



Qualification Specification

DGE-002

BPEC Level 3 Diploma in Gas Engineering

Qualification Number – 610/7690/9

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1. 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

Tel: 01332 376000

Or visit our website at:

www.bpec.org.uk

2. Introduction to the Qualification

2.1 Qualification Overview

Qualification Title	BPEC Level 3 Diploma in Gas Engineering					
Qualification Assessment Number (QAN)	160/7690/9					
BPEC Qualification Code	DGE-002					
Assessment Method/s	Multiple Choice Examination, Portfolio of Evidence, Practical Demonstration/Assignment, Written examination. Task-based Controlled Assessments.					
Entry Requirements	Learners must be 16 years old or over and registered on the Gas Engineering Operative Apprenticeship Standard (ST0155).					
Registration Duration	36 Months					
1	GLH	951	TQT	1189	Credits	N/A
Mandatory Units			11			
Optional Units			2			
Last Registration Date			31/07/2030			
Last Certification Date			31/07/2032			

2.2 Registration Duration

The registration duration for the qualification detailed within this document is detailed in the table above. All learners must complete the qualification within the registration duration, should they fail to complete the qualification within this period, the centre must register the learner again and pay for a new registration, fees are detailed in the BPEC Awarding Organisation Fees List.

Learners must be made aware that they will be required to complete the qualification within the registration duration, for the relevant qualification as detailed in the table above.

BPEC will only consider extending an learner registration in exceptional circumstances such as e.g. long-term illness, bereavement, psychological conditions, caring for family members etc. Please note this list is not exhaustive. Each request will be reviewed by BPEC on an individual basis, please contact AQadmin@bpec.org.uk , giving details of the learner, qualification, and the rationale for the request.

2.3 Who this Qualification is for

This qualification is for those learners currently employed in the gas industry as an apprentice gas engineering operative and registered on Gas Engineering Operative Apprenticeship Standard (ST0155). Learners will be required to demonstrate the necessary abilities, skills and knowledge to be able to plan, select, install and commission all aspects of gas appliances and systems contained within this qualification. In addition to this, Learners will also demonstrate a knowledge of service, maintenance and fault diagnosis and rectification of gas installations and appliances. This qualification is only permitted for apprentices currently employed as a gas engineering operative.

2.4 The Purpose of the Qualification

Learners will develop transferable skills, knowledge and disciplines in the gas utilisation industry. The qualification will demonstrate a commitment to working in the gas industry, giving those that hold the qualification a formal industry recognised qualification in Domestic Gas Engineering. The qualification has been designed to the on-programme element for the Gas Engineering Operative Apprenticeship Standard in England.

2.5 Support and Accreditation

This qualification is supported by industry and regulated by OFQUAL.

2.6 Relationship to Other Qualifications

N/A

2.7 Qualification Limitations

The holder of this qualification is recognised as being competent to carry out gas work as defined in the Gas Safety (Installation and Use) Regulations 1998 and can apply for Gas Safe Registration in the gas work categories defined in this programme. Upon successful completion of this qualification, the learner will have met the required criteria for the Gas Safe Registration categories required to progress through the gateway and onto End-point Assessment.

This qualification is aligned to CCN 1, CPA 1, CENWAT, CKR 1, HTR 1 and MET 1.

3. Qualification Structure

BPEC Level 3 Diploma in Gas Engineering (Aligned to CCN 1, CPA 1, CENWAT, HTR 1, CKR 1, MET 1)

Mandatory Units

This qualification consists of **11 mandatory units**. To achieve the BPEC Level 3 Diploma in Gas Engineering, learners must complete the following mandatory units.

Unit Code	Unit Type	Unit Title	Level	Credit Value	TQT	GLH
1	K/P	Understand and apply health and safety in gas utilisation	3			58
2	K	Understanding scientific principles in gas utilisation	3			28
3	K	Understanding combustion and properties of gas	3			90
4	K	Understanding buildings, services and structures	3			90
5	K	Understanding gas safety	3			93
6	K/P	Specific core installation and maintenance	3			118
7	K/P	Tightness test, purge, commission and de-commission gas pipework up to 35 mm (1½) diameter in small gas installations	3			22
8	K/P	Install, commission and de-commission gas pipework up to 35 mm (1½) diameter in domestic and small commercial premises	3			117
9	K/P	Install and maintain domestic gas water heaters and wet central heating appliances	3			185
10	K/P	Install and maintain domestic gas cooker appliances	3			60
11	K/P	Install and maintain domestic gas space heating appliances	3			90
		Totals	3		1189	951

Optional units

This qualification also consists of **2 optional units**.

Unit Code	Unit Type	Unit Title	Level	Credit Value	TQT	GLH
12	K	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK	3			8
13	K	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques	3			30

4. The Learners

4.1 Qualifications which a Learner must have completed before taking the qualification

None are applicable.

4.2 Knowledge, skills or understanding which the Learner is required to have before taking the qualification

General

1. The Centre should:

Undertake an initial assessment of each Learner to ensure 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.

4.3 The units which a Learner must have completed before the qualification will be awarded and any optional routes

Learners must successfully complete all 11 mandatory units to achieve this qualification. Learners may also choose to complete one or both of the optional units. Each optional unit is awarded separately and will only be awarded where the learner has successfully achieved that unit.

4.4 Any other requirements which a Learner must have satisfied before the Learner will be assessed or before the qualification will be awarded

None identified.

4.5 Qualification Achievement

The qualification will be awarded when all necessary units have been achieved.

5. Delivery Requirements

5.1 Centre Recognition

Centres wishing to deliver this qualification will need to gain Centre Recognition and Qualification Approval (see 5.2). For full details of the recognition process please contact:

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

5.2 Qualification Approval

Centres wishing to deliver this qualification who are already recognised (see 5.1) should complete and submit a **BPEC Application for Additional Qualification Approval Form** to BPEC Certification Ltd.

Before submission, centres should ensure 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.

5.3 Physical Resources

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

5.4 IGEM/IG/1 Supplement 2

The qualification has been designed to meet the requirements of IGEM/IG/1 – Standards of Training in Gas Work.

Centres must ensure that training of all learners registered on this qualification, complies with the latest requirements of IGEM/IG/1 Supplement 2, a copy of which can be downloaded from here:

- [IGEM/IG/1 Edition 2 Supplement 2 - Domestic training specification | The Institution of Gas Engineers and Managers \(IGEM\)](#)

This training specification covers the minimum training requirements for:

- new entrants to the gas industry wishing to work in the domestic Natural Gas (NG) utilisation sector within the scope of the Gas Safety (Installation & Use) Regulations (GS(I&UR)).

This Specification is designed to cover the breadth of the industry, including the legal requirements, knowledge and understanding, performance criteria and ‘on the job’ work experience that will be undertaken in the workplace related to domestic gas installations and appliances.

6. Assessor/Trainer Requirements

The centre must nominate all assessors to BPEC for approval prior to them conducting any assessments on this qualification.

6.1 Staff Conducting Assessments

6.1.1 Technical/occupational competency

Any staff assessing on this qualification must be vocationally and occupationally competent in the areas they will be assessing. They must also have a thorough knowledge of the units within the qualification being assessed.

In addition to the qualifications listed in 6.1.2, the assessor must also be able to provide documented evidence that demonstrates they have a minimum of five years relevant occupational experience in the activities they will be assessing.

6.1.2 Assessor Competency

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 gas qualification equal to or at the level above the training and/or assessment being delivered, which may include:
 - Level 3 Diploma in Gas Utilisation or
 - SQA S/NVQ in Domestic Natural Gas (Level 3) or
 - Certificate for Service Engineers (Gas) or
 - Certificate in Gas Installation Studies or
 - Certificate in Gas Fitting – Final.
 - Level 3 NVQ in Plumbing (Gas Pathway)
- Assessors must also hold a current gas safety certificate of competence in the categories of gas work they will be assessing that is not more than 5 years old.
- 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.
- For the optional units (Units 12-13) assessors must hold relevant certificates of competence in the areas being assessed and supporting CPD proving current experience.

Other qualifications in Mechanical Engineering Services or Building Engineering Services at Level 3/SCQF Level 6 or equivalent may be accepted, but centres must submit assessor approval

documentation to confirm the acceptability of other qualifications to BPEC for a decision regarding the suitability of other qualifications.

In addition to the above, the assessor must also hold one of the following:

- Assess candidate performance (D32)/Assess candidate using different sources of evidence (D33)
- Assess candidates using a range of methods (A1)
- Assess candidates' performance through observation (A2)
- Award in Assessing Vocationally Related Achievement
- Award in Assessing Competence in the Work Environment (**on-site assessments only**)
- Certificate in Assessing Vocational Achievement

Assessors holding D units must have evidence of CPD to demonstrate compliance with the A units.

Candidate assessors' who are working towards their assessor qualifications must always be supervised by a qualified and approved 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).

6.1.3 Assessor CPD

The occupational competence of assessors must be updated on a regular basis and be periodically confirmed via continuing professional development (CPD) via the 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.

6.2 Staff Conducting Internal Quality Assurance

The centre must nominate all IQA's to BPEC for approval prior to them conducting any quality assurance activities on this qualification.

Any staff conducting internal quality assurance this qualification must be vocationally and occupationally competent in the areas they will be verifying. They must also have a thorough knowledge of the units within the qualification being verified.

In addition to the qualifications listed below, the internal quality assurer must also be able to provide documented evidence that demonstrates they have a minimum of five years relevant occupational experience in the activities they will be verifying.

Internal Quality Assurers must hold one of the following qualifications:

- Level 3 Diploma in Gas Utilisation
- SQA - S/NVQ in Domestic Natural Gas (Level 3)
- Certificate for Service Engineers (Gas)
- Certificate in Gas Installation Studies
- Certificate in Gas Fitting – Final.
- Level 3 NVQ in Plumbing (Gas Pathway)

Other qualifications in Mechanical Engineering Services or Building Engineering Services at Level 3/SCQF Level 6 or equivalent may be accepted, but centres must submit assessor/IV approval documentation to confirm the acceptability of other qualifications to BPEC for a decision regarding the suitability of other qualifications.

Internal Quality Assurers must also hold a current gas safety certificate of competence in the categories of gas work they will be verifying that is not more than 5 years old.

For the optional units (Units 12-13) Internal Quality Assurers must hold relevant certificates of competence in the areas being assessed and provide supporting CPD proving current experience.

6.3 IQA Competence

In addition to the above, the IQA must also hold one of the following:

- Internally verify the assessment process (D34)
- Conduct internal quality assurance of the assessment process (V1)
- Award in the Internal Quality Assurance of Assessment Processes and Practice
- Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice

IQA's holding D units must have evidence of CPD to demonstrate compliance with the A and V units.

Candidate IQAs who are working towards their IQA qualifications must always be supervised by a qualified and approved IQA. They should have a clear action plan for achieving the IQA qualification(s), (IQA approval will be withdrawn if the IQA qualification/unit(s) have not been attained within a period of 18 months).

6.3.1 IQA CPD

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

It is the responsibility of each IQA 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

7. Support Materials

7.1 Qualification Specification

This Qualification Specification provides details of all units, Learning Outcomes, Range and specific advice regarding the assessment process.

7.2 Learner Result Submission Form

A Learner Result Submission Form is available for this qualification. This should be completed for each learner and submitted when certification is required.

7.3 Learner Assessment Packs

Assessment Packs are available for this qualification, these include:

- Level 3 GE Practical Assessment portfolio
- Level 3 GE On-Site Work Record

7.4 Training Resources

Training resources have been developed in-line with this qualification, these include:

- PowerPoint presentations
- Schemes of Work
- Gas Training Pack
- Gas Training Pack Rationale
- Gas Engineering Workshop Guide
- Health and Safety Practice Knowledge Exam
- Unit 2, 3 & 4 Combined Gas Practice Knowledge Exam

7.5 Gas Learning Manuals

Gas Learning Materials are available to support the gas specific units of this qualification from www.bpec.org.uk.

7.6 Scheme of Work

New Schemes of Work (Sow's) have been provided on the secure portal for the 11 Mandatory Units and 2 optional units.

8. Unit Details

The tables below detail the units which comprises the qualification; outlining the title, UAN, GLH, aim, learning outcomes, learning points and range.

Unit 1 – Understanding health and safety in gas utilisation

UAN – A/652/2390
GLH – 58
EUS DSG1.1

AIM

This knowledge and practical unit aims to provide learners with the knowledge and understanding of the general health and safety requirements for working within the gas industry. Upon completion of the unit the learner will be able to:

LO1 - Understand the health and safety legislation**Assessment Criteria and Range**

1.1	Explain the aims of health and safety legislation in protecting the workforce and members of the public
1.2	Explain the key features of the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)
1.3	Describe examples of where RIDDOR would be used in the gas industry
1.4	State the key responsibilities of employees, employers and customers (clients) under health and safety legislation
1.5	State the role of the following enforcing authorities under Health and Safety Legislation: • Health and Safety Executive (HSE) • Local Authority
1.6	State the roles, responsibilities and powers of HSE inspectors under Health and Safety Legislation for: • Issue of improvement and Prohibition notices • Powers of prosecution
1.7	Describe the HSE role in providing advice and guidance

LO2 - Know the health and safety measures for gas utilisation**Assessment Criteria and Range**

2.1	State the general hazards and dangers found on a typical work site and the organisations recording procedures
2.2	Explain the purpose and importance of completing a risk assessment
2.3	Describe the categories which are completed as part of a risk assessment: a) Hazards b) Risks c) Likelihood d) Severity

LO2 - Know the health and safety measures for gas utilisation**Assessment Criteria and Range (continued)**

2.4	Describe the following risk control measures: a) Eliminate b) Reduce c) Isolate d) Control e) PPE f) Personal Discipline
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2.5	State the types and purpose of personal protective equipment and clothing how and when it must be used, cleaned and stored to include: a) Eye Protection b) Hand protection c) Head protection d) Foot protection e) Clothing protection/Visibility f) Hearing Protection g) Respiratory Protection
2.6	Describe the types and purpose of signs and safety notices to include: a) Mandatory Signs b) Prohibition Signs c) Hazard Signs d) Firefighting signs e) Safe Condition signs f) Combination signs
2.7	State the purpose of and contents of: a) Method Statements b) Permit to Work Systems
2.8	Develop a model risk assessment to include all the key elements

LO3 - Know the regulations covering the use and disposal of hazardous substances

Assessment Criteria and Range

3.1	State the key purpose of the Control of Substances Hazardous to Health regulations (COSHH)
3.2	Describe hazardous substances and provide examples from each classification category to include: a) Toxic b) Harmful c) Corrosive d) Irritant e) Oxidising f) Extremely Flammable

LO3 - Know the regulations covering the use and disposal of hazardous substances

Assessment Criteria and Range (continued)

3.3	Explain the general precautions necessary for working with commonly encountered substances to include: a) Fluxes b) Solder c) Lead d) Jointing Compounds e) Sealants f) Asbestos
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	g) Gaskets h) Solvents and lubricants i) Cleaning agents j) Gases
3.4	State the key purpose of the Control of Asbestos at Work Regulations
3.5	Identify the different types of asbestos found in the workplace
3.6	Define the key risks associated with working with the following: a) White Asbestos (Chrysotile) b) Brown or Grey asbestos (Amosite) c) Blue Asbestos (Crocidolite) d) Asbestos cement materials
3.7	Explain the methods and actions required to protect workers and members of the public from the risk of asbestos
3.8	Describe how to remove and dispose of asbestos safely
3.9	State the licensing requirements for asbestos removal organisations
3.10	Identify common building materials and services components that may contain asbestos: a) Flue pipes b) Boiler casings, storage cisterns, insulation (pipe, roof, wall etc) c) Artex d) Small gaskets and seals e) Floor coverings
3.11	Identify the procedures that must be used to safely work with asbestos cement-based materials
3.12	State the actions to be taken when asbestos is encountered while undertaking work activities. (e.g. PPE)

LO4 - Know manual handling methodology and lifting techniques

Assessment Criteria and Range

4.1	Explain the process of planning a lift: a) How to assess a load b) Moving the load, route, safety c) Duration of lift, accessibility d) Informing others
4.2	Describe the safe manual handling of heavy and bulky loads
4.3	Explain the risks of personal injury associated with lifting and handling

4.4	Explain kinetic lifting techniques
4.5	Describe the safe lifting techniques used: a) To move loads alone b) For a 2-person lift c) Using mechanical aids
4.6	Develop a plan for a simulated lifting activity which includes all key factors

LO5 - Know how to identify and respond to accidents which occur at work

Assessment Criteria and Range

5.1	State the main responsibilities of the employer and employee under the 'Health and Safety at Work Act 1974' in relation to reporting of accidents at work
5.2	State the requirements for personal first aid provision
5.3	Describe the typical accident and incident recording and reporting procedures whilst working in: a) Domestic dwellings b) Business premises
5.4	Describe the benefits of reporting accidents and near misses
5.5	Explain how to raise the alarm following an accident and how to contact the police, fire service, ambulance and gas emergency service
5.6	State the responsibilities and procedures for dealing with minor and major workplace injuries
5.7	Describe how to deal with victims of electric shock including their removal from an electrical supply
5.8	Describe the correct method of administering CPR and identify when it would be performed
5.9	Explain the correct method of placing an accident victim in the recovery position and identify when this action would be performed
5.10	Describe the key elements which are included in a typical organisations' evacuation procedure

LO6 - Know the requirements for maintaining electrical safety, the associated dangers and earthing protection systems

Assessment Criteria and Range

6.1	Describe the electrical dangers of construction sites, business properties private dwellings to include the following: a) Signs of damage or worn electrical cables on power tools and property hard wiring systems b) Signs of visual fault on electrical components c) Trailing cables d) Proximity of cables to service pipe work e) Buried and hidden cables f) Avoidance of cables under wooden floors g) Inadequate over current protection devices
6.2	Identify the types and safe use of electrical tools and equipment including: a) Battery powered b) 110V supplies c) 240V supplies
6.3	Explain the purpose of the visual inspection of power tools
6.4	State the Portable Appliance Testing (PAT) requirements of electrical equipment
6.5	Describe the potential risks of electric shock resulting from: a) The existing electrical installation b) Faulty electrical tools and equipment
6.6	Identify the different types of earthing systems used in properties including their typical cable sizes: a) Lighting circuit b) Ring main c) Radial d) Spur
6.7	State the key purpose and differences between: a) Main protective bonding b) Supplementary bonding c) Temporary continuity bonding
6.8	Explain the use of electrical earth bonding labels
6.9	Understand the requirements of The Electricity at Work Regulations prior to commencing electrical work activities
6.10	Explain the electrical industry safe isolation procedure, to safely isolate an item of fixed mechanical or electrical equipment
6.11	State the requirements for the use of temporary continuity bonds
6.12	Describe the process for applying a temporary continuity bond when cutting into a fixed metallic pipe work system

LO7 - Know Fire safety

Assessment Criteria and Range

7.1	State the three elements of the combustion triangle
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7.2	State how to prevent fires on building sites, along with which HSE document to consult
7.3	State the circumstances when, and when not to tackle a fire
7.4	State which types of fire extinguisher would be required to tackle: a) An electrical fire b) A general fire c) A flammable liquids fire d) A small paper fire
7.5	State when it would be appropriate to use a fire blanket to extinguish a fire
7.6	State the precautions to be taken when using heat producing equipment: a) Blow lamps/torches b) Soldering irons c) Heat guns
7.7	Describe the safe storage, transportation, assembly, testing and use of blow lamps/torches and associated LPG cylinders

LO8 - Know the safety requirements for working at heights

Assessment Criteria and Range

8.1	State the safety measures, regulations and checks needed when working with steps, ladders and mobile scaffolding e.g. PUWER, WAH, PASMA
8.2	Describe the types of equipment to be used when working at heights to include: a) Step Ladders b) Ladders c) Roof ladders and crawling boards d) Mobile tower scaffolds
8.3	Describe how to assemble, erect and use access equipment when working at heights a) Step Ladders b) Ladders c) Roof ladders and crawling boards d) Mobile tower scaffolds
8.4	Describe the working at height safety hierarchy of Control Measures

LO9 - Know how to identify and work safely in confined spaces

Assessment Criteria and Range

9.1	State the definition of a confined space and state the requirements of the confined spaces legislation
9.2	Identify the typical confined spaces which gas engineers encounter at work to include: a) Roof spaces b) Under wooden floors c) Cellars d) Plant rooms e) Duct rooms f) Metering or governor houses g) Trenches
9.3	Describe the additional dangers when working in confined spaces
9.4	Describe the additional safety measures which need to be taken when working in confined spaces

LO10 - Know the regulations in force to protect the environment and control waste

Assessment Criteria and Range

10.1	State the requirements of environmental protection regulations: a) The controlled waste regulations b) Controlled waste (registration of carriers and seizure of vehicles) - packaging - building regulations (including energy efficiency requirements for new dwellings) and water supply regulations c) Methods of disposing of waste including: • licensed waste disposal sites • specialist waste disposal requirements e.g. asbestos • carriage of waste by roads • waste carriers license
10.2	Describe the environmental protection measures which can be incorporated into installation methods and practises: a) Minimising the wastage of equipment and materials b) Accurate cutting, bending and jointing c) Loss and/or theft of material on-site d) Using principles that minimise the usage of energy in installed systems and components e) Using principles that minimise the usage of water in installed systems and components f) Materials that can be readily recycled g) Ensuring that installed systems/components are correctly commissioned h) Ensuring that customers are informed on key operating requirements

Unit 2 – Understanding scientific principles in gas utilisation

UAN – R/652/2414

GLH – 28

EUS DSG1.2

AIM

This knowledge unit aims to provide the learners with the knowledge and understanding of the scientific principles in gas utilisation. Upon completion of the unit the learner will be able to:

LO1 - Know the Systeme Internationale (SI) units used within gas utilisation

Assessment Criteria and Range

1.1	Understand the Systeme Internationale (SI) Units used in gas utilisation to include: a) Metre b) Kilogram c) Second d) Kelvin
1.2	Describe SI derived units for: a) Area b) Volume c) Velocity d) Flow rate e) Acceleration f) Density g) Force h) Pressure i) Specific heat capacity j) Temperature k) Heat l) Power
1.3	Describe how to convert from imperial to SI units using formulas and conversion tables
1.4	Explain the basic scientific principles used in gas utilisation: a) Mass and weight b) Speed and velocity c) Acceleration d) Force e) Work and power f) Temperature g) Sensible heat and latent heat h) Condensation & Evaporation i) Comfort conditions j) Heat energy rates k) Thermal efficiency

LO2 - Know the sources of energy, heat transfer, and mechanics**Assessment Criteria and Range**

2.1	Define renewable and non-renewable energy
2.2	State the different types of non-renewable energy to include: a) Natural Gas and LPG b) Oil c) Solid fuel d) Electricity generated by fossil fuels
2.3	State the different types of renewable energy to include: a) Electricity generated by renewable energy sources b) Solar c) Biomass d) Hydrogen fuel cells e) Wind f) Hydro
2.4	Describe the methods of heat transfer: a) Radiation b) Conduction l) Convection
2.5	Identify the different forms of Mechanics: a) Mechanical advantages b) Mechanical reaction
2.6	State how the following can be used within the gas industry: a) Equilibrium: movement of a force
2.7	Explain the factors of Levers: a) Stress and strain b) Stress in beams c) Pulleys – Centre of gravity

LO3 – Properties of Natural Gas (NG) and Liquefied Petroleum Gas (LPG)**Assessment Criteria and Range**

3.1	State the chemical symbols of the NG & LPG
3.2	Understand, explain and describe the 3 families of gases
3.3	Understanding the characteristics of Gas: a) Relative density b) Calorific values c) Gross and Net CV's d) Flammability limits e) Wobbe number f) Flame speed g) Ignition temperature
3.4	Understand, explain and describe the types of gas meters
3.5	Understand, explain and describe how to calculate gas rates
3.6	Understand, explain and describe the types of gas detectors
3.7	State the formula for Charles law and Boyles law
3.8	Explain the interrelationship between pressure, volume and temperature

LO4 - Understand the combustion of fossil fuels and its alleged contribution to climate change**Assessment Criteria and Range**

4.1	Describe the effects of using renewable and non-renewable energy sources: a) Energy and the environment b) Climate change • How we contribute to climate change • The impact of climate change • What's being done to help fight climate change c) Combustion of fossil fuels
4.2	Describe the energy efficiency measures employed within buildings: a) Energy use in the house b) Energy saving products and their benefits
4.3	State the key factors of the building regulations (Part L1) which apply to energy efficiency

Unit 3 – Understanding combustion and properties of gas (natural gas and LPG)

UAN – T/652/2415
GLH – 90
EUS DSG 1.3
AIM This Knowledge unit aims to provide the learner with the knowledge and understanding of combustion and properties of gas. Upon completion of the unit the learners will be able to:

LO1 - Know the Natural Gas (NG) supply network and LPG supplies	
Assessment Criteria and Range	
1.1	Describe the key features of a natural gas network to include: a) Gas terminals b) Pipe materials and sizes c) Compressors d) Pressure regulation e) Storage f) Gas quality
1.2	Define the operating pressure ranges for: a) Low pressure b) Medium pressure c) Intermediate pressure d) High pressure
1.3	Know the effects of.... a) Low and high flow rates on a meter regulator b) Pressure absorption across a primary meter installation
1.4	Identify LPG ECV's, components and Isolating valves
1.5	Know the requirements components for LPG cylinder installations

LO2 - Understand the operation of pressure regulators	
Assessment Criteria and Range	
2.1	Explain the purpose and application of pressure regulators
2.2	State the different types of pressure regulators
2.3	Describe the construction and operation of a compensated constant pressure regulator

LO3 - Know the factors affecting pressure loss and the equipment used to measure gas pressure	
Assessment Criteria and Range	
3.1	State the factors affecting pressure loss
3.2	Describe the operation and uses of a typical monometer, clarify the required reading accuracy
3.3	Describe the operation and uses of a typical digital pressure gauge, clarify the required accuracy of reading and calibration checks

LO4 - Understand combustion of gases, the effects of its products and associated risks**Assessment Criteria and Range**

4.1	Describe the characteristics of complete and incomplete combustion including air and fuel requirements
4.2	Explain the causes of incomplete combustion
4.3	State the main constituents of complete and incomplete combustion
4.4	Explain pre- and post-aerated flames
4.5	State the symptoms/effects when humans are exposed to carbon monoxide
4.6	State other sources of carbon monoxide and carbon dioxide found in dwellings
4.7	Describe typical ambient levels of carbon dioxide and identify critical levels and the potential effects on the gas combustion process
4.8	Describe the types of gas and carbon monoxide detectors
4.9	State where gas and carbon monoxide detectors should be placed/installed and identify the associated maintenance requirements
4.10	Describe the visible warning signs associated with incomplete combustion
4.11	Explain the combustion process for gases used in dwellings: a) Combustion equation • British Thermal Units (BTUs) • Kilowatts (kW) b) Gross heat input to Net heat input equation
4.12	Describe the movement of Carbon Monoxide within a building and how it may enter a property
4.13	Explain the advice to give to a person who may be suffering from CO poisoning
4.14	Identify the causes of CO detector/indicator activation
4.15	Identify the measures necessary to ensure that exposure to Carbon Monoxide does not take place/ is minimised including correct appliance installation and maintenance
4.16	State the action to be taken when combustion readings cannot be obtained, when using an F.A.G

LO5 - Know gas burner operation, design, features and types**Assessment Criteria and Range**

5.1	Describe the operation of the following burners: a) Natural draught b) Pre and post aerated c) Pre-mix d) Forced draught e) Radiant f) Flameless combustion
5.2	State the differences between the performance of pre- and post-aerated burners

LO5 - Know gas burner operation, design, features, and types**Assessment Criteria and Range (continued)**

5.3	Describe the burner faults that can result in: a) Incomplete combustion b) Flame lift c) Lighting back
5.4	Describe the key parts and operation of a per-aerated natural draught burner to include: a) Gas injector b) Primary airports c) Venturi d) Burner head e) Burner/flame retention

LO6 - Know the properties and characteristics of natural gas and LPG**Assessment Criteria and Range**

6.1	Identify first, second and third families of gases
6.2	Explain the characteristics of natural gas and LPG a) Relative density b) Calorific value c) Gross and net calorific value d) Wobbe numbers e) Flammability limits f) Flame speed g) Ignition temperature h) Viscosity
6.3	Describe the characteristics and properties of LPG: a) Storage of LPG b) Boiling points of LPG c) Types of gases d) Vapour pressure curves e) Vaporisation and off-takes f) Viscosity g) Auto-refrigeration and excessive off-takes h) Origins of LPG

Unit 4 – Understanding buildings, services and structures

UAN – Y/652/2416
GLH – 90
EUS DSG 1.4
AIM The aim of this knowledge unit is to provide the learner with the knowledge and understanding of buildings, services and structures required for working in the gas industry. Upon completion of the unit the learners will be able to:

LO1 - Know the types and characteristics of construction materials	
Assessment Criteria and Range	
1.1	Explain heat treatments and the effects on metals
1.2	Identify and describe the effects of corrosion on metals
1.3	State the precautions taken to stop the effects of corrosion on metals
1.4	Describe the types and properties of construction materials used in the workplace to include: a) Concrete b) Bricks c) Blocks d) Cement e) Plaster f) Timber g) Roofing tiles
1.5	Describe the following building components: a) Foundations – Mass fill, strip b) Damp proof courses c) Brick/block Walls – exterior, load bearing d) Partition Walls e) Flooring types – concrete and wooden f) Ceilings g) Lintels h) Wall plates i) Roofing types- flat, traditional and trussed j) Types of Roof tiling

LO2 - Know how to use hand and power tools within gas utilisation	
Assessment Criteria and Range	
2.1	Identify basic tools associated with the gas industry and describe their uses to include: a) Hand tools b) Battery operated power tools c) 110 V and 240 V power tools
2.2	Describe the safety checking processes of gas industry tools carried out prior to their use to include: a) Visual inspections b) PAT testing/electrical checks c) Use of RCD adaptors

LO2 - Know how to use hand and power tools within gas utilisation	
Assessment Criteria and Range (continued)	
2.3	Identify appropriate personal protective equipment (PPE) to be used
2.4	Describe the tools required and the methods of cutting: a) Metal b) Wood c) Plastics
2.5	Identify the typical Fasteners and Fixings used for securing to different materials: a) Wood b) Solid walls and floors c) Dry lined walls and ceilings d) Timber and steel framed walls
2.6	Describe the types of drills required when drilling through different types of materials: a) Metal b) Wood c) Plastics d) Brick e) Concrete f) Solid walls and floors g) dry lined walls and ceilings h) Timber and steel framed walls

LO3 - Understand the requirements for ventilation, types of ventilation, correct sizing and installation methods	
Assessment Criteria and Range	
3.1	Describe the general requirements and reasons for ventilation in regard to gas appliances and installations
3.2	Recognise the differences between the following: a) Permanent ventilation b) Adventitious ventilation c) Compartment ventilation
3.3	Recognise the differences between gross and net calorific values (CV) and clarify the effect on ventilation calculations
3.4	Identify the approved types of ventilation grilles and openings and define the criteria they must meet
3.5	Identify suitable and unsuitable installations of ventilation: a) Through walls b) Via paths through other rooms c) Compartments d) Ventilated ducts
3.6	Describe the process of accurately measuring ventilator free areas
3.7	Identify the requirements for the provision of ventilation label and notices

LO3 - Understand the requirements for ventilation, types of ventilation, correct sizing and installation methods

Assessment Criteria and Range (continued)

3.8	Describe the potential effects on ventilation caused by the building environment: a) Extract fans b) Circulating hoods c) Fans in appliances d) Appliances of different fuel sources e) Double Glazing f) Building insulation g) Draught proofing h) Passive stack ventilation
3.9	Explain the ventilation requirements for vertex flues
3.10	State the minimum separation distances between ventilators and appliance flue terminals
3.11	Describe the purpose and requirements to install Intumescent air vents

LO4 - Understand the different types and operation of suitable chimney systems for gas appliances

Assessment Criteria and Range

4.1	State the Classification of Gas appliances according to chimney types: a) Type A (Flueless) b) Type B (Open Chimney) c) Type C (Room Sealed Chimney)		
4.2	Identify the construction and materials of chimney types to include: a) Brick / Masonry/Chimney Blocks b) Single and Double Wall c) Metallic and Non-Metallic d) Flexible Metallic Liners e) Shared Chimney Systems (Common, SE Duct and U Duct) f) Fan draught g) Vertex chimneys		
4.3	Explain the design, component parts and general operation of Open Flue Chimney systems to include: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="vertical-align: top; width: 50%;"> a) Parts of an Open-Flue Chimney System b) Primary c) Secondary flue d) Draught diverter e) Terminal f) Chimney System Operation g) Natural draught and fan draught h) Flue dampers i) Shared chimneys </td><td style="vertical-align: top; width: 50%;"> j) Cross sectional areas k) Temperature effects l) Condensing appliances and condensation m) Terminal Design n) Bird guards o) Requirements for the catchment space to open flued space heaters p) Existing solid fuel chimneys q) Effective flue height </td></tr> </table>	a) Parts of an Open-Flue Chimney System b) Primary c) Secondary flue d) Draught diverter e) Terminal f) Chimney System Operation g) Natural draught and fan draught h) Flue dampers i) Shared chimneys	j) Cross sectional areas k) Temperature effects l) Condensing appliances and condensation m) Terminal Design n) Bird guards o) Requirements for the catchment space to open flued space heaters p) Existing solid fuel chimneys q) Effective flue height
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LO4 - Understand the different types and operation of suitable chimney systems for gas appliances	
Assessment Criteria and Range (continued)	
4.4	State the requirements for open-flue, natural draught chimney outlet locations and positions
4.5	Explain the design considerations, component parts and general operation of room sealed chimney systems to include: a) Air supply duct, flue duct and terminals b) Chimney system operation c) Natural draught and fan draught d) Terminal Design e) Condensing Flues
4.6	State the requirements for room sealed chimney outlet locations and positions
4.7	Describe the requirements for open chimney balanced compartment installations to include: a) Compartment construction b) Ducted air positions and sizes
4.8	Describe the methods and checks required to establish satisfactory construction, effective and safe operation of a chimney to include: a) Open flue chimney b) Room sealed chimney
4.9	Describe the requirements for the provision of hearths to gas appliances

Unit 5 – Understanding gas safety

UAN A/652/2417
GLH – 93
EUS DSG 1.5
AIM This knowledge unit aims to provide learners with the knowledge and understanding of the gas safety requirements for working in the gas industry. Upon completion of the unit the learners will be able to:

LO1 - Have a general knowledge of industry specific legislation and standards	
Assessment Criteria and Range	
1.1	State the key points of gas industry legislation to include: a) The Gas Safety (Installation and Use) Regulations b) Building Regulations and Building Standards
1.2	Describe the content of the Gas Safety (Installation and Use) Regulations
1.3	State the key features of gas safety Regulations: a) The Gas Act b) Gas Safety (Management) Regulations c) Gas Safety (Rights of Entry) Regulations
1.4	Describe how and when to use the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) procedures
1.5	State the registration and competence process that applies to gas engineers
1.6	Describe the guidance information that applies to the Gas Utilisation industry: a) Approved codes of practice b) Industry standards for NG and LPG c) Manufacturer installation and service/maintenance instructions d) Information available to Gas Safe registered operatives (Technical bulletins/Safety updates)
1.7	Explain the Responsibilities under gas safety legislation a) Business registration and competence b) Personnel registration and competence c) Landlords, Consumers – private householders and tenants

LO2 - Know the emergency actions, responsibilities and procedures**Assessment Criteria and Range**

2.1	State the responsibilities and appropriate actions to be taken in the event of a gas emergency to include: a) Priorities of actions b) Reporting gas escapes c) Responsibilities of the gas user d) Responsibilities of the gas operative to give gas users advice and safety information e) Responsibilities of the gas engineer f) Turning off at emergency controls g) Elimination of ignition sources h) Reduction of gas concentrations via ventilation i) Action by the gas transporter j) Actions required to stop a gas escape downstream of an ECV k) Actions required if gas continues to escape l) Advice to occupants
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LO2 - Know the emergency actions, responsibilities and procedures**Assessment Criteria and Range (continued)**

2.2	State the gas emergency Priorities: a) Protect life b) Protect property c) Secure the escape d) Leave the site safe
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LO3 - Know the Gas Industry Unsafe Situations Procedure**Assessment Criteria and Range**

3.1	Describe the purpose and scope of the Unsafe Situations Procedure and define the criteria of the following categories: a) Immediately Dangerous (ID) Appliances/Installations b) At Risk (AR) Appliances/Installations c) Concern for safety notices
3.2	Explain how the Unsafe Situations procedure is applied
3.3	State the types of RIDDOR reportable work/incidents

LO4 - Understand the gas operatives' responsibilities in accurately completing the emergency notices, labels and forms**Assessment Criteria and Range**

4.1	Describe the emergency notices, labels and forms to include: a) Warning Notices b) Warning Labels c) RIDDOR Reporting Forms d) Advice Notices e) Gas emergency notices and labels
4.2	Explain gas operative's responsibilities in completing the emergency notices, warning labels and forms

LO5 - Understand the correct installation locations and types of emergency control and appliance isolation valves

Assessment Criteria and Range

5.1	Know the term and acronyms associated with gas meters, regulators and control valves: Not limited to the following: a) ECV – Emergency Control Valve b) AECV – Additional Emergency Control Valve c) MIV- Meter Isolation Valve d) Regulators (Governors) – to reduce the mains pressure to a safe useable pressure e) LP – Low Pressure (up to 75mbar) f) MP – Medium Pressure (75mbar-2bar) g) HP – High Pressure (7-16bar) h) MSN -Meter Serial Number i) U6 - Domestic diaphragm gas meter (capacity of 6 cubic metres per hour) j) Smart Meter – A meter that send the readings direct to the supplier k) CV – Calorific Value l) kWh – Kilowatts per hour consumption m) m³ – Metric (cubic meters) volume of the units gas consumed n) ft³ – Imperial (cubic feet) volume of the units gas consumed o) mbar – Millibar, the standard metric unit of pressure used in domestic gas installations (e.g. 21mbar)
5.2	Describe the installation, operation and positioning requirements for Emergency Control Valves (ECV) to include: a) Gas meter installations b) Remote meter installations c) Multiple occupancy meter installations d) Meter Inlet Valves (MIV)
5.3	Explain how to deal with incorrectly position ECV's
5.4	Explain the installation, operation and positioning requirements for appliance isolation valves (AIV)
5.5	Describe the associated labels required for ECVs
5.6	Identify the positions for service entries into buildings

LO6 - Know the requirements for gas meter installations up to 6 m³/h

Assessment Criteria and Range

6.1	State the installation methods and requirements for the installation of Natural Gas meters to include: a) Primary meters b) Secondary meters
6.2	Describe the associated meter labels required for primary and secondary meters

LO7 - Understand the types of gas meter housings and compartments and the requirements for installation and labelling**Assessment Criteria and Range**

7.1	Describe the types of gas meter housings and compartments to include: a) Surface mounted b) Semi-concealed c) Built-in meter boxes d) Purpose built meter housings
7.2	State the suitable locations and fixing requirements for gas meter housings and compartments
7.3	Explain the differences between low pressure and medium pressure gas meter houses and compartments
7.4	State gas operatives' responsibilities and the associated labels for meter housings and compartments

LO8 - Know how to check and set gas installation operating pressures**Assessment Criteria and Range**

8.1	Describe the process of checking and setting gas installation operating pressures to include: a) Meter regulators - low and medium pressure, including how to reseal them and why b) Low pressure c) Medium pressure d) Maintaining correct installation operating pressures e) Static (standing) pressure
8.2	State the procedure for contacting those authorised to re-set or exchange defective meter regulators

LO9 – Understand how to safely assess the potential risks and re-light temporarily isolated appliances**Assessment Criteria and Range**

9.1	Describe the process and safety factors associated with relighting temporarily isolated appliances to include: a) Confirmation that the installation is gas tight b) System and appliances are purged of air c) Appliance(s) are re-lit d) Satisfactory operation of user controls is confirmed e) Visual risk assessments are carried out for unsafe situations
9.2	Explain the correct actions required when un-commissioned appliances and systems are identified
9.3	Explain the correct actions required when pipework and appliances are not commissioned when the gas supply to the property is re-established

LO10 - Understand how to check and set appliance burner operating pressures and compare measured gas rates with published figures**Assessment Criteria and Range**

10.1	Explain the process of checking appliance inlet and burner operating pressures
10.2	Describe the procedure of accurately checking appliance gas rates/heat input in both metric (m ³), imperial (ft ³) and Smart meter (e.g. Flonidan G4S ZV)
10.3	Explain the process of establishing the potential causes of low/poor gas pressures
10.4	Describe the procedure for gas rating a range rated appliance

LO11 - Know the principles of operation, methods of testing and application of gas appliance safety controls

Assessment Criteria and Range

11.1	Describe the principles of operation, methods of testing and application of gas appliance safety controls to include: Gas Controls: a) Pressure regulators b) Air/gas ratio valves c) Thermal cut off d) Gas cocks/valves e) Cooker hotplate lid control f) Electric solenoid valve g) Excess flow valves h) Flame protection devices: i) Vapour pressure device j) Thermoelectric valve k) Flame conduction and rectification l) Interrupter devices m) Atmosphere sensing devices n) Spillage detection devices o) Multifunction control Thermostats: a) Bi metallic b) Liquid expansion c) Vapour pressure d) Electrical e) Overheat/limit f) Thermistors
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LO12 - Know where to acquire information and the types of documentation used during daily work activities

Assessment Criteria and Range

12.1	Explain how to access the types of "in company" information and documentation to include: a) Delivery notes b) Work programmes c) Time sheets d) Plans/drawings e) Job specifications f) Invoices/statements g) Quotations/estimates
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Unit 6 – Specific core installation and maintenance

UAN – D/652/2418
GLH – 118
EUS DSG 2.3
AIM This practical and knowledge unit enables learners to demonstrate competence in the work activities related to the installation and maintenance of gas appliances and associated gas fittings. Upon completion of the unit the learners will:

LO1 – Be able to use of correct Personal Protective Equipment (PPE)	
Assessment Criteria and Range	
1.1	Select PPE needed for specific activities, to include: a) Gloves b) Protective footwear c) Eye protectors d) Ear protection e) High visibility clothing f) Knee protectors g) Dust masks
1.2	Carry out gas installation or maintenance work wearing PPE as determined by each specific task

LO2 – Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities	
Assessment Criteria and Range	
2.1	Risk assess the work site and work activities to be undertaken
2.2	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
2.3	Prepare to lift and handle loads, to include: a) Using correct PPE b) Communication to others c) Ensuring a clear path
2.4	Lift and move loads in accordance with best practice and safe systems of work, to include: a) Correct kinetic techniques b) Assisted lift needing two people c) Simple mechanical lifting device

LO3 – Be able to use steps and ladders safely	
Assessment Criteria and Range	
3.1	Risk assess the work site and work activities to be undertaken
3.2	Prepare the site location where steps and /or ladders need to be used
3.3	Inspect ladders and steps for defects
3.4	Position and erect steps and ladders in accordance with regulations and safe working practice
3.5	Secure ladders by approved methods to ensure no slippage or movement may occur during use
3.6	Use steps and ladders for work activities in accordance with Regulations and safe working practice

LO4 – Be able to demonstrate the safe use of common tools used in the gas utilisation industry	
Assessment Criteria and Range	
4.1	Demonstrate the correct and safe use of tools for drilling, securing and cutting brick, concrete, block, studded, timber framed and dry lined walls to include: 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 plugs f) Checking that ITEE (P.A.T) certificates are in date
4.2	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
4.3	Make good materials and surfaces to include brick, concrete, block, studded, timber framed, tiled and dry lined

LO5 – Be able to work safely with electrical systems and components used in domestic gas utilisation	
Assessment Criteria and Range	
5.1	Using Ohms law, calculate: a) Current and power b) Voltage c) Resistance
5.2	Identify simple series and parallel circuits

LO5 – Be able to work safely with electrical systems and components used in domestic gas utilisation

Assessment Criteria and Range (continued)

5.3	Identify the type of electrical installation as: a) TT b) TN-S c) TN-C-S
5.4	Connect a domestic gas appliance to a fixed domestic electrical installation to include: a) Cable type and sizing calculation b) Fuse rating calculation c) Fused spur connection d) Wiring a three-pin plug
5.5	Safely carry out preliminary electrical safety checks to include: a) Earth continuity b) Polarity c) Short circuit d) Resistance to earth e) RCD operation test
5.6	Interpret appliance wiring diagrams to establish: a) Sequence of electrical operation b) Correct appliance and component wiring
5.7	Differentiate between main and supplementary electrical bonding connections
5.8	Demonstrate the correct procedure for safe electrical isolation to gas appliances and controls to include: 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 f) Safe to touch procedure
5.9	Identify electrical faults and defects on gas installations, initiating actions as required, to include: a) Inadequate earthing provision b) Incorrect cable types and position c) Clearances from other services d) Failed components e) Inadequate circuit protection conductors f) Defective automatic disconnection device g) Appliance connections

LO6 – Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments

Assessment Criteria and Range

6.1	Calculate the correct ventilation requirements for a range of domestic appliance installations in accordance with the relevant standards to include: a) Type A (Flueless) appliances b) Type B (Open) chimney appliances c) Type B and Type C appliances in compartments d) Multiple appliance installations e) Ventilation pathways via other rooms
6.2	Specify ventilation vents/grilles and methods

LO6 – Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments	
Assessment Criteria and Range (continued)	
6.3	Measure existing vents and grilles to ensure that they are the correct type and provide the correct supply of air

LO7 – Be able to plan and prepare work activities for installing domestic gas pipework and domestic gas appliances	
Assessment Criteria and Range	
7.1	Apply a risk assessment and method statement to work activities
7.2	Survey the work site and record details of any features that may affect the installation including: a) Any pre-installation damage b) Defects to existing building features
7.3	Advise the property occupier of any defects found in the survey
7.4	Protect the work site and the building fabric against possible damage being caused during: a) De-commissioning b) Installation
7.5	Obtain confirmation from the customer before the job starts to ensure that they agree to the planned work
7.6	Check and confirm that all materials, tools and equipment are available as required and are fit for purpose
7.7	Check and confirm that the proposed siting of the gas supply meets the appliance manufacturers and industry standards requirements
7.8	Check and confirm that the gas supply meets 'industry standards' requirements in relation to other services: a) The gas supply b) Equipotential bonding c) Provision of ventilation
7.9	Confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services
7.10	Calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across the installation
7.11	Check the existing installation for unsafe situations and apply the gas industry unsafe situations procedures to any identified unsafe situations

LO8 – Know how to install, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in domestic and small commercial properties	
Assessment Criteria and Range	
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 the processes for ordering, supplying, checking and delivery of equipment, materials and components required for the work activity
8.3	Explain how to safely secure and store tools, equipment, materials and components
8.4	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
8.5	Explain the steps to take should materials, components, tools and equipment not be available at the site
8.6	Describe how to confirm that the gas supply and equipotential bonding system requirements are adequate for the installation of the new gas pipework system
8.7	Explain how to confirm that the provision of ventilation meets the industry standards' requirements for the installation i.e. in voids, shafts, ducts
8.8	Calculate correct sizing of pipework to ensure minimum pressure loss across installation
8.9	State checks and tests to confirm suitability of the bonding system, including the installation and positioning of the main equipotential bonding

LO9 – Be able to install, exchange and remove gas pipework to industry standards	
Assessment Criteria and Range	
9.1	Carry out preparatory work to meet the installation requirements
9.2	Confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services
9.3	Ensure the work is completed in accordance with manufacturers and industry standards requirements
9.4	Advise of any delays to the work to any persons who are affected by the delay in a timely manner, to include: a) Customers b) Line managers c) Other trades
9.5	Carry out the installation processes minimising damage to the customer property
9.6	Use the correct tools and equipment
9.7	Remove existing gas and equipotential bonding system components required for the installation

LO9 – Be able to install, exchange and remove gas pipework to industry standards

Assessment Criteria and Range (continued)

9.8	Fabricate gas pipework system, fittings and components as required by the installation including jointing and bending: a) Steel tube b) Copper tube c) Pliable corrugated (stainless steel) tube d) Polyethylene pipe e) Stainless steel pipework f) Capillary fittings g) Mechanical joints h) Press end connections i) Pliable corrugated (stainless steel) fittings j) Screwed joints k) Lead composition pipework joints l) Electrofusion joints m) Double sets/offset bends n) 90°degree bends o) Crank sets/pass-over bends
9.9	Position the pipework and confirm it meets the pipework manufacturers and industry standards requirements: a) Surface mounted b) Laid in joisted floors c) In solid floors d) In walls e) Above-ground external pipework f) Buried external pipework
9.10	Provide the required ventilation for the pipework installation in accordance with the pipework manufacturers and industry standards requirements
9.11	Provide adequate support(s) for pipework installations to conform with the pipework manufacturers and industry standards requirements
9.12	Position and protect pipework installation in and through walls to meet the pipework manufacturers and industry standards requirements for sleeving and purpose designed channels
9.13	Position and protect pipework installation in multi-occupancy dwellings to meet industry standards' requirements
9.14	Position and protect pipework installations in protected areas to meet the pipework manufacturers and industry standards' requirements
9.15	Position and protect external installations to meet the pipework manufacturers and industry standards requirements
9.16	Ensure existing gas systems are clean and free of debris
9.17	Fix and connect gas pipework, valves, fittings and components to the supply
9.18	Install additional emergency control valve (AECV) to the supply

LO9 – Be able to install, exchange and remove gas pipework to industry standards	
Assessment Criteria and Range (continued)	
9.19	Carry out precautionary actions to prevent the unauthorised use of un-commissioned or potentially unsafe gas pipework, appliances and equipotential bonding by following: a) isolation b) procedures and use of warning notices
9.20	Protect the work site and the building fabric against possible damage being caused during: a) De-commissioning b) Installation c) Using exposed flame when pipework previously may have contained gas/or with gas meter already fitted
9.21	Calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across the installation
9.22	Check the existing installation for unsafe situations and apply the gas industry unsafe situations procedures to any identified unsafe situations
9.23	Install a domestic gas meter, pipework and domestic appliance(s) to include: 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 the appliance
9.24	Demonstrate tightness testing, purging and commissioning procedures
9.25	Carry out a gas rate check and confirm it complies with manufacturer's instructions
9.26	Demonstrate the correct method of removal of domestic meters and regulators to include: a) Permanent removal b) Temporary removal
9.27	Identify correct and incorrect methods of connecting the main equipotential bonding
9.28	Demonstrate how to identify gas pipework
9.29	Explain the thermal movement of gas pipework
9.30	Explain the difference between gas rate and heat input

LO10 - Be able to de-commission domestic gas pipework to industry standards	
Assessment Criteria and Range	
10.1	Check that the gas supply and electrical supply are in a condition that enables safe installation de-commissioning
10.2	Use the correct tools and equipment
10.3	Use designated safe Isolation methods, tests and procedures

LO10 - Be able to de-commission domestic gas pipework to industry standards	
Assessment Criteria and Range (continued)	
10.4	Take precautionary actions to ensure that temporarily de-commissioned appliances, systems and components do not present a safety hazard
10.5	Permanently remove and disconnect appliances, gas system components and equipotential bonding system components as necessary
10.6	After permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas

LO11 - Understand how to tightness test, purge, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in small natural gas and LPG installations	
Assessment Criteria and Range	
11.1	Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic tightness testing and direct purging process
11.2	Explain the processes for ordering, supplying, checking and delivery of equipment, materials and components required for the work activity
11.3	Explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
11.4	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
11.5	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
11.6	Measure, calculate and record gas system installation volumes for tightness testing and direct purging activities – IGEM/UP/1B
11.7	Identify medium pressure regulator sets – IGEM/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
11.8	Explain the tightness testing procedures – IGEM/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: a) Where a meter inlet valve (MIV) is fitted b) No meter inlet valve is fitted
11.9	State the routines and sequences for direct purging of gas systems, appliances and components – IGEM/UP/1B
11.10	Outline the routines and sequences for commissioning gas systems, valves and components to industry standards
11.11	Explain the system handover procedures and demonstrating the operation of gas systems, valves and components to industry standards
11.12	Describe how to safely collect and dispose of system contents that may be hazardous to health or the environments
11.13	Explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure

LO12 - Be able to resolve problems which could affect the de-commissioning, installation and commissioning process	
Assessment Criteria and Range	
12.1	Report deficiencies with supply services: a) Gas b) Equipotential bonding
12.2	Resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal gas pipework system or component defects
12.3	Resolve problems in accordance with approved procedures when gas pipework systems and components being commissioned do not meet design requirements
12.4	Resolve problems in accordance with approved procedures when the gas pipework system and components cannot be restored to full performance
12.5	Demonstrate the correct method of making and breaking gas connections to appliances

LO13 – Be able to complete the correct notices, forms and labels used in domestic gas utilisation	
Assessment Criteria and Range	
13.1	Identify correct application and complete the following records, forms and labels: a) Landlord/homeowner gas safety record b) Gas safety inspection form c) Benchmark maintenance report d) Service/maintenance checklist(s) e) Chimney/hearth notice plate
13.2	Be able to identify and apply the following notification, in relation to the following: a) Building Regulations b) British Standards c) Gas Regulations – IGEM documents

LO13 – Be able to complete the correct notices, forms and labels used in domestic gas utilisation	
Assessment Criteria and Range (continued)	
13.3	Select and attach appropriate labels applicable to domestic gas work: a) Un-commissioned appliance label b) Compartment label

LO14 – Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work	
Assessment Criteria and Range	
14.1	Liaise with the property occupier and other people who will be affected by the work processes to minimise disturbance to the job
14.2	Ensure the work is completed in accordance with pipework manufacturers and industry standards requirements
14.3	Advise of any delays to the work to any persons who are affected by the delay in a timely manner: a) Customers b) Line managers c) Other trades
14.4	Advise the designated persons of any unsafe situations and actions required to remedy those situations
14.5	Complete documentation to confirm the safe commissioning of the gas system and Components
14.6	Complete records and documentation confirming the safe commissioning of gas systems and components
14.7	Complete gas pipework and components commissioning and de-commissioning records

LO15 – Be able to demonstrate the correct use of combustion and atmosphere sampling analysers	
Assessment Criteria and Range	
15.1	Demonstrate the correct use of a combustion performance analysers and atmosphere sampling analysers, interpreting readings for type A, B and C gas appliances: a) CO, CO2, O2 readings, CO/CO2 ratios in a flueway b) CO, CO2, O2 readings in the atmosphere
15.2	Describe the required checks using a combustion/atmosphere analyser in the event of a “carbon monoxide detector” activation
15.3	Explain when to carry out combustion performance analysis: a) Retesting appliances after repair b) Action levels for appliances
15.4	Explain the various types of portable combustion analysers

LO16 - Be able to demonstrate how to carry out chimney performance checks	
Assessment Criteria and Range	
16.1	Carry out checks on open chimney systems, to include, but not limited to: a) Confirmation of correct type and visual checks throughout the length b) Chimney flow test c) Chimney spillage test d) Case seals are intact e) Damaged chimney section – joints and seals f) Shared flues – Landlords responsibility
16.2	Carry out checks on room sealed chimney systems, to include, but not limited to: a) Confirmation of correct type and installation b) Correct terminal location and protection c) Inspection hatches are accessible and in sight of any joints d) Testing operation to include case seal integrity
16.3	How to identify faults to chimney systems, along with rectifying any issues discovered: a) Damaged chimney section – joints and seals b) Case seals c) Inspection hatches d) Termination points

LO17- Be able to demonstrate that gas safety controls are operating correctly and demonstrate action to take if unsafe or ineffective operation is found			
Assessment Criteria and Range			
17.1	Safely diagnose correct, unsafe or ineffective operation of: <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> Flame protection devices, to include: Vapour pressure Thermoelectric Flame rectification Flame conduction </td><td style="vertical-align: top;"> Controls to include: Atmosphere sensing device Spillage detection device Pressure regulators Low pressure cut off Thermal cut off Gas cocks/valves Cooker hotplate lid control Electric solenoid valve Excess flow valves Thermoelectric valve Interrupter devices Multifunction control Thermostats to include: Liquid expansion Vapour pressure Electrical thermostats Thermistors Air/gas ratio valves Bi-metallic flame failure devices </td></tr> </table>	Flame protection devices, to include: Vapour pressure Thermoelectric Flame rectification Flame conduction	Controls to include: Atmosphere sensing device Spillage detection device Pressure regulators Low pressure cut off Thermal cut off Gas cocks/valves Cooker hotplate lid control Electric solenoid valve Excess flow valves Thermoelectric valve Interrupter devices Multifunction control Thermostats to include: Liquid expansion Vapour pressure Electrical thermostats Thermistors Air/gas ratio valves Bi-metallic flame failure devices
Flame protection devices, to include: Vapour pressure Thermoelectric Flame rectification Flame conduction	Controls to include: Atmosphere sensing device Spillage detection device Pressure regulators Low pressure cut off Thermal cut off Gas cocks/valves Cooker hotplate lid control Electric solenoid valve Excess flow valves Thermoelectric valve Interrupter devices Multifunction control Thermostats to include: Liquid expansion Vapour pressure Electrical thermostats Thermistors Air/gas ratio valves Bi-metallic flame failure devices		
17.2	Demonstrate actions to be taken when defective or unsafe control operation is identified		

Unit 7 – Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼”) diameter in small gas installations

UAN – F/652/2419
GLH – 22
EUS DSG 3.6
AIM This practical and knowledge unit follows the National occupational standard is for gas engineers who will be carrying out tightness testing and direct purging of small(domestic) natural gas installations. This standard also covers the work activities of planning, de-commissioning and commissioning gas installations. Upon completion of the unit the learners will:

LO1 – Be able to plan and prepare work activities for tightness testing and direct purging of gas systems installations, gas pipework and its components up to 35mm (1¼”) diameter to industry standards	
Assessment Criteria and Range	
1.1	Produce a risk assessment and method statement which incorporates safety provisions in the work site, access to the work site, movement of the workforce, members of the public, and the movement and safe storage of materials, tools and equipment for the job.
1.2	Survey the work site, pre-tightness testing and direct purging, for any damage or defects to existing building features and record it
1.3	Advise the property occupier of any defects found and agree the planned work
1.4	Protect the work site and the building fabric against possible damage being caused during the tightness testing and direct purging process.
1.5	Confirm from the property occupier the work activity to be undertaken prior to the commencement of all work activities
1.6	Confirm the siting of the gas supply and the provision of ventilation meets the requirements for tightness testing and direct purging
1.7	Confirm and ensure that all materials, components, tools and equipment are available as required, they are fully maintained, calibrated prior to the commencement of the work activity
1.8	You are to check the existing gas installation for unsafe situations applying IGEM/G/11 Ed2 procedures if and defects or issues are identified.

LO2 - Understand how to tightness test, purge, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in small natural gas and LPG installations

Assessment Criteria and Range (continued)

2.1	Know the types of pressure gauges suitable for carrying out tightness tests and identify the requirements for accuracy of reading
2.2	Be able to carry out tightness testing using the following mediums: a) Air b) Gas
2.3	Describe the actions to be taken in the event of an emergency control valve (ECV) letting by
2.4	Describe the potential effects of electronic token meter tamper devices on tightness testing
2.5	Identify gaps in knowledge and skills to undertake continuous professional development (CPD)
2.6	Confirm the permissible pressure drops for new and existing installations and in relation to: a) Meter type/size b) Pipe diameter c) Installation volume d) Appliances connected to a gas supply and not isolated e) No meter fitted
2.7	Confirm the procedures for Tightness testing of pipework >35mm or total installation volume >0.035m ³
2.8	Explain what actions are to be taken when a smell of gas persists following a gas tightness test, e.g. use of gas detection equipment and leak detection fluid
2.9	Explain what actions are to be taken when a smell of gas persists following a gas tightness test in relation to: a) When the emergency control valve / additional emergency control valve / meter inlet valve is turned off b) When a leaking installation cannot be repaired

LO3 - Be able to pre-commission and commission gas pipework to industry standards

Assessment Criteria and Range

3.1	Confirm that the complete pipework installation complies with: a) Manufacturers' specification b) Industry standards
3.2	Check that conditions within the gas system will permit safe commissioning
3.3	Select and use the correct tools and equipment
3.4	Use tightness testing and purging procedures to confirm the integrity of the installed pipework installation
3.5	Measure, calculate and record gas system installation volumes for tightness testing and direct purging activities
3.6	Ensure ventilation 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 Customer property
3.9	Use tightness testing procedures to confirm the integrity of the newly installed gas installation: a) With meter fitted b) Without meter fitted c) With appliances fitted d) Without appliances fitted

LO4 - Be able to pre-commission and commission gas pipework to industry standards	
Assessment Criteria and Range (continued)	
4.1	Use tightness testing procedures to confirm the integrity of the existing gas installation
4.2	Use tightness testing procedures to confirm the integrity of the gas system where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar, but not exceeding 2 bar and no meter inlet valve is fitted
4.3	Where the installation fails the tightness test, either: a) Apply the gas industry unsafe situations procedure b) Trace and repair the escape and retest installation c) Isolate unsafe gas appliances, gas system and components
4.4	Use purging procedures to confirm the safe supply of gas to the installed gas system and appliances
4.5	Instruct the customer on the correct operation of the gas system, valves and components
4.6	Prevent the unauthorised use of un-commissioned or potentially unsafe gas installations by following isolation procedures and use of warning notices
4.7	Apply protective coating to pipework and to joints after gas tightness testing has been completed
4.8	Check and confirm the operation of the installed gas valves and components to ensure they function safely and operate in accordance with manufacturers' instructions
4.9	Complete records/documentation to confirm the safe tightness testing and direct purging of the gas system and components
4.10	Complete gas system commissioning and de-commissioning records
4.11	Carry out all responsibilities in an ethical manner demonstrating self-discipline and a motivated approach when carrying out the work

LO5 – Be able to tightness test and purge gas systems and its components up to 35mm (1¼") diameter to industry standards	
Assessment Criteria and Range	
5.1	Carry out preparatory work for tightness testing and direct purging to meet industry standards
5.2	Check that conditions within the gas system will permit safe tightness testing and direct purging
5.3	Select and use the correct tools and equipment for tightness testing and direct purging activities
5.4	Measure, calculate and record gas system installation volumes for tightness testing and direct purging activities
5.5	Ensure ventilation for tightness testing and direct purging activities meets industry standards' requirements
5.6	Remove existing gas components as required
5.7	Ensure existing gas systems are clean and free of debris
5.8	Carry out the tightness testing and direct purging process minimising damage to customer property and building features
5.9	Use tightness testing procedures to confirm the integrity of the system to industry standards

5.10	Use tightness testing procedures to confirm the integrity of newly installed gas system and, where applicable, new and existing appliances
5.11	Use tightness testing procedures to confirm the integrity of existing installed gas system and, where applicable, new and existing appliances
5.12	Use recognition of medium pressure regulator sets 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
5.13	Follow approved procedures if the installation fails the tightness test e.g. IGEM/G/11 Ed2. Including 'Trace and Repair'
5.14	Use purging procedures to confirm the safe supply of gas to the installed gas system and appliances
5.15	The system handover procedures and demonstrating the operation of gas systems and components to end users
5.16	How to isolate and prevent any un-commissioned or unsafe gas appliances, gas systems and components and application being activated by following the gas industry unsafe situations procedure

LO6 – Understand how to tightness test, purge, commission, de-commission gas pipework systems and its components up to 35mm (1¼”) diameter to industry standards

Assessment Criteria and Range

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 the processes for ordering, supplying, checking and delivery of equipment, materials and components required for the work activity, including equipment for working at heights and/or in confined spaces.
6.3	How to safely secure and store tools, equipment, materials and components to minimise loss or wastage
6.4	The potential hazards that could arise from all tightness testing and direct purging activities and the checks to be carried out before work takes place
6.5	The steps to take should materials, components, tools and equipment not be available at the site to commence the tightness testing and direct purging activity
6.6	Measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
6.7	The need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
6.8	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
6.9	How to measure, calculate and record gas system installation volumes for tightness testing and direct purging activities – IGEM/UP/1B
6.10	Explain the tightness testing procedures – IGEM/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: c) Where a meter inlet valve (MIV) is fitted d) No meter inlet valve is fitted
6.11	Recognition of medium pressure regulator sets 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

6.12	State the routines and sequences for direct purging of gas systems, appliances and components as per IGEM/UP/1B
6.13	State the routines and sequences for commissioning gas systems, valves and components to industry standards
6.14	The system handover procedures and demonstrating the operation of gas systems and components to end users
6.15	Describe how to safely collect and dispose of system contents that may be hazardous to health or the environments
6.16	Demonstrate how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure – IGEM/G/11 Ed2
6.17	Outline the types of pressure gauges suitable for carrying out tightness tests and identify the requirements for accuracy of reading
6.18	Describe the actions to be taken in the event of an emergency control valve (ECV) letting by
6.19	Describe the potential effects of electronic token meter tamper devices on tightness testing
6.20	identify gaps in knowledge and skills to undertake continuous professional development (CPD)

Unit 8 – Install, commission and de-commission gas pipework up to 35mm (1¼”) diameter in domestic and small commercial premises

UAN – K/652/2420
GLH – 117
EUS DSG 3.5
AIM This practical and knowledge unit is for gas engineers who are required to install, exchange and remove gas pipework up to 35mm. It follows and covers the NOS installation, commission and de-commission gas pipework up to 35mm (1¼”) diameter Upon completion of the unit the learners will:

LO1 – Be able to design gas systems for installing gas pipework	
Assessment Criteria and Range	
1.1	You are to identify and record the customer’s job requirements for the work activity to be undertaken
1.2	You are required to compare the customers job requirements are in-line with the current standards and industry requirements, identifying and informing them of any conflicting issues found
1.3	Survey the work site and consult site diagrams as necessary for any key structural features and existing defects that could affect the installation and record them, advising property occupier of any defects found.
1.4	ensure the proposed positioning of the pipework meets the manufacturers’ and industry standards’ requirements for location and clearances
1.5	check that the availability of input services meets the pipework manufacturers’ and industry standards’ requirements
1.6	check and ensure the design of the proposed installation is in compliance with the pipework manufacturers’ and industry standards’ requirements.
1.7	prepare a range of design options to meet both customer and industry requirements, taking due consideration to costs.
1.8	You are to present your design options to the customer for formal agreement that meets all the requirements and standards

LO2 – Be able to plan and prepare work activities for installing domestic gas appliances.....	
Assessment Criteria and Range	
2.1	Check and confirm, that the gas and electricity supply are in a condition that will enable safe installation and de-commissioning
2.2	Confirm the selections of the correct tools and equipment, they are maintained to the correct standard and calibrated prior to carrying out the de-commissioning activity
2.3	Use designated safe isolation methods, tests and procedures while de-commissioning gas and electrical systems and components

2.4	Take precautionary actions to ensure that temporarily decommissioned appliances, systems, or components do not present a safety hazard
2.5	Permanently remove and disconnect appliances, gas system components, electricity system components and equipotential bonding system components, as necessary.
2.6	After permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas

LO3 – Be able to de-commission gas systems and its components up to 35mm (1¼”) diameter to industry standards

Assessment Criteria and Range

3.1	Check and confirm, that the gas and electricity supply are in a condition that will enable safe installation and de-commissioning
3.2	Confirm the selections of the correct tools and equipment, they are maintained to the correct standard and calibrated prior to carrying out the de-commissioning activity
3.3	Use designated safe isolation methods, tests and procedures while de-commissioning gas and electrical systems and components
3.4	Take precautionary actions to ensure that temporarily decommissioned appliances, systems, or components do not present a safety hazard
3.5	Permanently remove and disconnect appliances, gas system components, electricity system components and equipotential bonding system components, as necessary.
3.6	After permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas

LO4 – Be able to install, exchange, and remove gas pipework up to 35mm (1¼”) diameter to industry standards

Assessment Criteria and Range

4.1	Carry out preparatory work so that the installation meets the industry requirements
4.2	Carry out the installation of the gas pipework to minimise damage to the customers dwelling
4.3	Select the correct tools and equipment for the installation activity, ensuring they have by fully maintained and calibrated
4.4	Remove existing gas and earthing system components as required by the installation plan
4.5	Fabricate the gas pipework systems, fittings and components as required by the installation including jointing and bending
4.6	Position the pipework, confirming it meets the location, siting, clearances required by the pipework manufacturers’ and industry standards’ requirements
4.7	Provide the required and adequate ventilation for new or replacement pipework installations and systems as necessary and in-line with the pipework manufactures and industry requirements
4.8	Provide adequate support(s) for pipework installations to conform with the pipework manufacturers’ and industry standards’ requirements

4.9	Position and protect pipework installation in and through walls to meet the pipework manufacturers' and industry standards' requirements for sleeving and purpose designed channels
4.10	Position and protect pipework installations in and through walls in multi-occupancy dwellings to meet the pipework manufacturers' and industry standards' requirements
4.11	Position and protect pipework installations in protected areas (ducts and shafts) to meet the pipework manufacturers' and industry standards' requirements
4.12	Position and protect external installations including protection against mechanical movement, along with the minimum depth required below the ground level, to meet the pipework manufacturers' and industry standards' requirements
4.13	Ensure that the existing gas pipework systems are clean and free of debris
4.14	Fix and connect gas pipework, valves, fittings and components to the supply
4.15	install an additional emergency control valve (AECV) to the supply e.g. remote meter installations
4.16	Take precautionary actions to prevent the unauthorised use of un-commissioned or potentially unsafe gas pipework, appliances and equipotential bonding by following isolation procedures and use of warning notices

LO5 – Be able to pre-commission and commission gas pipework up to 35mm (1¼") diameter to industry standards

Assessment Criteria and Range

5.1	Confirm the complete pipework installation complies with the manufacturers' specification, industry standards, Gas Safety (Installation & Use) Regulations, British Standards and 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 the integrity of the installed gas system and, where applicable, 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 as necessary
5.7	Apply protective coating to pipework as necessary and to joints after gas tightness testing has been completed.
5.8	Apply protective coating to pipework as necessary and to joints after gas tightness testing has been completed
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 gas system, valves and components and provide them with their copy of any literature
5.11	Take precautionary actions to prevent the unauthorised use of commissioned gas appliances, gas systems, electrical systems and components by isolation procedures and use of warning notices

LO6 – Be able to use and communicate data and information to carry out decommissioning, installation and commissioning work of gas pipework up to 35mm (1¼”) diameter to industry standards

Assessment Criteria and Range

6.1	Liaise with the property occupier and other people who will be affected by the work during the planning, de-commissioning, installation, and commissioning processes to minimise disturbance to the job
6.2	Use normative documents, industry standards, British Standards and information from manufacturers’ instructions applicable to the gas system and the appliance to ensure the work is done to the specification
6.3	Advise any delays to the work activities to the customer or any person (other trade) who might be affected by the delays in a timely manner,
6.4	Advise the appropriate person(s) who need to be informed of unsafe situations and required remedial actions to those who require the information
6.5	Check that the customer is satisfied with the finished job
6.6	Complete records and documentation confirming the safe commissioning of gas systems and components
6.7	Complete the gas system de-commissioning records

LO7 – Be able to resolve problems within your own area of responsibilities and competence, which could affect decommissioning, installation and commissioning work of gas pipework up to 35mm (1¼”) diameter to industry standards

Assessment Criteria and Range

7.1	Rectify problems within own area of responsibility and competence and report deficiencies in gas and earthing input services
7.2	Resolve problems in accordance with approved procedures where: a) pre-commissioning checks and tests reveal gas system or component defects b) the gas systems and components being commissioned do not meet design requirement c) the gas system and components cannot be restored to full performance

LO8 –Know how to install and decommissioning gas pipework up to 35mm (1¼”) diameter in domestic and small industry premises to industry standards

Assessment Criteria and Range

8.1	Describe the Regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessment
8.2	Explain the processes for ordering, supplying, checking and delivery of equipment, materials and components required for the work activity e.g. when working at heights and/or in confined spaces
8.3	Explain how to safely secure and store tools, equipment, materials and components
8.4	Describe the potential hazards that could arise from all work activities and the checks to be carried out before, during and after the work takes place ‘Permit to Work’ (Hot Work Permit), the use of press fit fittings as an alternative

8.5	Explain the steps to take should materials, components, tools and equipment not be available at the site to commence the decommissioning, installation and commissioning activity.
8.6	Describe how to confirm that the gas supply and equipotential bonding system requirements are adequate for the installation of the new gas pipework system and components or, for extending the system or adding components to an existing system
8.7	Explain how to confirm that the provision of ventilation meets the industry standards' requirements for the installation i.e. in voids, shafts, duct
8.8	calculate correct sizing of pipework to ensure minimum pressure loss across installation
8.9	state checks and tests to confirm suitability of the bonding system, including the installation and positioning of the main equipotential bonding.

Unit 9 – Install and maintain domestic gas water heaters and wet central heating appliances

UAN – L/652/2421
GLH – 185
EUS DSG 3.3, 3.4 or 8
AIM This practical and knowledge unit covers the installation, and maintenance of domestic gas water heaters and wet central heating appliances. Learning Outcome 6 has been added to give a basic knowledge of central heating systems. Upon successful completion of the unit the learners will: be able to apply to the Gas Safe Register for a 'licence to practice' as a qualified gas engineer.

LO1 - Know the uses of gas water heating and wet central heating appliances in dwellings	
Assessment Criteria and Range	
1.1	State the purpose of gas water heating and wet central heating appliances used in dwellings.
1.2	Identify the different types of wet central heating appliances and space heating systems used in dwellings: a) System boiler b) Heat only boiler c) Combination boiler d) Gas Fire & Back Boiler e) Open-Flued Natural Draught Appliance f) Room Sealed Natural Draught Appliance g) Full systems h) Background heating i) Selective heating j) One and two pipe systems
1.3	Identify the different types of gas water heating appliances used in dwellings: a) Multi point b) Circulator c) Single point

LO2 - Know the types of gas water heating and wet central heating appliances and their layout requirements	
Assessment Criteria and Range	
2.1	Analyse the working principles of underfloor central heating system pipework and components: a) Underfloor pipework arrangements from manifold to room b) Use of manifolds c) Controls system application - time and temperature to space heating zones
2.2	Identify the system layout features for multiple boiler installations incorporating low loss headers

LO2 - Know the types of gas water heating and wet central heating appliances and their layout requirements

Assessment Criteria and Range (continued)

2.3	Identify the working principles of wet central heating appliances: a) System boiler b) Heat only boiler c) Combination boiler d) Gas Fire & Back Boiler e) Open-Flued Natural Draught Appliance f) Room Sealed Natural Draught Appliance
2.4	Identify the working principles of water heating appliances: a) Multi point b) Circulator c) Single point
2.5	State the general operating principles of gas fired heat producing appliances systems in dwellings: a) Open flued appliances b) Room sealed appliances c) Freestanding appliances d) Wall mounted appliances e) Fan assisted appliances f) Flueless water heaters
2.6	State the operating principles of wet central heating and hot water appliance control components: a) Chimney and flue systems b) Air pressure switches c) Horizontal and vertical systems d) Extended flue runs e) Fans f) Combustion g) Flueing h) Safety controls i) Burners j) Automatic air vents k) Circulating pumps l) Automatic bypass valves m) Diverter valves n) PCB's o) Condensate requirements p) Internal/external user controls q) Timing devices – clocks and programmers r) Room thermostats s) Hot water thermostats t) "Smart" controls u) Frost thermostats

LO3 - Know the types of hot water systems, layout and maintenance requirements for open vented and unvented systems

Assessment Criteria and Range (continued)

3.1	Explain the types of hot water supply systems used in dwellings: Centralised systems: a) Unvented hot water systems b) Open vented hot water systems Localised systems: a) Unvented point of use heaters b) Instantaneous heaters
3.2	Describe types of unvented/vented hot water systems: a) Indirect storage systems (include water jacketed tube heaters) b) Direct storage systems c) Electrically heated d) Gas or oil fired e) Small point of use (under sink) f) Bulk storage heaters (combination tank) g) Solar thermal hot water systems h) Combination boilers
3.3	State the minimum number of independent safety devices required to prevent overheating in unvented hot water systems
3.4	Know the component parts of vented and unvented hot water systems: a) Cold Water Storage Cistern (CWSC) b) Open vent pipe c) Line strainer d) Pressure reducing valve e) Check valves f) Isolation valves g) Expansion device (vessel or integral to cylinder) h) Tundish i) Temperature/Pressure Relief Valve (TPRV) j) Cylinder Thermostat k) Overheat/high limit stat l) Pressure Relief Valve (PRV) m) Composite valve n) Balanced cold water connection o) Cylinder p) D1 discharge q) Tundish r) D2 discharge s) Multiple discharge pipe arrangements from safety devices t) Termination
3.5	Be able to carry out maintenance tasks on unvented systems without certification: a) Visual Inspections: signs of rust around the cylinder. Pipework pitting b) Tundish Inspections: Visual check for blockage, signs of water drips (faulty PRV/TPRV) c) Checking Insulation: No cuts or rips in the cylinder jacket or pipework d) Leak Detection: Pipe connections, base of the cylinder, joints e) System Performance: Drop in water pressure, temperature or flow rate

LO4- Plan gas systems for installing domestic gas water heaters and wet central heating appliances

Assessment Criteria and Range

4.1	State the positioning and fixing requirements of pipework and components of gas water heating and wet central heating appliances: a) Installation pipework b) Gas / water c) Radiator valves d) Circulating pumps e) Feed and Expansion cisterns f) Motorised valves g) Automatic bypass valves h) Timing devices – time switches and programmers i) Thermostats – Room, cylinder and frost j) Boilers k) Chimney and flue systems l) Horizontal and vertical systems m) Extended flue runs n) Inspection Hatches o) Plume kits p) Ventilation requirements q) Condensate requirements r) Pressure release valve pipework
4.2	Identify and record the customer's job requirements: a) From plans b) From site
4.3	Compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues: a) Location b) Siting c) Clearances d) Building layout and features e) Suitability of system f) Energy efficiency g) Environmental impact
4.4	Survey the work site: a) Know the protection measure requirements for the building fabric or the customers property during the work activity b) Key structural features that could affect the installation c) Record details
4.5	Check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements: a) Gas supply b) Electricity supply c) Chimney suitability d) The provision of ventilation

4.6	Check that the availability of input services meets the appliance manufacturers' and industry standards' requirements for the appliance installation: a) Gas supply b) Electricity supply c) Chimney suitability d) The provision of ventilation
4.7	Apply changes to customer job requirements and obtain customer agreement to those changes
4.8	Check, use and ensure the design of the proposed central heating system installation is compliant with the following information sources: a) Appliance manufacturer's instructions – hardcopy, e-copy b) Industry standards – hard copy, e-copy c) Manufacturers technical instructions – hard copy, e-copy d) Verbal and written feedback for the customer
4.9	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
4.10	Check proposed location of condensate disposal is compliant: a) Appliance manufacturer's instructions b) Industry standards
4.11	Advise appropriate persons before central heating components or pipework are isolated in order to undertake work
4.12	Carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water

LO5 - Prepare work activities for installing, maintaining domestic gas water heaters and wet central heating appliances

Assessment Criteria and Range

5.1	Obtain confirmation from the customer before the job starts to ensure that they agree the planned work. Including the types of the following to be used: a) Pipework material: Copper, Plastic, LCS b) Fittings: Copper (capillary solder joints, compression joints), Plastic (push-fit joints), LPG threaded joints c) Components
5.2	Check and confirm all materials, tools and equipment necessary for the are available and are fit for purpose: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
5.3	State the procedures required to assemble valves to radiators and mount radiators on wall surfaces

5.4	State the range of hand and power tools required to complete work on central heating systems
5.5	State the positioning and fixing requirements of central heating pipework and components: a) In suspended timber floors b) In solid floors c) Embedded in walls d) In all areas of the building subject to frost
5.6	Identify how expansion and contraction may be catered for in central heating pipework containing: a) Plastics b) Copper
5.7	State how to select clips and brackets appropriate to the hot water system pipework and the industry recommended spacings: a) Horizontally mounted pipework b) Vertically mounted pipework
5.8	Be able to install central heating systems and components: a) Boilers b) Hot water storage cylinders c) Control components d) Assemble heat emitter components e) Make pipework fixings to copper and low carbon steel central heating system pipework f) Apply pipework insulation
5.9	Carry out all necessary checks and tests to confirm the installation meets the manufacturers and industry requirements: a) Gas supply b) Electricity supply c) The chimney system d) The provision of ventilation
5.10	Confirm that the siting of the gas supply meets industry standards' requirements in relation to other services: a) Electricity b) Water supply
5.11	Confirm the suitability of the proposed location of condensate disposal as required
5.12	Check the existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required
5.13	Carry out preparatory work to meet the activity Requirements: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning

5.14	Select and use the correct tools and equipment for the planned activity Tightness testing process: a) Direct purging process b) De-commissioning c) Installation d) Maintenance e) Commissioning
5.15	Demonstrate the correct procedure for commissioning and decommissioning central heating appliances in accordance with manufacturer's instructions
5.16	Demonstrate the correct handover procedure to the end user including safe demonstration of the appliance and system control features

LO6 - De-commission domestic gas water heaters and wet central heating appliances

Assessment Criteria and Range

6.1	Explain procedures for decommissioning systems a) Permanent b) Temporary
6.2	Carry out decommissioning procedures, which would also prevent the end-user from operating the appliance(s) and/or the system: a) Notify relevant person b) Isolate electricity supply c) Isolate water supply d) Isolate gas supply e) Apply warning notices and signs f) Drain system to a suitable location g) Appropriately dispose of contents and any additives h) Continuity bonding as required i) Temporary capping of pipework sections as required j) Notify building users k) Alternative source of heat or supplies as required
6.3	Identify the procedures for safely draining and disposing of central heating system contents

LO7- The basic requirements of Central Heating systems

Assessment Criteria and Range

7.1	Identify the component parts of a: a) Vented central heating system b) Sealed Central heating system														
	<table border="0"> <tr> <td><u>Vented</u></td><td><u>Sealed</u></td></tr> <tr> <td>a) Feed and Expansion cistern</td><td>Expansion vessel</td></tr> <tr> <td>b) Vent pipe inc. pipe size</td><td>Pressure relief valve</td></tr> <tr> <td>c) Feed pipe inc. pipe size</td><td>Temporary filling loop</td></tr> <tr> <td>d) Air separator</td><td></td></tr> <tr> <td>e) Connections to system</td><td></td></tr> <tr> <td>f) Pump position</td><td></td></tr> </table>	<u>Vented</u>	<u>Sealed</u>	a) Feed and Expansion cistern	Expansion vessel	b) Vent pipe inc. pipe size	Pressure relief valve	c) Feed pipe inc. pipe size	Temporary filling loop	d) Air separator		e) Connections to system		f) Pump position	
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f) Pump position															

7.2	Know the pipe work layouts of common central heating systems: a) Underfloor pipework arrangements from the manifold to the room b) Use of manifolds c) Control system and their applications for time and temperature to space heating zones d) One pipe system e) Two pipe systems: • With 2 port motorised valve • With three port mid position valves • With three port diverter valves
7.3	Know the requirements and function of components used in central heating systems, such as 'boiler plus and controls: • Weather compensation • Delayed start • Optimum start • Load compensation • Smart controls with automation and optimisation functions.
7.4	Identify what pump overrun is and how it affects heating systems

LO7- The basic requirements of Central Heating systems

Assessment Criteria and Range (continued)

7.5	Identify the energy efficiency measures required when installing central heating boilers and systems: a) Domestic Building Services Compliance Guide b) Building Regulation Approved Document L Volume 1 (plus equivalent in the devolved governments)
7.6	Describe the cleansing and corrosion proofing process of central heating systems and the use of: a) System cleanser b) Inhibitor c) De-scaler d) De-sludger
7.7	Understand human thermal comfort and its effect on heating system design: a) Room size b) Air change rate c) Occupancy patterns d) Usage e) Room temperature f) Outside temperature g) Temperature difference (Δt)
7.8	Understand how to conduct basic fabric heat loss calculations: a) The use of u-values – external and internal walls, glazing, doors b) The procedure for calculating ventilation heat loss c) Intermittent heating allowance

7.9	Know the different types of heat emitter: a) Convector/radiator b) Fan convector c) Bespoke radiators: column, vertical panel d) Underfloor heating e) Kick space f) Low surface temperature radiators g) Towel warmers h) Towel warmers with integrated panel radiators
7.10	Understand the use of common central heating components: a) Thermostatic Radiator Valves b) Wheel head/lock-shield valves c) System by-pass and automatic by-pass valves d) Circulating pump and valves e) Hot Water Storage Cylinders f) Cold Water Storage Cisterns (CWSC) g) Feed and Expansion Cisterns (F&EC)
7.11	Understand and analyse the operating principles of immersing central heating technologies: a) Low temperature systems b) Low carbon systems using heat pumps: ASHP's & GSHP' c) Interaction with gas boilers d) Micro Combined Heat and Power (MCHP)
7.12	Know how to size central heating systems, along with the Legislation for floor areas in larger single occupancy dwellings: a) Zoning requirements b) Space heating load c) Hot water heating load d) Heat emitter size e) Boiler size f) Heat loss from pipework g) Sizing heating Pipe work h) Pump size/speed i) Expansion vessel sizing
7.13	Understand how to commission and soundness test central heating systems: a) Open-vent and sealed systems b) F&E cisterns: Positions, cold supply, cold feed and vent pipe connections c) Expansion vessel position d) Filling, venting air from the system and testing e) Pump positions f) Pressure gauges (reading), pressure relief and filling loop positions g) Setting to work h) Balancing i) Benchmark j) Metallic pipework systems k) Plastic pipework systems

LO7- The basic requirements of Central Heating systems	
Assessment Criteria and Range (continued)	
7.14	Know how to fault find basic central heating faults using a manufacturer's flow chart: a) Motorised valve fault, b) Pump fault, c) Thermostat fault
7.15	Know how to use the manufacturers 'Short Parts List' in order to request spare parts.
7.16	Identify the actions that must be taken when inspection and testing reveal defects in central heating systems: a) Dealing with systems that do not meet correct installation requirements b) Remedial work associate with defective pipework bracketing c) Remedial work associated with defective control valves d) Remedial work associated with leakage from pipework systems
7.17	Be able to wire a central heating system to include: a) Motorised valves b) Room thermostat c) Time control d) Pump overrun (if required)
7.18	Be able to complete the following electrical checks: a) Measure and interpret resistance readings to ensure that it is safe to establish/re-establish the electrical supply b) Measure and interpret voltage readings to ensure safe electrical operation
7.19	Identify the layout features of underfloor central heating systems

LO8 - Know the service and maintenance requirements of central heating systems and components**Assessment Criteria and Range**

8.1	Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
8.2	Identify how to carry out routine checks on central heating components and pipework systems as part of a periodic maintenance programme: a) Visual inspection of pipework for leakage and adequate support b) Poor circulation in heat emitters c) Poor flow rate through heating systems d) Venting of gas build up within heat emitters e) Operation of control components f) Effective operation of thermostats g) Operation/ adjustment – system filling and venting components
8.3	State the procedures for dealing with defects in central heating components and pipework: a) Failure of control components b) Leakage in system pipework c) Leakage from heat emitters d) Replacement of control valves e) Replacement of heat emitters f) Replacement of hot water storage cylinders
8.4	The information that can be located on an appliance data plate, which will assist with the installation, service and maintenance of the appliance
8.5	Identify the types of information to be provided on a maintenance record for central heating systems

LO9 - Be able to service and maintain central heating systems and components**Assessment Criteria and Range**

9.1	Use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
9.2	Carry out routine checks on central heating components and pipework systems as part of a periodic maintenance programme: a) Visual inspection of pipework for leakage and adequate support b) Venting of gas build up within heat emitters c) Operation of control components d) Effective operation of thermostats e) Operation/ adjustment – system filling and venting components
9.3	Carry out repairs to defects in central heating system components a) Replacement of a radiator valve on a heat emitter b) Replacement of a radiator in an existing system
9.4	Complete the required details contained in a simple maintenance record for a central heating system

LO10 - Know the fault diagnosis and rectification procedures for central heating systems and components	
Assessment Criteria and Range	
10.1	Specify the periodic servicing requirements of central heating systems
10.2	State the methods of obtaining details of system faults from end users
10.3	Interpret manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components
10.4	Propose routine checks and diagnostics on central heating system components as part of a fault-finding process: - Checking components for correct operation – pressure settings, temperature and circulation - Cleaning system components (including dismantling and reassembly) - Checking for blockages in heat emitters and pipework - Checking for correct operation of system components: - Circulating pumps - Control components - Expansion vessels - Pressure relief valves - Feed and expansion cisterns
10.5	Specify methods of repairing faults in central heating system components: - Sealed and open vented – fill and vent pipework and components - Circulating pumps - Central heating control components: - Motorised valves - Timing devices - Thermostats - Specialist controls – weather compensation, delayed and optimum start - Blockages in heat emitters and pipework by power flushing

LO10 - Know the fault diagnosis and rectification procedures for central heating systems and components	
Assessment Criteria and Range (continued)	
10.6	Specify methods of safely isolating central heating systems or components to prevent them being brought into operation before the work has been fully completed
10.7	Know how to conduct the 'Safe to touch' procedure for isolating electrical systems and circuits prior to commencing work activities
10.8	Define procedures for carrying out diagnostic tests to locate faults in central heating system components: - Replacement of circulating pumps - Sealed heating system components - Control components

LO11 - Be able to diagnose and rectify faults in central heating systems and components	
Assessment Criteria and Range	
11.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components – hard copy, e-copy
11.2	Isolate central heating systems or components to prevent them being brought into operation before the work has been fully completed
11.3	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 flushing equipment
11.4	Carry out the periodic service of a central heating system

LO12 - Know the commissioning and decommissioning requirements of central heating systems and components	
Assessment Criteria and Range	
12.1	Interpret information sources required to complete commissioning work on central heating systems
12.2	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
12.3	State how to fill central heating pipework with water at normal operating pressure and check for leakage
12.4	Identify how to conduct a soundness test on central heating systems: a) Metallic systems b) Plastic pipework systems

LO12 - Know the commissioning and decommissioning requirements of central heating systems and components

Assessment Criteria and Range (continued)

12.5	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
12.6	Specify the method required to balance a central heating system during commissioning activities
12.7	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
12.8	Propose the range of information that would be detailed on a commissioning record for a central heating system
12.9	State the procedure for notifying works carried out to the relevant authority
12.10	Propose the points to be covered when handing over a completed system to the end-user
12.11	Identify working methods that reduce the periods during which central heating systems are not available to building users
12.12	State the information that needs to be provided to other persons before decommissioning work takes place
12.13	State how to temporarily decommission central heating and connecting pipework systems
12.14	Identify the work sequences for permanently decommissioning central heating and pipework systems
12.15	Identify the procedures for safely draining and disposing of central heating system contents
12.16	Identify the methods used during the decommissioning process to prevent the end-user from operating the appliance or system: a) Isolation of the fuel/electricity supply to the system b) Temporary capping of pipework sections c) Use of warning notices and signs

LO13 - Be able to commission and decommission central heating systems and components	
Assessment Criteria and Range	
13.1	Carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water
13.2	Charge central heating components with water at normal operating pressure and check for leakage
13.3	Flush and treat a central heating system with appropriate additives: a) System cleanser/neutraliser b) System inhibitor
13.4	Balance a central heating system to meet design requirements
13.5	Advise appropriate persons before central heating components or pipework are isolated in order to undertake work
13.6	Carry out temporary decommissioning of central heating system components and connecting pipework systems
13.7	Check to ensure that the decommissioning procedures carried out prevent the end-user from operating the appliance or system: a) Isolation of the fuel/electricity supply to the system b) Temporary capping of pipework sections c) Use of warning notices and signs

LO14 - Know the inspection and soundness testing requirements of central heating systems and components	
Assessment Criteria and Range	
14.1	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
14.2	State how to fill central heating systems with water at normal operating pressure and check for leakage
14.3	Identify how to carry out a soundness test to industry requirements on central heating systems pipework and components
14.4	Identify the actions that must be taken when inspection and testing reveals defects in central heating systems: a) Dealing with systems that do not meet correct installation requirements b) Remedial work associated with defective pipework bracketing c) Remedial work associated with defective control valves d) Remedial work associated with leakage from pipework systems

LO15 - Be able to inspect and soundness test central heating systems and components**Assessment Criteria and Range**

15.1	Carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water
15.2	Fill central heating systems with water at normal operating pressure and check for leakage
15.3	Perform a soundness test to industry requirements on central heating systems pipework and components

Unit 10 – Install and maintain domestic gas cookers

UAN – M/652/2422
GLH – 60
EUS DSG05
AIM This practical and knowledge unit covers the installation, and maintenance of domestic gas cooking appliances. Upon completion of the unit the learners will:

LO1 - Know the uses of domestic gas cookers appliances in dwellings	
Assessment Criteria and Range	
1.1	State the purpose of domestic gas cookers appliances used in dwellings
1.2	Identify the different types of domestic gas cookers appliances used in dwellings: a) Free standing b) Built-in c) Hob d) Flexible connection e) Rigid connection

LO2 - Know the types of domestic gas cookers appliances and their layout requirements	
Assessment Criteria and Range	
2.1	Identify the working principles of domestic gas cookers appliances
2.2	Identify the working principles of domestic gas cookers appliances: a) Free standing b) Built-in c) Hob
2.3	State the general operating principles of domestic gas cookers appliances systems in dwellings: a) Free standing b) Built-in c) Hob
2.4	State the operating principles of domestic gas cookers appliances control components: a) Safety controls b) Burners

LO3 - Plan gas systems for installing domestic gas cookers appliances	
Assessment Criteria and Range	
3.1	State the positioning and fixing requirements of domestic gas cookers appliances: a) Installation pipework b) Gas c) Ventilation requirements 1. Direct to the outside air 2. Via internal rooms 3. Into internal spaces/rooms
3.2	Identify and record the customer's job requirements – verbally, written, electronically
3.3	Compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues: a) Location b) Siting c) Clearances
3.4	Survey the work site a) Key structural features that could affect the installation b) Record details
3.5	Check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements: a) Gas supply b) Electricity supply c) The provision of ventilation
3.6	Check that the availability of input services meets the appliance manufacturers' and industry standards' requirements for the appliance installation: a) Gas supply b) Electricity supply c) The provision of ventilation
3.7	Apply changes to customer job requirements and obtain customer agreement to those changes
3.8	Check and ensure the design of the proposed installation is compliant: a) Appliance manufacturer's instructions – hard copy, e-copy b) Industry standards - hard copies, e-copies
3.9	Know the procedures to take when MI's are not available..... a) Manufacturers on-line resources/data base b) GIUSP c) IGEM

LO4 - Prepare work activities for installing, maintaining domestic gas cookers appliances	
Assessment Criteria and Range	
4.1	
4.2	Check and confirm all materials, tools and equipment necessary for the activity are available and are fit for purpose: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning

LO4 - Prepare work activities for installing, maintaining domestic gas cookers appliances**Assessment Criteria and Range (continued)**

4.3	Carry out all necessary checks and tests to confirm the installation meets the manufacturers and industry requirements: a) Gas supply b) Electricity supply c) The provision of ventilation
4.4	Confirm that the siting of the gas supply meets industry standards' requirements in relation to other services a) Water supply b) Electricity supply
4.5	Check the existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required
4.6	Carry out preparatory work to meet the activity requirements: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
4.7	Select and use the correct tools and equipment for the planned activity: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
4.8	Demonstrate the correct procedure for commissioning domestic gas cookers in accordance with manufacturer's instructions
4.9	Demonstrate the correct handover procedure to the end user including safe demonstration of the appliance and system control features

LO5 - De-commission domestic gas cookers appliances**Assessment Criteria and Range**

5.1	Explain procedures for decommissioning systems a) Permanent b) Temporary
5.2	Carry out decommissioning procedures: a) Notify relevant person b) Isolate electricity supply c) Isolate gas supply d) Apply warning notices and signs e) Continuity bonding as required f) Temporary capping of pipework sections as required g) Notify building users Recycle components – Metal casing, copper pipework etc h) Correctly dispose of non-recyclable material

Unit 11 – Install and maintain domestic gas space heating appliances

UAN – R/652/2423
GLH – 90
EUS DSG 04
AIM This practical and knowledge unit covers the installation, and maintenance of domestic gas space heating appliances. Upon completion of the unit the learners will:

LO1 - Know the uses of domestic gas space heating appliances in dwellings	
Assessment Criteria and Range	
1.1	State the purpose of domestic gas space heating appliances used in dwellings
1.2	Identify the different types of domestic gas space heating appliances used in dwellings: a) Outset Gas Fire b) Inset Live Fuel Effect Gas Fire c) Decorative Fuel Effect Appliance d) Convector Heater e) Flueless f) Open-Flued Natural Draught Appliance g) Room Sealed Natural Draught Appliance h) Open-Flued or Room Sealed Fanned Draught Appliance

LO2 - Know the working principles and performance criteria of domestic gas space heating appliances	
Assessment Criteria and Range	
2.1	Identify the working principles of domestic gas space heating appliances
2.2	Identify the working principles of domestic gas space heating appliances: a) Outset gas fire b) Inset live fuel effect gas fire c) Decorative fuel effect appliance d) Convective heater
2.3	State the general operating principles of domestic gas space heating appliances systems in dwellings: a) Outset gas fire b) Inset live fuel effect gas fire c) Decorative fuel effect appliance d) Convective heater
2.4	Know how to check the performance criteria when installing the following appliance against the manufacturers requirements and current legislation a) Inset gas fires b) Outset gas fires
2.5	State the operating principles of domestic gas space heating appliances control components: a) Safety controls b) Burners
2.6	Explain the correct installation procedure of domestic space heaters: a) Freestanding radiant type gas fire b) Inset live fuel effect gas fire c) Decorative fuel effect gas fire

LO3 - Plan gas systems for installing domestic gas space heating appliances**Assessment Criteria and Range**

3.1	State the positioning and fixing requirements of domestic gas space heating appliances: a) Installation pipework b) Gas c) Electricity supply d) Ventilation requirements
3.2	Identify and record the customer's job requirements – verbally, written, electronically
3.3	Compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues: a) Location b) Siting c) Clearances
3.4	Survey the work site: a) Key structural features that could affect the installation b) Record details
3.5	Check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements: a) Gas supply b) Electricity supply c) Chimney suitability d) The provision of ventilation
3.6	Check that the availability of input services meets the appliance manufacturers' and industry standards' requirements for the appliance installation: a) Gas supply b) Electricity supply c) Chimney suitability d) The provision of ventilation
3.7	Apply changes to customer job requirements and obtain customer agreement to those changes
3.8	Check and ensure the design of the proposed installation is compliant: a) Appliance manufacturer's instructions – hard copy, e-copy b) Industry standards – hard copies, e-copies

LO4 - Prepare work activities for installing, maintaining domestic gas space heating appliances	
Assessment Criteria and Range	
4.1	Obtain confirmation from the customer before the job starts to ensure that they agree the planned work
4.2	Check and confirm all materials, tools and equipment necessary for the activity are available and are fit for purpose: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
4.3	Carry out all necessary checks and tests to confirm the installation meets the manufacturers and industry requirements: a) Gas supply b) Electricity supply c) Chimney suitability d) The provision of ventilation
4.4	Confirm that the siting of the gas supply meets industry standards' requirements in relation to other services: a) Water supply b) Electricity supply
4.5	Confirm the suitability of the proposed location of condensate disposal as required
4.6	Check the existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required
4.7	Carry out preparatory work to meet the activity requirements: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
4.8	Select and use the correct tools and equipment for the planned activity: a) Tightness testing process b) Direct purging process c) De-commissioning d) Installation e) Maintenance f) Commissioning
4.9	Demonstrate the correct procedure for commissioning space heating appliances in accordance with manufacturer's instructions
4.10	Demonstrate the correct handover procedure to the end user including safe demonstration of the appliance and control features

LO5 - De-commission domestic gas space heating appliances	
Assessment Criteria and Range	
5.1	Explain procedures for decommissioning systems b) Permanent c) Temporary
5.2	Carry out decommissioning procedures: a) Notify relevant person b) Isolate electricity supply c) Isolate gas supply d) Apply warning notices and signs e) Continuity bonding as required f) Temporary capping of pipework sections as required g) Notify building users h) Recycle components – Metal casing, copper pipework etc i) Correctly dispose of non-recyclable material

Optional Units

Unit 12 – Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

UAN – T/652/2424
GLH – 8
EUS DSG 1.12
AIM This knowledge unit provides provide candidates with the underpinning knowledge of the legal requirements for plumbing systems in the UK covered by Water Supply (Water Fittings) Regulations and Water Byelaws. The purpose of this unit is to enable learners to develop the underpinning knowledge and skills required and existing workers in the occupation to develop their professional competence and extend their range of work. Upon completion of the unit the learners will:

LO1 - Understand the requirements of the Water Supply (Water Fittings) Regulations and Water Byelaws	
Assessment Criteria and Range	
1.1	Explain the requirements of the Water Regulations/Byelaws (Part 1): a) The domestic environment and the commercial, industrial environment
1.2	Explain the requirements of the Water Regulations/Byelaws (Part 2): a) Approved contractors b) The restriction on installation of water fittings, requirements for water fittings, notification requirements relating to any person who proposes to install a water fitting
1.3	Explain the requirements of the Water Regulations/Byelaws (Part 3): a) Penalties for contravening the Water Regulations, relaxation of the Water Regulations, dispute with a water undertaker

LO2 - Understand terminology used to confirm requirements of the Water Regulations**Assessment Criteria and Range**

2.1 Explain the meanings of the key factors within the interpretations of the Water Regulations:

- a) Backflow
- b) Cistern
- c) Combined feed and expansion cistern
- d) Combined temperature and pressure relief
- e) Contamination
- f) Distributing pipe
- g) Expansion cistern/vessel
- h) Expansion valve
- i) Flushing cistern
- j) Overflow pipe
- k) Pressure relief valve
- l) Primary circuit
- m) Secondary circuit
- n) Secondary system
- o) Servicing valve
- p) Stop valve
- q) Storage cistern
- r) Temperature relief valve
- s) Terminal fitting
- t) Vent pipe

2.2 Identify the different types of water treatment apparatus available to dwellings

LO3 - Know the suitability of materials and substances in contact with water**Assessment Criteria and Range**

3.1 Describe situations where materials or substances either alone or in combination are likely to cause contamination of water:

- a) Different classes of steel pipes
- b) Copper tubes and their connections above and below ground
- c) Unplasticised PVC
- d) Polyethylene pipes
- e) Stainless steel pipes

3.2 Identify suitable fittings for use above and below ground:

- a) Stop valves
- b) Drain-off valves
- c) Servicing valves

3.3 Identify suitable jointing materials and compounds

LO4 - Understand the requirements for water fittings	
Assessment Criteria and Range	
4.1	State the fitness for purpose of water fittings: a) British Standards or equivalent b) Immunity and protection from galvanic action
4.2	State the requirements for installed water fittings: a) Water tightness b) Prevention of ingress from contaminants c) Prevention from damage by freezing and other causes d) Prevention from deterioration by permeation e) The supporting pipework f) The fixings for water fittings
4.3	Describe the requirement for pressure testing pipework systems: a) Metallic b) Plastic
4.4	Explain how surges within a pipework system can affect system performance: a) Water hammer b) Relief valve discharge c) Pneumatic accumulators
4.5	State the connection requirements for the installation of a pump on a supply pipe: a) Permissible pump output capacity b) Permitted siting of a pump
4.6	State the connection requirements for the installation of a pumped shower: a) Permissible pump output capacity b) Recommended siting of a pump
4.7	State the installation requirements for pipes and operational fittings: a) Located in the cavity of a cavity wall b) Embedded in any wall or solid floor c) Located below a suspended floor d) Below a solid floor at ground level e) Location and accessibility to operational fittings
4.8	State the installation requirements for pipes entering a building: a) Depth of pipework b) Insulation requirements c) Protection of pipework
4.9	State the installation requirements for underground pipework: a) Pipes laid underground b) Pipes laid over an underground obstruction c) Pipes under an underground obstruction d) Pipes supplying water to a building below street level e) Pipes beneath a stream
4.10	Explain the terms 'concealed fitting' and 'dezincification resistant material'

LO5 - Know the design and installation requirements for a water supply system**Assessment Criteria and Range**

5.1	State factors to be taken into consideration in the design of a water supply system: a) Total daily consumption b) Maximum and average flows required c) Availability of mains supply d) Mains pressure variance e) Water storage capacity where needed f) Transient or surge pressures g) Environmental issues surrounding area and supply
5.2	Describe types of distribution system available within a dwelling: a) Direct fed system b) Indirect fed system c) Combination of direct and indirect fed systems
5.3	Explain the methods of preventing the contamination of water fittings and the water contained within them when passing through contaminated environment
5.4	State the distribution temperature of cold water
5.5	State the installation requirements for stop valves to premises: a) Individual property b) Location within premises supplied with water c) Block of flats supplied from a common supply pipe d) Block of flats with separate supply pipes to each flat
5.6	State the installation requirements for the provision, operation and location of servicing valves: a) Inlet to Float Operated Valve (FOV) b) Outlet of storage cisterns c) Inlet to appliances d) Accessibility of servicing valves e) Methods of operation
5.7	State the installation requirements for the provision of draining taps: a) Location b) Accessibility c) Types of draining taps
5.8	State the requirements with respect to dead legs and redundant fittings
5.9	State the requirements for pressure testing different systems: a) Systems that do not include any plastic b) Systems that include plastic pipes
5.10	Explain the reason for the flushing of a system installation
5.11	State when system disinfection is required

LO6 - Know the requirements for the prevention of cross connection to unwholesome water**Assessment Criteria and Range**

6.1	State the meaning of unwholesome water in relation to: a) Rainwater b) Recycled water c) Any fluid not supplied by a water undertaker
6.2	State the requirements for identifying an unwholesome water system so that it is readily distinguishable from a wholesome system to include: a) Colour coding for pipes and fittings b) Labelling for pipes and terminal fittings
6.3	Identify the correct arrangement for connecting a wholesome water supply to a re-use

LO7 - Know the backflow prevention fluid categories**Assessment Criteria and Range**

7.1	Define the five fluid categories
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LO8 - Know the requirements for backflow prevention**Assessment Criteria and Range**

8.1	State the requirements for the arrangements or devices to prevent the cross connection to unwholesome water
8.2	Identify devices or arrangements used for backflow, back pressure and back siphonage prevention and their suitability

LO9 - Understand the guidance clauses relating to backflow prevention**Assessment Criteria and Range**

9.1	Describe the requirements whereby water can flow back into a supply or distributing pipe
9.2	Explain the terms 'upstream' and 'downstream'
9.3	Identify the method of protection against the backflow of water into a supply or distributing pipe without the need for a mechanical backflow prevention device
9.4	Describe installation requirements for a mechanical backflow protection device: a) Accessibility of the mechanical backflow protection device b) Location within the premises c) Not to be buried in the ground d) Vented and verifiable or devices with relief outlets not to be installed in chambers below ground or where liable to flooding e) The installation of line strainers f) The lowest point of discharge from the ground and termination with a Type AA air gap
9.5	State the requirements for appliances supplied through or incorporating a pump

LO9 - Understand the guidance clauses relating to backflow prevention	
Assessment Criteria and Range (continued)	
9.6	State the requirements of a bidet or appliance using a hand-held spray: a) Ascending spray type b) Over rim type c) Spray handset fittings used with bidets and WC's
9.7	Explain the requirements for a water supply to a manually operated WC or urinal using a pressure flushing valve when supplied from a supply pipe or distributing pipe
9.8	Explain the requirements for tap outlets: a) Single outlet taps b) Combination taps assembly outlets c) Fixed shower heads over basins d) Baths and bidets e) Explain the requirements for a sink in a non-domestic environment
9.9	Explain the requirements for a sink in a non-domestic environment
9.10	Identify the requirements for submerged inlets to baths and washbasins in a dwelling and non-dwelling
9.11	Identify the requirements for the installation of a drinking water fountain
9.12	Identify the requirements for the installation of washing machines, washer-dryers and dishwashers in a dwelling and non-dwelling
9.13	State the requirements for the installation of hose pipes for a house garden and commercial installations
9.14	Explain when whole site and zone protection are required
9.15	State the requirements for fire protection systems: a) Direct fed sprinkler systems with no additives b) Direct fed sprinkler systems with additives c) Elevated storage cisterns with or without additives by gravity d) Elevated storage cisterns with pumped outlet with or without additives e) Dual feed cisterns with water from the water undertaker and from another source
9.16	State the requirements when applied to miscellaneous commercial and industrial applications: a) Pumped supply to laboratory fittings b) Separation of wholesome water from supplementary sources c) Separation of wholesome water from water that has been used d) Water supply taken directly from a supply pipe to a ship e) Water supply taken by gravity from storage on a quayside f) Water supply pumped from storage on a quayside g) Water taken from a hose union tap on a quayside

LO10 - Know the installation requirements for cold water services**Assessment Criteria and Range**

10.1	Describe the installation requirements and methods of connection for water fittings: a) Float operated valves b) Inlets to cisterns c) Outlets from cisterns d) Warning and overflow pipes e) Cold water storage cisterns
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LO11 – Know the installation requirements of hot water services**Assessment Criteria and Range**

11.1	Describe the installation requirements and methods of connection for water fittings: a) Directly heated unvented hot water systems b) Indirectly heated unvented hot water systems c) Independent water heaters d) Methods of accommodating expanded water in a hot water system e) Maximum temperature within a hot water system f) Hot water distribution temperatures g) Temperature of hot water at terminal fittings h) Surfaces of hot water pipes
11.2	State the requirements for discharge pipes from safety devices
11.3	State the requirements for discharge pipes from expansion valves
11.4	State the requirements for vent pipes from a primary circuit
11.5	State the requirements for vent pipes from a secondary hot water storage system

LO12 - Know the installation requirements for WCs, flushing devices and urinals approved for use**Assessment Criteria and Range**

12.1	Identify the installation methods and requirements for the operation of WC pans: a) Single flush cisterns, dual flush cisterns b) Single flush siphonic outlet c) Dual flush siphonic outlet d) Drop and flap valve e) Dual flush cistern capacities f) Operating instructions for dual flush cisterns g) Pressure flushing valves h) Cistern water line mark i) Requirements for warning pipes j) Internal overflows
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LO12 - Know the installation requirements for WCs, flushing devices and urinals approved for use	
Assessment Criteria and Range (continued)	
12.2	Explain methods for flushing urinals: a) Manually operated cistern b) Automatically operated cistern c) Pressure flushing valves
12.3	Describe methods for filling a urinal cistern: a) Manual infill b) Electronic sensor c) Pressure pad d) Time switch e) Frequency of flushing
12.4	State the requirements for urinal cistern filling rates for: a) A single urinal bowl b) A urinal stall or slab serving two or more urinals
12.5	State the requirements for the renewal of a WC cistern installed before 1 July 1999

LO13 - Know the types of bath, sink, showers taps location and installation requirements	
Assessment Criteria and Range	
13.1	State the requirements for drinking water points in premises
13.2	State the requirements for drinking water supplies: a) Water supplied from a supply pipe b) Water supplied from a pumped supply pipe c) Water supplied from a storage cistern d) Water that has been softened used for drinking purposes
13.3	State the requirements for waste outlets from appliances

LO14 - Know the design and installation requirements for a water supply system	
Assessment Criteria and Range	
14.1	State the upper limits of water consumption for domestic: a) Horizontal axis washing machines b) Washer – driers c) Dish washers

LO15 - Know the requirements for water supplied for outside use	
Assessment Criteria and Range	
15.1	State the installation requirements for animal drinking troughs or bowls in relation to: a) Methods of controlling the inflow to a trough or bowl b) The siting of servicing valves c) Backflow protection
15.2	State the installation requirements for ponds, fountains and pools in relation to: a) Impervious liners and water tightness b) Temporary connections to ponds, pools and fountains

Unit 13 – Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques

UAN – Y/652/2425
GLH – 30
EUS DSG 1.13
AIM This performance and knowledge unit provides learning in the design, installation, maintenance, and commissioning of a complex range of hot water system/component types. The unit also covers the requirements of statutory legislation for the installation, maintenance and commissioning of unvented hot water storage systems. Upon completion of the unit the learners will:

LO1 - Understand the types of hot water system and their layout requirements	
Assessment Criteria and Range	
1.1	Explain the types of hot water supply systems used in dwellings: Centralised systems: c) Unvented hot water systems d) Open vented hot water systems: Localised systems: c) Unvented point of use heaters d) Instantaneous heaters
1.2	Describe types of unvented/vented-hot water systems: i) Indirect storage systems j) Direct storage systems k) Electrically heated l) Gas or oil fired m) Small point of use (under sink) n) Solar thermal hot water systems
1.3	Identify hot water system pipework layout features including systems with secondary circulation: a) Direct and indirect vented and unvented b) Direct and indirect cylinders c) Solar thermal d) Secondary circulation e) Location of pump and type f) Automated timing devices g) Methods of balancing systems

LO1 - Understand the types of hot water system and their layout requirements**Assessment Criteria and Range (continued)**

1.4	State the recommended design temperatures within hot water systems: a) Hot water storage vessel b) Hot water delivery c) Secondary return d) At point of use: e) Storage system f) Fixed bath g) Basin h) Blending valve installation
1.5	Identify the layout requirements, location and safety features for unvented/vented hot water systems: a) Expansion and temperature relief pipework b) Vent pipes
1.6	Evaluate the various types of unvented hot water system: a) Indirect storage systems b) Direct storage systems: • Electrically heated • Gas or oil fired • Small point of use (under sink)
1.7	Clarify the use of cold-water accumulators in unvented hot water systems

LO2 - Know the types and operation of specialist components in hot water systems**Assessment Criteria and Range**

2.1	State methods of preventing stored water from exceeding 100° C
2.2	State the minimum number of independent safety devices required to prevent overheating in unvented hot water systems
2.3	State the expansion rate of water when converted to steam
2.4	Explain the working principle of functional devices in unvented hot water systems: a) Line strainer b) Pressure reducing valve c) Check valves d) Expansion device (vessel or integral to cylinder) e) Tundish f) Composite valve

LO3 - Understand the design techniques for hot water systems	
Assessment Criteria and Range	
3.1	Identify the factors which affect the selection of hot water systems for single occupancy dwellings
3.2	Explain how to minimise bacterial growth in hot water systems
3.3	State the criteria used for selecting hot water system and component types: a) Customers/occupiers needs/usage (Maximum usage per person per day) b) Building layout and features c) Suitability of system d) Energy efficiency e) Water efficiency f) Environmental impact
3.4	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
3.5	State which regulation applies to the installation of unvented hot water systems of more than 45kW and a capacity of 500 litres
3.6	Clarify how to take measurements of building features in order to carry out design calculations: a) From plans, drawings and specifications b) From site

LO4 - Know the installation requirements of hot water systems and components including any associated cold-water components	
Assessment Criteria and Range	
4.1	State the effects of unbalanced supply pressures in hot water systems
4.2	State the take off point on a cold-water supply to maintain a balanced hot and cold-water supply
4.3	State the additional safety components where multiple heat sources exist
4.4	Describe the installation and siting requirements of cold-water cisterns
4.5	Describe the requirements for positioning a cold-water pipe in relation to sources of heat

LO4 - Know the installation requirements of hot water systems and components including any associated cold-water components

Assessment Criteria and Range (continued)

4.6	Identify the positioning and fixing requirements of components in unvented hot water systems: a) Safety devices: • Control thermostat • Overheat thermostat (thermal cut-out) • Temperature relief valve b) Functional devices: • Line strainer • Pressure reducing valve • Check valve • Expansion device • Expansion relief valve • Tundish arrangements • Composite valves
4.7	State the pipe size and positioning methods for safety relief pipework: a) D1 discharge b) Tundish c) D2 discharge d) Multiple discharge pipe arrangements from safety devices e) Termination
4.8	State how to position, fix and connect new hot water safety relief pipework: a) D1 discharge b) Tundish c) D2 discharge d) Multiple discharge pipe arrangements from safety devices e) Termination
4.9	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

LO5 - Be able to install hot water systems and components	
Assessment Criteria and Range	
5.1	Connect pipework to an unvented hot water system: Incoming supply pipework: a) Line strainer b) Pressure reducing valve c) Expansion vessel d) Storage cylinder e) Check valve
5.2	Position, fix and connect new hot water safety relief pipework: a) D1 pipework b) Tundish c) D2 pipework d) Correction termination

LO6 - Be able to diagnose and rectify faults in hot water systems and components	
Assessment Criteria and Range	
6.1	Use manufacturer instructions and industry standards to establish the diagnostic requirements of hot water system components
6.2	Isolate hot water systems or 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 hot water system components, carry out repair work and confirm the correct operation of the system components and safety valves: a) Discharge pipework b) Expansion and pressure vessels c) Expansion relief d) Temperature relief e) Thermostats
6.4	Carry out the periodic service of an unvented hot water storage system

LO7 - Be able to commission hot water systems and components	
Assessment Criteria and Range	
7.1	State the checks to be carried out during a visual inspection
7.2	State how to fill hot water pipework with water at normal operating pressure and check for leakage
7.3	Identify how to conduct a soundness test on hot water systems: a) Metallic systems b) Plastic pipework systems
7.4	Describe the flushing procedure for hot water systems and components
7.5	Clarify how to take flow rate and pressure readings from new and existing hot water outlets
7.6	State how to balance a secondary circulation system during commissioning activities

LO7 - Be able to commission hot water systems and components	
Assessment Criteria and Range (continued)	
7.7	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
7.8	State the procedure for notifying works carried out to the relevant authority

LO8 - Be able to confirm that unvented hot water systems have been serviced in accordance with manufacturer's instructions	
Assessment Criteria and Range	
8.1	Carry out a visual inspection, service and commissioning of hot water systems

9. Assessment Methods and Arrangements

This qualification will be assessed as identified below.

Assessment Component	Set By	Marked By	Quality Assurance	
			Internal	External
Externally Set Online Assessments	BPEC	BPEC (online)	Examination invigilation and IQA monitoring	Moderation/verification of exam results and EQA monitoring of process during visits
Externally Set Offline Assessments	BPEC	Centre Assessor	Examination invigilation and IQA monitoring	EQA checks of exam results and EQA monitoring of process during visits
Externally Set Practical Performance Assessments	BPEC	Centre Assessor	IQA checks of assessment documentation and observation of assessments	EQA checks of assessment documentation and observation of assessment processes
Learner portfolios of evidence	BPEC	On-site Assessor	IQA checks of assessment documentation and observation of site assessments	EQA checks of assessment documentation, processes to include observation of on-site assessments

9.1 Assessment of the Qualification

- Multiple Choice Examination – 2 mandatory online examinations which are externally set and externally marked. (Health & Safety Exam, Unit 2, 3 & 4 combined unit exam).
- Portfolio of Evidence (Gas On-Site Work Record) – Externally set work record which is completed on-site; externally set and internally marked.
- Practical Demonstration/Assignment – A range of in-centre practical assessments; externally set and internally marked.
- Written Examination – A written examination contained within the Hot Water (Optional) Unit; externally set and internally marked.
- Task-based Controlled Assessments (including summative assessments) – Multiple choice examinations and practical assessments which are contained within the Hot Water Unit and the Summative Gas Assessments.

In order that learners can apply to become a member of the Gas Safe Register they must undertake a series of practical and knowledge assessments, these are referred to as Summative Gas Assessments.

Centres must not carry out any summative gas assessments with learners until all other training and assessment elements within the qualification have been successfully met. The Gas Work Log may be started at any point throughout the qualification, but this **MUST** be completed prior to the summative gas assessments being taken.

Centres must ensure that all examinations and assessments are conducted in-line with the **BPEC AO Examination, Assessment and Invigilation Policy and Procedure**.

9.2 Permitted Documents

- The Assessment Pack will indicate if the Learner is permitted to refer to documents during the assessment. These should be provided by the Centre.
- If the assessment is designated as 'Closed Book' the learner is not permitted to refer to any documentation. This includes dictionaries.
- Further information regarding BPEC online examinations can be found in the **BPEC Online Exams Information Pack**.
- Centres must ensure that all permitted reference materials are 'clean copies' and free from annotations, written notes, prompts, highlighting, bookmarks containing information or any other markings that could provide an unfair advantage. The permitted reference material must not contain any other additional information beyond the original published content.

10. Requirements for individual units

10.1 Mandatory generic units

Unit Ref: Understand and apply health and safety in gas utilisation

To achieve the completion of this combination unit, learners must satisfactorily complete the applicable knowledge assessment for the learning points within the unit and all practical assessments in learner's centre portfolio.

Unit Ref: Understanding scientific principles in gas utilisation

To achieve the completion of this knowledge unit, you must satisfactorily complete the applicable knowledge assessment for the learning points within the unit.

Unit Ref: Understanding combustion and properties of gas (natural gas and LPG)

To achieve the completion of this knowledge unit, you must satisfactorily complete the applicable knowledge assessment for the learning points within the unit.

Unit Ref: Understanding buildings, services and structures

To achieve the completion of this knowledge unit, you must satisfactorily complete the applicable knowledge assessment for the learning points within the unit.

Unit Ref: Understanding gas safety

To achieve the completion of this knowledge unit, you must satisfactorily complete the applicable knowledge assessment for the learning points within the unit.

Unit Ref: Specific core gas safety

To achieve the completion of this combination unit, you must satisfactorily complete the applicable summative knowledge assessment(s) for the knowledge learning outcomes within the unit. You must also complete the appropriate summative practical performance activities in RWE conditions, on-site assessments and evidence from the workplace as per the requirements for the unit as specified in the BPEC Qualification Specification.

10.2 Mandatory units:

Unit Ref: Install and maintain domestic gas water heaters and wet central heating appliances

To achieve the completion of this combination unit, you must satisfactorily complete the applicable summative knowledge assessment(s) for the knowledge learning outcomes within the unit. You must also complete the appropriate summative practical performance activities in RWE conditions, on-site assessments and evidence from the workplace as per the requirements for the unit as specified in the BPEC Qualification Specification.

Unit Ref: Install and maintain domestic gas cooker.

To achieve the completion of this combination unit, you must satisfactorily complete the applicable summative knowledge assessment(s) for the knowledge learning outcomes within the unit. You must also complete the appropriate summative practical performance activities in RWE conditions, on-site assessments and evidence from the workplace as per the requirements for the unit as specified in the BPEC Qualification Specification.

Unit Ref: Install and maintain domestic gas space heating appliances

To achieve the completion of this combination unit, you must satisfactorily complete the applicable summative knowledge assessment(s) for the knowledge learning outcomes within the unit. You must also complete the appropriate summative practical performance activities in RWE conditions, on-site assessments and evidence from the workplace as per the requirements for the unit as specified in the BPEC Qualification Specification.

10.3 Optional Units

Unit Ref: 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 summative knowledge assessment(s) for the knowledge learning outcomes within the unit. You must also complete the appropriate summative practical performance activities in RWE conditions as per the requirements for the unit as specified in the BPEC Qualification Specification.

Unit Ref: Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

To achieve the completion of this Knowledge Unit, you must satisfactorily complete the applicable knowledge assessment for the learning points within the unit.

11. Assessment Documentation

The following documentation will also be supplied by BPEC Certification Ltd. to support the delivery of the L3 Diploma in Gas Engineering qualification.

- Qualification assessment manual, including:
 - Diploma in Gas Engineering Workshop Guide
 - Diploma in Gas Engineering Practical Gas Training pack
 - Diploma in Gas Engineering Practical Gas Training Pack Rationale
 - Diploma in Gas Engineering In-Centre Practical Assessments Pack
 - Diploma in Gas Engineering - Gas On-Site Work Record
- Knowledge assessment papers and question specifications (centre only).

11.1 Learner Result Submission Form (LRSF)

A learner result submission form has been produced for this qualification. This document shall be used to record that the learner has completed each unit and the whole qualification in a satisfactory manner. The document shall be completed and signed by the centre assessor and the internal verifier. Tracking documents detailing individual assessment/task completion dates should be devised by the centre.

The completed learner result submission form shall be sent to BPEC Certification Ltd. for certification. Copies of the learner result submission form shall also be retained in the learner's centre portfolio.

11.2 Evidence Forms

BPEC Certification Ltd. has designed evidence forms which may be used to capture evidence relating to a learner's performance in the workplace. Such evidence may include:

- Assessor feedback to the learner
- Records of supplementary questions posed by the assessor and the learner responses
- Learner feedback – statements made by the learner to clarify their competence
- Witness testimony – statements made by witnesses e.g. supervisor, customer etc. relating to the competence of the learner.

11.4 Matter of Gas Safety (MoGs)

The Institution of Gas Engineers and Managers (IGEM) on behalf of Gas Safe Register have overall responsibility of maintaining and updating the Matters of Gas Safety criteria. BPEC will ensure that all assessments that contain 'matters of gas safety' (MOGs) are kept in-line with current requirements issued by IGEM. The requirements are currently updated every 12 months to reflect any changes within Industry, these usually have an implementation date of the 1st January each year, unless a safety critical update is required. Centres must ensure that the 'summative gas assessments' are used when undertaking assessments with learners. All relevant documentation is available to the centre via the BPEC portal.

It is vital that all assessors and IQAs familiarise themselves with the changes in the assessment paperwork, health and safety and normative documents. A suggested CPD plan is included on the BPEC portal for all approved centre personnel; management representatives, assessors and IQAs. As a minimum this suggested plan should be completed to enable demonstration of continual professional development ensuring CPD is maintained and updated as required by BPEC.