Qualification Specification

DPH-004

BPEC Level 3 NVQ Diploma in Domestic Plumbing and Heating (Gas Water Heating and Wet Central Heating Appliances)

Qualification Number – **600/6284/8**

Content

About BPEC

BPEC Certification Ltd was initially established in 1997 to act as an accredited certification body to oversee competence assessment of individuals working in the gas industry. It has extended its coverage and now offers a range of assessment and certification services to meet the needs of operatives working in the Building Services Sector.

In 2010 BPEC established a recognised Awarding Organisation, offering a suite of regulated qualifications. These have been developed with the input of industry and learning providers to meet the skills needs of the Building Services Engineering sector.

The Company is committed to high levels of customer service and providing support to organisations who deliver our qualifications. We are also committed to offering qualifications, assessments and learning materials, which meet the needs of employers, learners, and training providers on an ongoing basis.

BPEC Certification is a not-for-profit company, and any surplus funds are gift aided to the BPEC Charity. The focus of the Charity is to raise the knowledge and skills of those who work in the UK plumbing and heating industry and support associated projects, grants, and awards.

Should you wish to learn more about BPEC (including our charity work) please contact:

BPEC Certification Ltd
1-2 Mallard Way
Pride Park
Derby
DE24 8GX

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Or visit our website at:

www.bpec.org.uk

1. Introduction to the Qualification

1.1. Qualification Overview

Qualification Title		BPEC Level 3 NVQ Diploma in Domestic Plumbing and Heating (Gas Water Heating and Wet Central Heating Appliances).			
Qualification Number (QN)		600/6248/8			
BPEC Qualification Code		DPH-004			
Assessment Method/s		Online MCT's**,** Written Design Assignment, In Centre Practical Assessments, Summative Gas Assessments, On-site Assessments			
Entry Requirements		Learners must be 16 years old or over			
GLH	1034	**TQT**	1460	**Credits**	146
Mandatory Units		13			
Last Registration Date		30/09/2023			
Last Certification Date		30/09/2026			

1.2. Who this Qualification is for?

This Qualification is for those Learners currently employed in the Plumbing and Domestic Heating industry as an apprentice plumber/domestic heating engineer. Learners will be required to demonstrate the necessary abilities, skills, and knowledge to be able to plan, select, install, and commission all aspects of plumbing and heating systems. in addition to this, Learners will also demonstrate a knowledge of service, maintenance and fault diagnosis and rectification of plumbing and heating systems.

1.3. The Purpose of the Qualification

For Learners to be able to further develop those skills learned at Level 2 deemed necessary for a career in the Plumbing and Domestic Heating industry.

1.4. Support and Accreditation

This qualification is supported by industry and regulated by OFQUAL.

1.5. Relationship to Other Qualifications

This Level 3 qualification is part of a suite of three (3) BPEC NVQ Diploma qualifications in domestic plumbing and heating.

Successful completion of this qualification proves that learners are competent to install, commission, decommission service and maintain domestic plumbing and heating systems, components, and appliances.

Successful completion of this qualification also allows Learners to pursue a Higher National Certificate (Level 4 HNC) or Higher National Diploma (Level 5 HND) in Building Services Engineering (mechanical).

1.6. Pre-requisites for the qualification

The Learner must have completed a Level 2 Diploma in Plumbing Foundation or equivalent.

2. Qualification Structure

This is a Level 3 qualification of 146 credits and 1034 guided learning hours consisting of 13 mandatory units. ALL units must be successfully completed to achieve the overall qualification.

Successful completion of this qualification proves that learners are competent to install, commission, decommission service and maintain domestic plumbing and heating systems, components, and appliances. The qualification and unit details are shown below:

Unit Ref.	Unit Type	Unit Title	Level	Credit Value	TQT	GLH
R/602/2498	K	Understand how to organise resources within BSE	3	3	1460	26
K/502/8930	K/P	Understand and apply domestic cold water system installation, commissioning, service, and maintenance techniques	3	9		76
K/502/9155	K/P	Understand and apply domestic hot water system installation, commissioning, service, and maintenance techniques	3	9		76
M/502/9156	K/P	Understand and apply domestic central heating system installation, commissioning, service, and maintenance techniques	3	12		98
T/502/9157	K/P	Understand and carry out electrical work on domestic plumbing and heating systems and components	3	12		102
D/502/9296	K/P	Understand and apply domestic sanitation system installation, commissioning, service, and maintenance techniques	3	8		72
K/502/9298	P	Install, commission, service and maintain domestic plumbing and heating systems	3	3		4
J/502/9390	K	Understand core gas safety principles for natural gas within domestic building services engineering	3	13		120
H/502/8487	K/P	Specific Core Installation & Maintenance	3	21		120
T/502/8381	K/P	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises	3	19		115
D/503/8628	K/P	Tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations.	2	3		16
Y/502/8454	K/P	Install domestic gas water heaters and wet central heating appliances	3	18		134
T/502/8459	K/P	Maintain gas water heating and wet central heating appliances	3	16		75
		Totals	---	**146**	**1460**	**1034**

Completion of this Qualification Combination will enable Gas Safe Registration in the following categories: **CCN 1, CENWAT, CPA 1, MET1/2, CoNGLP1 PD**

2.1. The GAS training requirements of IGEM/IG/1 Supplement 2

From September 1st, 2022, GAS training for this qualification must comply with the relevant requirements for the **Standards of Training in Gas Work IGEM/IG/1 supplement 2, 2022**, a copy of which can be downloaded from here.

3. The Learners

1.7. 3.1. Qualifications that the Learner must have completed before taking the Qualification

BPEC NVQ Level 2 in Domestic Plumbing and Heating or equivalent

3.2. Knowledge, skills or understanding that the Learner is required to have before taking the qualification

a) Specific

None that are applicable

b) General

The centre should:

- Undertake initial assessment of each Learner to ensure that they have the minimum levels of numeracy and literacy to comply with the health and safety aspects of the qualification and the completion of the Learning Outcomes and assessments.
- Establish if the Learner has any specific training needs
- Identify any support and guidance the Learner may require when working towards the qualification.

3.3. The Units the Learner must have completed before the Qualification will be awarded

Learners will need to complete all 13 mandatory Units.

3.4. Any other requirements which a Learner must have satisfied before the Learner will be assessed or before the Qualification is awarded

None identified

3.5. Qualification achievement

The Qualification will be awarded when all necessary Units have been completed.

4. Delivery requirements

4.1. Centre Recognition

Centres wishing to deliver this qualification will need to gain Centre Recognition and Qualification Approval. For full details of the recognition process please contact:

BPEC Certification

1-2 Mallard Way
Pride Park
Derby
DE24 8GX
Tel: 01332 376000
aoadmin@bpec.org.uk

4.2. Qualification Approval

- Centres wishing to deliver this Qualification who are already recognised (see 5.1) should complete and submit a Qualification Approval Form to BPEC Certification Ltd.
- Before submission, centres should ensure that they can meet the delivery requirements.
- Centres who are approved to deliver this qualification and wish to extend delivery to satellite sites must seek approval for each additional site.

4.3. Physical Resources

- General – Centres must provide a safe environment for Learners and staff with appropriate policies and procedures in place which are adhered to.
- Teaching Provision – Centres must provide adequate facilities and equipment to allow the effective teaching of the qualification including any practical provision.
- Assessments/Exam Provision – Centres must provide facilities and equipment which allow assessments and exams to be conducted in accordance with the assessment criteria/guidance and exam procedures.

4.4. Assessor/Trainer Requirements

Assessors must:

- Hold, or be working towards TAQA (A1/A2 – D32/33 updated) standards and continue to practice to these standards and possess CPD evidence of personally maintaining these standards, or
- Have other suitable equivalent assessor qualifications endorsed by BPEC.
- 'Candidate assessors' who are working towards their assessor qualifications must always be supervised by a qualified assessor. They should have a clear action plan for achieving the assessor qualification(s), (assessor approval will be withdrawn if the assessor qualification/units have not been attained within a period of 18 months).

4.4.1. Assessor occupational competence

For the purposes of this qualification, occupational competence will be deemed to have been demonstrated by the verifiable evidence of all the following:

- A relevant level 3 plumbing qualification:
    - If older qualifications are held – such as city & guilds craft or advanced craft certificates – the assessor must be able to evidence through CPD activity a thorough knowledge of the qualification standards and requirements
    - If other MES-related NVQ/SVQ qualifications are held – such as domestic gas (wet central heating), heating and ventilation installation (domestic), domestic heating – the assessor must be able to evidence plumbing competence through CPD activity
- A relevant, current CPD record including relevant qualifications
- A verifiable CV of industry experience and current knowledge of industry practice and techniques relevant to the occupational area in which they assess
- A thorough knowledge and understanding of the qualification standards and requirements.

4.4.2. T/502/9157 - Understand and carry out electrical work on domestic plumbing and heating systems and components

The person responsible for assessing this unit must be competent in the technical areas of the unit. This means that assessors must have an NVQ in the technical area and/or relevant up to date CPD, such as the BPEC Level 3 Electricity for Plumbers Certificate. An assessor without this evidence of competence must engage a qualified electrician to directly observe all the critical safety aspects of the assessment.

4.4.3. Assessor occupational competence (Natural Gas)

The centre must nominate all assessors to BPEC for approval prior to them conducting any assessments. Assessors may be employed by the centre (centre-based assessors) or be work based (workplace assessors) who may or may not be from the same organisation as the learner.

Assessors must be vocationally and occupationally competent in the areas they are assessing and have a thorough knowledge of the units, within the qualification, being assessed.

In addition to the qualifications listed below, the assessor must be able to provide appropriate documented evidence that demonstrates they have a minimum of five years' proven occupational experience in the activities they will be assessing. Particular attention should be paid to providing evidence of occupational experience in the gas safety critical areas being assessed.

Where assessors undertake assessments in the workplace, and are not supported by a suitable gas operative, then they or their employer must be a member of an appropriate Gas Registration Body in accordance with the Gas Safety (Installation and Use) Regulations. In these circumstances they should also hold suitable insurance for this activity.

Assessors must be technically qualified in domestic gas installation/maintenance and hold one of the following qualifications:

- City & Guilds Level 3 Diploma in Gas Utilisation
- City & Guilds / SQA S/NVQ in Domestic Natural Gas (Level 3) or
- City & Guilds 662 Certificate for Service Engineers (Gas) or
- City & Guilds 598-2 Certificate in Gas Installation Studies or
- City & Guilds 660 Certificate in Gas Fitting - Final

This list is not considered exhaustive and other 'Mechanical Engineering Services' (MES) or 'Building Engineering Services' (BES) qualifications at Level 3/SCQF Level 6 or equivalent may be considered acceptable. Centres must submit requests to confirm the acceptability of other qualifications to their External Quality Assurer. The External Quality Assurer must keep a record of any such decisions.

In addition to the above qualifications, all assessors must hold a current certificate of gas safety competence in the areas of gas work they will be assessing that is not more than five years old (either current ACS Certificates of Gas Safety Competence or an aligned qualification are acceptable). For elective units, assessors must hold a relevant qualification and/or evidence of current competency in the areas they will be assessing.

4.4.4. Assessor continuing professional development

The occupational competence of assessors must be updated on a regular basis and be periodically confirmed via continuing professional development (CPD) via the Assessment Centre. Evidence of CPD will be sought by the External Quality Assurer (EQA) for all approved Assessors at the Centre.

It is the responsibility of each assessor to identify and make use of opportunities for CPD, such as industry conferences, access to trade journals, and Professional Body/Trade Association events, at least on an annual basis to enhance and upgrade their professional development and technical knowledge.

It is imperative that records are kept of all such CPD opportunities/occasions and that they provide evidence of cascading such technical knowledge and industry intelligence to all relevant colleagues.

4.5. IQA occupational competence (Natural Gas)

For the purposes of this qualification, occupational competence will be deemed to have been demonstrated by the verifiable evidence of one of the following:

- A Level 3 NVQ in Plumbing
- A related building services qualification with proven technical expertise
- A related building services qualification with access to plumbing technical expertise when undertaking IQA activities.

In addition to the qualifications listed below, the Internal Quality Assurers for the Natural Gas pathway must be able to provide appropriate documentary evidence that demonstrates they have a minimum of five years' proven occupational experience in the activities they will be verifying. Particular attention should be paid to providing evidence of occupational experience in the gas safety critical areas being verified.

Internal Quality Assurers must be technically qualified in domestic gas installation/maintenance and hold one of the following qualifications:

- City & Guilds Level 3 Diploma in Gas Utilisation
- City & Guilds/SQA - S/NVQ in Domestic Natural Gas (Level 3) or
- City & Guilds 662 Certificate for Service Engineers (Gas) or
- City & Guilds 598-2 Certificate in Gas Installation Studies or
- City & Guilds 660 Certificate in Gas Fitting – Final.

This list is not considered exhaustive and other 'Mechanical Engineering Services' (MES) or 'Building Engineering Services' (BES) qualifications at Level 3 / SCQF Level 6 or equivalent may be considered acceptable. Centres must submit requests to confirm the acceptability of other qualifications to their External Quality Assurer. The External Quality Assurer must keep a record of any such decisions

4.6. External Quality Assurers (EQAs)

EQAs must:

- Hold or be working towards TAQA (V2 or D36 updated)
- Hold a Level 3 NVQ in plumbing or a related building services engineering qualification.

5. Support Materials

5.1. Qualification Specification

This Qualification Specification provides details of all Units, Learning Outcomes, Assessment Criteria, and specific advice regarding the assessment process.

5.2. Learner Knowledge Assessment Packs

An Underpinning Knowledge Learner Work Pack is available FOC for this Qualification for all Learners registered on the Qualification.

5.3. Textbooks

BPEC Qualification Textbooks are available from BPEC direct.

5.4 Scheme of Work

New Schemes of Work for the GAS units have been provided on the secure portal that take into account the requirements of **IGEM/IG/1 supplement 2, 2022** and these **must be used** whenever gas training is taking place. Schemes of work are available for all 6 GAS Units.

6. Unit Details

R/602/2498 - Understand how to organise resources within BSE

Unit level	**3**	*This knowledge unit provides learning in the basic supervisory skills required to organise and co- ordinate the work of self and a small team of craft operatives in undertaking work in the building services industry.*
GLH	**26**	
Unit		
R/602/2498 - Understand how to organise resources within BSE		

Learning Outcomes		**Assessment Criteria**
LO1	Know the responsibilities of relevant people in the building services industry	1.1 – 1.6
LO2	Know how to oversee building services work	2.1 – 2.3
LO3	Know how to produce risk assessments and method statements for the building services industry	3.1 – 3.4
LO4	Know how to plan work programmes for work tasks in the building services industry	4.1 – 4.6

Learning Outcome 1	
Know the responsibilities of relevant people in the building services industry	
Assessment Criteria	
1.1	Define the types of clients that are encountered when working: a) Private customer b) Direct communication c) Through customer representatives managing agents d) Contracting customer e) Internal customer – within same company
1.2	Specify the types of communication that may be required with clients throughout the progress of a job
1.3	Specify the types of communication that may be required with the site management team: a) Architect b) Quantity surveyor c) Buyer/Estimator d) Surveyor e) Project manager/Clerk of Works f) Structural engineer g) Building services engineer h) Construction manager

1.4	Define the typical site responsibilities for craft operatives in the workplace: a) Apprentices/trainees b) Level 2 craft level qualified staff c) Limited self-responsibility d) Level 3 craft level qualified staff e) Supervision of self and other staff members

Learning Outcome 1	
Know the responsibilities of relevant people in the building services industry	
Assessment Criteria (continued)	
1.5	Specify the different methods of supervising individuals that can be used: a) Styles of supervision b) Methods of motivating staff
1.6	Define the job responsibilities when supervising staff: a) Identifying the competence of subordinates to undertake work b) Identifying when direct supervision or detailed direction is required c) Specific health and safety issues d) Responsibility for planning safe working for subordinates e) How to adjust work schedules when health and safety problems delay works

Learning Outcome 2	
Know how to oversee building services work	
Assessment Criteria	
2.1	Specify how to deal with variations to works: a) Prescribed by the work environment b) Communication to the client c) Agreement to extra time and costs d) Prescribed by the customer e) Agreement to extra time and costs
2.2	Clarify how to undertake ongoing monitoring of the work progress against the work programme to ensure: a) Safety b) Cost effectiveness c) Quality
2.3	Clarify how to deal with problems that arise with deficiencies in work performance that could affect: a) Safety b) Cost effectiveness c) Quality

Learning Outcome 3	
Know how to produce risk assessments and method statements for the building services industry	
Assessment Criteria	
3.1	Define the levels of risk presented by work situations

3.2	Define the hazards presented by work situations
3.3	Specify the methods used to carry out a risk assessment for a task: a) Methods of assessing risk b) Risk calculation formula c) Presentation of a risk assessment

Learning Outcome 3	
Know how to produce risk assessments and method statements for the building services industry	
Assessment Criteria (continued)	
3.4	Identify how to produce a method statement for areas of work with safety risk: a) Information to be provided in a method statement b) Presentation of a method statement

Learning Outcome 4	
Know how to plan work programmes for work tasks in the building services industry	
Assessment Criteria	
4.1	Specify the types of work programme that would be used for: a) Private installation work b) Private service/maintenance work c) New-build installation contract work d) Service/maintenance contract work
4.2	State the process for planning work activities against job specifications: a) The scope, purpose, and requirements of the work b) Identification of work responsibilities c) External factors that affect timeframe
4.3	State the process for selecting the required resources against the job specification: a) Materials b) Plant c) Vehicles d) Equipment
4.4	Specify material delivery requirements against work programmes and the impact that the non-availability of materials may have on work progress: a) Work in private properties b) Work on new-build housing c) Work on commercial contracts d) Avoiding loss of materials on site (theft)
4.5	Define the factors which affect working time allocation to work activities: a) Labour resources b) Planning work with other trades c) Material deliveries
4.6	Identify how to produce simple work programmes: a) Simple bar (progress) charts

K/502/8930 - Understand and apply domestic cold water system installation, commissioning, service, and maintenance techniques

Unit level	**3**
GLH	**76**
Unit	
K/502/8930 - Understand and apply domestic cold water system installation, commissioning, service, and maintenance techniques	*This combination unit provides learning in the design, maintenance, and commissioning of a complex range of cold-water system/component types in dwellings including those in multi-storey properties and single occupancy dwellings fed by private water supplies. The unit covers compliance with the requirements of the Water Supply (Water Fittings) Regulations and Building Regulations applicable to this type of system.*

Learning Outcomes		**Assessment Criteria**
LO1	Know the legislation relating to the installation and maintenance of cold water supplied for domestic purposes	1.1 – 1.3
LO2	Know the types of cold-water system layout used in multi-storey dwellings	2.1 – 2.4
LO3	Know the types of cold-water system layout used with single occupancy dwellings fed by private water supplies	3.1 – 3.4
LO4	Know the requirements for backflow protection in plumbing systems	4.1 – 4.5
LO5	Know the uses of specialist components in cold water systems	5.1 – 5.2
LO6	Know the design techniques for cold water systems	6.1 – 6.4
LO7	Be able to apply design techniques for cold water systems	7.1 – 7.3
LO8	Know the fault diagnosis and rectification procedures for cold water systems and components	8.1 – 8.7
LO9	Be able to diagnose and rectify faults in cold water systems and components	9.1 – 9.3
LO10	Know the commissioning requirements of cold-water systems and components	10.1 – 10.10
LO11	Be able to commission cold water systems and components	11.1 – 11.7

Learning Outcome 1	
Know the legislation relating to the installation and maintenance of cold water supplied for domestic purposes	
Assessment Criteria	
1.1	Interpret the legislation controlling the installation and use of water systems: a) Supplied from a water undertaker b) Supplied form a private source
1.2	Clarify the notification requirements for work on wholesome and recycled water systems: a) Water undertaker b) Building control or self-certification
1.3	Differentiate between installer and user responsibilities under water legislation

Learning Outcome 2	
Know the types of cold-water system layout used in multi-storey dwellings	
Assessment Criteria	
2.1	State the cold-water system component layout features for multi-storey dwellings: a) Supplied direct from the main b) Using break cistern arrangements c) Providing drinking water

Learning Outcome 2	
Know the types of cold-water system layout used in multi-storey dwellings	
Assessment Criteria (continued)	
2.2	State the system layout features for large scale storage cisterns used in multi-storey cold-water systems for dwellings: a) Warning/overflow pipe b) Alternative filling methods using c) Float switches and solenoid valves d) Specialist inlet valves e) Interlinking multiple cisterns f) Use of sectional cisterns
2.3	State the system layout features for break cisterns used in multi-storey cold water systems for dwellings
2.4	Define the function of components used in boosted cold water systems in multi-storey dwellings: a) Booster pumps b) Sets with integral controls c) Self-assembled sets d) Pressure/expansion vessels e) Pressure switch (transducer) f) Float switch

Learning Outcome 3	
Know the types of cold-water system layout used with single occupancy dwellings fed by private water supplies	
Assessment Criteria	
3.1	Propose the methods of providing private water supplies to single occupancy dwellings: a) Pumped from wells and boreholes b) Collected from surface water sources – streams and springs c) Use of externally sited break cisterns
3.2	Propose the methods of treating water for use in single occupancy dwellings: a) Localised water filtration units b) Localised water treatment units – ultraviolet

3.3	State the system layout features for cold water systems fed from private water supplies: a) Conventional direct or indirect systems from an incoming supply b) Boosted (pumped) supply from a well or borehole c) Boosted (pumped) supply from a low level internal or external break cistern
3.4	Define the method of operation of the components used in a boosted (pumped) cold water supply system from private sources for single occupancy dwellings: a) Small booster pump sets which incorporate all controls and components b) Boosted system with separate controls and components c) Use of accumulators in increasing system flow rate

Learning Outcome 4	
Know the requirements for backflow protection in plumbing systems	
Assessment Criteria	
4.1	Interpret the five fluid risk levels as laid down in water legislation
4.2	Define terminology used when selecting and applying backflow prevention devices: a) Point of use protection b) Whole site or zone protection
4.3	Propose the installation situations in which non-mechanical backflow prevention devices may be used: a) Type AA – air gap with unrestricted discharge above spill over level b) Type AB – air gap with weir overflow c) Type AD – air gap with injector d) Type AG – air gap with minimum size circular overflow e) Type AUK1 – air gap with interposed cistern f) Type AUK2 – air gaps for taps and combination taps g) Type AUK3 – air gaps for taps and combination taps h) Type DC pipe interrupter with permanent atmospheric vent
4.4	Propose the installation situations in which mechanical backflow prevention devices may be used: a) Type BA – reduced pressure zone valve b) Type DB – pipe interrupter with permanent atmospheric vent and moving element c) Type EC/ED – double check valves d) Type HUK1 – hose union tap with double check valves e) Type CA – non verifiable disconnector f) Type EA/EB – single check valves g) Type HA – hose union backflow preventer h) Type HC – diverter with automatic return
4.5	Determine methods of preventing cross connection in systems that contain non-wholesome water sources

Learning Outcome 5
Know the uses of specialist components in cold water systems
Assessment Criteria

5.1	Analyse the working principles of cold-water system components: a) Infra-red operated taps b) Concussive taps c) Combination baths tap and shower head d) Flow limiting valves e) Spray taps f) Urinal – water conservation controls g) Shower pumps – single and twin impellor h) Pressure reducing valves i) Shock arrestors/mini expansion vessels

Learning Outcome 5	
Know the uses of specialist components in cold water systems	
Assessment Criteria (continued)	
5.2	Evaluate the use of components in cold water systems to overcome temperature and pressure effects caused by the installation of backflow prevention devices

Learning Outcome 6	
Know the design techniques for cold water systems	
Assessment Criteria	
6.1	Interpret information sources when undertaking design work on cold water systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
6.2	Clarify how to take measurements of building features to carry out design calculations: a) From plans, drawings, and specifications b) From site
6.3	Calculate the size of cold-water system components used in single occupancy dwellings: a) Cistern b) Pipework c) Pump d) Pressure vessel
6.4	Clarify how to present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 7
Be able to apply design techniques for cold water systems
Assessment Criteria

7.1	Use information sources when undertaking design work for cold water systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
7.2	Calculate the size of cold-water system components used in single occupancy dwellings: a) Cistern b) Pipework c) Pump d) Pressure vessel
7.3	Present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 8	
Know the fault diagnosis and rectification procedures for cold water systems and components	
Assessment Criteria	
8.1	State the methods of obtaining details of system faults from end users
8.2	Interpret manufacturer instructions and industry standards to establish the diagnostic requirements of cold-water system components
8.3	Propose routine checks and diagnostics on cold water system components as part of a fault-finding process: a) Checking components for correct operating pressures and flow rates b) Cleaning system components (including dismantling and reassembly) c) Checking for correct component operation d) Pumps e) Pressure switches (transducers) f) Float switches g) Expansion and pressure vessels h) Gauges and controls i) Checking for correct operation of treatment devices j) Water filters k) Water softeners
8.4	Specify methods of repairing faults in cold water system components: a) Pumps b) Expansion/pressure vessels c) Pressure switches (transducers) d) Float switches e) Gauges and controls
8.5	Specify methods of safely isolating cold water systems or components to prevent them being brought into operation before the work has been fully completed

8.6	Define procedures for carrying out diagnostic tests to locate faults in cold water system components: a) Booster (pump) set to a system b) Backflow prevention devices
8.7	Specify methods for diagnosing and preventing corrosion within cold water system pipework: a) Electrolytic corrosion b) Blue water corrosion

Learning Outcome 9	
Be able to diagnose and rectify faults in cold water systems and components	
Assessment Criteria	
9.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of cold-water system components
9.2	Isolate cold-water systems or components to prevent them being brought into operation before the work has been fully completed
Learning Outcome 9	
Be able to diagnose and rectify faults in cold water systems and components	
Assessment Criteria (continued)	
9.3	Carry out diagnostic tests to locate faults in cold water system components and carry out repair work: a) Booster (pump) set to a system b) Backflow prevention devices

Learning Outcome 10	
Know the commissioning requirements of cold-water systems and components	
Assessment Criteria	
10.1	Interpret information sources required to complete commissioning work on cold water systems
10.2	State how to fill cold water pipework with water at normal operating pressure and check for leakage
10.3	Identify how to conduct a soundness test on cold water systems: a) Metallic systems b) Plastic pipework systems
10.4	Specify the disinfection procedures for cold water systems and the circumstances in which disinfection should be applied
10.5	State the flushing procedure for cold water systems and components
10.6	Clarify how to take flow rate and pressure readings from new and existing cold water systems

10.7	Specify the actions that must be taken when commissioning reveals defects in cold water systems: a) Dealing with systems that do not meet correct installation requirements b) Micro-biological contamination within a cold-water system c) Remedial work associated with defective components
10.8	State the procedure for notifying works carried out to the relevant authority
10.9	Propose the range of information that would be detailed on a commissioning record for a cold water system
10.10	Propose the points to be covered when handing over a completed system to the end-user

Learning Outcome 11	
Be able to commission cold water systems and components	
Assessment Criteria	
11.1	Carry out a visual inspection of a boosted cold-water system to confirm that it is ready to be filled with water
11.2	Charge cold water pipework with water at normal operating pressure and check for leakage

Learning Outcome 11	
Be able to commission cold water systems and components	
Assessment Criteria (continued)	
11.3	Perform a soundness test to industry requirements on cold water systems pipework and components
11.4	Perform a disinfection procedure on a cold-water system to industry requirements
11.5	Flush the system with wholesome water on completion of soundness testing
11.6	Use test instruments to take readings of the water supply pressure and flow rate
11.7	Adjust and set controls to achieve system design requirements: a) Pressure at outlets b) Flow rate at outlets

K/502/9155 - Understand and apply domestic hot water system installation, commissioning, service, and maintenance techniques

Unit level	**3**	*This combination unit provides learning in the design, installation, maintenance, and commissioning of a complex range of hot water system/component types in single occupancy dwellings. The unit also covers the requirements of statutory legislation for the installation, maintenance, and commissioning of unvented hot water storage systems.*
GLH	**76**	
Unit		
K/502/9155 - Understand and apply domestic hot water system installation, commissioning, service, and maintenance techniques		

Learning Outcomes		Assessment Criteria
LO1	Know the types of hot water system and their layout requirements	1.1 – 1.9
LO2	Know the uses of specialist components in hot water systems	2.1 – 2.2
LO3	Know the design techniques for hot water systems	3.1 – 3.6
LO4	Be able to apply design techniques for hot water systems	4.1 – 4.3
LO5	Know the installation requirements of hot water systems and components	5.1 – 5.4
LO6	Be able to install hot water systems and components	6.1 – 6.2
LO7	Know the fault diagnosis and rectification procedures for hot water systems and components	7.1 – 7.7
LO8	Be able to diagnose and rectify faults in hot water systems and components	8.1 – 8.4
LO9	Know the commissioning requirements of hot water systems and components	9.1 – 9.11
LO10	Be able to commission hot water systems and components	10.1 – 10.6

Learning Outcome 1	
Know the types of hot water system and their layout requirements	
Assessment Criteria	
1.1	Compare the types of hot water supply systems used in dwellings: a) Centralised systems b) Unvented hot water systems c) Open vented hot water systems d) Localised systems e) Unvented point of use heaters f) Instantaneous heaters
1.2	Identify hot water system pipework layout features for dwellings: a) Centralized unvented hot water systems b) Larger systems requiring a secondary circulation system
1.3	Confirm the recommended design temperatures within hot water systems: a) Hot water storage vessel b) Hot water outflow c) Secondary return d) At point of use e) Instantaneous heaters f) Storage system g) Thermostatic mixing valve installations
Learning Outcome 1	
Know the types of hot water system and their layout requirements	
Assessment Criteria (continued)	
1.4	Evaluate the various types of unvented hot water system: a) Indirect storage systems b) Direct storage systems c) Electrically heated d) Gas or oil fired e) Small point of use (under sink)
1.5	Clarify the use of cold-water accumulators in unvented hot water systems
1.6	Define the function of components in unvented hot water systems: a) Safety devices b) Control thermostat c) Overheat thermostat (thermal cut-out) d) Temperature relief valve e) Functional devices f) Line strainer g) Pressure reducing valve h) Single check valve i) Expansion device (vessel or integral to cylinder) j) Expansion relief valve k) Tundish arrangements l) Application of composite valves

1.7	Specify the layout features for temperature and expansion relief pipe in unvented hot water systems
1.8	Specify the layout features for pipework systems incorporating secondary circulation: a) Pump type and location b) Timing devices c) Prevention of reverse circulation d) Methods of balancing circuits
1.9	State how trace heating can be used as an alternative to a secondary circulation system

Learning Outcome 2	
Know the uses of specialist components in hot water systems	
Assessment Criteria	
2.1	Analyse the working principles of hot water system components: a) Infra-red operated taps b) Concussive taps c) Combination baths tap and shower head d) Flow limiting valves e) Spray taps f) Shower pumps – single and twin impellor g) Pressure reducing valves h) Show arrestors/mini expansion vessels
Learning Outcome 2	
Know the uses of specialist components in hot water systems	
Assessment Criteria (continued)	
2.2	Evaluate the use of components in hot water systems to overcome temperature and pressure effects caused by the installation of backflow prevention devices

Learning Outcome 3	
Know the design techniques for hot water systems	
Assessment Criteria	
3.1	Define the factors which affect the selection of hot water systems for single occupancy dwellings
3.2	State the criteria used then selecting hot water system and component types: a) Customer needs b) Building layout and features c) Suitability of system d) Energy efficiency e) Environmental impact
3.3	Interpret information sources when undertaking design work on hot water systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer

3.4	Clarify how to take measurements of building features to carry out design calculations: a) From plans, drawings, and specifications b) From site
3.5	Calculate the size of hot water system components used in single occupancy dwellings: a) Cistern b) Hot water storage vessel c) Pipework d) Secondary circulation pump e) Booster pump (shower and full system)
3.6	Clarify how to present calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 4	
Be able to apply design techniques for hot water systems	
Assessment Criteria	
4.1	Use information sources when undertaking design work for hot water systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
Learning Outcome 4	
Be able to apply design techniques for hot water systems	
Assessment Criteria (continued)	
4.2	Calculate the size of hot water system components used in single occupancy dwellings: a) Cistern b) Cylinder c) Pipework d) Secondary circulation pump e) Booster pump (shower and full system)
4.3	Present design calculations in an acceptable format a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for a work in a small-scale dwelling

Learning Outcome 5	
Know the installation requirements of hot water systems and components	
Assessment Criteria	
5.1	Define the terms balanced and unbalanced supply pressures in unvented hot water storage systems

5.2	Specify the positioning and fixing requirements of components and unvented hot water systems: a) Safety devices b) Control thermostat c) Overheat thermostat (thermal cut-out) d) Temperature relief valve e) Functional devices f) Line strainer g) Pressure reducing valve h) Single check valve i) Expansion relief valve (vessel or integral to cylinder) j) Tundish arrangements k) Application of composite valves
5.3	State the pipe size and positioning methods for safety relief pipework connected to unvented hot water cylinder safety valves: a) D1 section b) Tundish c) D2 pipework d) Correction termination

Learning Outcome 5	
Know the installation requirements of hot water systems and components	
Assessment Criteria (continued)	
5.4	State the positioning and fixing requirements of components of secondary circulation systems: a) System pipework b) Pump c) Control valves d) Timing devices e) Reverse circulation control valves f) Pipework insulation

Learning Outcome 6
Be able to install hot water systems and components
Assessment Criteria

6.1	Connect pipework to an unvented hot water system: a) Incoming supply pipework b) Line strainer c) Pressure reducing valve d) Expansion vessel e) Storage cylinder f) Check valve
6.2	Position, fix and connect new hot water safety relieve pipework: a) D1 pipework b) Tundish c) D2 pipework d) Correction termination

Learning Outcome 7	
Know the fault diagnosis and rectification procedures for hot water systems and components	
Assessment Criteria	
7.1	Specify the periodic servicing requirements of hot water systems
7.2	State the methods of obtaining details of system faults from end users
7.3	Interpret manufacturer instructions and industry standards to establish the diagnostic requirements of hot water system components

Learning Outcome 7	
Know the fault diagnosis and rectification procedures for hot water systems and components	
Assessment Criteria (continued)	
7.4	Propose routine checks and diagnostics on got water system components as part of a fault finding process: a) Checking components for correct operating pressures, temperatures, and flow rates b) Cleaning system components (including dismantling and reassembling) c) Checking for correct operation of system components d) Thermostats e) Pumps f) Timing devices g) Expansion and pressure levels h) Gauges and controls i) Checking for correct operation of system safety valves: j) Temperature relief

	k) Expansion
7.5	Specify methods of repairing faults in hot water system components: a) Pumps b) Expansion/pressure c) Vessel's safety valves d) Temperature relief e) Expansion relief f) Thermostats g) Gauges and controls
7.6	Specify methods of safety isolation hot water systems or components to prevent them being brought into operation before work has been fully completed
7.7	Define procedures for carrying out diagnostic tests to locate faults in hot water system components: a) Shower booster pump unit b) Safety devices c) Expansion devices d) Thermostats

Learning Outcome 8	
Be able to diagnose and rectify faults in hot water systems and components	
Assessment Criteria	
8.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of hot water system components
8.2	Isolate hot water systems or components to prevent them being brought into operation before the work has been fully completed

Learning Outcome 8
Be able to diagnose and rectify faults in hot water systems and components
Assessment Criteria (continued)

8.3	Carry out diagnostic tests to locate faults in hot water system components and carry out repair work a) Shower booster pump unit b) Safety devices c) Expansion devices d) Thermostats
8.4	Carry out the periodic service of an unvented hot water storage system

Learning Outcome 9	
Know the commissioning requirements of hot water systems and components	
Assessment Criteria	
9.1	Interpret information sources required to complete commissioning work on hot water systems
9.2	State the checks to be carried out during a visual inspection of an unvented hot water storage system to confirm that it is ready to be filled with water
9.3	State how to fill hot water pipework with water at normal operating pressure and check for leakage
9.4	Identify how to conduct a soundness test on hot water systems: a) Metallic systems b) Plastic pipework systems
9.5	State the flushing procedure for hot water systems and components
9.6	Clarify how to take flow rate and pressure readings from new and existing hot water outlets
9.7	State how to balance a secondary circulation system during commissioning activities
9.8	Specify the actions that must be taken when commissioning reveals defects in hot water systems: a) Dealing with systems that do not meet correct installation requirements b) Remedial work associated with defective components
9.9	State the procedure for notifying works carried out to the relevant authority
9.10	Propose the range of information that would be detailed on a commissioning record for a hot water system
9.11	Propose the points to be covered when handing over a completed system to the end-user

Learning Outcome 10	
Be able to commission hot water systems and components	
Assessment Criteria	
10.1	Carry out a visual inspection of an unvented hot water system to confirm that it is ready to be filled with water
Learning Outcome 10	
Be able to commission hot water systems and components	
Assessment Criteria (continued)	

10.2	Charge hot water pipework with water at normal operating pressure and check for leakage
10.3	Perform a soundness test to industry requirements on hot water systems pipework and components
10.4	Flush the system with wholesome water on completion of soundness testing
10.5	Use test instruments to take readings of the water supply pressure and flow rate
10.6	Adjust and set system controls to achieve system design requirements: a) Pressure at outlets b) Flow rate at outlets

M/502/9156 - Understand and apply domestic central heating system installation, commissioning, service, and maintenance techniques

Unit level	**3**	

GLH	98	*This combination unit provides learning in the design, installation, maintenance, and commissioning of a complex range of central heating system/component types in single occupancy dwellings. The unit also covers the requirements of statutory legislation relating to the energy conservation of heating systems. The scope of the unit also covers underfloor heating systems, complex control systems and multiple boiler installations in larger dwellings using low loss headers.*
Unit		
M/502/9156 - Understand and apply domestic central heating system installation, commissioning, service, and maintenance techniques		

Learning Outcomes		Assessment Criteria
LO1	Know the types of central heating system and their layout requirements	1.1 – 1.7
LO2	Know the design techniques for central heating systems	2.1 – 2.13
LO3	Be able to apply design techniques for central heating systems	3.1 – 3.3
LO4	Know the installation requirements of central heating systems and components	4.1 – 4.3
LO5	Be able to install central heating systems and components	5.1 – 5.2
LO6	Know the fault diagnosis and rectification procedures for central heating systems and components	6.1 – 6.7
LO7	Be able to diagnose and rectify faults in central heating systems and components	7.1 – 7.3
LO8	Know the commissioning requirements of central heating systems and components	8.1 – 8.10
LO9	Be able to commission central heating systems and components	9.1 – 9.5

Learning Outcome 1	
Know the types of central heating system and their layout requirements	
Assessment Criteria	
1.1	Define the space heating zoning requirements under statutory legislation for larger single occupancy dwellings
1.2	Define the function of components used in central heating systems: a) Zone control valves for multiple space heating applications with appropriate time and temperature control arrangements b) Controllers c) Weather compensation d) Delayed start e) Optimum start f) Home automation systems
1.3	Analyse the operating principles of environmental heat sources used in conjunction with central heating systems: a) Heat pumps b) Ground source c) Air source d) Micro combined heat and power
1.4	Identify the layout features of underfloor central heating systems

Learning Outcome 1
Know the types of central heating system and their layout requirements
Assessment Criteria (continued)

1.5	Analyse the working principles of underfloor central heating system pipework and components a) Use of manifolds b) Controls system application - time and temperature to space heating zones c) Underfloor pipework arrangements from manifold to room
1.6	Identify the system layout features for multiple boiler installations incorporating low loss headers
1.7	Analyse functional flow wiring diagrams to determine the method of control operation for central heating systems: a) Pumped heating only systems b) Pumped heating systems with combination boilers c) Pumped heating with gravity hot water systems d) Fully pumped incorporating 3 port valves – mid position and diverter valves e) Fully pumped incorporating 2 x two port valves f) Fully pumped incorporating hot water and multiple space heating zones g) Fully pumped incorporating weather compensation, optimum start, or delayed start controllers h) Multiple boiler controls application i) Application of frost thermostats and boilers with pump overrun facility

Learning Outcome 2	
Know the design techniques for central heating systems	
Assessment Criteria	
2.1	Define the factors which affect the selection of central heating systems for dwellings
2.2	State the criteria used when selecting heating system and component types: a) Customers' needs b) Building layout and features c) Suitability of system d) Energy efficiency e) Environmental impact
2.3	Interpret information sources when undertaking design work on central heating systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
2.4	Clarify how to take measurements of building features to carry out design calculations: a) From plans, drawings, and specifications b) From site
2.5	Justify the selection of system and control types for single family dwellings

Learning Outcome 2
Know the design techniques for central heating systems

Assessment Criteria (continued)	
2.6	State the principles of heat loss and gain in dwellings: a) Through the building fabric b) Due to ventilation
2.7	Evaluate the heating requirements of rooms in dwellings when designing a central heating system: a) Room size b) Temperature required – indoor to outdoor c) Air change rate
2.8	Specify the methods of sizing pipework and circulators for central heating systems: a) Pipe sizing calculations – space heating and hot water circuits b) Pump sizing calculations
2.9	Justify the selection criteria for boilers in dwellings: a) Space heating load b) Hot water heating load c) Heat loss from pipework d) Factors for intermittent heating
2.10	Clarify how to size expansion vessels for sealed central heating systems and feed and expansion cisterns for open vented systems
2.11	Clarify the design principles for underfloor central heating systems: a) Combined with radiators b) Stand alone
2.12	Calculate the size of central heating components used in single occupancy dwellings: a) Heat emitter size b) Hot water heating load c) Pipe size d) Pump size e) Boiler size
2.13	Clarify how to present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 3	
Be able to apply design techniques for central heating systems	
Assessment Criteria	
3.1	Use information sources when undertaking design work for central heating systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer

Learning Outcome 3
Be able to apply design techniques for central heating systems

Assessment Criteria (continued)	
3.2	Calculate the size of central heating components used in single occupancy dwellings: a) Heat emitter size b) Hot water heating load c) Pipe size d) Pump size e) Boiler size
3.3	Present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 4	
Know the installation requirements of central heating systems and components	
Assessment Criteria	
4.1	Specify the positioning and fixing requirements of components in underfloor central heating systems: a) Manifolds b) Pipework arrangements (cabling) c) Pipework installation techniques d) Solid floor e) Suspended timber floor
4.2	Specify the positioning, fixing and connection requirements of new central heating components for sealed central heating systems: a) Connections to a boiler b) Fully pumped central heating control components – mid position or 2 x two port valve arrangement c) Sealed system components d) Connections to panel radiators or underfloor heating manifold e) Connections to hot water cylinder
4.3	Specify the positioning and fixing requirements of multiple boiler installations with low loss headers

Learning Outcome 5	
Be able to install central heating systems and components	
Assessment Criteria	
5.1	Connect pipework to an underfloor central heating system

Learning Outcome 5
Be able to install central heating systems and components

Assessment Criteria (continued)	
5.2	Position, fix and connect new central heating components for a sealed central heating system: a) Connections to a boiler b) Fully pumped central heating control components – mid position or 2 x two port valve arrangement c) Sealed system components d) Connections to panel radiators or underfloor heating manifold e) Connections to hot water cylinder

Learning Outcome 6	
Know the fault diagnosis and rectification procedures for central heating systems and components	
Assessment Criteria	
6.1	Specify the periodic servicing requirements of central heating systems
6.2	State the methods of obtaining details of system faults from end users
6.3	Interpret manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components
6.4	Propose routine checks and diagnostics on central heating system components as part of a fault-finding process: a) Checking components for correct operation – pressure settings, temperature, and circulation b) Cleaning system components (including dismantling and reassembly) c) Checking for blockages in heat emitters and pipework d) Checking for correct operation of system components e) Circulating pumps f) Control components g) Expansion vessels h) Pressure relief valves i) Feed and expansion cisterns
6.5	Specify methods of repairing faults in central heating system components: a) Sealed and open vented – fill and vent pipework and components b) Circulating pumps c) Central heating control components d) Motorised valves e) Timing devices f) Thermostats g) Specialist controls – weather compensation, delayed and optimum start h) Blockages in heat emitters and pipework by power flushing
6.6	Specify methods of safely isolating central heating systems or components to prevent them being brought into operation before the work has been fully completed

Learning Outcome 6
Know the fault diagnosis and rectification procedures for central heating systems and components

Assessment Criteria (continued)	
6.7	Define procedures for carrying out diagnostic tests to locate faults in central heating system components: a) Replacement of circulating pumps b) Sealed heating system components c) Control components

Learning Outcome 7	
Be able to diagnose and rectify faults in central heating systems and components	
Assessment Criteria	
7.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components
7.2	Isolate central heating systems or components to prevent them being brought into operation before the work has been fully completed
7.3	Carry out diagnostic tests to locate faults in central heating system components and carry out repair work: a) Replacement of a circulating pump b) Sealed heating system components c) Control components d) Clean system components using power

Learning Outcome 8	
Know the commissioning requirements of central heating systems and components	
Assessment Criteria	
8.1	Interpret information sources required to complete commissioning work on central heating systems
8.2	State the checks to be carried out during a visual inspection of a central heating system to confirm that it is ready to be filled with water
8.3	State how to fill central heating pipework with water at normal operating pressure and check for leakage
8.4	Identify how to conduct a soundness test on central heating systems: a) Metallic systems b) Plastic pipework systems

Learning Outcome 8
Know the commissioning requirements of central heating systems and components

Assessment Criteria (continued)	
8.5	Specify the flushing requirements including the use of chemical treatments for new and existing central heating systems: a) Cold and hot flushing b) Power flushing c) System additives d) Neutralisers e) Control components f) Cleansers g) Corrosion inhibitors
8.6	Specify the method required to balance a central heating system during commissioning activities
8.7	Specify the actions that must be taken when commissioning reveals defects in central heating systems: a) Dealing with systems that do not meet correct installation requirements b) Defects in the connection of components in systems c) Unbalanced systems – poor circulation d) Poor boiler connection into a low loss header e) Remedial work associated with defective components
8.8	Propose the range of information that would be detailed on a commissioning record for a central heating system
8.9	State the procedure for notifying works carried out to the relevant authority
8.10	Propose the points to be covered when handing over a completed system to the end-user

Learning Outcome 9	
Be able to commission central heating systems and components	
Assessment Criteria	
9.1	Carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water
9.2	Charge central heating components with water at normal operating pressure and check for leakage
9.3	Perform a soundness test to industry requirements on central heating systems pipework and components
9.4	Flush and treat a central heating system with appropriate additives: a) System cleanser/neutraliser b) System inhibitor
9.5	Balance a central heating system to meet design requirements

T/502/9157 - Understand and carry out electrical work on domestic plumbing and heating systems and components

Unit level	3	*This combination unit provides learning in work preparation, installation, inspection, testing and fault diagnosis/rectification of electrical components, equipment, and connections to Domestic MES systems. This unit also cover the requirements for completing associated documentation required upon completion of electrical installation, inspection, testing and maintenance activities.*
GLH	102	
Unit		
T/502/9157 - Understand and carry out electrical work on domestic plumbing and heating systems and components		

Learning Outcomes		Assessment Criteria
LO1	Know the electrical standards that apply to the mechanical services industry	1.1 – 1.3
LO2	Know the principles of electricity supply to dwellings	2.1 – 2.3
LO3	Know the layout features of electrical circuits in dwellings	3.1 – 3.8
LO4	Understand the electrical industry safe isolation procedure	4.1 – 4.3
LO5	Be able to carry out the electrical industry safe isolation procedure	5.1 – 5.2
LO6	Know the site preparation techniques for the electrical connection of mechanical services components in dwellings	6.1 – 6.7
LO7	Be able to apply site preparation techniques for the electrical connection of mechanical services components in dwellings	7.1 – 7.2
LO8	Understand the installation and connection requirements of electrically operated mechanical services components	8.1 – 8.6
LO9	Be able to install and connect electrically operated mechanical services components	9.1 – 9.3
LO10	Know the inspection and testing requirements of electrically operated mechanical services components	10.1 – 10.6
LO11	Be able to inspect and test electrically operated mechanical services components	11.1 – 11.2
LO12	Know the procedures for safely diagnosing and rectifying faults in electrically operated mechanical services components	12.1 – 12.7
LO13	Be able to safely diagnose and rectify faults in electrically operated mechanical services components	13.1 – 13.3

Learning Outcome 1	
Know the electrical standards that apply to the mechanical services industry	
Assessment Criteria	
1.1	State the statutory legislation and guidance information that applies to electrical supply and control of domestic mechanical services systems and their components a) General legislation b) Construction specific legislation c) Mechanical services specific legislation a. Professional body guidance d) Codes of practice e) Manufacturer installation & service/maintenance instructions f) Manufacturer user instructions
Learning Outcome 1	
Know the electrical standards that apply to the mechanical services industry	
Assessment Criteria (continued)	

1.2	Identify the range of information that would be detailed on a minor works certificate for an electrical system or component
1.3	Specify the procedure for notifying works carried out to the relevant authority

Learning Outcome 2	
Know the principles of electricity supply to dwellings	
Assessment Criteria	
2.1	Specify the methods by which electricity is generated: a) Basic power station operation b) Principles of generation c) Types of supply d) Single phase e) Three-phase and neutral
2.2	Specify the methods by which generated electricity is distributed to dwellings: a) Basic operation of the national grid and local distribution systems b) Sub-stations c) Supply transformers d) Local distribution of three – and single-phase supplies to premises
2.3	State the purpose of electrical components at entry to the property: a) Main fuse (single phase) and cable head connection b) Meter c) Consumer unit d) Main earth terminal

Learning Outcome 3	
Know the layout features of electrical circuits in dwellings	
Assessment Criteria	
3.1	Define the system layout features for electrical circuits in dwellings: a) Ring main circuit b) Radial circuit c) Fixed appliance supplies d) Cooker e) Immersion heater f) Instantaneous shower g) Lighting h) Macerator WC i) Central heating controls j) Shower pump/Jacuzzi k) Heat producing or cooling appliances
3.2	Specify the types of cables and cords used for the installation of electrical equipment in domestic mechanical services systems
Learning Outcome 3	
Know the layout features of electrical circuits in dwellings	
Assessment Criteria (continued)	

3.3	State the applications and limitations of the types of cable and conductors used for the installation of electrical equipment in mechanical services systems
3.4	Clarify the difference between class 1 and class 2 electrical equipment
3.5	Define the function of electrically operated components used in domestic mechanical services systems: a) Flame rectification devices b) Flame suppression devices c) Solenoid valves d) Thermistors e) Thermocouples f) Micro switches g) Relays h) Printed circuit boards i) Pressure switches j) Pumps k) Fans l) Control components m) Thermostats n) Programmers/timers o) Electrically operated control valves p) Wiring centres q) Switches r) Rocker plate (with/without cpc) – single and double pole s) Pull cord
3.6	Define the operating principles of electrical circuit protection devices: a) Miniature circuit breakers b) Residual current devices including RCBOs c) Fuses d) Re-wireable e) Cartridge f) High breaking capacity
3.7	Clarify the need for, and requirements of earthing systems: a) Main earthing systems 1) TT system 2) TN - S system 3) TN-C-S system b) Protective equipotential bonding c) High risk rooms (zones) in dwellings d) Supplementary earthing (bonding) e) Temporary continuity bonding
3.8	Identify the warning notices to be applied to consumer units
Learning Outcome 4	
Understand the electrical industry safe isolation procedure	
Assessment Criteria	

4.1	Identify the test equipment required to prove that circuits to be worked on are dead: a) Approved voltage indicating device b) Proving unit
4.2	Specify the electrical industry agreed procedure for safe isolation of electrical circuits: a) Select the approved voltage indicating device and test on a known supply b) Locate and identify the isolation point for the equipment to be worked on c) Isolate the supply and prevent re-energisation d) Verify that the equipment is dead e) Fit warning labels f) Re-check the approved voltage indicating on a known supply for correct function
4.3	Clarify the methods of ensuring that circuits cannot be re-activated while work is taking place on them: a) Use of locking devices b) Device retention (fuse removal)

Learning Outcome 5	
Be able to carry out the electrical industry safe isolation procedure	
Assessment Criteria	
5.1	Check to ensure that test equipment is safe to be used
5.2	Carry out the safe isolation procedure to industry standards

Learning Outcome 6	
Know the site preparation techniques for the electrical connection of mechanical services components in dwellings	
Assessment Criteria	
6.1	Identify the required sources of information when carrying out work on electrical systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions
6.2	Identify the preparatory work required to be carried out to the building fabric to install, commission, decommission or maintain electrical systems or components
6.3	State the types of pre-existing damage to the existing building fabric or customer property that may be encountered before commencing work on electrical systems and components: a) Building wall/floor surfaces b) Existing electrical system components c) Building décor and carpets

Learning Outcome 6
Know the site preparation techniques for the electrical connection of mechanical services components in dwellings

Assessment Criteria (continued)	
6.4	State how to carry out simple electrical calculations: a) Ohm's law b) Power consumption of electrical circuits c) Basic over-current protection device size d) Voltage, current and resistance in series and parallel circuits
6.5	Identify the protection measures to be applied to the building fabric or customer property, during and on completion of work on electrical systems and components: a) Building wall/floor surfaces b) Existing and new electrical systems and kitchen furniture c) Building décor and carpets
6.6	Identify the cable, materials and fittings required to complete work on electrical systems
6.7	Identify the hand and power tools required to complete work on electrical systems

Learning Outcome 7	
Be able to apply site preparation techniques for the electrical connection of mechanical services components in dwellings	
Assessment Criteria	
7.1	Check the safety of the work location for the work to safely proceed: a) Safe access and exit b) Immediate work location e.g., tripping hazards c) Appropriate risk assessments/ method statements are followed
7.2	Wear Personal Protective Equipment relevant to the installation, decommissioning or maintenance tasks being carried out

Learning Outcome 8	
Understand the installation and connection requirements of electrically operated mechanical services components	
Assessment Criteria	
8.1	Define the method used to identify that existing electrical supplies and circuits are suitable for the proposed installation of electrical equipment used in domestic mechanical services systems
8.2	a) State the procedure for sizing electrical materials and components: b) Basic cable sizing procedure domestic type cables and cords c) Basic circuit protection device sizing procedure –domestic circuit types
8.3	Specify the method used to select suitable cables and cords for components and circuits: a) Selection of appropriate multi-core cable b) Selection of appropriate multi-core cords c) Selection of pvc single conductors

Learning Outcome 8
Understand the installation and connection requirements of electrically operated mechanical

services components	
Assessment Criteria (continued)	
8.4	Specify the requirements for protecting cables installed in the building fabric and terminating in enclosures: a) Protection methods in wall and floor surfaces b) Embedded (sheathing) – depth of cover, application of RCD protection c) Exposed (mini trunking) d) Within ducting e) Within timber stud partitions f) Within timber floor structures g) Junction boxes h) Switch/socket boxes i) Countersunk j) Pattresses k) Surface mounted l) Wiring centres
8.5	Define the types of cable termination methods approved for use in dwellings a) Screw terminals b) Pillar terminals c) Claw and washer terminals d) Crimping e) Strip connectors
8.6	Specify the method of installation and wiring termination for fixed electrical appliances **From consumer unit** a) Macerator WC b) Central heating control system c) Instantaneous shower d) Immersion heater e) Shower pump/Jacuzzi **From fused-spur connection unit** a) Central heating control system b) Shower pump/Jacuzzi **From existing appliance supply point** a) Macerator WC b) Central heating control system c) Shower pump/Jacuzzi d) Immersion heater e) Shower

Learning Outcome 9

Be able to install and connect electrically operated mechanical services components	
Assessment Criteria	
9.1	Carry out the electrical wiring of a central heating control system from an existing fused spur connection unit: a) Fully pumped system incorporating all necessary control components b) Positioning and fixing of all necessary enclosures, switches, and circuit protection devices c) Correct routing, installation and termination of appropriate cables and cords to control system components d) Correct earthing provision for all components and exposed metallic parts of the system
9.2	Carry out the replacement of electrical cords from an existing isolation point to the fixed appliance: a) Immersion heater b) WC macerator unit c) Shower pump
9.3	Apply temporary continuity bonding to metallic pipework prior to making pipework connections

Learning Outcome 10	
Know the inspection and testing requirements of electrically operated mechanical services components	
Assessment Criteria	
10.1	Specify the requirements of a visual inspection of completed electrical installation work for domestic mechanical services systems prior to electrical inspection and testing
10.2	Define the equipment used for electrical testing of mechanical services components and its calibration requirements
10.3	Identify the importance of carrying out tests on dead circuits wherever possible
10.4	State the purpose of the electrical testing procedures for new and existing circuits: a) Polarity b) Earth continuity c) Insulation resistance d) Earth fault loop impedance e) Residual current device
10.5	Clarify the requirements for carrying out functional testing of electrical components
10.6	Clarify the procedure for final handover of electrical circuits that supply electrically operated domestic mechanical services components: a) Installation completion of certification b) Demonstration to the user

Learning Outcome 11

Be able to inspect and test electrically operated mechanical services components	
Assessment Criteria	
11.1	Carry out the inspection and testing of a completed central heating controls system: a) Visual inspection b) Selection and use of appropriate test equipment c) Appropriate circuit testing d) Polarity e) Earth continuity f) Insulation resistance g) Functional testing h) Completion of a minor works certificate
11.2	Carry out the inspection and testing of existing electrical circuits following replacement of electrical cords: a) Immersion heater b) WC macerator unit c) Shower pump

Learning Outcome 12	
Know the procedures for safely diagnosing and rectifying faults in electrically operated mechanical services components	
Assessment Criteria	
12.1	State the methods of obtaining details of system faults from end users
12.2	Identify and use manufacturer instructions and industry standards to establish the diagnostic requirements of electrical system components
12.3	Identify the electrical test equipment used to undertake fault diagnostics
12.4	Identify the situations in which dead testing of components can be carried out
12.5	Identify the situations in which live testing of components may be necessary and the safety precautions required

Learning Outcome 12

Know the procedures for safely diagnosing and rectifying faults in electrically operated mechanical services components	
Assessment Criteria	
12.6	Define how to perform a range of routine checks and diagnostics on electrical system components as part of a fault-finding process. Checking for correct operation of: a) Appliance components b) Flame rectification devices c) Flame suppression devices d) Solenoid valves e) Thermistors f) Thermocouples g) Micro switches h) Relays i) Pressure switches j) Printed circuit boards k) Pumps l) Fans m) Control components n) Thermostats o) Programmers/timers p) Electrically operated control valves q) Wiring centres r) Switches s) Rocker plate (with/without cpc) - single and double pole t) Pull cord
12.7	State the methods of correcting deficiencies in electrical components: a) Inadequate earthing provision b) Defective cable positioning (aged cables/ proximity to other services) c) Failed electrical components d) Incorrect polarity e) Provision of inadequate circuit protection devices

Learning Outcome 13	
Be able to safely diagnose and rectify faults in electrically operated mechanical services components	
Assessment Criteria	
13.1	Safely isolate electrical systems or components to prevent them being brought into operation before the work has been fully completed
13.2	Carry out diagnostic checks to electrical circuits: a) Inadequate earthing provision b) Defective cable routing c) Defective termination d) Incorrect polarity e) Provision of inadequate circuit protection devices

Learning Outcome 13	
Be able to safely diagnose and rectify faults in electrically operated mechanical services components	
Assessment Criteria (continued)	
13.3	State the methods of correcting deficiencies in electrical components: a) Replacement of a motorised valve head gear b) Boiler components replacement c) Thermistor d) Thermocouples e) Pressure switches f) Control components g) Thermostats h) Programmers/timers i) Shower control components

D/502/9296 - Understand and apply domestic sanitation system installation, commissioning, service, and maintenance techniques

Unit level	**3**
GLH	**72**
Unit	
D/502/9296 - Understand and apply domestic sanitation system installation, commissioning, service, and maintenance techniques	*This combination unit provides learning in the design, installation, maintenance, and commissioning of a complex range of sanitation system/component types in single occupancy dwellings and multiple storey dwellings up to 3 storeys. The unit also covers the requirements of work on WC macerator units and sink waste disposal units.*

Learning Outcomes		Assessment Criteria
LO1	Know the types of sanitation system and their layout requirements	1.1 – 1.5
LO2	Know the design techniques for sanitation and rainwater systems	2.1 – 2.10
LO3	Be able to apply design techniques for sanitation and rainwater systems	3.1 – 3.4
LO4	Understand the installation requirements of sanitation system components	4.1 – 4.5
LO5	Know the fault diagnosis and rectification procedures for sanitary pipework systems and components	5.1 – 5.6
LO6	Be able to diagnose and rectify faults in sanitary pipework systems and components	6.1 – 6.3
LO7	Know the commissioning requirements of sanitary pipework systems and components	7.1 – 7.9
LO8	Be able to commission sanitary pipework systems and components	8.1 – 8.4

Learning Outcome 1	
Know the types of sanitation system and their layout requirements	
Assessment Criteria	
1.1	State the use of air admittance valves in above ground sanitary pipework systems: a) Types of air admittance valves b) Their suitability of use in the various types of pipework system c) Application on multi-dwelling housing estates
1.2	Clarify the statutory requirements for the provision of sanitary facilities and equipment in dwellings for the disabled: a) Spacing requirements of the human body b) Appliance space requirements for the disabled
1.3	Analyse the working principles and layout features for foul tanks in sanitation systems: a) Cesspits b) Septic tanks
1.4	State the periodic maintenance and cleaning requirements of foul tanks: a) Cesspits b) Septic tanks
1.5	Analyse the working principles and system layout features of specialist sanitary components: a) WC macerators b) Waste water lifters c) Sink waste disposals

Learning Outcome 2	
Know the design techniques for sanitation and rainwater systems	
Assessment Criteria	
2.1	Define the factors which affect the selection of sanitation systems for dwellings
2.2	State the criteria used when selecting sanitation systems and appliances: a) Customers' needs b) Building layout and features c) Suitability of system d) Energy efficiency e) Environmental impact
2.2	Interpret information sources required when undertaking design work for sanitation systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
2.3	Specify the fire stopping arrangements required under statutory legislation as they apply to sanitary pipework passing between fire compartments in a dwelling
2.4	Calculate the sanitary provision requirements for dwellings
2.5	Clarify the method of sizing and selecting the correct gradient for branch pipework used in sanitary pipework systems
2.6	Clarify the methods used when designing a sanitary pipework system: a) Main stack size b) Branch pipework sizes c) Ventilation requirements d) Air admittance valves e) Ventilating pipes
2.7	Clarify the methods used when designing a rainwater system: a) Roof area calculations b) Gutter type selection c) Outlet positioning
2.8	Calculate the size of sanitary pipework used in single occupancy dwellings: a) Main stack size b) Branch pipework size c) Stack vent size
2.9	Calculate the size of rainwater system components used with single occupancy and multiple terraced properties: a) Outlet requirements b) Gutter requirements c) Rainwater pipe requirements
2.10	Clarify how to present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 3	
Be able to apply design techniques for sanitation and rainwater systems	
Assessment Criteria	
3.1	Use information sources when undertaking design work for sanitation systems: a) Statutory regulations b) Industry standards c) Manufacturer technical instructions d) Verbal and written feedback from the customer
3.2	Calculate the size of sanitary pipework used in single occupancy dwellings. Simple calculations of: a) Main stack size b) Branch pipework size c) Stack vent size
3.3	Calculate the size of rainwater system components used with single occupancy and multiple terraced properties: a) Outlet requirements b) Gutter requirements c) Rainwater pipe requirements
3.4	Present design calculations in an acceptable format: a) Using basic not to scale line drawings b) Details for insertion into a quotation or tender for work in a small-scale dwelling

Learning Outcome 4	
Understand the installation requirements of sanitation system components	
Assessment Criteria	
4.1	State the layout features for walk in wet rooms in dwellings
4.2	Specify the installation and fixing methods for components of walk-in wet rooms used in dwellings a) Glass sanitary appliances b) Antique style sanitary appliances c) Sanitary appliances with floor mounted taps
4.3	State how to assemble and prepare for the installation of sanitation system components: a) WC macerator b) Waste water lifter c) Sink waste disposal unit
4.4	Specify the methods for positioning and fixing WC macerators and waste water lifters: a) Reference to manufacturer's instructions b) Vertical lift position c) Use of long radius bends d) Pipework material selection and assembly
4.5	Specify the methods for positioning and fixing sink waste disposal units: a) Reference to manufacturer's instructions b) Trapping and branch discharge pipework requirements

Learning Outcome 5	
Know the fault diagnosis and rectification procedures for sanitary pipework systems and components	
Assessment Criteria	
5.1	State the methods of obtaining details of system faults from end users
5.2	Interpret manufacturer instructions and industry standards to establish the diagnostic requirements of sanitation system components
5.3	Propose routine checks and diagnostics on sanitation system components as part of a fault finding process: Checking for correct operation of system components WC macerators Waste water lifters Sink waste disposal units
5.4	Specify methods of repairing faults in sanitation components: a) WC macerators b) Waste water lifters c) Sink waste disposal units d) Air admittance valves
5.5	Specify methods of safely isolating sanitation system components to prevent them being brought into operation before the work has been fully completed
5.6	Define procedures for diagnosing faults in macerator units

Learning Outcome 6	
Be able to diagnose and rectify faults in sanitary pipework systems and components	
Assessment Criteria	
6.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of sanitation system components
6.2	Isolate sanitation system components to prevent them being brought into operation before the work has been fully completed
6.3	Carry out diagnostic tests to locate faults in macerator units

Learning Outcome 7	
Know the commissioning requirements of sanitary pipework systems and components	
Assessment Criteria	
7.1	Interpret information sources required to complete commissioning work on sanitation systems
7.2	State the checks to be carried out during a visual inspection of a sanitation system to confirm that it is ready to be operated
7.3	Identify how to carry out an air test on a sanitary pipework system to industry requirements
7.4	State how to performance test sanitation systems to test for trap seal retention
7.5	Specify the commissioning procedures for macerator type WCs
7.6	Specify the actions that must be taken when commissioning reveals defects in sanitation systems

Learning Outcome 7	
Know the commissioning requirements of sanitary pipework systems and components	
Assessment Criteria (continued)	
7.7	Propose the range of information that would be detailed on a commissioning record for a sanitation system
7.8	State the procedure for notifying works carried out to the relevant authority
7.9	Propose the points to be covered when handing over a completed system to the end-user

Learning Outcome 8	
Be able to commission sanitary pipework systems and components	
Assessment Criteria	
8.1	Carry out a visual inspection of a sanitation system to confirm that it is ready to be operated
8.2	Perform an air test on a sanitary pipework system to industry requirements
8.3	Carry out a performance test on a sanitary pipework system to check for effective trap seal retention: a) Branch discharge pipework b) Test for self-siphonage c) Test for induced siphonage d) Main discharge stack e) Test for induced siphonage and compression
8.4	Commission a WC with macerator pump installation

K/502/9298 - Install, commission, service and maintain domestic plumbing and heating systems

Unit level	**3**	*This performance unit confirms job competence at Level 3 in the selection of components, installation, commissioning, and fault diagnosis & rectification of a range of advanced plumbing & heating systems and components in dwellings and industrial/commercial properties (of similar size and scope to domestic dwellings).*
GLH	**4**	
Unit		
K/502/9298 - Install, commission, service and maintain domestic plumbing and heating systems		

Learning Outcomes		**Assessment Criteria**
LO1	Be able to select plumbing and heating systems and components for application the workplace	1.1 – 1.6
LO2	Be able to prepare work sites for the installation of plumbing and heating systems and components in the workplace	2.1 – 2.12
LO3	Be able to install plumbing and heating systems and components in the workplace	3.1 – 3.8
LO4	Be able to commission plumbing and heating systems in the workplace	4.1 – 4.11
LO5	Be able to diagnose faults in plumbing and heating components in the workplace	5.1 – 5.8
LO6	Be able to rectify faults in plumbing and heating components in the workplace	6.1 – 6.17

Learning Outcome 1	
Be able to select plumbing and heating systems and components for application the workplace	
Assessment Criteria	
1.1	Obtain details of the customer job requirement: a) By face-to-face site visit b) By taking details from plans, drawings, and specifications
1.2	Discuss and agree initial system and component options with the customer: a) Cold water systems b) Hot water systems c) Central heating systems d) Sanitation systems and sanitary appliances e) Gravity rainwater systems
1.3	Calculate the size and quantities of components required for systems installation
1.4	Present design calculations and information to the customer
1.5	Obtain agreement from the customer to progress plumbing and heating work: a) Items of small jobbing (maintenance) type work b) Full system/component installation work
1.6	Apply changes to customer job requirements and obtain customer agreement to those changes

Learning Outcome 2	
Be able to prepare work sites for the installation of plumbing and heating systems and components in the workplace	
Assessment Criteria	
2.1	Use job information to plan the installation work
2.2	Confirm the position of pipework and components with other persons before commencing the installation work
2.3	Comply with health and safety requirements when carrying out the installation work
2.4	Prepare a safe and unobstructed access route to the work areas to carry out the installation work
2.5	Arrange for all tools, equipment, and materials to be available to undertake the installation work
2.6	Use job information to identify the location of the building fabric that requires preparatory work to be carried out
2.7	Prepare a safe and unobstructed access route to the work areas to carry out the installation work
2.8	Arrange for all tools, equipment, and materials to be available to undertake the installation work
2.9	Use job information to identify the location of the building fabric that requires preparatory work to be carried out
2.10	Report any pre-existing damage to the building fabric or customer property to other persons before carrying out the installation work
2.11	Provide protection to the building fabric or customer property as the work progresses
2.12	Carry out preparatory work to the building fabric

Learning Outcome 3	
Be able to install plumbing and heating systems and components in the workplace	
Assessment Criteria	
3.1	Confirm that the incoming or outgoing main supplies meet the requirements of the system or component being installed
3.2	Measure and mark out the position of the components to be installed: a) System pipework b) Main system components c) System controls
3.3	Make pipework and component fixings to the building fabric
3.4	Position and fix pipework and components to the building fabric: a) Copper b) Plastics
3.5	Connect pipework to system controls and main components: a) Cold water systems b) Hot water systems c) Central heating systems d) Sanitation systems

Learning Outcome 3	
Be able to install plumbing and heating systems and components in the workplace	
Assessment Criteria (continued)	
3.6	Connect system pipework to incoming supplies or outgoing services: a) Existing system pipework and components b) Cold water supply pipework c) Below ground drainage pipework
3.7	Carry out installation work minimising the wastage of equipment and materials
3.8	Take precautions to ensure that the system cannot be brought into operation before the installation work is fully completed

Learning Outcome 4	
Be able to commission plumbing and heating systems in the workplace	
Assessment Criteria	
4.1	Carry out a visual inspection of the system to be tested to make sure that it is ready to be filled with water
4.2	Charge the system to normal operating pressure and check for leakage: a) Cold water systems b) Hot water systems c) Central heating systems
4.3	Perform a soundness test to industry requirements on the installed system: a) Cold water systems b) Hot water systems c) Central heating systems d) Sanitation systems
4.4	Flush the system with cold water on completion of soundness testing
4.5	Rectify any leakage from the system found during the soundness test procedure
4.6	Re-fill the system treating the contents with additives as appropriate
4.7	Operate the system and take performance readings to compare them too the design specifications a) Mechanical component readings b) Electrical component readings
4.8	Adjust system controls to establish that the system operates to its design specifications
4.9	Carry out remedial work to systems when commissioning reveals that the system does not work to the design specifications
4.10	Prepare commissioning records for completed systems
4.11	Instruct the customer in the efficient and effective operation of the system

Learning Outcome 5	
Be able to diagnose faults in plumbing and heating components in the workplace	
Assessment Criteria	
5.1	Use job information to plan the fault diagnosis work
5.2	Comply with health and safety requirements when carrying out fault diagnosis work
5.3	Prepare a safe and unobstructed access route to the work areas to carry out the fault diagnosis work
5.4	Arrange for all required tools, equipment, and materials to be available to undertake the fault diagnosis work
5.5	Report any pre-existing damage to the building fabric or customer property to other persons before carrying out the fault diagnosis work
5.6	Provide protection to the building fabric or customer property as the work progresses
5.7	Establish details of the fault from other persons
5.8	Test the component to diagnose the cause of the fault

Learning Outcome 6	
Be able to rectify faults in plumbing and heating components in the workplace	
Assessment Criteria	
6.1	Liaise with other persons to reach agreement on the rectification work to be carried out
6.2	Isolate unsafe components that are not to be rectified and leave the component in a safe condition
6.3	Isolate the component from the supply source or outgoing service: a) Turn off the electricity and fuel supply to the component b) Turn off the water supply to the component c) Prevent the use of sanitary appliances
6.4	Drain the component contents
6.5	Take precautions to ensure that the component cannot be brought back into operation before the rectification work is complete
6.6	Carry out the rectification or replacement of the component to industry requirements
6.7	Reinstate the supply or service to the component
6.8	Liaise with other persons to reach agreement on the rectification work to be carried out
6.9	Isolate unsafe components that are not to be rectified and leave the component in a safe condition
6.10	Isolate the component from the supply source or outgoing service: a) Turn off the electricity and fuel supply to the component b) Turn off the water supply to the component c) Prevent the use of sanitary appliances
6.11	Drain the component contents
6.12	Take precautions to ensure that the component cannot be brought back into operation before the rectification work is complete
6.13	Carry out the rectification or replacement of the component to industry requirements
6.14	Reinstate the supply or service to the component
6.15	Test the component for effective operation

Learning Outcome 6	
Be able to rectify faults in plumbing and heating components in the workplace	
Assessment Criteria (continued)	
6.16	Advise other persons that work on the system or component has been successfully completed
6.17	Complete the details contained in a maintenance record for the system or component

J/502/9390 - Understand core gas safety principles for natural gas within domestic building services engineering

Unit level	**3**	*This knowledge unit provides learning in legislation, (natural gas and LPG) characteristic of combustion and basic principles of requirements for ventilation, chimneys, check and set pressures and gas rates relating to meters and appliances, and effective flue operation and identifying and responding to unsafe gas situations.*
GLH	**120**	
Unit		
J/502/9390 - Understand core gas safety principles for natural gas within domestic building services engineering		

Learning Outcomes		**Assessment Criteria**
LO1	Know the gas legislation that applies to the domestic mechanical services industry	1.1 – 1.5
LO2	Know how domestic NG and LPG supplies are metered, regulated, and controlled	2.1 – 2.10
LO3	Know how to take pressure readings in domestic gas systems and check meter regulators	3.1 – 3.4
LO4	Know the operating principles of appliance gas safety devices and controls	4.1 – 4.4
LO5	Know how to install NG and LPG gas pipework and fittings	5.1 – 5.11
LO6	Know how to test for tightness of a gas pipework system and purge the system	6.1 – 6.10
LO7	Know the characteristics, combustion process and the types of burners used with natural gas and LPG	7.1 – 7.10
LO8	Know the ventilation requirements of gas appliances installed in dwellings	8.1 – 8.8
LO9	Know the standards of chimneys and flue systems to be used with gas appliances	9.1 – 9.12
LO10	Know how to re-establish gas supplies and relight appliances	10.1 – 10.4
LO11	Know how to check and set appliance burner pressures and gas rates	11.1 – 11.4
LO12	Know how to test gas appliance flue systems for effective operation	12.1 – 12.5
LO13	Know how to identify and respond to unsafe gas situations	13.1 – 13.4
LO14	Know the general requirements of LPG systems	14.1 – 14.9

Learning Outcome 1	
Know the gas legislation that applies to the domestic mechanical services industry	
Assessment Criteria	
1.1	Define the types of statutory legislation and guidance information that applies to gas installation and maintenance work in the industry a) Gas safety legislation b) Approved codes of practice c) Industry standards for NG and LPG d) Manufacturer installation and service/maintenance instructions
1.2	Identify laid down responsibilities under gas safety legislation a) Business registration and competence b) Personnel registration and competence c) Landlords d) Consumers – private householders and tenants
1.3	Analyse and interpret the requirements of specific gas safety legislation

Learning Outcome 1	
Know the gas legislation that applies to the domestic mechanical services industry	
Assessment Criteria (continued)	
1.4	Define the range of information that would be contained within a commissioning record for a gas system or component
1.5	Identify the procedure for notifying works carried out to the approved gas registration provider

Learning Outcome 2	
Know how domestic NG and LPG supplies are metered, regulated, and controlled	
Assessment Criteria	
2.1	Interpret the gas safety legislation that applies to the installation of gas meters and regulators a) Gas operative responsibilities b) Meter housing and compartment labels c) Medium pressure installations
2.2	Describe the installation, operation, and positioning requirements for Emergency Control Valves (ECV) to include: a) Natural gas/LPG meter installations b) Remote meter installations c) Multiple occupancy meter installations d) Meter Inlet Valves (MIV)
2.3	Explain the installation, operation, and positioning requirements for appliance isolation valves (AIV)
2.4	Describe the associated labels required for ECV's
2.5	Identify the gas supply route to domestic properties a) The natural gas network b) Components of the network c) Pressure tiers within the network
2.6	Define the methods of entry and layout features of natural gas service pipework to Domestic dwellings a) Minimum depth of service pipework b) Types of domestic gas meter housings and compartments c) Surface mounted meter boxes d) Semi-concealed meter boxes e) Built-in meter boxes f) Purpose built meter housings g) Medium pressure installations h) Multi-occupancy installation - remote meters i) Primary meter installations j) Use of secondary meters k) Use of pre-payment meters l) Use of meter labels – secondary and primary meters

Learning Outcome 2	
Know how domestic NG and LPG supplies are metered, regulated, and controlled	
Assessment Criteria (continued)	
2.7	State the operation and accuracy of gas positive displacement meter
2.8	Identify the procedure to take when a fault is diagnosed on an emergency control valve
2.9	Define the characteristics of meters used in domestic dwellings a) U6 b) E6 c) Semi-concealed d) Inferential e) Rotary f) Positive displacement
2.10	Define the operating principles of domestic regulators and governors a) The construction of a regulator b) The operation of a gas meter regulator c) Identification of medium pressure meter and regulator installation d) Maintaining correct installation operating pressures e) Checking and/or setting correct installation operating pressures

Learning Outcome 3	
Know how to take pressure readings in domestic gas systems and check meter regulators	
Assessment Criteria	
3.1	Specify the procedures for taking pressure readings in domestic gas supply systems a) Measurement of pressure b) Types of pressure gauges c) Use of pressure gauges d) Procedures for taking pressure readings e) Static pressure at the meter f) Working pressure at the meter g) Working pressure at appliances
3.2	Identify the factors which can affect the pressure readings at meter regulators a) Factors affecting pressure loss b) Effects of low flow rates and high flow rates on regulator outlet pressures (19 – 23 mbar) c) Effects of pressure absorption across the primary meter installation
3.3	Describe the process for setting a) Meter regulators low and medium pressure b) LPG regulators
3.4	State the procedures to take when incorrect pressure readings are encountered in gas supply systems

Learning Outcome 4	
Know the operating principles of appliance gas safety devices and controls	
Assessment Criteria	
4.1	Interpret the gas safety legislation that applies to gas safety devices and controls
4.2	Define the types of gas control devices used for gas appliances and their operating principles a) Pressure regulators b) Low pressure cut-off valves c) Thermal cut-off valves d) Gas cocks/valves e) Cooker hotplate lid control valves f) Electric solenoid valves g) Excess flow valves
4.3	Define the types and operating principles of flame protection devices used in gas appliances a) Vapour pressure devices b) Thermoelectric valves c) Flame conduction and rectification systems d) Interrupter devices e) Atmosphere sensing devices f) Spillage detection devices g) Multifunctional control valves
4.4	Define the types and operating principles of thermostats used to control heat emitted from gas appliances a) Bimetallic b) Liquid expansion c) Vapour pressure d) Electrical control e) Electrical overheat/limit f) f. Thermistors

Learning Outcome 5	
Know how to install NG and LPG gas pipework and fittings	
Assessment Criteria	
5.1	Interpret the gas safety legislation that applies to the installation of gas pipework and fitting
5.2	Clarify the materials suitable for gas pipework and fittings a) Standards for pipework and fittings b) Materials used 1) Copper 2) Low carbon steel 3) Steel semi-rigid

Learning Outcome 5	
Know how to install NG and LPG gas pipework and fittings	
Assessment Criteria (continued)	
5.3	Identify the acceptable jointing methods for pipework used for domestic gas supplies a) Cleansing agents b) Jointing methods • Copper to copper • Mild steel to mild steel • Copper to mild steel c) Steel semi-rigid pipework and termination d) Application of unions and compression fittings e) Movable appliance hoses f) Hoses
5.4	Calculate gas pipe sizes for domestic NG and LPG supply systems a) Supply from meter to appliance branches b) Supply from main branch connection to appliance termination
5.5	Clarify the circumstances in which polyethylene pipework may be used for domestic gas supply pipework
5.6	Specify the correct positioning, support, and fixing requirements for gas supply pipework a) pipework • Mild steel pipework • Steel semi-rigid pipework a) Requirements for sleeving pipework • Through building features such as walls and into meter boxes b) External surface mounted installation pipework c) Ventilation size requirements for pipework installed within ducts d) Ventilation requirements for protected shafts and voids e) Accommodation for thermal movement of pipework
5.7	Specify the installation requirements for gas supply pipework a) Exterior pipework b) Pipework installed between joists in suspended floors or roof spaces c) Solid timber: Metal web: Timber engineered: Installed across solid timber d) joists fitted with flooring e) Installed in floors or walls f) Sheathing requirements: Buried in concrete floors/walls: Installed behind dry lined walls: Installed within stud partition walls: Installed under the base of a wall or foundation

Learning Outcome 5	
Know how to install NG and LPG gas pipework and fittings	
Assessment Criteria (continued)	
5.8	Specify the provision of safety and control measures to gas supply pipework a) Positioning requirements adjacent to other services b) Corrosion protection c) Gas pipe identification d) Main equipotential bonding (minimum cross-sectional area) e) Disconnection of pipes and fittings – use of temporary continuity bond
5.9	Specify the requirements for pipework to multi-occupancy dwellings a) Safety requirements for fire stopping in buildings containing flats or maisonettes b) Safety requirements for pipework inside a protected shaft or other fire escape route
5.10	State the precautions to be taken when making new connections into an existing gas pipework system a) Breaking gas connections to an appliance b) Fixing requirements for installation pipework when connected to a meter not securely restrained
5.11	State the precautions to be taken when using an exposed flame for soldering joints on existing gas pipework systems

Learning Outcome 6	
Know how to test for tightness of a gas pipework system and purge the system	
Assessment Criteria	
6.1	Interpret the gas safety legislation that applies to the tightness testing of gas installations
6.2	Define the acronyms and symbols used within the industry standards for tightness testing
6.3	State the types of pressure gauge suitable for carrying out a tightness test and identify the requirements for the accuracy of reading
6.4	Identify the points when tightness testing of an installation should be carried out a) Before work commences on existing systems b) On completion of work on new and existing gas systems c) Following the report of a gas escape
6.5	Clarify how differing system types and configurations impacts on the tightness testing procedure a) Maximum installation volume for individual tightness tests (0.035m³) b) Calculating pipe volume: Fitting's volume: Meter volume c) Pipe diameter up to (35mm) d) Inlet pressure exceeds 75 mbar without meter inlet valve e) Different meter types f) Diaphragm U6/G4/U16/G10: Ultrasonic E6: Single dwellings: Multiple dwellings with emergency control valves only g) Anti-tamper devices

Learning Outcome 6	
Know how to test for tightness of a gas pipework system and purge the system	
Assessment Criteria (continued)	
6.6	Determine the tightness testing procedures for gas supply systems a) Testing new installation pipework (no meter connected) b) Testing new installations (meter connected) with or without appliances connected c) Testing existing installations (meter connected) with or without appliances connected d) Testing existing medium pressure fed installations without a meter inlet valve fitted
6.7	Specify the actions to take to investigate and repair suspected leakage from gas supplies and components a) Use of gas detection equipment b) Use of leak detection fluid
6.8	Specify the actions to be taken when a smell of gas persists following a gas tightness test a) When the emergency control valve / additional emergency control valve / meter inlet valve is turned off b) When a leaking installation cannot be repaired
6.9	Describe the requirements to issue gas testing and purging certificates
6.10	State the purging methods and requirements for systems that have undergone tightness testing a) Volume 0.2m³ or less b) Volume over 0.2m³

Learning Outcome 7	
Know the characteristics, combustion process and the types of burners used with natural gas and LPG	
Assessment Criteria	
7.1	Interpret the gas safety legislation that applies to the burner settings of gas appliances
7.2	Define the different types of gases used to supply appliances in domestic dwellings a) Chemical symbols • Methane (CH4) • Propane (C3H8) • Butane (C4H10) b) Gas characteristics c) Viscosity d) Families of gas • 1st, 2nd, and 3rd families e) Relative density of gases compared to air f) Explosive mixtures

Learning Outcome 7	
Know the characteristics, combustion process and the types of burners used with natural gas and LPG	
Assessment Criteria (continued)	
7.3	Identify the combustion process with gases used in dwellings a) combustion equation b) Air requirements for combustion c) Main constituents of complete combustion d) Main constituents of incomplete combustion e) Carbon Monoxide: Soot deposits f) Flammability limits of gases g) Causes of incomplete combustion h) Calorific Values of gases i) Gross: Net: British thermal units (BTU's): Kilowatts (kW): Use of conversion charts j) Wobbe number of gases
7.4	Identify the potential effects of Carbon Monoxide when incomplete combustion takes place a) Effects of exposure to Carbon Monoxide on the human body b) Symptoms of CO poisoning c) Advice to give to a person who describes symptoms of being affected by products of combustion
7.5	State typical ambient levels of carbon dioxide and identify critical levels and the potential effects on the gas combustion process
7.6	Specify the measures necessary to ensure that exposure to Carbon Monoxide does not take place/ is minimised? a) Primary measures – correct appliance installation and maintenance b) Secondary measures – use of Carbon Monoxide detectors c) Types of CO detectors available and standards of manufacture d) The positioning requirements for Carbon Monoxide detectors e) The associated maintenance requirements of CO detectors f) Other sources of Carbon Monoxide in dwellings g) Causes of activation of CO detectors and indicators
7.7	Define the layout features and operating principles of gas appliance burners a) Pre and post aerated burners b) Premix burners c) Forced draught burners d) Radiant burners
7.8	Define the key terms related to gas appliance burners a) Flame speed b) Ignition temperature c) Venturi d) Burner head e) Burner (flame) retention

Learning Outcome 7	
Know the characteristics, combustion process and the types of burners used with natural gas and LPG	
Assessment Criteria (continued)	
7.9	Identify how to diagnose faults in gas appliance burners a) Flame picture b) Sooting c) Discolouration d) Flame Chilling e) Linting f) Condition of the burner g) Air supply faults h) Condition and size of injectors
7.10	Clarify the reasons for burner faults that result in incomplete combustion a) Gas rate / pressure settings b) Effects of excessive pressure at the appliance (flame lift) c) Aeration d) Vitiation e) Light back f) Flame chilling

Learning Outcome 8	
Know the ventilation requirements of gas appliances installed in dwellings	
Assessment Criteria	
8.1	Interpret the gas safety legislation that applies to the ventilation requirements of gas appliances
8.2	Calculate the ventilation requirements for open flued and flueless gas appliances a) Adventitious air supplies b) Gross and net calorific values of appliances c) For multiple appliance installations in the same room/space d) Multiple open flued and flueless appliances e) Open flued and flueless appliances
8.3	Calculate the ventilation required for appliances located in compartments a) Open flued appliances b) Room sealed appliances
8.4	Identify the types of grilles and vents available for ventilation a) Types of grilles and vents b) Sizing of grilles and vents (free area availability)
8.5	Calculate the free area of unmarked grilles and vents

Learning Outcome 8	
Know the ventilation requirements of gas appliances installed in dwellings	
Assessment Criteria (continued)	
8.6	Specify the acceptable locations for ventilation to appliances a) Restrictions to ventilator/grille locations b) Installation of vents through walls (including cavity walls) c) Ventilation paths via other rooms d) Ventilation paths to compartments including ducts e) Siting of ventilation f) Wall g) Window h) floor/ceiling (ducted and un-ducted)
8.7	Clarify the effect that other heat producing appliances and other types of extraction have on the requirement for ventilation of gas appliances a) Oil or solid fuel appliances and flue systems b) Passive stack ventilation c) Extractor fans d) Cooker hoods e) Tumble driers
8.8	Specify the ventilation requirements of open flued and flued decorative effect space heaters a) Single appliances b) In rooms with multiple appliances c) Oil and solid fuel appliances

Learning Outcome 9	
Know the standards of chimneys and flue systems to be used with gas appliances	
Assessment Criteria	
9.1	Interpret the legislation that applies to chimneys and flues that serve gas appliances a) Gas safety legislation b) Exchange of information and planning requirements for chimneys
9.2	State how gas appliances are classified according to the type of chimney or flue used a) Flueless b) Open flued c) Natural draught d) Forced (fanned) draught e) Room sealed f) Natural draught g) Forced (fanned) draught h) Vertex type appliances

Learning Outcome 9	
Know the standards of chimneys and flue systems to be used with gas appliances	
Assessment Criteria (continued)	
9.3	Identify the working principles of flue systems serving gas appliances a) Open flued chimneys b) Room sealed - natural draught c) Room sealed - fanned draught d) Vertex type flues
9.4	State the types and general layout features of chimney and flue construction a) Rigid chimney types b) Brick / masonry c) Pre-cast flue blocks d) Metallic (single and double wall flues) e) Flexible metallic liner installation f) Use of flue box systems g) Shared (common) chimney systems - SE and U Ducts
9.5	Specify the requirements for new and existing chimney/flue installation a) Minimum cross-sectional area of new chimney installations to serve appliances b) Types of flue liners – during construction (salt glazed, clay etc.) a. Poured/pumped concrete flue liners: Pre-cast flue blocks: Flexible flue liners c) Restrictions on the use of poured concrete liners
9.6	Specify the requirements for new and existing chimney/flue installation a) Pre-cast flue design b) Minimum cross-sectional area of new gas flue blocks: Minimum requirement of vertical flue blocks before off sets: Jointing material for pre-cast flue blocks: Minimum flue size diameter for connecting pre-cast transfer blocks to termination point: Effects of temperature on installation requirements for pre-cast flues c) Flexible flue liners d) Sealing and support requirements for flexible flue liners in chimneys: Flexible liner components: Termination of flue liners
9.7	Define the design requirements of flues used with gas appliances a) Requirements of designer, builder, provider, or installer when installing gas chimneys b) Requirements for chimney/hearth certificates c) Chimney system design d) Distance requirements when passing through combustible material e) Special requirements for chimneys passing adjacent to combustible material or through other dwellings f) Temperature effects and condensation problems caused by flue pipe runs

Learning Outcome 9	
Know the standards of chimneys and flue systems to be used with gas appliances	
Assessment Criteria (continued)	
9.8	Define the design requirements of flues used with gas appliances Requirements for the catchment space to open flued space heaters Open flued chimney system Parts of an open flue chimney system Room-sealed chimney system Parts of a room sealed flue chimney system Natural and fanned draught
9.9	Specify the requirements for the provision of hearths to gas appliances
9.10	Specify the requirements for the termination of flue systems serving gas appliances a) Room sealed flue positions b) Condensing appliances c) Terminal guard requirements d) Open flue terminal positions e) Flue/ chimney outlet locations/terminal positions - before 2001 f) Flue chimney outlet locations/terminal positions - after 2001 g) Methods of dealing with down-draught on steeply pitched roofs
9.11	Specify the requirements for installing chimney fans to open flues/chimney systems a) Requirements prior to installing fans in secondary flues b) Additional safety requirements when fans are installed in secondary flues c) Requirements for fan dilution and shared open flue, fanned draught systems in domestic dwellings
9.12	Specify the flueing requirements for balanced compartments used with open flued appliances a) Compartment construction b) Ducted air positioning c) Cross sectional areas of air inlet ducts

Learning Outcome 10	
Know how to re-establish gas supplies and relight appliances	
Assessment Criteria	
10.1	Interpret the gas safety legislation that applies to re-establishing gas supplies and relighting appliances
10.2	State the correct action to be taken when a non-commissioned appliance is identified
10.3	State the actions to be taken if pipework and appliances are not commissioned when the gas supply to the property is re-established
10.4	Identify the procedures for re-establishing gas supplies and relighting appliances

Learning Outcome 11	
Know how to check and set appliance burner pressures and gas rates	
Assessment Criteria	
11.1	Identify the methods of determining and/or setting gas appliance working pressures a) Fixed rated appliances b) Range rated appliances
11.2	Identify the methods of determining gas rates at appliances a) Use of manufacturer data (appliance input) b) Use of meter test dial/index for calculation of gas consumption rate
11.3	Calculate the gas consumption rates for gas appliances a) Imperial rated meters b) Metric rated meters
11.4	Identify and rectify faults discovered during testing a) Excessive pressure loss at the appliance b) Incorrect gas consumption rates at appliances c) Effects of meter pressure absorption under full load conditions

Learning Outcome 12	
Know how to test gas appliance flue systems for effective operation	
Assessment Criteria	
12.1	Specify the key points to be checked in the visual inspection of a flue system prior to undertaking commissioning of the gas appliance/ flue system a) Open flue systems b) Room sealed flue systems – natural draught and fan assisted c) Vertex type appliances
12.2	State the factors that can affect flue system performance a) Downdraught conditions b) Wind effects at the appliance termination c) Passive stack ventilation d) Extraction fans sited in the vicinity of open flued appliances
12.3	Specify the testing procedures that should be performed to check the correct operation of an existing chimney flue/ gas appliance a) Flue flow test b) Spillage test c) Flue testing procedures with appliances sited in the vicinity of extraction fans d) Testing fanned draught open-flue systems and associated safety controls
12.4	Specify the testing procedures for room sealed fanned draught flue installations a) Checking case seals /case integrity b) Checking flue pipe/ air inlet connections for leakage c) Checking/testing of positive pressure case appliances

Learning Outcome 12	
Know how to test gas appliance flue systems for effective operation	
Assessment Criteria (continued)	
12.5	Specify the testing procedures for gas appliances that require commissioning by analysis of the flue combustion products a) Types of portable combustion gas analysers b) Flue gas samples to be taken during the commissioning process c) Sources of information required to determine correct flue gas products and ratios

Learning Outcome 13	
Know how to identify and respond to unsafe gas situations	
Assessment Criteria	
13.1	Interpret the gas safety legislation that applies to situations relating to unsafe gas supplies or appliances a) Gas operative advice b) Gas user advice c) Responsibilities of the gas user d) Reporting gas escapes e) Actions that can be undertaken by the gas transporter f) Action of the LPG supplier g) Rights of entry to properties h) Turning off emergency controls i) Elimination of ignition sources j) Reduction of gas concentrations via ventilation
13.2	Identify the correct procedure for prioritising actions in the event of an unsafe situation a) Gas emergency priorities b) Protect life c) Protect property d) Secure the escape e) Leave the site safe
13.3	Clarify the types of unsafe situation that may be found with appliances and installations and how to respond to them a) Immediately Dangerous (ID) situations b) Actions to take: 'Do not use' notices and labels: Warning notice forms: RIDDOR reportable Installations: RIDDOR reporting forms and information required c) At Risk (AR) situations d) Actions to take: Concern for safety notices and labels e) Not to Current Standards (NCS) situations f) Actions to take: Advice notices: Notification criteria for each category of NCS: Methods of notification

Learning Outcome 13	
Know how to identify and respond to unsafe gas situations	
Assessment Criteria (continued)	
13.4	Identify the use of general notices and warning labels to avoid the occurrence of unsafe situations a) Meter labelling requirements b) Compartment labelling c) Appliance commissioning certificates d) Appliance service certificates e) Landlords' safety certificates

Learning Outcome 14	
Know the general requirements of LPG systems	
Assessment Criteria	
14.1	Interpret the gas safety legislation that applies to the installation of LPG pipework and appliances
14.2	Describe the additional characteristic and properties of LPG a) Origins of LPG b) Boiling point of LPG c) Types of gasses d) Vapour pressure curves e) Vaporisation and off takes f) Auto refrigeration and excessive off takes
14.3	Identify the methods of supplying LPG gases to permanent dwellings a) Bottled supplies b) Bulk storage
14.4	State the typical operating pressures within LPG systems for permanent dwellings
14.5	Define the methods of entry and layout features of LPG service pipework to domestic dwellings fed from bulk storage and bottled supplies a) Pipework materials, jointing, layout, and routing b) Regulator types and positioning requirements c) Types of flexible connections and hoses d) Operation and positioning of LPG emergency control valves and isolation valves
14.6	State the methods of checking and setting domestic LPG regulators
14.7	Interpret the gas safety legislation that applies to the tightness testing of LPG installations
14.8	Specify the tightness test procedure for LPG systems
14.9	Specify the purging requirements for LPG systems that have undergone tightness testing

H/502/8487 – Specific Core Installation & Maintenance

Unit level	**3**	*This Practical and Knowledge unit enable learners to demonstrate occupational competence in demonstrating the use of tools, the safety of gas control operation and explain actions for unsafe procedures, how to carry out chimney performance checks, working safe with electrical systems and components, combustion and atmosphere sampling devices and calculate ventilation requirements.*
GLH	**120**	
Unit		
H/502/8487 – Specific Core Installation & Maintenance		

Learning Outcomes		**Assessment Criteria**
LO1	Demonstrate the use of common tools used in the gas utilisation industry.	1.1 – 1.5
LO2	Demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found	2.1 – 2.2
LO3	Know the construction and operation of chimneys used for domestic gas appliances	3.1
LO4	Demonstrate how to carry out chimney performance checks	4.1 – 4.3
LO5	Identify and complete the correct notices, forms and labels used in domestic gas utilisation	5.1 – 5.3
LO6	Demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation	6.1 – 6.11
LO7	Demonstrate the correct use of combustion and atmosphere sampling analysers	7.1 – 7.2
LO8	Demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities	8.1 – 8.5
LO9	Demonstrate the safe use of steps and ladders used in domestic gas utilisation activities	9.1 – 9.6
LO10	Demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities	10.1 – 10.2
LO11	Install and commission a small domestic gas installation	11.1 – 11.7
LO12	Calculate the requirements for permanent ventilation in domestic gas utilisation environments	12.1 – 12.3

Learning Outcome 1	
Demonstrate the use of common tools used in the gas utilisation industry	
Assessment Criteria	
1.1	Demonstrate the correct and safe use of tools for drilling, securing, and cutting brick, concrete, block, studded, timber framed and dry lined walls: a) Basic Hand Tools b) Battery Operated Tools c) RCD adaptors d) Power Tools including visual inspection of drills, circular saws, and jig saws e) Visual Inspections of tools including checking the condition of flexes cables and plug
1.2	Checking that PAT Certificates are in date

Learning Outcome 1	
Demonstrate the use of common tools used in the gas utilisation industry	
Assessment Criteria (continued)	
1.3	Demonstrate the correct use of tools for measuring, cutting, securing, and jointing pipework and other materials used in gas installation activities: a) Measuring devices b) Cutting devices and saws c) Metallic and non-metallic pipes d) Soldered Joints e) Screwed Joints f) Compression Joints
1.4	Demonstrate the correct and safe use of the following tools used to test systems a) Pressure Gauges b) Voltage Indicators c) Continuity Testers d) Electrical Multi-meters e) Plug In Socket Testers f) Electrical Proving Units g) Thermometers
1.5	Make good materials and surfaces to include brick, concrete, block, studded, timber framed, tiled and dry lined

Learning Outcome 2	
Demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found	
Assessment Criteria	
2.1	Safely diagnose correct, unsafe, or ineffective operation of: **Flame Protection Devices, to include** a) Vapour pressure b) Thermoelectric c) Flame rectification d) Flame conduction **Controls to include:** a) Atmosphere Sensing Device b) Spillage Detection Device c) Pressure Regulators d) Low Pressure Cut Off e) Thermal Cut Off f) Gas Cocks/Valves g) Cooker Hotplate Lid Control h) Electric Solenoid Valve i) Excess Flow Valves j) Thermoelectric Valve k) Interrupter Devices l) Multifunction Control **Thermostats to include:** a) Bi metallic b) Liquid Expansion c) Vapour Pressure d) Electrical Thermostats e) Thermistors
2.2	Demonstrate actions to be taken when defective or unsafe control operation is identified

Learning Outcome 3	
Know the construction and operation of chimneys used for domestic gas appliances	
Assessment Criteria	
3.1	Classify gas appliances according to their Chimney types: a) Flueless b) Open Chimney c) Room Sealed Chimney

Learning Outcome 4	
Demonstrate how to carry out chimney performance checks	
Assessment Criteria	
4.1	Carry out checks on open chimney systems: a) Visual checks throughout the length b) Confirmation of correct type c) Adequate cross-sectional area d) Catchment space measurement e) Chimney flow test f) Chimney Spillage test
4.2	Carry out checks on room sealed chimney systems: a) Confirmation of correct type and installation b) Correct terminal location and protection
4.3	Testing operation to include case seal integrity for positive and negative appliance designs

Learning Outcome 5	
Identify and complete the correct notices, forms and labels used in domestic gas utilisation	
Assessment criteria	
5.1	Identify correct application and complete the following records, forms, and labels: a) Landlord / Home Owner Gas Safety Record b) Gas Safety Inspection Form c) Benchmark Maintenance Report d) Service / Maintenance Checklist(s) e) Chimney / Hearth Notice Plate
5.2	Select and attach appropriate labels applicable to domestic gas work: a) Un-commissioned Appliance Label
5.3	Balanced Compartment Label

Learning Outcome 6	
Demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation	
Assessment Criteria	
6.1	Using Ohms Law, calculate: b) Current and Power c) Voltage d) Resistance
6.2	Assemble simple series and parallel circuits
6.3	Identify the type of electrical installation as: a) TT b) TN-S c) TN-C-S

Learning Outcome 6	
Demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation	
Assessment Criteria (continued)	
6.4	Connect a domestic gas appliance to a fixed domestic electrical installation: a) Cable Type and Sizing calculation b) Fuse Rating calculation c) Fused Spur connection d) Wiring a Three Pin Plug
6.5	Safely carry out preliminary electrical safety checks: a) Earth Continuity b) Polarity c) Short Circuit d) Resistance to Earth e) RCD Operation Test
6.6	Demonstrate the safe isolation of electrical supplies connected to gas appliances or controls
6.7	Read and interpret appliance wiring diagrams to establish: a) Sequence of electrical operation b) Correct appliance and component wiring
6.8	Differentiate between main and supplementary electrical bonding connections
6.9	Demonstrate the procedure for safe electrical isolation: a) Use of locking devices b) Circuit protection device retention c) Voltage indicating device d) Use of proving unit e) Confirmation of safety – absence of electricity
6.10	Identify electrical faults and defects on domestic gas installations, initiating actions as required: a) Inadequate earthing provision b) Incorrect cable types and position c) Clearances from other services d) Failed components e) Incorrect polarity f) Inadequate circuit protection conductors g) Defective automatic disconnection device h) Appliance connections
6.11	Complete electrical installation certificate

Learning Outcome 7	
Demonstrate the correct use of combustion and atmosphere sampling analysers	
Assessment Criteria	
7.1	Demonstrate the Correct use of a Combustion Performance Analysers and Atmosphere Sampling Analysers interpreting: a) CO, CO2, O2 readings, CO/CO2 Ratios in a flueway b) CO, CO2, O2 readings in the atmosphere c) Visually and using combustion performance analysis identify complete and incomplete combustion for Type 'A', 'B' and 'C' gas appliances
7.2	Complete the required checks using a combustion/atmosphere analyser in the event of "Carbon monoxide detector" activation.

Learning Outcome 8	
Demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities	
Assessment Criteria	
8.1	Risk assess the work site and work activities to be undertaken
8.2	Assess loads to be handled and moved, to include: a) Size of Loads b) Weight of Loads c) Shape of Loads d) Configuration of Loads e) Need for assistance
8.3	Prepare to lift and handle loads, to include: a) Using correct PPE b) Communication to others Ensuring a clear path
8.4	Lift and move loads in accordance with best practice and safe systems of work a) Correct kinetic techniques b) Assisted lift needing two people
8.5	Simple mechanical lifting device

Learning Outcome 9	
Demonstrate the safe use of steps and ladders used in domestic gas utilisation activities	
Assessment Criteria	
9.1	Risk assess the work site and work activities to be undertaken
9.2	Prepare the site location where steps and /or ladders need to be used
9.3	Inspect ladders and steps for defects
9.4	Position and erect steps and ladders in accordance with Regulations and safe working practice
9.5	Secure ladders by approved methods to ensure no slippage or movement may occur during use
9.6	Use steps and ladders for work activities in accordance with Regulations and safe working practice

Learning Outcome 10	
Demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities	
Assessment Criteria	
10.1	Select PPE needed for specific activities: a) Gloves b) Protective foot ware c) Eye protectors d) Ear protection e) High visibility clothing f) Knee protectors g) Dust masks
10.2	Carry out gas installation or maintenance work wearing PPE as determined by each specific task

Learning Outcome 11	
Install and commission a small domestic gas installation	
Assessment Criteria	
11.1	Install a domestic gas meter, pipework, and domestic appliance: a) Selecting correct materials and fittings b) Demonstrate the correct method of jointing materials and fittings c) Demonstrate the correct method of installing securing and supporting domestic meters and regulators d) Demonstrate the correct method of installing a domestic appliance
11.2	Demonstrate tightness testing, purging, and commissioning procedures including the procedure for resetting and sealing a regulator
11.3	Carry out a gas rate check and confirm it complies with manufacturer's instructions
11.4	Demonstrate the correct method of removal of domestic meters and regulators: a) Permanent removal b) Temporary removal
11.5	Identify correct and incorrect methods of connecting the main equipotential bonding
11.6	Demonstrate action to meet the main equipotential bonding requirements for both permanent and temporary meter removal a) Method of bonding connection b) Positioning of bond
11.7	Sizing of bond

Learning Outcome 12	
Calculate the requirements for permanent ventilation in domestic gas utilisation environments	
Assessment Criteria	
12.1	Calculate the correct ventilation requirements for a range of domestic appliance installations in accordance with BS5440: a) Open chimney appliances b) Flueless appliances c) Appliances in compartments d) Multiple appliance installations e) Ventilation pathways via other rooms
12.2	Specify ventilation vents/grilles and methods
12.3	Measure existing vents and grilles to ensure that they are the correct type and provide the correct supply of air

T/502/8381 – Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises

Unit level	**3**	*The practical and knowledge criteria detailed in this unit is in the installation of gas pipework up to 35 mm (1¼ inch) diameter (where the volume of the pipework does not exceed 0.035 cubic metre) from a meter outlet connection to gas appliance connection point, including 'installation pipework and appliance connector pipework' or in the case of non-metered installations from the Emergency Control Valve (EVC) located either inside or outside the property to the appliance connection point, supplied with 2nd or 3rd family gases.*
GLH	**115**	
Unit		
T/502/8381 – Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises		

Learning Outcomes		**Assessment Criteria**
LO1	Design gas systems for installing gas pipework	1.1 – 1.9
LO2	Plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances	2.1 – 2.12
LO3	De-commission domestic gas pipework to industry standards	3.1 – 3.6
LO4	Install, exchange, and remove gas pipework to industry standards	4.1 – 4.17
LO5	Pre-commission and Commission gas pipework to industry standards	5.1 – 5.11
LO6	Use and communicate data and information to carry out de-commissioning, installation, and commissioning work	6.1 – 6.8
LO7	Resolve problems which could affect the de-commissioning, installation, and commissioning process	7.1 – 7.4
LO8	Install, commission and de-commission gas pipework up to 35mm (1¼) diameter in domestic and small commercial premises	8.1 – 8.50

Learning Outcome 1	
Design gas systems for installing gas pipework	
Assessment Criteria	
1.1	Identify and record the customer's job requirements
1.2	Compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
1.3	Survey the work site: a) consult site diagrams for any key structural features that could affect the installation b) record details of any features that may affect the installation
1.4	Check that the proposed positioning of the pipework meets the manufacturers' and industry standards' requirements for: a) location b) clearances
1.5	Check that the availability of input services: a) gas b) electricity c) meet the appliance manufacturers' and industry standards' requirements for the pipework installation.
1.6	Check and ensure the design of the proposed installation is in compliance with industry standards

Learning Outcome 1	
Design gas systems for installing gas pipework	
Assessment Criteria (continued)	
1.7	Prepare a range of design options to meet both customer and industry requirements
1.8	Present design options to the customer using variety of media: a) written b) oral c) drawing
1.9	Consult with the customer and obtain agreement to the design option that best meets all the requirements

Learning Outcome 2	
Plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances	
Assessment Criteria	
2.1	Produce a risk assessment and method statement that incorporates: a) safety provisions on the work site b) access to the work site c) movement of people on site d) the movement and safe storage of installation materials, tools, and equipment for the job
2.2	Survey the work site for a) any pre-installation damage b) defects to existing building features c) record details of any features that may affect the installation
2.3	Advise the property occupier of any defects found in the survey
2.4	Protect the work site and the building fabric against possible damage being caused during: a) de-commissioning b) installation
2.5	Obtain confirmation from the customer before the job starts to ensure that they agree the planned work
2.6	Check and confirm that all materials, tools, and equipment are available as required and are fit for purpose needed for a) de-commissioning b) installation c) commissioning
2.7	Check and confirm that the proposed siting of the gas supply meets the appliance manufacturers and industry standards requirements for: a) location b) siting c) clearances

Learning Outcome 2	
Plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances	
Assessment Criteria (continued)	
2.8	Check and confirm that: a) the gas supply, b) earthing supply c) provision of ventilation d) meets industry standards' requirements in relation to other services
2.9	Confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services i.e., electricity supply
2.10	Carry out all necessary checks and tests to confirm: a) the gas supply b) electricity supply c) meet the manufacturers and industry requirements for the installation
2.11	Calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across installation
2.12	Check the existing installation for unsafe: a) appliances b) system components c) apply the gas industry unsafe situations procedures to any identified

Learning Outcome 3	
De-commission domestic gas pipework to industry standards	
Assessment Criteria	
3.1	Check that the: a) gas supply b) electricity supply c) are in a condition that enables safe appliance de-commissioning
3.2	Use the correct tools and equipment for de-commissioning activities
3.3	Use designated safe: a) isolation methods b) tests c) procedures d) to de-commission gas and systems and components
3.4	Take precautionary actions to ensure that temporarily de-commissioned: a) appliances b) systems c) components d) do not present a safety hazard
3.5	Permanently remove and disconnect: a) appliances b) gas system components c) earthing system components

Learning Outcome 3	
De-commission domestic gas pipework to industry standards	
Assessment Criteria (continued)	
3.6	After permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas

Learning Outcome 4	
Install, exchange, and remove gas pipework to industry standards	
Assessment Criteria	
4.1	Carry out preparatory work to meet the installation requirements
4.2	Carry out the installation processes minimising damage to: a) customer property b) building features
4.3	Select and use the correct tools and equipment for installation activities
4.4	Remove existing gas and earthing system components as required by the installation plan
4.5	Fabricate gas system, fittings and components as required by the installation plan
4.6	Position the pipework and confirm it meets the: a) location b) siting c) clearances d) required by the appliance manufacturers' and industry standards' specification
4.7	Provide adequate ventilation for: a) new b) replacement c) pipework installations and systems
4.8	Provide adequate support(s) for pipework installation to conform with industry standards' specification
4.9	Position and protect pipework installation in and through walls to meet industry standards for sleeving and purpose designed channels
4.10	Position and protect pipework installation in multi-occupancy dwellings to meet industry standards' requirements. Use of fire stops, sleeving, purposed designed shafts
4.11	Position and protect pipework installation in protected shafts containing: a) stairs b) lifts c) other protected fire escape routes to meet industry standards' requirements
4.12	Position and protect external installations to meet industry standards and requirements
4.13	Ensure existing gas systems are clean and free of debris
4.14	Fix and connect gas pipework, valves, fittings, and components to the supply
4.15	Mark any live gas pipes with a notice to indicate the pipe contains gas
4.16	Install additional emergency control valve (AECV) to the supply
4.17	Connect earthing system components to the gas supply

Learning Outcome 5	
Pre-commission and Commission gas pipework to industry standards	
Assessment Criteria	
5.1	Confirm that the complete appliance installation complies with: a) manufacturers' specification b) industry standards, c) Gas Safety (Installation and Use) Regulations, d) British Standards e) Building Regulations
5.2	Check that conditions within the gas system will permit safe commissioning
5.3	Select and use the correct tools and equipment for commissioning activities
5.4	Use tightness testing and purging procedures to confirm: a) the integrity of the installed gas system b) existing appliance(s)
5.5	Use purging procedures to confirm the safe supply of gas to the installed gas system
5.6	Use electrical testing procedures to confirm the integrity of the installed earthing system
5.7	Apply protective coating to pipework and to joints after gas tightness testing has been completed
5.8	Reconfirm that the ventilation requirements meet industry standards for the installation
5.9	Check and confirm the operation of the installed gas valves and components to ensure they function safely and operate in accordance with manufacturers' instructions
5.10	Instruct the property occupier on the correct operation of the: a) gas system b) valves c) components d) providing them with a copy of any user instructions
5.11	Take precautionary actions to prevent the unauthorised use of: a) un-commissioned gas appliances b) gas systems c) electrical systems d) components e) by isolation procedures and use of warning notices

Learning Outcome 6	
Use and communicate data and information to carry out de-commissioning, installation and commissioning work	
Assessment Criteria	
6.1	Liaise with the property occupier and other people who will be affected by the work during. a) planning, b) de-commissioning c) installation d) commissioning e) to minimise disturbance to the job

Learning Outcome 6	
Use and communicate data and information to carry out de-commissioning, installation and commissioning work	
Assessment Criteria (continued)	
6.2	Use: a) normative documents b) industry standards c) British Standards d) information from manufacturers' instructions for the appliance to ensure the work is completed in accordance with the specification
6.3	Advise of any delays to the work to any persons who are affected by the delay
6.4	Report any delays in the work schedules to the line manager responsible for the job
6.5	Advise the designated persons of any unsafe situations and actions required to remedy those situations
6.6	Complete documentation to confirm the safe commissioning of the gas system and components
6.7	Complete records and documentation confirming the safe commissioning of gas systems and components
6.8	Complete gas system de-commissioning records

Learning Outcome 7	
Resolve problems which could affect the de-commissioning, installation, and commissioning process	
Assessment Criteria	
7.1	Rectify and report deficiencies in gas and earthing input services
7.2	Resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal gas system or component defects
7.3	Resolve problems in accordance with approved procedures when gas systems and components being commissioned do not meet design requirements
7.4	Resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance

Learning Outcome 8	
Maintain water heating and wet central heating appliances	
Assessment Criteria	
8.1	Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
8.2	Explain safe access and working at heights procedures
8.3	Specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
8.4	Describe the methods of working which protect the building décor, customer property and existing systems and components
8.5	State the care and maintenance requirements of tools and equipment, and checks for safe condition

Learning Outcome 8	
Maintain water heating and wet central heating appliances	
Assessment Criteria (continued)	
8.6	State the tools, equipment, materials, and components required for the gas system de-commission, maintenance, and commission – ordering, supplying, advising, checking and delivery procedures
8.7	Explain how to safely secure and store tools, equipment, materials, and components to minimise loss or wastage
8.8	Describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
8.9	Explain the steps to take should materials, components, tools, and equipment not be available at the site to commence the de-commissioning, maintenance, and commissioning activity
8.10	Demonstrate how and where to access the required information, i.e., normative documents, industry standards guidance documents, British Standards, and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
8.11	Demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards, and manufacturers' instructions
8.12	Describe how to measure and record installation and site details for prefabrication purposes
8.13	Explain how to confirm that the gas supply and earthing system requirements are adequate for the installation of the new gas system and components or, for extending the system or adding components
8.14	Explain how to confirm that the provision of ventilation meets the industry standards' requirements for the installation i.e., in voids, shafts, ducts
8.15	Calculate correct sizing of pipework to ensure minimum pressure loss across installation
8.16	State checks and tests to confirm suitability of the gas supply
8.17	State checks and tests to confirm suitability of the earthing system, including the installation and positioning of the main equipotential bonding
8.18	State safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
8.19	Explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
8.20	Describe measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
8.21	Describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
8.22	Summarise the points in the de-commissioning, installation, and commissioning process where co-operation and liaison with other trades and property occupier may be required

Learning Outcome 8	
Maintain water heating and wet central heating appliances	
Assessment Criteria (continued)	
8.23	State the industry practices and work standards for fabricating and installing gas pipework, valves, systems, and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
8.24	Identify and describe the types of pipe materials suitable for carrying gas - steel, malleable iron, copper, corrugated stainless steel tube (CSST), polyethylene and lead
8.25	Identify and describe the types of pipe fittings suitable for carrying gas – capillary, compression, push-fit, union joints and screwed joints
8.26	State the industry practices and work standards for jointing materials and fittings suitable for carrying gas, including connecting to lead composition pipes
8.27	Describe the safety precautions to take when jointing materials and fittings - Including COSHH
8.28	Explain the industry practices and methods of bending pipe materials suitable for carrying gas i.e., bending methods of copper pipe, corrugated stainless steel tube (CSST) and stainless-steel flexible pipe (anacondas)
8.29	Explain the industry practices and methods of bending copper pipework to set measured distances to include double sets/offset bends, 90-degree bends, crank sets/passover bends
8.30	State the positioning and fixing requirements for gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
8.31	Describe how Installation of gas pipework meets the industry standards' requirements for: location, siting, clearance requirements and relationship to other services, i.e., electricity supply
8.32	State industry practices and work standards of providing adequate support(s) for pipework installation to conform with industry standards' requirements
8.33	Produce a plan showing the positioning, protection, and fixing methods for gas pipework, valves, systems and components in floors, ducts, through walls, buried in walls, multi-occupancy buildings and protected shafts containing stairs, lifts, or other protected fire escape routes, to comply with industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations i.e., sleeving, purposed designed channels, fire stops, purposed designed shafts
8.34	State the industry practices and work standards for pipe installation within suspended and joisted floors including methods of lifting and replacing floorboards and chipboard flooring
8.35	State the industry practices and work standards for pipe installation in concrete floors
8.36	Explain the installation and protection of external installations to meet industry standards requirements i.e., protection against mechanical damage, minimum depth below ground level

Learning Outcome 8	
Maintain water heating and wet central heating appliances	
Assessment Criteria (continued)	
8.37	Describe the procedures and work methods for connecting to input services including gas, earthing and ventilation systems
8.38	Describe the procedures and work methods of connecting pipework, valves and components to both new and existing gas systems and appliances
8.39	Describe the procedures and work methods to ensure correct gas pipe identification
8.40	Describe the process and procedures, equipment, and legislative requirements for applying tightness testing and purging to gas appliances, systems, and components
8.41	Describe the process and procedures, equipment, and legislative requirements for applying electrical tests to earthing systems and components to ensure safe functioning i.e., earth continuity checks
8.42	State the procedures for checking the correct operation and performance of gas systems, valves and components and checking against the design specification to ensure safe functioning
8.43	Explain the routines and sequences for commissioning gas systems, valves, and components
8.44	State how to complete all installation and commissioning documentation and records to be left with the property occupier including Benchmark, Landlord/Home owner gas safety record
8.45	Explain system handover procedures and demonstrate the operation of gas systems, valves and components to end users
8.46	Summarise the steps to take when problems arise in the work activities
8.47	Describe Job management structures and methods of reporting and recording job progress or problems delaying progress
8.48	Describe how to safely collect and dispose of system contents that may be hazardous to health or the environments i.e., waste products including asbestos and insulation materials
8.49	Demonstrate how and where to access the required information, i.e., Industry regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations.
8.50	Explain how to isolate unsafe gas appliances, gas systems and components and apply the gas industry unsafe situations procedure

D/503/8628 – Tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations.

Unit level	**3**	*The practical and knowledge criteria detailed in this unit covers the work activities of planning, de- commissioning, commissioning and gas tightness testing and direct purging of small 2nd family gas (natural gas) installations downstream of an Emergency Control Valve (ECV). The unit is based on the Institution of Gas Engineers and Managers, normative standard IGE/UP/1B.*
GLH	**16**	
Unit		
D/503/8628 – Tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations.		

Learning Outcomes		**Assessment Criteria**
LO1	Plan and prepare work activities for tightness testing and direct purging	1.1 – 1.10
LO2	De-commission gas systems and components to industry standards	2.1 – 2.5
LO3	Tightness testing and direct purging of gas systems and components	3.1 – 3.15
LO4	Use and communicate data and information to carry out de-commissioning, tightness testing and direct purging	4.1 – 4.8
LO5	Resolve problems which could affect de-commissioning, tightness testing and direct purging	5.1 – 5.4
LO6	Understand how to tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations	6.1 – 6.43

Learning Outcome 1	
Plan and prepare work activities for tightness testing and direct purging	
Assessment Criteria	
1.1	Carry out a risk assessment which incorporates: a) safety provisions in the work site b) access to the work site c) movement of the workforce d) members of the public e) the movement and safe storage of materials, tools, and equipment
1.2	Survey the work site for: a) any damage or defects to existing building features record details of any features that may affect the work
1.3	Advise the property occupier of any defects found
1.4	Protect the work site and the building fabric against possible damage being caused during the: a) tightness testing process direct purging process
1.5	Obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
1.6	Confirm the: a) siting of the gas supply b) provision of ventilation c) meets the requirements for tightness testing and direct purging

Learning Outcome 1	
Plan and prepare work activities for tightness testing and direct purging	
Assessment Criteria (continued)	
1.7	Check and confirm all: a) materials b) tools c) test equipment d) necessary for the tightness testing and direct purging process are available as required and are fit for purpose
1.8	Check and confirm that the: a) gas supply b) earthing supply c) provision of ventilation d) meet the industry standards' requirements for the installation
1.9	Carry out all necessary checks and tests to confirm the gas supply meets the industry requirements for the installation
1.10	Check existing installation for: a) unsafe appliances and system components and apply the gas industry unsafe situations procedures as necessary

Learning Outcome 2	
De-commission gas systems and components to industry standards	
Assessment Criteria	
2.1	Check and confirm that conditions within the gas system will permit safe de- commissioning
2.2	Select and use the correct: a) tools b) equipment c) for de-commissioning activities
2.3	Use designated safe: a) isolation methods b) tests c) procedures d) to de-commission gas systems and components
2.4	Take precautionary actions to ensure that temporarily de-commissioned: a) appliances b) gas systems c) components d) do not present a safety hazard
2.5	Permanently remove and disconnect: a) appliances b) gas system components as necessary

Learning Outcome 3	
Tightness testing and direct purging of gas systems and components	
Assessment Criteria	
3.1	Confirm the complete pipework installation complies with the: a) manufacturers' specification industry standards
3.2	Carry out preparatory work for tightness testing and direct purging to meet industry standards
3.3	Check that conditions within the gas system will permit safe tightness testing and direct purging
3.4	Select and use the correct tools and equipment for tightness testing and direct purging activities
3.5	Measure, calculate and record gas system installation volumes for tightness testing and direct purging activities
3.6	Ensure ventilation for tightness testing and direct purging activities meets industry standards' requirements
3.7	Remove existing gas components as necessary
3.8	Carry out the tightness testing and direct purging process, minimising damage to: a) customer property b) building features
3.9	Use tightness testing procedures to confirm the integrity of the newly installed a) gas system b) new and or existing appliances
3.10	Use tightness testing procedures to confirm the integrity of the existing: a) gas system b) new and existing appliances to ensure the installation doesn't exceed the maximum permissible pressure drop
3.11	Use tightness testing procedures to confirm the integrity of the gas system where the: a) maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2 bar b) no meter inlet valve is fitted
3.12	Where the installation fails the tightness test, either: a) trace and repair the escape and retest installation b) isolate unsafe gas appliances c) gas system d) components e) and apply the gas industry unsafe situations procedure
3.13	Use purging procedures to confirm the safe supply of gas to the installed: a) gas system b) appliances
3.14	Instruct the property occupier on the correct operation of the gas system a) valves b) components.

Learning Outcome 3	
Tightness testing and direct purging of gas systems and components	
Assessment Criteria (continued)	
3.15	Take precautionary actions to prevent the unauthorised use of uncommissioned gas a) appliances b) systems c) components d) by isolation procedures and use of warning notices

Learning Outcome 4	
Use and communicate data and information to carry out de-commissioning, tightness testing and direct purging	
Assessment Criteria	
4.1	Liaise with the property occupier and other people who will be affected by the work during the tightness testing and direct purging processes to minimise disturbance to the job
4.2	Use: a) normative documents b) industry standards c) British Standards d) information from manufacturers' instructions to ensure the work is carried out to the specification
4.3	Advise of any delays to the work to any persons who are affected by the delay
4.4	Report any delays in the work schedules to the job supervisor
4.5	Advise the designated person in the property of any unsafe situations and actions required to remedy those situations
4.6	Check that the customer is satisfied with the finished job
4.7	Complete records and documentation confirming the safe tightness testing and direct purging of gas systems and components
4.8	Complete gas system de-commissioning records

Learning Outcome 5	
Resolve problems which could affect de-commissioning, tightness testing and direct purging	
Assessment Criteria	
5.1	Rectify and report deficiencies in gas and earthing input services
5.2	Resolve problems in accordance with approved procedures where pre- tightness testing and direct purging checks and tests reveal gas system or component defects
5.3	Resolve problems in accordance with approved procedures when gas systems and components being tightness tested and purged do not meet design requirements
5.4	Resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance

Learning Outcome 6	
Understand how to tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations	
Assessment Criteria	
6.1	Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic tightness testing and direct purging process
6.2	Explain safe access and working at heights procedures
6.3	Specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
6.4	Describe the methods of working which protect the building décor, customer property and existing systems and components
6.5	Explain the tools, equipment, materials, and components required for de-commissioning, tightness testing and direct purging processes – ordering, supplying, advising, checking and delivery procedures
6.6	State the care and maintenance requirements of tools and equipment, and checks for safe condition
6.7	Explain how to safely secure and store tools, equipment, materials, and components to minimise loss or wastage
6.8	Describe the potential hazards that could arise from all de-commissioning, tightness testing and direct purging activities and the checks to be carried out before work takes place
6.9	Explain the steps to take should materials, components, tools, and equipment not be available at the site to commence the de-commissioning, tightness testing and direct purging activity
6.10	Demonstrate how and where to access the required information, i.e., normative documents, industry standards guidance documents, British Standards, and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to industry standards
6.11	Demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards, and manufacturers' instructions
6.12	State safe isolation methods, tests, and procedures to de-commission gas systems or components
6.13	Explain the procedures for temporary and permanent de-commissioning of gas systems including use of temporary continuity bonds
6.14	Explain the precautions to ensure that de-commissioned gas systems do not prove a safety hazard
6.15	Describe measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
6.16	Describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
6.17	Summarise the points in the de-commissioning, tightness testing and direct purging process where co-operation and liaison with other trades and property occupier may be required

Learning Outcome 6	
Understand how to tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations	
Assessment Criteria (continued)	
6.18	State the industry practices and work standards for fabricating and installing gas pipework, valves, systems, and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
6.19	Identify the types of pipe materials suitable for carrying gas - steel, malleable iron, copper, tracpipe, polyethylene and lead, etc.
6.20	Identify the types of pipe fittings suitable for carrying gas – capillary, compression, push-fit, union joints and screwed joints
6.21	State the industry practices and work standards for jointing materials and fittings suitable for carrying gas, including connecting to lead composition pipes
6.22	State the positioning and fixing requirements for gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
6.23	State the procedures and work methods for connecting to input services including gas, earthing systems and ventilation
6.24	State the procedures and work methods of connecting pipework, valves, and components to both new and existing gas systems and appliances
6.25	Demonstrate how to confirm that the gas supply and ventilation are adequate for de-commissioning, tightness testing and direct purging of the gas system, appliance(s), and components – IGE/UP/1B
6.26	Describe how to measure, calculate, and record gas system installation volumes for tightness testing and direct purging activities – IGE/UP/1B
6.27	State the test equipment and legislative requirements for applying tightness testing to gas systems, appliances, and components – IGE/UP/1B
6.28	Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of newly installed gas system and, where applicable, new, and existing appliances
6.29	Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of the existing installed gas system and, where applicable, new, and existing appliances to ensure the installation doesn't exceed the maximum permissible pressure drop
6.30	Explain recognition of medium pressure regulator sets – IGE/UP/1B where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2bar and, whether a meter inlet valve (MIV) is fitted
6.31	Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of gas systems where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2bar and, where a meter inlet valve (MIV) is fitted or, no meter inlet valve is fitted
6.32	State the industry practices and procedures for tracing and repairing gas escapes
6.33	Explain the process and procedures, equipment, and legislative requirements for applying direct purging of gas systems, appliances, and components – IGE/UP/1B

Learning Outcome 6	
Understand how to tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations	
Assessment Criteria (continued)	
6.34	State the routines and sequences for direct purging of gas systems, appliances and components – IGE/UP/1B
6.35	State the routines and sequences for commissioning gas systems, valves, and components to industry standards
6.36	Describe measures to prevent un-commissioned gas systems being brought into operation utilising safety and warning notices
6.37	Explain how to complete all tightness testing and direct purging documentation and records to be left with the property occupier – IGE/UP/1B i.e., Gas testing and purging – domestic (NG) certificate, benchmarks, landlord/homeowner gas safety record, etc
6.38	Describe the system handover procedures and demonstrating the operation of gas systems and components to end users
6.39	Explain the steps to take when problems arise in the work activities
6.40	Describe job management structures and methods of reporting and recording job progress or problems delaying progress
6.41	Describe how to safely collect and dispose of system contents that may be hazardous to health or the environments e.g., waste products such as asbestos, insulation, etc
6.42	Demonstrate how and where to access the required information, i.e., Industry regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.
6.43	Explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure

Y/502/8454 – Install domestic gas water heaters and wet central heating appliances

Unit level	**3**	*The practical and knowledge criteria detailed in this unit is from the appliance shut-off valve to and including the appliance, locating, and fixing the appliance to the wall, connecting, and assembling the chimney components to the appliance, drilling the wall to accommodate the chimney assembly, and connecting the appliance to water supplies. Electrical connection will be made either to an existing 13-amp 240 volt plug socket, fused socket outlet or to a suitable connection point on the central heating wiring system.*
GLH	**134**	
Unit		
Y/502/8454 – Install domestic gas water heaters and wet central heating appliances		

Learning Outcomes		**Assessment Criteria**
LO1	Designing gas systems for installing domestic gas water heaters and wet central heating appliances	1.1 – 1.11
LO2	Plan and prepare work activities for installing domestic gas water heaters and wet central heating appliances	2.1 – 2.10
LO3	De-commissioning domestic gas water heaters and wet central heating appliances	3.1 – 3.5
LO4	Install, exchange, and remove domestic gas water heaters and wet central heating appliances	4.1 – 4.14
LO5	Pre-commission and Commission domestic gas water heaters and wet central heating appliances	5.1 – 5.11
LO6	Use and communicate data and information to carry out de-commissioning, installation, and commissioning work	6.1 – 6.8
LO7	Resolve problems which could affect the de-commissioning, installation, and commissioning process	7.1 – 7.4
LO8	Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances	8.1 – 8.12

Learning Outcome 1	
Design gas systems for installing domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
1.1	Identify and record the customer's job requirements
1.2	Compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
1.3	Survey the work site: a) consult site diagrams for any key structural features that could affect the installation b) record details of any features that may affect the installation
1.4	Check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements for: a) location b) clearances
1.5	Check that the availability of input services meet the appliance manufacturers and industry standards' requirements for the appliance installation

Learning Outcome 1	
Design gas systems for installing domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
1.6	Check: a) size b) location c) availability of input services meet the: a) appliance manufacturer's b) industry standards requirements for the installation of: a) gas supply b) electricity supply c) chimney suitability d) the provision of ventilation
1.7	Check proposed location of condensate disposal is in compliance with: a) appliance manufacturer's instructions b) industry standards
1.8	Check and ensure the design of the proposed installation is in compliance with industry standards
1.9	Prepare a range of design options to meet both: a) customer b) industry requirements
1.10	Present design options to the customer using a variety of media: a) written b) oral c) drawings
1.11	Consult with the customer and obtain agreement to the design option that best meets all the requirements

Learning Outcome 2	
Plan and prepare work activities for installing domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
2.1	Carry out a risk assessment that incorporates: a) safety provisions b) access at the work site, c) movement of people on site d) movement and safe storage of installation materials, tools and equipment
2.2	Survey the work site for: a) any pre-installation damage b) defects to existing building features c) record details of any features that may affect the installation

Learning Outcome 2	
Plan and prepare work activities for installing domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
2.3	Advise the property occupier of any defects found
2.4	Protect the work site and the building fabric against possible damage being caused during de-commissioning installations
2.5	Obtain confirmation from the customer before the job starts to ensure that they agree the planned work
2.6	Check and confirm that all materials, tools, and equipment are available as required and are fit for purpose needed for: a) de-commissioning b) installation c) commissioning
2.7	Carry out checks and tests to confirm the: a) gas supply b) electricity supply c) the provision of ventilation d) meet the industry standards' requirements for the installation
2.8	Check existing installation for any unsafe appliances and system components apply the gas industry unsafe situations procedures as required
2.9	Confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services, i.e. electricity supply
2.10	Confirm the suitability of the proposed location of condensate disposal as required

Learning Outcome 3	
De-commission domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
3.1	Check that the: a) gas supply b) electricity supply c) is in a condition that enables safe appliance de-commissioning
3.2	Use the correct tools and equipment for de-commissioning activities
3.3	Use designated safe: a) isolation methods b) tests c) procedures d) to de-commission gas and systems and component
3.4	Take precautionary actions to ensure that temporarily de-commissioned: a) appliances b) systems c) components d) do not present a safety hazard

Learning Outcome 3	
De-commission domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
3.5	Permanently remove and disconnect: a) appliances b) gas system components electricity system component

Learning Outcome 4	
Install, exchange, and remove domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
4.1	Carry out preparatory work to meet the manufacturer's installation requirements
4.2	Install the appliance minimising damage to: a) customer property b) building features
4.3	Select and use the correct tools and equipment for the installation
4.4	Remove any existing gas and electricity system components required for the installation
4.5	Fabricate gas and electricity system components required by the installation
4.6	Position the appliance and confirm it meets the: a) location b) siting c) clearances d) required by the manufacturers' and industry standards' specification
4.7	Provide the required ventilation for the appliance installation in accordance manufacturer's instructions
4.8	Ensure existing gas systems are clean and free from debris
4.9	Fix and connect the: a) gas supply b) electricity supply components to the appliance
4.10	Fix and connect the condensate disposal system as required
4.11	Use tightness testing and purging procedures to confirm the integrity of the installed gas system and appliance
4.12	Use electrical testing procedures to confirm the integrity of the installed electrical system and appliance
4.13	Use industry: a) standard checks b) testing procedures c) to confirm the integrity of the newly installed or existing chimney system and appliance flue seals
4.14	Carry out precautionary actions to prevent the unauthorised use of: a) Un-commissioned gas appliances b) gas systems c) electrical systems d) components e) by following isolation procedures and use of warning notices

Learning Outcome 5	
Pre-commission and Commission domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
5.1	Confirm that the complete appliance installation complies with the: manufacturers' specification industry standards Gas Safety (Installation and Use) Regulations British Standards Building Regulations
5.2	Check that the condition of the gas and electricity systems will allow safe commissioning
5.3	Use the correct tools and equipment for commissioning
5.4	Check and confirm the gas system operating pressures meet industry standards
5.5	Check and confirm the appliance: a) operating pressure b) heat input c) meet industry standards and manufacturers' requirements instructions
5.6	Check the combustion performance by: a) visual inspection b) conducting flue gas analysis using an electronic flue gas analyser
5.7	Confirm the operation of the gas appliance and components to ensure they function safely and operate in accordance with manufacturers' instructions
5.8	Test chimney performance and reconfirm it performs according to manufacturer's and industry requirements
5.9	Confirm the electrical system and components function safely and operate in accordance with the manufacturers' instructions
5.10	Instruct the customer on the correct operation of the: a) appliance b) gas system c) Provide customer with a copy of the appliance literature
5.11	Check and confirm the operation of the condensate disposal system

Learning Outcome 6	
Use and communicate data and information to carry out de-commissioning, installation and commissioning work	
Assessment Criteria	
6.1	Liaise with the property occupier and other people who will be affected by the work during the: a) planning b) de- commissioning c) installation d) commissioning e) processes to minimise disturbance to the job

Learning Outcome 6	
Use and communicate data and information to carry out de-commissioning, installation and commissioning work	
Assessment Criteria (continued)	
6.2	Use: a) normative documents b) industry standards c) British Standards d) information from manufacturers' instructions e) for the appliance to ensure the work is completed in accordance with the specification
6.3	Advise of any delays to the work to any persons who are affected by the delay
6.4	Report any delays in the work schedules to the line manager responsible for the job
6.5	Identify and advise persons that need to be informed of any unsafe situations and actions required to remedy those situations
6.6	Complete documentation to confirm the safe commissioning of the gas appliance and components
6.7	Complete gas appliance and system de-commissioning Records
6.8	Submit details of installation and exchange appliance(s) to a Gas Work Notification Scheme

Learning Outcome 7	
Resolve problems which could affect the de-commissioning, installation and commissioning process	
Assessment Criteria	
7.1	Report deficiencies in: a) gas supply services b) electricity supply services
7.2	Resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal: a) gas appliance b) gas supply c) component defects
7.3	Resolve problems in accordance with approved procedures when: a) gas appliances b) gas systems c) components being commissioned do not meet design requirements
7.4	Report problems in accordance with approved procedures when the: a) gas appliances b) gas systems c) components cannot be restored to full performance

Learning Outcome 8	
Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances	
Assessment Criteria	
8.1	Legislative and Safety Knowledge a) Interpret regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments b) Interpret legislation covering the general responsibilities of the installer for their own safety and that of others The Gas Safety (Installation and Use) Regulations 1998 and associated Approved Code of Practice Guidance a) Regulation 26 – Gas appliances Regulation 28 – Access b) Regulation 29 – Manufacturer's instructions Regulation 33 – Testing of appliances c) Regulation 34 – Use of appliances
8.2	Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances knowledge: a) Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process b) Explain safe access and working at heights c) Specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces d) Describe the methods of working which protect the building décor, customer property and existing systems and components
8.3	a) State the care and maintenance requirements of tools and equipment, and checks for safe condition b) State the tools, equipment, materials and components required for the gas appliance and gas system de-commission, installation and commission – ordering, supplying, advising, checking and delivery procedures c) Explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage d) Describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
8.4	a) Explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity b) Demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the appliance, to ensure the work is done to the specification and industry standards c) Demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions d) Explain how to measure and record installation and site details for prefabrication purposes

Learning Outcome 8	
Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
8.5	a) Explain how to confirm that the gas supply, electric supply, chimney system and b) ventilation requirements are adequate for installation of the new gas appliance, gas system and components c) Explain how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for extending the system d) Describe isolation methods, tests, and procedures to de-commission gas and electricity systems or components e) State procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds f) Explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
8.6	a) Describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices b) Describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation c) Summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required d) Explain the industry practices and work standards for fabricating and installing domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
8.7	a) State the procedures and work methods for connecting to input services including: • gas, electric, ventilation and chimney systems b) State the procedures and work methods of connecting domestic gas cookers, tumble dryers, leisure appliances and components to both new and existing gas, electric, ventilation and chimney systems c) State the process and procedures, equipment, and legislative requirements for applying tightness testing and purging to appliances, gas systems and components d) State the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning i.e. preliminary electrical safety checks

Learning Outcome 8	
Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
8.8	a) Explain the routines and sequences for commissioning domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards b) State the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components and checking against the design specification c) State the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to ensure safe functioning
8.9	a) State the procedures for checking and confirming the gas system operating pressures b) State the procedures for checking and confirming the appliance operating pressure and the heat input c) Describe the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance d) Describe the tests and checks to confirm the integrity, suitability and performance of the chimney system e) Describe the tests and checks to confirm the suitability and performance of the ventilation system
8.10	a) Explain how to complete all installation and commissioning documentation and records to be left with the property occupier i.e., Benchmarks, Landlord/Home owner gas safety record, Chimney/Hearth notice plate, b) Describe measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices c) Explain the system handover procedures and demonstrating the operation of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to end users d) Summarise the steps to take when problems arise in the work activities e) Describe job management structures and methods of reporting and recording job progress or problems delaying progress
8.11	a) Describe how to safely collect and dispose of system contents that may be hazardous to health or the environment i.e. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances. b) Demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations

Learning Outcome 8	
Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances	
Assessment Criteria (continued)	
8.12	Explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure

T/502/8459 – Maintain gas water heating and wet central heating appliances

Unit level	**3**	*The practical and knowledge criteria detailed in this unit is in the maintenance, commission and decommissions of water heating and wet central heating domestic gas appliances up to and including the appliance isolation (service) point supplied with 2nd or 3rd family gases.* *This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.*
GLH	**75**	
Unit		
T/502/8459 – Maintain gas water heating and wet central heating appliances		

Learning Outcomes		**Assessment Criteria**
LO1	Plan and prepare work activities for maintaining water heating and wet central heating appliances	1.1 – 1.11
LO2	De-commission water heating and wet central heating appliances to industry standard	2.1 – 2.5
LO3	Maintain domestic water heating and wet central heating appliances to industry standards	3.1 – 3.12
LO4	Pre-commission and Commission water heating and wet central heating appliances to industry standards	4.1 – 4.12
LO5	Use and communicate data and information to carry out de-commissioning, maintenance and commissioning work	5.1 – 5.8
LO6	Resolve problems which could affect the de-commissioning, maintenance and commissioning process	6.1 – 6.4
LO7	Maintain water heating and wet central heating appliances	7.1 – 7.44

Learning Outcome 1	
Plan and prepare work activities for maintaining water heating and wet central heating appliances	
Assessment Criteria	
1.1	Produce a risk assessment and method statement which incorporates safety provisions on the work site: a) access to the work site, b) movement of people on the site c) movement and safe storage of materials, tools and equipment for the job
1.2	Survey the work site for: a) any pre-maintenance damage b) defects to existing building features and record it
1.3	Advise the property occupier of any defects found
1.4	Protect the work site and the building fabric against possible damage being caused during the de-commissioning and maintenance process
1.5	Obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
1.6	Check and confirm all materials, tools and equipment necessary for the de commissioning, maintenance and commissioning process are available as required and are fit for purpose

Learning Outcome 1	
Plan and prepare work activities for maintaining water heating and wet central heating appliances	
Assessment Criteria	
1.7	Check and confirm that the siting of the appliance meets the manufacturers' and industry standards' requirements for: a) location b) siting and clearances
1.8	Confirm that the: a) gas supply, b) electricity supply, c) ventilation and where required, d) chimney / flue suitability where necessary) meet the appliance manufacturers' and industry standards' requirements for the installation
1.9	Carry out all necessary checks and tests to confirm the a) gas supply b) electricity supply c) chimney /flue system (where required) meet the manufacturers and industry requirements for the installation
1.10	Check location of condensate disposal is in compliance with appliance manufacturers and industry standards requirements as necessary
1.11	Check existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required

Learning Outcome 2	
De-commission water heating and wet central heating appliances to industry standards	
Assessment Criteria	
2.1	Check that conditions within the: a) gas b) electricity systems will permit safe de-commissioning
2.2	Use the correct tools and equipment for de-commissioning activities
2.3	Use designated: a) safe isolation methods, b) tests, c) procedures to de-commission gas and electricity systems and components
2.4	Take precautionary actions to ensure that temporarily de-commissioned: a) appliances b) systems, c) components do not present a safety hazard

Learning Outcome 2	
De-commission water heating and wet central heating appliances to industry standards	
Assessment Criteria (continued)	
2.5	Permanently remove and disconnect: a) appliances b) gas system components c) electricity system components as required

Learning Outcome 3	
Maintain domestic water heating and wet central heating appliances to industry standards	
Assessment Criteria	
3.1	Carry out preparatory work to meet the maintenance requirements
3.2	Remove existing gas and electricity system components as required by the maintenance activities
3.3	Carry out the maintenance process in accordance with: a) manufacturers' specification b) industry standards
3.4	Carry out the maintenance process, minimising damage to a) customer property b) building features
3.5	Use the correct tools and equipment for maintenance work activities
3.6	Re-position the appliance and confirm it meets the: a) location, b) siting c) clearances required by the manufacturers' and industry standards' specification
3.7	Check existing ventilation for appliances and system meets industry requirements for the installation
3.8	Ensure existing gas systems are clean and free of debris
3.9	Re-connect: a) gas b) electricity c) system components to the appliance
3.10	Use tightness testing and purging procedures to confirm the integrity of the re-connected gas system and appliance
3.11	Use electrical testing procedures to confirm the integrity of the re-installed electrical system and appliance
3.12	Use industry standard checks and testing procedures to confirm the integrity of the existing chimney system and appliance flue seals where required

Learning Outcome 4	
Pre-commission and Commission water heating and wet central heating appliances to industry standards	
Assessment Criteria	
4.1	Confirm the complete appliance installation complies with: a) the manufacturers' specification b) industry standards c) Gas Safety (Installation and Use) Regulations, d) British Standards and Building Regulations
4.2	Check that conditions within the: a) gas b) electricity systems will permit safe commissioning
4.3	Use the correct tools and equipment for commissioning activities
4.4	Check that the gas system operating pressures meet industry standards
4.5	Check the appliance in accordance with industry standards and manufacturers' requirements for: a) operating pressure b) heat input
4.6	Check the combustion performance as required: a) visually b) by flue gas analysis
4.7	Test chimney performance and reconfirm it performs according to (where required) a) manufacturers' instructions b) industry standards'
4.8	Check that the ventilation requirements meet current industry standards for the installation
4.9	Check the operation of the: a) gas appliance, b) gas system c) gas components to ensure they function safely and operate in accordance with manufacturers' instructions
4.10	Check the: a) electrical system b) electrical components function safely and operate in accordance with the manufacturers' instructions
4.11	Explain to the property occupier the correct operation of the a) appliance b) gas system and provide them with their copy of the appliance literature
4.12	Take precautionary actions by isolation procedures and use of warning notices to prevent the unauthorised use of un-commissioned: a) gas appliances b) gas systems c) electrical systems and components

Learning Outcome 5	
Use and communicate data and information to carry out de-commissioning, maintenance and commissioning work	
Assessment Criteria	
5.1	Liaise with the property occupier and other people who will be affected by the work in order to minimise disturbance to the job during: a) the planning b) de-commissioning c) installation commissioning processes
5.2	Use normative documents, such as: a) industry standards b) British Standards c) manufacturers' instructions for the appliance to ensure the work is done to specification
5.3	Advise of any delays to the work to any persons who are affected by the delay
5.4	Report any delays in the work schedules to the job supervisor
5.5	Advise the designated persons of any unsafe situations and actions required to remedy those situations
5.6	Check that the customer is satisfied with the finished job
5.7	Complete records and documentation confirming the safe maintenance of a) gas appliances b) systems c) components
5.8	Complete commissioning and de-commissioning records for a) gas appliance b) gas system as required and ensure they are stored securely

Learning Outcome 6	
Resolve problems which could affect the de-commissioning, maintenance, and commissioning process	
Assessment Criteria	
6.1	Rectify and report deficiencies in gas and electric input services
6.2	Resolve problems in accordance with approved procedures where pre-maintenance checks and tests reveal gas appliance, gas system or component defects
6.3	Resolve problems in accordance with approved procedures when gas appliances, gas system and components being commissioned do not meet design requirements
6.4	Resolve problems in accordance with approved procedures when the gas appliance, the gas system or component cannot be restored to full performance

Learning Outcome 7	
Maintain water heating and wet central heating appliances	
Assessment criteria	
7.1.	Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic maintenance process
7.2	Explain safe access and working at heights procedures
7.3	Specify the tools and equipment necessary to provide safe access to work at heights, or in Confined spaces
7.4	Describe the methods of working which protect the building décor, customer property and Existing systems and components
7.5	State the care and maintenance requirements of tools and equipment, and checks for safe Condition
7.6	State the tools, equipment, materials, and components required for the gas system de-Commission, maintenance, and commission – ordering, supplying, advising, checking and delivery procedures
7.7	Explain how to safely secure and store tools, equipment, materials, and components to Minimise loss or wastage
7.8	Describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
7.9	Explain the steps to take should materials, components, tools, and equipment not be Available at the site to commence the de-commissioning, maintenance, and commissioning activity
7.10	Demonstrate how and where to access the required information, i.e., Normative documents, Industry standards guidance documents, British Standards, and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
7.11	Demonstrate how to read and interpret the information contained in normative Documents, industry standards guidance documents, British Standards, and manufacturers' instructions
7.12	Describe how to confirm that the gas supply, electric supply, chimney system and Ventilation requirements are adequate for existing gas appliances, systems, or components
7.13	State safe isolation methods, tests, and procedures to de-commission gas and electricity Systems or components
7.14	State safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
7.15	Explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
7.16	Describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
7.17	Explain how to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
7.18	Describe the points in the de-commissioning, maintenance, and re-commissioning process where co-operation and liaison with other trades and property occupier may be required

Learning Outcome 7	
Maintain water heating and wet central heating appliances	
Assessment criteria (continued)	
7.19	State the industry practices and work standards for fabricating and installing water heating and wet central heating gas appliances, systems, and components to comply with the manufacturers specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
7.20	State the positioning and fixing requirements for water heating and wet central heating gas appliances, systems, and components to comply with the manufacturers specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
7.21	State the positioning and fixing requirements for water heating and wet central heating gas appliances, systems, and components in; airing cupboards, compartments, roof spaces and external installations in order to comply with the manufacturers specification and industry standards
7.22	Explain the industry practices and manufacturers requirements for the positioning and the installation of condensate drain for condensing boilers
7.23	Describe the procedures and work methods for connecting to input services including gas, electric, ventilation and chimney systems
7.24	State the procedures and work methods of connecting water heating and wet central heating gas appliances and components to both new and existing gas, water, electric, ventilation and chimney systems
7.25	Explain the process and procedures, equipment, and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
7.26	Describe the process and procedures, equipment, and legislative requirements for Applying electrical safety tests to appliances, systems, and components to ensure safe Functioning
7.27	Describe the routines and sequences of the maintenance process of water heating and wet Central heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
7.28	Describe the routines and sequences for recommissioning water heating and wet central Heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
7.29	Explain the procedures for checking the correct operation and performance of water Heating and wet central heating gas appliances, gas systems and components and checking against the design specification
7.30	Explain the procedures for checking the correct operation and performance of water Heating and wet central heating gas appliances, gas systems and components to ensure safe functioning
7.31	Explain the procedures for checking that the hot water performance of water heating gas Appliances and combination boilers complies with the manufacturers' specification i.e., there is sufficient pressure and flow rate, and correct temperatures are achieved
7.32	State the procedures for checking and confirming the gas system operating pressures

Learning Outcome 7	
Maintain water heating and wet central heating appliances	
Assessment criteria (continued)	
7.33	Describe the procedures for checking and confirming the appliance operating pressure and the heat input
7.34	Describe the tests, checks, and use of flue gas analysers which confirm the suitability of the Gas combustion performance
7.35	Describe the tests and checks to confirm the integrity, suitability, and performance of the Chimney system
7.36	Describe the tests and checks to confirm the suitability and performance of the ventilation system
7.37	Explain how to complete all maintenance documentation and records to be left with the Property occupier i.e., Benchmarks, Landlord/Home owner gas safety record, maintenance report form, etc
7.38	Describe the measures to prevent un-commissioned gas systems being brought into Operation utilising safety and warning notices
7.39	Explain the system handover procedures and demonstrating the operation of replacement Systems and components to end users
7.40	Explain the steps to take when problems arise in the work activities
7.41	Describe job management structures and methods of reporting and recording job progress or problems delaying progress
7.42	Describe how to safely collect and dispose of system contents that may be hazardous to Health or the environment e.g., Waste products such as asbestos, insulation, etc.
7.43	Demonstrate how and where to access the required information, i.e., Industry regulations Regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.
7.44	Explain how to isolate unsafe gas appliances, gas systems and components and application Of the gas industry unsafe situations procedure

7. Assessment Requirements for Individual Units

7.1. L3 Generic Units

Unit Ref: R/602/2498 – Understand how to organise resources within BSE

To achieve the completion of this knowledge unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes and assessment criteria within the unit (detail contained with BPEC assessment specification).

Unit Ref: K/502/8930 – Understand and apply domestic cold water system installation, commissioning, service, and maintenance techniques

To achieve the completion of this combination unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes within the unit (detail contained with BPEC assessment specification). You must also complete the appropriate practical performance activities in simulated conditions as per the requirements of BPEC Practical Assessment no.1 as detailed in the BPEC L3 Plumbing and Heating practical assessment manual.

Unit Ref: K/502/9155 – Understand and apply domestic hot water system installation, commissioning, service, and maintenance techniques

To achieve the completion of this combination unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes within the unit (detail contained with BPEC assessment specification). You must also complete the appropriate practical performance activities in simulated conditions as per the requirements of BPEC Practical Assessment no.2 as detailed in the BPEC L3 Plumbing and Heating practical assessment manual.

Unit Ref: M/502/9156 – Understand and apply domestic central heating system installation, commissioning, service, and maintenance techniques

To achieve the completion of this combination unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes within the unit (detail contained with BPEC assessment specification). You must also complete the appropriate practical performance activities in simulated conditions as per the requirements of BPEC Practical Assessment no.3 as detailed in the BPEC L3 Plumbing and Heating practical assessment manual.

Unit Ref: T/502/9157 – Understand and carry out electrical work on domestic plumbing and heating systems and components

To achieve the completion of this combination unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes within the unit (detail contained with BPEC assessment specification). You must also complete the appropriate practical performance activities in simulated conditions as per the requirements of BPEC Practical Assessment no.4 as detailed in the BPEC L3 Plumbing and Heating practical assessment manual.

Unit Ref: D/502/9296 – Understand and apply domestic sanitation system installation, commissioning, service, and maintenance techniques

To achieve the completion of this combination unit, you must satisfactorily complete the applicable knowledge assessment for the knowledge learning outcomes within the unit (detail contained with BPEC assessment specification). You must also complete the appropriate practical performance activities in

simulated conditions as per the requirements of BPEC Practical Assessment no.5 as detailed in the BPEC L3 Plumbing and Heating practical assessment manual.

Unit Ref: K/502/9298 – Install, commission, service and maintain domestic plumbing and heating systems

To achieve the completion of this performance unit, you must provide satisfactory evidence of having met the requirements of the Learning Outcomes and Assessment Criteria from a real working environment. The performance-based learning outcomes for this unit will be assessed by utilising practical activities in a real working environment, for at least 2 of the following 5 types of plumbing system (cold water, hot water, central heating, rainwater, and above ground drainage) at a minimum of two separate work locations and on a minimum of two occasions.

7.2. L3 Gas units

Unit Ref: J/502/9390 – Understand core gas safety principles for natural gas within domestic building services engineering

To achieve the completion of this **knowledge unit**, you must satisfactorily complete the applicable knowledge assessments for the knowledge learning outcomes within the unit.

Unit Ref: H/502/8487 – Specific Core Installation & Maintenance

To achieve the completion of this **combination unit**, you must satisfactorily complete the applicable knowledge assessments for the knowledge learning outcomes within the unit. You mustalso complete the appropriate practical performance activities under simulated conditions as per the requirements for the unit as specified in the BPEC Qualification manual. Any additional criteria not assessed during practical performance activities under simulated conditions must be assessed in the real working environment.

Unit Ref: T/502/8381 – Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises

A minimum of **one** assessment conducted in the workplace is required for this unit and **one** 'in- centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment ofexperience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

See next page

UNIT ASSESSMENT REQUIREMENTS:

- Assessments must be carried out as documented in this table
- Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements

RANGE	RWE ASSESSMENT	ASSESSMENT OF EXPERIENCE	WORKPLACE ASSESSMENT
Primary Range: • Copper Tube • Steel Tube • Corrugated Stainless Steel Tube (CSST) • Polyethylene Tube (PE) **Secondary Range:** • Through Walls • Under Wooden Floors • Surface Mounted • Capillary Joints • Compression Joints • CSST Joints • Screwed Joints • Formed Bends	One Successful Assessment	Evidence of experience undertaking the satisfactory tightness testing and purging is required across the documented ranges. At least **5**[1] separate installation occasions must occur with the Learner demonstrating experience across the Assessment Criteria on each occasion. At least **3**[1] of the installation occasions must be from the workplace.	One Successful Assessment

Table Notes:

1. The documented numbers required to be evidenced do include the assessment occasions.

Unit Ref: D/503/8628 – Tightness test, purge, commission, and de-commission gas pipework up to 35mm 1¼ diameter in small natural gas installations.

A minimum of one assessment conducted in the workplace is required for this unit and one 'in- centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment of experience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

UNIT ASSESSMENT REQUIREMENTS:

- Assessments must be carried out as documented in this table
- Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements

RANGE	RWE ASSESSMENT	ASSESSMENT OF EXPERIENCE	WORKPLACE ASSESSMENT
Primary Range: • Natural Gas Installations • LPG Installations **Secondary Range:** • Purge Natural Gas Installation with Volume ≤ 0.02 m^3 • Purge Natural Gas Installation with Volume >0.02 m3 ≤ 0.035 m^3 • Including a Meter • New Installation • Existing Installation	One Successful Assessment	Evidence of experience undertaking the satisfactory tightness testing and purging is required across the documented ranges. At least **5**[1] separate installation occasions must occur with the Learner demonstrating experience across the Assessment Criteria on each occasion. At least **3**[1] of the installation occasions must be from the workplace.	One Successful Assessment[2]

Table Notes:

1. The documented numbers required to be evidenced do include the assessment occasions.
2. The assessment must be of a different 'Primary Range' type than the one utilised as part of the RWE Assessment.

Unit Ref: Y/502/8454– Install domestic gas water heaters and wet central heating appliances

A minimum of **one** assessment conducted in the workplace is required for this unit and **one** 'in- centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment ofexperience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

(Successful completion of the **Y/502/8454** knowledge assessments is also required for this unit).

UNIT ASSESSMENT REQUIREMENTS:

- Assessments must be carried out as documented in this table
- Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements

RANGE	RWE ASSESSMENT	ASSESSMENT OF EXPERIENCE	WORKPLACE ASSESSMENT
Primary Range: • Traditional Boiler [1] • System Boiler [2] • Combination Boiler [3] **Secondary Range:** • Room Sealed Fanned DraughtAppliance (Horizontal Chimney) *(Appliance Type C_{12} or C_{13})* • Room Sealed Fanned DraughtAppliance (Vertical Chimney) *(Appliance Type C_{32} or C_{33})* • Condensing Appliance • New Installation • Installation Exchange	One Successful Assessment	Evidence of experience undertaking the satisfactory tightness testing and purging is required across the documented ranges. At least **5**[4] separate installation occasions must occur with the Learner demonstrating experience across the Assessment Criteria on each occasion. At least **3**[4] of the installation occasions must be from the workplace.	One Successful Assessment[5]

Table Notes:

1 A 'Traditional Boiler' for the purpose of this document is deemed to be a boiler where the central heating system controls such as the pump, zone valves and other auxiliary controls are external to the appliance casing as supplied by the manufacturer.

2 A 'System Boiler' for the purpose of this document is deemed to be a boiler where one or more of the central heating system controls such as the pump, zone valves and other auxiliary controls are internal to the appliance casing as supplied by the manufacturer.

3 A 'Combination Boiler' for the purpose of this document is deemed to be a boiler that provides instantaneous hot water to single or multiple hot water outlets, such as taps, with no water storage capacity (other than small quantities that may, by manufacturers design, be stored internally to prevent any delay in hot water delivery).

4 The documented numbers required to be evidenced do include the assessment occasions.

5 The appliance must be of a different 'Primary Range' type than the one utilised as part of the RWE Assessment.

Unit Ref: T/502/8459 – Maintain gas water heating and wet central heating appliances Routine full service of a gas fired boiler

A minimum of one assessment conducted in the workplace is required for this unit and one 'in-centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment of experience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

Successful completion of the **T/502/8459** knowledge assessments is also required for this unit.

See next page

UNIT ASSESSMENT REQUIREMENTS: • Assessments must be carried out as documented in this table • Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements			
RANGE	**RWE ASSESSMENT**	**ASSESSMENT OF EXPERIENCE**	**WORKPLACE ASSESSMENT**
Primary Range: • Traditional Boiler [1] • System Boiler [2] • Combination Boiler [3] • Gas Fire and Back Boiler[4] **Secondary Range:** • Open-Flued Natura lDraught Appliance (incl. Draught Diverter) (Appliance Type B_{11}) • Room Sealed Natural Draught Appliance (Appliance Type C_{11}) • Room Sealed Fanned Draught Appliance (Appliance Type C_{12} or C_{13} or C_{32} or C_{33} or C_{52} or C_{53}) • Condensing Appliance • Non Condensing Appliance	One Successful Assessment	Evidence of experience undertaking the satisfactory tightness testing and purging is required across the documented ranges. At least **5**[5] separate installation occasions must occur with the Learner demonstrating experience across the Assessment Criteria on each occasion. At least **3**[5] of the installation occasions must be from the workplace.	One Successful Assessment[6]

Routine full service of a gas fired instantaneous water heater

There is a requirement to successfully complete one 'in-centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment of experience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

UNIT ASSESSMENT REQUIREMENTS: • Assessments must be carried out as documented in this table • Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements			
RANGE	**RWE ASSESSMENT**	**ASSESSMENT OF EXPERIENCE**	**WORKPLACE ASSESSMENT**
Primary Range: Multipoint Water Heater	One Successful Assessment	N/A	One Successful Assessment[6]

Identify and repair faults on gas fired boilers and instantaneous water heaters

There is a requirement to successfully complete one 'in-centre' performance assessment provided by BPEC Certification Ltd. The remaining assessment of experience should be carried out in the workplace (See below for the Gas Utilisation Specific Assessment Strategy (Appendix F) for full assessment requirements).

UNIT ASSESSMENT REQUIREMENTS:

- Assessments must be carried out as documented in this table
- Learners must demonstrate sufficient evidence of competence through experience of satisfactorily undertaking the work activities documented across the full range. This shall be evidenced via the Learners Portfolio and be assessed as meeting the minimum documented requirements

RANGE	RWE ASSESSMENT	ASSESSMENT OF EXPERIENCE	WORKPLACE ASSESSMENT
Primary Range: • Traditional Boiler [1] • System Boiler [2] • Combination Boiler [3] • Gas Fire and Back Boiler[4] **Secondary Range:** • Open-Flued Natura lDraught Appliance (incl. Draught Diverter) (Appliance Type B_{11}) • Room Sealed Natural Draught Appliance (Appliance Type C_{11}) • Room Sealed Fanned Draught Appliance (Appliance Type C_{12} or C_{13} or C_{32} or C_{33} or C_{52} or C_{53}) • Condensing Appliance • Non-Condensing Appliance	One Successful Assessment	Evidence of experience undertaking the satisfactory tightness testing and purging is required across the documented ranges. At least **4**[5] separate installation occasions must occur with the Learner demonstrating experience across the Assessment Criteria on each occasion. At least **2**[5] of the installation occasions must be from the workplace.	One Successful Assessment[6]

Table Notes:

1. A 'Traditional Boiler' for the purpose of this document is deemed to be a boiler where the central heating system controls such as the pump, zone valves and other auxiliary controls are external to the appliance casing as supplied by the manufacturer.
2. A 'System Boiler' for the purpose of this document is deemed to be a boiler where one or more of the central heating system controls such as the pump, zone valves and other auxiliary controls are internal to the appliance casing as supplied by the manufacturer.
3. A 'Combination Boiler' for the purpose of this document is deemed to be a boiler that provides instantaneous hot water to single or multiple hot water outlets, such as taps, with no water storage capacity (other than small quantities that may, by manufacturers design, be stored internally to prevent any delay in hot water delivery).
4. A 'Gas Fire & Boiler' for the purpose of this document is deemed to be a boiler, not a back circulator, that is connected to a flexible flue liner and has a gas fire connected to the front of the appliance.
5. The documented numbers required to be evidenced do include the assessment occasions.
6. The appliance must be of a different 'Primary Range' type than that the one utilised as part of the RWE Assessment.
7. The defects listed are 'Appliance Defects' and relate to controls within the appliance casing and do not refer to defects on controls on the heating or hot water systems.

8. Marking Strategies

8.1. On-line Multiple-Choice Tests

There are 6 Multiple Choice Tests:

Unit		No. of Questions	Open or closed book
R/602/2498	Understand how to organise resources within BSE	20	**Closed book**
K/502/8930	Understand and apply domestic cold water system installation, commissioning, service, and maintenance techniques	45	**Open book**
K/502/9155	Understand and apply domestic hot water system installation, commissioning, service, and maintenance techniques	45	**Open book**
M/502/9156	Understand and apply domestic central heating system installation, commissioning, service, and maintenance techniques	30	**Open book**
T/502/9157	Understand and carry out electrical work on domestic plumbing and heating systems and components	25	**Open book**
D/502/9296	Understand and apply domestic sanitation system installation, commissioning, service, and maintenance techniques	49	**Open book**

The pass rate for all **on-line** exams is **60%.**

If the pass rate of 60% if not achieved a full re-sit will be required. The centre should use the exams summary report to identify any areas that would need further training before offering any re-sits.

The centre should not enter any Learner into any exams without first confirming they are ready.

8.2. Performance Assessments

The pass mark for the practical assessments is pass/fail.

First Attempt – Learners are given a first attempt in all areas of the performance assessment. Second Attempt – performance areas not satisfactorily completed will be re-attempted. At the assessor's discretion, the Learner is re-assessed by oral questioning and/or observing the performance to establish competence in all remaining areas. Learners who have not achieved the 100% pass mark at this stage will be deemed to have failed the performance assessment. Learners wishing to retake the assessment will be required to re-attempt the full performance assessment in its entirety.

8.3. Written Design Assignment

The pass mark for written assignments is 100%

8.4. Marking Knowledge Exams - BPEC Level L3 Gas Units

Paper based exams

1. The pass rate for all gas exams is 100%
2. The learner will complete a first attempt

3. If the learner does not achieve the 100% pass mark, they will be given a second attempt at answering any questions answered incorrectly on the first attempt
4. Oral Verification - providing the learner has achieved a minimum of 80% during their second attempt, the learner will be orally questioned in an attempt to establish competence in all remaining areas
5. Learners who have not achieved the 80% pass mark after their second attempt will be deemed to have failed the knowledge assessment. Learners wishing to retake the assessment will be required to re-attempt the full theory exam in its entirety

8.5. Learner Result Submission Form

Learner Result Submission Forms have been produced for the L2 Plumbing qualification. This document shall be used to record that the learner has completed the whole qualification in a satisfactory manner. The document shall be completed and signed by the centre assessor and the internal verifier.

The completed Learner Result Submission Forms shall be sent to BPEC Certification Ltd. for certification. Copies of the Learner Result Form shall also be retained in the Learner Portfolio and the Centre Portfolio.

9. Further Information

Requests for further information regarding centre/scheme approval or any aspect of assessment of the BPEC qualifications please contact:

BPEC Certification Ltd. 2 Mallard Way, Pride Park, Derby, DE24 8GX

T: 01332 376000 E: AOadmin@bpec.org.uk W: www.bpec.org.uk