and components e. rainwater systems and components underpinned by: ○ identify operational checks required during commissioning ○ identify the range of information that would be detailed on commissioning documentation ○ identify actions that must be taken when commissioning reveals defects. And associated with:	Describes how they carry out commissioning procedures for: a. cold water systems and components b. hot water systems and components c. central heating systems and components d. sanitary appliances, pipework systems and components e. rainwater systems and components in line with company procedures. (gd53)	Justifies their decisions when their commissioning has found defects.

	○ identify information sources required to complete testing and commissioning of rainwater systems in non-domestic properties ○ know operational checks required during commissioning of rainwater systems in non-domestic properties ○ identify actions that must be taken when commissioning of rainwater systems in non-domestic premises reveals defects ○ carry out soundness testing commissioning procedures on rainwater systems.		
	Describe the procedure for handing over to the end user: a. cold water systems and components b. hot water systems and components c. central heating systems	Describes the procedure for handing over to the end user: a. cold water systems and components b. hot water systems and components c. central heating systems	None.

	and components d. sanitary appliances, pipework systems and components e. rainwater systems and components f. electrical control systems and components. And associated with: ○ carry out the procedure for handing over rainwater systems in non-domestic properties to the end user	and components d. sanitary appliances, pipework systems and components e. rainwater systems and components f. electrical control systems and components in line with company procedures. (gd54)	

Core - Servicing, maintenance, fault diagnosis and rectification (mechanical parts) **S8**: Core Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on the non-electrical components of plumbing and domestic heating systems. underpinned by: **K15**: Core The routine service and maintenance procedures applicable to plumbing and domestic heating systems. **K16**: Core The fault finding, diagnosis and rectification procedures applicable to plumbing and domestic heating systems.	Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults on: a. cold water systems and components b. hot water systems and components c. central heating systems and components d. sanitary appliances, pipework systems and components e. rainwater systems and components underpinned by: ○ carry out diagnostic checks for a range of faults for: ▪ cold water systems and components ▪ hot water systems and components ▪ central heating systems and components ▪ sanitary appliances, pipework systems and components ▪ rainwater systems and	Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults on: a. cold water systems and components b. hot water systems and components c. central heating systems and components d. sanitary appliances, pipework systems and components e. rainwater systems and components in line with company procedures. (gd55)	Justifies their fault-finding approach.

	components ○ apply methods of obtaining information on system faults for: ▪ cold water systems and components ▪ hot water systems and components ▪ central heating systems and components ▪ sanitary appliances, pipework systems and components ▪ rainwater systems and components. And associated with: ○ identify methods of obtaining information on system faults for rainwater systems in non-domestic premises ○ carry out diagnostic checks for a range of faults on rainwater systems in non-domestic premises. ○ carry out repair and		

	rectification procedures to deal with a range of faults on rainwater systems in non-domestic premises.		

	Explain how to carry out: a. service or maintenance of cold water systems b. service or maintenance of hot water systems c. service or maintenance of central heating systems d. routine checks of sanitary appliances and pipework systems underpinned by: ○ understand routine checks required on: ▪ cold water system components and pipework ▪ hot water system components and pipework ▪ central heating system components and pipework ▪ sanitary appliances and pipework systems as part of a periodic maintenance programme.	Explain how to carry out: a. service or maintenance of cold water systems b. service or maintenance of hot water systems c. service or maintenance of central heating systems d. routine checks of sanitary appliances and pipework systems in line with company procedures. (gd56)	None.
Core - Decommissioning **S10**: Core	Explain how to carry out decommissioning of: a. cold water systems	Explains how they carry out decommissioning of a. cold water systems	Explains the impact of not decommissioning

Decommission plumbing and domestic heating systems. **S11**: Core Decommission electrical and electrical control systems applicable to plumbing and domestic heating systems. underpinned by: **K14**: Core The decommissioning procedures applicable to plumbing and domestic heating systems	b. hot water systems c. central heating systems d. sanitary appliances and pipework systems e. rainwater systems f. electrical systems in accordance with company procedures.	b. hot water systems c. central heating systems d. sanitary appliances and pipework systems e. rainwater systems f. electrical systems in accordance with company procedures. (gd57)	correctly, on the customer and on the business.
Core – Technical planning **S13**: Core Plan, size and select domestic heating and rainwater systems to meet customers' needs in accordance with manufacturers' guidance, regulatory requirements and industry recognised standards and procedures. underpinned by: **K6**: Core	Explain how to plan central heating systems underpinned by: ○ identify sources of information required when undertaking work on central heating systems ○ identify typical pipe sizes used in central heating systems, types and layouts within dwellings ○ consider factors that affect the selection of central	Explains how to plan central heating systems in line with task requirements, manufacturers' guidance, regulatory requirements and industry recognised standards. (gd66)	None.

The legislative requirements and sources of information applicable to plumbing and domestic heating systems system installation, service and repair. **K8**: Core The layout features, working principles and legislative requirements of plumbing and domestic heating systems. **K9**: Core The basic factors which influence system choice for particular applications with regard to the installation of plumbing and domestic heating systems. **K17**: Core The procedures for sizing and selecting plumbing and domestic heating systems and components to meet customers' needs. **Option 2 planning skills are not directly assessed as they are associated with the core planning skills.**	heating systems for dwellings ○ use information sources required to size and select hot central heating systems and components ○ consider the principles of heat loss and heat gain and how this affects heating requirements ○ calculate central heating system requirements used in dwellings ○ select central heating system components in accordance with calculations from predetermined data ○ present calculations and information in a suitable format for quotation and tender ○ interpret information to complete a detailed materials list. And associated with: Explain how to plan air source heat pump systems		

S27: Option 2 Plan, size and select air source heat pump (non-refrigerant circuits) systems. underpinned by: **K29**: Option 2 The legislative requirements, approved codes of practice and guidance and sources of information applicable to the installation, service and repair of air source heat pump (non-refrigerant circuits) systems. **K41**: Option 2 The procedures for sizing and selecting air source heat pump (non-refrigerant circuits) systems.	underpinned by: ○ know the purpose and operational characteristics of the following components: ▪ evaporator fan coil ▪ compressor ▪ high pressure switch ▪ condenser ▪ fan ▪ expansion valve ▪ refrigerant four-way valve ▪ de-frost cycle ○ use manufacturers' data to select heat pump units: ▪ output charts ▪ other data ○ identify the factors that need to be considered when selecting an air source heat pump in relation to: ▪ heat load based on a heat loss calculation based on worst case outside temperature ▪ flow temperature ▪ emitter type ▪ hot water requirements		

	▪ monovalent, bivalent or hybrid systems ○ identify the factors that need to be considered when positioning an air source heat pump in relation to: ▪ operating noise and proximity to habitable rooms and neighbouring properties. ▪ planning considerations and permitted development ▪ ensuring adequate airflow and clearances ○ identify the factors that need to be considered when wall or floor mounting an air source heat pump.		

	Explain how to plan sanitary appliances and pipework systems underpinned by: ○ identify sources of information required when undertaking work on sanitary appliances and pipework systems ○ identify typical pipe sizes and maximum distances permitted in sanitary appliances pipework systems within dwellings ○ identify jointing methods used in sanitary appliances pipework systems ○ consider factors that affect the selection of sanitary appliances pipework systems for dwellings ○ use information sources required to size and select sanitary appliances pipework systems ○ consider the principles of heat loss and heat gain and how this affects heating requirements	Explains how to plan sanitary appliances and pipework system in line with task requirements, manufacturers' guidance, regulatory requirements and industry recognised standards. (gd67)	None.

	○ calculate sanitary appliance pipework system requirements used in dwellings ○ select sanitary system components in accordance with calculations from predetermined data ○ present calculations and information in a suitable format for quotation and tender ○ interpret information to complete a detailed materials list.		

	Explain how to plan rainwater harvesting or greywater reuse systems underpinned by: ○ consider the design requirements for types and layouts of rainwater harvesting systems ○ consider the design requirements for types and layouts of greywater reuse systems ○ consider the information requirements used to select, size and position components ○ confirm the pre-installation design requirements ○ calculate rainwater harvesting or greywater reuse system requirements used in dwellings ○ consider factors that affect the selection of rainwater systems for dwellings ○ use information sources required to size and select rainwater systems components	Explains how to plan rainwater harvesting or greywater reuse systems in line with task requirements, manufacturers' guidance, regulatory requirements and industry recognised standards. (gd68)	None.

	○ calculate rainwater systems requirements used in dwellings ○ select rainwater system components in accordance with calculations from predetermined data ○ interpret information to complete a detailed materials list ○ present calculations and information in a suitable format for quotation and tender.		

Core - Professionalism **B1**: Core Acts professionally and ethically to collaborate with colleagues and customers. **B3**: Core Committed to continuous professional development. **B4**: Core Committed to keeping up to date with industry best practice. underpinned by: **K7**: Core. How to communicate with customers, suppliers, co-workers and members of the public who may come into contact with the work area.	None.	Explains how their collaboration and communication with customers and colleagues is achieved by acting professionally and upholding ethical principles. Outlines the planned and unplanned learning and development activities they have carried out and shows a commitment to future continued professional development to maintain and enhance competence. Describes how they keep up to date with industry best practice.	None.
Decommissioning – Option 2 **S25**: Option 2 Decommission (including disconnection and dismantling) air	Explain how to carry out decommissioning of: a. an air source heat pump system b. a solar thermal system	Explain how to carry out decommissioning of: a. an air source heat pump system b. a solar thermal system	Explains the impact of not decommissioning correctly on the customer and the business.

source heat pump (non-refrigerant circuits) systems. **S26**: Option 2 Decommission (including disconnection and dismantling) air source heat pumps solar thermal systems. underpinned by: **K35**: Option 2 The decommissioning procedures applicable to air source heat pump (non-refrigerant circuits) systems. **K36**: Option 2 The decommissioning procedures applicable to solar thermal systems.	in accordance with company procedures.	in accordance with company procedures. (gd58)	
Option 3 – Installation **S30**: Option 3 Carry out and apply the common processes and techniques used in the installation of plumbing (above 28mm) and non-domestic plumbing systems and appliances.	Explain how to install: a. cold water systems b. hot water systems c. sanitary appliances and pipework systems d. rainwater systems in non-domestic premises underpinned by:	Explains how to install: a. cold water systems b. hot water systems c. sanitary appliances and pipework systems d. rainwater systems in non-domestic premises in-line with manufacturer's	Explains how they accommodate changes to customer requirements during installation.

K44: Option 3 The factors which influence and apply to the installation of plumbing (above 28mm) and non-domestic plumbing systems and appliances. **K46**: Option 3 The installation requirements applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	○ identify the positioning and fixing of pipework within the building fabric ○ identify sources of information required when undertaking work on systems in non-domestic premises.	instructions and customer requirements. (gd59)	
Decommissioning – Option 3 **S33**: Option 3 Decommission (including disconnection and dismantling) plumbing (above 28mm) and non-domestic plumbing systems and appliances. **K48**: Non-domestic Plumbing Technician. The decommissioning procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	Explain how to carry out decommissioning of: a. cold water systems b. hot water systems c. sanitary appliances and pipework systems d. rainwater systems in non-domestic premises in accordance with company procedures.	Explain how to carry out decommissioning of: a. cold water systems b. hot water systems c. sanitary appliances and pipework systems d. rainwater systems in non-domestic premises in accordance with company procedures. (gd60)	Explains the impact of not decommissioning correctly on the system.

Practical planning test (PPT)		
Themes and KSBs mapping	**Alignment with appendices**	**Pass**
Core – Task planning and risk **S4**: Core Plan tasks within plumbing and domestic heating systems industry. **S5**: Core Identify and document hazards for the plumbing and domestic heating systems work. Apply control measures.	Produce a simple work programme including: a. planning work with other trades b. material deliveries c. simple work programmes d. simple bar (progress) charts underpinned by: ○ identify factors to consider when planning activities to job specifications ○ interpret information to complete a detailed materials list.	Produces a simple work programme including: a. planning work with other trades b. material deliveries c. simple work programmes d. simple bar (progress) charts in line with the task requirements. (gd61)
	Produce a risk assessment and method statement for the work to be carried out, in accordance with: a. the plumbing and domestic heating system's design b. the conditions of the working environment c. organisational procedures Produce a risk assessment for a task underpinned by: ○ identify different hazards ○ identify levels of risk. Produce a method statement.	Produce a risk assessment and method statement for the work to be carried out, in accordance with: a. the plumbing and domestic heating system's design b. the conditions of the working environment c. organisational procedures. (gd62)

	Comply with company policies and procedures underpinned by: ○ interpret workplace information.	Complies with company policies and procedures. (gd63)
Core - Technical Planning **S12**: Core Plan, size and select domestic cold and hot water systems to meet customers' needs in accordance with manufacturers' guidance, regulatory requirements and industry recognised standards and procedures. underpinned by: **K6**: Core The legislative requirements and sources of information applicable to plumbing and domestic heating systems system installation, service and repair. **K8**: Core The layout features, working principles and legislative requirements of plumbing and domestic heating systems.	Plan cold water systems underpinned by: ○ identify sources of information required when undertaking work on cold water systems ○ identify types and typical pipe sizes used in cold water systems within dwellings ○ apply factors that affect the selection of cold water systems for dwellings ○ use information sources required to size and select cold water systems and components ○ consider recommended design temperatures within cold water systems ○ calculate cold water system requirements used in dwellings ○ select cold water components in accordance with calculations from predetermined data ○ present calculations and information in a suitable format for quotation and tender.	Plans a cold water system in line with task requirements, manufacturers' guidance, regulatory requirements and industry recognised standards. (gd64)
	Plan hot water systems underpinned by:	Plans a hot water system in line with task requirements, manufacturers' guidance,

K9: Core The basic factors which influence system choice for particular applications with regard to the installation of plumbing and domestic heating systems. **K17**: Core The procedures for sizing and selecting plumbing and domestic heating systems and components to meet customers' needs. **Option 2 planning skills are not directly assessed as they are associated with the core planning skills.** **S28**: Option 2 Plan, size and select solar thermal systems. underpinned by: **K30**: Option 2 The legislative requirements, approved codes of practice and	○ identify sources of information required when undertaking work on hot water systems ○ identify location and function of unvented system components ○ consider factors that affect the selection of hot water systems for dwellings ○ use information sources required to size and select hot water systems and components ○ consider recommended design temperatures within hot water systems ○ calculate hot water system requirements used in dwellings ○ select hot water components in accordance with calculations from predetermined data ○ present calculations and information in a suitable format for quotation and tender. And associated with: Plan solar thermal systems underpinned by: ○ know the purpose of the following solar thermal system components: ▪ differential temperature controller ▪ cylinder sensor(s) ▪ solar collector sensor ▪ drain back vessel ▪ flow meter	regulatory requirements and industry recognised standards. (gd65)

guidance and sources of information applicable to the installation, service and repair of solar thermal systems. **K42**: Option 2 The procedures for sizing and selecting solar thermal systems.	▪ flow regulator (mechanical) ▪ expansion vessel ○ determine the information requirements in relation to: ▪ building design ▪ building dimensions/angles ▪ building location and orientation ▪ building fabric/material details ▪ existing input services ▪ existing hot water/heating systems ○ determine or use typical domestic hot water system storage vessel requirements in relation to: ▪ daily demand (Vd) (litres/day per person or litres/day per m2 of floor area) ▪ boiler volume (Vb) ▪ dedicated solar volume (Vs) (litres per m2 of collector area or as a % or Vd) ▪ total cylinder volume (Vt) ▪ solar heat exchange coli surface area (m^2 of surface area in relation to collector flow rate and collector surface area) ○ propose suitable pipework materials in relation to: ▪ system operating temperatures ▪ system operating pressures ▪ system chemicals ○ plan for optimum collection capacity:	

	▪ the suitability of the building fabric in relation to the installation of the solar collector panel(s).	

Practical competence test (PCT)		
Themes and KSBs mapping	**Alignment with appendices**	**Pass**
Core - Installation and test (mechanical) **S2**: Core Carry out and apply the common processes and techniques used in the installation and test of plumbing and domestic heating systems (cold water, hot water, central heating and sanitary appliances and pipework). **K2**: Core The common processes and techniques used in the installation and test of plumbing and domestic heating systems (cold water systems, hot water systems, domestic wet central heating systems, sanitation systems).	Use and maintain hand and power tools. Apply the methods of safe storing of tools and equipment. both underpinned by: ○ identify the purpose of hand tools and power tools.	Uses and maintains hand and power tools in line with manufacturers' instructions. (gd1) Applies the methods of safe storing of tools and equipment in line with organisational procedures. (gd2)
	Apply work methods for preparing and protecting the building for installation work underpinned by: ○ identify the pre-existing damage checks to the building fabric or customer property before the work commences ○ use sources of information for carrying out preparatory work.	Applies work methods for preparing and protecting the building for installation work in line with industry guidance. (gd3)
	Use clips and brackets appropriate to the system pipework and the industry recommended spacing	Uses clips and brackets appropriate to the system pipework and the industry recommended

K10: Core The installation and testing requirements applicable to plumbing and domestic heating systems and components (cold water, hot water, central heating, sanitary appliances and pipework).	underpinned by: ○ measure and mark out fixings for pipework and plumbing and heating components.	spacing. (gd4)
	Join pipework to specification underpinned by: ○ identify pipework installation requirements ○ select pipework materials and fittings from instructions ○ measure, mark and cut pipework materials for installation ○ fabricate pipework bends to clear obstacles ○ select, position and fix pipework materials to specifications.	Joins pipework to specification. (gd5)
	Apply the processes and techniques used in the installation of: a. a cold water system b. a hot water system c. a central heating system d. a sanitary appliances and pipework system underpinned by: ○ identify the positioning and fixing of pipework within the building fabric.	Applies the installation processes and techniques used in the installation of: a. a cold water system b. a hot water system c. a central heating system d. a sanitary appliances and pipework system in line with task requirements. (gd6)
	Apply the processes and techniques used in the soundness testing of: a. a cold water system b. a hot water system	Applies the processes and techniques used in the soundness testing of: a. a cold water system

	c. a central heating system d. a sanitary appliances and pipework system underpinned by: ○ carry out a visual inspection of: ▪ a cold water system ▪ a hot water system ▪ a central heating system ▪ a sanitary appliances and pipework system to confirm that it is ready to be soundness tested. ○ apply soundness test industry requirements on: ▪ a cold water system and components ▪ a hot water systems and components ▪ a central heating system and components ▪ a sanitary appliances and pipework system and components.	b. a hot water system c. a central heating system d. a sanitary appliances and pipework system in line with company procedures. (gd7)
Core - Installation, fault finding, repair, test and commissioning (electrical) **S7**: Core Install, test, and commission, electrical and electrical control systems applicable to plumbing and domestic heating systems.	Prioritise the electrical safety of tools and equipment underpinned by: ○ identify common electrical dangers encountered on construction sites and in private dwellings ○ demonstrate methods of safe supply for electrical tools and equipment on site ○ demonstrate the procedure that should be applied for tools and equipment that fail	Prioritises electrical safety of tools and equipment in line with company procedures and industry practice. (gd8)

S9: Core Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on electrical and electrical control systems applicable to plumbing and domestic heating systems including industry safe isolation procedures. **K13**: Core The testing and commissioning requirements applicable to electrical control systems and components. **K18**: Core The legislative requirements, processes and procedures of electrical supply and control systems applicable to plumbing and domestic heating systems and work including limits to operative competence.	safety checks ○ identify safe isolation procedure when replacing attachments to power tools ○ conduct a visual inspection of a power tool for safe condition before use ○ use temporary continuity bonding when working on pipework components.	
	Carry out the safe isolation of electrical equipment and components associated with the electrical supply of the plumbing and domestic heating system underpinned by: ○ confirm the status of the electrical supply ○ confirm, as necessary, that the electrical supply is suitable for the plumbing and domestic heating systems.	Carries out the safe isolation of electrical equipment and components associated with the electrical supply of the plumbing and domestic heating system in line with company procedures and industry practice. (gd9)
	Select, as required, electrical equipment, cables, wiring and components and confirm that they are: a. of the right type and size b. fit for purpose in accordance with the plumbing and domestic heating system's design.	Selects, as required, electrical equipment, cables, wiring and components and confirm that they are: a. of the right type and size b. fit for purpose in accordance with the plumbing and domestic heating system's design. (gd10)
	Carry out work on electrical equipment, cables, wiring and components associated with the	Carries out work on electrical equipment, cables, wiring and

	electrical supply and control of the plumbing and domestic heating system in accordance with the requirements of: a. industry recognised methods and procedures b. manufacturers' instructions.	components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with the requirements of: a. industry recognised methods and procedures b. manufacturers' instructions (gd11)
	Check that the electrical equipment, cables, wiring and components are in accordance with the requirements of the plumbing and domestic heating system.	Checks that the electrical equipment, cables, wiring and components are in accordance with the requirements of the plumbing and domestic heating system. (gd12)
	Check that the electrical equipment, cables, wiring and components are of proper construction in accordance with the requirements of the plumbing and domestic heating system.	Checks that the electrical equipment, cables, wiring and components are of proper construction in accordance with the requirements of the plumbing and domestic heating system. (gd13)
	Undertake functional testing of the electrical equipment and components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with:	Undertakes functional testing of the electrical equipment and components associated with the electrical supply and control of the

	a. industry recognised methods and procedures b. manufacturers' instructions.	plumbing and domestic heating system in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions. (gd14)
	Commission electrical control systems in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions c. legislative requirements.	Commissions electrical control systems components in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions c. legislative requirements. (gd15)
	Identify and rectify electrical faults and deficiencies on plumbing and domestic heating systems in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions.	Identifies and rectifies electrical faults and deficiencies on plumbing and domestic heating systems in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions. (gd16)
Ownership **B2**: Core	None.	Takes ownership by completing the tasks and outlines the limits of the role and how they escalate, seek advice and assistance, in line with company policy.

Takes ownership of work within limits of own competence, knowing when to seek advice or assistance.		
Option 2 – Installation, fault finding, repair, test and commissioning (mechanical & electrical) **S19**: Option 2 Carry out and apply the common processes and techniques used in the installation of air source heat pump (non-refrigerant circuits) systems. **S20**: Option 2 Carry out and apply the common processes and techniques used in the installation of solar thermal systems. **S21**: Option 2 Test, commission and handover air source heat pump (non-refrigerant circuits) systems. **S22**: Option 2	Carry out work on electrical equipment, cables, wiring and components associated with the electrical supply and control in accordance with the requirements of: a. industry recognised methods and procedures b. manufacturers' instructions.	Carries out work on electrical equipment, cables, wiring and components associated with the electrical supply and control in accordance with the requirements of: a. industry recognised methods and procedures b. manufacturers' instructions. (gd17)
	Join pipework to specification underpinned by: ○ identify pipework installation requirements ○ select pipework materials and fittings from instructions ○ measure, mark and cut pipework materials for installation ○ fabricate pipework bends to clear obstacles ○ select, position and fix pipework materials to specifications.	Joins pipework to specification. (gd18)
	Prepare an air source heat pump system underpinned by:	Prepares an air source heat pump system in line with task requirements. (gd19)

Test, commission and handover solar thermal systems. **S23**: Option 2 Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on air source heat pump (non-refrigerant circuits) systems. **S24**: Option 2 Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on solar thermal systems. underpinned by: **K27**: Option2 The common installation processes and techniques used in the installation and maintenance of air source heat pump (non-refrigerant circuits) systems **K28**: Option 2 The common installation	○ undertake pre-installation checks for an air source heat pump installation to include checks relating to: ▪ authorisation for the work to proceed ▪ client/end user requirements ▪ statutory regulations and industry recognised procedures ▪ manufacturers' requirements ▪ the availability of appropriate access to all required work areas ▪ the availability and collation of all relevant information ▪ 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 compatible with the proposed heat pump installation. ▪ 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	

processes and techniques used in the installation and maintenance of solar thermal systems. **K31**: Option 2 The installation requirements (including retrofit) applicable to air source heat pump (non-refrigerant circuits) systems and components. **K32**: Option 2 The installation requirements (including retrofit) applicable to solar thermal systems and components. **K33**: Option 2 The testing and commissioning requirements applicable to air source heat pump (non-refrigerant circuits) systems. **K34**: Option 2 The testing and commissioning requirements applicable to solar thermal systems. **K37**: Option 2 The routine service and	○ confirm that the tools, materials, and equipment required for the installation work are available and are in a safe, usable condition.	
	Apply the processes and techniques used in the installation of an air source heat pump in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures.	Applies the processes and techniques used in the installation of an air source heat pump in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd20)
	Test the system for hydraulic soundness of the air source heat pump using appropriate test equipment in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ prepare an air source heat pump system for testing and commissioning to include checks/actions to confirm: ▪ compliance with the system design and specification ▪ compliance with system/component manufacturer requirements ▪ the suitability of electrical supply circuit arrangements	Tests the system for hydraulic soundness of the air source heat pump using appropriate test equipment in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd21)

maintenance procedures applicable to air source heat pump (non-refrigerant circuits) systems. **K38**: Option 2 The routine service and maintenance procedures applicable to solar thermal systems. **K39**: Option 2 The fault finding, diagnosis and rectification procedures applicable to air source heat pump (non-refrigerant circuits) systems. **K40**: Option 2 The fault finding, diagnosis and rectification procedures applicable to solar thermal systems.	▪ correct flushing the system of installation debris ▪ correct filling and venting the hydraulic circuits ▪ protection of the system against freezing.	
	Commission the installation of an air source heat pump system in accordance with: a. manufacturers' guidance b. design requirements c. client's requirements d. statutory requirements and e. industry recognised procedures underpinned by: ○ know the commissioning requirements for heat pump systems in relation to: ▪ setting of mechanical controls ▪ setting of electrical controls and temperature sensor-09 ▪ functional tests ▪ hydraulic balancing ▪ checking flow rates. ▪ checking the designed Δt ▪ checking start and stop temperatures ○ identify the commissioning requirements for the installation in relation to: ▪ the system and component manufacturer(s) requirements ▪ system design/specification	Commissions the installation of an air source heat pump system in accordance with: a. manufacturers' guidance b. design requirements c. client's requirements d. statutory requirements and e. industry recognised procedures. (gd22)

	requirements ▪ the client or end user requirements ▪ statutory regulations and industry recognised procedures ○ complete relevant documentation to record the commissioning activities.	
	Explain and demonstrate to the end user the operation and use of the air source heat pump system using manufacturers' guidance and industry agreed handover procedures underpinned by: ○ know the pre-handover checks that need to be carried out for a heat pump system installation ○ know the industry handover procedures for a heat pump system installation in relation to the: ▪ provision of completed commissioning sheet ▪ provision of diagrammatic information ▪ provision of verbal information or demonstration relating to system operation and use ○ undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturers' guidance, the system design/specification, client's requirements, regulatory requirements and industry recognised requirements	Explains and demonstrates to the end user the operation and use of the air source heat pump system using manufacturers' guidance and industry agreed handover procedures. (gd23)

	○ identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements ○ obtain acceptance by the end user of the system according to the industry agreed handover procedures ○ 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 manufacturers' guidance and industry recognised procedures.	
	Apply identification and rectification techniques on four separate faults including functional tests on an air source heat pump system to confirm: a. safe operation b. efficient operation c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ agree with the relevant person(s) fault rectification procedures for the faults identified	Applies identification and rectification techniques on four separate faults including functional tests on an air source heat pump system to confirm: a. safe operation b. efficient operation c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd24)

	○ know the information that needs to be available to enable fault diagnosis ○ know the work action and sequences required to diagnose and rectify the faults ○ obtain the relevant information required to enable the fault diagnosis and fault rectification work ○ take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work.	
	Apply routine service or maintenance techniques including functional tests on an air source heat pump system to confirm: a. safe operation b. sufficient operation c. the function of system components and controls d. noise and vibration levels in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ know which documentation needs to be available to enable routine service and maintenance work on air source heat pump system installations ○ know typical routine service and maintenance requirements for an air source	Applies routine service or maintenance techniques including functional tests on an air source heat pump system to confirm: a. safe operation b. sufficient operation c. the function of system components and controls d. noise and vibration levels in accordance with: a. manufacturer′s instructions b. regulatory requirements and c. industry recognised procedures. (gd25)

	heat pump installation in relation to: ▪ visual inspection requirements ▪ cleaning of components ▪ checking of system water content ▪ functional tests ○ know the industry requirements for the recording and reporting of routine service and maintenance work on heat pump system installations ○ know 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 ○ obtain relevant documentation required to be enable a routine service and maintenance work on air source heat pump system installations ○ demonstrate the knowledge of the routine servicing of relevant components of an air source heat pump installation, including checks in relation to: ▪ external isolation is used ▪ evaporator fins for any blockage ▪ evaporator fins are cleaned ▪ fan is not obstructed and moving freely ▪ outer casing ▪ condensate drain functioning and not blocked ▪ condition of flexible hoses ▪ condition and grade of pipe insulation	

	▪ signs of system water leakage ▪ oil leaks or deposits ▪ condition and security of fixing system ▪ anti-vibration mounts ▪ fuse rating ○ demonstrate the knowledge of the routine servicing of an air source heat pump connected to hydraulic emitter circuits and controls, including checks in relation to: ▪ signs of system water leakage ▪ heating system water pressure ▪ heating system water content and makeup ▪ expansion vessel size and pressure pressure relief valve (prv) operation ▪ system filters ▪ system bypass ▪ buffer vessel if installed ▪ circulation pumps ▪ mechanical valves ▪ condition and grade of pipe insulation ▪ control unit and alarm logs ▪ heating settings ▪ hot water settings ▪ indoor and outdoor sensors or thermostats ○ complete service and maintenance records.	
	Prepare a solar thermal system underpinned by:	Prepares a solar thermal system in-line with task requirements.

	○ undertake pre-installation checks for a solar hot water system installation to include checks relating to: ▪ authorisation for the work to proceed ▪ verification that the generation capacity of the proposed solar hot water system installation is appropriate to the hot water system load ▪ the availability of appropriate access to all required work areas ▪ the inspection of existing domestic hot water/heating system installations ▪ 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 ▪ the suitability of the proposed location and position of the solar collector panel(s) ○ confirm that the tools, materials, and equipment required for the installation work are available and are in a safe, usable condition.	(gd26)
	Apply the processes and techniques used in the installation of a solar thermal system in accordance with: a. manufacturers' guidance	Applies the processes and techniques used in the installation of a solar thermal system in accordance with:

	b. regulatory requirements c. industry recognised procedures.	a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd27)
	Test the solar thermal system for hydraulic soundness using appropriate test equipment in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ prepare a fully filled or drain back solar thermal system for testing and commissioning to include checks/actions to confirm: ▪ compliance with the system design and specification ▪ compliance with system/component manufacturer requirements ▪ the suitability of electrical supply circuit arrangements ▪ correct flushing the system of installation debris ▪ correct filling and venting the hydraulic circuits ▪ protection of the system against freezing ▪ adequate provision of system labelling.	Tests the solar thermal system for hydraulic soundness using appropriate test equipment in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd28)
	Commission a fully filled or drain back system	Commissions a fully filled or drain

	in accordance with: a. manufacturers' guidance b. design requirements c. client's requirements d. statutory requirements e. industry recognised procedures underpinned by: ○ know the commissioning requirements for a fully filled indirect sealed collector circuit installation in relation to: ▪ setting of the expansion vessel charge pressure ▪ setting of the system fluid level ▪ setting of mechanical controls ▪ setting of electrical controls and temperature sensors ▪ system functional tests ○ know the commissioning requirements for a fully filled drain back installation in relation to: ▪ setting of the system fluid level ▪ setting of mechanical controls ▪ setting of electrical controls and temperature sensors ▪ system functional tests ○ know the commissioning requirements for multiple collector arrays connected in series ○ know the recording requirements for the commissioning of solar thermal system installations	back system in accordance with: a. manufacturers' guidance b. design requirements c. client's requirements d. statutory requirements and e. industry recognised procedures. (gd29)

	○ identify the commissioning requirements for the installation in relation to: ▪ the system and component manufacturer(s) requirements ▪ system design/specification requirements ▪ the client or end user requirements ▪ statutory regulations and industry recognised procedures ○ complete relevant documentation to record the commissioning activities.	
	Explain and demonstrate to the end user the operation and use of the solar thermal system using manufacturers' guidance and industry agreed handover procedures underpinned by: ○ know the pre-handover checks that need to be carried out ○ know industry handover procedures in relation to the: ▪ provision of written information ▪ provision of diagrammatic information ▪ provision of verbal information or demonstration relating to system operation and use ○ undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturers' guidance, the system design and specification, client's	Explains and demonstrates to the end user the operation and use of the solar thermal system using manufacturers' guidance and industry agreed handover procedures. (gd30)

	requirements, regulatory requirements and industry recognised requirements ○ identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements ○ obtain acceptance by the end user of the system according to the industry agreed handover procedures ○ 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 manufacturers' guidance and industry recognised procedures.	
	Apply identification and rectification techniques on a minimum of two separate faults on a solar thermal systems to confirm: a. safe operation b. efficient operation c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ know the information that needs to be available to enable fault diagnosis	Apply identification and rectification techniques on a minimum of two separate faults on a solar thermal systems to confirm: a. safe operation b. efficient operation c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd31)

	○ know the work action and sequences required to diagnose the following faults: ▪ loss of system pressure without evidence of discharge ▪ discharge from pressure relief valve on the solar primary circuit ▪ insulation melting on solar collector circuit pipework ▪ overheating of solar collector circuit ▪ lack of circulation within the solar collector circuit ▪ poor or no system performance ▪ system noise and/or vibration ○ know the work action and sequences required to rectify the following faults: ▪ loss of system pressure without evidence of discharge ▪ evidence of discharge valve on the solar primary circuit ▪ insulation melting on solar collector circuit pipework ▪ overheating of solar collector circuit ▪ lack of circulation within the solar collector circuit ▪ poor or no system performance ▪ system noise and/or vibration ○ obtain the relevant information required to enable the fault diagnosis work ○ identify the cause of a minimum of two separate faults from the following list:	

	▪ loss of system pressure without evidence of discharge ▪ discharge from pressure relief valve on the solar primary circuit ▪ insulation melting on solar collector circuit pipework ▪ overheating of solar collector circuit ▪ lack of circulation within the solar collector circuit ▪ poor or no system performance ▪ system noise and/or vibration ○ agree with the relevant person(s) fault rectification procedures for the faults identified ○ obtain the relevant information required to enable the fault rectification work ○ take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work ○ take relevant precautionary actions to minimise the risk of injury to self or others during the fault rectification work.	
	Apply routine service or maintenance techniques including functional tests on a fully-filled or drain back solar thermal system to confirm: a. safe operation b. efficient operation	Applies routine service or maintenance techniques including functional tests on a fully-filled or drain back solar thermal system to confirm: a. safe operation b. efficient operation

	c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ undertake routine service and maintenance of relevant components on a fully-filled or drain back, 'active' solar thermal system to include: ▪ checking the system water levels ▪ checking provision for the expansion of system water ▪ checking for protection of the system water against freezing ▪ cleaning of system components adjustment of system controls ○ know which documentation needs to be available to enable routine service and maintenance work on 'active' solar thermal systems ○ know the typical routine service and maintenance requirements for fully filled systems in relation to: ▪ visual inspection requirements ▪ cleaning of components ▪ checking of system water content ▪ functional tests	c. the correct functioning of system components and controls in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd32)

	○ know the typical routine service and maintenance requirements for drain back systems in relation to: ▪ visual inspection requirements ▪ cleaning of components ▪ checking of system water content ▪ functional tests ○ know the industry requirements for the recording and reporting of routine service and maintenance work on solar thermal systems ○ obtain the relevant information required to enable the work to commence ○ undertake a visual service and maintenance inspection of a fully-filled or drain back, 'active' solar thermal system installation to include checks in relation to: ▪ compliance with manufacturers' installation instructions ▪ compliance with statutory regulations ▪ condition of system components including cleanliness ▪ correct positioning of system components ▪ security of fixing of system components ○ complete the relevant service and maintenance records in accordance with industry recognised procedures.	

Option 3 – Installation, fault finding, repair, test, commissioning and handover **S29**: Option 3 Carry out and apply the common processes and techniques used in the installation of plumbing (above 28mm) and non-domestic plumbing pipework. **S31:** Option 3 Test, commission and handover plumbing pipework (above 28mm) and non-domestic plumbing systems and appliances in the workplace. **S32**: Option 3 Perform routine service, maintenance, fault diagnosis and rectification procedures and techniques on plumbing (above 28mm) and non-domestic plumbing systems and appliances. Underpinned by:	Visually inspect and use hand and power tools applicable to non-domestic plumbing systems work underpinned by: ○ identify the purpose of hand tools and power tools used in non-domestic plumbing systems work.	Visually inspects and uses hand and power tools applicable to non-domestic plumbing systems work in line with manufacturers' instructions. (gd33)
	Select and fix clips and brackets appropriate to the system pipework and the industry recommended spacing underpinned by: ○ measure and mark out fixings to non-domestic pipework and components ○ identify types of fixing devices ○ identify clip and bracket types.	Selects and fixes clips and brackets appropriate to the system pipework and the industry recommended spacing in line with task requirements. (gd34)
	Apply the processes and techniques used in the installation of pipework to specification underpinned by: ○ identify pipework installation requirements. ○ select pipework materials and fittings from instructions. ○ measure, mark and cut pipework materials for installation. ○ fabricate pipework bends to clear obstacles. ○ select, position and fix pipework materials to specifications.	Applies the processes and techniques used in the installation of pipework to specification. (gd35)

K45: Option 3 The installation requirements applicable to plumbing (above 28mm) and non-domestic plumbing pipework. **K47**: Option 3 The testing and commissioning requirements applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances. **K49**: Option 3 The routine service and maintenance procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances. **K50**: Option 3 Fault finding, diagnosis and rectification procedures applicable to plumbing (above 28mm) and non-domestic plumbing systems and appliances.	Test the pipework in a non-domestic premises using appropriate test equipment underpinned by: ○ identify information sources required to complete testing of pipework in a non-domestic premises ○ carry out a visual inspection of pipework to confirm that it is ready to be soundness tested.	Tests the pipework in a non-domestic premises using appropriate test equipment in line with task requirements. (gd36)
	Apply identification and rectification techniques on a fault on a cold water non-domestic system to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ obtain the relevant information required to enable the fault rectification work ○ carry out diagnostic checks for a range of faults. And associated with:	Applies identification and rectification techniques on a fault on a cold water non-domestic system to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd37)

	○ perform fault diagnosis and rectification procedures on hot water systems and components in non-domestic premises ○ carry out diagnostic checks for a range of faults on hot water systems in non-domestic properties ○ carry out repair and rectification procedures to deal with a range of faults on hot water systems in non-domestic properties.	
	Carry out a soundness test on a cold water system in a non-domestic premises in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ identify information sources required to complete testing and commissioning of a cold water system in a non-domestic premises ○ carry out a visual inspection of a cold water system in non-domestic premises to confirm that it is ready to be soundness tested. And associated with: ○ identify information sources required to complete testing and commissioning on hot	Carries out a soundness test on a cold water system in a non-domestic premises in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd38)

	water systems in non-domestic premises carry out a visual inspection of a hot water system in a non-domestic premises to confirm that it is ready to be soundness tested ○ carry out a soundness test to industry requirements on hot water systems pipework and components applicable to non-domestic premises.	
	Apply routine service or maintenance techniques on a cold water system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ know the typical routine service and maintenance requirements for cold water systems in relation to: ▪ visual inspection requirements ▪ cleaning of components ▪ checking of system functional tests	Applies routine service or maintenance techniques on a cold water system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd39)

	○ identify types of information to be provided on a maintenance record for cold water systems ○ complete the relevant service and maintenance records in accordance with industry recognised procedures And associated with: ○ know the routine checks required on hot water system components and pipework as part of a periodic maintenance programme ○ identify types of information to be provided on a maintenance record for hot water systems ○ carry out service and maintenance of hot water systems.	
	Commission the cold water system of a non-domestic premises in accordance with: a. manufacturers' guidance b. design requirements c. statutory requirements d. industry recognised procedures underpinned by: ○ know the operational checks required during commissioning ○ identify the range of information that would be detailed on commissioning documentation	Commissions the cold water system of a non-domestic premises in accordance with: a. manufacturers' guidance b. design requirements c. statutory requirements d. industry recognised procedures. (gd40)

	○ identify actions that must be taken when commissioning reveals defects. And associated with: ○ know operational checks required during commissioning of hot water systems in non-domestic premises ○ identify the range of information that would be detailed on commissioning documentation of hot water systems in non-domestic properties ○ identify actions that must be taken when commissioning of hot water systems in non-domestic properties reveals defects ○ carry out commissioning procedures for hot water systems in non-domestic premises.	
	Explain and demonstrate to the end user the operation and use of a cold water system using manufacturers' guidance and industry agreed handover procedures underpinned by: ○ know the pre-handover checks that need to be carried out ○ ensure that all relevant handover documentation is correctly completed and recorded in the appropriate information systems and passed to the end user in	Explains and demonstrates to the end user the operation and use of a cold water system using manufacturers' guidance and industry agreed handover procedures. (gd41)

	accordance with manufacturers' guidance and industry recognised procedures. And associated with: ○ carry out the procedure for handing over hot water systems in non-domestic premises to the end user.	
	Apply identification and rectification techniques on a fault on a sanitary appliance and pipework system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ obtain the relevant information required to enable the fault rectification work ○ carry out diagnostic checks for a range of faults.	Applies identification and rectification techniques on a fault on a sanitary appliance and pipework system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd42)
	Carry out a soundness test on a sanitary appliance and pipework system in a non-domestic premises in accordance with:	Carry out a soundness test on a sanitary appliance and pipework system in a non-domestic

	a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ identify information sources required to complete testing and commissioning of a sanitary appliances and pipework system in non-domestic premises ○ carry out a visual inspection of a sanitary appliances and pipework system in a non-domestic premises to confirm that it is ready to be soundness tested.	premises in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd43)
	Apply routine service or maintenance techniques on a sanitary appliance and pipework system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures underpinned by: ○ know the typical routine service and maintenance requirements for sanitary appliances and pipework systems in relation to:	Applies routine service or maintenance techniques on a sanitary appliance and pipework system in a non-domestic premises to confirm: a. safe operation b. sufficient operation c. the correct functioning of system components in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures. (gd44)

	▪ visual inspection requirements ▪ cleaning of components ▪ checking of system functional tests ○ complete the relevant service and maintenance records in accordance with industry recognised procedures.	
	Commission the sanitary appliance and pipework system of a non-domestic premises in accordance with: a. manufacturers' guidance b. design requirements c. statutory requirements d. industry recognised procedures underpinned by: ○ know the operational checks required during commissioning ○ identify the range of information that would be detailed on commissioning documentation ○ identify actions that must be taken when commissioning reveals defects.	Commissions the sanitary appliance and pipework system of a non-domestic premises in accordance with: a. manufacturers' guidance b. design requirements c. statutory requirements d. industry recognised procedures. (gd45)
	Explain and demonstrate to the end user the operation and use of a sanitary appliance and pipework system using manufacturers' guidance and industry agreed handover procedures underpinned by:	Explains and demonstrates to the end user the operation and use of a sanitary appliance and pipework system using manufacturers' guidance and industry agreed handover procedures. (gd46)

	○ know the pre-handover checks that need to be carried out ○ 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 manufacturers' guidance and industry recognised procedures. ○ follow the procedure for handing over to the end user.	

Appendix 1

Plumbing and domestic heating core

The EPA test specification outlines specific areas of knowledge and skills that should be assessed and is provided to EPAOs for the development of the knowledge test, practical planning test (PPT), practical competence test (PCT), and interview underpinned by an apprenticeship portfolio of evidence (IPE).

Learning outcome	Ques in Ass't	Assessment Criteria	Min Ques in bank	Notes
Know and apply health and safety legislation that applies to the building services industry.	1	1. Identify health & safety legislation in protecting the workforce and members of the public.	3	
		2. Identify responsibilities of members of the construction team	3	
		3. Identify the legal status of health and safety guidance materials.	3	
		4. Identify the role of enforcing authorities.	2	
		5. Identify the control measures of inspectors.	2	
		6. Explain how to operate in a safe working manner by adhering to health and safety legislation, approved codes of practice and guidance and applying safe working practices.	0	covered in IPE (gd69)
Understand hazardous situations working in the building services industry.	1	1. Identify types of site hazards that may be encountered while at work or by members of the public.	4	
		2. Identify strategies used to prevent accidents during work activities.	2	
		3. Identify how the hazards of some substances and mixtures can be identified from the labels and packaging.	2	
		4. Identify how to deal with commonly encountered substances including disposal where applicable.	2	
		5. Identify common building materials and services components that may contain asbestos.	2	
		6. Identify types of asbestos that may be encountered in the workplace.	2	

		7. Identify procedures that must be used to safely work with asbestos cement based materials.	2	
Apply personal protection measures.	0	1. Understand the purpose of personal protective equipment (PPE).	0	covered in IPE (underpins gd47)
		2. Explain how to apply and use personal protective equipment (PPE).	0	covered in IPE (gd47)
		3. Understand procedures for manual handling.	0	covered in IPE (underpins gd48)
		4. Explain how to carry out correct manual handling.	0	covered in IPE (gd48)
		5. Explain how to use mechanical lifting aids.	0	covered in IPE (gd49)
Understand how to respond to accidents.	1	1. Identify requirements for first aid provision in the workplace.	2	
		2. Identify actions that should be taken when an accident or emergency is discovered.	2	
		3. Identify procedures for dealing with minor injuries.	2	
		4. Identify procedures for dealing with major injuries.	2	
		5. Identify recording procedures for accidents and near misses at work.	2	
Apply procedures for electrical safety.	0	1. Identify common electrical dangers encountered on construction sites and in private dwellings.	0	covered in PCT (underpins gd8)
		2. Demonstrate methods of safe supply for electrical tools and equipment on site.	0	covered in PCT (underpins gd8)
		3. Demonstrate the procedure that should be applied for tools and equipment that fail safety checks.	0	covered in PCT (underpins

				gd8)
		4. Identify safe isolation procedure when replacing attachments to power tools.	0	covered in PCT (underpins gd8)
		5. Conduct a visual inspection of a power tool for safe condition before use.	0	covered in PCT (underpins gd8)
		6. Use temporary continuity bonding when working on pipework components.	0	covered in PCT (underpins gd8)
		7. Prioritise the electrical safety of tools and equipment.	0	covered in PCT (gd8)
Understand how to work safely with heat producing equipment.	1	1. Identify various types of gases used in pipe jointing processes.	4	
		2. Identify how bottled gases and equipment should be safely transported and stored.	4	
		3. Identify various types of heat producing equipment and how to check them for safety.	2	
		4. Identify how gas heating equipment is safely assembled and used.	2	
		5. Identify the three elements of the fire triangle and how combustion takes place.	3	
		6. Identify the dangers of working with heat producing equipment and how to prevent fires occurring.	2	
		7. Identify the method for fighting small, localised fires that can occur in the workplace in order to aid escape.	3	
Understand and Safely use access equipment.	1	1. Identify situations where it may be necessary to work at height.	2	
		2. Identify how to select appropriate access equipment to permit work at heights.	2	
		3. Identify safety checks to be carried out on access equipment.	0	covered in IPE (underpins gd50)

		4. Explain how to use access equipment.	0	covered in IPE (gd50)
Understand working safely in excavations and confined spaces.	1	1. Identify situations where it may be necessary to work in excavations and confined spaces.	2	
		2. Identify safe working in excavations and confined spaces.	3	
		3. Identify dangers associated with excavations and confined spaces.	2	
		4. Identify safety measures when working in excavations and confined spaces.	2	
Questions in assessment				6
Questions in bank				72

Learning outcome	Ques in Ass't	Assessment Criteria	Min Ques in bank	Notes
Use hand and power tools in plumbing and domestic heating systems work.	0	1. Identify the purpose of hand tools and power tools.	0	covered in PCT (underpins gd1 and gd2)
		2. Use and maintain hand and power tools.	0	covered in PCT (gd1)
Know types of plumbing and domestic heating system pipework and their jointing principles.	1	1. Identify pipework materials and sizes used in dwellings.	5	
		2. Identify fitting types used in dwellings.	6	
		3. Identify methods of jointing pipework.	6	
		4. Identify methods of bending pipework.	2	
Apply site preparation techniques for plumbing and domestic heating systems work.	0	1. Apply work methods for preparing and protecting the building for installation work	0	covered in PCT (gd3)
		2. Identify the pre-existing damage checks to the building fabric or customer property before the work commences.	0	covered in PCT (underpins gd3)
		3. Apply the methods of safe storing of tools and equipment.	0	covered in PCT (gd2)
		4. Use sources of information for carrying out preparatory work.	0	covered in PCT (underpins gd3)

Understand and Use clips and brackets to support plumbing and domestic heating pipework and components	1	1. Measure and mark out fixings for pipework and plumbing and heating components.	0	covered in PCT (underpins gd4)
		2. Identify types of fixing devices.	3	
		3. Identify clip and bracket types.	3	
		4. Use clips and brackets appropriate to the system pipework and the industry recommended spacing.	0	covered in PCT (gd4)
Install plumbing and domestic heating system pipework.	0	1. Identify pipework installation requirements.	0	covered in PCT (underpins gd5)
		2. Select pipework materials and fittings from instructions.	0	covered in PCT (underpins gd5)
		3. Measure, mark and cut pipework materials for installation.	0	covered in PCT (underpins gd5)
		4. Fabricate pipework bends to clear obstacles.	0	covered in PCT (underpins gd5)
		5. Select, position and fix pipework materials to specifications.	0	covered in PCT (underpins gd5)
		6. Join pipework to specifications.	0	covered in PCT (gd5)
Questions in assessment				**2**
Questions in bank				**25**

Learning outcome	**Ques in Ass't**	Assessment Criteria	**Min Ques in bank**	**Notes**
Understand units of measurement used in the plumbing and domestic heating systems industry.	1	1. Identify internationally recognised (SI) units of measurement	3	
		2. Identify the application and use of SI derived units.	2	
		3. Identify the use of conversion tables for non-SI units.	2	
Understand properties of materials.		1. Identify relative densities of common materials.	4	
		2. Identify properties and applications of solid materials.	2	
		3. Identify why solid materials breakdown.	2	
		4. Identify methods of preventing corrosion.	2	

	1	5. Identify applications of liquids and gases.	2	
		6. Identify basic properties of liquids.	2	
		7. Identify basic properties of gases.	2	
Understand the relationship between energy, heat and power.	2	1. Identify the relationship between the Celsius and Kelvin temperature scales.	2	
		2. Identify the principles associated with a change of state.	2	
		3. Identify the terms latent and sensible heat as they apply to liquids and gases.	2	
		4. Identify methods of heat transfer.	4	
		5. Identify how units of energy and heat are related and derived.	2	
		6. Carry out heat, energy and power calculations.	2	
Understand principles of force and pressure and their application in the plumbing and domestic heating systems industry.	2	1. Identify the units of force and pressure derived from SI units.	2	
		2. Identify pressure and flow rate units of measurements.	2	
		3. Identify the application of pressure and flow rate measurements.	2	
		4. Carry out simple force and pressure calculations.	2	
		5. Identify the relationship between velocity, pressure and flow rate in systems.	2	
		6. Identify how restrictions in the pipework effects the flow of liquids and gases.	4	
		7. Identify the principles of a siphon.	2	
Understand mechanical principles in the plumbing and domestic heating systems industry.	1	1. Identify principles of simple machines	3	
		2. Identify principles of basic mechanics	3	
Understand principles of electricity in the plumbing and domestic heating systems industry.	1	1. Identify basic principles of electron flow theory.	2	
		2. Identify the purpose and application of simple units of electrical measurement.	4	
		3. Carry out simple electrical calculations.	3	
		4. Identify the requirements for earthing of electrical circuits.	2	
		1. Identify the different types of non-renewable energy	4	
		2. Identify the different types of renewable energy	3	

		1. Identify the benefits of energy efficient products, services and equipment	**2**	
		2. Identify the key factors of the Building Regulations and Guidance that apply to energy efficiency.	**2**	
Know the sources of renewable and non-renewable energy.	1	1. Identify renewable and non-renewable energy	**2**	
		2. Identify the different types of non-renewable energy	**2**	
		3. Identify the different types of renewable energy	**2**	
Know current energy efficiency advice and guidance	1	1. Identify the effects of using renewable and non-renewable energy sources	**2**	
		2. Identify the benefits of energy efficient products, services and equipment	**2**	
		3. Identify the key factors of the Building Regulations and Guidance that apply to energy efficiency.	**2**	
Questions in assessment				**10**
Questions in bank				**93**

Learning outcome	**Ques in Ass't**	Assessment criteria	Min Ques in bank	**Notes**
Know the role of the construction team within the plumbing and domestic heating systems industry.	**1**	1. Identify key roles of the site management team.	**4**	
		2. Identify key roles of the site operatives.	**4**	
		3. Identify common site visitors.	**2**	
Understand information sources in the building services industry.	**0**	1. Interpret workplace information.	**0**	covered in PPT (underpins gd63)
		2. Comply with company policies and procedures.	**0**	covered in PPT (gd63)
Know how to communicate with others.	**1**	1. Identify methods for effective communication with individual's needs.	**2**	
		2. Identify suitable communication methods.	**2**	
		3. Identify appropriate actions to deal with conflicting parties.	**2**	
		4. Identify the effects of poor communication with individuals.	**2**	
Understand responsibilities of		1. Identify different types of client.	**2**	

relevant people in the building services industry.	**1**	2. Identify what may be communicated to the client through the progress of a job.	**2**	
		3. Identify duties and methods for supervising staff.	**2**	
Understand and produce work programme for tasks in the plumbing and domestic heating systems industry.	**1**	1. Identify types of projects.	**2**	
		2. Identify factors to consider when planning activities to job specifications.	**0**	covered in PPT (underpins gd61)
		3. Identify the impact when materials are not delivered on time against the work programme.	**2**	
		4. Identify factors which affect working time allocation to work activities.	**2**	
	0	5. Produce a simple work programme including: a. Planning work with other trades b. Material deliveries. c. Simple work programmes. d. Simple bar (progress) charts.	**0**	covered in PPT (gd61)
Produce risk assessments and method statements for the plumbing and domestic heating systems industry.	**0**	1. Identify different hazards.	**0**	covered in PPT (underpins gd62)
		2. Identify levels of risk.	**0**	covered in PPT (underpins gd62)
	0	3. Produce a risk assessment for a task.	**0**	covered in PPT (gd62)
		4. Produce a method statement for a task.	**0**	covered in PPT (gd62)
Questions in assessment				**4**
Questions in bank				**30**

Learning outcome	**Ques in Ass't**	Assessment criteria	Min Ques in bank	**Notes**
Understand cold water supply to dwellings.		1. Identify the key stages in the rainwater cycle.	**2**	
		2. Identify the various sources of water and the typical properties of water from those sources.	**2**	

	2	3. Identify the types of water supply to dwellings and how these are regulated	3	
		4. Identify the different types of water and uses of water in dwellings	5	
		5. Identify the mains water treatment processes and typical mains water distribution system from treatment works to property.	3	
		6. Identify the private supply water treatment processes	2	
		7. Identify water treatment processes and typical supply pipework and storage systems utilising harvested rainwater and recycled greywater.	3	
		8. Identify water service to the property and isolation points	2	
		9. Identify the requirements to provide water whilst preventing waste, undue consumption, misuse or contamination.	2	
Questions in assessment				**2**
Questions in bank				**24**

Learning outcome	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Understand and recognise the layouts of plumbing and domestic heating systems.	5	1. Identify types and layout features of cold water systems in dwellings.	4	
		2. Identify the types and layout features of hot water systems in dwellings.	4	
		3. Identify the types and layout features of domestic central heating systems.	4	
		4. Identify the types and layout features of sanitary pipework systems.	4	
		5. Identify the types and layout features of rainwater systems: pipe (RWP) and gutter	2	
Questions in assessment				**5**
Questions in bank				**18**

Learning outcome	Ques in Ass't	Assessment criteria	Min Ques in bank	**Notes**
Understand and Install cold water systems.	3	1. Identify fluid categories of water and uses of water supplied to dwellings	**5**	
		2. Identify the advantages and disadvantages of cold water systems.	**2**	
		3. Identify types and typical pipe sizes used in cold water systems within dwellings	**0**	covered in PPT (underpins gd64)
		4. Identify working principles of cold water systems, positioning fixing, connection and operation of components.	**4**	
		5. Identify layout and installation requirements for protected plastic storage cisterns	**3**	
		6. Identify insulation requirements, system frost protection and prevention of undue warming of cold water systems	**2**	
		7. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in PCT (underpins gd6)
		8. Identify sources of information required when undertaking work on cold water systems	**0**	covered in PPT (underpins gd64)
		9. Identify backflow risk and required methods of prevention	**4**	
		10. Apply the processes and techniques used in the installation of a cold water system.	**0**	covered in PCT (gd6)
		11. Plan cold water systems	**0**	covered in PPT (gd64)
Understand and Install hot water systems		1. Identify advantages and disadvantages of hot water systems	**4**	
		2. Identify types and typical pipe sizes used in hot water systems within dwellings	**4**	
		3. Identify working principles of hot water systems, positioning fixing, connection and operation of components	**4**	
		4. Identify insulation requirements and system frost protection	**2**	

	2	5. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in PCT (underpins gd6)
		6. Identify expansion and contraction in hot water systems and negative effects	**2**	
		7. Identify location and function of unvented system components	**0**	covered in PPT (underpins gd65)
		8. Identify secondary circulation and how trace heating can be used	**2**	
		9. Identify sources of information required when undertaking work on hot water systems	**0**	covered in PPT (underpins gd65)
		10. Identify backflow risk and required methods of prevention	**3**	
		11. Apply the processes and techniques used in the installation of a hot water system.	**0**	covered in PCT (gd6)
		12. Plan hot water systems	**0**	covered in PPT (gd65)
Understand and Install domestic central heating systems	2	1. Identify advantages and disadvantages of types and layout features of heating systems	**4**	
		2. Identify typical pipe sizes used in central heating systems types and layouts within dwellings	**0**	covered in IPE (underpins gd66)
		3. Identify working principles of types of central heating systems, positioning fixing, connection and operation of components	**4**	
		4. Identify the importance of pump positioning	**2**	
		5. Identify operating principles for system control	**3**	
		6. Identify zoning and control requirements of central heating systems in accordance with statutory legislation	**3**	
		7. Identify insulation requirements and system frost protection	**2**	
		8. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in PCT (underpins gd6)
		9. Identify expansion and contraction in central heating systems and negative effects	**2**	

		10. Identify sources of information required when undertaking work on central heating systems	**0**	covered in IPE (underpins gd66)
		11. Identify procedures for filling and venting system types	**2**	
		12. Identify the operating principles of heat-producing appliances	**3**	
		13. Apply the processes and techniques used in the installation of a central heating systems.	**0**	covered in PCT (gd6)
		14. Explain how to plan central heating systems	**0**	covered in IPE (gd66)
Install sanitary appliances and pipework systems	2	1. Identify advantages and disadvantages of sanitary appliances pipework systems	**4**	
		2. Identify typical pipe sizes and maximum distances permitted in sanitary appliances pipework systems within dwellings	**0**	covered in IPE (underpins gd67)
		3. Identify working principles of sanitary appliances pipework systems and layouts and the positioning, fixing, connection and operation of components	**2**	
		4. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in PCT (underpins gd6)
		5. Identify expansion and contraction in sanitary appliances pipework systems and negative effects	**2**	
		6. Identify sources of information required when undertaking work on sanitary appliances and pipework systems	**0**	covered in IPE (underpins gd67)
		7. Identify different types of sanitary appliances and components used in dwellings	**2**	
		8. Identify factors that lead to trap seal loss in sanitary pipework systems	**2**	
		9. Identify the suitability of below ground drainage systems to receive waste water	**2**	
		10. Identify the installation features of sanitary facilities and equipment in dwellings for the disabled including wet rooms	**2**	

		11. Identify jointing methods used in sanitary appliances pipework systems	**0**	covered in IPE (underpins gd67)
		12. Identify working principles of greywater recycling systems	**2**	
		13. Apply the processes and techniques used in the installation of a sanitary appliances and pipework system.	**0**	covered in PCT (gd6)
		14. Plan sanitary appliances and pipework systems	**0**	covered in IPE (gd67)
Understand and Install rainwater systems	2	1. Identify advantages and disadvantages of rainwater systems: pipe (RWP) and gutter	**3**	
		2. Identify typical sizes and materials used in rainwater systems: pipe (RWP) and gutter	**4**	
		3. Identify working principles of rainwater systems (positioning fixing, connection and operation of components)	**0**	covered in IPE (underpins gd51)
		4. Identify expansion and contraction in rainwater systems and negative effects	**2**	
		5. Identify factors affecting gutter bracket selection and fixing for buildings	**2**	
		6. Identify sources of information required when undertaking work on rainwater systems	**0**	covered in IPE (underpins gd51)
		7. Identify working principles of rainwater recycling systems	**0**	covered in IPE (underpins gd51)
		8. Explain how to install rainwater systems.	**0**	covered in IPE (gd51)
		9. Explain how to plan rainwater harvesting or greywater reuse systems.	**0**	covered in IPE (gd68)
Questions in assessment				**11**
Questions in bank				**95**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**

Decommission plumbing and central heating systems	0	1. Explain how to carry out decommissioning of cold water systems in accordance with company procedures	0	covered in IPE (gd57)
		2. Explain how to carry out decommissioning of hot water systems in accordance with company procedures	0	covered in IPE (gd57)
		3. Explain how to carry out decommissioning of central heating systems in accordance with company procedures	0	covered in IPE (gd57)
		4. Explain how to carry out decommissioning of sanitary appliances and pipework systems in accordance with company procedures	0	covered in IPE (gd57)
		5. Explain how to carry out decommissioning of rainwater systems in accordance with company procedures	0	covered in IPE (gd57)
Questions in assessment				**0**
Questions in bank				**0**

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Understand and Perform a soundness test and commission cold water systems and components		1. Identify information sources required to complete testing and commissioning	2	
		2. Identify how to fill and vent cold water systems	2	
		3. Carry out a visual inspection of a cold water system to confirm that it is ready to be soundness tested	0	covered in PCT (underpins gd7)
		4. Apply soundness test industry requirements on cold water systems and components	0	covered in PCT (underpins gd7)
		5. Identify the flushing requirements including the use of system additives for new and existing cold water systems	2	
		6. Apply the processes and techniques used in the soundness testing of a cold water system	0	covered in PCT (gd7)
		7. Identify operational checks required during commissioning	0	covered in IPE

				(underpins gd53)
	1	8. Identify the range of information that would be detailed on commissioning documentation	0	covered in IPE (underpins gd53)
		9. Identify actions that must be taken when commissioning reveals defects	0	covered in IPE (underpins gd53)
		10. Describe the procedure for handing over to the end user	0	covered in IPE (gd54)
		11. Describe how to carry out commissioning procedures for cold water systems and components.	0	covered in IPE (gd53)
Understand and Perform a soundness test and commission hot water systems and components	1	1. Identify information sources required to complete testing and commissioning	2	
		2. Identify how to fill and vent hot water systems	2	
		3. Carry out a visual inspection of a hot water system to confirm that it is ready to be soundness tested	0	covered in PCT (underpins gd7)
		4. Apply soundness test industry requirements on a hot water system and components	0	covered in PCT (underpins gd7)
		5. Identify the flushing requirements including the use of system additives for new and existing hot water systems	2	
		6. Apply the processes and techniques used in the soundness testing of a hot water system	0	covered in PCT (gd7)
		7. Identify operational checks required during commissioning	0	covered in PE (underpins gd53)
		8. Identify the range of information that would be detailed on commissioning documentation	0	covered in IPE (underpins gd53)
		9. Identify actions that must be taken when commissioning reveals defects	0	covered in IPE (underpins gd53)
		10. Describe the procedure for handing over to the end user	0	covered in IPE (gd54)
		11. Describe how to carry out commissioning procedures for hot water systems and components.	0	covered in IPE (gd53)
Understand and Perform a soundness test and commission central heating systems and components		1. Identify information sources required to complete testing and commissioning	2	
		2. Identify how to fill and vent central heating systems	2	
		3. Carry out a visual inspection of a central heating system to confirm that it is ready to be soundness tested	0	covered in PCT (underpins gd7)

	1	4. Apply soundness test industry requirements on a central heating system and components	0	covered in PCT (underpins gd7)
		5. Identify the flushing requirements including the use of system additives for new and existing central heating systems	2	
		6. Apply the processes and techniques used in the soundness testing of a central heating system	0	covered in PCT (gd7)
		7. Identify operational checks required during commissioning	0	covered in IPE (underpins gd53)
		8. Identify the range of information that would be detailed on commissioning documentation	0	covered in IPE (underpins gd53)
		9. Identify actions that must be taken when commissioning reveals defects	0	covered in IPE (underpins gd53)
		10. Describe the procedure for handing over to the end user	0	covered in IPE (gd54)
		11. Describe how to carry out commissioning procedures for central heating systems and components.	0	covered in IPE (gd53)
Understand and Perform a soundness test and commission sanitary appliances, pipework systems and components	0	1. Identify information sources required to complete testing and commissioning	0	covered in IPE (underpins gd53)
		2. Carry out a visual inspection of a sanitary appliances and pipework system to confirm that it is ready to be soundness tested	0	covered in PCT (underpins gd7)
		3. Apply soundness test industry requirements on a sanitary appliances and pipework system and components	0	covered in PCT (underpins gd7)
		4. Identify operational checks required during commissioning	0	covered in IPE (underpins gd53)
		5. Identify the range of information that would be detailed on commissioning documentation	0	covered in IPE (underpins gd53)
		6. Identify actions that must be taken when commissioning reveals defects	0	covered in IPE (underpins gd53)
		7. Describe the procedure for handing over to the end user	0	covered in IPE (gd54)
		8. Apply the processes and techniques used in the soundness testing of a sanitary appliances and pipework system	0	covered in PCT (gd7)

		9. Describe how to carry out commissioning procedures for sanitary appliances, pipework systems and components	0	covered in IPE (gd53)
Understand and Perform a soundness test and commission rainwater systems and components	1	1. Identify information sources required to complete testing and commissioning	1	
		2. Carry out a visual inspection of a rainwater system to confirm that it is ready to be soundness tested	0	covered in IPE (underpins gd52)
		3. Apply soundness test industry requirements on rainwater systems and components	0	covered in IPE (underpins gd52)
		4. Identify operational checks required during commissioning	0	covered in IPE (underpins gd53)
		5. Identify the range of information that would be detailed on commissioning documentation		covered in IPE (underpins gd53)
		6. Identify actions that must be taken when commissioning reveals defects	0	covered in IPE (underpins gd53)
		7. Describe the procedure for handing over to the end user	0	covered in IPE (gd54)
		8. Explain how to carry out a soundness test.	0	covered in IPE (gd52)
		9. Describe how to carry out commissioning procedures for rainwater systems and components	0	covered in IPE (gd53)
Questions in assessment				**4**
Questions in bank				**19**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Perform fault diagnosis and rectification procedures on cold water systems and components	0	1. Apply methods of obtaining information on system faults	0	covered in IPE (underpins gd55)
		2. Carry out diagnostic checks for a range of faults	0	covered in IPE (underpins gd55)
		3. Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults	0	covered in IPE (gd55)

Perform fault diagnosis and rectification procedures on hot water systems and components	0	1. Apply methods of obtaining information on system faults	0	covered in IPE (underpins gd55)
		2. Carry out diagnostic checks for a range of faults	0	covered in IPE (underpins gd55)
		3. Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults.	0	covered in IPE (gd55)
Perform fault diagnosis and rectification procedures on central systems and components	0	1. Apply methods of obtaining information on system faults	0	covered in IPE (underpins gd55)
		2. Carry out diagnostic checks for a range of faults	0	covered in IPE (underpins gd55)
		3. Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults.	0	covered in IPE (gd55)
Perform fault diagnosis and rectification procedures on sanitary appliances, pipework systems and components	0	1. Apply methods of obtaining information on system faults	0	covered in IPE (underpins gd55)
		2. Carry out diagnostic checks for a range of faults	0	covered in IPE (underpins gd55)
		3. Explain how to carry out identification and rectification procedures and techniques to deal with a range of faults	0	covered in IPE (gd55)
Perform fault diagnosis and rectification procedures on rainwater systems and components	0	1. Apply methods of obtaining information on system faults	0	covered in IPE (underpins gd55)
		2. Carry out diagnostic checks for a range of faults	0	covered in IPE (underpins gd55)
		3. Explain how to carry out repair and rectification procedures to deal with a range of faults.	0	covered in IPE (gd55)
Questions in assessment				**0**
Questions in bank				**0**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**

Understand and Carry out service and maintenance on cold water systems	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Understand routine checks required on cold water system components and pipework as part of a periodic maintenance programme	0	covered in IPE (underpins gd56)
		3. Identify types of information to be provided on a maintenance record for cold water systems	2	
		4. Identify requirements for legionella and bacterial growth control measures	4	
		5. Explain how to carry out service or maintenance of cold water systems.	0	covered in IPE (gd56)
Understand and Carry out service and maintenance of hot water systems.	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	4	
		2. Understand routine checks required on hot water system components and pipework as part of a periodic maintenance programme	0	covered in IPE (underpins gd56)
		3. Identify types of information to be provided on a maintenance record for hot water systems	4	
		4. Identify requirements for legionella and bacterial growth control measures	4	
		5. Explain how to carry out service or maintenance of hot water systems.	0	covered in IPE (gd56)
Understand and Carry out service and maintenance on central heating systems	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Understand routine checks required on central heating system components and pipework as part of a periodic maintenance programme	0	covered in IPE (underpins gd56)
		3. Identify types of information to be provided on a maintenance record for central heating systems	2	
		4. Explain how to carry out service or maintenance of central heating systems.	0	covered in IPE (gd56)

Understand and Carry out service and maintenance on sanitary appliances and pipework systems	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Understand routine checks required on sanitary appliances and pipework systems as part of a periodic maintenance programme	0	covered in IPE (underpins gd56)
		3. Identify types of information to be provided on a maintenance record for sanitary appliances and pipework systems	2	
		4. Explain how to carry out routine checks of sanitary appliances and pipework systems.	0	covered in IPE (gd56)
Questions in assessment				**4**
Questions in bank				**28**

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Size and select cold water systems and components for dwellings.	0	1. Apply factors that affect the selection of cold water systems for dwellings	0	covered in PPT (underpins gd64)
		2. Use information sources required to size and select cold water systems and components	0	covered in PPT (underpins gd64)
		3. Consider recommended design temperatures within cold water systems	0	covered in PPT (underpins gd64)
		4. Calculate cold water system requirements used in dwellings	0	covered in PPT (underpins gd64)
		5. Select cold water components in accordance with calculations from predetermined data	0	covered in PPT (underpins gd64)
		6. interpret information to complete a detailed materials list	0	covered in PPT (underpins gd61)
		7. Present calculations and information in a suitable format for quotation and tender	0	covered in PPT (underpins gd64)
Size and select rainwater harvesting and greywater reuse systems and		1. Consider the design requirements for types and layouts of rainwater harvesting systems	0	covered in IPE (underpins gd68)

components for dwellings.	0	2. Consider the design requirements for types and layouts of greywater reuse systems	0	covered in IPE (underpins gd68)
		3. Consider the information requirements used to select, size and position components	0	covered in IPE (underpins gd68)
		4. Confirm the pre-installation design requirements	0	covered in IPE (underpins gd68)
		5. Calculate rainwater harvesting or greywater reuse system requirements used in dwellings	0	covered in IPE (underpins gd68)
Size and select hot water systems and components for dwellings.	0	1. Consider factors that affect the selection of hot water systems for dwellings	0	covered in PPT (underpins gd65)
		2. Use information sources required to size and select hot water systems and components	0	covered in PPT (underpins gd65)
		3. Consider recommended design temperatures within hot water systems	0	covered in PPT (underpins gd65)
		4. Calculate hot water system requirements used in dwellings	0	covered in PPT (underpins gd65)
		5. Select hot water components in accordance with calculations from predetermined data	0	covered in PPT (underpins gd65)
		6. interpret information to complete a detailed materials list	0	covered in PPT (underpins gd61)
		7. Present calculations and information in a suitable format for quotation and tender	0	covered in PPT (underpins gd65)
Size and select central heating systems and components for dwellings.	0	1. Consider factors that affect the selection of central heating systems for dwellings	0	covered in IPE (underpins gd66)
		2. Use information sources required to size and select hot central heating systems and components	0	covered in IPE (underpins gd66)
		3. Consider the principles of heat loss and heat gain and how this affects heating requirements	0	covered in IPE (underpins gd66)
		4. Calculate central heating system requirements used in dwellings	0	covered in IPE (underpins gd66)
		5. Select central heating system components in accordance with calculations from predetermined data	0	covered in IPE (underpins gd66)
		6. Interpret information to complete a detailed materials list	0	covered in PPT (underpins gd66)

		7. Present calculations and information in a suitable format for quotation and tender	0	covered in IPE (underpins gd66)
Size and select sanitary appliances pipework systems and components for dwellings.	0	1. Consider factors that affect the selection of sanitary appliances pipework systems for dwellings	0	covered in IPE (underpins gd67)
		2. Use information sources required to size and select sanitary appliances pipework systems	0	covered in IPE (underpins gd67)
		3. Calculate sanitary appliance pipework system requirements used in dwellings	0	covered in IPE (underpins gd67)
		4. Select sanitary system components in accordance with calculations from predetermined data	0	covered in IPE (underpins gd67)
		5. Interpret information to complete a detailed materials list	0	covered in PPT (underpins gd67)
		6. Present calculations and information in a suitable format for quotation and tender	0	covered in IPE (underpins gd67)
Size and select rainwater systems components for dwellings.	0	1. Consider factors that affect the selection of rainwater systems for dwellings	0	covered in IPE (underpins gd68)
		2. Use information sources required to size and select rainwater systems components	0	covered in IPE (underpins gd68)
		3. Calculate rainwater systems requirements used in dwellings	0	covered in IPE (underpins gd68)
		4. Select rainwater system components in accordance with calculations from predetermined data	0	covered in IPE (underpins gd68)
		5. interpret information to complete a detailed materials list	0	covered in IPE (underpins gd68)
		6. Present calculations and information in a suitable format for quotation and tender	0	covered in IPE (underpins gd68)
Questions in assessment				**0**
Questions in bank				**0**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**

Know the basic operating principles of micro-renewable energy technologies.	1	1. Identify the basic operating principles of heat producing micro-renewable energy technologies	3	
		2. Identify the basic operating principles of heat-led micro-combined heat and power	3	
Understand requirements to install micro-renewable energy systems to existing systems.	1	1. Identify the suitability of building location and features when installing micro-renewable energy systems	3	
		2. Identify statutory regulations affecting installation of micro-renewable energy systems	1	
		3. Identify what would be typically classified as 'permitted development' under town and country planning regulations in relation to the deployment of technologies	2	
		4. Identify which parts of the regulations apply in relation to the installation of environmental technologies	2	
		5. Identify typical advantages and disadvantages associated with environmental technologies	2	
Questions in assessment				**2**
Questions in bank				**16**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Understand factors affecting fuel selection.	2	1. Identify the types of fuels used in appliances	4	
		2. Identify the factors which affect the selection of fuels	4	
		3. Identify sources of information for fuel supply installation	4	
		4. Identify the regulatory type bodies which govern the installation of various fuel types	4	
		5. Identify the storage requirements for fuels	4	
		6. Identify factors which could affect storage requirements for fuels	4	
Know combustion processes of fuel		1. Identify the combustion process	4	

supplied systems.	2	2. Identify the main constituents of complete and incomplete combustion	3	
		3. Identify causes of incomplete combustion	4	
		4. Identify signs of incomplete combustion	4	
		5. Identify the symptoms of CO poisoning	4	
		6. Identify the purpose of CO detectors	3	
		7. Identify the requirements for ventilation	4	
		8. Identify the different types of ventilation	3	
		9. Identify installation practices for ventilation	3	
Know principles of chimney/flue systems.	2	1. Identify the operating principles of chimney/flue systems	2	
		2. Identify types of chimney/flue systems	2	
		3. Identify the components within chimney/flue systems	3	
		4. Identify the effects of layout on chimney/flue systems	3	
		5. Identify the layout and features of chimney and flue construction	3	
		6. Identify termination requirements for chimney/flue systems from relevant documents	3	
		7. Identify basic inspection and testing procedures for chimney/flue systems	3	
Questions in assessment				**6**
Questions in bank				**75**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Understand and Perform pre-installation activity prior to undertaking electrical work on plumbing and domestic heating systems.		1. Identify the limitations of your responsibility when carrying out work on electrical supplies and/or circuits for the control of plumbing and domestic heating systems	4	
		2. Identify the applications, advantages and limitations of electrical supplies	4	
		3. identify the applications, advantages and limitations of different electrical equipment,	3	

	1	cables/wiring and components in relation to the working environment		
		4. Identify the appropriate industry standards and regulations relevant to carrying out work on electrical supplies and/or circuits for the control of plumbing and domestic heating systems	3	
		5. Identify how to verify that job information and documentation is current and relevant and that the plant, instruments, access equipment and tools are fit for purpose	2	
		6. Produce a risk assessment and method statement for the work to be carried out, in accordance with: a. the plumbing and domestic heating system's design b. the conditions of the working environment c. organisational procedures.	0	covered in PPT (gd62)
		7. Explain how to apply and use personal protective equipment (PPE)	0	covered in IPE (gd47)
		8. Confirm the status of the electrical supply	0	covered in PCT (underpins gd9)
		9. Confirm, as necessary, that the electrical supply is suitable for the plumbing and domestic heating systems	0	covered in PCT (underpins gd9)
		10. Select, as required, electrical equipment, cables, wiring and components and confirm that they are: a. of the right type and size b. fit for purpose in accordance with the plumbing and domestic heating system's design.	0	covered in PCT (gd10)
Apply industry standard safe isolation procedures.	1	1. Identify the correct means of electrical isolation prior to commencing work	2	
		2. Carry out the safe isolation of electrical equipment and components associated with the electrical supply of the plumbing and domestic heating system.	0	covered in PCT (gd9)
Carry out the safe installation, testing, commissioning and decommissioning of electrical systems.		1. Carry out work on electrical equipment, cables, wiring and components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with the requirements of:	0	covered in PCT (gd11)

	0	a. industry recognised methods and procedures b. manufacturers' instructions		
		2. Check that the electrical equipment, cables, wiring and components are in accordance with the requirements of the plumbing and domestic heating system	0	covered in PCT (gd12)
		3. Check that the electrical equipment, cables, wiring and components are of proper construction in accordance with the requirements of the plumbing and domestic heating system	0	covered in PCT (gd13)
		4. Undertake functional testing of the electrical equipment and components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions.	0	covered in PCT (gd14)
		5. Commission electrical control systems in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions c. legislative requirements.	0	covered in PCT (gd15)
		6. Explain how to carry out decommissioning of electrical systems in accordance with company procedures.	0	covered in IPE (gd57)
Carry out the identification of faults and safe repair of electrical work.	0	1. Identify and rectify electrical faults and deficiencies on plumbing and domestic heating systems in accordance with: a. industry recognised methods and procedures b. manufacturers' instructions.	0	covered in PCT (gd16)
Questions in assessment				**2**
Questions in bank				**18**

Appendix 2

Option 1 Domestic Gas Systems and Hot Water Heating Appliances

The EPA mapping outlines specific knowledge and skills that must be assessed and is provided to EPAOs for the development of the interview underpinned by an apprenticeship portfolio of evidence (IPE).

This section outlines the on-site portfolio of evidence requirements that are assessed through performance. This is necessary to meet the requirements for the Accredited Certification Scheme (ASC) to work under the Gas Safe Register.

Evidence is gathered through activities carried out by the apprentice (under the observation of a centre assessor or an expert observer) for a customer at their premises.

Note: The expert observer:

- must be occupationally competent, suitably experienced, trained and registered with the centre
- training must include the requirements of assessment and the completion of related direct observation documentation
- training must be documented and recorded within quality assurance documentation and be subject to annual review by an IQA
- will be subject to the same internal quality assurance process as centre assessors (see note* relating to enhanced quality assurance)
- must demonstrate proof of gas safe registration.

Assessment Codes

Colour Code	Description	Codes for Assessment
Green	**Directly Observed**	**DOC -** Directly observed simulated realistic activity in centre
Orange	**Observation on-site with a Centre Assessor or Expert Observer**	**RAS** – Reflective Account Site from site with supporting evidence. This is the preferred option for portfolios **RAC** – Reflective Account Centre from simulated centre with supporting evidence

Installation of Gas Pipework ≤ 35mm	
Candidates are to be observed on the minimum number of occasions and range as identified below.	
Note: The candidate must have covered the necessary training/mentoring required prior to the observation	
Observation requirements	
Total - 5 observations - Install gas pipework; these may be related directly to the installation requirements of an appliance.	
Observation 1	**RAS Reflective Account** From site
Observation 2	**RAS Reflective Account** From site
Observation 3	**RAS Reflective Account** From site
Observation 4	**RAS Reflective Account** From site

Observation 5	**RAS Reflective Account** From site
Installation to include: • New or replacement pipework • Associated pipework fixings and joints	
Range – • Copper Tube	**Secondary Range** – at least two of the following: • Capillary Joints** • Compression Joints • Fabricated bending using mechanical tools ** mandatory
Gas Tightness Testing, Direct Purging (IGEM/UP/1B) and Relighting Appliances	
Candidates are to be observed on the minimum number of occasions and range as identified below.	
Note: The candidate must have covered the necessary training/mentoring required prior to the observation	
Observation requirements	
Total - 5 observations - Tightness testing, purging and relighting of gas installations and appliances.	
Observation 1	**RAS Reflective Account** From site
Observation 2	**RAS Reflective Account** From site
Observation 3	**RAS Reflective Account** From site
Observation 4	**RAS Reflective Account**

	From site
Observation 5	**RAS Reflective Account** From site
Installation to include: • Tightness test • Purge • Re-light appliances	
The Installation of Low Pressure Domestic Gas Meters ***Note: This task can be carried out after the disconnection of a meter for hot working***	
Candidates are to be observed on the minimum number of occasions and range as identified below.	
Note: The candidate must have covered the necessary training/mentoring required prior to the observation	
Observation requirements	
Total - 5 observations - Installation of LP domestic gas meter	
Observation 1	**RAS Reflective Account** From site
Observation 2	**RAS Reflective Account** From site
Observation 3	**RAS Reflective Account** From site
Observation 4	**RAS Reflective Account** From site
Observation 5	**RAS Reflective Account** From site

Installation to include: • Installation of a LP domestic gas meter • Associated meter installation checks.				
Install, Service and Fault Find Gas Water Heating and Wet Central Heating Appliances				
Candidates are to be observed on the minimum number of occasions and range as identified below. ***Note****: *The observations are only to be simulated where it has not been possible for the observation to be obtained on-site.*				
Note: The candidate must have covered the necessary training/mentoring required prior to the observation				
Observation requirements				
Total – 14 observations for installation, service and fault finding		**Install & Commission**	**Service**	**Fault Finding**
Observation 1	**Directly Observed** **All three may be DO in centre**			
Observation 2	**Reflective Account** **All 3 accounts are to come from site**			
Observation 3	**Reflective Account** **Minimum of 2** **accounts are to come from site** **1 account may be simulated***			
Observation 4	**Reflective Account** **Minimum of 2** **accounts are to come from site** **1 account may be simulated***			

Observation 5	**Reflective Account** **Minimum of 1** **account is to come from site** **1 account may be simulated***			
Observation to include • New or replacement appliance • Associated pipework connections • Associated flueing • Commission, handover and completion of relevant documentation				
Range – The types of appliances below are to be covered • Traditional Boiler (open flued and/or room sealed) ** • System Boiler • Combination Boiler **Service and maintenance only.				

On completion of the on-site portfolio of evidence, interview underpinned by an apprenticeship portfolio, paper 1 of the knowledge test and the practical planning test, candidates must successfully complete the Nationally Accredited Certification Scheme for Gas Fittings Operatives Assessment categories CCN1 (Domestic Natural Gas Safety) and CENWAT (Domestic Gas Central Heating Boilers and Domestic Gas Water Heaters).

Appendix 3

Option 2 Domestic air source heat pump and solar thermal systems technician

The EPA test specification below outlines specific areas of knowledge and skills that should be assessed and is provided to the EPAO for the development of the knowledge test, practical planning test (PPT), practical competence test (PCT), and interview underpinned by a portfolio of evidence (IPE) for air source heat pump systems and solar thermal systems.

Know the requirements to install, commission and handover heat pump systems (non-refrigerant circuits)

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
1. Know what an air source heat pump is, the principle of the vapour compression system and system components	5	1. Identify key components of the vapour compression refrigeration cycle: ○ Compressor ○ Evaporator ○ Expansion valve ○ Condenser ○ Refrigerant	11	
		2. Identify how the vapour compression refrigerant circuit within a heat pump unit operates.	3	
		3. Know the purpose and operational characteristics of the following components: ○ Evaporator fan coil ○ Compressor ○ High pressure switch ○ Condenser ○ Fan ○ Expansion valve ○ Refrigerant four-way valve ○ De-frost cycle	0	covered in IPE (associated with gd66)
2. Know the different operational characteristics of each type of heat		1. Identify the different types of Air Source heat pump: ○ Monoblock, fixed speed, inverter driven ○ Split	2	

pump unit and system arrangement.	2	○ Air to air		
		2. Identify the requirements of the current fluorinated greenhouse gases regulations in relation to: ○ The competence of personnel installing heat pumps where the refrigerant circuit has been assembled and tested by the product manufacturer ○ The competence of personnel installing and charging split air source 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 servicing of a split air source heat pumps ○ The competence of personnel undertaking recovery of fluorinated greenhouse gases from heat pump refrigerant circuits ○ Flammability of certain refrigerants	2	
3. Know the fundamental principles of heat pump efficiency and design selection that are common for heat pumps	20	1. Identify the meaning of the term 'Coefficient of Performance'.	2	
		2. Identify the relationship between Coefficient of Performance and the: ○ heat pump input temperature ○ heat pump emitter temperature	2	
		3. Identify the effect that ambient temperature can have on: ○ coefficient of performance ○ heat pump output.	2	
		4. Identify the meaning of the term 'Seasonal Coefficient of Performance'.	2	
		5. Identify the factors that can affect the Seasonal Coefficient of Performance.	2	
		6. Demonstrate understanding of a products ErP label and product Fiche	2	
		7. Identify the meaning of the term 'System Efficiency'.	2	

		8. Identify the factors that can affect the 'System Efficiency'.	2	
		9. Demonstrate understanding of a products package label	2	
		10. Identify why achieving minimum heat loss from the building is particularly important when designing a heat pump system.	2	
		11. Identify the effect that oversizing of a heat pump has on: ○ system performance/efficiency ○ heat pump operation.	2	
		12. Identify the effect that under-sizing of a heat pump has on: ○ system performance/efficiency ○ heat pump operation	2	
		13. Identify the meaning of the terms: ○ monovalent system ○ bivalent system ○ hybrid system.	2	
		14. Use manufacturers' data to select heat pump units: ○ output charts ○ other data.	0	covered in IPE (associated with gd66)
		15. Identify the meaning of the term 'bivalent points' in relation to heat pump output charts.	2	
		16. Identify how 'bivalent points' are used to determine auxiliary heat requirements.	2	
		17. Identify how heat pump output capacity is affected by: ○ heat pump input temperature ○ heat pump output temperature.	2	
		18. Identify the typical mean water temperature recommended when designing a hydraulic emitter circuit that incorporates: ○ standard panel radiators. ○ underfloor heating ○ fan assisted convector heaters ○ fan coils	2	

		19. Identify the typical annual operating hours for a heat pump that is being used for: ○ heating only ○ heating and domestic hot water.	2	
		20. Identify how heat pump annual operating hours may vary in relation to the: ○ type of building ○ geographical location of the installation	2	
4. Know the fundamental design considerations that are specific to air source heat pumps	0	1. Identify the factors that need to be considered when selecting an air source heat pump in relation to: ○ heat load based on a heat loss calculation based on worst case outside temperature ○ flow temperature ○ emitter type ○ hot water requirements ○ monovalent, bivalent or hybrid systems.	0	covered in IPE (associated with gd66)
5. Know the fundamental principles of domestic hot water cylinder selection and system design that are common for heat pumps.	7	1. Identify the different type of heat pump hot water cylinders: ○ heat pump, hot water packaged unit ○ coiled indirect cylinder ○ tank in tank cylinder ○ thermal store ○ solar cylinder	3	
		2. Identify volume of hot water cylinder required for the building.	3	
		3. Identify output required from heat pump to heat the hot water cylinder.	3	
		4. Identify correct selection of hot water cylinder for the heat pump.	3	
		5. Identify correct zone valve selection for heat pump and hot water cylinder.	2	
		6. Identify requirements for secondary hot water circulation.	2	
		7. Identify safe system design in relation to regulations for: ○ Legionella protection	2	

		○ Hot water temperature protection and prevention of scalding.		
6. Know the fundamental principles of hydraulic system design that are common for heat pumps.	10	1. Identify the installation requirements where flow and return pipework passes through the external building fabric in relation to: ○ Provision for movement ○ Prevention of water ingress	2	
		2. Identify the suitability of the following types of hydraulic heating system emitter for heat pump systems: ○ Standard panel radiators. ○ Underfloor heating ○ Fan assisted convector heaters ○ Fan coils ○ Combined systems (radiators, underfloor heating) ○ Multiple zones.	2	
		3. Identify the installation requirements for the connection to the following types of hydraulic heating system emitter: ○ Standard panel radiators. ○ Underfloor heating ○ Fan assisted convector heaters ○ Fan coils ○ Combined systems (radiators, underfloor heating) ○ Multiple zones	2	
		4. Identify heat pump hydraulic flow rate requirements and circulation pump selection	2	
		5. Identify heat pump hydraulic flow rate requirements and circulation pump selection.	2	
		6. Identify heat pump pipe size requirements in relation to designed flow temperature.	2	
		7. Identify the correct pipe size requirements in relation to designed flow temperature.	2	
		8. Identify why a buffer vessel maybe required in the system design	2	

		9. Identify if a buffer vessel is required in the system design and is correctly sized.	2	
		10. Identify correct piping alternatives for buffer vessels in the system design.	2	
		11. Identify the installation requirements for suitable insulation of external pipework in relation to: ○ Thermal loss ○ Protection against freezing ○ UV protection ○ Animal protection	2	
7. Know the fundamental principles of heat pump controls	1	1. Identify the common control systems for heat pump units in relation to: ○ weather compensation ○ indoor and outdoor sensors ○ heat curves ○ scheduling ○ optimisation ○ accessories ○ internet connections and Apps	2	
8. Know the preparatory work required for heat pump installation work	1	1. Identify the common requirements of pre-installation checks for heat pump unit installations connected to hydraulic emitters circuits in relation to: ○ 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 ○ Verify the correct fuse rating for heat pump	2	

		○ Adequate provision for the siting of key internal system components ○ The suitability of the building structure in relation to the proposed installation. ○ DNO notification ○ Building regulation and assignment of rights		
9. Know the preparatory work required for the installation of an air source heat pump	4	1. Explain how to plan air source heat pump systems.	0	covered in IPE (associated with gd66)
		2. Identify the factors that need to be considered when positioning an air source heat pump in relation to: ○ Operating noise and proximity to habitable rooms and neighbouring properties. ○ Planning considerations and permitted development ○ Ensuring adequate airflow and clearances	0	covered in IPE (associated with gd66)
		3. Identify the factors that need to be considered when wall or floor mounting an air source heat pump.	0	covered in IPE (associated with gd66)
		4. Identify the requirements for moving and handling air source heat pumps units to avoid damage and personal injury.	2	
		5. Identify the options to deal with the condensate produced from normal and defrost cycle operation of an air source heat pump.	2	
		6. Identify suitable electrical supply in relation to: ○ District Network Operator (DNO) connection ○ Isolation switches ○ Fuse rating	2	
10. Know the requirements to install and test air source heat pump systems (non-refrigerant circuits)	5	1. Identify the requirements for moving and handling heat pump units to avoid damage to the unit.	2	
		2. Identify 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.	2	

		3. Identify the requirements where brine circuit pipework passes through the external building fabric in relation to: ○ Provision for movement ○ Protection against freezing ○ Prevention of water ingress	2	
		4. Identify the charging and flushing requirements for hydraulic system in relation to: ○ Correct filling and venting ○ Purging of air and installation debris ○ Addition of antifreeze protection and suitable cleansers and or inhibitors. ○ Checking for leaks ○ Check filters for debris	3	
		5. Identify what equipment is needed for system charging and flushing.	2	
		6. Identify the hydraulic test requirements.	2	
11. Understand the requirements to commission air source heat pump system installations (non-refrigerant circuits)	2	1. Identify the conditions that are required to implement commissioning activities for heat pump systems.	3	
		2. Know the commissioning requirements for heat pump systems in relation to: ○ setting of mechanical controls ○ setting of electrical controls and temperature sensor-09 ○ functional tests ○ hydraulic balancing ○ checking flow rates. ○ checking the designed Δt ○ checking start and stop temperatures	0	covered in PCT (underpins gd22)
12. Understand the requirements to handover heat pump system installations	2	1. Know the pre-handover checks that need to be carried out for a heat pump system installation.	0	covered in PCT (underpins gd23)
		2. Know the industry handover procedures for a heat pump system installation in relation to the: ○ Provision of completed commissioning sheet ○ Provision of diagrammatic information ○ Provision of verbal information or demonstration relating to system operation and use.	0	covered in PCT (underpins‘gd23)

Questions in assessment	**59**
Questions in bank	**122**

Permitted Normative Document list for Air source Heat Pump Assessments

- MIS 3005-D
- MIS 3005-I
- MGD 007
- EPAOs are permitted to provide their own reference materials for this assessment

The EPA test specification below outlines specific areas of knowledge and skills that should be assessed and is provided to assessing End-Point Assessment Organisations for the development of the Practical competence test (PCT) for air source heat pump systems.

Install, commission, and handover heat pumps (non-refrigerant circuits)

Learning outcomes		Assessment criteria		**Notes**
1. Plan and prepare for the installation of an air source heat pumps (non-refrigerant circuits)		1. Undertake pre-installation checks for an air source heat pump installation to include checks relating to: ○ Authorisation for the work to proceed ○ Client/end user requirements ○ Statutory regulations and industry recognised procedures ○ Manufacturer's requirements ○ The availability of appropriate access to all required work areas ○ The availability and collation of all relevant information ○ 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		covered in PCT (underpins gd19)

		○ Verification that the emitter circuit design or existing installation is compatible with the proposed heat pump installation. ○ 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		
		2. Confirm that the tools, materials, and equipment required for the installation work are available and are in a safe, usable condition.		covered in PCT (underpins gd19)
		3. Prepare an air source heat pump system.		covered in PCT (gd19)
2. Install an air source heat pump unit (non-refrigerant circuits)		1. Apply the processes and techniques used in the installation of an air source heat pump in accordance with manufacturers' guidance, regulatory requirements and industry recognised procedures,		covered in PCT (gd20)
3. Install system pipework.		1. Identify pipework installation requirements.		covered in PCT (underpins gd18)
		2. Select pipework materials and fittings from instructions.		covered in PCT (underpins gd18)
		3. Measure, mark and cut pipework materials for installation.		covered in PCT (underpins gd18)
		4. Fabricate pipework bends to clear obstacles.		covered in PCT (underpins gd18)
		5. Select, position and fix pipework materials to specifications.		covered in PCT (underpins gd18)
		6. Join pipework to specifications.		covered in PCT (gd18)
4. Carry out electrical work safely.		1. Carry out work on electrical equipment, cables, wiring and components associated with the electrical supply and controls in accordance with the requirements of:		covered in PCT (gd17)

		a. industry recognised methods and procedures b. manufacturers' instructions		
5. Test and commission an air source heat pump system (non-refrigerant circuits).		1. Prepare an air source heat pump system for testing and commissioning to include checks/actions to confirm: ○ Compliance with the system design and specification ○ Compliance with system/component manufacturer requirements ○ The suitability of electrical supply circuit arrangements ○ Correct flushing the system of installation debris ○ Correct filling and venting the hydraulic circuits ○ Protection of the system against freezing.		covered in PCT (underpins gd21)
		2. Test the system for hydraulic soundness of the air source heat pump using appropriate test equipment in accordance with manufacturers' guidance, regulatory requirements, and industry recognised procedures		covered in PCT (gd21)
		3. Identify the commissioning requirements for the installation in relation to: ○ The system and component manufacturer(s) requirements ○ System design/specification requirements ○ The client orend user requirements ○ Statutory regulations and industry recognised procedures.		covered in PCT (underpins gd22)
		4. Commission the installation of an air source heat pump system in accordance with manufacturers' guidance, design requirements, client's requirements, and statutory requirements and industry recognised procedures.		covered in PCT (gd22)
		5. Complete relevant documentation to record the commissioning activities		covered in PCT (underpins gd22)
6. Handover an air source heat pump installation (non-refrigerant circuits)		1. Undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturers' guidance, the system design/specification, client's requirements, regulatory requirements and industry recognised requirements.		covered in PCT (underpins gd23)
		2. Explain and demonstrate to the end user the operation and use of the air source heat pump system using		covered in PCT (gd23)

		manufacturers' 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		covered in PCT (underpins gd23)
		4. Obtain acceptance by the end user of the system according to the industry agreed handover procedures.		covered in PCT (underpins gd23)
		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 manufacturers' guidance and industry recognised procedures		covered in PCT (underpins gd23)
7. Know the requirements for non-refrigerant circuit routine service and maintenance of an air source heat pump system installation (non-refrigerant circuits).		1. Know which documentation needs to be available to enable routine service and maintenance work on air source heat pump system installations.		covered in PCT (underpins gd25)
		2. Know typical routine service and maintenance requirements for an air source heat pump installation in relation to: ○ Visual inspection requirements ○ Cleaning of components ○ Checking of system water content ○ Functional tests.		covered in PCT (underpins gd25)
		3. Know the industry requirements for the recording and reporting of routine service and maintenance work on heat pump system installations.		covered in PCT (underpins gd25)
		4. Know 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.		covered in PCT (underpins gd25)
8. Undertake routine service and maintenance of an air source heat pump system (non-refrigerant circuits).		1. Obtain relevant documentation required to be enable a routine service and maintenance work on air source heat pump system installations.		covered in PCT (underpins gd25)
		2. Demonstrate knowledge of the routine servicing of relevant components of an air source heat pump installation, including checks in relation to: ○ External isolation is used		covered in PCT (underpins gd25)

		○ Evaporator fins for any blockage ○ Evaporator fins are cleaned ○ Fan is not obstructed and moving freely ○ Outer casing ○ Condensate drain functioning and not blocked ○ Condition of flexible hoses ○ Condition and grade of pipe insulation ○ Signs of system water leakage ○ Oil leaks or deposits ○ Condition and security of fixing system ○ Anti-vibration mounts ○ Fuse rating		
		3. Demonstrate knowledge of the routine servicing of an air source heat pump connected to hydraulic emitter circuits and controls, including checks in relation to: ○ Signs of system water leakage ○ Heating system water pressure ○ Heating system water content and makeup ○ Expansion vessel size and pressure ○ Pressure relief valve (prv) operation ○ System filters ○ System bypass ○ Buffer vessel if installed ○ Circulation pumps ○ Mechanical valves ○ Condition and grade of pipe insulation ○ Control unit and alarm logs ○ Heating settings ○ Hot water settings ○ Indoor and outdoor sensors or thermostats		covered in PCT (underpins gd25)
		4. Apply routine service or maintenance techniques including functional tests on an air source heat pump system to confirm: ○ Safe operation ○ Sufficient operation		covered in PCT (gd25)

		○ The function of system components and controls ○ Noise and vibration levels in accordance with: a. manufacturers' guidance b. regulatory requirements c. industry recognised procedures		
		5. Complete service and maintenance records.		covered in PCT (underpins gd25)
9. Undertake non-refrigerant circuit fault diagnosis work on an air source heat pump system installation.		1. Apply identification and rectification techniques on FOUR separate faults including functional tests on an air source heat pump system to confirm: ○ safe operation ○ efficient operation ○ the correct functioning of system components and controls in accordance with ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures		covered in PCT (gd24)
		2. Agree with the relevant person(s) fault rectification procedures for the faults identified.		covered in PCT (underpins gd24)
		3. Know the information that needs to be available to enable fault diagnosis		covered in PCT (underpins gd24)
		4. Know the work action and sequences required to diagnose and rectify the faults		covered in PCT (underpins gd24)
		5. Obtain the relevant information required to enable the fault diagnosis and fault rectification work		covered in PCT (underpins gd24)
		6. Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work		covered in PCT (underpins gd24)

Decommissioning – Option 2

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Decommission air source heat pump systems	0	1. Explain how to carry out decommissioning of an air source heat pump system in accordance with company procedures.	0	covered in IPE (gd58)
Questions in assessment				0
Questions in bank				0

EPAOs will need to provide the following equipment for practical assessment purposes. The provision must represent the type of equipment currently available in the domestic air source heat pump market. The simulation installation shall represent a realistic working environment for the apprentices when undertaking assessment. These must include:

- a working air source heat pump with a real or simulated heat distribution system (either radiators, underfloor heating or both).
- appropriate tools and test instrumentation, including refractometers, thermometers, purging and filling pumps.
- suitable faulty and replacement parts to suit the faults and defects utilised within the assessments (see specification in tables above for recommended faults)

The equipment provided for assessment must enable apprentices as a minimum to:

- connect the air source heat pump to the heat distribution system
- commission the air source heat pump
- maintain and service the air source heat pumps.
- diagnose and rectify faults on the air source heat pumps.

By 'working' it is not necessarily meant that the system is a permanent installation but will need to be a system that will produce a realistic output when assembled.

The EPA test specification below outlines specific areas of knowledge and skills that should be assessed and is provided to EPAOs for the development of the knowledge Test for solar thermal systems.

Know the requirements to install, commission and handover solar thermal systems

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
1. Know the health and safety risks and safe systems of work associated with solar thermal system installation work	4	1. Identify which aspects of solar thermal system installation work pose risk of: ○ electrocution/electric shock ○ burns ○ toxic poisoning ○ injury through flash to steam of system heat transfer fluid ○ a fall from height ○ personal injury though component / equipment handling	4	
		2. Identify safe systems of work for solar thermal system installation work in relation to prevention of: ○ electrocution/electric shock ○ burns ○ toxic poisoning ○ injury through flash to steam of system heat transfer fluid ○ a fall from height ○ personal injury though component/equipment handling	4	
2. Know the requirements of relevant regulations/standards relating to practical installation, testing, and commissioning activities for solar thermal system installation work	3	1. Interpret building regulation/building standards guidance documentation as relevant to solar thermal system installation work to identify the requirements in relation to: ○ maintaining the structural integrity of the building ○ maintaining the fire-resistant integrity of the building ○ the prevention of moisture ingress (building water tightness) ○ notification of work requirements	2	

		○ control of temperature in primary and secondary circuits including primary circuits connected to unvented hot water storage systems ○ energy conservation ○ testing and commissioning requirements ○ compliance certification		
		2. Interpret industry recognised water regulation/byelaw guidance documentation as relevant to solar thermal system installation work to identify the requirements in relation to: ○ prevention of contamination of the wholesome water supply ○ energy conservation ○ safe operation ○ testing and commissioning requirements	4	
3. Know the types and layouts of solar thermal system	3	1. Identify the following solar thermal system types: ○ Fully filled (active) ○ Drain back (active) ○ Passive (thermo-siphon)	2	
		2. Identify the following solar thermal system storage vessel types and collector circuit arrangements: ○ direct (fully filled) DHW storage cylinder only ○ indirect, sealed collector circuit, DHW storage cylinder only (solar primary coil only) ○ indirect, sealed collector circuit, DHW storage cylinder only (dual coil) ○ indirect, sealed collector circuit, pre-heat cylinder and DHW storage cylinder ○ indirect, sealed collector circuit, thermal store	4	
4. Know the purpose of components used within solar thermal system installations	2	1. Know the purpose of the following solar thermal system components: ○ differential temperature controller ○ cylinder sensor(s) ○ solar collector sensor ○ drain back vessel	0	covered in PPT (associated with gd65)

		○ flow meter ○ flow regulator (mechanical) ○ expansion vessel		
5. Know the types and key operating principles of solar collectors	3	1. Identify the following types of solar collector: ○ unglazed collector ○ flat plate glazed collector ○ roof integrated glazed collector ○ evacuated tube collector – direct flow ○ evacuated tube collector – heat pipe	4	
		2. Identify the key operating principles for: ○ flat plate collectors ○ evacuated tube collector – direct flow ○ evacuated tube collector – heat pipe	2	
		3. Identify the effect that the temperature difference between the solar primary circuit/collector temperature and the ambient temperature has on the relative efficiency of the following types of solar collector: ○ unglazed collector ○ flat plate glazed collector ○ evacuated tube collector	2	
6. Know the information requirements to enable system component selection and sizing	2	1. Plan solar thermal systems	0	covered in PPT (associated with gd65)
		2. Determine the information requirements in relation to: ○ building design ○ building dimensions/angles ○ building location and orientation ○ building fabric/material details ○ existing input services ○ existing hot water/heating systems	0	covered in PPT (associated with gd65)
		3. Identify the information requirements in relation to: ○ building occupancy	2	

		○ required hot water usage pattern		
7. Know the fundamental techniques used to select, size and position components for solar thermal systems	10	1. Determine or use typical domestic hot water system storage vessel requirements in relation to: ○ daily demand (Vd) (litres/day per person or litres/day per m^2 of floor area) ○ boiler volume (Vb) ○ dedicated solar volume (Vs) (litres per m^2 of collector area or as a % or Vd) ○ total cylinder volume (Vt) ○ solar heat exchange coli surface area (m^2 of surface area in relation to collector flow rate and collector surface area)	0	covered in PPT (associated with gd65)
		2. Identify how to determine typical domestic hot water system collector area requirements in relation to: ○ building occupancy ○ proposed angle of collector installation ○ proposed orientation of collector installation ○ Shading that may affect collector performance	3	
		3. Identify the annual irradiation yield as a % of optimum in relation to: ○ collector orientation ○ collector angle ○ proposed orientation of collector installation ○ Shading that may affect collector performance	3	
		4. State typical recommended solar primary circuit circulation rates	3	
		5. Identify solar primary circuit pipe size requirements in relation to: ○ primary circuit circulation rates ○ collector area ○ primary circuit pipework length	3	
		6. Identify total solar primary circuit water content volume	3	

		7. Identify total solar primary circuit expansion vessel size requirements in relation to: ○ primary circuit water content volume ○ collector height above cylinder	3	
		8. Identify typical sizing requirements for drain back vessels in relation to: ○ net collector area ○ total volume of the system	3	
		9. Identify solar primary circuit dynamic pressure drop and circulating pump size requirements for: ○ fully filled systems ○ drain back systems	3	
8. Know how the performance of solar hot water systems is measured	3	1. Identify the meaning of the term 'solar fraction'	3	
		2. Identify factors that affect the solar fraction	3	
9. Know the preparatory work required for solar thermal system installation work	5	1. Identify the requirements in relation to: ○ authorisation for the work to proceed ○ the availability of appropriate access to all required work areas	2	
		2. Identify the requirements of pre-installation checks in relation to: ○ the suitability of the proposed location and position of the solar collector(s) for optimum collection capacity ○ the suitability of the building structure and the building fabric in relation to the installation of system components ○ verification that the generation capacity of the proposed solar hot water system installation is appropriate to the hot water system energy load and usage ○ the inspection of existing hot water/heating system installations ○ water quality ○ the availability of a suitable electrical input service	7	

		○ the proposed siting of key internal system components		
10. Know the requirements for connecting solar thermal system collector circuits to combination boiler domestic hot water circuits	2	1. Identify the suitability of combination boilers to receive preheated water	2	
		2. Identify the pipework layout and components required for connecting a solar thermal system to a combination boiler to include the: ○ arrangements for prevention of backflow ○ arrangements for ensuring that the combination boiler cold inlet supply water is provided at an appropriate temperature ○ arrangements for allowing stored hot water to be used directly from the store when the temperature of the stored water is appropriate	3	
11. Know the requirements for installing solar collector arrays	5	1. Identify the positioning and fixing requirements and where appropriate the weathering requirements for the following solar collector types: ○ flat plate, surface mounted, inclined roof with single lap roof covering ○ flat plate, surface mounted, inclined roof with double lap roof covering ○ flat plate, integrated, inclined single lap roof covering ○ flat plate, integrated, inclined double lap roof covering ○ evacuated tube, inclined single lap roof covering ○ evacuated tube, inclined double lap roof covering ○ frame mounted, inclined (roof, wall or ground) ○ frame mounted, horizontal (roof or ground)	7	
		2. Identify the pipework layout, component requirements and component positioning requirements for the following system types and collector array connection arrangements: ○ fully filled system, collector array connected in series	5	

		○ fully filled system, collector array connected in parallel ○ fully filled system, collector array connected with east/west split ○ drain back system, single collector array		
		3. Identify the requirements to achieve durable weather-tightness of buildings where collector array connection pipework passes through the building fabric	3	
		4. Identify when specialist equipment is required in relation to preventing irradiation reaching collector absorbers during installation	2	
12. Know the requirements for installing for solar thermal system pipework	5	1. Propose suitable pipework materials in relation to: ○ system operating temperatures ○ system operating pressures ○ system chemicals	0	covered in PPT (associated with gd65)
		2. Identify the requirements for pipework supports in relation to: ○ suitable materials ○ spacing of pipework supports	3	
		3. Identify suitable pipework jointing methods in relation to: ○ system operating temperatures ○ system operating pressures ○ system chemicals	3	
		4. Identify the requirements for pipework insulation for solar thermal system installation work in relation to: ○ system operating temperatures ○ system efficiency and performance ○ potential exposure of the insulation to ultra-violet rays/light ○ potential exposure of the insulation to adverse weather ○ the sections of installations that must be insulated	4	

		○ the sections of installations that must not be insulated ○ resistance to vermin attack		
		5. Identify the requirements for installing pressure relief valve discharge pipework in relation to: ○ routing of pipework ○ termination of pipework	3	
13. Know the requirements to test and commission solar thermal system installations		1. Identify the requirements to prepare for testing and commissioning in relation to: ○ compliance with the system design and specification ○ compliance with system/component manufacturer requirements ○ suitability of electrical supply circuit arrangements ○ flushing the system of installation debris ○ selection of suitable heat transfer fluid ○ filling and venting the hydraulic circuits ○ checking system water quality ○ protection against freezing ○ provision of system labelling	3	
		2. Identify what specialist equipment is required in relation to: ○ the introduction and checking of system freeze protection fluids ○ setting system pressure ○ checking the corrosion protection of the system	3	
		3. Identify the testing requirements for hydraulic circuits within solar thermal system installations in relation to: ○ hydraulic test pressure ○ hydraulic test duration	3	
		4. Know the commissioning requirements for a fully filled indirect sealed collector circuit installation in relation to: ○ setting of the expansion vessel charge pressure		knowledge covered in PCT if working on an indirect sealed collector circuit.

		○ setting of the system fluid level ○ setting of mechanical controls ○ setting of electrical controls and temperature sensors ○ system functional tests		(underpins gd29)
		5. Know the commissioning requirements for a fully filled drain back installation in relation to: ○ setting of the system fluid level ○ setting of mechanical controls ○ setting of electrical controls and temperature sensors ○ system functional tests		knowledge covered in PCT if working on a drain back system. (underpins gd29)
		6. Know the commissioning requirements for multiple collector arrays connected in series		covered in PCT (underpins gd29)
		7. Know the recording requirements for the commissioning of solar thermal system installations		covered in PCT (underpins gd29)
14. Know the requirements to handover solar thermal systems		1. Know the pre-handover checks that need to be carried out		covered in PCT (underpins gd30)
		2. Know industry handover procedures in relation to the: ○ provision of written information ○ provision of diagrammatic information ○ provision of verbal information or demonstration relating to system operation and use		covered in PCT (underpins gd30)
Questions in assessment				**47**
Questions in bank				**113**

Know the requirements to inspect, service and maintain ‘active’ solar thermal systems

Learning outcomes		Assessment criteria		Notes
1. Know the requirements for the routine service and maintenance of ‘active’ solar thermal systems		1. Know which documentation needs to be available to enable routine service and maintenance work on ‘active’ solar thermal systems		covered in PCT (underpins gd32)
		2. Know the typical routine service and maintenance requirements for fully filled systems in relation to: o visual inspection requirements o cleaning of components o checking of system water content o functional tests		covered in PCT (underpins gd32)
		3. Know the typical routine service and maintenance requirements for drain back systems in relation to: o visual inspection requirements o cleaning of components o checking of system water content o functional tests		covered in PCT (underpins gd32)
		4. Know the industry requirements for the recording and reporting of routine service and maintenance work on solar thermal systems		covered in PCT (underpins gd32)
2. Know how to diagnose faults in ‘active’ solar thermal system installations		1. Know the information that needs to be available to enable fault diagnosis		covered in PCT (underpins gd31)
		2. Know the work action and sequences required to diagnose the following faults: o loss of system pressure without evidence of discharge o discharge from pressure relief valve on the solar primary circuit o insulation melting on solar collector circuit pipework o overheating of solar collector circuit o lack of circulation within the solar collector circuit o poor or no system performance		covered in PCT (underpins gd31)

		○ system noise and/or vibration		
3. Know how to rectify faults in 'active' solar thermal systems		1. Know the work action and sequences required to rectify the following faults: ○ loss of system pressure without evidence of discharge ○ evidence of discharge valve on the solar primary circuit ○ insulation melting on solar collector circuit pipework ○ overheating of solar collector circuit ○ lack of circulation within the solar collector circuit ○ poor or no system performance ○ system noise and/or vibration		covered in PCT (underpins gd31)

Permitted Normative Document list for Solar Thermal MCT assessments

- MIS 3001
- MCS 024
- EPAOs are permitted to provide their own reference materials for this assessment

The EPA test specification below outlines specific areas of knowledge and skills that should be assessed and is provided to EPAOs for the development of the practical competence test (PCT) and practical planning test (PPT) for solar thermal systems.

Install, commission and handover 'active' solar thermal systems

Learning outcomes		Assessment criteria		**Notes**
1. Plan and prepare for the installation of 'active' solar thermal system		1. Undertake pre-installation checks for a solar hot water system installation to include checks relating to: ○ authorisation for the work to proceed ○ verification that the generation capacity of the proposed solar hot water system installation is appropriate to the hot water system load ○ the availability of appropriate access to all required work areas		covered in PCT (underpins gd26)

		○ the inspection of existing domestic hot water/heating system installations ○ 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 ○ the suitability of the proposed location and position of the solar collector panel(s)		
		2. Plan for optimum collection capacity: ○ the suitability of the building fabric in relation to the installation of the solar collector panel(s)		covered in PPT (associated with gd65)
		3. Confirm that the tools, materials, and equipment required for the installation work are available and are in a safe, usable condition		covered in PCT (underpins 26)
		4. Prepare a solar thermal system		covered in PCT (gd26)
2. Install solar thermal system components		○ Apply the processes and techniques used in the installation of a solar thermal system in accordance with manufacturers' guidance, regulatory requirements and industry recognised procedures,		covered in PCT (gd27)
3. Install system pipework.		1. Identify pipework installation requirements.		covered in PCT (underpins gd18)
		2. Select pipework materials and fittings from instructions.		covered in PCT (underpins gd18)
		3. Measure, mark and cut pipework materials for installation.		covered in PCT (underpins gd18)
		4. Fabricate pipework bends to clear obstacles.		covered in PCT (underpins gd18)
		5. Select, position and fix pipework materials to specifications.		covered in PCT (underpins gd18)
		6. Join pipework to specifications.		covered in PCT (gd18)

4. Carry out electrical work safely.		1. Carry out work on electrical equipment, cables/, /wiring and components associated with the electrical supply and controls in accordance with the requirements of: a. industry recognised methods and procedures b. manufacturers' instructions		covered in PCT (gd17)
5. Test and commission an 'active' solar thermal system		1. Prepare a fully filled or drain back solar thermal system for testing and commissioning to include checks/actions to confirm: ○ compliance with the system design and specification ○ compliance with system/component manufacturer requirements ○ the suitability of electrical supply circuit arrangements ○ correct flushing the system of installation debris ○ correct filling and venting the hydraulic circuits ○ protection of the system against freezing ○ adequate provision of system labelling		covered in PCT (underpins gd28)
		2. Test the solar thermal system for hydraulic soundness using appropriate test equipment in accordance with manufacturers' guidance, regulatory requirements, and industry recognised procedures		covered in PCT (gd28)
		3. Identify the commissioning requirements for the installation in relation to: ○ the system and component manufacturer(s) requirements ○ system design/specification requirements ○ the client or end user requirements ○ statutory regulations and industry recognised procedures		covered in PCT (underpins gd29)
		4. Commission a fully filled or drain back system in accordance with manufacturers' guidance, design requirements, client's requirements, statutory requirements, industry recognised procedures		covered in PCT (gd29)
		5. Complete relevant documentation to record the commissioning activities		covered in PCT (underpins gd29)
6. Handover an 'active' solar thermal system		1. Undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturers' guidance, the system design and specification, client's		covered in PCT (underpins gd30)

		requirements, regulatory requirements and industry recognised requirements		
		2. Explain and demonstrate to the end user the operation and use of the solar thermal system using manufacturers' guidance and industry agreed handover procedures		covered in PCT (gd30)
		3. Identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements		covered in PCT (underpins gd30)
		4. Obtain acceptance by the end user of the system according to the industry agreed handover procedures		covered in PCT (underpins gd30)
		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 manufacturers' guidance and industry recognised procedures		covered in PCT (underpins gd30)

Inspect, service and maintain 'active' solar thermal systems

Learning outcomes		Assessment criteria		**Notes**
1. Undertake the routine service and maintenance of an 'active' solar thermal system		1. Obtain the relevant information required to enable the work to commence		covered in PCT (underpins gd32)
		2. Undertake a visual service and maintenance inspection of a fully-filled or drain back, 'active' solar thermal system installation to include checks in relation to: ○ compliance with manufacturer's installation instructions ○ compliance with statutory regulations ○ condition of system components including cleanliness ○ correct positioning of system components ○ security of fixing of system components		covered in PCT (underpins gd32)

		3. Undertake routine service and maintenance of relevant components on a fully-filled or drain back, 'active' solar thermal system to include: ○ checking the system water levels ○ checking provision for the expansion of system water ○ checking for protection of the system water against freezing ○ cleaning of system components adjustment of system controls		covered in PCT (gd32)
		4. Apply routine service or maintenance techniques including functional tests on a fully-filled or drain back solar thermal system to confirm: ○ safe operation ○ efficient operation ○ the correct functioning of system components and controls in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures		covered in PCT (gd32)
		5. Complete the relevant service and maintenance records in accordance with industry recognised procedures		covered in PCT (underpins gd32)
2. Undertake fault diagnosis work on 'active' solar thermal system installations		1. Obtain the relevant information required to enable the fault diagnosis work		covered in PCT (underpins gd31)
		2. Identify the cause of a minimum of TWO separate faults from the following list: ○ loss of system pressure without evidence of discharge ○ discharge from pressure relief valve on the solar primary circuit ○ insulation melting on solar collector circuit pipework ○ overheating of solar collector circuit ○ lack of circulation within the solar collector circuit ○ poor or no system performance ○ system noise and/or vibration		covered in PCT (underpins gd31)
		3. Agree with the relevant person(s) fault rectification procedures for the faults identified		covered in PCT (underpins gd31)

3. Undertake fault rectification work on 'active' solar thermal system installations		1. Obtain the relevant information required to enable the fault rectification work		covered in PCT (underpins gd31)
		2. Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work		covered in PCT (underpins gd31)
		3. Take relevant precautionary actions to minimise the risk of injury to self or others during the fault rectification work		covered in PCT (underpins gd31)
		4. Apply identification and rectification techniques on a minimum of TWO separate faults on a solar thermal systems to confirm: ○ safe operation ○ efficient operation ○ the correct functioning of system components and controls in accordance with ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures		covered in PCT (gd31)

Decommissioning – Option 2				
Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Decommission solar thermal systems	0	1. Explain how to carry out decommissioning of a solar thermal system in accordance with company procedures.	0	covered in IPE (gd58)
Questions in assessment				0
Questions in bank				0

EPAOs will need to ensure that the following equipment for assessment purposes is provided in the assessment centre. The provision must represent the type of equipment currently available in the domestic solar thermal systems market. The simulation

installation(s) shall represent a realistic working environment for the apprentices when undertaking assessment. These must include:

- assessment facilities that simulate the domestic installation environment with an adequate degree of realism. Equipment for practical training and assessment should consist of commercially available systems or individual components, which are appropriate for use in the domestic solar thermal systems.
- as wide a range of system types and configurations as possible. As a minimum for this assessment, learners must have the opportunity to learn how to install components for both drain back and fully filled systems but will only be assessed on one of the two systems.
- appropriate tools and test instrumentation, including AC voltage and current meters, thermometers, refractometers, etc.
- suitable faulty and replacement parts to suit the faults/defects utilised within the assessments.

By ‘working’ it is not necessarily meant that the system is a permanent installation but will need to be a system that will produce a realistic output when assembled.

Appendix 4

Option 3 Non-domestic plumbing technician

The EPA test specification outlines specific areas of knowledge and skills that should be assessed and is provided to End-Point Assessment Organisations for the development of the knowledge test, practical competence test (PCT), and interview underpinned by a portfolio of evidence (IPE).

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Understand health and safety risks and legislation associated with common processes for fabricating installing and testing non-domestic plumbing systems.	1	1. Identify which aspects of installation work pose health and safety risks	2	
		2. Identify safe systems of work for installation work	1	
		3. Identify legislation relevant to installation, testing and commissioning.	1	
Use hand and power tools in non-domestic plumbing systems work.	1	1. Identify the purpose of hand tools and power tools used in non-domestic plumbing systems work.	0	covered in PCT (underpins gd33)
		2. Visually inspect and use hand and power tools applicable to non-domestic plumbing systems work.	0	covered in PCT (gd33)
Know types of non-domestic plumbing systems pipework and their jointing principles.	1	1. Identify pipework materials and sizes used in non-domestic plumbing systems.	3	
		2. Identify fitting types used in non-domestic plumbing systems	2	
		3. Identify methods of jointing pipework used in non-domestic plumbing systems	1	
		4. Identify methods of bending pipework used in non-domestic plumbing systems.	1	
Understand site preparation techniques for non-domestic		1. Identify work methods for preparing and protecting the building for installation work.	1	

plumbing systems work.	1	2. Identify the pre-existing damage checks to the building fabric or customer property before the work commences.	1	
		3. Identify the methods of safe storing of tools, equipment.	1	
		4. Identify sources of information for carrying out preparatory work.	1	
Use clips and brackets to support non-domestic plumbing pipework and components	0	1. Measure and mark out fixings to non-domestic pipework and components.	0	covered in PCT (underpins gd34)
		2. Identify types of fixing devices.	0	covered in PCT (underpins gd34)
		3. Identify clip and bracket types.	0	covered in PCT (underpins gd34)
		4. Select and fix clips and brackets appropriate to the system pipework and the industry recommended spacing.	0	covered in PCT (gd34)
Install non-domestic plumbing pipework.	0	1. Identify pipework installation requirements.	0	covered in PCT (underpins gd35)
		2. Select pipework materials and fittings from instructions.	0	covered in PCT (underpins gd35)
		3. Measure, mark and cut pipework materials for installation.	0	covered in PCT (underpins gd35)
		4. Fabricate pipework bends to clear obstacles.	0	covered in PCT (underpins gd35)
		5. Select, position and fix pipework materials to specifications.	0	covered in PCT (underpins gd35)
		6. Apply the processes and techniques used in the installation of pipework to specification.	0	covered in PCT (gd35)
Questions in assessment				**4**
Questions in bank				**15**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Understand cold water supply to non-domestic premises.		1. Identify the typical mains water distribution system from treatment works to non-domestic premises.	1	

	1	2. Identify the types of water supply to non-domestic premises and how these are regulated.	2	
		3. Identify the different types of water and uses of water in non-domestic premises	2	
		4. Identify the private supply water treatment processes and typical pipework systems from source to properties.	1	
		5. Identify water service to the premises and isolation points	1	
		6. Identify the requirements to provide water whilst preventing waste, undue consumption, misuse or contamination.	2	
Questions in assessment				**1**
Questions in bank				**9**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Understand and recognise the layouts of non-domestic plumbing systems.	2	1. Identify types and layout features of cold water systems in non-domestic and multi-storey premises.	4	
		2. Identify the types and layout features of hot water systems non-domestic premises.	2	
		3. Identify the types and layout features of sanitary pipework systems in non-domestic and multi-storey premises.	2	
		4. Identify the types and layout features of rainwater systems: pipe (RWP) and gutter in non-domestic premises	1	
Install cold water systems in non-domestic and multi-storey premises.		1. Identify fluid categories of water and uses of water supplied to non-domestic premises	2	
		2. Identify the advantages and disadvantages of cold water systems applicable to non-domestic and multi-storey premises.	2	
		3. Identify the working principles of cold water systems applicable to non-domestic and multi-storey premises.	2	

	2	4. Identify layout and installation requirements for protected cold water storage cisterns ≤ 1000 litres capacity	2	
		5. Identify insulation requirements, system frost protection and prevention of undue warming of cold water systems	1	
		6. Identify the positioning and fixing of pipework within the building fabric	0	covered in IPE (underpins gd59)
		7. Identify sources of information required when undertaking work on systems in non-domestic premises	0	covered in IPE (underpins gd59)
		8. Identify backflow risk and required methods of prevention	1	
		9. Explain how to install cold water systems in non-domestic premises.	0	covered in IPE (gd59)
Install hot water systems in non-domestic premises.	2	1. Identify advantages and disadvantages of hot water systems applicable to non-domestic premises.	2	
		2. Identify types and typical pipe sizes used in hot water systems within non-domestic premises.	2	
		3. Identify working principles of hot water systems, positioning fixing, connection and operation of components	2	
		4. Identify working principles of hot water systems, positioning fixing, connection and operation of components	2	
		5. Identify the positioning and fixing of pipework within the building fabric	0	covered in IPE (underpins gd59)
		6. Identify expansion and contraction in hot water systems and negative effects	1	
		7. Identify secondary circulation and how trace heating can be used	1	
		8. Identify sources of information required when undertaking work on systems in non-domestic premises.	0	covered in IPE (underpins gd59)
		9. Identify backflow risk and required methods of prevention	1	
		10. Explain how to install hot water systems in non-domestic premises.	0	covered in IPE (gd59)

Install sanitary appliances and pipework systems in non-domestic and multi storey premises	2	1. Identify advantages and disadvantages of sanitary appliance pipework systems applicable to non-domestic and multi-storey premises.	2	
		2. Identify types and typical pipe sizes and maximum permitted distances used in sanitary appliance pipework within non-domestic and multi-storey premises.	1	
		3. Identify working principles of sanitary appliances pipework systems, positioning fixing, connection and operation of components applicable to non-domestic and multi-storey premises	2	
		4. Identify the positioning and fixing of pipework within the building fabric	0	covered in IPE (underpins gd59)
		5. Identify expansion and contraction in sanitary appliances pipework systems applicable to non-domestic and multi-storey premises and its negative effects	1	
		6. Identify sources of information required when undertaking work on systems in non-domestic premises.	0	covered in IPE (underpins gd59)
		7. Identify different types of sanitary appliances and components used in non-domestic and healthcare premises	2	
		8. Identify the suitability of below ground drainage systems to receive waste water from non-domestic and health care premises	2	
		9. Identify the installation features of sanitary facilities and equipment for the disabled in buildings other than dwellings	1	
		10. Explain how to install sanitary appliances and pipework systems in non-domestic premises.	0	covered in IPE (gd59)
Install rainwater systems in non-domestic premises		1. Identify advantages and disadvantages of rainwater systems applicable to non-domestic premises.	1	
		2. Identify typical sizes and materials used in rainwater systems: pipe (RWP) and gutter applicable to non-domestic premises.	2	

	1	3. Identify working principles of rainwater systems, (positioning fixing, connection and operation of components) applicable to non-domestic premises.	1	
		4. Identify sources of information required when undertaking work systems in non-domestic premises	0	covered in IPE (underpins gd59)
		5. Identify expansion and contraction in rainwater systems applicable to non-domestic premises and its negative effects	1	
		6. Identify the positioning and fixing of pipework within the building fabric.	0	covered in IPE (underpins gd59)
		7. Explain how to install rainwater systems in non-domestic premises.	0	covered in IPE (gd59)
Questions in assessment				**9**
Questions in bank				**46**

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Decommission non-domestic plumbing systems	0	1. Explain how to carry out decommissioning of cold water systems in non-domestic premises in accordance with company procedures	0	covered in IPE (gd60)
		2. Explain how to carry out decommissioning of hot water systems in non-domestic premises in accordance with company procedures	0	covered in IPE (gd60)
		3. Explain how to carry out decommissioning of sanitary appliances and pipework systems in non-domestic in accordance with company procedures	0	covered in IPE (gd60)
		4. Explain how to carry out decommissioning of rainwater systems in non-domestic premises in accordance with company procedures	0	Covered in IPE (gd60)
Questions in assessment				0
Questions in bank				0

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Perform a soundness test and commission pipework in non-domestic premises		1. Identify information sources required to complete testing of pipework in a non-domestic premises.	0	covered in PCT (underpins gd36)
		2. Carry out a visual inspection of pipework to confirm that it is ready to be soundness tested.	0	covered in PCT (underpins gd36)
		3. Test the pipework in a non-domestic premises using appropriate test equipment.	0	covered in PCT (gd36)
Perform a soundness test and commission cold water systems and components in non-domestic and multi-storey premises	2	1. Identify information sources required to complete testing and commissioning of a cold water system in a non-domestic premises	0	covered in PCT (underpins gd38)
		2. Identify how to fill and vent cold water systems in non-domestic and multi-storey premises.	1	
		3. Carry out a visual inspection of a cold water system in a non-domestic premises to confirm that it is ready to be soundness tested	0	covered in PCT (underpins gd38)
		4. Identify the flushing requirements including the use of system additives for new and existing cold water systems in non-domestic and multi-storey premises	1	
		5. Carry out a soundness test on a cold water system in a non-domestic premises in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures	0	covered in PCT (gd38)
		7. Know the operational checks required during commissioning.	0	covered in PCT (underpins gd40)
		8. Identify the range of information that would be detailed on commissioning documentation	0	covered in PCT (underpins gd40)
		9. Identify actions that must be taken when commissioning reveals defects	0	covered in PCT (underpins gd40)
		10. Know the pre-handover checks that need to be carried out	0	covered in PCT (underpins gd41)

		11. 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 manufacturers' guidance and industry recognised procedures.	0	covered in PCT (underpins gd41)
		12. Explain and demonstrate to the end user the operation and use of a cold water system using manufacturers' guidance and industry agreed handover procedures	0	covered in PCT (gd41)
		13. Commission a cold water system of a non-domestic premises in accordance with: ○ manufacturers' guidance ○ design requirements ○ statutory requirements ○ industry recognised procedures	0	covered in PCT (gd40)
Perform a soundness test and commission hot water systems and components in non-domestic premises	2	1. Identify information sources required to complete testing and commissioning on hot water systems in non-domestic premises	0	covered in PCT (associated with gd38)
		2. Identify how to fill and vent hot water systems in non-domestic premises	1	
		3. Carry out a visual inspection of a hot water system in a non-domestic premises to confirm that it is ready to be soundness tested	0	covered in PCT (associated with gd38)
		4. Carry out a soundness test to industry requirements on hot water systems pipework and components applicable to non-domestic premises.	0	covered in PCT (associated with gd38)
		5. Identify the flushing requirements including the use of system additives for new and existing hot water systems in non-domestic premises	1	
		6. Know operational checks required during commissioning of hot water systems in non-domestic premises.	0	covered in PCT (associated with gd40)
		7. Identify the range of information that would be detailed on commissioning documentation of hot water systems in non-domestic properties.	0	covered in PCT (associated with gd40)

		8. Identify actions that must be taken when commissioning of hot water systems in non-domestic properties reveals defects.	0	covered in PCT (associated with gd40)
		9. Carry out the procedure for handing over hot water systems in non-domestic premises to the end user	0	covered in PCT (associated with gd41)
		10. Carry out commissioning procedures for hot water systems in non-domestic premises.	0	covered in PCT (associated with gd40)
Perform a soundness test and commission sanitary appliances, pipework systems and components in non-domestic and multi-storey premises	1	1. Carry out a visual inspection of a sanitary appliances and pipework system in a non-domestic premises to confirm that it is ready to be soundness tested.	0	covered in PCT (underpins gd43)
		2. Identify information sources required to complete testing and commissioning of a sanitary appliances and pipework system in a non-domestic premises	0	covered in PCT (underpins gd43)
		3. Identify a soundness test to industry requirements on sanitary appliances pipework systems and components in non-domestic and multi-storey premises	1	
		4. Know the operational checks required during commissioning	0	covered in PCT (underpins gd45)
		5. Identify the range of information that would be detailed on commissioning documentation	0	covered in PCT (underpins gd45)
		6. Identify actions that must be taken when commissioning reveals defects	0	covered in PCT (underpins gd45)
		7. Follow the procedure for handing over to the end user	0	covered in PCT (underpins gd46)
		8. Carry out a soundness test on a sanitary appliance and pipework system in a non-domestic premises in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures.	0	covered in PCT (gd43)
		9. Commission the sanitary appliance and pipework system of a non-domestic premises in accordance with: ○ manufacturers' guidance ○ design requirements ○ statutory requirements	0	covered in PCT (gd45)

		○ industry recognised procedures		
		10. Explain and demonstrate to the end user the operation and use of a sanitary appliance and pipework system using manufacturers' guidance and industry agreed handover procedures	0	covered in PCT (gd46)
		11. Know the pre-handover checks that need to be carried out.	0	covered in PCT (underpins gd46)
		12. 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 manufacturers' guidance and industry recognised procedures.	0	covered in PCT (underpins gd46)
Perform a soundness test and commission rainwater systems in non-domestic premises	0	1. Identify information sources required to complete testing and commissioning of rainwater systems in non-domestic properties	0	covered in PCT (associated with gd53)
		2. Carry out a visual inspection of a rainwater systems in non-domestic premises to confirm that it is ready to be soundness tested	0	covered in PCT (associated with gd52)
		3. Carry out a soundness test to industry requirements on rainwater/gutter systems pipework and components in non-domestic premises	0	covered in PCT (associated with gd52)
		4. Know operational checks required during commissioning of rainwater systems in non-domestic properties	0	covered in PCT (associated with gd53)
		5. Identify actions that must be taken when commissioning of rainwater systems in non-domestic premises reveals defects	0	covered in PCT (associated with gd53)
		6. Carry out the procedure for handing over rainwater systems in non-domestic properties to the end user	0	covered in PCT (associated with gd54)
		7. Carry out soundness testing commissioning procedures on rainwater systems.	0	covered in PCT (associated with gd53)
Questions in assessment				**5**
Questions in bank				**5**

Learning outcomes	Ques in Ass't	Assessment criteria	Min Ques in bank	Notes
Perform fault diagnosis and rectification procedures on cold water systems and components in non-domestic and multi-storey premises	0	1. Obtain the relevant information required to enable the fault rectification work	0	covered in PCT (underpins gd37)
		2. Carry out diagnostic checks for a range of faults	0	covered in PCT (underpins gd37)
		3. Apply identification and rectification techniques on a fault on a cold water non-domestic system to confirm: ○ safe operation ○ sufficient operation ○ the correct functioning of system components in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures	0	covered in PCT (gd37)
Perform fault diagnosis and rectification procedures on hot water systems and components in non-domestic premises	0	1. Perform fault diagnosis and rectification procedures on hot water systems and components in non-domestic premises	0	covered in PCT (associated with gd37)
		2. Carry out diagnostic checks for a range of faults on hot water systems in non-domestic properties	0	covered in PCT (associated with gd37)
		3. Carry out repair and rectification procedures to deal with a range of faults on hot water systems in non-domestic properties	0	covered in PCT (associated with gd37)
Perform fault diagnosis and rectification procedures on sanitary appliances and pipework in non-domestic and multi-storey premises.	0	1. Obtain the relevant information required to enable the fault rectification work	0	covered in PCT (underpins gd42)
		2. Carry out diagnostic checks for a range of faults	0	covered in PCT (underpins gd42)
		3. Apply identification and rectification techniques on a fault on a sanitary appliance and pipework system in a non-domestic premises to confirm: ○ safe operation ○ sufficient operation	0	covered in PCT (gd42)

		○ the correct functioning of system components in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures		
Perform fault diagnosis and rectification procedures on rainwater systems and components on non-domestic premises	0	1. Identify methods of obtaining information on system faults for rainwater systems in non-domestic premises.	0	covered in PCT (associated with gd55)
		2. Carry out diagnostic checks for a range of faults on rainwater systems in non-domestic premises.	0	covered in PCT (associated with gd55)
		3. Carry out repair and rectification procedures to deal with a range of faults on rainwater systems in non-domestic premises.	0	covered in PCT (associated with gd55)
Questions in assessment				**0**
Questions in bank				**0**

Learning outcomes	**Ques in Ass't**	Assessment criteria	**Min Ques in bank**	**Notes**
Carry out service and maintenance on cold water systems in non-domestic and multi-storey premises	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Identify routine checks required on cold water system components and pipework as part of a periodic maintenance programme	2	
		3. Identify types of information to be provided on a maintenance record for cold water systems	0	covered in PCT (underpins (gd39)
		4. Identify requirements for legionella and bacterial growth control measures	2	
		5. Know the typical routine service and maintenance requirements for cold water systems in relation to: ○ visual inspection requirements	0	covered in PCT (underpins (gd39)

		○ cleaning of components ○ checking of system functional tests		
		6. Complete the relevant service and maintenance records in accordance with industry recognised procedures.	0	covered in PCT (underpins (gd39)
		7. Apply routine service or maintenance techniques on a cold water system in a non-domestic premises to confirm: ○ safe operation ○ sufficient operation ○ the correct functioning of system components in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures	0	covered in PCT (gd39)
Carry out service and maintenance on hot water systems in non-domestic premises	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Know the routine checks required on hot water system components and pipework as part of a periodic maintenance programme	0	covered in PCT (associated with gd39)
		3. Identify types of information to be provided on a maintenance record for hot water systems	0	covered in PCT (associated with gd39)
		4. Identify requirements for legionella and bacterial growth control measures	2	
		5. Carry out service and maintenance of hot water systems.	0	covered in PCT (associated with gd39)
Carry out service and maintenance on sanitary appliances and pipework systems in non-domestic and multi-storey premises	1	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	2	
		2. Identify routine checks required on sanitary appliances and pipework systems as part of a periodic maintenance programme	2	
		3. Identify types of information to be provided on a maintenance record for sanitary appliances and pipework systems	2	

		4. Know the typical routine service and maintenance requirements for sanitary appliances and pipework systems in relation to: ○ visual inspection requirements ○ cleaning of components ○ checking of system functional tests	0	covered in PCT (underpins gd44)
		5. Complete the relevant service and maintenance records in accordance with industry recognised procedures.	0	covered in PCT (underpins gd44)
		6. Apply routine service or maintenance techniques on a sanitary appliance and pipework system in a non-domestic premises to confirm: ○ safe operation ○ sufficient operation ○ the correct functioning of system components in accordance with: ○ manufacturers' guidance ○ regulatory requirements ○ industry recognised procedures	0	covered in PCT (gd44)
Questions in assessment				**3**
Questions in bank				**16**

Non-domestic Plumbing Practical Competence Test Guidance

Practical Competence test

A pipework installation (28mm and 35mm diameter) exercise to include different pipework materials, for example copper, stainless steel and plastic pressure pipe and fittings including soldered, compression, crimped and solvent welded joints, with appropriate bracketing and fixings.

Practical competence test

Servicing**,** recommissioning, fault finding and rectification on an indirect boosted cold system and non-domestic sanitation system, the system to include:

- a low level CWSC with a low water level float switch and a Type AB air gap and weir overflow
- a twin pump cold water booster set and accumulator
- high level CWSC with a delayed action float operated valve

- 3 hand basins fed directly from the booster pump and connected to a common waste pipe and soil stack
- 3 WCs with solenoid flushing valves fed from the high level CWSC and connected to the same common soil pipe as the hand basins