

Level 3 Diploma in Gas Utilisation (6014)



Unit handbook for centres

- 6014-03 Level 3 Diploma in Domestic Natural Gas (leading to Gas-Safe registration)
- 6014-04 Level 3 Diploma in Domestic Natural Gas
- 6014-55 Level 3 Diploma in Gas Utilisation (Installation and Maintenance)

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Unit handbook for centres

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Date and version number	Change detail	Section
February 2012 V2.0	Title of Learning Outcome 6 in Unit 201 amended	Unit
May 2012 V3.0	Document title amended to Dipoloma in Gas Utilisation	Title pages and footers
July 2013 V3.1	Added a statement regarding the list of approved materials for open book examination to units 203, 205, 323, 324, 325 and 327	Units
July 2013 v4.0	Units 207/277, 208, 209, 210, 211, 328 and 329 added.	Units
June 2015 v4.1	Units 208, 209, 210 and 211 replaced by units 218, 219, 220 and 221 respectively	Units

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1 Units

Availability of units

The complete set of units including learning outcomes and assessment criteria for the additional competence based units are viewable on the Register of Regulated Qualifications <http://register.ofqual.gov.uk>

Structure of units

The units in these qualifications are written in a standard format and comprise the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria

Summary of units

City & Guilds unit	Title	QCF unit ref (UAN)	Credits
201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in small natural gas installations	K/502/8376	3
202	Install gas meters and regulators (2.5 to 16.0m ³ /hr)	A/502/8303	12
203/003	Understand and apply domestic cold water system installation and maintenance techniques	H/602/2697	8
204/004	Understand and apply domestic hot water system installation and maintenance techniques	F/602/2884	8
205/005	Understand and apply domestic central heating system installation and maintenance techniques	Y/602/2888	10
206	Install and maintain domestic heating systems	R/602/2971	4
207/277	Delivery of effective customer service	J/600/1003	6
218	Understand the principles and operation of Government energy efficiency incentives	K/506/1880	1
219	Understand the use of energy efficiency measures on existing buildings	F/506/1884	4
220	Understand insulation and building treatment methods	J/506/1885	1

City & Guilds unit	Title	QCF unit ref (UAN)	Credits
221	Understand air quality and ventilation requirements for buildings	L/506/1886	1
301	Understanding health and safety in gas utilisation	M/502/8461	11
302	Understanding scientific principles in gas utilisation	A/502/8463	4
303	Understanding combustion and properties of gas	M/502/8475	15
304	Understanding buildings, services and structures	A/502/8480	12
305	Understanding gas safety	Y/502/8485	15
306	Specific core metering	D/502/8486	23
307	Specific core emergency	K/502/8488	45
308	Specific core installation and maintenance	H/502/8487	21
309	Install domestic gas cookers, tumble dryers and leisure appliances	Y/502/8292	10
310	Maintain domestic gas cookers, tumble dryers and leisure appliances	L/502/8452	13
311	Install domestic gas water heaters and wet central heating appliances	Y/502/8454	18
312	Maintain gas water heating and wet central heating appliances	T/502/8459	16
313	Install, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in domestic and small commercial premises	T/502/8381	19
314	Install domestic gas space heating appliances	D/502/8374	15
315	Maintain domestic gas space heating appliances	R/502/8372	15
316	Install domestic gas warm air central heating appliances	F/502/8299	12
317	Maintain gas warm air central heating systems and appliances	T/502/8302	11
318	Install gas meters and regulators (2.5 to 1076m ³ /hr)	L/502/8371	25
319	Dealing with reported upstream gas emergencies	Y/502/8373	32
320	Dealing with reported downstream gas emergencies	T/502/8378	32
321	Strength testing, gas tightness testing and direct purging – IGE/UP/1A	M/502/8380	12
322	Water compulsory core unit	J/502/8465	13
323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques	K/502/8930	9
324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques	K/502/9155	9
325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques	M/502/9156	12

City & Guilds unit	Title	QCF unit ref (UAN)	Credits
326	Install, commission, service and maintain domestic heating systems	A/502/8933	3
327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components	T/502/9157	12
328	Water Supply 'Water Fittings' Regulations and Water Byelaws in the UK	T/504/1602	3
329/330	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations	D/504/1545	1

Unit 201

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

Level: 2
Credit value: 3
URN: D/503/8628

Unit aim

The aim of the unit is to assess the competence of individuals to recognised national occupational standards. The Unit supports workforce development and describes the competencies necessary to tightness test, purge, commission and decommission gas pipework.

The scope of work of this unit covers the work activities of planning, de-commissioning, commissioning and gas tightness testing and direct purging of small 2nd family gas (natural gas) installations downstream of an emergency control valve (ECV). The unit is based on the Institution of Gas Engineers and Managers, normative standard IGE/UP/1B

The gas installation to be tested and purged;

- must have a maximum operating pressure (MOP) at the outlet of the ECV not exceeding 2 bar
- an operating pressure (OP) at the outlet of the primary meter of 21 mbar (nominal)
- a nominal bore of pipework not greater than 35mm
- a maximum rated capacity through the primary meter of 16m³/h (U16), and
- a maximum installation volume (IV) supplying an individual dwelling or non domestic premises of 0.035 cubic metre.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

- 1 Be able to plan and prepare work activities for tightness testing and direct purging
- 2 Be able to de-commission gas systems and components to industry standards
- 3 Be able to tightness test and direct purging gas systems and components
- 4 Be able to use and communicate data and information to carry out de-commissioning, tightness testing and direct purging
- 5 Be able to resolve problems which could affect de-commissioning, tightness testing and direct purging
- 6 Understand how to tightness test, purge, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in small natural gas installations

Guided learning hours

It is recommended that **16** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety NOS DSG 3.6 Gas Tightness Testing and Direct Purging.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit is assessed by:

- A portfolio of evidence

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 1	Be able to plan and prepare work activities for tightness testing and direct purging

Assessment Criteria

The learner can:

- 1.1 carry out a risk assessment which incorporates:
 - safety provisions in the work site
 - access to the work site
 - movement of the workforce
 - members of the public
 - the movement and safe storage of materials, tools and equipment
- 1.2 survey the work site for:
 - any damage or defects to existing building features
 - record details of any features that may affect the work
- 1.3 advise the property occupier of any defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the:
 - tightness testing process
 - direct purging process
- 1.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 confirm the:
 - siting of the gas supply
 - provision of ventilation
 meets the requirements for tightness testing and direct purging
- 1.7 check and confirm all:
 - materials
 - tools
 - test equipment
 necessary for the tightness testing and direct purging process are available as required and are fit for purpose
- 1.8 check and confirm that the:
 - gas supply
 - earthing supply
 - provision of ventilation
 meet the industry standards' requirements for the installation
- 1.9 carry out all necessary checks and tests to confirm the gas supply meets the industry requirements for the installation
- 1.10 check existing installation for unsafe appliances and system components and apply the gas industry unsafe situations procedures as necessary.

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 2	Be able to de-commission gas systems and components to industry standards

Assessment Criteria

The learner can:

- 2.1 check and confirm that conditions within the gas system will permit safe de-commissioning
- 2.2 select and use the correct:
 - tools
 - equipment
 for de-commissioning activities
- 2.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - gas systems
 - components
 do not present a safety hazard
- 2.5 permanently remove and disconnect:
 - appliances
 - gas system components
 as necessary.

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 3	Be able to tightness test and direct purging of gas systems and components

Assessment Criteria

The learner can:

- 3.1 confirm the complete pipework installation complies with the:
 - manufacturers' specification
 - industry standards
- 3.2 carry out preparatory work for tightness testing and direct purging to meet industry standards
- 3.3 check that conditions within the gas system will permit safe tightness testing and direct purging
- 3.4 select and use the correct tools and equipment for tightness testing and direct purging activities
- 3.5 measure, calculate and record gas system installation volumes for tightness testing and direct purging activities
- 3.6 ensure ventilation for tightness testing and direct purging activities meets industry standards' requirements
- 3.7 remove existing gas components as necessary
- 3.8 carry out the tightness testing and direct purging process, minimising damage to:
 - customer property
 - building features
- 3.9 use tightness testing procedures to confirm the integrity of the newly installed:
 - gas system
 - new and or existing appliances
- 3.10 use tightness testing procedures to confirm the integrity of the existing:
 - gas system
 - new and existing appliances

to ensure the installation doesn't exceed the maximum permissible pressure drop
- 3.11 use tightness testing procedures to confirm the integrity of the gas system where the:
 - maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2 bar
 - no meter inlet valve is fitted
- 3.12 where the installation fails the tightness test, either:
 - trace and repair the escape and retest installation
 - isolate unsafe gas appliances
 - gas system
 - components

and apply the gas industry unsafe situations procedure
- 3.13 use purging procedures to confirm the safe supply of gas to the installed:

- gas system
 - appliances
- 3.14 instruct the property occupier on the correct operation of the gas:
- system
 - valves
 - components
- 3.15 take precautionary actions to prevent the unauthorised use of uncommissioned gas:
- appliances
 - systems
 - components
- by isolation procedures and use of warning notices.

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 4	Be able to use and communicate data and information to carry out de-commissioning, tightness testing and direct purging

Assessment Criteria

The learner can:

- 4.1 liaise with the property occupier and other people who will be affected by the work during the tightness testing and direct purging processes to minimise disturbance to the job
- 4.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructions
 to ensure the work is carried out to the specification
- 4.3 advise of any delays to the work to any persons who are affected by the delay
- 4.4 report any delays in the work schedules to the job supervisor
- 4.5 advise the designated person in the property of any unsafe situations and actions required to remedy those situations
- 4.6 check that the customer is satisfied with the finished job
- 4.7 complete records and documentation confirming the safe tightness testing and direct purging of gas systems and components
- 4.8 complete gas system de-commissioning records.

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 5	Be able to resolve problems which could affect de-commissioning, tightness testing and direct purging

Assessment Criteria

The learner can:

- 5.1 rectify and report deficiencies in gas and earthing input services
- 5.2 resolve problems in accordance with approved procedures where pre- tightness testing and direct purging checks and tests reveal gas system or component defects
- 5.3 resolve problems in accordance with approved procedures when gas systems and components being tightness tested and purged do not meet design requirements
- 5.4 resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance.

Unit 201	Tightness test, purge, commission and de-commission gas pipework up to 35mm (1¼) diameter in small natural gas installations
Outcome 6	Understand how to tightness test, purge, commission and de-commission gas pipework up to 35mm (1 ¼) diameter in small natural gas installations

Assessment Criteria

The learner can:

- 6.1 Describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic tightness testing and direct purging process
- 6.2 Explain safe access and working at heights
- 6.3 Specify the tools and equipment necessary to provide safe access to work at heights, or in
confined spaces
- 6.4 State the methods of working which protect the building décor, customer property and
existing systems and components
- 6.5 Explain the tools, equipment, materials and components required for de-commissioning,
tightness testing and direct purging processes – ordering, supplying, advising, checking and
delivery procedures
- 6.6 State the care and maintenance requirements of tools and equipment, and checks for safe
condition
- 6.7 Explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 6.8 Describe the potential hazards that could arise from all de-commissioning, tightness testing
and direct purging activities and the checks to be carried out before work takes place
- 6.9 Explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, tightness testing and direct purging activity
- 6.10 Demonstrate how and where to access the required information, i.e. normative documents,
industry standards guidance documents, British Standards and manufacturers' instructions
applicable to the gas system and appliance, to ensure the work is done to industry standards
- 6.11 Demonstrate how to read and interpret the information contained in normative documents,

- industry standards guidance documents, British Standards and manufacturers' instructions
- 6.12 State safe isolation methods, tests, and procedures to de-commission gas systems or components
 - 6.13 Explain the procedures for temporary and permanent de-commissioning of gas systems
 - including use of temporary continuity bonds
 - 6.14 Explain the precautions to ensure that de-commissioned gas systems do not prove a safety hazard
 - 6.15 Describe measures to prevent de-commissioned gas systems being brought into operation
 - utilising safety and warning notices
 - 6.16 Describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
 - 6.17 Summarise the points in the de-commissioning, tightness testing and direct purging process
 - where co-operation and liaison with other trades and property occupier may be required
 - 6.18 State the industry practices and work standards for fabricating and installing gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation & Use) Regulations, British Standards and Building Regulations
 - 6.19 Identify the types of pipe materials suitable for carrying gas - steel, malleable iron, copper, trapeze, polyethylene & lead, etc.
 - 6.20 Identify the types of pipe fittings suitable for carrying gas – capillary, compression, push-fit, union joints & screwed joints
 - 6.21 State the industry practices and work standards for jointing materials and fittings suitable for carrying gas, including connecting to lead composition pipes
 - 6.22 State the positioning and fixing requirements for gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation & Use) Regulations, British Standards and Building Regulations
 - 6.23 State the procedures and work methods for connecting to input services including; gas, earthing systems and ventilation
 - 6.24 State the procedures and work methods of connecting pipework, valves and components to both new and existing gas systems and appliances
 - 6.25 Demonstrate how to confirm that the gas supply and ventilation are adequate for de-commissioning, tightness testing and direct purging of the gas system, appliance(s) and components – IGE/UP/1B
 - 6.26 Describe how to measure, calculate and record gas system installation volumes for tightness testing and direct purging activities – IGE/UP/1B

- 6.27 State the test equipment and legislative requirements for applying tightness testing to gas systems, appliances and components – IGE/UP/1B
- 6.28 Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of newly installed gas system and, where applicable, new and existing appliances
- 6.29 Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of the existing installed gas system and, where applicable, new and existing appliances to ensure the installation doesn't exceed the maximum permissible pressure drop
- 6.30 Explain recognition of medium pressure regulator sets – IGE/UP/1B where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2bar and, whether a meter inlet valve (MIV) is fitted
- 6.31 Explain tightness testing procedures – IGE/UP/1B to confirm the integrity of gas systems where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2bar and, where a meter inlet valve (MIV) is fitted or, no meter inlet valve is fitted
- 6.32 State the industry practices and procedures for tracing and repairing gas escapes
- 6.33 Explain the process and procedures, equipment and legislative requirements for applying direct purging of gas systems, appliances and components – IGE/UP/1B
- 6.34 State the routines and sequences for direct purging of gas systems, appliances and components – IGE/UP/1B
- 6.35 State the routines and sequences for commissioning gas systems, valves and components to industry standards
- 6.36 Describe measures to prevent uncommissioned gas systems being brought into operation utilising safety and warning notices
- 6.37 Explain how to complete all tightness testing and direct purging documentation and records to be left with the property occupier – IGE/UP/1B i.e., Gas testing & purging – domestic (NG) certificate, benchmarks, landlord/home owner gas safety record, etc.
- 6.38 Describe the system handover procedures and demonstrating the operation of gas systems and components to end users
- 6.39 Explain the steps to take when problems arise in the work activities
- 6.40 Describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 6.41 Describe how to safely collect and dispose of system contents that may be hazardous to health or the environments e.g., waste products such as asbestos, insulation, etc.

- 6.42 Demonstrate how and where to access the required information, i.e. Industry regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.
- 6.43 Explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure

Unit 202

Install gas meters and regulators 2.5 to 16.0m³/hr

Level: 2
Credit value: 12
URN: A/502/8303

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission domestic gas meters and regulators.

The scope of work covered by this Unit is the installation, commission and decommission gas meters and regulators from 2.5 to 16.0m³/hr

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing and exchanging gas meters and regulators on gas systems
2. Be able to plan and prepare work activities for installing and exchanging gas meters and regulators on low pressure and medium pressure
3. Be able to de-commission domestic gas meters and regulators on low pressure and medium pressure
4. Be able to install, exchange, and remove gas meters and regulators on low pressure and medium pressure
5. Be able to pre-commission and Commission gas meters and regulators on low pressure and medium pressure
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install, commission and decommission gas meters and regulators on low pressure and medium pressure gas systems

Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.12 Install Gas Meters and Regulators (2.5 to 16 cu m/hr)

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit is assessed by:

- A portfolio of evidence

Unit 202

Install gas meters and regulators 2.5 to 16.0m³/hr

Outcome 1

Be able to design gas systems for installing and exchanging gas meters and regulators on gas systems

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams or any key structural features that could affect the installation
 - record any details of features that may affect the installation
- 1.4 check that the proposed position of the gas meter and regulator meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
- 1.5 check that the proposed position of the gas meter housing for both low and medium pressure meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
- 1.9 check the availability of input services:
 - gas supply
 - electricity earthing
 - ventilation provisionsmeets the manufacturers' and industry standards requirements.
- 1.7 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.8 prepare a range of design options to meet both customer and industry requirements
- 1.9 present design options to the customer using a variety of media:
 - written
 - oral
 - drawings
- 1.10 consult with the customer to obtain agreement to the design option that best meets all the requirements.

Unit 202	Install gas meters and regulators 2.5 to 16.0m ³ /hr
Outcome 2	Be able to plan and prepare work activities for installing and exchanging gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 2.1 carry out a risk assessment and method statement that incorporates:
 - safety provisions
 - access to the work site
 - movement of people on site
 - movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for:
 - any pre-installation damage
 - defects to existing building features
 - recording details
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and installation process
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment needed for the de-commissioning, installation and commissioning process are available as required and are fit for purpose
- 2.7 check and confirm whether the gas meter and regulator Installation is:
 - a primary meter
 - a secondary meter
- 2.8 check and confirm that the gas supply is:
 - low pressure
 - medium pressure
- 2.9 check and confirm that the position of the gas meter and regulator meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
- 2.10 check and confirm that the position of the meter housing meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
 for both low and medium pressure installations

- 2.11 check and confirm that the position of the meter housing and proximity distances of meter boxes and vent-discharges can be achieved and meets the manufacturers' and industry standards requirements for medium pressure installations
- 2.12 check and confirm the siting of the emergency control valve (ECV) and meter inlet valve (MIV) is:
- accessible
 - correctly labelled
 - correct operation
- 2.13 check and confirm the siting of the existing supply and it's proximity to other services that may affect the installation
- 2.14 check and confirm that the:
- gas supply
 - ventilation provision
- meets the gas meter and regulator manufacturers' and industry standards requirements for the installation
- 2.15 carry out all necessary checks and tests to confirm the:
- gas supply
 - earthing system
- meets the manufacturers' and industry standards requirements for the installation
- 2.16 check existing installation for unsafe:
- appliances
 - system components
- and apply the gas industry unsafe situation procedures to any that are identified.

Unit 202

Install gas meters and regulators 2.5 to 16.0m³/hr

Outcome 3

Be able to de-commission domestic gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas systems
 - earthing systemsare in a condition that enables safe de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe isolation methods, tests, and procedures to de-commission:
 - gas meters
 - regulators
 - earthing systems
 - gas systems and components
- 3.4 carry out precautionary actions to ensure that temporarily de-commissioned:
 - gas meters
 - regulators
 - earthing systems
 - gas systems and componentsdo not present a safety hazard
- 3.5 permanently remove and disconnect:
 - gas meters
 - regulators
 - gas systems and componentsas required
- 3.6 after permanent removal of a meter, mark any live gas pipes with a notice to indicate the pipe contains gas.

Unit 202

Install gas meters and regulators 2.5 to 16.0m³/hr

Outcome 4

Be able to install, exchange, and remove gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the installation requirements
- 4.2 install the gas meter and regulator minimising damage to customer property and building features
- 4.3 use the correct tools and equipment for the installation
- 4.4 remove any existing gas and earthing system components required for the installation
- 4.5 visually check the new gas meter and regulator for any:
 - damage to the meter
 - defects on seals
 - blocked gas ways
- 4.6 fabricate and assemble the gas meter and regulator system required for the installation
- 4.7 position the gas meter and regulator and confirm they meet the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 4.8 provide the required ventilation for new or replacement gas meter and regulator installations and systems
- 4.9 ensure existing gas systems are clean and free of debris
- 4.10 connect the gas and earthing system components to the gas meter and regulator installation
- 4.11 use tightness testing and purging procedures to confirm the integrity of the installed gas meter and regulator, gas appliances, gas system
- 4.12 take action to prevent the unauthorised use of uncommissioned gas meter and regulator and gas system and components by isolation procedures and use of warning notices
- 4.13 complete and attach an emergency notice on or near the meter or at the ECV if remote from the primary meter
- 4.14 complete the meter labelling.

Unit 202

Install gas meters and regulators 2.5 to 16.0m³/hr

Outcome 5

Be able to pre-commission and commission gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 5.1 confirm that the complete gas meter and regulator installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 select and use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards, if incorrect contact the gas supplier
- 5.5 ensure that adjustments and resealing of meter regulators are performed by OFGEM approved meter Installers
- 5.6 reconfirm that the ventilation requirements meet industry standards
- 5.7 confirm the operation of the gas meter, regulator and components to ensure they function safely and operate in accordance with manufacturers' instructions, industry standards and British Standards
- 5.8 confirm the earthing system and components function safely and operate in accordance with industry standards
- 5.9 instruct the property occupier on the correct operation of the gas meter and regulator installation and provide them with their copy of the any literature.

Unit 202	Install gas meters and regulators 2.5 to 16.0m ³ /hr
Outcome 6	Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during:
 - planning,
 - de-commissioning
 - installation
 - commissioning
 to minimise disturbance to the job
- 6.2 use:
 - normative documents,
 - industry standards,
 - British Standards
 - information from manufacturers' instructions for the gas meter, regulator and components
 to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 advise the designated person of any unsafe situations and actions required to remedy those situations
- 6.6 check that the customer is satisfied with the finished job
- 6.7 complete documentation to confirm the safe commissioning of the gas meter, regulator and components
- 6.8 complete gas meter and system de-commissioning records.

Unit 202	Install gas meters and regulators 2.5 to 16.0m ³ /hr
Outcome 7	Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 rectify and report deficiencies in gas and earthing input services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal gas meter, regulator, gas systems and component defects
- 7.3 resolve problems in accordance with approved procedures when gas meter, regulator, gas systems and component being commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the gas meter, regulator, gas systems and component defects cannot be restored to full performance.

Unit 202	Install gas meters and regulators 2.5 to 16.0m ³ /hr
Outcome 8	Know how to install, commission and decommission gas meters and regulators on low pressure and medium pressure gas systems

Assessment Criteria

The learner can:

- 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 safe access and working at heights procedures
- 8.3 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.4 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.6 state the tools, equipment, materials and components required for the gas meter and regulator system installation, commission and de-commission, – ordering, supplying, advising, checking and delivery procedures
- 8.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.8 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 8.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 8.12 explain how to measure and record installation and site details for prefabrication purposes
- 8.13 explain how to confirm that the gas supply, earthing supply and ventilation requirements are adequate for the installation of the new gas meter, regulator and components for both low and medium pressure
- 8.14 explain how to confirm that the gas supply, earthing supply and ventilation requirements are adequate for extending the system or adding components to both low and medium pressure
- 8.15 state safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas meters, regulators, gas systems and components, including the use of temporary continuity bonds
- 8.16 describe checks and tests to confirm suitability of the gas supply

- 8.17 explain the precautions to ensure that de-commissioned gas meters, regulators, gas systems and components do not prove a safety hazard
- 8.18 describe measures required to prevent de-commissioned gas meters, regulators, gas systems and components being brought into operation, utilising safety and warning notices
- 8.19 describe how to liaise with others whose procedures or routines may be affected by the suspension of the gas meters, regulators, gas systems and components operation
- 8.20 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 8.21 identify gas meter installations that incorporate non-return valves and the manufacturers' and industry standards' installation
- 8.22 explain the industry practices and work standards for fabricating and installing emergency control valves (ECV's) and meter inlet valves (MIV's)
- 8.23 state the industry practices and work standards for fabricating and installing domestic gas meters, regulators as a primary or secondary meter installation
- 8.24 outline the procedures and work methods for connecting to input services including; gas, earthing systems and ventilation systems
- 8.25 state the industry practices and work standards for fabricating and installing domestic gas meters, regulators and components on both low and medium pressure installations to comply with manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulation
- 8.26 describe the positioning and fixing requirements for domestic gas meters, regulators and components on both low and medium pressure installations to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 8.27 state the industry practices and work standards for fabricating and installing domestic gas meters, regulators and components in meter housings, including both low and medium pressure installations
- 8.28 state the industry practices and work standards for the provision of ventilation when installing domestic gas meters and regulators
- 8.29 describe the process and procedures, equipment and legislative requirements for applying tightness testing and purging of domestic gas meters, regulators, gas systems and components on both low and medium pressures
- 8.30 explain the routines and sequences for commissioning domestic gas meters, regulators and components in accordance with manufacturers' specification and industry standards
- 8.31 describe the process and procedures, equipment and legislative requirements for applying tightness testing and purging of domestic gas meters, regulators, gas systems and components on both low and medium pressures
- 8.32 state the procedures for checking the correct operation and performance of domestic gas meters, regulators and components and checking against the design specification and British Standards for low and medium pressure installations
- 8.33 state the procedures for checking the operation of domestic gas meters, regulators and components to ensure they function safely and operate in accordance with manufacturers' instructions and industry standards
- 8.34 describe the procedures for checking and confirming the gas system operating pressure is correct and actions to take if incorrect
- 8.35 state the procedures for making adjustments to meter regulators
- 8.36 describe how to complete all domestic gas meter installation and commissioning documentation, labels and records to be left with the property occupier e.g.

- benchmark, landlord/home owner gas safety record, recording meter details for gas supplier on job documentation and meter label, emergency notices, ECV labels, medium pressure labels, etc
- 8.37 describe system handover procedures and demonstrate the operation of domestic gas meters, regulators and components to end users
 - 8.38 summarise the steps to take when problems arise in the work activities
 - 8.39 describe job management structures and methods of reporting and recording job progress or problems delaying progress
 - 8.40 describe how to safely collect and dispose of system contents that may be hazardous to health or the environments i.e. waste products including asbestos and insulation materials
 - 8.41 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations
 - 8.42 explain how to isolate unsafe gas appliances, gas systems and components and apply the gas industry unsafe situations procedure.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Level: 2
Credit value: 8
URN: H/602/2697

Unit aim

This combination unit provides learning in the installation, maintenance, decommissioning and soundness testing of a basic range of cold water system/component types in dwellings and industrial/commercial properties (of similar size and scope to domestic dwellings).

The unit covers systems in buildings up to 3 storeys in height with pipework up to 28mm diameter. The scope of the system is from the boundary stop valve into the property feeding the water outlets.

Learning outcomes

There are **twelve** learning outcomes to this unit. The learner will:

1. Know the cold water supply route to dwellings
2. Know the types of cold water system and their layout requirements
3. Know the site preparation techniques for cold water systems and components
4. Be able to apply site preparation techniques for cold water systems and components
5. Know the installation requirements of cold water systems and components
6. Be able to install cold water systems and components
7. Know the service and maintenance requirements of cold water systems and components
8. Be able to service and maintain cold water systems and components
9. Know the decommissioning requirements of cold water systems and components
10. Be able to decommission cold water systems and components
11. Know the inspection and soundness testing requirements of cold water systems and components
12. Be able to inspect and soundness test cold water systems and components

Guided learning hours

It is recommended that **62** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M7, M10, M12, M13, M25.

Assessment

This unit is assessed by:

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 1	Know the cold water supply route to dwellings

Assessment Criteria

The learner can:

- 1.1 state the key stages in the rainwater cycle
- 1.2 identify the various water supply sources and the typical properties of water from those sources:
 - surface sources – lakes, reservoirs, rivers and streams
 - underground sources – deep and shallow wells, artesian wells, bore-holes, springs
- 1.3 state the two main types of water supply to dwellings:
 - supply from a water undertaker's main
 - supply from a private source
- 1.4 identify the mains water treatment process and typical mains water distribution system from treatment works to property
- 1.5 identify the uses of cold water supplied to dwellings:
 - wholesome water for domestic purposes - drinking, washing, food production
 - recycled water – WC flushing, water for outdoor use, clothes washing.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 2 Know the types of cold water system and their layout requirements

Assessment Criteria

The learner can:

- 2.1 state the cold water system pipework features between the water undertaker's main and the main internal stop valve in dwellings:
 - connection methods to the main
 - communication pipe
 - service pipe
 - main external stop valve and meter housing including surface mounted meter boxes (groundbreaker)
 - depth of external service pipework below ground level
 - correct methods of entry of the service pipework to a property
- 2.2 identify the type of cold water system from layout diagrams
- 2.3 state the factors which affect the selection of cold water systems for dwellings:
 - direct cold water system:
 - o supplying a storage cistern
 - o supplying a combination boiler
 - indirect cold water system
- 2.4 state the typical pipe sizes used in cold water systems in dwellings:
 - supply pipe
 - distributing pipe
 - service pipe
- 2.5 state the factors that can lead to backflow from cold water outlets and equipment in dwellings
- 2.6 identify the standard backflow prevention devices that are used in cold water systems in dwellings supplying water to appliances:
 - baths
 - WCs
 - over the rim bidets
 - wash hand basins
 - sinks
 - mixer taps
 - outside taps
 - shower mixer valves/ instantaneous showers
 - refrigerators, washing machines and dishwashers
- 2.7 identify the working principles of cold water system components:
 - stop valves
 - servicing valves

- drain valves
 - float operated valves
 - terminal fittings
 - pillar taps
 - bib taps
 - mixer taps
 - ceramic disc taps
 - shower mixer valves
 - gravity
 - mains fed
 - water softeners
 - water filters
 - water conditioners
 - water meters
 - backflow prevention devices
 - simple air gap arrangements
 - double and single check valves
 - cold water storage cisterns
 - combined feed and expansion cisterns
 - WC/urinal flushing cisterns
- 2.8 state the system layout features for protected plastic storage cisterns:
- typical cistern sizes for small dwellings
 - warning pipe (overflow) arrangements
 - inlet/outlet position
 - position of float operated valve
 - position of cistern vent
 - position of open vent pipe connection
 - requirement for a rigid close fitting lid
 - service valve requirements
 - cistern base support requirements
- 2.9 state the methods of linking cold water storage cisterns for use in dwellings.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 3	Know the site preparation techniques for cold water systems and components

Assessment Criteria

The learner can:

- 3.1 identify the sources of information required when undertaking work on cold water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
- 3.2 identify the preparatory work required to be undertaken to the building fabric in order to install, decommission or maintain cold water systems and components
- 3.3 identify the protection measures required to the building fabric or customer property, during and on completion of work on cold water systems and components
- 3.4 identify the pipework materials and fittings required to complete work on cold water systems:
 - external water service pipework
 - internal water supply pipework
- 3.5 state the range of hand and power tools required to complete work on cold water systems and components.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 4	Be able to apply site preparation techniques for cold water systems and components

Assessment Criteria

The learner can:

- 4.1 check the safety of the work location in order for the work to safely proceed:
 - safe access and exit
 - immediate work location e.g. tripping hazards
 - appropriate risk assessments/ method statements are available
- 4.2 wear Personal Protective Equipment appropriate to the installation, decommissioning or maintenance task being carried out
- 4.3 apply protection measures to the building fabric or customer property, during and on completion of work on cold water systems and components
- 4.4 select the pipework materials and fittings required to complete work on cold water systems ensuring that they are not damaged
- 4.5 select the hand and power tools required to complete work on cold water systems and components
- 4.6 carry out preparatory work in order to install cold water systems and components.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 5	Know the installation requirements of cold water systems and components

Assessment Criteria

The learner can:

- 5.1 state how to take readings of the incoming water supply pressure and flow rate
- 5.2 identify suitable methods of connecting cold water system supply pipework to incoming service pipework:
 - medium density polyethylene (MDPE)
 - copper
 - lead
- 5.3 state the positioning requirements of components in cold water systems:
 - supply stop valves
 - drain valves
 - water meters
 - water conditioning devices
 - service valves
 - backflow prevention devices
- 5.4 identify how to measure, mark out and drill plastic storage cisterns to receive pipework connections
- 5.5 identify how to make pipework connections to storage cisterns
- 5.6 state the positioning and fixing requirements for cold water system pipework and components:
 - in suspended timber floors
 - in solid floors
 - embedded in walls
 - in areas of the building subject to frost
 - that may be exposed to warming
- 5.7 state how to select clips and brackets appropriate to the cold water system pipework and the industry recommended spacings:
 - horizontally mounted pipework
 - vertically mounted pipework
- 5.8 identify how to position, fix and connect new cold water pipework to outlets:
 - bath tap or shower mixer valve
 - wash hand basin tap
 - sink tap
 - combination boiler
 - WC flushing cistern
 - cold water storage cistern
- 5.9 identify suitable methods of making new pipework connections into existing cold water system pipework:

- copper
 - plastic
 - lead
 - galvanised steel
- 5.10 identify the insulation requirements of cold water system components:
- pipework sections
 - storage cisterns.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 6 Be able to install cold water systems and components

Assessment Criteria

The learner can:

- 6.1 use test instruments to take readings of the incoming water supply pressure and flow rate
- 6.2 connect cold water supply pipework to incoming service pipework:
 - MDPE to copper coupler
 - supply stop and drain valve
- 6.3 joint cold water pipework components in copper with capillary soldered and compression fittings
- 6.4 measure, mark out and drill plastic storage cisterns to receive pipework connections
- 6.5 make pipework connections to storage cisterns
- 6.6 make pipework fixings to copper pipework
- 6.7 position, fix and connect new cold water pipework to outlets:
 - bath tap or shower mixer valve
 - wash hand basin tap
 - sink tap
 - combination boiler
 - WC flushing cistern
 - cold water storage cistern
- 6.8 apply insulation to cold water system components:
 - pipework sections
 - storage cisterns
- 6.9 demonstrate that cold water systems or components cannot be brought into operation by the end user before the work has been fully completed.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 7 Know the service and maintenance requirements of cold water systems and components

Assessment Criteria

The learner can:

- 7.1 identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of cold water system components
- 7.2 identify how to carry out routine checks on cold water system components as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage and adequate support
 - effective operation of terminal fittings
 - effective operation of float operated valves
 - effective operation of stop and service valves
 - condition of protected cold water storage cistern
- 7.3 state the procedures for dealing with defects in cold water components and pipework:
 - cistern failure
 - incorrect support to cold water system pipework and storage cisterns
 - excessive noise in pipework systems
 - leakage of internal cold water system pipework and fittings
 - leakage from below ground cold water service pipework
 - leakage or ineffective operation of:
 - o terminal fittings
 - o float operated valves
 - o stop and service valves
- 7.4 identify the types of information to be provided on a maintenance record for cold water systems.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 8 Be able to service and maintain cold water systems and components

Assessment Criteria

The learner can:

- 8.1 use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of cold water system components
- 8.2 carry out routine checks on cold water system components as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage and adequate support
 - effective operation of terminal fittings
 - effective operation of float operated valves
 - effective operation of stop and service valves
 - condition of protected cold water storage cistern
- 8.3 carry out repairs to defects in cold water system components:
 - leakage of cold water system pipework and fittings – repair to water-filled pipework
 - leakage or ineffective operation of:
 - o terminal fittings
 - o float operated valves
 - o stop and service valves
- 8.4 complete the required details contained in a simple maintenance record for a cold water system.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 9 Know the decommissioning requirements of cold water systems and components

Assessment Criteria

The learner can:

- 9.1 identify the working methods that reduce the time periods during which cold water systems need to be isolated
- 9.2 state the information that needs to be provided to other persons before decommissioning work takes place
- 9.3 state how to temporarily decommission cold water system components and connecting pipework systems
- 9.4 identify the work sequences for permanently decommissioning cold water system components
- 9.5 identify the methods used during the decommissioning process to prevent the end-user from operating cold water system components:
 - isolation of stop/ servicing valves
 - temporary capping of pipework sections
 - use of warning notices and signs.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 10	Be able to decommission cold water systems and components

Assessment Criteria

The learner can:

- 10.1 advise appropriate persons before cold water system components or pipework are isolated in order to undertake work
- 10.2 carry out temporary decommissioning of cold water system components and connecting pipework systems
- 10.3 check to ensure that the decommissioning procedures carried out prevent the end-user from operating cold water system components.

Unit 203/003 Understand and apply domestic cold water system installation and maintenance techniques

Outcome 11 Know the inspection and soundness testing requirements of cold water systems and components

Assessment Criteria

The learner can:

- 11.1 state the checks to be carried out during a visual inspection of a cold water system to confirm that it is ready to be filled with water
- 11.2 state how to fill cold water pipework with water at normal operating pressure and check for leakage
- 11.3 identify how to carry out a soundness test to industry requirements on cold water systems pipework and components
- 11.4 state the flushing procedure for cold water systems and components
- 11.5 identify the actions that must be taken when inspection and testing reveals defects in cold water systems:
 - dealing with systems that do not meet correct installation requirements
 - remedial work associated with defective pipework bracketing
 - remedial work associated with leakage from pipework systems.

Unit 203/003	Understand and apply domestic cold water system installation and maintenance techniques
Outcome 12	Be able to inspect and soundness test cold water systems and components

Assessment Criteria

The learner can:

- 12.1 carry out a visual inspection of a cold water system to confirm that it is ready to be filled with water
- 12.2 fill cold water pipework with water at normal operating pressure and check for leakage
- 12.3 perform a soundness test to industry requirements on cold water systems pipework and components
- 12.4 flush the system with wholesome water on completion of soundness testing.

Unit 204/004 Understand and apply domestic hot water system installation and maintenance techniques

Level: 2
Credit value: 8
URN: F/602/2884

Unit aim

This combination unit provides learning in the installation, maintenance, decommissioning and soundness testing of a basic range of hot water system/component types in dwellings and industrial/commercial properties (of similar size and scope to domestic dwellings).

The unit covers systems in building up to 3 storeys in height with pipework up to 28mm diameter.

Learning outcomes

There are **eleven** learning outcomes to this unit. The learner will:

1. Know the types of hot water system and their layout requirements
2. Know the site preparation techniques for hot water systems and components
3. Be able to apply site preparation techniques for hot water systems and components
4. Know the installation requirements of hot water systems and components
5. Be able to install hot water systems and components
6. Know the service and maintenance requirements of hot water systems and components
7. Be able to service and maintain hot water systems and components
8. Know the decommissioning requirements of hot water systems and components
9. Be able to decommission hot water systems and components
10. Know the inspection and soundness testing requirements of hot water systems and components
11. Be able to inspect and soundness test hot water systems and components

Guided learning hours

It is recommended that **62** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M7, M10, M12, M13, M25.

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit is assessed by:

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 1	Know the types of hot water system and their layout requirements

Assessment Criteria

The learner can:

- 1.1 identify the type of hot water system from layout diagrams:
 - direct system:
 - conventional boiler (small hot water only boiler)
 - immersion heater including low energy tariff types
 - indirect system:
 - fed by combined hot water and heating boiler
 - single point of use vented heaters
 - instantaneous hot water heaters:
 - multipoint heaters
 - combination boilers
- 1.2 state the factors that need to be considered when the type of hot water system is selected for use in a building:
 - quantity and usage of hot water required
 - distance of outlet from hot water source
 - need for a secondary recirculation system
- 1.3 identify the working principles of hot water system components:
 - stop valves
 - fullway gate valves
 - servicing valves
 - drain valves
 - float operated valves
 - terminal fittings:
 - bib taps
 - pillar taps
 - mixer taps
 - ceramic disc taps
 - showers:
 - gravity mixer
 - mains fed mixer
 - electric instantaneous
 - thermostatic mixing valves
 - backflow prevention devices:
 - simple air gaps
 - single check valves
 - feed and expansion cisterns

- cold water feed cisterns
 - directly heated storage cylinders
 - indirectly heated storage cylinders:
 - single feed
 - double feed
 - combination
 - instantaneous water heaters:
 - mains fed multipoint heaters
 - mains fed combination boilers
 - single point of use vented heaters
- 1.4 state the typical pipe sizes used in centralised open vented hot water systems in dwellings:
- primary circuit
 - secondary circuit
- 1.5 state the system layout features for the open vent and cold feed pipes of primary and secondary open vented hot water circuits
- 1.6 state the connection requirements for feed and expansion cisterns into open vented primary hot water circuits
- 1.7 state the system layout features for plastic feed and expansion cisterns:
- typical cistern sizes for small dwellings
 - warning pipe (overflow) arrangements
 - inlet/outlet position
 - position of float operated valve
 - position of cistern vent
 - service valve requirements
 - cistern base support requirements
- 1.8 identify the types and typical sizes of open vented storage cylinder used in hot water systems in dwellings:
- direct
 - single feed indirect
 - double feed indirect
 - double feed indirect super duty recovery
 - combination
- 1.9 state the system layout features for hot water heaters:
- mains fed Instantaneous multipoint water heaters including combination boilers
 - localised (point of use) open vented hot water heaters
- 1.10 state the typical pipe sizes used with mains fed instantaneous hot water heaters and open vented point of use water heaters in dwellings
- 1.11 identify the need for temperature control of hot water systems:
- thermostats
 - overheat thermostats
 - temperature relief valves
- 1.12 state the factors that can lead to backflow from hot water outlets and equipment in dwellings
- 1.13 identify the standard backflow prevention devices that are used in hot water systems in dwellings supplying water to appliances:
- baths
 - over the rim bidets

- wash hand basins
 - sinks
 - mixer taps
 - showers
- 1.14 state the system layout features for the installation of hot water components:
- gravity fed showers
 - mains fed showers
 - instantaneous electric showers
 - thermostatic mixing valves.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 2	Know the site preparation techniques for hot water systems and components

Assessment Criteria

The learner can:

- 2.1 identify the sources of information required when undertaking work on hot water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
- 2.2 identify the preparatory work required to be undertaken to the building fabric in order to install, decommission or maintain hot water systems and components
- 2.3 identify the protection measures required to the building fabric or customer property, during and on completion of work on hot water systems and components
- 2.4 identify the pipework materials and fittings required to complete work on hot water systems
- 2.5 state the range of hand and power tools required to complete work on hot water systems and components.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 3	Be able to apply site preparation techniques for hot water systems and components

Assessment Criteria

The learner can:

- 3.1 check the safety of the work location in order for the work to safely proceed:
 - safe access and exit
 - immediate work location e.g. tripping hazards
 - appropriate risk assessments/ method statements are available
- 3.2 wear Personal Protective Equipment appropriate to the installation, decommissioning or maintenance task being carried out
- 3.3 apply protection measures to the building fabric or customer property, during and on completion of work on hot water systems and components
- 3.4 select the pipework materials and fittings required to complete work on hot water systems ensuring that they are not damaged
- 3.5 select the hand and power tools required to complete work on hot water systems and components
- 3.6 carry out preparatory work in order to install hot water systems and components.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 4	Know the installation requirements of hot water systems and components

Assessment Criteria

The learner can:

- 4.1 state how to take readings of hot water supply pressure and flow rate
- 4.2 state the positioning and fixing requirements of hot water pipework and components:
 - in suspended timber floors
 - in solid floors
 - embedded in walls
 - in areas of the building subject to frost
- 4.3 identify how expansion and contraction may be catered for in hot water pipework containing:
 - plastics
 - copper
- 4.4 state how to select clips and brackets appropriate to the hot water system pipework and the industry recommended spacings:
 - horizontally mounted pipework
 - vertically mounted pipework
- 4.5 state the positioning requirements of components in hot water systems:
 - heaters/storage cylinders
 - cisterns – hot water feed cisterns and feed and expansion cisterns
 - drain valves
 - service valves
 - thermostatic mixing valves
 - showers – gravity fed mixer, mains fed mixer and instantaneous electric
- 4.6 identify how to measure, mark out and drill plastic storage cisterns to receive pipework connections
- 4.7 identify how to make pipework connections to storage cisterns
- 4.8 identify how to make pipework connections to open vented hot water storage cylinders
- 4.9 state how to position, fix and connect new hot water pipework to outlets and supply sources:
 - bath tap or shower mixer valve
 - wash hand basin tap
 - sink tap
 - combination boiler
 - cold water storage cistern
 - hot water storage cylinder
 - thermostatic mixing valve

- 4.10 identify suitable methods of making new pipework connections into existing hot water system pipework:
- copper
 - plastic
- 4.11 identify the insulation requirements of hot water system components:
- pipework
 - cisterns
 - storage vessels.

Unit 204/004 Understand and apply domestic hot water system installation and maintenance techniques

Outcome 5 Be able to install hot water systems and components

Assessment Criteria

The learner can:

- 5.1 use test instruments to take readings of the hot water supply pressure and flow rate from existing hot water outlets
- 5.2 make pipework fixings to copper and plastic pipework
- 5.3 joint hot water pipework components:
 - copper – capillary soldered and compression
 - plastic – pushfit
- 5.4 measure, mark out and drill plastic storage cisterns to receive pipework connections
- 5.5 make pipework connections to storage cisterns
- 5.6 make pipework connections to open vented hot water storage cylinders
- 5.7 position, fix and connect new hot water pipework to outlets:
 - bath tap or shower mixer valve
 - wash hand basin tap
 - sink tap
 - combination boiler
 - cold water storage cistern
 - hot water storage cylinder
 - thermostatic mixing valve
- 5.8 apply insulation to hot water system pipework
- 5.9 demonstrate that hot water components and pipework systems cannot be brought into operation by the end user before the work has been fully completed.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 6	Know the service and maintenance requirements of hot water systems and components

Assessment Criteria

The learner can:

- 6.1 identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
- 6.2 identify how to carry out routine checks on hot water components and pipework as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage, adequate support and insulation
 - effective operation of terminal fittings
 - effective operation of float operated valves
 - effective operation of service valves
 - condition of hot water cylinder/heater and storage cisterns
 - effective operation of thermostatic control devices
- 6.3 state the procedures for dealing with defects in hot water components and pipework:
 - incorrect support to hot water system pipework and storage cisterns
 - excessive noise in pipework systems
 - leakage of hot water system pipework and fittings
 - cistern failure
 - hot water storage cylinder/ heater failure
 - leakage or ineffective operation of:
 - o terminal fittings
 - o float operated valves
 - o stop and service valves
 - o mixer showers
 - o thermostatic mixing valves
- 6.4 identify the types of information to be provided on a maintenance record for hot water systems.

Unit 204/004 Understand and apply domestic hot water system installation and maintenance techniques

Outcome 7 Be able to service and maintain hot water systems and components

Assessment Criteria

The learner can:

- 7.1 use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
- 7.2 carry out routine checks on hot water components and pipework as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage, adequate support and insulation
 - effective operation of terminal fittings
 - effective operation of float operated valves
 - effective operation of service valves
 - condition of hot water cylinder/heater and storage cisterns
 - effective operation of thermostatic control devices
- 7.3 carry out repairs to defects in hot water system components:
 - leakage of hot water system pipework and fittings – repair to water-filled pipework
 - leakage or ineffective operation of:
 - o terminal fittings
 - o float operated valves
 - o stop and service valves
- 7.4 complete the required details contained in a simple maintenance record for a hot water system.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 8	Know the decommissioning requirements of hot water systems and components

Assessment Criteria

The learner can:

- 8.1 identify the working methods that reduce the time periods during which hot water systems need to be isolated
- 8.2 state the information that needs to be provided to other persons before decommissioning work takes place
- 8.3 state how to temporarily decommission hot water system components and connecting pipework systems
- 8.4 identify the work sequences for permanently decommissioning hot water components and pipework systems
- 8.5 identify the methods used during the decommissioning process to prevent the end-user from operating hot water system components:
 - temporary capping of pipework sections
 - use of warning notices and signs.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 9	Be able to decommission hot water systems and components

Assessment Criteria

The learner can:

- 9.1 advise appropriate persons before hot water components or pipework are isolated in order to undertake work
- 9.2 carry out temporary decommissioning of cold water system components and connecting pipework systems
- 9.3 check to ensure that the decommissioning procedures carried out prevent the end-user from operating the hot water system components.

Unit 204/004 Understand and apply domestic hot water system installation and maintenance techniques

Outcome 10 Know the inspection and soundness testing requirements of hot water systems and components

Assessment Criteria

The learner can:

- 10.1 state the checks to be carried out during a visual inspection of a hot water system to confirm that it is ready to be filled with water
- 10.2 state how to fill hot water pipework with water at normal operating pressure and check for leakage
- 10.3 identify how to carry out a soundness test to industry requirements on hot water systems pipework and components
- 10.4 state the flushing procedure for hot water systems and components
- 10.5 identify the actions that must be taken when inspection and testing reveals defects in hot water systems:
 - dealing with systems that do not meet correct installation requirements
 - remedial work associated with defective pipework bracketing
 - remedial work associated with leakage from pipework systems.

Unit 204/004	Understand and apply domestic hot water system installation and maintenance techniques
Outcome 11	Be able to inspect and soundness test hot water systems and components

Assessment Criteria

The learner can:

- 11.1 carry out a visual inspection of a hot water system to confirm that it is ready to be filled with water
- 11.2 fill hot water pipework with water at normal operating pressure and check for leakage
- 11.3 perform a soundness test to industry requirements on hot water systems pipework and components
- 11.4 flush the system with wholesome water on completion of soundness testing.

Unit 205/005 Understand and apply domestic central heating system installation and maintenance techniques

Level: 2
Credit value: 10
URN: Y/602/2888

Unit aim

This combination unit provides basic learning in the installation, maintenance, decommissioning and soundness testing of a basic range of wet central heating system/component types in dwellings and industrial/commercial properties (of similar size and scope to domestic dwellings).

The unit covers systems in buildings up to 3 storeys in height and with systems up to a maximum of 40kW heat output and pipework up to 32mm diameter. The unit provides an appreciation of the working principles of the various fossil fuel type heat producing appliances.

Learning outcomes

There are **twelve** learning outcomes to this unit. The learner will:

1. Know the uses of central heating systems in dwellings
2. Know the types of central heating system and their layout requirements
3. Know the site preparation techniques for central heating systems and components
4. Be able to apply site preparation techniques for central heating systems and components
5. Know the installation requirements of central heating systems and components
6. Be able to install central heating systems and components
7. Know the service and maintenance requirements of central heating systems and components
8. Be able to service and maintain central heating systems and components
9. Know the decommissioning requirements of central heating systems and components
10. Be able to decommission central heating systems and components
11. Know the inspection and soundness testing requirements of central heating systems and components
12. Be able to inspect and soundness test central heating systems and components

Guided learning hours

It is recommended that **82** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the Mechanical Services Industry: SummitSkills NOS M7, M10, M12, M13, M25.

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit is assessed by:

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 1	Know the uses of central heating systems in dwellings

Assessment Criteria

The learner can:

- 1.1 state the purpose of central heating systems used in dwellings
- 1.2 identify the different types of space heating systems used in dwellings:
 - full central heating
 - background heating
 - selective heating
 - two and one pipe systems.

Unit 205/005 Understand and apply domestic central heating system installation and maintenance techniques

Outcome 2 Know the types of central heating system and their layout requirements

Assessment Criteria

The learner can:

- 2.1 identify the working principles of central heating systems:
 - pumped heating only system
 - pumped with gravity hot water
 - fully pumped with 2 x two port valves
 - fully pumped with a mid position valve
 - combination boiler with pumped heating
- 2.2 identify the type of central heating system from layout diagrams:
 - open vented:
 - pumped heating only
 - pumped with gravity hot water including heat sink circuits
 - fully pumped with 2 x two port valves
 - fully pumped with a mid position valve
 - sealed system:
 - pumped heating only
 - fully pumped with 2 x two port valves
 - fully pumped with a mid position valve
 - combination boiler with pumped heating
 - system boiler with pumped heating
- 2.3 state the system layout features for filling and venting systems:
 - open vented systems:
 - feed and expansion cistern position
 - pump position
 - cold feed and open vent pipe connection
 - methods of releasing air from the system
 - sealed systems:
 - expansion vessel position
 - pressure gauge, pressure relief valve and filling loop position
 - pump position
 - methods of releasing air from the system
- 2.4 state the layout features for systems that include micro and minibore pipework
- 2.5 state the general operating principles of solid fuel heat producing appliances:
 - open fire with high output back boilers
 - room heaters
 - cookers
 - independent boilers

- 2.6 state the general operating principles of oil fired heat producing appliances:
- pressure jet:
 - o traditional boilers
 - o condensing boilers
 - o combination boilers
 - o freestanding boilers
 - o wall mounted boilers
 - o open flued boilers
 - o room sealed boiler
 - vaporising:
 - o open flued cookers
- 2.7 state the general operating principles of gas fired heat producing appliances:
- open flued boilers
 - room sealed boilers
 - traditional boilers
 - condensing boilers
 - combination boilers
 - system boilers
 - freestanding boilers
 - wall mounted boilers
 - fan assisted boilers
- 2.8 state the operating principles of heat emitters:
- panel radiators
 - column radiators
 - low surface temperature radiators
 - fan convectors:
 - o wall mounted
 - o kick space
 - towel warmers
 - towel warmers with integral panel radiators
- 2.9 state the operating principles of central heating control components:
- radiator valves – thermostatic and manual valves
 - automatic air vents
 - motorised valves – two port and three port mid position and diverter
 - hot water storage cylinders
 - feed and expansion cisterns
 - circulating pumps
 - automatic bypass valves
 - thermo-mechanical cylinder control valves
 - anti gravity valves
 - drain valves
 - timing devices – clocks and programmers
 - room thermostats
 - cylinder thermostats and overheat protection devices
 - frost and pipe combined thermostats
- 2.10 state the operating principles of devices used in central heating systems to minimise the build-up of sediment.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 3	Know the site preparation techniques for central heating systems and components

Assessment Criteria

The learner can:

- 3.1 identify the sources of information required when undertaking work on central heating systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
- 3.2 identify the preparatory work required to be carried out to the building fabric in order to install, decommission or maintain central heating systems
- 3.3 identify the protection measures required to the building fabric or customer property, during and on completion of work on central heating systems and components
- 3.4 identify the pipework materials and fittings required to complete work on central heating systems ensuring that they are not damaged
- 3.5 state the range of hand and power tools required to complete work on central heating systems.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 4	Be able to apply site preparation techniques for central heating systems and components

Assessment Criteria

The learner can:

- 4.1 check the safety of the work location in order for the work to safely proceed:
 - safe access and exit
 - immediate work location e.g. tripping hazards
 - appropriate risk assessments/ method statements are available
- 4.2 wear Personal Protective Equipment relevant to the installation, decommissioning or maintenance task being carried out
- 4.3 apply protection measures to the building fabric or customer property, during and on completion of work on central heating systems and components
- 4.4 select the pipework materials and fittings required to complete work on central heating systems ensuring that they are not damaged
- 4.5 select the hand and power tools required to complete work on central heating systems
- 4.6 carry out preparatory work in order to install central heating systems.

Unit 205/005 Understand and apply domestic central heating system installation and maintenance techniques

Outcome 5 Know the installation requirements of central heating systems and components

Assessment Criteria

The learner can:

- 5.1 state the procedures required to assemble valves to radiators and mount radiators on wall surfaces
- 5.2 state the positioning and fixing requirements of central heating pipework and components:
 - in suspended timber floors
 - in solid floors
 - embedded in walls
 - in areas of the building subject to frost
- 5.3 identify how expansion and contraction may be catered for in central heating pipework containing:
 - plastics
 - copper
- 5.4 state how to select clips and brackets appropriate to the hot water system pipework and the industry recommended spacings:
 - horizontally mounted pipework
 - vertically mounted pipework
- 5.5 identify how to select joints for use in central heating system pipework:
 - LCS threaded joints
 - plastic – pushfit joints
 - capillary solder joints
 - compression joints
- 5.6 state the positioning and fixing requirements of components in central heating systems:
 - radiator valves – thermostatic and manual valves
 - automatic air vents
 - hot water storage cylinders
 - feed and expansion cisterns
 - motorised valves – two port and three port mid position and diverter
 - circulating pumps
 - automatic bypass valves
 - thermo mechanical cylinder control valve
 - anti gravity valve
 - drain valves
 - timing devices – clocks and programmers
 - room thermostats

- cylinder thermostats and overheat protection devices
 - frost and pipe combined thermostat
- 5.7 identify suitable methods for making new central heating pipework connections to components:
- boilers
 - central heating control system components
 - heat emitters
 - hot water storage cylinders
 - feed and expansion cisterns
- 5.8 state how to position, fix and connect new central heating pipework to components:
- panel radiators
 - boilers
 - control components
 - hot water storage cylinders
 - filling and venting components
- 5.9 identify suitable methods for making new central heating pipework connections into existing central heating circuits:
- within a one or two pipe copper system
 - within a one or two pipe low carbon steel system
 - to a microbore or minibore system
- 5.10 identify the insulation requirements of central heating system components:
- pipework
 - cisterns.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 6	Be able to install central heating systems and components

Assessment Criteria

The learner can:

- 6.1 assemble heat emitter components
- 6.2 make pipework fixings to copper and low carbon steel central heating system pipework
- 6.3 joint central heating pipework systems:
 - LCS threaded joints
 - capillary solder joints
 - compression joints
- 6.4 position, fix and connect new central heating pipework to components heat emitters:
 - boilers
 - control components
 - hot water storage cylinders
 - filling and venting components
- 6.5 apply insulation to central heating system pipework
- 6.6 demonstrate that central heating components and pipework systems cannot be brought into operation by the end user before the work has been fully completed.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 7	Know the service and maintenance requirements of central heating systems and components

Assessment Criteria

The learner can:

- 7.1 identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
- 7.2 identify how to carry out routine checks on central heating components and pipework systems as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage and adequate support
 - poor circulation in heat emitters
 - poor flow rate through heating systems
 - venting of gas build up within heat emitters
 - operation of control components
 - effective operation of thermostats
 - operation/ adjustment – system filling and venting components
- 7.3 state the procedures for dealing with defects in central heating components and pipework:
 - failure of control components
 - leakage in system pipework
 - leakage from heat emitters
 - replacement of control valves
 - replacement of heat emitters
 - replacement of hot water storage cylinders
- 7.4 identify the types of information to be provided on a maintenance record for central heating systems.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 8	Be able to service and maintain central heating systems and components

Assessment Criteria

The learner can:

- 8.1 use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
- 8.2 carry out routine checks on central heating components and pipework systems as part of a periodic maintenance programme:
 - visual inspection of pipework for leakage and adequate support
 - venting of gas build up within heat emitters
 - operation of control components
 - effective operation of thermostats
 - operation/ adjustment – system filling and venting components
- 8.3 carry out repairs to defects in central heating system components:
 - replacement of a radiator valve on a heat emitter
 - replacement of a radiator in an existing system
- 8.4 complete the required details contained in a simple maintenance record for a central heating system.

Unit 205/005 Understand and apply domestic central heating system installation and maintenance techniques

Outcome 9 Know the decommissioning requirements of central heating systems and components

Assessment Criteria

The learner can:

- 9.1 identify working methods that reduce the periods during which central heating systems are not available to building users
- 9.2 state the information that needs to be provided to other persons before decommissioning work takes place
- 9.3 state how to temporarily decommission central heating and connecting pipework systems
- 9.4 identify the work sequences for permanently decommissioning central heating and pipework systems
- 9.5 identify the procedures for safely draining and disposing of central heating system contents
- 9.6 identify the methods used during the decommissioning process to prevent the end-user from operating the appliance or system:
 - isolation of the fuel/electricity supply to the system
 - temporary capping of pipework sections
 - use of warning notices and signs.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 10	Be able to decommission central heating systems and components

Assessment Criteria

The learner can:

- 10.1 advise appropriate persons before central heating components or pipework are isolated in order to undertake work
- 10.2 carry out temporary decommissioning of central heating system components and connecting pipework systems
- 10.3 check to ensure that the decommissioning procedures carried out prevent the end-user from operating the appliance or system:
 - isolation of the fuel/electricity supply to the system
 - temporary capping of pipework sections
 - use of warning notices and signs.

Unit 205/005 Understand and apply domestic central heating system installation and maintenance techniques

Outcome 11 Know the inspection and soundness testing requirements of central heating systems and components

Assessment Criteria

The learner can:

- 11.1 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
- 11.2 state how to fill central heating systems with water at normal operating pressure and check for leakage
- 11.3 identify how to carry out a soundness test to industry requirements on central heating systems pipework and components
- 11.4 identify the actions that must be taken when inspection and testing reveals defects in central heating systems –
 - dealing with systems that do not meet correct installation requirements:
 - remedial work associated with defective pipework bracketing
 - remedial work associated with defective control valves
 - remedial work associated with leakage from pipework systems.

Unit 205/005	Understand and apply domestic central heating system installation and maintenance techniques
Outcome 12	Be able to inspect and soundness test central heating systems and components

Assessment Criteria

The learner can:

- 12.1 carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water
- 12.2 fill central heating systems with water at normal operating pressure and check for leakage
- 12.3 perform a soundness test to industry requirements on central heating systems pipework and components.

Level: 2
Credit value: 4
URN: R/602/2971

Unit aim

The aim of this unit is to confirm job competence at Level 2 in the installation, maintenance decommissioning and soundness testing of a range of basic domestic heating and hot water systems and components in dwellings.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. Be able to prepare sites for the installation of domestic heating and hot water systems and components in the workplace
2. Be able to install domestic heating and hot water systems and components in the workplace
3. Be able to soundness test domestic heating and hot water systems and components in the workplace
4. Be able to decommission domestic heating and hot water systems in the workplace
5. Be able to maintain domestic heating and hot water components in the workplace

Guided learning hours

It is recommended that **4** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M7, M10, M12, M13, M25.

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit is assessed by:

- A portfolio of evidence collection and assessment in the workplace.

Unit 206

Install and maintain domestic heating systems

Outcome 1

Be able to prepare sites for the installation of domestic heating and hot water systems and components in the workplace

Assessment Criteria

The learner can:

- 1.1 check that all necessary job information is available before commencing the installation work
- 1.2 liaise with other persons to confirm the detail of the installation work to be carried out
- 1.3 comply with health and safety requirements when carrying out the installation work
- 1.4 prepare a safe and unobstructed access route to the work areas to carry out the installation work
- 1.5 check that all required tools, equipment and materials are available to undertake the installation work
- 1.6 use job information to identify the location of the building fabric that requires preparatory work to be carried out
- 1.7 report any pre-existing damage to the building fabric or customer property to other persons before carrying out the installation work
- 1.8 provide protection to the building fabric or customer property as the work progresses
- 1.9 carry out preparatory work to the building fabric:
 - lifting timber floor surfaces
 - cutting holes and notches in timber floor joists
 - cutting chases in wall or floor surfaces.

Unit 206

Install and maintain domestic heating systems

Outcome 2

Be able to install domestic heating and hot water systems and components in the workplace

Assessment Criteria

The learner can:

- 2.1 confirm that the incoming supplies meet the requirements of the system or component being installed
- 2.2 measure and mark out the position of the components to be installed:
 - system pipework
 - main system components
 - system controls
- 2.3 make pipework and component fixings to the building fabric
- 2.4 position and fix pipework and components to the building fabric:
 - copper
 - plastics
- 2.5 connect pipework to system controls and main components:
 - cold water systems (connections into)
 - hot water systems
 - central heating systems
- 2.6 connect system pipework to hot and cold water systems
- 2.7 carry out installation work using methods and techniques which minimise the wastage of equipment and materials
- 2.8 take precautions to ensure that the system cannot be brought into operation before the installation work is fully completed.

Unit 206

Install and maintain domestic heating systems

Outcome 3

Be able to soundness test domestic heating and hot water systems and components in the workplace

Assessment Criteria

The learner can:

- 3.1 carry out a visual inspection of the system or component to be tested to make sure that it is ready to be filled with water
- 3.2 charge the system to normal operating pressure and check for leakage:
 - cold water systems (connections from existing system pipework or cold water system installed by others)
 - hot water systems
 - central heating systems
- 3.3 perform a soundness test to industry requirements on the installed system or component:
 - hot water systems
 - central heating systems
- 3.4 flush the system with water on completion of soundness testing
- 3.5 rectify any leakage from the system or component found during the soundness test procedure.

Unit 206

Install and maintain domestic heating systems

Outcome 4

Be able to decommission domestic heating and hot water systems in the workplace

Assessment Criteria

The learner can:

- 4.1 check that all necessary job information is available before commencing the decommissioning work
- 4.2 liaise with other persons to confirm the detail of the decommissioning work to be carried out
- 4.3 arrange for temporary supplies or services to be available for the duration of decommissioning
- 4.4 comply with health and safety requirements when carrying out decommissioning work
- 4.5 prepare a safe and unobstructed access route to the work areas to carry out the decommissioning work
- 4.6 check that all required tools, equipment and materials are available to undertake the decommissioning work
- 4.7 report any pre-existing damage to the building fabric or customer property to other persons before carrying out the decommissioning work
- 4.8 provide protection to the building fabric or customer property as the work progresses
- 4.9 isolate the system from the supply source:
 - turn off the electricity supply and fuel source to the system
 - turn off the water supply to the system
- 4.10 drain and safely dispose of the system contents:
 - hot water systems
 - central heating systems
- 4.11 take precautions to ensure that the system cannot be brought back into operation before the decommissioning work is complete
- 4.12 advise other persons that the system has been successfully decommissioned.

Unit 206

Install and maintain domestic heating systems

Outcome 5

Be able to maintain domestic heating and hot water components in the workplace

Assessment Criteria

The learner can:

- 5.1 check that all necessary job information is available before commencing the maintenance work
- 5.2 liaise with other persons to confirm the detail of the maintenance work to be carried out
- 5.3 comply with health and safety requirements when carrying out maintenance work
- 5.4 prepare a safe and unobstructed access route to the work areas to carry out the maintenance work
- 5.5 check that all required tools, equipment and materials are available to undertake the maintenance work
- 5.6 report any pre-existing damage to the building fabric or customer property to other persons before carrying out the maintenance work
- 5.7 provide protection to the building fabric or customer property as the work progresses
- 5.8 isolate the component from the supply source:
 - turn off the electricity supply and fuel source to the component
 - turn off the water supply to the component
- 5.9 drain the component contents
- 5.10 take precautions to ensure that the component cannot be brought back into operation before the maintenance work is complete
- 5.11 carry out the maintenance or replacement of the component to industry requirements
- 5.12 reinstate the supply or service to the component and check it for correct operation
- 5.13 advise other persons that work on the system or component has been successfully completed
- 5.14 complete the details contained in simple maintenance records.

Unit 207/277 Delivery of effective customer service

Level: 2
Credit value: 6
URN: J/600/1003

Unit aim

The aim of this unit is to enable the candidate to develop an appropriate knowledge and understanding of the principles of effective customer service.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. Describe the principles of customer service
2. Understand how customer needs and expectations are formed
3. Understand principles of responding to customers' problems or complaints
4. Identify the interpersonal and team working skills required in the customer service environment
5. Identify the legislation which supports the customer service process

Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the ICS National Occupational Standards: NVQ Level 2 – 1, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 31, 36, 37, 38.

Assessment

This unit is assessed by:

- An online multiple choice test (207) **or** an assignment (277)

Unit 207/277 Delivery of effective customer service

Outcome 1 Describe the principles of customer service

Assessment Criteria

The learner can:

- 1.1 identify the purpose of customer service
- 1.2 describe how customer service affects the success of the organisation
- 1.3 describe different types of customers of an organisation
- 1.4 identify the range of customer needs
- 1.5 identify the customer service information which may be retained.
- 1.6 identify the difference between providing a product and providing a service
- 1.7 describe what is meant by an after-sales service
- 1.8 describe what is meant by a Unique Selling Point (USP) and a Unique Service Offer (USO)
- 1.9 identify the methods a customer service deliverer can use to keep product and service knowledge up-to-date
- 1.10 describe how an organisation can promote its products and/or services

Guidance

1.1

Good customer service is:

- ensuring customer needs are met
- encouraging customer loyalty
- forming a relationship with customers
- ensuring customers leave happy and return
- ensuring customers pass on positive feedback to others.

1.2

Having experienced a certain level of customer service from an organisation, customers will expect that level of customer service in the future, whether good or bad.

Good customer service can give an organisation an edge over its competitors while poor service can result in a loss of business. A reputation for poor service can be difficult to change.

1.3

A customer can be an individual or an organisation. Customers can be internal eg from another part of the same organisation or colleagues; external eg individuals, businesses including suppliers.

1.4

Different customers will have different needs and expectations from an organisation eg that timescales are met, promises kept, value for money, quality presentation, employees are knowledgeable and friendly, products are fit for use/purpose, are reliable, easy to use.

Other types of customer needs exist where customers' health, language skills, age, cultural background or learning difficulties influence how a service provider may need to adapt their behaviour and their methods of communication to meet these individual needs.

1.5

There is a range of customer service information/records which organisations may retain eg personal data – customer's name, address, account details, previous purchases; customer feedback on a product or service – user evaluation; warranty/guarantee records; records of complaints.

1.6

Products are tangible ie a customer can buy a product like a car and own it. However, they cannot own a service. A product is produced by a manufacturing process and you subscribe to a service. The main difference between providing products and a service is that contact that is more personal may be required when marketing a service as compared with marketing products. Providing a product may also involve providing after-sales service as in help-line facilities following the sale of a computer.

1.7

An after sales service - providing support for a service or a product after purchase eg help-line facilities following the sale of a computer. After sales service for products may involve dealing with warranties, guarantees, exchanges, repair agreements, refunds. There may be various terms, legal constraints and organisational policies, which need to be considered.

1.8

A USP - Unique Selling Point makes a product different or better from its competitor(s) eg price, packaging, performance, market perception, quality, availability, meeting deadlines. A Unique Selling Point or Proposition (USP) defines an organisation's competitive advantage. An organisation must identify what makes it different from the competitors and emphasise these advantages in marketing, influencing the customer's choice of products and services.

A USO – Unique Service Offer makes a service different or better from its competitor(s) eg 24-hour availability. A USO is used to differentiate a service offer from that of competitors or comparable organisations. USOs are directly related to why customers conduct business with organisations and use their products or services. Customers buy benefits and solutions and the candidate should be familiar with the technique of selling features and benefits and should know how these compare with those of competitors.

USPs and USOs are used to differentiate what one organisation provides by way of products and/or services from another.

1.9

Keeping up-to-date with product and services knowledge is vital. Various sources of information about products and/or services will be available within an organisation eg catalogues, brochures, price lists, colleagues, internet, intranet, training sessions, organisational product and/or service information/literature, feedback from customers.

1.10

Promotion methods can be leaflets, telephone calling, demonstrations, mailshots, promotional videos, newspaper (national and local) advertisements, television advertisements, local/national radio advertisements.

Unit 207/277 Delivery of effective customer service

Outcome 2 Understand how customer needs and expectations are formed

Assessment Criteria

The learner can:

- 2.2 describe the purpose of an organisation's service offer
- 2.2 describe how customer expectations are formed
- 2.3 describe the interrelationship between customer satisfaction and customer expectations
- 2.4 describe how customer needs can be identified
- 2.5 identify the methods of obtaining customer feedback
- 2.6 describe how an organisation can maintain customer loyalty
- 2.7 identify why it is important to ensure effective customer relationships are maintained
- 2.8 describe why it is important for a customer to be able to identify a 'brand'.

Guidance

2.1

Organisation's service offer - also known as a customer charter – is the organisation's statement about the level of service they will offer eg some customer charters will set out how they will compensate a customer when customer service has not been delivered in line with the charter; or it will clearly state the timescales for responses.

The service offer sets the basis on which the organisation will provide a service to its customers. Customers will know this is what they can expect while organisations know what they must deliver.

2.2

Customer expectations are what customers think should happen and how they believe they should be treated when asking for or receiving customer service. Expectations are formed eg through what customers hear and see

what they read and the messages the organisation sends (ie via its reputation and brand)
what actually happens to them when dealing now and in the past with an organisation.

Customer expectations are also heavily influenced by word of mouth (eg friends and family) and also the media.

Customers may have experiences with similar organisations which impact upon their overall impression and expectations of that particular service industry, eg hotels and restaurants, supermarkets, banking, insurance.

2.3

Customer service equals the totality of what an organisation does to meet customer expectations and produce customer satisfaction. Customer expectations are what customers think should happen and how they believe they should be treated when asking for or receiving customer service. Customer satisfaction then occurs when a customer is happy with the service provided.

However, it is not sufficient for some organisations to simply achieve customer satisfaction; they want to do better and talk in terms of exceeding customer expectations, delighting the customer or surprising the customer. Customer satisfaction is still achieved but the perception is to a greater degree.

2.4

Customer needs can be identified through the use of well-developed inter-personal skills which enable a service deliverer to accurately identify those needs.

Customers at times do not have a clear understanding of their needs. Assisting in determining needs is a valuable service to the customer and this can be done by asking the customer relevant questions and listening carefully to the customer's responses.

2.5

Customer feedback is what the customer provides to an organisation about the customer service experienced. It may be collected by the organisation formally using questionnaires, comment cards, competitions, focus groups or surveys (telephone or mail). This is sometimes called formal feedback.

All staff in an organisation has a responsibility for gathering spontaneous customer feedback, eg chance remarks or comments, verbal or in writing made by customers without being asked. This is informal feedback.

2.6

If the service customers receive is consistently good, loyalty will be built. If there is a good background of achieving customer satisfaction, customer loyalty may exist but even when things go wrong, organisations can recover from a negative situation with an individual customer by working towards a solution. Repeat business is influenced by a customer's on-going perception of the service they receive.

Customer loyalty can be rewarded by making special customer service arrangements and offers for repeat customers, eg points programme, loyalty scheme and special offers.

2.7

Customer relationships exist where customers provide repeat business over time with the same organisation and/or service provider. Good customer relationships are important to a service provider because they build customer loyalty, resulting in repeat business.

It is beneficial for an organisation to have loyal customers as it tends to be cheaper and easier to retain business with an existing satisfied customer than it is to find a new customer.

2.8

Knowing the 'brand' of the product or service is an important message to transmit to customers. A brand is a promise to customers. A strong brand name tells customers; 'you know the name, you can trust the promise'. Generally there is a 'logo' and instantly customers have a visual reminder of what the company is offering and promising customers and they know what to expect. Customers can be attracted to the brand above that of the competition.

Unit 207/277 Delivery of effective customer service

Outcome 3 Understand principles of responding to customers' problems or complaints

Assessment Criteria

The learner can:

- 3.1 identify common causes of customer problems and complaints
- 3.2 identify different methods of communication
- 3.3 describe the importance of adapting methods of communication and behaviour to meet the individual needs of customers
- 3.4 explain how the non verbal communication of the service deliverer can affect the behaviour of the customer
- 3.5 describe how personal presentation, approach and attitude will influence the perception of the service delivered.

Guidance

3.1

Customer problems and complaints can be caused through eg faulty goods, poor quality, incorrect stock, failure to return calls, failure to meet deadlines, poor staff attitude.

3.2

The most effective methods of communication are eg
face-to-face
written communication eg letter, email
telephone and text

Face-to-face – is using regular eye contact and active listening. Eye contact may differ across cultures; 'active listening' is about head nodding, gestures and repeating back phrases that are heard to confirm understanding.

Written communication is eg letter, email, memos and reports. There will be guidelines on when and how to use written communication eg house styles, language to be used. Written communication may be necessary when a formal response is required.

Telephone communication requires being able to operate the equipment efficiently and effectively; making sure customers are regularly informed when the service deliverer is accessing information to provide responses, or if they are going to be on hold. Speaking clearly and slowly to allow for the possibility that reception on the 'phone line may be poor; adapting speech to meet individual customer needs. Telephone communication is used when an immediate response is needed, when more detail needs to be obtained or when negotiation is necessary.

3.3

It is important to adapt methods of communication to meet the individual needs of a range of customers for example those with:
language difficulties
health issues

different age groups
cultural differences
learning difficulties

It is important to communicate in a clear, polite and confident way eg where there are language difficulties it may require the service deliverer to talk slowly, clearly and without the use of jargon. The service deliverer should treat the customer with respect at all times and work with the individual to meet their needs.

3.4

Non-verbal communication is the use of body language eg

Gestures

Posture

Facial expression

Eye contact

Personal presentation eg dress

It is important to be aware of the potential impact of a range of body language variations eg

Standing very close to a customer versus standing at a distance

Folding arms versus open arms

Giving lots of eye contact versus giving no eye contact

Pointing fingers, frowning versus smiling

Body language can signal pleasure, anger, frustration or aggression without you realising it and can affect the behaviour of the customer who reacts to what they perceive the message to be.

3.5

The customer service deliverer's own personal presentation, approach and attitude will influence the customer's perception of the service delivered. If the customer expects to see staff in uniform who make a friendly approach and have a positive attitude they will not be satisfied if they are faced with someone who makes no approach and appears not to care.

A service deliverer's presentation, approach and attitude can create the first impression a customer has of the organisation and it is important to realise that creating a good first impression is vital – you don't get a second chance to make a good first impression.

Service deliverers should always be professional despite difficult circumstances eg being under pressure through lack of time, during busy periods.

Unit 207/277 Delivery of effective customer service

Outcome 4 Identify the interpersonal and team working skills required in the customer service environment

Assessment Criteria

The learner can:

- 4.1 describe the skills required for effective team working
- 4.2 describe how to maintain effective working relationships within a team
- 4.3 describe the range of inter-personal skills required for effective customer service.

Guidance

1.4

The skills required for effective team working include the ability to:

be supportive

be comfortable with disagreement and the ability to successfully overcome differences in opinion

discuss and listen

learn from experience, reviewing and improving performance from both successes and failures

The following phases (Bruce Tuckman) are all necessary and inevitable in order for a team to grow, to face up to challenges, to tackle problems, to find solutions, to plan work, and to deliver results and be effective. The phases are:

- Forming
- Norming
- Storming
- Performing

4.2

Maintaining effective working relationships requires people to:

- share workloads
- share information
- be able to work co-operatively with others
- show sensitivity to the needs and feelings of others
- work as a team to resolve customer problems and complaints
- apply teamwork to give good customer service
- work effectively with others to complete an allotted task
- respond positively to requests for help or support
- understand where and when to ask for help and support

There should always be awareness of the different personalities that could exist within a team eg introvert, confident, assertive, aggressive and withdrawn and the fact that there may be a

requirement to adapt personal behaviour to the needs and feelings of team members. There will need to be an awareness of how an individual's behaviour can impact on team performance and that individuals in the team are working towards a common goal.

4.3

The range of interpersonal skills required for effective customer service includes:

- oral communication skills
- written communication skills
- non-verbal communication skills (body language)
- telephone skills
- questioning skills
- listening skills
- decision-making skills
- problem-solving skills
- information-gathering skills
- personal development skills
- team working skills

Unit 207/277 Delivery of effective customer service

Outcome 5 Identify the legislation which supports the customer service process

Assessment Criteria

The learner can:

- 5.1 identify the key aspects of the legislation relating to consumer law
- 5.2 identify the main principles of equal opportunities legislation in relation to providing customer service
- 5.3 identify the responsibilities of the employer and employee under the Health and Safety at Work Act
- 5.4 describe why it is important to respect customer and organisation confidentiality
- 5.5 identify the main principles of the Data Protection Act
- 5.6 identify how a code of practice or ethical standards can impact upon the activities of a service deliverer.

Guidance

5.1

The key aspects of the legislation relating to consumer law are:

- Sale of Goods Act – relates to goods which are sold – of merchantable (ie satisfactory) quality; as described, fit for purpose, there are likely to be organisational procedures in relation to rights to refund under Act.
- Supply of Goods and Services Act – involved with supplying goods or services to customers; eg work done, and products supplied by tradesmen and professionals, eg dentists, builders, plumbers, gardeners – ‘duty of care’.
- Unsolicited Goods and Services Act - goods or services, not ordered by customers – traders cannot charge for goods or services they have sent to customers without their being ordered.
- Trade Descriptions Act – must not falsely describe something for sale; must not make false claims for services, accommodation or facilities.
- Consumer Protection Act – customers can claim compensation for death, injury or damage to property over £275 if a product they use turns out to be faulty; producers and distributors of goods are required to ensure that their products are safe; it is an offence to display or to give a customer misleading information.
- Consumer Credit Act - protects customers when they buy or borrow on credit – gives customers a wide range of rights.
- The Consumer Protection Regulations – protection to customers who shop by ‘phone, mail order via the Internet or digital TV.

5.2

The equal opportunities legislation that relates to providing customer service is:

Disability Discrimination Act – complex legislation where customer service must not be seen to discriminate against customers with disabilities; obligations of the organisation are different according to the size of the organisation and the products or services being offered. It influences customers’ rights of access to goods, facilities, services and premises.

Sex Discrimination Act and Race Relations Act (as amended) aims to prevent people being discriminated against to ensure people are treated fairly and equally. Sex Discrimination Act – influences customers' rights of access to goods, facilities, services and premises.

People have different needs, expectations, opportunities and responsibilities, therefore, it is important to remember that treating people fairly means recognising their differences.

5.3

Health and Safety at Work Act (HASWA) covers the responsibilities of employers to their employees and to customers who are on the premises. It also covers safe working practices, common risks and hazards eg slippery or uneven floors, excessive noise and/or moving parts in machinery, chemicals.

It covers responsibilities relating to (a) fire drill procedures (b) evacuation procedures (c) suspicious packages (d) terrorism procedures (e) special codes to indicate the level of threat the organisation believes they are under at any moment in time eg a government department.

5.4

Protecting confidential information is a business requirement, and an ethical and legal requirement. Information security means protecting information and information systems from unauthorised access, use, disclosure, disruption, modification, or destruction. Any loyalty and goodwill which exists between customers and the organisation will be lost if confidentiality is breached.

Security and confidentiality of data is covered by legislation ie Data Protection Act 1998 which has 8 principles that must be applied.

Organisations retain 'personal information' about customers – eg account details, addresses and this information cannot be disclosed to anyone who asks for it. An organisation which handles personal information has a duty by law to keep its customers' personal information safe and secure, whether it is stored in a manual format or electronically.

Legislation controls the use of data and not respecting customer and organisation confidentiality could result in a loss of the customer.

5.5

The 8 principles of the Data Protection Act are:

- Personal information shall be processed fairly and lawfully and, in particular, shall not be processed unless conditions are met
- Personal information be obtained only for specified and lawful purposes and shall not be further processed in a manner incompatible with those purposes.
- Personal information shall be adequate, relevant and not excessive for the purpose
- Personal information shall be accurate and, where necessary, kept up to date
- Personal information shall not be kept for longer than is necessary for the purpose
- Personal information should be processed in accordance with the rights of data subjects

These rights are:

- Access to personal information
- Prevent processing likely to cause damage or distress
- Prevent processing for direct marketing
- Automated decision making

- Compensation
- Rectification, blocking, erasure & destruction
- Jurisdiction and procedure
- Appropriate measures shall be taken against unauthorised or unlawful processing of personal data and against accidental loss, destruction or damage to the data
- The final principle refers to passing information to countries outside the EU who may not have the same levels of security.

5.6

Trade Associations and Professional Bodies have a Code of Practice – sector code of practice - that guides members on how they should conduct their business. Most Codes of Practice include guidance on how to deal with customers. They usually cover how members should deal with complaints and customer problems, guidance to customers on how to make a complaint/follow grievance procedure.

Ethical standards influence how decisions are made when resolving customer problems and the behaviour of employees towards customers.

Organisational ethics include personal qualities such as:

- responsibility
- integrity
- honesty
- openness
- ethical leadership
- pride in reputation
- social awareness

Unit 218

Understand the principles and operation of Government energy efficiency incentives

Level: 2
Credit value: 1
URN: K/506/1880

Learning outcomes

There are **two** learning outcomes to this unit. The learner will:

1. Understand the principles and operation of energy efficiency incentives
2. Understand the funding mechanisms for energy efficiency incentives

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by cskills

Assessment

This unit is assessed by:

- externally set, internally marked short-written answer question papers

Unit 218	Understand the principles and operation of Government energy efficiency incentives
Outcome 1	Understand the principles and operation of energy efficiency incentives

Assessment Criteria

The learner can:

- 1.1 describe the relationship between different building construction types and the choice of energy efficiency incentives
- 1.2 describe which energy efficiency measures are eligible for incentives
- 1.3 identify relevant Codes of Practice relating to energy efficiency incentives
- 1.4 describe the main stages involved in the operation of energy efficiency incentives
- 1.5 describe the roles and responsibilities of the energy supplier, funding provider, assessor, remote advisor, installer and consumer
- 1.6 describe the legal safeguards for customers and buildings in relation to energy efficiency incentives
- 1.7 state the principle sources of information available to customers in relation to energy efficiency incentives

Range

1.1

Who is eligible

- building owner
- tenants (domestic and non-domestic)

Restrictions

- Property must have an electricity meter supplied by a registered electricity supplier
- Measures must meet the Golden Rule
- (**Golden Rule** - Expected financial savings must be greater to or equal to the costs attached to the energy bill)
- If tenant, then permission from building owner
- If Landlord, then permission from tenant
- Consent of the bill payer.

1.2

- Suitable
- Fixed to the property, not portable
- Needs to be on the **PCDF** (Product Characteristics Data File)
- Meet the Golden Rule
- SAP Appendix T – hierarchy of measures – check whether still relevant in Green Deal
- Product assurance.

1.3

- Raising awareness of energy efficiency
- Reducing fuel poverty
- Providing a financial means to install measures without customer capital
- Helping the government reduce CO2 emissions and meet its targets and obligations.

1.4

Part 1 Energy Efficiency chapters 1-5

- Creates a financial framework for implementing energy efficient improvements
- Consideration of Consumer Credit Act for domestic and non-domestic sectors
- Requirement for Secretary of State to act to improve energy efficiency
- Requirement for Secretary of State to report on the contributions of the Green Deal to reduce carbon emissions.
- Energy Company Obligation (ECO)
- Green Deal code of practice
- Source - Department of Communities and Local Government (DCLG)

Unit 218	Understand the principles and operation of Government energy efficiency incentives
Outcome 2	Understand the funding mechanisms for energy efficiency incentives

Assessment Criteria

The learner can:

- 2.1 describe the types of funding available in relation to energy efficiency incentives
- 2.2 describe the potential savings in relation to energy efficiency measures

Range

2.1

Main stages of the Green Deal journey

- Unlocking consumer demand
- Qualifying assessment
- Developing the Green Deal plan
- Installation
- repayments

2.2

- Energy supplier – must agree to the Deal and collect payment
- Provider – finance provider (eg British Gas)
- Assessor – produce energy performance certificate (EPC) on the building
- GD/remote advisor – carry out occupancy assessment and gives GD advice; ensures measures meet the Golden Rule
- Installer/operative – carry out recommended measures
- Consumer – pay for work through energy bill.

2.3

Legal safeguards

- The Consumer Credit Act
- Office of Fair Trading
- Green Deal code of practice.

2.4

Vulnerable Groups

- Elderly
- people in fuel poverty
- people with poor credit history
- mentally impaired
- physically impaired

- Legislations - Energy Act 2011; ECO

Unit 219

Understand the use of energy efficiency measures on existing buildings

Level: 2
Credit value: 4
URN: F/506/1884

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Understand the main considerations when undertaking energy efficiency measures
2. Understand energy efficiency measures and priorities
3. Understand the impact that energy efficiency measures could have on existing buildings
4. Understand the recording and reporting procedures when carrying out energy efficiency measures on existing buildings

Guided learning hours

It is recommended that **40** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by cskills

Assessment

This unit is assessed by:

- externally set, internally marked short-written answer question papers

Unit 219	Understand the use of energy efficiency measures on existing buildings
Outcome 1	Understand the main considerations when undertaking energy efficiency measures

Assessment Criteria

The learner can:

- 1.1 identify any regulatory requirements which might affect the viability of the energy efficiency measures
- 1.2 describe why it is important that the fabric of the building is in good condition before energy efficiency measures are addressed
- 1.3 state examples of existing building features which can assist in reducing energy consumption
- 1.4 describe why it is important to work with the design and fabric of the building
- 1.5 describe the considerations that must be taken into account in relation to:
 - a) the avoidance of damage to the existing building, during construction and the longer term
 - b) moisture movement (moisture ingress and condensation)
 - c) the design, age, type and use of the building
 - d) the building location, size and orientation
 - e) the soundness and viability of existing structure, the building fabric types and materials (including affected enclosed cavities and spaces)
 - f) heating and cooling
 - g) thermal insulation methods (cavity wall, loft, under-floor, internal/external solid wall)
 - h) air-tightness
 - i) ventilation - natural and artificial
 - j) light – natural and artificial
 - k) fire – protection and insulation
- 1.6 describe why it is important to maintain architectural, cultural and historically significant character and features of the building.

Range

1.1

- Local planning office
- Building owners / occupiers commercial or domestic
- Conservation officer.

1.2

Construction material – brick work, openings, roof, floor

Energy aspects – boilers; lighting; heating other energy users.

1.3

Features

- Insulation (wall, internal, external, ceiling); glazing; boilers; lighting; behaviour change.

1.4

- HVAC
- Planning and building regulations.

1.5

Considerations

- Inappropriate insulation
- Inappropriate glazing
- listed building or not
- Financial viability.

1.6

- Planning and conservation

Unit 219

Understand the use of energy efficiency measures on existing buildings

Outcome 2

Understand energy efficiency measures and priorities

Assessment Criteria

The learner can:

- 2.1 describe appropriate ways in which to reduce demand for energy by:
 - a) efficient use of lighting and appliances
 - b) efficient use of heating controls
 - c) monitoring energy use and planning reduction
 - d) energy advice/assessment
- 2.2 describe appropriate ways to improve the efficiency of energy usage by:
 - a) insulating lofts, pipes and floors
 - b) insulating cavity and solid walls
 - c) installing energy efficient measures for windows
 - d) installing draught-proofing
- 2.3 describe the use of low carbon environmental technologies including:
 - a) solar hot water
 - b) solar photovoltaic electricity
 - c) heat pumps
 - d) biomass
 - e) micro-Combined Heat and Power (mCHP)

Range

2.1

Appropriate ways

- Energy efficient lighting and controls
- A rated appliances
- energy meters
- temperature control eg thermostatic radiator valves
- EPC
- energy inspection
- Green Deal occupancy assessment

2.2

- Insulating options
- Installation options

2.3

Recycling environmental technology - Water harvesting

- Solar
- Heat pumps.

Unit 219

Understand the use of energy efficiency measures on existing buildings

Outcome 3

Understand the impact that energy efficiency measures could have on existing buildings

Assessment Criteria

The learner can:

- 3.1 Describe the potential negative effects that energy efficiency measures could have on different buildings in relation to:
- a) trapping moisture and condensation
 - b) restricting air flow
 - c) accelerating decay
 - d) structural implications
 - e) visually
 - f) combustion appliances

Range

3.1

Counter productive effects

damp, rot, decay, poor air quality, condensation, loss of productivity (non –domestic building)

Different buildings

construction type: solid wall, cavity wall, timber frame, portal frame, British Iron and Steel Federation / system built

Unit 219	Understand the use of energy efficiency measures on existing buildings
Outcome 4	Understand the recording and reporting procedures when carrying out energy efficiency measures on existing buildings

Assessment Criteria

The learner can:

- 4.1 describe the suitable methods for reporting and recording the energy efficiency work being carried out

Range

4.1

suitable methods

- Building logbook
- EPC
- Green Deal advisory report

Unit 220

Understand insulation and building treatment methods

Level: 2
Credit value: 1
URN: J/506/1885

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. Understand the different insulation and building treatment methods
2. Understand energy efficiency priorities
3. Understand the advantages and disadvantages of using insulation measures on buildings

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by cskills

Assessment

This unit is assessed by:

- externally set, internally marked short-written answer question papers

Unit 220

Understand insulation and building treatment methods

Outcome 1

Understand the different insulation and building treatment methods

Assessment Criteria

The learner can:

- 1.1 describe the different insulation methods employed when carrying out energy efficiency measures to buildings including:
 - a) cavity wall insulation
 - b) internal wall insulation
 - c) external wall insulation
 - d) loft insulation
 - e) draught proofing
 - f) floor insulation
 - g) window and door upgrades
- 1.2 describe the **suitable areas** within the **envelope** of the building where the relevant insulation methods could be used effectively
- 1.3 describe **typical circumstances** when it would be inappropriate to use certain types of insulation methods to buildings.

Range

1.1

- cavity wall insulation
- internal wall insulation
- external wall insulation
- loft insulation
- draught proofing
- floor insulation
- glazing upgrade

1.2

Envelope

- Wall
- Floor
- roof

Suitable areas

- Cavity
- external or internal walls
- floors to be insulated

1.3

typical circumstances

- Solid walls
- narrow cavities
- listed buildings
- geographically exposed buildings.

Unit 220 Understand insulation and building treatment methods

Outcome 2 Understand energy efficiency priorities

Assessment Criteria

The learner can:

- 2.1 describe **appropriate ways** in which to reduce demand for energy by:
 - a) efficient use of lighting and appliances
 - b) efficient use of heating controls
 - c) monitoring energy use and planning reduction
 - d) energy advice/assessment
- 2.2 describe appropriate ways to improve the efficiency of energy usage by:
 - a) insulating lofts and pipes
 - b) insulating cavity and solid walls
 - c) installing energy efficient glazing
 - d) installing draught-proofing
- 2.3 Describe the use of low carbon environmental technologies including:
 - a) solar hot water
 - b) solar photovoltaic electricity
 - c) heat pumps

Range

2.1

appropriate ways

- Energy efficient lighting and controls
- A rated appliances
- energy meters
- temperature control eg thermostatic radiator valves
- EPC
- energy inspection.

Unit 220	Understand insulation and building treatment methods
Outcome 3	Understand the advantages and disadvantages of using insulation measures on buildings

Assessment Criteria

The learner can:

- 3.1 describe the **potential benefits** of insulating buildings in relation to:
 - a) energy savings
 - b) improved comfort and environment
 - c) reductions to heating and cooling costs
 - d) potential cost savings
 - e) reducing carbon emissions
 - f) soundproofing qualities
- 3.2 describe the potential disadvantages of insulating buildings in relation to:
 - a) cost
 - b) health, safety and welfare
 - c) interior space
 - d) future retrofit activities
 - e) thermal bridging
 - f) reduction in moisture movement and air flow.

Range

3.1

Reducing energy consumption; reducing Co2 emissions; reducing energy costs

3.2

potential benefits

- Commercial/public building: productivity
- Payback period – reduced for existing installations
- Reducing emissions – meet corporate social responsibility targets ; reduces costs
- Preventing damp, rot, building fatigue
- Improved comfort and environment
- Reductions to heating and cooling costs
- Reducing moisture to building envelope
- Soundproofing qualities.

Unit 221

Understand air quality and ventilation requirements for buildings

Level: 2
Credit value: 1
URN: L/506/1886

Learning outcomes

There are **two** learning outcomes to this unit. The learner will:

1. Understand air quality requirements for buildings
2. Understand ventilation requirements for buildings

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by cskills

Assessment

This unit is assessed by:

- externally set, internally marked short-written answer question papers

Unit 221	Understand air quality and ventilation requirements for buildings
Outcome 1	Understand air quality requirements for buildings

Assessment Criteria

The learner can:

- 1.1 describe why it is important to have a suitable level of air quality in buildings:
 - a) health, wellbeing and comfort
 - b) building fabric
 - c) removing unpleasant odours
 - d) preventing stagnation of air
- 1.2 describe suitable measures and methods to control and improve air quality in building:
 - a) natural ventilation
 - b) mechanical ventilation.

Range

1.1

- health
- comfort
- well being

1.2

suitable measures

- Supply and extraction

methods

- air vents
- supply and extraction fans
- trickle ventilation
- mechanical ventilation
- air filters
- air flow rates

Unit 221

Understand air quality and ventilation requirements for buildings

Outcome 2

Understand ventilation requirements for buildings

Assessment Criteria

The learner can:

- 2.1 describe why it is important to have acceptable levels of ventilation in buildings in relation to:
 - a) effects from **hazardous gases**
 - b) combustion ventilation
 - c) minimizing the chances of condensation and damp
 - d) health, wellbeing and comfort
- 2.2 describe the main benefits of ventilating buildings in relation to:
 - a) removing excessive moisture
 - b) introducing outside air
 - c) circulating indoor air
- 2.3 describe the effects that inadequate ventilation could have on the occupier, building and internal environment
- 2.4 describe the **potential effects** that condensation and damp have on the building
- 2.5 describe **suitable measures** and **methods** to improve ventilation in buildings.

Range

2.1

Legislative requirement – COSHH

hazardous gases

- carbon monoxide
- process related eg paint
- Soldering
- welding

2.2

- removing unpleasant odours
- removing excessive moisture
- introducing outside air
- circulating indoor air
- preventing stagnation of air

2.3

effects

- Damp
- Condensation

- Rot
- health implications
- hazardous gases
- Risk of explosion

2.4

potential effects

- Deterioration of building fabric
- cost implications

2.5

suitable measures

- Supply and extraction

Methods

- New equipment
- Installation of supply and extract fans
- Air handling units
- Soffit ventilation
- Ensure air vents not blocked
- Installation of wind and stack ventilation
- Use natural ventilation

Unit 301

Understanding health and safety in gas utilisation

Level: 3
Credit value: 11
URN: M/502/8461

Unit aim

This unit aims to provide learners with the knowledge and understanding of the general health and safety requirements for working in the gas industry.

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will:

1. Know the health and safety legislation
2. Know the health and safety measures for gas utilisation
3. Know the regulations covering the use and disposal of hazardous substances
4. Know manual handling methodology and lifting techniques
5. Know how to identify and respond to accidents which occur at work
6. Know the requirements for maintaining electrical safety, earthing protection systems and associated dangers
7. Know fire safety
8. Know the safety requirements for working at heights
9. Know how to work safely in confined spaces

Guided learning hours

It is recommended that **70** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit is assessed by:

- A portfolio of evidence

Unit 301 Understanding health and safety in gas utilisation

Outcome 1 Know the health and safety legislation

Assessment Criteria

The learner can:

- 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.

Unit 301

Understanding health and safety in gas utilisation

Outcome 2

Know the health and safety measures for gas utilisation

Assessment Criteria

The learner can:

- 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 including:
 - hazards
 - risks
 - likelihood
 - severity
- 2.4 describe risk control measures:
 - eliminate
 - reduce
 - isolate
 - control
 - PPE
 - personal discipline
- 2.5 state the types and purpose of personal protective equipment and clothing
 - eye protection
 - hand protection
 - head protection
 - foot protection
 - clothing protection/visibility
 - hearing protection
 - respiratory protection
- 2.6 explain how and when the above PPE must be used, cleaned and stored
- 2.7 describe the types and purpose of signs and safety notices to include
 - mandatory signs
 - prohibition signs
 - hazard signs
 - fire fighting signs
 - safe condition signs
 - combination signs
- 2.8 state the purpose of and contents of method statements and permit to work systems
- 2.9 describe a model risk assessment to include all the key elements.

Unit 301

Understanding health and safety in gas utilisation

Outcome 3

Know the regulations covering the use and disposal of hazardous substances

Assessment Criteria

The learner can:

- 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:
 - toxic
 - harmful
 - corrosive
 - irritant
 - oxidising
 - extremely flammable
- 3.3 explain the general precautions necessary for working with commonly encountered substances to include:
 - fluxes
 - solder
 - lead
 - jointing compounds
 - sealants
 - gaskets.
- 3.4 state the key purpose of the Control of Asbestos at Work Regulations
- 3.5 describe the different types of asbestos found in the workplace
- 3.6 explain the key risks associated with working with the following:
 - white asbestos (Chrysotile)
 - brown or grey asbestos (Amorite)
 - blue asbestos (Crocidilite)
 - 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.

Unit 301

Understanding health and safety in gas utilisation

Outcome 4

Know manual handling methodology and lifting techniques

Assessment Criteria

The learner can:

- 4.1 explain the process of planning a lift
 - how to assess a load
 - moving the load
 - route safety
 - duration of lift accessibility
 - 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 technique used:
 - to move loads alone
 - for a 2 person lift
 - using mechanical aids
- 4.6 describe a plan for a simulated lifting activity which includes all key factors.

Unit 301	Understanding health and safety in gas utilisation
Outcome 5	Know how to identify and respond to accidents which occur at work

Assessment Criteria

The learner can:

- 5.1 state the main responsibilities of the employer and employee under the 'Health and Safety at Work Act 1974'
- 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 domestic dwellings and 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 classify minor and major workplace injuries
- 5.7 state the responsibilities and procedures for dealing with minor and major workplace injuries
- 5.8 describe how to deal with victims of electric shock including their removal from an electrical supply
- 5.9 describe the correct method of administering CPR and identify when it would be performed
- 5.10 explain the correct method of placing an accident victim in the recovery position and identify when this action would be performed
- 5.11 describe the key elements which are included in a typical organisations evacuation procedure
- 5.12 describe the procedures for reporting accidents and serious occurrences
- 5.13 describe the first aid procedure(s) required to treat liquid gas burns.

Unit 301

Understanding health and safety in gas utilisation

Outcome 6

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

Assessment Criteria

The learner can:

- 6.1 describe the electrical dangers of construction sites, business properties private dwellings
 - signs of damage or worn electrical cables on power tools and property hard wiring systems
 - signs of visual fault on electrical components
 - trailing cables
 - proximity of cables to service pipe work
 - buried and hidden cables
 - avoidance of cables under wooden floors
 - inadequate over current protection devices
- 6.2 describe the safe use of electrical tools and equipment
 - power powered supplies
 - 100V supplies
 - 240V supplies
- 6.3 explain the purpose and key elements included in the visual inspection of power tools
- 6.4 state the Portable Appliance Testing (PAT) requirements of electrical equipment and state the procedures applied when electrical equipment fails safety tests
- 6.5 describe the potential risks of electric shock resulting from the existing electrical installation and faulty electrical tools and equipment
- 6.7 describe the different types of earthing systems used in properties including typical cable sizes
- 6.8 state the key purpose and differences between different types of bonding
 - main equipotential bonding
 - supplementary protective bonding
 - temporary protective bonding
- 6.9 explain the use of electrical earth bonding labels
- 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.

Unit 301	Understanding health and safety in gas utilisation
Outcome 7	Know fire safety

Assessment Criteria

The learner can:

- 7.1 state the three elements of the combustion triangle
- 7.2 state when to when not to tackle a fire
- 7.3 describe the types of fire extinguisher used to tackle different types of fires
 - electrical fire
 - general fire
 - gas fire
 - small paper fire
- 7.4 explain when it would be appropriate to use a fire blanket to extinguish a fire
- 7.5 state the precautions which should be taken when using blow torches in different locations
 - near to flammable materials
 - in or under wooden floors
 - in roof spaces and other hazardous areas
 - in proximity to electrics
- 7.6 describe the safe storage, transportation, assembly, testing and use of blow torches.

Unit 301

Understanding health and safety in gas utilisation

Outcome 8

Know the safety requirements for working at heights

Assessment Criteria

The learner can:

- 8.1 explain the circumstances where it is necessary to work at heights
- 8.2 state the safety measures and checks needed when working with steps and ladders
- 8.3 describe the types of equipment used when working at heights
 - step ladders
 - ladders
 - roof ladders and crawling boards
 - mobile tower scaffolds
- 8.4 describe how to assemble, erect and use types of equipment when working at heights
 - step ladders
 - ladders
 - roof ladders and crawling boards
 - mobile tower scaffolds
- 8.5 explain the working at height safety hierarchy and the selection of equipment.

Unit 301

Understanding health and safety in gas utilisation

Outcome 9

Know how to work safely in confined spaces

Assessment Criteria

The learner can:

- 9.1 state the definition of a confined space and the requirements of the confined spaces legislation
- 9.2 describe the typical **confined spaces** which gas engineers encounter at work including
 - roof spaces
 - under wooden floors
 - cellars
 - plant rooms
 - duct rooms
 - metering or governor houses
 - 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
- 9.5 explain situations where working in confined spaces is required.

Level: 3
Credit value: 4
URN: A/502/8463

Unit aim

This unit aims to provide the learner with the knowledge and understanding of scientific principles in gas utilisation.

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Know the Systeme Internationale (SI) units and uses within gas utilisation
2. Know the sources of energy and heat transfer
3. Know the combined gas laws
4. Know energy efficiency legislation

Guided learning hours

It is recommended that **30** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 302

Understanding scientific principles in gas utilisation

Outcome 1

Know the Systeme Internationale (SI) units and uses within gas utilisation

Assessment Criteria

The learner can:

- 1.1 describe the Systeme Internationale (SI) units used in gas utilisation to include:
 - metre, kilogram, Second and Kelvin.
- 1.2 describe SI derived units for:
 - area
 - volume
 - velocity
 - flow rate
 - acceleration
 - density
 - force
 - pressure
 - specific heat capacity
 - temperature
 - heat
 - power.
- 1.3 describe how to convert from imperial to Standard International units using formulas and tables
- 1.4 explain:
 - mass and weight
 - speed and velocity
 - acceleration
 - force
 - work and power
 - temperature
 - specific heat and specific heat capacity
 - sensible heat and latent heat
 - condensation and evaporation
 - comfort conditions – heat energy rates-thermal efficiency
 - mechanics – mechanical advantage- action and reaction
 - equilibrium
 - moment of force
 - levers
 - stress and strain
 - stresses in beams
 - pulleys – centre of gravity.

Unit 302

Understanding scientific principles in gas utilisation

Outcome 2

Know the sources of energy and heat transfer

Assessment Criteria

The learner can:

- 2.1 define renewable and non renewable energy
- 2.2 state the different types of non- renewable energy
 - gas and LPG
 - oil
 - solid fuel
 - electricity generate by fossil fuels
- 2.3 describe the different types of renewable energy
 - electricity generated by wind, hydro and wave power
 - solar
 - biomass
 - hydrogen fuel cells
 - air source
 - ground source
- 2.4 describe the transfer of heat and provide examples of the transfer of heat via:
 - radiation
 - conduction
 - convection.

Unit 302

Understanding scientific principles in gas utilisation

Outcome 3

Know the combined gas laws

Assessment Criteria

The learner can:

- 3.1 state the formula for Charles' and Boyle's Law
- 3.2 explain the interrelationship between pressure, volume and temperature.

Unit 302

Understanding scientific principles in gas utilisation

Outcome 4

Know energy efficiency legislation

Assessment Criteria

The learner can:

- 4.1 describe the effects of using renewable and non renewable energy sources on:
 - the environment
 - climate change
- 4.2 outline the benefits of energy efficient products, services and equipment
- 4.3 state the key factors of the Building Regulations (Part L1) which apply to energy efficiency.

Level: 3
Credit value: 15
URN: M/502/8475

Unit aim

This unit aims to provide the learner with the knowledge and understanding of combustion and properties of gas.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Know the natural gas supply network and LPG supplies
2. Know the operation pressure regulators
3. Know the factors affecting pressure loss and the equipment used to measure gas pressure
4. Understand the combustion of gases, and potential risks
5. Know gas burner operation, design, features and types
6. Know the properties and characteristics of NG and LPG

Guided learning hours

It is recommended that **110** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 303	Understanding combustion and properties of gas
Outcome 1	Know the natural gas supply network and LPG supplies

Assessment Criteria

The learner can:

- 1.1 describe the key features of a natural gas network to include:
 - gas terminals
 - pipe materials and sizes
 - compressors
 - pressure regulation
 - storage
 - gas quality
- 1.2 state the operating pressure ranges for:
 - low pressure
 - medium pressure
 - intermediate pressure
 - high pressure
- 1.3 describe LPG bulk and cylinder supply systems.

Unit 303	Understanding combustion and properties of gas
Outcome 2	Know the operation pressure regulators

Assessment Criteria

The learner can:

- 2.1 explain the need for, 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.

Unit 303	Understanding combustion and properties of gas
Outcome 3	Know the factors affecting pressure loss and the equipment used to measure gas pressure

Assessment Criteria

The learner can:

- 3.1 state the factors affecting pressure loss
- 3.2 describe the operation and uses of a typical manometer, 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.

Unit 303	Understanding combustion and properties of gas
Outcome 4	Understand the combustion of gases and potential risks

Assessment Criteria

The learner can:

- 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, state where they should be placed/installed and identify the associated maintenance requirements
- 4.9 describe and define the warning signs associated with incomplete combustion.

Unit 303	Understanding combustion and properties of gas
Outcome 5	Know gas burner operation, design, features and types

Assessment Criteria

The learner can:

- 5.1 describe the operation of the following burners:
 - natural draught
 - pre and post aerated
 - pre mix
 - forced draught
 - radiant
 - flameless combustion
- 5.2 state the differences between the performance of pre and post aerated burners
- 5.3 describe which burner faults result in:
 - incomplete combustion
 - flame lift
 - lighting back.
- 5.4 describe the key parts and operation of a per-aerated natural draught burner to include:
 - gas injector
 - primary airports
 - venturi
 - burner head
 - burner retention.

Unit 303	Understanding combustion and properties of gas
Outcome 6	Know the properties and characteristics of NG and LPG

Assessment Criteria

The learner can:

- 6.1 describe first, second and third family gases and state their chemical symbols
- 6.2 explain the following characteristics of NG and LPG:
 - relative density
 - calorific value
 - gross and net calorific value
 - Wobbe numbers
 - flammability limits
 - flame speed
 - ignition temperature
 - viscosity
- 6.3 describe the additional characteristics and properties of LPG:
 - storage of LPG
 - boiling points of LPG
 - types of gases
 - vapour pressure curves
 - vaporisation and offtakes
 - viscosity
 - auto-refrigeration and excessive offtakes
 - origins of LPG.

Level: 3
Credit value: 12
URN: A/502/8480

Unit aim

The aim of this unit is to provide the learner with the knowledge and understanding of building services and structures required for working in the gas industry.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Know the types and characteristics of construction materials
2. Know the construction methods of buildings and how to read and interpret plans
3. Know how to use hand and power tools within gas utilisation
4. Know the installation requirements, methods and materials for gas pipework (NG and LPG)
5. Know the ventilation requirements, types and methods
6. Know the different types and operation of suitable chimney systems for gas appliances
7. Know the methods for checking and testing chimney performance

Guided learning hours

It is recommended that **90** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 304	Understanding buildings, services and structures
Outcome 1	Know the types and characteristics of construction materials

Assessment Criteria

The learner can:

- 1.1 describe the following types of metals:
 - pure metals
 - ferrous metals
 - non ferrous metals
 - alloys
- 1.2 state the properties of metals:
 - strength
 - hardness
 - ductility
 - malleability
 - conductivity
- 1.3 explain heat treatments and there effects on metals
- 1.4 describe the effects of corrosion on metals
- 1.5 state the precautions taken to stop the effects of corrosion on metals
- 1.6 describe the types and properties of construction materials used in the workplace:
 - types of concrete
 - types of bricks
 - types of construction blocks
 - cement
 - plaster products
 - plastic products
 - timber
 - roofing tiles and materials
- 1.7 describe the typical use these construction materials.

Unit 304

Understanding buildings, services and structures

Outcome 2

Know the construction methods of buildings and how to read and interpret plans

Assessment Criteria

The learner can:

- 2.1 describe the following building components:
 - foundations – mass fill, strip
 - damp proof courses
 - brick/block walls – exterior, load bearing
 - partition walls
 - flooring types – concrete and wooden
 - ceilings
 - lintels
 - wallplates
 - roofing types- flat, traditional and trussed
 - types of roof tiling
- 2.2 state the positions and requirements for service entries into buildings
- 2.3 describe the construction methods and materials used in small commercial buildings
- 2.4 describe the construction methods and materials used in Park homes.

Unit 304

Understanding buildings, services and structures

Outcome 3

Know how to use hand and power tools within gas utilisation

Assessment Criteria

The learner can:

- 3.1 describe the range of basic tools and their uses:
 - screwdrivers
 - hammers
 - chisels
 - masonry and wood
 - grips
 - wrenches
 - spanners – fixed and adjustable
 - spirit levels
 - pipe cutters
 - hand saws
 - hacksaws
 - springs
 - bending machines
- 3.2 describe the range of battery operated tools and their uses:
 - drills – screwdrivers
- 3.3 describe the range of power tools (110v and 240V) and their uses:
 - drills – small and large
 - circular saws
 - jig saws
 - screwdrivers
 - portable threading machine
- 3.4 describe the safety checking processes of gas utilisation tools carried out prior to their use:
 - visual inspections
 - PAT testing/electrical checks
 - use of RCD adaptors
- 3.5 state how to safely use the range of gas utilisation tools:
 - correct application
- 3.6 clarify appropriate PPE to be used

- 3.7 describe the tools required and the methods of cutting:
- metal
 - steel
 - wood
 - copper
 - alloys
 - plastics, etc
- 3.8 describe the typical fasteners and fixings used in the gas industry
- 3.9 explain the methods and types of drills required when drilling through:
- metal
 - steel
 - wood
 - copper
 - alloys
 - plastics
 - brick
 - concrete
 - thermalite block
 - studded
 - dry lined and timber frame.

Unit 304	Understanding buildings, services and structures
Outcome 4	Know the installation requirements, methods and materials for gas pipework (NG and LPG)

Assessment Criteria

The learner can:

- 4.1 describe the types of pipe materials and fittings suitable for carrying natural gas and/or LPG to include:
 - copper
 - steel
 - corrugated stainless steel
 - MDPE
 - movable appliance hoses
 - hoses
- 4.2 describe the types of joints, jointing materials, and jointing methods:
 - copper capillary
 - compression
 - push-fit joints - press-fit joints
 - threaded and union joints
 - fusion techniques/joints
 - joint sealing materials
- 4.3 describe the techniques and methods required to bend copper pipe accurately using:
 - bending machines
 - bending springs
- 4.4 describe the general types of pipe supports and fixings for use in brick, concrete, thermal blocks, studded, dry lined, and timber frame applications
- 4.5 state the general requirements for Pipework* runs:
 - location of pipes
 - route
 - appearance
 - positioning requirements for gas controls/isolation valves
 - clipping/securing
 - methods of accommodating movement of pipework in buildings
 - marking of pipes
 - protection of buildings, ventilation
 - pipework in protected shafts, fire escape routes
 - fire stopping in buildings
 - exterior pipework
 - below ground pipework
 - restrictions in the use of union/compression fittings
 - proximity to other services

- electrical earth bonding
 - corrosion protection
 - gas pipe identification
 - entry to dwellings from medium pressure meter installations
 - main equipotential bonding
- * **Pipework:** passing through cavity walls, in walls, in dry lined walls, in voids, in ducts/shafts, in roof spaces, under wooden floors, under solid floors, under the base of walls/foundations
- 4.6 describe the correct methods of lifting and replacing floorboards and chipboard flooring
- 4.7 explain the procedures for the disconnection of pipes and fittings including the use of temporary continuity bonds
- 4.8 explain the precautions to be taken when using exposed flames for soldering joints on existing gas installations/meters
- 4.9 describe the process of correctly sizing the gas pipe work in an installation to include:
- copper
 - steel
 - NG and LPG.

Unit 304

Understanding buildings, services and structures

Outcome 5

Know the ventilation requirements, types and methods

Assessment Criteria

The learner can:

- 5.1 describe the general requirements and reasons for ventilation in regard to gas appliances and installations
- 5.2 define the following:
 - permanent ventilation
 - adventitious ventilation
 - compartment ventilation
- 5.3 explain the terms gross and net CV and clarify the effect on ventilation calculus
- 5.4 state the normative documents related to gas appliance ventilation
- 5.5 explain the methods of calculating the ventilation requirements for:
 - open-chimney appliances
 - flueless appliances
 - appliances in compartments
 - multiple appliance ventilation
- 5.6 describe the approved types of ventilation openings and grilles and define the criteria they must meet
- 5.7 explain the following:
 - recommended siting/location of vents
 - installation of vents through walls
 - ventilation paths via other rooms
 - ventilation paths to compartments including ducts
- 5.8 state the process of accurately measuring ventilator free areas
- 5.9 describe the requirements for the provision of ventilation labels/notices
- 5.10 describe the potential adverse effects on ventilation from:
 - extract fans
 - cooker hoods
 - tumble dryers
 - solid fuel appliances
 - double glazing
 - cavity wall insulation
 - general draft proofing
- 5.11 explain the ventilation requirements/paths for vertex flues
- 5.12 describe the ventilation requirements for gas appliances installed in dwellings with passive stack ventilation systems
- 5.13 state the minimum separation distances between ventilators and appliance flue terminals
- 5.14 describe the purpose and requirements to install intumescent air vents

- 5.15 define the term restricted location, and describe the associated requirements for ventilators/grilles
- 5.16 explain the different ventilation requirements for permanent dwellings, residential park homes, boats and leisure accommodation vehicles.

Unit 304

Understanding buildings, services and structures

Outcome 6

Know the different types and operation of suitable chimney systems for gas appliances

Assessment Criteria

The learner can:

- 6.1 state the classification of gas appliances according to chimney types
- 6.2 describe the construction and materials of chimney types to include:
 - brick / masonry/chimney blocks
 - single and double wall
 - metallic and non metallic
 - flexible metallic liners
 - shared (common) chimney systems
 - fan draught
 - vertex chimneys
 - Se and u ducts
 - gas flue boxes
- 6.3 explain the design, component parts and general operation of open flue chimney systems to include:
 - parts of an open-flue chimney system
 - open-flue chimney system operation
 - chimney system design
 - flue dampers
 - shared open flued chimneys
 - cross sectional areas
 - temperature effects
 - condensation problems
 - flue terminal design
 - bird guards
- 6.4 state the requirements for open-flue, natural draught chimney outlet locations and positions to include:
 - open-flue chimney outlet locations/terminal positions - before 2001
 - open-flue chimney outlet locations/terminal positions - after 2001
- 6.5 explain the design considerations, component parts and general operation of room sealed flue chimney systems to include:
 - metallic and plastics
 - parts of a room-sealed appliance flue (natural draught and fan draught)
 - room-sealed appliance flue operation (natural draught and fan draught)
 - flue terminal design
 - condensing flues
- 6.6 state the requirements for room sealed chimney outlet locations and positions:
 - terminal positions

- proximity to doors and windows
 - carports or extensions
 - neighbouring properties
 - condensing appliances
 - basements, light wells and retaining walls
 - terminal guards – requirements
- 6.7 describe the requirements for open chimney balanced compartment installations:
- compartment construction
 - ducted air positions and sizes.

Unit 304

Understanding buildings, services and structures

Outcome 7

Know the methods for checking and testing chimney performance

Assessment Criteria

The learner can:

- 7.1 describe the methods and checks required to establish satisfactory construction, effective and safe flue performance to include:
 - open-flue, natural draught chimneys:
 - visual checks throughout its length
 - factors that affect performance - down draught - wind effects
 - effects of passive stack ventilation
 - effects of fans
 - flue flow test and spillage test
 - testing fanned draught open-flue systems
- 1.2 room sealed appliance chimneys:
 - visual checks on flue and appliance
 - checking case seals and case integrity on natural draft, negative and positive pressure appliances
 - checking combustion fan operation.

Level: 3
Credit value: 15
URN: Y/502/8485

Unit aim

This unit aims to provide learners with the knowledge and understanding of the gas safety requirements for working in the gas industry.

Learning outcomes

There are **sixteen** learning outcomes to this unit. The learner will:

1. Know industry specific legislation and standards
2. Know gas safety legislation
3. Know the gas emergency actions, responsibilities and procedures relevant to the industry
4. Know the gas industry unsafe situations procedure
5. Know the gas operatives responsibilities in accurately completing emergency notices, warning labels and forms
6. Know the correct installation locations and types of Emergency Control and Appliance Isolation Valves
7. Know and understand the requirements for natural gas and LPG meter installations up to .035cu mtrs
8. Know the types of gas meter housings and compartments and the requirements for installation and labelling
9. Know the methods and requirements to tightness test and purge small gas installations. (NG and LPG)
10. Know how to check and set gas installation operating pressures at gas meters and LPG regulators
11. Know how to safely assess the potential risks, tightness test and re-light temporarily isolated appliances
12. Know how to check and set appliance burner pressures and compare measured gas rates with published figures
13. Know the principles of operation and methods of testing gas appliance safety controls
14. Know how to safely work in customers premises and liaise with clients regarding the progress of the job
15. Know where to acquire information and documentation used during their daily work activities
16. Know the regulations in force to protect the environment and control waste

Guided learning hours

It is recommended that **110** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 305

Understanding gas safety

Outcome 1

Know industry specific legislation and standards

Assessment Criteria

The learner can:

- 1.1 state the key points of gas industry legislation:
 - application of Gas Safety (Installation and Use) Regulations to work activities
 - application of relevant building regulations and standards
 - precautionary actions required to prevent use of unsafe installations
 - UKLPG COPS
 - pressure systems safety regulations.

Assessment Criteria

The learner can:

- 2.1 describe the Gas Safety (Installation and Use) Regulations:
 - regulation 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 20, 22, 23, 25, 26, 27, 30, 32, 33, 34, 35, 36, 37
- 2.2 state the key features of:
 - the Gas Act
 - Gas Safety (Management) Regulations
 - Gas Safety (Rights of Entry) Regulations
 - Gas Safety Regulations affecting Northern Ireland and Isle of Man
- 2.3 describe how and when to use the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) procedures
- 2.4 state the registration and competence process that applies to gas engineers.

Unit 305

Understanding gas safety

Outcome 3

Know the gas emergency actions, responsibilities and procedures relevant to the industry

Assessment Criteria

The learner can:

- 3.1 state the responsibilities and appropriate actions to be taken in the event of a gas emergency:
 - reporting gas escapes
 - responsibilities of the gas user
 - responsibilities of the gas operative to give gas users advice and safety information
 - responsibilities of the gas engineer
 - turning off at emergency controls
 - elimination of ignition sources
 - reduction of gas concentrations via ventilation
 - action by the gas transporter
 - action by the LPG Supplier
- 3.2 state the Gas Emergency Priorities:
 - protect life
 - protect property
 - secure the escape
 - leave the site safe.

Unit 305
Outcome 4

Understanding gas safety
Know the gas industry unsafe situations
procedure

Assessment Criteria

The learner can:

- 4.1 explain the purpose and scope of the Unsafe Situations Procedure and define the criteria of the following categories:
 - Immediately Dangerous (ID) appliances/installations
 - At Risk (AR) appliances/Installations
 - Not to Current Standards (NCS) appliances/installations
- 4.2 describe the national gas emergency provider "Concern for Safety" procedure
- 4.3 explain how the Unsafe Situations procedure is applied
- 4.4 explain the purpose and use of the associated warning notices and labels
- 4.5 state the types of RIDDOR reportable work/incidents.

Unit 305

Understanding gas safety

Outcome 5

Know the gas operatives responsibilities in accurately completing emergency notices, warning labels and forms

Assessment Criteria

The learner can:

- 5.1 describe the range of gas utilisation emergency notices, warning labels and forms:
 - warning notices
 - warning labels
 - RIDDOR Reporting Forms
 - advice notices
 - gas emergency notices and labels
 - concern for safety notices and labels
- 5.2 explain gas operative's responsibilities in completing the emergency notices, warning labels and forms to capture all relevant and required information.

Unit 305

Understanding gas safety

Outcome 6

Know the correct installation locations and types of Emergency Control and Appliance Isolation Valves

Assessment Criteria

The learner can:

- 6.1 describe the installation, operation and positioning requirements for Emergency Control Valves (ECV):
 - natural gas/LPG meter installations
 - remote meter installations
 - multiple occupancy meter installations
 - Meter Inlet Valves (MIV)
- 6.2 explain the installation, operation and positioning requirements for appliance isolation valves (AIV)
- 6.3 describe the associated labels required for ECV's.

Unit 305

Understanding gas safety

Outcome 7

Know and understand the requirements for natural gas and LPG meter installations up to .035cu mtrs

Assessment Criteria

The learner can:

- 7.1 state the installation methods and requirements for the installation of natural gas/LPG meter installations:
 - primary meters
 - secondary meters
 - prepayment meters
- 7.2 describe the associated meter labels required for primary and secondary meters
- 7.3 describe the operation and accuracy of gas positive displacement meters.

Unit 305

Understanding gas safety

Outcome 8

Know the types of gas meter housings and compartments and the requirements for installation and labelling

Assessment Criteria

The learner can:

- 8.1 describe the types of gas meter housings and compartments:
 - surface mounted
 - semi-concealed
 - built-in meter boxes
 - medium pressure installations
 - purpose built meter housings
- 8.2 state the suitable locations and fixing requirements for gas meter housings and compartments
- 8.3 explain the differences between low pressure and medium pressure gas meter houses and compartments
- 8.4 state gas operative's responsibilities and the associated labels for meter housings and compartments.

Unit 305

Understanding gas safety

Outcome 9

Know the methods and requirements to tightness test and purge small gas installations. (NG and LPG)

Assessment Criteria

The learner can:

- 9.1 state the key requirements of IGE/UP/1B and BS5482 part 1 in regards to both tightness testing and purging
- 9.2 outline the types of pressure gauges suitable for carrying out tightness tests and identify the requirements for accuracy of reading
- 9.3 describe the process of carrying out gas tightness tests:
 - calculating system volumes
 - visual checks of gas installations
 - isolation of appliances
 - testing pressures
 - avoidance of Governor Lock Up
 - let by
 - temperature stabilisation
 - test periods
 - use of leak detector to check test point and inlet connection from ECV
 - allowed pressure drops for existing installations
- 9.4 describe the actions to be taken in the event of an ECV letting by
- 9.5 describe the potential effects of electronic token meter tamper devices on tightness testing
- 9.6 explain the situations when a test for gas tightness is required
- 9.7 state how to identify low and medium pressure gas installations
- 9.8 describe the methods of correctly purging a U6/G4 small domestic gas installation
- 9.9 describe the general requirements of tightness testing following a reported gas escape
- 9.10 explain the process of tracing and repairing gas escapes on installations and the use of gas leak detectors
- 9.11 describe the requirements to issue gas testing and purging certificates.

Unit 305

Understanding gas safety

Outcome 10

Know how to check and set gas installation operating pressures at gas meters and LPG regulators

Assessment Criteria

The learner can:

- 10.1 describe the process of checking and setting gas installation operating pressures:
 - meter regulators - low and medium pressure
 - LPG regulators
 - maintaining correct installation operating pressures
- 10.2 state the procedure for contacting those authorised to re-set or exchange defective meter governors.

Unit 305

Understanding gas safety

Outcome 11

Know how to safely assess the potential risks, tightness test and re-light temporarily isolated appliances

Assessment Criteria

The learner can:

- 11.1 describe the process and safety factors associated with relighting temporarily isolated appliances:
- confirmation that the installation is gas tight
 - system and appliances are purged of air
 - appliance(s) are re-lit
 - satisfactory operation of user controls is confirmed
 - visual risk assessments are carried out for unsafe situations
- 11.2 explain the correct actions required when uncommissioned appliances and systems are identified.

Unit 305

Understanding gas safety

Outcome 12

Know how to check and set appliance burner pressures and compare measured gas rates with published figures

Assessment Criteria

The learner can:

- 12.1 explain the process of checking appliance inlet and burner pressures:
 - cookers
 - fires
 - boilers
- 12.2 describe the procedure of accurately checking appliance gas rates in both metric (m³) and imperial (ft³):
 - cookers
 - fires
 - boilers
- 12.3 explain the process of establishing the potential causes of low/poor gas pressures.

Unit 305

Understanding gas safety

Outcome 13

Know the principles of operation and methods of testing gas appliance safety controls

Assessment Criteria

The learner can:

13.1 describe the principles of operation, methods of testing and application of gas appliance safety controls:

- Gas Controls:
 - pressure regulators
 - low pressure cut off
 - thermal cut off
 - gas cocks/valves
 - cooker hotplate lid control
 - electric solenoid valve
 - excess flow valves
- Flame Protection Devices:
 - vapour pressure device
 - thermoelectric valve
 - flame conduction and rectification
 - interrupter devices
 - atmosphere sensing devices
 - spillage detection devices
 - Multifunction Control
- Thermostats:
 - bi metallic
 - liquid expansion
 - vapour pressure
 - electrical
 - overheat/limit
 - thermistors

Unit 305

Understanding gas safety

Outcome 14

Know how to safely work in customers premises and liaise with clients regarding the progress of the job

Assessment Criteria

The learner can:

- 14.1 explain how to survey the work site to check for any pre-existing damage to:
 - building wall/floor surfaces – existing kitchen, sanitary appliances, heating equipment and other building fitments – building décor and carpets – furniture
- 14.2 describe the methods available to ensure work site areas are protected:
 - use of dust sheets – building wall / floor surfaces – existing and new sanitary appliances and kitchen furniture – building décor and carpets – gardens/lawns
- 14.3 describe how to minimise disturbance to the job:
 - liaison with the responsible person for the property and people who will be affected by the work
- 14.4 state how to ensure that work is done to the specification:
 - use of normative documents, industry standards, British and European Standards and information from manufacturers' instructions – self certification requirements – building control notification requirements
- 14.5 describe how to ensure the availability of materials on-site (site storage):
 - work in private properties – work on new-build housing – work on commercial contracts – avoiding loss of materials on site (theft)
- 14.6 explain how to maintain a safe worksite:
 - hazard and risk control – working safely – work areas are clean and tidy – keeping tools and equipment in an orderly manner – following industry standards
- 14.7 explain how to ensure customer satisfaction to:
 - communication, consideration, work to specification and required quality, work safely, protect and respect customer property, advise on delays/problems, instruct customers on the appliance and system operation, leave instructions and appliance literature, check out customer satisfaction.

Unit 305

Understanding gas safety

Outcome 15

Know where to acquire information and documentation used during their daily work activities

Assessment Criteria

The learner can:

- 15.1 describe how to access the types of information and documentation required for work activities:
- regulations inc: Building – Water – Gas - Data Protection - Equal Opportunities
 - standards inc: British Standards - European standards – UKLPG COP's, IGEN standards, other recognised standard sources e.g. Energy Savings Trust
 - manufacturer guidance inc: Installation instructions - service and maintenance instructions - user instructions
- 15.2 explain how to access the types of "in company" information and documentation:
- delivery notes - work programmes - time sheets - plans/drawings - job specifications - invoices/statements - quotations/estimates.

Unit 305

Understanding gas safety

Outcome 16

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

Assessment Criteria

The learner can:

- 16.1 state the requirements of environmental protection regulations:
- the controlled waste regulations
 - controlled waste (registration of carriers and seizure of vehicles) - packaging - building regulations (including energy efficiency requirements for new dwellings) and water supply regulations
 - methods of disposing of waste inc: licensed waste disposal sites - specialist waste disposal requirements e.g. asbestos - carriage of waste by roads – waste carriers license
- 16.2 describe the environmental protection measures which can be incorporated into installation methods and practises:
- minimising the wastage of equipment and materials
 - accurate cutting, bending and jointing
 - loss/theft of material on-site
 - using principles that minimise the usage of energy in installed systems /components
 - using principles that minimise the usage of water in installed systems /components
 - materials that can be readily recycled
 - ensuring that installed systems/components are correctly commissioned
 - ensuring that customers are informed on key operating requirements.

Level: 3
Credit value: 23
URN: D/502/8486

Unit aim

This unit is part of a defined combination of units, to enable learners to demonstrate whole job competence.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **fifteen** learning outcomes to this unit. The learner will:

1. Be able to demonstrate the use of common tools used in the gas utilisation industry
2. Be able to identify the range and capacities of domestic gas meters
3. Be able to identify the specification, for domestic gas meters housings
4. Be able to identify the requirements for emergency control and bypass valves on domestic gas meters installations
5. Be able to specify, install and commission natural gas domestic meters and regulators
6. Be able to identify and complete the documentation required when installing and commissioning natural gas domestic meters and regulators
7. Be able to demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found
8. Know the construction and operation of chimneys used for domestic gas appliances
9. Be able to demonstrate how to carry out chimney performance checks
10. Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation
11. Be able to demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation
12. Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities
13. Be able to demonstrate the safe use of steps and ladders used in domestic gas utilisation activities
14. Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities
15. Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments

Guided learning hours

It is recommended that **60** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation. This unit incorporates the 'matters of gas safety' Competence Criteria for Gas Safe Registration : CCN1

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 306

Specific core metering

Outcome 1

Be able to demonstrate the use of common tools used in the gas utilisation industry

Assessment Criteria

The learner can:

- 1.1 demonstrate the correct and safe use of tools for drilling, securing and cutting brick, concrete, block, studded, timber framed and dry lined walls:
 - basic hand tools
 - battery operated tools
 - RCD adaptors
 - power tools including visual inspection of drills, circular saws and jig saws
 - visual inspections of tools including checking the condition of flexes cables and plugs
 - checking that PAT Certificates are in date
- 1.2 demonstrate the correct use of tools for measuring, cutting, securing and jointing pipework and other materials used in gas installation activities:
 - measuring devices
 - cutting devices and saws
 - metallic and non metallic pipes
 - soldered joints
 - screwed joints
 - compression joints
- 1.3 demonstrate the correct and safe use of the following tools used to test systems:
 - pressure gauges
 - voltage indicators
 - continuity testers
 - electrical multi-meters
 - plug in socket testers
 - electrical proving units
 - thermometers
- 1.4 make good materials and surfaces to include brick, concrete, block, studded, timber framed, tiled and dry lined.

Unit 306

Specific core metering

Outcome 2

Be able to identify the range and capacities of domestic gas meters

Assessment Criteria

The learner can:

- 2.1 identify domestic gas meter types:
 - diaphragm
 - pre-payment (coin and token operated)
 - smart meters
 - electronic
 - positive displacement
- 2.2 calculate the gas flow rate requirements for a range of natural gas installations and select the correct meter size:
 - meter construction
 - capacities, sizing and selection of meters
 - calculation of gas flow rate requirements
- 2.3 identify the key components and features of domestic gas meters:
 - coin operated
 - electronic token operated
 - associated faults
- 2.4 explain the features of Smart meters:
 - types
 - communication methods
 - customer display devices
- 2.5 describe the procedures to deal with potential theft of gas:
 - common methods used
 - signs to look for to detect theft
 - reporting procedures.

Unit 306

Specific core metering

Outcome 3

Be able to identify the specification, for domestic gas meters housings

Assessment Criteria

The learner can:

- 3.1 identify correct and incorrect installations of domestic meters in meter housings and compartments:
 - surface mounted meter boxes
 - semi-concealed meter boxes
 - built-in meter boxes
 - purpose built meter housings
 - medium pressure installations
 - ventilation requirements
- 3.2 complete and position meter housing and compartment labels including low and medium pressure installations
- 3.3 identify the correct specification, location and installation of medium pressure installations in meter housings and compartments:
 - proximity distances for meter boxes and vent discharge.

Unit 306

Specific core metering

Outcome 4

Be able to identify the requirements for emergency control and bypass valves on domestic gas meters installations

Assessment Criteria

The learner can:

4.1 identify correct and incorrect installation and positioning of:

- emergency control valve (ECV)
- additional emergency control valve (AECV)
- meter bypass valves
- isolation valves.

Unit 306

Specific core metering

Outcome 5

Be able to specify, install and commission natural gas domestic meters and regulators

Assessment Criteria

The learner can:

- 5.1 identify both correct and incorrect domestic gas meter Installations:
 - primary meters
 - secondary meters
 - types of low and medium pressure regulators
 - multiple occupancy Installations
 - interrelation of meter installations with other services
 - locations inside and outside for domestic natural gas meter installations
 - multiple occupancy installations
 - meter locations in building escape routes
 - interrelation of meter installations with other services
 - handling and care of meters and regulators
 - protection against mechanical damage
 - materials, pipework and fittings
 - connections and Jointing
 - securing and supporting meters and regulators
 - non-return valves
 - pressure test points
- 5.2 install simple U6/E6/G4 domestic gas meters to include a low pressure and medium pressure supply installations:
 - select correct materials and fittings
 - demonstrate the correct method of jointing materials and fittings
 - demonstrate the correct method of securing and supporting domestic meters and regulators
- 5.3 demonstrate the routines and sequences for commissioning domestic gas meters, regulators and components:
 - tightness testing on low and medium pressure supply meters/installations
 - setting/checking low pressure regulators
 - setting/checking medium pressure regulators – excess flow and pressure
 - purging
- 5.4 identify factors affecting pressure loss on Installations through pressure absorption
- 5.5 demonstrate the correct method of removal of domestic meters and:
 - permanent removal
 - temporary removal
 - equipotential bonding requirements during and after temporary/permanent removal
- 5.6 identify correct and incorrect main equipotential bonding connections:
 - method of bonding connection
 - positioning of bond

- sizing of bond

5.7 state the installation requirements for existing meters located in building escape routes.

Unit 306

Specific core metering

Outcome 6

Be able to identify and complete the documentation required when installing and commissioning natural gas domestic meters and regulators

Assessment Criteria

The learner can:

- 6.1 demonstrate the correct Identification, location and completion of the range of documentation, labels and forms associated with domestic meter installation and commissioning:
 - primary and secondary meter labels
 - gas emergency notice
 - secondary meter label
 - medium pressure labels and notices
 - installation notice
 - exchange meter labels
 - Additional Emergency Control Valve (AECV)
 - un-commissioned appliance label
 - live gas notices and labels
 - ON/OFF tape and labelling
 - pressure test record
 - bypass and valve(s) label
 - gas identification tape and labels
 - electrical bonding label
- 6.2 specify and complete labels, installation and commissioning documentation and records to be left with the property occupier.

Unit 306

Specific core metering

Outcome 7

Be able to demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found

Assessment Criteria

The learner can:

- 7.1 safely diagnose correct, unsafe or ineffective operation of:
 - flame protection devices, to include:
 - vapour pressure
 - thermoelectric
 - flame rectification
 - flame conduction
 - controls to include:
 - pressure regulators
 - thermal cut off
 - gas cocks/valves
 - cooker hotplate lid control
 - electric solenoid valve
 - excess flow valves
 - thermoelectric valve
 - multifunction control
- 7.2 demonstrate actions to be taken when defective or unsafe control operation is identified.

Unit 306

Specific core metering

Outcome 8

Know the construction and operation of chimneys used for domestic gas appliances

Assessment Criteria

The learner can:

- 8.1 classify gas appliances according to their chimney types:
- flueless
 - open chimney
 - room sealed chimney.

Unit 306

Specific core metering

Outcome 9

Be able to demonstrate how to carry out chimney performance checks

Assessment Criteria

The learner can:

- 9.1 carry out checks on open chimney systems:
 - visual checks throughout the length
 - confirmation of correct type
 - adequate cross sectional area
 - catchment space measurement
 - chimney flow test
 - chimney spillage test
- 9.2 carry out checks on room sealed chimney systems, to include:
 - confirmation of correct type and installation
 - correct terminal location and protection
 - testing operation to include case seal integrity for positive and negative appliance designs.

Unit 306

Specific core metering

Outcome 10

Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation

Assessment Criteria

The learner can:

- 10.1 select and attach appropriate labels applicable to domestic gas work:
- un-commissioned appliance label.

Unit 306

Specific core metering

Outcome 11

Be able to demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation

Assessment Criteria

The learner can:

- 11.1 demonstrate the safe isolation of electrical supplies connected to gas appliances or controls
- 11.2 differentiate between main and supplementary electrical bonding connections:
 - confirmation of safety – absence of electricity
- 11.3 identify electrical faults and defects on domestic gas installations, initiating actions as required, to include:
 - inadequate earthing provision
 - clearances from other services.

Unit 306

Specific core metering

Outcome 12

Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities

Assessment Criteria

The learner can:

- 12.1 risk assess the work site and work activities to be undertaken
- 12.2 assess loads to be handled and moved:
 - size of loads
 - weight of loads
 - shape of loads
 - configuration of loads
 - need for assistance
- 12.3 prepare to lift and handle loads:
 - using correct PPE
 - communication to others
 - ensuring a clear path
- 12.4 lift and move loads in accordance with best practice and safe systems of work:
 - correct kinetic techniques
 - assisted lift needing two people
 - simple mechanical lifting device.

Unit 306

Specific core metering

Outcome 13

Be able to demonstrate the safe use of steps and ladders used in domestic gas utilisation activities

Assessment Criteria

The learner can:

- 13.1 risk assess the work site and work activities to be undertaken
- 13.2 prepare the site location where steps and /or ladders need to be used
- 13.3 inspect ladders and steps for defects
- 13.4 position and erect steps and ladders in accordance with Regulations and safe working practice
- 13.5 secure ladders by approved methods to ensure no slippage or movement may occur during use
- 13.6 use steps and ladders for work activities in accordance with Regulations and safe working practice.

Unit 306

Specific core metering

Outcome 14

Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities

Assessment Criteria

The learner can:

14.1 select PPE needed for specific activities:

- gloves
- protective foot ware
- eye protectors
- ear protection
- high visibility clothing
- knee protectors
- dust masks

14.2 carry out gas installation or maintenance work wearing PPE as determined by each specific task.

Unit 306

Specific core metering

Outcome 15

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

Assessment Criteria

The learner can:

- 15.1 calculate the correct ventilation requirements for a range of domestic appliance installations in accordance with BS5440:
 - open chimney appliances
 - flueless appliances
 - appliances in compartments
 - multiple appliance installations
 - ventilation pathways via other rooms
- 15.2 specify ventilation vents/grills and methods
- 15.3 measure existing vents and grilles to ensure that they are the correct type and provide the correct supply of air.

Level: 3
Credit value: 45
URN: K/502/8488

Unit aim

This unit is part of a defined combination of units, to enable learners to demonstrate whole job competence, also facilitating Gas Safe Registration.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **twenty six** learning outcomes to this unit. The learner will:

1. Be able to identify the gas industry legislation that applies to Emergency First Call Operatives (FCO)
2. Be able to identify and use the specific tools associated with FCO working
3. Know the purpose and operation of typical gas controls
4. Be able to demonstrate exchanging meter controls and gas isolation valves
5. Know how the control of pressure and gas flow is achieved
6. Be able to identify, exchange and commission Industrial and Commercial regulators
7. Be able to identify meter housings and compartments for Industrial and Commercial applications
8. Know the installation requirements for Industrial and Commercial natural gas meter installations
9. Be able to identify Industrial and Commercial natural gas meter installation
10. Know pipework materials and types of fittings that may be used for gas installations
11. Be able to test for tightness and purge installations in accordance with industry standards and procedures
12. Be able to apply the procedures and methods for dealing with gas emergencies and incidents
13. Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation
14. Be able to identify and demonstrate the electrical safety checks required when working on gas systems
15. Be able to carry out the ESP/FCO activities and actions when dealing with reported LPG emergencies
16. Be able to demonstrate domestic gas appliance installation
17. Be able to demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found
18. Know the construction and operation of chimneys used for domestic gas appliances
19. Be able to demonstrate how to carry out chimney performance checks
20. Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with FCO activities

21. Be able to demonstrate the safe use of steps and ladders and working platforms used in gas FCO activities
22. Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for FCO activities
23. Be able to install and commission a small domestic gas installation
24. Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments
25. Be able to calculate the requirements for permanent ventilation and fresh air in commercial and industrial gas installation environments

Guided learning hours

It is recommended that **60** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation. This unit incorporates the 'matters of gas safety' Competence Criteria for Gas Safe Registration: CCN1

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 307

Specific core emergency

Outcome 1

Be able to demonstrate the use of common tools used in the gas utilisation industry

Assessment Criteria

The learner can:

- 1.1 demonstrate the correct and safe use of tools for drilling, securing and cutting brick, concrete, block, studded, timber framed and dry lined walls:
 - basic hand tools
 - battery operated tools
 - RCD adaptors
 - power tools including visual inspection of drills, circular saws and jig saws
 - visual inspections of tools including checking the condition of flexes cables and plugs
 - checking that PAT certificates are in date
- 1.2 demonstrate the correct use of tools for measuring, cutting, securing and jointing pipework and other materials used in gas installation activities:
 - measuring devices
 - cutting devices and saws
 - metallic and non metallic pipes
 - soldered joints
 - screwed joints
 - compression joints
- 1.3 demonstrate the correct and safe use of the following tools used to test systems:
 - pressure gauges
 - voltage indicators
 - continuity testers
 - electrical multi-meters
 - plug in socket testers
 - electrical proving units
 - thermometers
- 1.4 make good materials and surfaces to include brick, concrete, block, studded, timber framed, tiled and dry lined.

Unit 307

Specific core emergency

Outcome 2

Be able to identify the gas industry legislation that applies to Emergency First Call Operatives (FCO)

Assessment Criteria

The learner can:

- 2.1 state the key features/requirements of regulations applicable to emergency working:
 - Gas Safety (Installation and Use) Regulations
 - Building Regulations
 - Gas Safety (Rights of Entry) Regulations
 - New Roads and Street Works Act
- 2.2 describe how to access ESP policy and procedure documents and outline the key points of the documents.

Unit 307

Specific core emergency

Outcome 3

Identify and use the specific tools associated with FCO working

Assessment Criteria

The learner can:

- 3.1 demonstrate the correct and safe use of specific tools associated with emergency operations:
- gas detection equipment
 - bar holing equipment
 - service entry isolation equipment
 - emergency control valve exchange equipment.

Unit 307

Specific core emergency

Outcome 4

Know the purpose and operation of typical gas controls

Assessment Criteria

The learner can:

- 4.1 describe the purpose and operation gas safety controls and safety devices:
 - Safety Shut Off Valves (SSOV)
 - modulating gas valves
 - zero governor
 - flame protection devices including air pressure switches and UV cells
 - thermostats
- 4.2 describe the correct operation of automatic electric isolation valves (interlocks).

Unit 307

Specific core emergency

Outcome 5

Be able to demonstrate exchanging meter controls and gas isolation valves

Assessment Criteria

The learner can:

- 5.1 identify both correct and incorrect installation and positioning of Industrial and commercial emergency control valves, including additional valves (AECV)
- 5.2 identify both correct and incorrect installation and positioning of industrial and commercial meter inlet valves
- 5.3 identify both correct and incorrect installation and positioning of industrial and commercial meter bypass valves
- 5.4 demonstrate the correct method of exchanging or replacing meter control valves (ECV and MIV).

Unit 307

Specific core emergency

Outcome 6

Know how the control of pressure and gas flow is achieved

Assessment Criteria

The learner can:

- 6.1 describe the types of industrial and commercial pressure regulators for both low and medium pressure
- 6.2 explain the requirements for the installation and positioning of industrial and commercial natural gas meter regulators (IGE/GM/6) and (IGE/GM/8) connected to:
 - low pressure
 - medium pressure
- 6.3 state the routines and sequences for commissioning industrial and commercial gas meter regulators
- 6.4 describe the factors affecting pressure loss:
 - incorrect pipe sizing
 - blockages and restrictions
 - number of fittings.

Unit 307

Specific core emergency

Outcome 7

Be able to identify, exchange and commission industrial and commercial regulators

Assessment Criteria

The learner can:

- 7.1 identify low and medium pressure industrial and commercial regulators
- 7.2 demonstrate the correct commissioning methods of industrial and commercial low pressure regulators
- 7.3 demonstrate the correct commissioning methods of industrial and commercial medium pressure regulators
- 7.4 demonstrate the correct method of exchanging or replacing industrial and commercial low pressure regulators
- 7.5 demonstrate the correct method of exchanging or replacing industrial and commercial medium pressure regulators
- 7.6 demonstrate the correct method of locating blockages and restrictions in installation pipework.

Unit 307

Specific core emergency

Outcome 8

Be able to identify meter housings and compartments for industrial and commercial applications

Assessment Criteria

The learner can:

- 8.1 identify the types of meter housing or compartment suitable for industrial and commercial use:
 - purpose built meter housings
 - medium pressure installations
- 8.2 identify correct and incorrect Installations of gas meter housings and compartments suitable for industrial and commercial use for both low and medium pressures.

Unit 307

Specific core emergency

Outcome 9

Know the installation requirements for industrial and commercial natural gas meter installations

Assessment Criteria

The learner can:

- 9.1 identify 'To Industry Standards' and 'Not to Industry Standards' industrial and commercial gas meter installations:
- installation and positioning of industrial and commercial natural gas meters (IGE/GM/6) and (IGE/GM/8)
 - primary meters
 - secondary meters
 - remote meter installations
 - securing and supporting industrial and commercial meters
 - materials, pipework and fittings required for industrial and commercial gas meter installations
 - connections and jointing
 - meter bypasses and valves
 - purge and vent points.

Unit 307

Specific core emergency

Outcome 10

Be able to identify industrial and commercial natural gas meter installation

Assessment Criteria

The learner can:

- 10.1 identify materials and fittings suitable for carrying gas in accordance with IGE/UP/2
- 10.2 identify the correct jointing of materials and fittings suitable for carrying gas in accordance with IGE/UP/2
- 10.3 identify the correct method of pipework protection against corrosion and damage
- 10.4 identify and describe the correct operation of a gas proving device
- 10.5 identify and describe the correct operation of a gas booster, compressor and a pre-mix machine
- 10.6 identify correct and incorrect types of catering flexible connection in accordance with BS6173
- 10.7 identify correct and incorrect labels for pipework and components in accordance with IGE/UP/2
- 10.8 trace pipework using a variety of gas supply line diagrams.

Unit 307

Specific core emergency

Outcome 11

Know pipework materials and types of fittings that may be used for gas installations

Assessment Criteria

The learner can:

- 11.1 describe the range of pipework fittings and materials suitable /unsuitable for gas mains and service pipework:
 - steel
 - plastic
 - PE pipe
 - lead
 - flexible connections
- 11.2 describe the correct jointing methods of materials and fittings suitable for gas mains and service pipework
- 11.3 describe the correct methods of protecting mains and service pipework against corrosion and damage
- 11.4 explain the types and purpose of identification labels for pipework and components.

Unit 307

Specific core emergency

Outcome 12

Be able to test for tightness and purge installations in accordance with industry standards and procedures

Assessment Criteria

The learner can:

- 12.1 survey and calculate the volume of installations to establish the correct tightness testing and purging method, in accordance with:
 - IGE/UP/1
 - IGE/UP/1A
 - IGE/UP/1B
- 12.2 demonstrate basic tightness testing on new and existing Installations to IGE/UP/1B
- 12.3 demonstrate purging of gas supplies on new and existing Installations to IGE/UP/1B.

Unit 307

Specific core emergency

Outcome 13

Be able to apply the procedures and methods for dealing with gas emergencies and incidents

Assessment Criteria

The learner can:

- 13.1 demonstrate the correct procedure when dealing with public reported gas escapes:
 - safeguarding life and property
 - evacuation criteria
 - domestic and commercial building design that may lead to gas concentrations
 - forced entry criteria
 - service entry checking
 - isolation of supplies and sources of ignition
- 13.2 demonstrate the correct method of tracing and repairing gas escapes on internal pipework using a range of gas leak detection methods and equipment:
 - leak detection fluid
 - gas detection equipment
 - section isolation
- 13.3 demonstrate the correct method of tracing and repairing gas escape(s) externally using a range of gas leak detection methods and equipment:
 - leak detection fluid
 - gas detection equipment
 - section isolation
- 13.4 demonstrate the correct application of the NRSWA requirements for signing, lighting and guarding
- 13.5 identify the process and criteria for gas escape programming
- 13.6 interpret gas detector readings correctly and take the appropriate action required
- 13.7 demonstrate the correct method and procedure for tracing and avoiding underground plant
- 13.8 demonstrate the correct method and procedure of bar holing when tracing escape(s) externally
- 13.9 demonstrate the correct procedures and communication techniques when attending a gas incident/emergency involving other co workers and Emergency services
- 13.10 identify types of typical requests for emergency attendance:
 - no gas
 - fluctuating supplies
 - poor supply pressure - water ingress, rust, undersized pipework
 - regulator blockage
 - NORM.

Unit 307

Specific core emergency

Outcome 14

Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation

Assessment Criteria

The learner can:

- 14.1 demonstrate the correct identification and completion of:
 - landlord / home owner gas safety record
 - gas safety inspection form
 - benchmark maintenance report
 - service / maintenance checklist(s)
 - chimney / hearth notice plate
- 14.2 select and attach appropriate labels applicable to domestic gas work:
 - un-commissioned appliance label
 - balanced compartment label.

Unit 307

Specific core emergency

Outcome 15

Be able to identify and demonstrate the electrical safety checks required when working on gas systems

Assessment Criteria

The learner can:

- 15.1 carry out electrical safety checks when working on gas systems:
 - visual inspection
 - earth bonding checks
 - the use of temporary earth continuity bonding
- 15.2 confirm electrical safety and the absence of electricity using the appropriate testing device(s)
- 15.3 demonstrate the correct use of a temporary earth continuity bond
- 15.4 demonstrate the safe isolation of electrical supplies connected to gas appliances or controls
- 15.5 explain the differences between main and supplementary electrical bonding connections
- 15.6 demonstrate, using a voltage indicating device, confirmation of safety – absence of electricity.

Unit 307

Specific core emergency

Outcome 16

Be able to carry out the ESP/FCO activities and actions when dealing with reported LPG emergencies

Assessment Criteria

The learner can:

- 16.1 demonstrate ESP/FCO roles and responsibilities when called to LPG escapes:
- 16.2 identify LPG installations and components:
 - the supply of LPG
 - tanks/storage vessel installations
 - LPG networks
 - meters
 - pressure regulators
 - changeover valves
 - pressure relief valves
 - mobile LPG heaters (cabinet heaters)
 - flexible connection and hose requirements
- 16.3 identify the characteristics and properties of LPG:
 - vapour pressures
 - specific gravity
 - limits of flammability
- 16.4 describe the correct method of testing for LPG tightness in accordance with industry standards:
 - domestic installations
 - leisure accommodation installations
 - small commercial installations
- 16.5 explain the methods of tracing and repairing gas escape(s) on internal and external LPG installations using a range of gas leak detection methods:
 - leak detection fluid
 - gascoseeker
 - section isolation
- 16.6 describe the correct purging procedures of LPG gas supplies for new and existing installations in accordance with industry standards
- 16.7 identify correct and incorrect types of LPG flexible connection in accordance with industry standards.

Unit 307

Specific core emergency

Outcome 17

Be able to demonstrate domestic gas appliance installation

Assessment Criteria

The learner can:

- 17.1 explain the correct procedure for the installation and commissioning of domestic gas appliances:
 - fires and space heaters
 - cookers
 - water heaters
 - central heating appliances
 - warm air units
- 17.2 demonstrate the correct method of installing and commissioning a range of domestic gas appliances:
 - fires and space heaters
 - cookers
 - water heaters
 - central heating appliances
 - warm air units
- 17.3 demonstrate the correct methods of plaster and cement patching and making good.

Unit 307

Specific core emergency

Outcome 18

Demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found

Assessment Criteria

The learner can:

- 18.1 safely diagnose correct, unsafe or ineffective operation of:
- flame protection devices
 - 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:
 - bi metallic
 - liquid expansion
 - vapour pressure
 - electrical thermostats
 - thermistors
- 18.2 demonstrate actions to be taken when defective or unsafe control operation is identified.

Unit 307

Specific core emergency

Outcome 19

Know the construction and operation of chimneys used for domestic gas appliances

Assessment Criteria

The learner can:

19.1 classify gas appliances according to their chimney types:

- flueless
- open chimney
- room sealed chimney.

Unit 307

Specific core emergency

Outcome 20

Be able to demonstrate how to carry out chimney performance checks

Assessment Criteria

The learner can:

20.1 carry out checks on open chimney systems:

- visual checks throughout the length
- confirmation of correct type
- adequate cross sectional area
- catchment space measurement
- chimney flow test
- chimney spillage test

20.2 carry out checks on room sealed chimney systems:

- confirmation of correct type and installation
- correct terminal location and protection
- testing operation to include case seal integrity for positive and negative appliance designs.

Unit 307

Specific core emergency

Outcome 21

Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with FCO activities

Assessment Criteria

The learner can:

21.1 risk assess the work site and work activities to be undertaken

21.2 assess loads to be handled and moved:

- size of loads
- weight of loads
- shape of loads
- configuration of loads
- need for assistance

21.3 prepare to lift and handle loads:

- using correct PPE
- communication to others
- ensuring a clear path

21.4 lift and move loads in accordance with best practice and safe systems of work:

- correct kinetic techniques
- assisted lift needing two people
- simple mechanical lifting device.

Unit 307

Specific core emergency

Outcome 22

Be able to demonstrate the safe use of steps and ladders and working platforms used in gas FCO activities

Assessment Criteria

The learner can:

- 22.1 risk assess the work site and work activities to be undertaken
- 22.2 prepare the site location where steps and /or ladders need to be used
- 22.3 inspect ladders and steps for defects
- 22.4 position and erect steps, ladders and platforms in accordance with regulations and safe working practice
- 22.5 secure ladders by approved methods to ensure no slippage or movement may occur during use
- 22.6 use steps and ladders for work activities in accordance with regulations and safe working practice.

Unit 307

Specific core emergency

Outcome 23

Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for FCO activities

Assessment Criteria

The learner can:

23.1 select PPE needed for specific activities:

- gloves
- protective foot ware
- eye protectors
- ear protection
- high visibility clothing
- flame retardant clothing
- knee protectors
- dust masks

23.2 carry out gas FCO work wearing PPE as determined by each specific task.

Unit 307

Specific core emergency

Outcome 24

Be able to install and commission a small domestic gas installation

Assessment Criteria

The learner can:

- 24.1 install a simple domestic gas meter, pipework and cooker installation:
 - selecting correct materials and fittings
 - demonstrate the correct method of jointing materials and fittings
 - demonstrate the correct method of installing securing and supporting domestic meters and regulators
 - demonstrate the correct method of installing the cooker
- 24.2 demonstrate tightness testing, purging and commissioning procedures including the procedure for resetting and sealing a regulator
- 24.3 demonstrate the correct method of removal of domestic meters and regulators:
 - permanent removal
 - temporary removal
- 24.4 identify correct and incorrect methods of connecting the main equipotential bonding
- 24.5 demonstrate action to meet the main equipotential bonding requirements for both permanent and temporary meter removal:
 - method of bonding connection
 - positioning of bond
 - sizing of bond.

Unit 307

Specific core emergency

Outcome 25

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

Assessment Criteria

The learner can:

- 25.1 calculate the correct ventilation requirements for a range of domestic appliance installations in accordance with BS5440:
 - open chimney appliances
 - flueless appliances
 - appliances in compartments
 - multiple appliance installations
 - ventilation pathways via other rooms
- 25.2 specify ventilation vents/grills and methods
- 25.3 measure existing vents and grilles to ensure that they are the correct type and provide the correct supply of air.

Unit 307

Specific core emergency

Outcome 26

Be able to calculate the requirements for permanent ventilation and fresh air in commercial and industrial gas installation environments

Assessment Criteria

The learner can:

- 26.1 calculate the correct ventilation requirements for a range of industrial and commercial appliances in accordance with IGE/UP/10
- 26.2 calculate the correct ventilation requirements for a variety of catering appliances in accordance with BS6173 and/or HSE Catering Sheet No.10
- 26.3 calculate the correct ventilation requirements for a variety of industrial and commercial gas meter housings and compartments.

Level: 3
Credit value: 21
URN: H/502/8487

Unit aim

This unit is part of a defined combination of units, to enable learners to demonstrate whole job competence, also facilitating Gas Safe Registration.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **twelve** learning outcomes to this unit. The learner will:

1. Be able to demonstrate the use of common tools used in the gas utilisation industry
2. Be able to demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found
3. Know the construction and operation of chimneys used for domestic gas appliances
4. Be able to demonstrate how to carry out chimney performance checks
5. Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation
6. Be able to demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation
7. Be able to demonstrate the correct use of combustion and atmosphere sampling analysers
8. Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities
9. Be able to demonstrate the safe use of steps and ladders used in domestic gas utilisation activities
10. Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities
11. Be able to install and commission a small domestic gas installation
12. Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments

Guided learning hours

It is recommended that **120** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation. This unit incorporates the 'matters of gas safety' Competence Criteria for Gas Safe Registration: CCN1, CPA1, CMDDA1

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 308

Specific core installation and maintenance

Outcome 1

Be able to demonstrate the use of common tools used in the gas utilisation industry

Assessment Criteria

The learner can:

- 1.1 demonstrate the correct and safe use of tools for drilling, securing and cutting brick, concrete, block, studded, timber framed and dry lined walls:
 - basic hand tools
 - battery operated tools
 - RCD adaptors
 - power tools including visual inspection of drills, circular saws and jig saws
 - visual inspections of tools including checking the condition of flexes cables and plugs
 - checking that PAT certificates are in date
- 1.2 demonstrate the correct use of tools for measuring, cutting, securing and jointing pipework and other materials used in gas installation activities:
 - measuring devices
 - cutting devices and saws
 - metallic and non metallic pipes
 - soldered joints
 - screwed joints
 - compression joints
- 1.3 demonstrate the correct and safe use of the following tools used to test systems:
 - pressure gauges
 - voltage indicators
 - continuity testers
 - electrical multi-meters
 - plug In socket testers
 - electrical proving units
 - thermometers
- 1.4 make good materials and surfaces to include brick, concrete, block, studded, timber framed, tiled and dry lined.

Unit 308

Specific core installation and maintenance

Outcome 2

Be able to demonstrate that gas safety controls are operating correctly and explain the actions required when unsafe or ineffective operation is found

Assessment Criteria

The learner can:

2.1 safely diagnose correct, unsafe or ineffective operation of:

- flame protection devices, to include:
 - o vapour pressure
 - o thermoelectric
 - o flame rectification
 - o flame conduction
- controls to include:
 - o atmosphere sensing device
 - o spillage detection device
 - o pressure regulators
 - o low pressure cut off
 - o thermal cut off
 - o gas cocks/valves
 - o cooker hotplate lid control
 - o electric solenoid valve
 - o excess flow valves
 - o thermoelectric valve
 - o interrupter devices
 - o multifunction control
- thermostats to include:
 - o bi metallic
 - o liquid expansion
 - o vapour pressure
 - o electrical thermostats
 - o thermistors

2.2 demonstrate actions to be taken when defective or unsafe control operation is identified.

Unit 308

Specific core installation and maintenance

Outcome 3

Know the construction and operation of chimneys used for domestic gas appliances

Assessment Criteria

The learner can:

- 3.1 classify gas appliances according to their chimney types:
- flueless
 - open chimney
 - room sealed chimney.

Unit 308

Specific core installation and maintenance

Outcome 4

Be able to demonstrate how to carry out chimney performance checks

Assessment Criteria

The learner can:

- 4.1 carry out checks on open chimney systems:
 - visual checks throughout the length
 - confirmation of correct type
 - adequate cross sectional area
 - catchment space measurement
 - chimney flow test
 - chimney spillage test
- 4.2 carry out checks on room sealed chimney systems:
 - confirmation of correct type and installation
 - correct terminal location and protection
 - testing operation to include case seal integrity for positive and negative appliance designs.

Unit 308

Specific core installation and maintenance

Outcome 5

Be able to identify and complete the correct notices, forms and labels used in domestic gas utilisation

Assessment Criteria

The learner can:

- 5.1 identify correct application and complete the following records, forms and labels:
 - landlord / home owner gas safety record
 - gas safety inspection form
 - benchmark maintenance report
 - service / maintenance checklist(s)
 - chimney / hearth notice plate
- 5.2 select and attach appropriate labels applicable to domestic gas work:
 - un-commissioned appliance label
 - balanced compartment label.

Unit 308

Specific core installation and maintenance

Outcome 6

Be able to demonstrate how to work correctly and safely with electrical systems and components used in domestic gas utilisation

Assessment Criteria

The learner can:

- 6.1 using Ohms law, calculate:
 - current and power
 - voltage
 - resistance
- 6.2 assemble simple series and parallel circuits
- 6.3 identify the type of electrical installation as:
 - TT
 - TN-S
 - TN-C-S
- 6.4 connect a domestic gas appliance to a fixed domestic electrical installation:
 - cable type and sizing calculation
 - fuse rating calculation
 - fused spur connection
 - wiring a three pin plug
- 6.5 safely carry out preliminary electrical safety checks:
 - earth continuity
 - polarity
 - short circuit
 - resistance to earth
 - RCD operation test
- 6.6 demonstrate the safe isolation of electrical supplies connected to gas appliances or controls
- 6.7 read and interpret appliance wiring diagrams to establish:
 - sequence of electrical operation
 - correct appliance and component wiring
- 6.8 differentiate between main and supplementary electrical bonding connections
- 6.9 demonstrate the procedure for safe electrical isolation:
 - use of locking devices
 - circuit protection device retention
 - voltage indicating device
 - use of proving unit
 - confirmation of safety – absence of electricity
- 6.10 identify electrical faults and defects on domestic gas installations, initiating actions as required:
 - inadequate earthing provision
 - incorrect cable types and position

- clearances from other services
- failed components
- incorrect polarity
- inadequate circuit protection conductors
- defective automatic disconnection device
- appliance connections

6.11 complete electrical installation certificate.

Unit 308

Specific core installation and maintenance

Outcome 7

Be able to demonstrate the correct use of combustion and atmosphere sampling analysers

Assessment Criteria

The learner can:

- 7.1 demonstrate the correct use of a combustion performance analysers and atmosphere sampling analysers interpreting:
 - CO, CO₂, O₂ readings, CO/CO₂ ratios in a flueway
 - CO, CO₂, O₂ readings in the atmosphere
 - visually and by the use of combustion performance analysis identify complete and incomplete combustion for type 'A', 'B' and 'C' gas appliances
- 7.2 complete the required checks using a combustion/atmosphere analyser in the event of 'carbon monoxide detector' activation.

Unit 308

Specific core installation and maintenance

Outcome 8

Be able to demonstrate safe lifting and handling techniques when moving equipment, materials and appliances associated with gas utilisation activities

Assessment Criteria

The learner can:

- 8.1 risk assess the work site and work activities to be undertaken
- 8.2 assess loads to be handled and moved, to include:
 - size of loads
 - weight of loads
 - shape of loads
 - configuration of loads
 - need for assistance
- 8.3 prepare to lift and handle loads, to include:
 - using correct PPE
 - communication to others
 - ensuring a clear path
- 8.4 lift and move loads in accordance with best practice and safe systems of work:
 - correct kinetic techniques
 - assisted lift needing two people
 - simple mechanical lifting device.

Unit 308

Specific core installation and maintenance

Outcome 9

Be able to demonstrate the safe use of steps and ladders used in domestic gas utilisation activities

Assessment Criteria

The learner can:

- 9.1 risk assess the work site and work activities to be undertaken
- 9.2 prepare the site location where steps and /or ladders need to be used
- 9.3 inspect ladders and steps for defects
- 9.4 position and erect steps and ladders in accordance with regulations and safe working practice
- 9.5 secure ladders by approved methods to ensure no slippage or movement may occur during use
- 9.6 use steps and ladders for work activities in accordance with regulations and safe working practice.

Unit 308

Specific core installation and maintenance

Outcome 10

Be able to demonstrate selection and use of correct Personal Protective Equipment (PPE) for domestic gas utilisation activities

Assessment Criteria

The learner can:

10.1 select PPE needed for specific activities:

- gloves
- protective foot ware
- eye protectors
- ear protection
- high visibility clothing
- knee protectors
- dust masks

10.2 carry out gas installation or maintenance work wearing PPE as determined by each specific task.

Unit 308	Specific core installation and maintenance
Outcome 11	Be able to install and commission a small domestic gas installation

Assessment Criteria

The learner can:

- 11.1 install a domestic gas meter, pipework and domestic appliance:
 - selecting correct materials and fittings
 - demonstrate the correct method of jointing materials and fittings
 - demonstrate the correct method of installing securing and supporting domestic meters and regulators
 - demonstrate the correct method of installing a domestic appliance
- 11.2 demonstrate tightness testing, purging and commissioning procedures including the procedure for resetting and sealing a regulator
- 11.3 carry out a gas rate check and confirm it complies with manufacturers instructions
- 11.4 demonstrate the correct method of removal of domestic meters and regulators:
 - permanent removal
 - temporary removal
- 11.5 identify correct and incorrect methods of connecting the main equipotential bonding
- 11.6 demonstrate action to meet the main equipotential bonding requirements for both permanent and temporary meter removal:
 - method of bonding connection
 - positioning of bond
 - sizing of bond.

Unit 308	Specific core installation and maintenance
Outcome 12	Be able to calculate the requirements for permanent ventilation in domestic gas utilisation environments

Assessment Criteria

The learner can:

- 12.1 calculate the correct ventilation requirements for a range of domestic appliance installations in accordance with BS5440:
 - open chimney appliances
 - flueless appliances
 - appliances in compartments
 - multiple appliance installations
 - ventilation pathways via other rooms
- 12.2 specify ventilation vents/grilles and methods
- 12.3 measure existing vents and grilles to ensure that they are the correct type and provide the correct supply of air.

Unit 309

Install domestic gas cookers, tumble dryers and leisure appliances

Level: 3
Credit value: 10
URN: Y/502/8292

Unit aim

The aim of the unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission gas cookers, tumble dryers and leisure appliances.

The scope of work covered by this Unit is from the appliance isolation valve to and including the appliance. Electrical connection (where necessary) will be made to an existing 13 amp 240 volt plug socket adjacent to the appliance

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing domestic gas cookers, tumble dryers and leisure appliances
2. Be able to plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances
3. Be able to de-commission domestic gas cookers, tumble dryers and leisure appliances
4. Be able to install, exchange, and remove domestic gas cookers, tumble dryers, and leisure appliances
5. Be able to pre-commission and commission domestic gas cookers, tumble dryers and leisure appliances
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install, commission and de-commission domestic gas cookers, tumble dryers and leisure appliances

Guided learning hours

It is recommended that **54** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.1 Install Gas Cookers, Tumbling Dryers and Leisure Appliances.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 309	Install domestic gas cookers, tumble dryers and leisure appliances
Outcome 1	Be able to design gas systems for installing domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams for any key structural features that could affect the installation
 - record details of any features that may affect the installation
- 1.4 check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - clearances
- 1.5 check that the availability of input services;
 - gas
 - electricity
 meet the appliance manufacturers' and industry standards' requirements for the pipework installation
- 1.6 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.7 prepare a range of design options to meet both customer and industry requirements
- 1.8 present design options to the customer using variety of media:
 - written
 - oral
 - drawings
- 1.9 consult with the customer and obtain agreement to the design option that best meets all the requirements.

Unit 309 Install domestic gas cookers, tumble dryers and leisure appliances

Outcome 2 Be able to plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 2.1 produce a risk assessment and method statement that incorporates:
 - safety provisions on the work site
 - access to the work site,
 - movement of people on site
 - movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for:
 - any pre-installation damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during:
 - de-commissioning
 - installation
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment are available as required and are fit for purpose needed for:
 - de-commissioning
 - installation
 - commissioning
- 2.7 check and confirm that the proposed siting of the gas supply meets the appliance manufacturers and industry standards requirements for:
 - location
 - siting
 - clearances
- 2.8 check and confirm that:
 - the gas supply,
 - electricity supply
 - the provision of ventilationmeets industry standards' requirements in relation to other services
- 2.9 confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services i.e. electricity supply
- 2.10 carry out checks and tests to confirm:
 - the gas supply
 - electricity supply

- meet the manufacturers' and industry requirements for the installation
- 2.11 calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across installation
- 2.12 check the existing installation for unsafe;
- appliances
 - system components
- 2.13 apply the gas industry unsafe situations procedures to any identified unsafe situations.

Unit 309	Install domestic gas cookers, tumble dryers and leisure appliances
Outcome 3	Be able to de-commission domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas supply
 - electricity supply
 is in a condition that enables safe appliance de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas and systems and components
- 3.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 3.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components
- 3.6 after permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas.

Unit 309 Install domestic gas cookers, tumble dryers and leisure appliances

Outcome 4 Be able to install, exchange, and remove domestic gas cookers, tumble dryers, and leisure appliances

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the manufacturers' installation requirements
- 4.2 install the appliance minimising damage to:
 - customer property
 - building features
- 4.3 use the correct tools and equipment for the installation
- 4.4 remove any existing gas and electricity system components required for the installation
- 4.5 fabricate gas and electricity system components required by the installation
- 4.6 position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 4.7 provide the required ventilation for the appliance Installation in accordance with manufacturers instructions
- 4.8 ensure existing gas system is clean and free of debris
- 4.9 connect the gas and electricity supply components to the appliance
- 4.10 use tightness testing and purging procedures to confirm the integrity of the installed appliance and gas system
- 4.11 use electrical testing procedures to confirm the integrity of the installed electrical system and appliance
- 4.12 carry out precautionary actions to prevent the unauthorised use of potentially unsafe gas appliances by following isolation procedures and use of warning notices.

Unit 309	Install domestic gas cookers, tumble dryers and leisure appliances
Outcome 5	Be able to pre-commission and commission domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 5.1 confirm that the complete appliance installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards
- 5.5 check and confirm the appliance:
 - operating pressure
 - heat input
 meet industry standards' and manufacturers' requirements
- 5.6 check the combustion performance visually
- 5.7 confirm the operation of the gas appliance and components to ensure they function safely and operate in accordance with manufacturers' instructions
- 5.8 confirm the electrical system and components function safely and operate in accordance with the manufacturers' instructions
- 5.9 instruct the customer on the correct:
 - operation of the appliance
 - gas system
 provide the customer with a copy of the appliance user instructions.

Unit 309 Install domestic gas cookers, tumble dryers and leisure appliances

Outcome 6 Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during the:
 - planning
 - de- commissioning
 - installation
 - commissioningprocesses to minimise disturbance to the job
- 6.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructionsfor the appliance to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 identify and advise persons that need to be informed of any unsafe situations and actions required to remedy those situations
- 6.6 complete documentation to confirm the safe commissioning of the gas appliance and components
- 6.7 complete gas appliance and system de-commissioning records
- 6.8 submit details of installation and exchange appliance(s) to a gas work notification scheme

Unit 309

Install domestic gas cookers, tumble dryers and leisure appliances

Outcome 7

Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 report deficiencies in:
 - gas supply services
 - electricity supply services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal:
 - gas appliance
 - gas supply
 - component defects
- 7.3 resolve problems in accordance with approved procedures when:
 - gas appliances
 - gas systems
 - componentsbeing commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the:
 - gas appliance
 - gas system
 - componentcannot be restored to full performance.

Unit 309 Install domestic gas cookers, tumble dryers and leisure appliances

Outcome 8 Know how to install, commission and de-commission domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

Legislative and safety knowledge:

- 8.1 interpret regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 interpret legislation covering the general responsibilities of the installer for their own safety and that of others:
 - the Gas Safety (Installation and Use) Regulations 1998 and associated Approved Code of Practice Guidance
 - o Regulation 26 - Gas appliances
 - o Regulation 28 - Access
 - o Regulation 29 – Manufacturer’s instructions
 - o Regulation 33 – Testing of appliances
 - o Regulation 34 – Use of appliances

The learner can:

Installing, commissioning and de-commissioning cookers, tumble dryers and leisure appliances knowledge:

- 8.3 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.4 explain safe access and working at heights
- 8.5 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.6 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.7 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.8 state the tools, equipment, materials and components required for the gas appliance and gas system de-commission, installation and commission – ordering, supplying, advising, checking and delivery procedures
- 8.9 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.10 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.11 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.12 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and

- manufacturers' instructions applicable to the appliance, to ensure the work is done to the specification and industry standards
- 8.13 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
 - 8.14 describe how to measure and record installation and site details for prefabrication purposes
 - 8.15 describe how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for installation of the new gas appliance, gas system and components
 - 8.16 describe how confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for extending the system
 - 8.17 state isolation methods, tests, and procedures to de-commission gas and electricity systems or components
 - 8.18 state procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds
 - 8.19 explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
 - 8.20 describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
 - 8.21 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
 - 8.22 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
 - 8.23 state the industry practices and work standards for fabricating and installing domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
 - 8.24 state the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
 - 8.25 state the procedures and work methods of connecting domestic gas cookers, tumble dryers, leisure appliances and components to both new and existing gas, electric, ventilation and chimney systems
 - 8.26 state the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
 - 8.27 describe the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning i.e. preliminary electrical safety checks
 - 8.28 describe the routines and sequences for commissioning domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards
 - 8.29 explain the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components and checking against the design specification
 - 8.30 explain the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to ensure safe functioning
 - 8.31 explain the procedures for checking and confirming the gas system operating pressures
 - 8.32 explain the procedures for checking and confirming the appliance operating pressure and the heat input

- 8.33 describe the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance
- 8.34 describe the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 8.35 describe the tests and checks to confirm the suitability and performance of the ventilation system
- 8.36 explain how to complete all installation and commissioning documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, chimney/hearth notice plate, etc.
- 8.37 describe the measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 8.38 explain the system handover procedures and demonstrating the operation of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to end users
- 8.39 summarise the steps to take when problems arise in the work activities
- 8.40 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.41 describe how to safely collect and dispose of system contents that may be hazardous to health or the environment i.e. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances etc.
- 8.42 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations, etc.
- 8.43 explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 310

Maintain domestic gas cookers, tumble dryers and leisure appliances

Level: 3
Credit value: 13
URN: L/502/8452

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to maintain domestic gas cookers, tumble driers and leisure appliances.

The scope of work covered by this unit is the maintenance, commission and decommission of gas cookers, tumble dryers and leisure appliances up to and including the appliance isolation (service) point supplied with 2nd or 3rd family gases.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to plan and prepare work activities for maintaining domestic gas cookers, tumble dryers and leisure appliances
2. Be able to de-commission domestic gas cookers, tumble dryers and leisure appliances to industry standards
3. Be able to maintain domestic gas cookers, tumble dryers, and leisure appliances to industry standards
4. Be able to pre-commission and Commission domestic gas cookers, tumble dryers and leisure appliances to industry standards
5. Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work
6. Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process
7. Know how to maintain domestic gas cookers, tumble dryers and leisure appliances

Guided learning hours

It is recommended that **54** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.2 Maintain Gas Cookers, Tumble Dryers and Leisure Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills.

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 310 Maintain domestic gas cookers, tumble dryers and leisure appliances

Outcome 1 Be able to plan and prepare work activities for maintaining domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 1.1 produce a risk assessment and method statement that incorporates:
 - safety provisions on the work site,
 - access to the work site,
 - movement of people on the site,
 - movement and safe storage of materials, tools and equipment for the job
- 1.2 survey the work site for:
 - any pre-maintenance damage
 - defects to existing building featuresand record it
- 1.3 advise the property occupier of any defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and maintenance process
- 1.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 check and confirm all materials, tools and equipment necessary for the de-commissioning, maintenance and commissioning process are available as required and are fit for purpose
- 1.7 check and confirm that the siting of the appliance meets the manufacturers' and industry standards' requirements for:
 - location,
 - siting and clearances
- 1.8 confirm that the:
 - gas supply
 - electricity supply
 - ventilation and where required
 - chimney / flue suitability (where necessary)meet the appliance manufacturers' and industry standards' requirements for the installation
- 1.9 carry out all necessary checks and tests to confirm the:
 - gas supply
 - electricity supply
 - chimney / flue system (where required)meet the manufacturers' and industry requirements for the installation
- 1.10 check existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required.

Unit 310	Maintain domestic gas cookers, tumble dryers and leisure appliances
Outcome 2	Be able to de-commission domestic gas cookers, tumble dryers and leisure appliances to industry standards

Assessment Criteria

The learner can:

- 2.1 check that conditions within the:
 - gas
 - electricity
 systems will permit safe de-commissioning
- 2.2 use the correct tools and equipment for de-commissioning activities
- 2.3 use designated:
 - safe isolation methods
 - tests
 - procedures
 to de-commission gas and electricity systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 2.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components
 as required.

Unit 310	Maintain domestic gas cookers, tumble dryers and leisure appliances
Outcome 3	Be able to maintain domestic gas cookers, tumble dryers, and leisure appliances to industry standards

Assessment Criteria

The learner can:

- 3.1 carry out preparatory work to meet the maintenance requirements
- 3.2 remove existing gas and electricity system components as required by the maintenance activities
- 3.3 carry out the maintenance process in accordance with:
 - manufacturers' specification
 - industry standards
- 3.4 carry out the maintenance process minimising damage to
 - customer property
 - building features
- 3.5 use the correct tools and equipment for maintenance work activities
- 3.6 re-position the appliance and confirm it meets the:
 - location
 - siting
 - clearances
 required by the manufacturers' and industry standards' specification
- 3.7 check existing ventilation for appliances and system meets industry requirements for the installation
- 3.8 ensure existing gas systems are clean and free of debris
- 3.9 re-connect
 - gas
 - electricity
 system components to the appliance
- 3.10 use tightness testing and purging procedures to confirm the integrity of the re-connected gas system and appliance
- 3.11 use electrical testing procedures to confirm the integrity of the re-installed electrical system and appliance
- 3.12 use industry standard checks and testing procedures to confirm the integrity of the existing chimney system and appliance flue seals where required.

Unit 310 Maintain domestic gas cookers, tumble dryers and leisure appliances

Outcome 4 Be able to pre-commission and commission domestic gas cookers, tumble dryers and leisure appliances to industry standards

Assessment Criteria

The learner can:

- 4.1 confirm the complete appliance installation complies with:
 - the manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations,
 - British Standards and Building Regulations
- 4.2 check that conditions within the:
 - gas
 - electricitysystems will permit safe commissioning
- 4.3 use the correct tools and equipment for commissioning activities
- 4.4 check that the gas system operating pressures meet industry standards
- 4.5 check the appliance in accordance with industry standards' and manufacturers' requirements for:
 - operating pressure
 - heat input
- 4.6 check the combustion performance as required:
 - visually
 - by flue gas analysis
- 4.7 test chimney performance and reconfirm it performs according to (where required):
 - manufacturers' instructions
 - industry standards
- 4.8 check that the ventilation requirements meet current industry standards for the installation
- 4.9 check the operation of the:
 - gas appliance,
 - gas system
 - gas componentsto ensure they function safely and operate in accordance with manufacturers' instructions
- 4.10 check the:
 - electrical system
 - electrical componentsfunction safely and operate in accordance with the manufacturers' instructions
- 4.11 explain to the property occupier the correct operation of the:
 - appliance

- gas system
- and provide them with their copy of the appliance literature
- 4.12 take precautionary actions by isolation procedures and use of warning notices to prevent the unauthorised use of un-commissioned:
- gas appliances
 - gas systems
 - electrical systems
 - components.

Unit 310 Maintain domestic gas cookers, tumble dryers and leisure appliances

Outcome 5 Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work

Assessment Criteria

The learner can:

- 5.1 liaise with the property occupier and other people who will be affected by the work in order to minimise disturbance to the job during:
 - the planning
 - de-commissioning
 - installation commissioning processes
- 5.2 use normative documents, such as:
 - industry standards
 - British Standards
 - manufacturers' instructions for the appliance to ensure the work is done to specification
- 5.3 advise of any delays to the work to any persons who are affected by the delay
- 5.4 report any delays in the work schedules to the job supervisor
- 5.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 5.6 check that the customer is satisfied with the finished job
- 5.7 complete records and documentation confirming the safe maintenance of:
 - gas appliances
 - systems
 - components
- 5.8 complete commissioning and de-commissioning records for:
 - gas appliance
 - gas system as requiredand ensure they are stored securely.

Unit 310	Maintain domestic gas cookers, tumble dryers and leisure appliances
Outcome 6	Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process

Assessment Criteria

The learner can:

- 6.1 rectify and report deficiencies in gas and electric input services
- 6.2 resolve problems in accordance with approved procedures where pre-maintenance checks and tests reveal gas appliance, gas system or component defects.

Unit 310	Maintain domestic gas cookers, tumble dryers and leisure appliances
Outcome 7	Know how to maintain domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 7.1 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic maintenance process
- 7.2 explain safe access and working at heights procedures
- 7.3 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 7.4 describe the methods of working which protect the building décor, customer property and existing systems and components
- 7.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 7.6 state the tools, equipment, materials and components required for the gas system de-commission, maintenance and commission – ordering, supplying, advising, checking and delivery procedures
- 7.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 7.8 describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
- 7.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, maintenance and commissioning activity
- 7.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 7.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 7.12 describe how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for existing gas appliances, systems, or components
- 7.13 state safe isolation methods, tests, and procedures to de-commission gas and electricity systems or components
- 7.14 state safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
- 7.15 explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
- 7.16 describe measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
- 7.17 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation

- 7.18 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 7.19 explain the industry practices and work standards for fabricating and installing gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.20 explain the positioning and fixing requirements for domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.21 state the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
- 7.22 state the procedures and work methods of connecting domestic gas cookers, tumble dryers, leisure appliances and components to both new and existing gas, electric, ventilation and chimney systems
- 7.23 state the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components – see Unit 201
- 7.24 state the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning e.g. preliminary electrical safety checks
- 7.25 explain the routines and sequences for the maintenance process of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.26 explain the routines and sequences for re-commissioning domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.27 explain the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components and checking against the design specification
- 7.28 state the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to ensure safe functioning
- 7.29 state the procedures for checking and confirming the gas system operating pressures
- 7.30 describe the procedures for checking and confirming the appliance operating pressure and the heat input
- 7.31 explain the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance
- 7.32 explain the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 7.33 explain the tests and checks to confirm the suitability and performance of the ventilation system
- 7.34 describe how to complete all maintenance documentation and records to be left with the property occupier i.e., Benchmarks, Landlord/Home owner gas safety record, maintenance report form, etc
- 7.35 state the measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 7.36 explain the system handover procedures and demonstrating the operation of replacement domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to end users
- 7.37 explain the steps to take when problems arise in the work activities

- 7.38 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 7.39 explain how to safely collect and dispose of system contents that may be hazardous to health or the environment e.g. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances, etc
- 7.40 explain where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations, etc
- 7.41 explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 311

Install domestic gas water heaters and wet central heating appliances

Level: 3
Credit value: 18
URN: Y/502/8454

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission domestic gas water heaters and wet central heating appliances.

The scope of work covered by this unit is from the appliance shut-off valve to and including the appliance, locating and fixing the appliance to the wall, connecting and assembling the chimney components to the appliance, drilling the wall to accommodate the chimney assembly and connecting the appliance to water supplies. Electrical connection will be made either to an existing 13 amp 240 volt plug socket, fused socket outlet or to a suitable connection point on the central heating wiring system.

The range of appliances, fitted in domestic and or small commercial premises, covered by this unit are;

- Instantaneous single and multipoint flued and flueless water heaters
- Back boiler units not exceeding 70 kW net
- Open, balanced and fan assisted, system, combination and condensing boilers not exceeding 70 kW net
- Storage hot water boilers not exceeding 70 kW net
- Swimming pool boilers not exceeding 140 kW

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

- 1 Be able to design gas systems for installing domestic gas water heaters and wet central heating appliances
- 2 Be able to plan and prepare work activities for installing domestic gas water heaters and wet central heating appliances
- 3 Be able to de-commission domestic gas water heaters and wet central heating appliances
- 4 Be able to install, exchange, and remove domestic gas water heaters and wet central heating appliances
- 5 Be able to pre-commission and commission domestic gas water heaters and wet central heating appliances
- 6 Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

- 7 Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
- 8 Know how to install, commission and de-commission domestic gas water heaters and wet central heating appliances

Guided learning hours

It is recommended that **134** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.3 Install Gas Water Heating and Wet Central Heating Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 311 Install domestic gas water heaters and wet central heating appliances

Outcome 1 Be able to design gas systems for installing domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams for any key structural features that could affect the installation
 - record details of any features that may effect the installation
- 1.4 check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - clearances
- 1.5 check that the availability of input services meet the appliance manufacturers' and industry standards' requirements for the appliance installation
- 1.6 check:
 - size
 - location
 - availabilityof input services meet the:
 - appliance manufacturer's
 - industry standardsrequirements for the installation of:
 - gas supply
 - electricity supply
 - chimney suitability
 - the provision of ventilation
- 1.7 check proposed location of condensate disposal is in compliance with:
 - appliance manufacturer's instructions
 - industry standards
- 1.8 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.9 prepare a range of design options to meet both:
 - customer
 - industry requirements
- 1.10 present design options to the customer using a variety of media:
 - written
 - oral
 - drawings

- 1.11 consult with the customer and obtain agreement to the design option that best meets all the requirements.

Unit 311	Install domestic gas water heaters and wet central heating appliances
Outcome 2	Be able to plan and prepare work activities for installing domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

- 2.1 carry out a risk assessment that incorporates:
 - safety provisions
 - access at the work site
 - movement of people on site
 - movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for:
 - any pre-installation damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during:
 - de-commissioning
 - installation
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment are available as required and are fit for purpose needed for:
 - de-commissioning
 - installation
 - commissioning
- 2.7 carry out checks and tests to confirm the:
 - gas supply
 - electricity supply
 - provision of ventilation
 meet the industry standards' requirements for the installation
- 2.8 check existing installation for any unsafe appliances and system components apply the gas industry unsafe situations procedures as required
- 2.9 confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services, i.e. electricity supply
- 2.10 confirm the suitability of the proposed location of condensate disposal as required.

Unit 311	Install domestic gas water heaters and wet central heating appliances
Outcome 3	Be able to de-commission domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas supply
 - electricity supply
 is in a condition that enables safe appliance de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas and systems and components
- 3.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 3.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components.

Unit 311 Install domestic gas water heaters and wet central heating appliances

Outcome 4 Be able to install, exchange, and remove domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the manufacturer's installation requirements
- 4.2 install the appliance minimising damage to:
 - customer property
 - building features
- 4.3 select and use the correct tools and equipment for the installation
- 4.4 remove any existing gas and electricity system components required for the installation
- 4.5 fabricate gas and electricity system components required by the installation
- 4.6 position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 4.7 provide the required ventilation for the appliance installation in accordance manufacturer's instructions
- 4.8 ensure existing gas systems are clean and free from debris
- 4.9 fix and connect the:
 - gas supply
 - electricity supply componentsto the appliance
- 4.10 fix and connect the condensate disposal system as required
- 4.11 use tightness testing and purging procedures to confirm the integrity of the installed gas system and appliance
- 4.12 use electrical testing procedures to confirm the integrity of the installed electrical system and appliance
- 4.13 use industry:
 - standard checks
 - testing proceduresto confirm the integrity of the newly installed or existing chimney system and appliance flue seals
- 4.14 carry out precautionary actions to prevent the unauthorised use of:
 - uncommissioned gas appliances
 - gas systems
 - electrical systems
 - componentsby following isolation procedures and use of warning notices.

Unit 311	Install domestic gas water heaters and wet central heating appliances
Outcome 5	Be able to pre-commission and commission domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

- 5.1 confirm that the complete appliance installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards
- 5.5 check and confirm the appliance:
 - operating pressure
 - heat input
 meet industry standards' and manufacturers' requirements instructions
- 5.6 check the combustion performance by:
 - visual inspection
 - conducting flue gas analysis using an electronic flue gas analyser
- 5.7 confirm the operation of the gas appliance and components to ensure they function safely and operate in accordance with manufacturers' instructions
- 5.8 test chimney performance and reconfirm it performs according to manufacturer's and industry requirements
- 5.9 confirm the electrical system and components function safely and operate in accordance with the manufacturers' instructions
- 5.10 instruct the customer on the correct operation of the:
 - appliance
 - gas system
- 5.11 provide customer with a copy of the appliance literature
- 5.12 check and confirm the operation of the condensate disposal system.

Unit 311 Install domestic gas water heaters and wet central heating appliances

Outcome 6 Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during the:
 - planning
 - de- commissioning
 - installation
 - commissioningprocesses to minimise disturbance to the job
- 6.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructionsfor the appliance to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 identify and advise persons that need to be informed of any unsafe situations and actions required to remedy those situations
- 6.6 complete documentation to confirm the safe commissioning of the gas appliance and components
- 6.7 complete gas appliance and system de-commissioning records
- 6.8 submit details of installation and exchange appliance(s) to a gas work notification scheme.

Unit 311	Install domestic gas water heaters and wet central heating appliances
Outcome 7	Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 report deficiencies in:
 - gas supply services
 - electricity supply services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal:
 - gas appliance
 - gas supply
 - component defects
- 7.3 resolve problems in accordance with approved procedures when:
 - gas appliances
 - gas systems
 - components
 being commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the:
 - gas appliance
 - gas system
 - component
 cannot be restored to full performance.

Unit 311	Install domestic gas water heaters and wet central heating appliances
Outcome 8	Know how to install, commission and de-commission domestic gas water heaters and wet central heating appliances

Assessment Criteria

The learner can:

Legislative and safety knowledge

- 8.1 Interpret regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 Interpret legislation covering the general responsibilities of the installer for their own safety and that of others
 - The Gas Safety (Installation and Use) Regulations 1998 and associated Approved Code of Practice Guidance
 - o Regulation 26 Gas appliances
 - o Regulation 28 – Access
 - o Regulation 29 – Manufacturer’s instructions
 - o Regulation 33 – Testing of appliances
 - o Regulation 34 – Use of appliances

The learner can:

Installing, commissioning and de-commissioning domestic gas water heaters and wet central heating appliances knowledge:

- 8.3 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.4 explain safe access and working at heights
- 8.5 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.6 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.7 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.8 state the tools, equipment, materials and components required for the gas appliance and gas system de-commission, installation and commission – ordering, supplying, advising, checking and delivery procedures
- 8.9 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.10 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.11 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.12 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and

- manufacturers' instructions applicable to the appliance, to ensure the work is done to the specification and industry standards
- 8.13 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
 - 8.14 explain how to measure and record installation and site details for prefabrication purposes
 - 8.15 explain how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for installation of the new gas appliance, gas system and components
 - 8.16 explain how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for extending the system
 - 8.17 describe isolation methods, tests, and procedures to de-commission gas and electricity systems or components
 - 8.18 state procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds
 - 8.19 explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
 - 8.20 describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
 - 8.21 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
 - 8.22 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
 - 8.23 explain the industry practices and work standards for fabricating and installing domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
 - 8.24 state the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
 - 8.25 state the procedures and work methods of connecting domestic gas cookers, tumble dryers, leisure appliances and components to both new and existing gas, electric, ventilation and chimney systems
 - 8.26 state the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
 - 8.27 state the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning i.e. preliminary electrical safety checks
 - 8.28 explain the routines and sequences for commissioning domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards
 - 8.29 state the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components and checking against the design specification
 - 8.30 state the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to ensure safe functioning
 - 8.31 state the procedures for checking and confirming the gas system operating pressures
 - 8.32 state the procedures for checking and confirming the appliance operating pressure and the heat input
 - 8.33 describe the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance

- 8.34 describe the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 8.35 describe the tests and checks to confirm the suitability and performance of the ventilation system
- 8.36 explain how to complete all installation and commissioning documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, chimney/hearth notice plate
- 8.37 describe measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 8.38 explain the system handover procedures and demonstrating the operation of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to end users
- 8.39 summarise the steps to take when problems arise in the work activities
- 8.40 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.41 describe how to safely collect and dispose of system contents that may be hazardous to health or the environment i.e. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances
- 8.42 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations
- 8.43 explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 312

Maintain gas water heating and wet central heating appliances

Level: 3
Credit value: 16
URN: T/502/8459

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to maintain domestic water heating and wet central heating gas appliances.

The scope of work covered by this unit is the maintenance, commission and decommissions of water heating and wet central heating domestic gas appliances up to and including the appliance isolation (service) point supplied with 2nd or 3rd family gases.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

- 1 Be able to plan and prepare work activities for maintaining water heating and wet central heating appliances
- 2 Be able to de-commission water heating and wet central heating appliances to industry standards
- 3 Be able to maintain domestic water heating and wet central heating appliances to industry standards
- 4 Be able to pre-commission and commission water heating and wet central heating appliances to industry standards
- 5 Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work
- 6 Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process
- 7 Know how to maintain water heating and wet central heating appliances

Guided learning hours

It is recommended that **75** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.5 Maintain Gas Water Heating and Wet Central Heating Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 1	Be able to plan and prepare work activities for maintaining water heating and wet central heating appliances

Assessment Criteria

The learner can:

- 1.1 produce a risk assessment and method statement which incorporates:
 - safety provisions on the work site,
 - access to the work site
 - movement of people on the site
 - movement and safe storage of materials, tools and equipment for the job
- 1.2 survey the work site for:
 - any pre-maintenance damage
 - defects to existing building features
 and record it
- 1.3 advise the property occupier of any defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and maintenance process
- 1.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 check and confirm all materials, tools and equipment necessary for the de-commissioning, maintenance and commissioning process are available as required and are fit for purpose
- 1.7 check and confirm that the siting of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - siting and clearances
- 1.8 confirm that the:
 - gas supply
 - electricity supply
 - ventilation and where required
 - chimney / flue suitability where necessary)
 meet the appliance manufacturers' and industry standards' requirements for the installation
- 1.9 carry out all necessary checks and tests to confirm the:
 - gas supply
 - electricity supply
 - chimney / flue system(where required)
 meet the manufacturers' and industry requirements for the installation
- 1.10 check location of condensate disposal is in compliance with appliance manufacturers and industry standards requirements as necessary

- 1.11 check existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required.

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 2	Be able to de-commission water heating and wet central heating appliances to industry standards

Assessment Criteria

The learner can:

- 2.1 check that conditions within the:
 - gas
 - electricity
 systems will permit safe de-commissioning
- 2.2 use the correct tools and equipment for de-commissioning activities
- 2.3 use designated:
 - safe isolation methods
 - tests
 - procedures
 to de-commission gas and electricity systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 2.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components
 as required.

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 3	Be able to maintain domestic water heating and wet central heating appliances to industry standards

Assessment Criteria

The learner can:

- 3.1 carry out preparatory work to meet the maintenance requirements
- 3.2 remove existing gas and electricity system components as required by the maintenance activities
- 3.3 carry out the maintenance process in accordance with:
 - manufacturers' specification
 - industry standards
- 3.4 carry out the maintenance process, minimising damage to:
 - customer property
 - building features
- 3.5 use the correct tools and equipment for maintenance work activities
- 3.6 re-position the appliance and confirm it meets the:
 - location
 - siting
 - clearances
 required by the manufacturers' and industry standards' specification
- 3.7 check existing ventilation for appliances and system meets industry requirements for the installation
- 3.8 ensure existing gas systems are clean and free of debris
- 3.9 re-connect:
 - gas
 - electricity
 system components to the appliance
- 3.10 use tightness testing and purging procedures to confirm the integrity of the re-connected gas system and appliance
- 3.11 use electrical testing procedures to confirm the integrity of the re-installed electrical system and appliance
- 3.12 use industry standard checks and testing procedures to confirm the integrity of the existing chimney system and appliance flue seals where required

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 4	Be able to pre-commission and commission water heating and wet central heating appliances to industry standards

Assessment Criteria

The learner can:

- 4.1 confirm the complete appliance installation complies with:
 - the manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations,
 - British Standards and Building Regulations
- 4.2 check that conditions within the:
 - gas
 - electricity
 systems will permit safe commissioning
- 4.3 use the correct tools and equipment for commissioning activities
- 4.4 check that the gas system operating pressures meet industry standards
- 4.5 check the appliance in accordance with industry standards' and manufacturers' requirements for:
 - operating pressure
 - heat input
- 4.6 check the combustion performance as required:
 - visually
 - by flue gas analysis
- 4.7 test chimney performance and reconfirm it performs according to (where required):
 - manufacturers' instructions
 - industry standards'
- 4.8 check that the ventilation requirements meet current industry standards for the installation
- 4.9 check the operation of the:
 - gas appliance
 - gas system
 - gas components
 to ensure they function safely and operate in accordance with manufacturers' instructions
- 4.10 check the:
 - electrical system
 - electrical components
 function safely and operate in accordance with the manufacturers' instructions
- 4.11 explain to the property occupier the correct operation of the:
 - appliance

- gas system
- and provide them with their copy of the appliance literature
- 4.12 take precautionary actions by isolation procedures and use of warning notices to prevent the unauthorised use of uncommissioned:
- gas appliances
 - gas systems
- electrical systems and components.

Unit 312 Maintain gas water heating and wet central heating appliances

Outcome 5 Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work

Assessment Criteria

The learner can:

- 5.1 liaise with the property occupier and other people who will be affected by the work in order to minimise disturbance to the job during:
 - the planning
 - de-commissioning
 - installation commissioning processes
- 5.2 use normative documents, such as:
 - industry standards
 - British Standards
 - manufacturers' instructions for the applianceto ensure the work is done to specification
- 5.3 advise of any delays to the work to any persons who are affected by the delay
- 5.4 report any delays in the work schedules to the job supervisor
- 5.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 5.6 check that the customer is satisfied with the finished job
- 5.7 complete records and documentation confirming the safe maintenance of:
 - gas appliances
 - systems
 - components
- 5.8 complete commissioning and de-commissioning records for:
 - gas appliance
 - gas system as requiredand ensure they are stored securely.

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 6	Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process

Assessment Criteria

The learner can:

- 6.1 rectify and report deficiencies in gas and electric input services
- 6.2 resolve problems in accordance with approved procedures where pre-maintenance checks and tests reveal gas appliance, gas system or component defects
- 6.3 resolve problems in accordance with approved procedures when gas appliances, gas systems and components being commissioned do not meet design requirements
- 6.4 resolve problems in accordance with approved procedures when the gas appliance, the gas system or component cannot be restored to full performance.

Unit 312	Maintain gas water heating and wet central heating appliances
Outcome 7	Know how to maintain water heating and wet central heating appliances

Assessment Criteria

The learner can:

- 7.1 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic maintenance process
- 7.2 explain safe access and working at heights procedures
- 7.3 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 7.4 describe the methods of working which protect the building décor, customer property and existing systems and components
- 7.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 7.6 state the tools, equipment, materials and components required for the gas system de-commission, maintenance and commission – ordering, supplying, advising, checking and delivery procedures
- 7.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 7.8 describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
- 7.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, maintenance and commissioning activity
- 7.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 7.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 7.12 describe how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for existing gas appliances, systems, or components
- 7.13 state safe isolation methods, tests, and procedures to de-commission gas and electricity systems or components
- 7.14 state safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
- 7.15 explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
- 7.16 describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
- 7.17 explain how to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation

- 7.18 describe the points in the de-commissioning, maintenance and re-commissioning process where co-operation and liaison with other trades and property occupier may be required
- 7.19 state the industry practices and work standards for fabricating and installing water heating and wet central heating gas appliances, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.20 state the positioning and fixing requirements for water heating and wet central heating gas appliances, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.21 state the positioning and fixing requirements for water heating and wet central heating gas appliances, systems and components in; airing cupboards, compartments, roof spaces and external installations in order to comply with the manufacturers' specification and industry standards
- 7.22 explain the industry practices and manufacturers' requirements for the positioning and the installation of condensate drain for condensing boilers
- 7.23 describe the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
- 7.24 state the procedures and work methods of connecting water heating and wet central heating gas appliances and components to both new and existing gas, water, electric, ventilation and chimney systems
- 7.25 explain the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
- 7.26 describe the process and procedures, equipment and legislative requirements for applying electrical safety tests to appliances, systems and components to ensure safe functioning
- 7.27 describe the routines and sequences of the maintenance process of water heating and wet central heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.28 describe the routines and sequences for re-commissioning water heating and wet central heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.29 explain the procedures for checking the correct operation and performance of water heating and wet central heating gas appliances, gas systems and components and checking against the design specification
- 7.30 explain the procedures for checking the correct operation and performance of water heating and wet central heating gas appliances, gas systems and components to ensure safe functioning
- 7.31 explain the procedures for checking that the hot water performance of water heating gas appliances and combination boilers complies with the manufacturers' specification i.e., there is sufficient pressure and flow rate and correct temperatures are achieved
- 7.32 state the procedures for checking and confirming the gas system operating pressures
- 7.33 describe the procedures for checking and confirming the appliance operating pressure and the heat input
- 7.34 describe the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance
- 7.35 describe the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 7.36 describe the tests and checks to confirm the suitability and performance of the ventilation system

- 7.37 explain how to complete all maintenance documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, maintenance report form, etc
- 7.38 describe the measures to prevent un-commissioned gas systems being brought into operation utilising safety and warning notices
- 7.39 explain the system handover procedures and demonstrating the operation of replacement systems and components to end users
- 7.40 explain the steps to take when problems arise in the work activities
- 7.41 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 7.42 describe how to safely collect and dispose of system contents that may be hazardous to health or the environment e.g. waste products such as asbestos, insulation, etc.
- 7.43 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g. Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.
- 7.44 explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 313

Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises

Level: 3
Credit value: 19
URN: T/502/8381

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission gas pipework.

The scope of work covered by this unit is the installation of gas pipework up to 35 mm (1¼ inch) diameter (where the volume of the pipework does not exceed 0.035 cubic metre) from a meter outlet connection to gas appliance connection point, including 'installation pipework and appliance connector pipework' or in the case of non metered installations from the Emergency Control Valve (EVC) located either inside or outside the property to the appliance connection point, supplied with 2nd or 3rd family gases.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing gas pipework
2. Be able to plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances
3. Be able to de-commission domestic gas pipework to industry standards
4. Be able to install, exchange, and remove gas pipework to industry standards
5. Be able to pre-commission and commission gas pipework to industry standards
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install, commission and de-commission gas pipework up to 35mm (1¼) diameter in domestic and small commercial premises

Guided learning hours

It is recommended that **115** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety

NOS DSG 3.5 Install Gas Pipework up to 35mm BS6891

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 1	Be able to design gas systems for installing gas pipework

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams for any key structural features that could affect the installation
 - record details of any features that may affect the installation
- 1.4 check that the proposed positioning of the pipework meets the manufacturers' and industry standards' requirements for:
 - location
 - clearances
- 1.5 check that the availability of input services:
 - gas
 - electricity
 meet the appliance manufacturers' and industry standards' requirements for the pipework installation
- 1.6 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.7 prepare a range of design options to meet both customer and industry requirements
- 1.8 present design options to the customer using variety of media:
 - written
 - oral
 - drawings
- 1.9 consult with the customer and obtain agreement to the design option that best meets all the requirements.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 2	Be able to plan and prepare work activities for installing domestic gas cookers, tumble dryers and leisure appliances

Assessment Criteria

The learner can:

- 2.1 produce a risk assessment and method statement that incorporates:
 - safety provisions on the work site
 - access to the work site
 - movement of people on site
 - the movement and safe storage of installation materials, tools and equipment for the job
- 2.2 survey the work site for:
 - any pre-installation damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 2.3 advise the property occupier of any defects found in the survey
- 2.4 protect the work site and the building fabric against possible damage being caused during:
 - de-commissioning
 - installation
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment are available as required and are fit for purpose needed for:
 - de-commissioning
 - installation
 - commissioning
- 2.7 check and confirm that the proposed siting of the gas supply meets the appliance manufacturers and industry standards requirements for:
 - location
 - siting
 - clearances
- 2.8 check and confirm that:
 - the gas supply,
 - earthing supply
 - provision of ventilation
 meets industry standards' requirements in relation to other services
- 2.9 confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services i.e. electricity supply
- 2.10 carry out all necessary checks and tests to confirm:

- the gas supply
 - electricity supply
- meet the manufacturers' and industry requirements for the installation
- 2.11 calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across installation
- 2.12 check the existing installation for unsafe:
- appliances
 - system components
- apply the gas industry unsafe situations procedures to any identified.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 3	Be able to de-commission domestic gas pipework to industry standards

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas supply
 - electricity supply
 are in a condition that enables safe appliance de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas and systems and components
- 3.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 3.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - earthing system components
- 3.6 after permanent removal of pipework mark any live gas pipes with a notice to indicate the pipe contains gas.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 4	Be able to install, exchange, and remove gas pipework to industry standards

Assessment Criteria

The learner can:

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

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 5	Be able to pre-commission and commission gas pipework to industry standards

Assessment Criteria

The learner can:

- 5.1 confirm that the complete appliance installation complies with:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - 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
 - existing appliance(s)
- 5.5 use purging procedures to confirm the safe supply of gas to the installed gas system
- 5.6 use electrical testing procedures to confirm the integrity of the installed earthing system
- 5.7 apply protective coating to pipework and to joints after gas tightness testing has been completed
- 5.8 reconfirm that the ventilation requirements meet industry standards for the installation
- 5.9 check and confirm the operation of the installed gas valves and components to ensure they function safely and operate in accordance with manufacturers' instructions
- 5.10 instruct the property occupier on the correct operation of the:
 - gas system
 - valves
 - components
 providing them with a copy of any user instructions
- 5.11 take precautionary actions to prevent the unauthorised use of:
 - uncommissioned gas appliances
 - gas systems
 - electrical systems
 - components
 by isolation procedures and use of warning notices.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 6	Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during:
 - planning
 - de-commissioning
 - installation
 - commissioning
 - to minimise disturbance to the job
- 6.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructions for the appliance to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 6.6 complete documentation to confirm the safe commissioning of the gas system and components
- 6.7 complete records and documentation confirming the safe commissioning of gas systems and components
- 6.8 complete gas system de-commissioning records.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 7	Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 rectify and report deficiencies in gas and earthing input services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal gas system or component defects
- 7.3 resolve problems in accordance with approved procedures when gas systems and components being commissioned do not meet design requirements
- 7.4 resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance.

Unit 313	Install, commission and de-commission gas pipework up to 35mm 1¼ diameter in domestic and small commercial premises
Outcome 8	Know how to install, commission and de-commission gas pipework up to 35mm (1¼) diameter in domestic and small commercial premises

Assessment Criteria

The learner can:

- 8.1 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.2 explain safe access and working at heights procedures
- 8.3 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.4 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.6 state the tools, equipment, materials and components required for the gas system installation, commission and de-commission, – ordering, supplying, advising, checking and delivery procedures
- 8.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.8 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 8.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 8.12 describe how to measure and record installation and site details for prefabrication purposes
- 8.13 explain how to confirm that the gas supply and earthing system requirements are adequate for the installation of the new gas system and components or, for extending the system or adding components to
- 8.14 explain how to confirm that the provision of ventilation meets the industry standards' requirements for the installation i.e. in voids, shafts, ducts
- 8.15 calculate correct sizing of pipework to ensure minimum pressure loss across installation

- 8.16 state checks and tests to confirm suitability of the gas supply
- 8.17 state checks and tests to confirm suitability of the earthing system, including the installation and positioning of the main equipotential bonding
- 8.18 state safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
- 8.19 explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
- 8.20 describe measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
- 8.21 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
- 8.22 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 8.23 state the industry practices and work standards for fabricating and installing gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 8.24 identify and describe the types of pipe materials suitable for carrying gas - steel, malleable iron, copper, corrugated stainless steel tube (CSST), polyethylene and lead
- 8.25 identify and describe the types of pipe fittings suitable for carrying gas – capillary, compression, push-fit, union joints and screwed joints
- 8.26 state the industry practices and work standards for jointing materials and fittings suitable for carrying gas, including connecting to lead composition pipes
- 8.27 describe the safety precautions to take when jointing materials and fittings - Including COSHH
- 8.28 explain the industry practices and methods of bending pipe materials suitable for carrying gas i.e. bending methods of copper pipe, corrugated stainless steel tube (CSST) and stainless steel flexible pipe (anacondas)
- 8.29 explain the industry practices and methods of bending copper pipework to set measured distances to include; double sets/offset bends, 90 degree bends, crank sets/passover bends
- 8.30 state the positioning and fixing requirements for gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 8.31 describe how Installation of gas pipework meets the industry standards' requirements for; location, siting, clearance requirements and relationship to other services, i.e. electricity supply
- 8.32 state industry practices and work standards of providing adequate support(s) for pipework installation to conform with industry standards' requirements
- 8.33 produce a plan showing the positioning, protection and fixing methods for gas pipework, valves, systems and components in; floors, ducts, through walls, buried in walls, multi-occupancy buildings and protected shafts containing stairs, lifts or other protected fire escape routes, to comply with industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations i.e. sleeving, purposed designed channels, fire stops, purposed designed shafts
- 8.34 state the industry practices and work standards for pipe installation within suspended and joisted floors including methods of lifting and replacing floorboards and chipboard flooring

- 8.35 state the industry practices and work standards for pipe installation in concrete floors
- 8.36 explain the installation and protection of external installations to meet industry standards requirements i.e. protection against mechanical damage, minimum depth below ground level
- 8.37 describe the procedures and work methods for connecting to input services including; gas, earthing and ventilation systems
- 8.38 describe the procedures and work methods of connecting pipework, valves and components to both new and existing gas systems and appliances
- 8.39 describe the procedures and work methods to ensure correct gas pipe identification
- 8.40 describe the process and procedures, equipment and legislative requirements for applying tightness testing and purging to gas appliances, systems and components
- 8.41 describe the process and procedures, equipment and legislative requirements for applying electrical tests to earthing systems and components to ensure safe functioning i.e. earth continuity checks
- 8.42 state the procedures for checking the correct operation and performance of gas systems, valves and components and checking against the design specification to ensure safe functioning
- 8.43 explain the routines and sequences for commissioning gas systems, valves and components
- 8.44 state how to complete all installation and commissioning documentation and records to be left with the property occupier including; benchmark, landlord/home owner gas safety record.
- 8.45 explain system handover procedures and demonstrate the operation of gas systems, valves and components to end users
- 8.46 summarise the steps to take when problems arise in the work activities
- 8.47 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.48 describe how to safely collect and dispose of system contents that may be hazardous to health or the environments i.e. waste products including asbestos and insulation materials
- 8.49 demonstrate how and where to access the required information, i.e. Industry regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations
- 8.50 explain how to isolate unsafe gas appliances, gas systems and components and apply the gas industry unsafe situations procedure.

Level: 3
Credit value: 15
URN: D/502/8374

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission gas space heating appliances.

The scope of work covered by this Unit is from the appliance isolation valve to and including the appliance. Electrical connection (where necessary) will be made to an existing 13 amp 240 volt plug socket adjacent to the appliance. The range of space heating appliances covered by this unit are;

- Direct flue radiant convector gas fires
- Inset Live Fuel Effect (ILFE) gas fires
- Decorative Fuel Effect (DFE) gas fires
- Heating stoves
- Condensing gas fires
- Flueless gas fires

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing domestic gas space heating appliances
2. Be able to plan and prepare work activities for installing domestic gas space heating appliances
3. Be able to de-commission domestic gas space heating appliances
4. Be able to install, exchange, and remove domestic gas space heating appliances
5. Be able to pre-commission and Commission domestic gas space heating appliances
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install domestic gas space heating appliances

Guided learning hours

It is recommended that **88** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS: DSG 3.7 Install Domestic Gas Space Heating Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 314

Install domestic gas space heating appliances

Outcome 1

Be able to design gas systems for installing domestic gas space heating appliances

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams for any key structural features that could affect the installation
 - record details of any features that may affect the installation
- 1.4 check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - clearances
- 1.5 check that the availability of input services:
 - gas
 - electricitymeet the appliance manufacturers' and industry standards' requirements for the pipework installation
- 1.6 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.7 prepare a range of design options to meet both customer and industry requirements
- 1.8 present design options to the customer using variety of media:
 - written
 - oral
 - drawings
- 1.9 consult with the customer and obtain agreement to the design option that best meets all the requirements.

Unit 314	Install domestic gas space heating appliances
Outcome 2	Be able to plan and prepare work activities for installing domestic gas space heating appliances

Assessment Criteria

The learner can:

- 2.1 produce a risk assessment and method statement that incorporates:
 - safety provisions
 - access at the work site
 - movement of people on site
 - movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for
 - any pre-installation damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during:
 - de-commissioning
 - installation
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment are available as required and are fit for purpose needed for:
 - de-commissioning
 - installation
 - commissioning
- 2.7 check and confirm that the proposed siting of the gas supply meets the appliance manufacturers and industry standards requirements for:
 - location
 - siting
 - clearances
- 2.8 check and confirm that the:
 - gas supply
 - electricity supply
 - chimney suitability
 - provision of ventilationmeets industry standards' requirements in relation to other services
- 2.9 confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services i.e. electricity supply
- 2.10 carry out checks and tests to confirm the:
 - gas supply
 - electricity supply

- chimney system
- meet the manufacturers' and industry requirements for the installation
- 2.11 calculate and confirm the correct sizing of pipework to ensure minimum pressure loss across installation
- 2.12 check the existing installation for unsafe:
- appliances
 - system components
- and apply the gas industry unsafe situations procedures to any identified unsafe situations.

Unit 314	Install domestic gas space heating appliances
Outcome 3	Be able to de-commission domestic gas space heating appliances

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas supply
 - electricity supplyare in a condition that enables safe appliance de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe:
 - isolation methods
 - tests
 - proceduresto de-commission gas and systems and components
- 3.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - componentsdo not present a safety hazard
- 3.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components

Unit 314

Install domestic gas space heating appliances

Outcome 4

Be able to install, exchange, and remove domestic gas space heating appliances

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the manufacturers' installation requirements
- 4.2 install the appliance minimising damage to:
 - customer property
 - building features
- 4.3 select and use the correct tools and equipment for the installation
- 4.4 remove any existing gas and electricity system components required for the installation
- 4.5 fabricate gas and electricity system components required by the installation
- 4.6 position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 4.7 provide the required ventilation for the appliance Installation in accordance with manufacturers instructions
- 4.8 ensure existing gas system is clean and free of debris
- 4.9 connect the gas and electricity supply components to the appliance
- 4.10 use tightness testing and purging procedures to confirm the integrity of the installed appliance and gas system
- 4.11 use electrical testing procedures to confirm the integrity of the installed electrical system and appliance
- 4.12 carry out precautionary actions to prevent the unauthorised use of potentially unsafe gas appliances by following isolation procedures and use of warning notices

Unit 314

Install domestic gas space heating appliances

Outcome 5

Be able to pre-commission and commission domestic gas space heating appliances

Assessment Criteria

The learner can:

- 5.1 confirm that the complete appliance installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards
- 5.5 check and confirm the appliance:
 - operating pressure
 - heat inputmeet industry standards' and manufacturers' requirements
- 5.6 check the combustion performance by:
 - visual inspection
 - conducting a flue gas analysis using electronic flue gas analyser
- 5.7 test chimney performance and reconfirm it performs according to manufacturer's and industry standards
- 5.8 reconfirm that the ventilation requirements meet industry standards
- 5.9 confirm the operation of the gas appliance and components to ensure they function safely and operate in accordance with manufacturers' instructions
- 5.10 confirm the electrical system and components function safely and operate in accordance with the manufacturers' instructions
- 5.11 instruct the customer on the correct:
 - operation of the appliance
 - gas systemprovide the customer with a copy of the appliance user instructions.

Unit 314	Install domestic gas space heating appliances
Outcome 6	Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during the:
 - planning
 - de- commissioning
 - installation
 - commissioningprocesses to minimise disturbance to the job
- 6.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructionsfor the appliance to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 identify and advise persons that need to be informed of any unsafe situations and actions required to remedy those situations
- 6.6 complete documentation to confirm the safe commissioning of the gas appliance and components
- 6.7 complete gas appliance and system de-commissioning records
- 6.8 submit details of installation and exchange appliance(s) to a gas work notification scheme.

Unit 314

Install domestic gas space heating appliances

Outcome 7

Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 report deficiencies in:
 - gas supply services
 - electricity supply services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal:
 - gas appliance
 - gas supply
 - component defects
- 7.3 resolve problems in accordance with approved procedures when:
 - gas appliances
 - gas systems
 - componentsbeing commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the:
 - gas appliance
 - gas system
 - componentcannot be restored to full performance.

Unit 314 Install domestic gas space heating appliances

Outcome 8 Know how to install domestic gas space heating appliances

Assessment Criteria

Legislative and Safety Knowledge

The learner can:

- 8.1 interpret regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 interpret legislation covering the general responsibilities of the installer for their own safety and that of others:
 - The Gas Safety (Installation and Use) Regulations 1998 and associated Approved Code of Practice Guidance:
 - o Regulation 26 –Gas appliances
 - o Regulation 28 –Access
 - o Regulation 29 – Manufacturer’s instructions
 - o Regulation 33 – Testing of appliances
 - o Regulation 34 – Use of appliances.

Installing, commissioning and de-commissioning domestic gas space heating appliances knowledge

The learner can:

- 8.3 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.4 explain safe access and working at heights
- 8.5 specify the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.6 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.7 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.8 state the tools, equipment, materials and components required for the gas appliance and gas system de-commission, installation and commission – ordering, supplying, advising, checking and delivery procedures
- 8.9 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.10 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.11 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.12 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers’ instructions applicable to the appliance, to ensure the work is done to the specification and industry standards

- 8.13 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 8.14 describe how to measure and record installation and site details for prefabrication purposes
- 8.15 explain how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for installation of the new gas appliance, gas system and components
- 8.16 explain how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for extending the system
- 8.17 state isolation methods, tests, and procedures to de-commission gas and electricity systems or components
- 8.18 state procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds
- 8.19 explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
- 8.20 describe measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
- 8.21 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
- 8.22 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 8.23 state the industry practices and work standards for fabricating and installing domestic gas space heating appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 8.24 state the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
- 8.25 state the procedures and work methods of connecting domestic gas space heating appliances and components to both new and existing gas, electric, ventilation and chimney systems
- 8.26 state the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
- 8.27 state the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning i.e. preliminary electrical safety checks
- 8.28 describe the routines and sequences for commissioning domestic gas space heating appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 8.29 state the procedures for checking the correct operation and performance of domestic gas space heating appliances, gas systems and components and checking against the design specification
- 8.30 state the procedures for checking the correct operation and performance of domestic gas space heating appliances, gas systems and components to ensure safe functioning
- 8.31 state the procedures for checking and confirming the gas system operating pressures
- 8.32 apply the procedures for checking and confirming the appliance operating pressure and the heat input
- 8.33 state the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance

- 8.34 state the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 8.35 perform the tests and checks to confirm the suitability and performance of the ventilation system
- 8.36 demonstrate how to complete all installation and commissioning documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, chimney/hearth notice plate
- 8.37 apply measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 8.38 demonstrate the system handover procedures and demonstrating the operation of domestic gas space heating appliances, gas systems and components to end users
- 8.39 summarise the steps to take when problems arise in the work activities
- 8.40 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.41 describe how to safely collect and dispose of system contents that may be hazardous to health or the environment i.e. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances
- 8.42 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations
- 8.43 demonstrate how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 315

Maintain domestic gas space heating appliances

Level: 3
Credit value: 15
URN: R/502/8372

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to maintain domestic gas space heating appliances.

The scope of work covered by this Unit is the maintenance, commission and decommission of domestic gas space heating appliances, up to and including the appliance isolation (service) point supplied with 2nd or 3rd family gases.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to plan and prepare work activities for maintaining domestic gas fires and wall heaters
2. Be able to de-commission domestic gas fires and wall heaters to industry standards
3. Be able to maintain domestic gas fires and wall heaters appliances to industry standards
4. Be able to pre-commission and commission domestic gas fires and wall heaters to industry standards
5. Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work
6. Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process
7. Know how to maintain domestic gas space heating appliances

Guided learning hours

It is recommended that **88** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.8 Maintain Domestic Gas Space Heating Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 315

Maintain domestic gas space heating appliances

Outcome 1

Be able to plan and prepare work activities for maintaining domestic gas fires and wall heaters

Assessment Criteria

The learner can:

- 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 and members of the public
 - movement and safe storage of materials, tools and equipment for the job
- 1.2 survey the work site for:
 - any pre-maintenance damage
 - defects to existing building featuresand record it
- 1.3 advise the property occupier of any defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and maintenance process
- 1.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 check and confirm all materials, tools and equipment necessary for the de-commissioning, maintenance and commissioning process are available as required and are fit for purpose
- 1.7 check and confirm that the siting of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - siting and clearances
- 1.8 confirm that the:
 - gas supply
 - electricity supply
 - ventilation and where required
 - chimney / flue suitability where necessary)meet the appliance manufacturers' and industry standards' requirements for the installation
- 1.9 carry out all necessary checks and tests to confirm the:
 - gas supply
 - electricity supply
 - chimney /flue system(where required)meet the manufacturers' and industry requirements for the installation
- 1.10 check existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required.

Unit 315

Maintain domestic gas space heating appliances

Outcome 2

Be able to de-commission domestic gas fires and wall heaters to industry standards

Assessment Criteria

The learner can:

- 2.1 check that conditions within the:
 - gas
 - electricitysystems will permit safe de-commissioning
- 2.2 use the correct tools and equipment for de-commissioning activities
- 2.3 use designated:
 - safe isolation methods
 - tests
 - proceduresto de-commission gas and electricity systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - componentsdo not present a safety hazard
- 2.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system componentsas required.

Unit 315

Maintain domestic gas space heating appliances

Outcome 3

Be able to maintain domestic gas fires and wall heaters appliances to industry standards

Assessment Criteria

The learner can:

- 3.1 carry out preparatory work to meet the maintenance requirements
- 3.2 remove existing gas and electricity system components as required by the maintenance activities
- 3.3 carry out the maintenance process in accordance with:
 - manufacturers' specification
 - industry standards
- 3.4 carry out the maintenance process minimising damage to:
 - customer property
 - building features
- 3.5 use the correct tools and equipment for maintenance work activities
- 3.6 re-position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 3.7 check existing ventilation for appliances and system meets industry requirements for the installation
- 3.8 ensure existing gas systems are clean and free of debris
- 3.9 re-connect:
 - gas
 - electricitysystem components to the appliance
- 3.10 use tightness testing and purging procedures to confirm the integrity of the re-connected gas system and appliance
- 3.11 use electrical testing procedures to confirm the integrity of the re-installed electrical system and appliance
- 3.12 use industry standard checks and testing procedures to confirm the integrity of the existing chimney system and appliance flue seals where required.

Unit 315

Maintain domestic gas space heating appliances

Outcome 4

Be able to pre-commission and commission domestic gas fires and wall heaters to industry standards

Assessment Criteria

The learner can:

- 4.1 confirm the complete appliance installation complies with:
 - the manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards and Building Regulations
- 4.2 check that conditions within the:
 - gas
 - electricitysystems will permit safe commissioning
- 4.3 use the correct tools and equipment for commissioning activities
- 4.4 check that the gas system operating pressures meet industry standards
- 4.5 check the appliance in accordance with industry standards' and manufacturers' requirements for:
 - operating pressure
 - heat input
- 4.6 check the combustion performance as required:
 - visually
 - by flue gas analysis
- 4.7 test chimney performance and reconfirm it performs according to (where required):
 - manufacturers' instructions
 - industry standards
- 4.8 check that the ventilation requirements meet current industry standards for the installation
- 4.9 check the operation of the:
 - gas appliance
 - gas system
 - gas componentsto ensure they function safely and operate in accordance with manufacturers' instructions
- 4.10 check the:
 - electrical system
 - electrical componentsfunction safely and operate in accordance with the manufacturers' instructions
- 4.11 explain to the property occupier the correct operation of the:
 - appliance

- gas system
- and provide them with their copy of the appliance literature
- 4.12 take precautionary actions by isolation procedures and use of warning notices to prevent the unauthorised use of uncommissioned:
- gas appliances
 - gas systems
 - electrical systems
 - components.

Unit 315 Maintain domestic gas space heating appliances

Outcome 5 Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work

Assessment Criteria

The learner can:

- 5.1 liaise with the property occupier and other people who will be affected by the work in order to minimise disturbance to the job during:
 - the planning
 - de-commissioning
 - installation commissioning processes
- 5.2 use normative documents such as:
 - industry standards
 - British Standards
 - manufacturers' instructions for the applianceto ensure the work is done to specification
- 5.3 advise of any delays to the work to any persons who are affected by the delay
- 5.4 report any delays in the work schedules to the job supervisor
- 5.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 5.6 check that the customer is satisfied with the finished job
- 5.7 complete records and documentation confirming the safe maintenance of:
 - gas appliances
 - systems
 - components
- 5.8 complete commissioning and de-commissioning records for:
 - gas appliance
 - gas system as requiredand ensure they are stored securely.

Unit 315	Maintain domestic gas space heating appliances
Outcome 6	Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process

Assessment Criteria

The learner can:

- 6.1 rectify and report deficiencies in gas and electric input services
- 6.2 resolve problems in accordance with approved procedures where pre-maintenance checks and tests reveal gas appliance, gas system or component defects
- 6.3 resolve problems in accordance with approved procedures when gas appliances, gas systems and components being commissioned do not meet design requirements
- 6.4 resolve problems in accordance with approved procedures when the gas appliance, the gas system or component cannot be restored to full performance.

Unit 315 Maintain domestic gas space heating appliances

Outcome 7 Know how to maintain domestic gas space heating appliances

Assessment Criteria

The learner can:

- 7.1 implement the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic maintenance process
- 7.2 apply safe access and working at heights procedures
- 7.3 select and use the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 7.4 apply the methods of working which protect the building décor, customer property and existing systems and components
- 7.5 demonstrate the care and maintenance requirements of tools and equipment, and checks for safe condition
- 7.6 select and use the tools, equipment, materials and components required for the gas system de-commission, maintenance and commission – ordering, supplying, advising, checking and delivery procedures
- 7.7 demonstrate how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 7.8 describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
- 7.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, maintenance and commissioning activity
- 7.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 7.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 7.12 demonstrate How to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for existing gas appliances, systems, or components
- 7.13 demonstrate safe isolation methods, tests, and procedures to de-commission gas and electricity systems or components
- 7.14 apply safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas systems, earthing systems and components, including the use of temporary continuity bonds
- 7.15 explain the precautions to ensure that de-commissioned gas and earthing systems do not prove a safety hazard
- 7.16 perform measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices
- 7.17 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation

- 7.18 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 7.19 apply the industry practices and work standards for fabricating and installing gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.20 explain the positioning and fixing requirements for domestic gas space heating appliances, gas systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.21 demonstrate the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
- 7.22 define the procedures and work methods of connecting domestic gas space heating appliances and components to both new and existing gas, electric, ventilation and chimney systems
- 7.23 demonstrate the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components – See Unit 201
- 7.24 define the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning e.g. preliminary electrical safety checks
- 7.25 explain the routines and sequences for the maintenance process of domestic gas space heating appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.26 explain the routines and sequences for re-commissioning domestic gas cookers, tumble dryers, leisure appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.27 explain the procedures for checking the correct operation and performance of domestic gas space heating appliances, gas systems and components and checking against the design specification
- 7.28 demonstrate the procedures for checking the correct operation and performance of domestic gas cookers, tumble dryers, leisure appliances, gas systems and components to ensure safe functioning
- 7.29 demonstrate the procedures for checking and confirming the gas system operating pressures
- 7.30 demonstrate the procedures for checking and confirming the appliance operating pressure and the heat input
- 7.31 explain the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance
- 7.32 demonstrate the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 7.33 explain the tests and checks to confirm the suitability and performance of the ventilation system
- 7.34 demonstrate how to complete all maintenance documentation and records to be left with the property occupier i.e., Benchmarks, Landlord/Home owner gas safety record, maintenance report form, etc
- 7.35 define measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 7.36 explain the system handover procedures and demonstrating the operation of replacement domestic gas space heating appliances, gas, systems and components to end users
- 7.37 explain the steps to take when problems arise in the work activities

- 7.38 define job management structures and methods of reporting and recording job progress or problems delaying progress
- 7.39 explain how to safely collect and dispose of system contents that may be hazardous to health or the environment e.g. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances etc
- 7.40 explain where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations, etc
- 7.41 demonstrate how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 316

Install domestic gas warm air central heating appliances

Level: 3
Credit value: 12
URN: F/502/8299

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission domestic gas warm air central heating appliances.

The scope of work covered by this unit is from the appliance isolation valve to and including the appliance. Electrical connection (where necessary) will be made to an existing 13 amp 240 volt plug socket or fused socket outlet or a suitable connection point on the heating wiring system. The range of warm air appliances (up to 70 kW net input), providing whole house or selective heating, covered by this unit are:

- Up flow
- Down flow
- Cross (horizontal) flow

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing domestic gas warm air central heating appliances
2. Be able to plan and prepare work activities for installing domestic gas warm air central heating appliances
3. Be able to de-commission domestic gas warm air central heating appliances
4. Be able to install, exchange, and remove domestic gas warm air central heating appliances
5. Be able to pre-commission and commission domestic gas warm air central heating appliances
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install domestic gas warm air central heating appliances

Guided learning hours

It is recommended that **54** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.10 Install Gas Warm Air Systems and Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 316 Install domestic gas warm air central heating appliances

Outcome 1 Be able to design gas systems for installing domestic gas warm air central heating appliances

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues.
- 1.3 survey the work site:
 - consult site diagrams for any key structural features that could affect the installation
 - record details of any features that may affect the installation
- 1.4 check that the proposed positioning of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - clearances
- 1.5 check that the availability of input services:
 - gas
 - electricitymeet the appliance manufacturers' and industry standards' requirements for the pipework installation
- 1.6 check:
 - size
 - location
 - availabilityof new or existing warm air and return air duct systems are suitable for the installation of warm air central heating appliances, systems and components
- 1.7 check:
 - size
 - location
 - availabilityof plenum adaptors, transfer grilles, registers and grilles are suitable for the installation of warm air central heating appliances, systems and components
- 1.8 check and ensure the design of the proposed installation is in compliance with industry standards
- 1.9 prepare a range of design options to meet both customer and industry requirements
- 1.10 present design options to the customer using variety of media:
 - written
 - oral
 - drawings

- 1.11 consult with the customer and obtain agreement to the design option that best meets all the requirements.

Unit 316	Install domestic gas warm air central heating appliances
Outcome 2	Be able to plan and prepare work activities for installing domestic gas warm air central heating appliances

Assessment Criteria

The learner can:

- 2.1 produce a risk assessment and method statement that incorporates:
 - safety provisions
 - access at the work site
 - movement of people on site
 - movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for:
 - any pre-installation damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during:
 - de-commissioning
 - installation
- 2.5 obtain confirmation from the customer before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment are available as required and are fit for purpose needed for:
 - de-commissioning
 - installation
 - commissioning
- 2.7 carry out checks, tests and confirm that:
 - the gas supply
 - electricity supply
 - the provision of ventilation
 meets industry standards' requirements in relation to other services
- 2.8 check the existing installation for unsafe:
 - appliances
 - system components
 and apply the gas industry unsafe situations procedures to any identified unsafe situations
- 2.9 confirm that the proposed siting of the gas supply meets industry standards' requirements in relation to other services i.e. electricity supply
- 2.10 check and confirm that the proposed siting of the gas supply meets the appliance manufacturer's and industry's requirements for:
 - location

- siting
- clearance.

Unit 316	Install domestic gas warm air central heating appliances
Outcome 3	Be able to de-commission domestic gas warm air central heating appliances

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas supply
 - electricity supply
 are in a condition that enables safe appliance de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas and systems and components
- 3.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 3.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components.

Unit 316 Install domestic gas warm air central heating appliances

Outcome 4 Be able to install, exchange, and remove domestic gas warm air central heating appliances

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the manufacturers' installation requirements
- 4.2 install the appliance minimising damage to:
 - customer property
 - building features
- 4.3 use the correct tools and equipment for the installation
- 4.4 remove any existing gas and electricity system components required for the installation
- 4.5 fabricate gas and electricity system components required by the installation
- 4.6 position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 4.7 provide the required ventilation for the appliance Installation in accordance with manufacturers' instructions
- 4.8 ensure existing gas system is clean and free of debris
- 4.9 connect the gas and electricity supply components to the appliance
- 4.10 use tightness testing and purging procedures to confirm the integrity of the installed appliance and gas system
- 4.11 use electrical testing procedures to confirm the integrity of the installed electrical system and appliance
- 4.12 carry out precautionary actions to prevent the unauthorised use of potentially unsafe gas appliances by following isolation procedures and use of warning notices.

Unit 316	Install domestic gas warm air central heating appliances
Outcome 5	Be able to pre-commission and commission domestic gas warm air central heating appliances

Assessment Criteria

The learner can:

- 5.1 confirm that the complete appliance installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards
- 5.5 check and confirm the appliance:
 - operating pressure
 - heat input
 meet industry standards' and manufacturers' requirements
- 5.6 check the combustion performance visually
- 5.7 confirm the operation of the gas appliance and components to ensure they function safely and operate in accordance with manufacturers' instructions
- 5.8 confirm the electrical system and components function safely and operate in accordance with the manufacturers' instructions
- 5.9 instruct the customer on the correct:
 - operation of the appliance
 - gas system
 provide the customer with a copy of the appliance user instructions

Unit 316 Install domestic gas warm air central heating appliances

Outcome 6 Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during the:
 - planning
 - de- commissioning
 - installation
 - commissioningprocesses to minimise disturbance to the job
- 6.2 Use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructionsfor the appliance to ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 identify and advise persons that need to be informed of any unsafe situations and actions required to remedy those situations
- 6.6 complete documentation to confirm the safe commissioning of the gas appliance and components
- 6.7 complete gas appliance and system de-commissioning records
- 6.8 submit details of installation and exchange appliance(s) to a gas work notification scheme.

Unit 316 Install domestic gas warm air central heating appliances

Outcome 7 Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 report deficiencies in:
 - gas supply services
 - electricity supply services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal:
 - gas appliance
 - gas supply
 - component defects
- 7.3 resolve problems in accordance with approved procedures when:
 - gas appliances
 - gas systems
 - componentsbeing commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the:
 - gas appliance
 - gas system
 - componentcannot be restored to full performance.

Unit 316	Install domestic gas warm air central heating appliances
Outcome 8	Know how to install domestic gas warm air central heating appliances

Assessment Criteria

Legislative and Safety Knowledge

The learner can:

- 8.1 interpret regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 interpret legislation covering the general responsibilities of the installer for their own safety and that of others:
 - The Gas Safety (Installation and Use) Regulations 1998 and associated Approved Code of Practice Guidance:
 - o Regulation 26 – Gas Appliances
 - o Regulation 28 – Access
 - o Regulation 29 – Manufacturer’s instructions
 - o Regulation 33 – Testing of appliances
 - o Regulation 34 – Use of appliances.

Installing, commissioning and de-commissioning cookers, tumble dryers and leisure appliances knowledge

The learner can:

- 8.3 implement the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.4 apply safe access and working at heights
- 8.5 select and use the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.6 apply the methods of working which protect the building décor, customer property and existing systems and components
- 8.7 demonstrate the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.8 select and use the tools, equipment, materials and components required for the gas appliance and gas system de-commission, installation and commission – ordering, supplying, advising, checking and delivery procedures
- 8.9 demonstrate how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.10 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.11 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.12 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and

- manufacturers' instructions applicable to the appliance, to ensure the work is done to the specification and industry standards
- 8.13 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
 - 8.14 demonstrate how to measure and record installation and site details for prefabrication purposes
 - 8.15 evaluate and confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for installation of the new gas appliance, gas system and components
 - 8.16 evaluate and confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for extending the system
 - 8.17 perform isolation methods, tests, and procedures to de-commission gas and electricity systems or components
 - 8.18 apply procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds
 - 8.19 explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
 - 8.20 apply measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices
 - 8.21 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
 - 8.22 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
 - 8.23 apply the industry practices and work standards for fabricating and installing domestic warm air central heating appliances and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
 - 8.24 apply the procedures and work methods for connecting to input services including; gas, electric, ventilation and chimney systems
 - 8.25 apply the procedures and work methods of connecting warm air central heating appliances and components to both new and existing gas, electricity, ventilation and chimney systems
 - 8.26 demonstrate the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components
 - 8.27 demonstrate the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning i.e. preliminary electrical safety checks
 - 8.28 apply the routines and sequences for commissioning domestic warm air central heating appliances and components in accordance with manufacturers' specification and industry standards
 - 8.29 apply the procedures for checking the correct operation and performance of domestic warm air central heating appliances and components and checking against the design specification
 - 8.30 apply the procedures for checking the correct operation and performance of domestic warm air central heating appliances and components to ensure safe functioning
 - 8.31 apply the procedures for checking and confirming the gas system operating pressures
 - 8.32 apply the procedures for checking and confirming the appliance operating pressure and the heat input

- 8.33 perform the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance
- 8.34 perform the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 8.35 perform the tests and checks to confirm the suitability and performance of the ventilation system
- 8.36 demonstrate how to complete all installation and commissioning documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, chimney/hearth notice plate
- 8.37 apply measures to prevent un-commissioned gas appliances and gas systems being brought into operation utilising safety and warning notices
- 8.38 demonstrate the system handover procedures and demonstrating the operation of domestic warm air central heating appliances and components to end users
- 8.39 summarise the steps to take when problems arise in the work activities
- 8.40 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.41 describe how to safely collect and dispose of system contents that may be hazardous to health or the environment i.e. waste products such as asbestos, insulation, electrical/electronic items and those containing fluorinated gases as in gas refrigeration appliances
- 8.42 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Fluorinated Greenhouse Gases Regulations (F gas), Control of Asbestos at Work Regulations.
- 8.43 demonstrate how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 317

Maintain gas warm air central heating systems and appliances

Level: 3
Credit value: 11
URN: T/502/8302

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to maintain gas warm air heating systems and appliances.

The scope of work covered by this Unit is the maintenance, commission and decommission of gas warm air central heating systems and appliances up to and including the appliance isolation (service) point supplied with 2nd or 3rd family gases.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to plan and prepare work activities for maintaining warm air central heating
2. Be able to de-commission warm air central heating to industry standards
3. Be able to maintain warm air central heating to industry standards
4. Be able to pre-commission and commission warm air central heating to industry standards
5. Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work
6. Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process
7. Know how to maintain gas warm air central heating systems and appliances

Guided learning hours

It is recommended that **54** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.11 Maintain Gas Warm Air Central Heating Appliances

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 317 Maintain gas warm air central heating systems and appliances

Outcome 1 Be able to plan and prepare work activities for maintaining warm air central heating

Assessment Criteria

The learner can:

- 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 and members of the public
 - movement and safe storage of materials, tools and equipment for the job
- 1.2 survey the work site for any pre-maintenance damage
 - defects to existing building featuresand record it
- 1.3 advise the property occupier of any defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and maintenance process
- 1.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 check and confirm all materials, tools and equipment necessary for the de-commissioning, maintenance and commissioning process are available as required and are fit for purpose
- 1.7 check and confirm that the proposed position of the appliance meets the manufacturers' and industry standards' requirements for:
 - location
 - siting
 - clearances
- 1.8 check the existing duct system of the appliance to ensure it meets manufacturers' and industry standards' requirements
- 1.9 confirm that the:
 - gas supply
 - electricity supply
 - ventilation and where required
 - chimney / flue suitability (where necessary)meets the appliance manufacturers' and industry standards' requirements for the installation
- 1.10 carry out all necessary checks and tests to confirm the:
 - gas supply
 - electricity supply
 - chimney / flue system (where required)meet the manufacturers' and industry requirements for the installation
- 1.11 check location of condensate disposal is in compliance with appliance manufacturers and industry standards requirements as necessary

- 1.12 check existing installation for any unsafe appliances and system components and apply the gas industry unsafe situations procedures as required.

Unit 317	Maintain gas warm air central heating systems and appliances
Outcome 2	Be able to de-commission warm air central heating to industry standards

Assessment Criteria

The learner can:

- 2.1 check that conditions within the:
 - gas
 - electricity
 systems will permit safe de-commissioning
- 2.2 use the correct tools and equipment for de-commissioning activities
- 2.3 use designated:
 - safe isolation methods
 - tests
 - procedures
 to de-commission gas and electricity systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - systems
 - components
 do not present a safety hazard
- 2.5 permanently remove and disconnect:
 - appliances
 - gas system components
 - electricity system components
 as required.

Unit 317	Maintain gas warm air central heating systems and appliances
Outcome 3	Be able to maintain warm air central heating to industry standards

Assessment Criteria

The learner can:

- 3.1 carry out preparatory work to meet the maintenance requirements
- 3.2 remove existing gas and electricity system components as required by the maintenance activities
- 3.3 carry out the maintenance process in accordance with:
 - manufacturers' specification
 - industry standards
- 3.4 carry out the maintenance process minimising damage to:
 - customer property
 - building features
- 3.5 use the correct tools and equipment for maintenance work activities
- 3.6 re-position the appliance and confirm it meets the:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards' specification
- 3.7 check existing ventilation for appliances and system meets industry requirements for the installation
- 3.8 ensure existing gas systems are clean and free of debris
- 3.9 re-connect:
 - gas
 - electricitysystem components to the appliance
- 3.10 use tightness testing and purging procedures to confirm the integrity of the re-connected gas system and appliance
- 3.11 use electrical testing procedures to confirm the integrity of the re-installed electrical system and appliance
- 3.12 use industry standard checks and testing procedures to confirm the integrity of the existing chimney system and appliance flue seals where required.

Unit 317 Maintain gas warm air central heating systems and appliances

Outcome 4 Be able to pre-commission and commission warm air central heating to industry standards

Assessment Criteria

The learner can:

- 4.1 confirm the complete appliance installation complies with:
 - the manufacturers' specification
 - industry standards
 - Gas Safety (Installation and Use) Regulations
 - British Standards and Building Regulations
- 4.2 check that conditions within the:
 - gas
 - electricitysystems will permit safe commissioning
- 4.3 use the correct tools and equipment for commissioning activities
- 4.4 check that the gas system operating pressures meet industry standards
- 4.5 check the appliance in accordance with industry standards' and manufacturers' requirements for:
 - operating pressure
 - heat input
- 4.6 check the combustion performance as required:
 - visually
 - by flue gas analysis
- 4.7 test chimney performance and reconfirm it performs according to:
 - manufacturers' instructions
 - industry standards
- 4.8 check that the location of any condensate disposal method complies with:
 - appliance manufacturers instructions
 - industry standards
- 4.9 check that the ventilation requirements meet current industry standards for the installation
- 4.10 check the operation of the:
 - gas appliance
 - gas system
 - gas componentsto ensure they function safely and operate in accordance with manufacturers' instructions
- 4.11 check the:
 - electrical system
 - electrical componentsfunction safely and operate in accordance with the manufacturers' instructions
- 4.12 explain to the property occupier the correct operation of the:

- appliance
- gas system

and provide them with their copy of the appliance literature

4.13 take precautionary actions by isolation procedures and use of warning notices to prevent the unauthorised use of uncommissioned:

- gas appliances
- gas systems
- electrical systems and components.

Unit 317 Maintain gas warm air central heating systems and appliances

Outcome 5 Be able to use and communicate data and information to carry out de-commissioning, maintenance and commissioning work

Assessment Criteria

The learner can:

- 5.1 liaise with the property occupier and other people who will be affected by the work in order to minimise disturbance to the job during:
 - planning
 - de-commissioning
 - installation
 - commissioning processes
- 5.2 use normative documents:
 - industry standards
 - British Standards
 - manufacturers' instructions for the applianceto ensure the work is completed in accordance with their requirements
- 5.3 advise of any delays to the work to any persons who are affected by the delay
- 5.4 report any delays in the work schedules to the job supervisor
- 5.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 5.6 check that the customer is satisfied with the finished job
- 5.7 complete records and documentation confirming the safe maintenance of:
 - gas appliances
 - systems
 - components
- 5.8 complete commissioning and de-commissioning records for:
 - gas appliance
 - gas systemand ensure they are stored securely.

Unit 317 Maintain gas warm air central heating systems and appliances

Outcome 6 Be able to resolve problems which could affect the de-commissioning, maintenance and commissioning process

Assessment Criteria

The learner can:

- 6.1 rectify and report deficiencies in gas and electric input services
- 6.2 resolve problems in accordance with approved procedures where pre-maintenance checks and tests reveal gas appliance, gas system or component defects
- 6.3 resolve problems in accordance with approved procedures when gas appliances, gas systems and components being commissioned do not meet design requirements
- 6.4 resolve problems in accordance with approved procedures when the gas appliance, the gas system or component cannot be restored to full performance .

Unit 317	Maintain gas warm air central heating systems and appliances
Outcome 7	Know how to maintain gas warm air central heating systems and appliances

Assessment Criteria

The learner can:

- 7.1 describe the health, safety and environmental factors that need to be incorporated in risk assessment for the domestic maintenance process
- 7.2 outline methods for safe access and working at heights
- 7.3 specify tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 7.4 explain the methods of working which protect the building décor, customer property and existing systems and components
- 7.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 7.6 specify the tools, equipment, materials and components required for the gas appliance and gas system de-commissioning, maintenance and commissioning – ordering, supplying, advising, checking and delivery procedures
- 7.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 7.8 describe the potential hazards that could arise from all de-commissioning, maintenance and commissioning activities and the checks to be carried out before work takes place
- 7.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, maintenance and commissioning activity
- 7.10 explain how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the appliance, to ensure the work is done to the specification and industry standards
- 7.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 7.12 describe how to confirm that the gas supply, electric supply, chimney system and ventilation requirements are adequate for existing gas appliances, systems, or components
- 7.13 describe how to confirm that the existing duct system is adequate for the warm air central heating appliance, system and components
- 7.14 state safe isolation methods, tests, and procedures to de-commission gas and electricity systems or components
- 7.15 explain the procedures for temporary and permanent de-commissioning of appliances and systems including use of temporary continuity bonds
- 7.16 explain the precautions to ensure that de-commissioned appliances or systems do not prove a safety hazard
- 7.17 explain measures to prevent de-commissioned appliances or systems being brought into operation utilising safety and warning notices

- 7.18 define the need to liaise with others whose procedures or routines may be affected by the suspension of the gas appliance and gas system operation
- 7.19 define the points in the de-commissioning, maintenance and re-commissioning process where co-operation and liaison with other trades and property occupier may be required
- 7.20 identify the types of warm air central heating appliances to ensure correct heater selection; downflow, upflow, horizontal flow, and slot-fit
- 7.21 state the industry practices and work standards for fabricating and installing warm air central heating gas appliances, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.22 identify the positioning and fixing requirements for warm air central heating gas appliances, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 7.23 identify the positioning and fixing requirements for warm air central heating appliances, systems and components in; airing cupboards, compartments, roof spaces, slot-fit and under stairs installations in order to comply with the manufacturers' and industry standards' requirements
- 7.24 define the positioning and fixing requirements for the installation of; warm air ducting, return air ducting, plenums, plenum adaptors, transfer grilles, registers and grilles
- 7.25 explain the industry practices and work standards for connecting to input services including; gas, electric, ventilation and chimney systems, including natural and fanned air supply
- 7.26 define the industry practices and work standards for connecting warm air central heating gas appliances and components to both new and existing gas, electric, ventilation and chimney systems
- 7.27 explain the industry practices and manufacturers' requirements for the positioning and the installation of condensate drain for condensing warm air units
- 7.28 describe the process and procedures, equipment and legislative requirements for applying tightness testing and purging to appliances, gas systems and components – See Unit 201
- 7.29 specify the process and procedures, equipment and legislative requirements for applying electrical tests to appliances, systems and components to ensure safe functioning e.g. preliminary electrical safety checks
- 7.30 define the routines and sequences of the maintenance process of warm air central heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.31 define the routines and sequences for re-commissioning warm air central heating domestic gas appliances, gas systems and components in accordance with manufacturers' specification and industry standards
- 7.32 state the procedures for checking the correct operation and performance of warm air central heating gas appliances, gas systems and components and checking against the design specification
- 7.33 state the procedures for checking the correct operation and performance of warm air central heating gas appliances, gas systems and components to ensure safe functioning
- 7.34 state the procedures for checking and confirming the gas system operating pressures
- 7.35 state the procedures for checking and confirming the appliance operating pressure and the heat input
- 7.36 describe the tests, checks and use of flue gas analysers which confirm the suitability of the gas combustion performance

- 7.37 describe the tests and checks to confirm the integrity, suitability and performance of the chimney system
- 7.38 explain the tests and checks to confirm the suitability and performance of the ventilation system
- 7.39 explain how to complete all maintenance documentation and records to be left with the property occupier i.e., benchmarks, landlord/home owner gas safety record, maintenance report form, etc
- 7.40 describe the measures to prevent un-commissioned gas systems being brought into operation utilising safety and warning notices
- 7.41 explain the system handover procedures and demonstrating the operation of replacement systems and components to end users
- 7.42 explain the steps to take when problems arise in the work activities
- 7.43 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 7.44 describe how to safely collect and dispose of system contents that may be hazardous to health or the environments e.g. waste products such as asbestos, insulation, etc
- 7.45 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g. Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc
- 7.46 explain how to isolate unsafe gas appliances, gas systems and components and application of the gas industry unsafe situations procedure.

Unit 318

Install gas meters and regulators 2.5 to 1076m³/hr

Level: 3
Credit value: 25
URN: L/502/8371

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to install, commission and decommission domestic gas meters and regulators.

The scope of work covered by this Unit is the installation, commission and decommission gas meters and regulators from 2.5 to 16.0m³/hr.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to design gas systems for installing and exchanging gas meters and regulators on gas systems
2. Be able to plan and prepare work activities for installing and exchanging gas meters and regulators on low pressure and medium pressure
3. Be able to de-commission domestic gas meters and regulators on low pressure and medium pressure
4. Be able to install, exchange, and remove gas meters and regulators on low pressure and medium pressure
5. Be able to pre-commission and commission gas meters and regulators on low pressure and medium pressure
6. Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work
7. Be able to resolve problems which could affect the de-commissioning, installation and commissioning process
8. Know how to install, commission and decommission gas meters and regulators on low pressure and medium pressure gas systems

Guided learning hours

It is recommended that **108** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.13 Install Gas Meters and Regulators (2.5 to 1076 cu m/hr)

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 1	Be able to design gas systems for installing and exchanging gas meters and regulators on gas systems

Assessment Criteria

The learner can:

- 1.1 identify and record the customer's job requirements
- 1.2 compare the customer's job requirements with statutory and industry requirements and identify any conflicting issues
- 1.3 survey the work site:
 - consult site diagrams or any key structural features that could affect the installation
 - record any details of features that may affect the installation
- 1.4 check that the proposed position of the gas meter and regulator meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
- 1.5 check that the proposed position of the gas meter housing for both low and medium pressure meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearances
- 1.6 check the availability of:
 - input services
 - gas supply
 - electricity earthing
 - ventilation provisions
 meets the manufacturers' and industry standards requirements for meter installations
- 1.7 check and ensure the design of the proposed installation is in compliance with industry standards.
- 1.8 prepare a range of design options to meet both customer and industry requirements
- 1.9 present design options to the customer using a variety of media:
 - written
 - oral
 - drawings
- 1.10 consult with the customer to obtain agreement to the design option that best meets all the requirements.

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 2	Be able to plan and prepare work activities for installing and exchanging gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 2.1 carry out a risk assessment and method statement that incorporate safety provisions and access at the work site, movement of people on site and the movement and safe storage of installation materials, tools and equipment
- 2.2 survey the work site for any pre-installation damage or defects to existing building features and record it
- 2.3 advise the property occupier of any defects found
- 2.4 protect the work site and the building fabric against possible damage being caused during the de-commissioning and installation process
- 2.5 obtain confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 2.6 check and confirm that all materials, tools and equipment needed for the de-commissioning, installation and commissioning process are available as required and are fit for purpose
- 2.7 check and confirm whether the gas meter and regulator installation is:
 - a primary meter
 - a secondary meter
- 2.8 check and confirm that the gas supply is:
 - low pressure
 - medium pressure
- 2.9 check and confirm the position of the emergency control valve (ECV) and meter inlet valve (MIV) is:
 - accessible
 - correctly labelled
 - correct operation
- 2.10 check and confirm that the position of any:
 - bypass valves
 - non-return valves
 - filters
 - pressure test points
 to ensure they are accessible, correctly labelled and the correct operation is achieved
- 2.11 check and confirm that the position of the gas meter and regulator meets the manufacturers' and industry standards requirements for:
 - location
 - siting

- clearances
- 2.12 check and confirm that the position of the meter housing meets the manufacturers' and industry standards requirements for:
 - location
 - siting
 - clearancesfor both low and medium pressure installations
- 2.13 check and confirm that the siting of the meter housing and proximity distances of meter boxes and vent-discharges can be achieved and meets the manufacturers' and industry standards requirements for medium pressure installations
- 2.14 check and confirm the gas meter and regulator installation is protected against any potential mechanical damage and the protection meets industry standards requirements
- 2.15 check and confirm the siting of the existing supply and it's proximity to other services that may affect the installation; check the proximity to:
 - electrical switchgear
 - heating equipment
 - process equipmentto ensure compliance with industry standards
- 2.16 check and confirm that the:
 - gas supply
 - ventilation provisionmeets the gas meter and regulator manufacturers' and industry standards requirements for the installation
- 2.17 carry out all necessary checks and tests to confirm the:
 - gas supply
 - earthing systemmeets the manufacturers' and industry standards' requirements for the installation
- 2.18 check existing installation for unsafe:
 - appliances
 - system componentsand apply the gas industry unsafe situation procedures to any identified
- 2.19 check and confirm that all pressure test records for gas system and components are complete.

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 3	Be able to de-commission domestic gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 3.1 check that the:
 - gas systems
 - earthing systems
 are in a condition that enables safe de-commissioning
- 3.2 use the correct tools and equipment for de-commissioning activities
- 3.3 for installations with a meter bypass – ensure that the system bypass valves are opened prior to the gas meter removal to ensure continuity of the gas supply and record the time that system is on bypass
- 3.4 use designated safe isolation methods, tests and procedures to de-commission:
 - gas meters
 - regulators
 - earthing systems
 - gas systems and components
- 3.5 carry out precautionary actions to ensure that temporarily de-commissioned:
 - gas meters
 - regulators
 - earthing systems
 - gas systems and components
 do not present a safety hazard
- 3.6 permanently remove and disconnect:
 - gas meters
 - regulators
 - gas systems and components
 as required
- 3.7 following permanent removal of the meter, mark any live gas pipework with a notice to indicate that the pipe contains gas
- 3.8 use purging procedures to confirm the safe permanent de-commissioning of the installed gas meter by purging with air.

Unit 318

Install gas meters and regulators 2.5 to 1076m³/hr

Outcome 4

Be able to install, exchange, and remove gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 4.1 carry out preparatory work to meet the installation requirements
- 4.2 install the gas meter and regulator minimising damage to customer property and building features
- 4.3 use the correct tools and equipment for the installation
- 4.4 remove any existing gas and earthing system components required for the installation
- 4.5 visually check the new gas meter and regulator to identify:
 - damage to the meter
 - damaged seals
 - that gas ways are clear
- 4.6 fabricate and assemble the gas meter and regulator system required for the installation
- 4.7 position the gas meter and regulator and confirm it meets:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards
- 4.8 position any filters and pressure test points and confirm that they meet:
 - location
 - siting
 - clearancesrequired by the manufacturers' and industry standards
- 4.9 provide the required ventilation for new or replacement gas meter and regulator installations and systems
- 4.10 ensure existing gas systems are clean and free of debris
- 4.11 connect the gas and earthing system components to the gas meter and regulator installation
- 4.12 on rotary displacement meter installations, ensure the gas meter is oiled in accordance with manufacturers' instructions
- 4.13 cap, plug or valve off any unused tappings, vents or purge points
- 4.14 use tightness testing and purging procedures to confirm the integrity of the installed gas meter and regulator, gas appliances, gas system
- 4.15 complete and attach an emergency notice on or near the meter or at the ECV if remote from the primary meter
- 4.16 take action to prevent the unauthorised use of uncommissioned gas meter and regulator and gas system and components by isolation procedures and use of warning notices.

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 5	Be able to pre-commission and commission gas meters and regulators on low pressure and medium pressure

Assessment Criteria

The learner can:

- 5.1 confirm that the complete gas meter and regulator installation complies with the:
 - manufacturers' specification
 - industry standards
 - Gas Safety (Installation Use) Regulations
 - British Standards
 - Building Regulations
- 5.2 check that the condition of the gas and electricity systems will allow safe commissioning
- 5.3 select and use the correct tools and equipment for commissioning
- 5.4 check and confirm the gas system operating pressures meet industry standards, if incorrect contact the gas supplier
- 5.5 ensure that adjustments and resealing of meter regulators are performed by OFGEM approved meter installers
- 5.6 reconfirm that the ventilation requirements meet industry standards
- 5.7 on rotary displacement meters, ensure that the meter is oiled in accordance with manufacturers' instructions
- 5.8 confirm the operation of the gas meter, regulator and components to ensure they function safely and operate in accordance with manufacturers' instructions, industry standards and British Standards
- 5.9 confirm the earthing system and components function safely and operate in accordance with industry standards
- 5.10 installations with a bypass – ensure that the system bypass valves are closed and resealed after commissioning the gas meter installation and record the time that system has been on bypass
- 5.11 instruct the property occupier on the correct operation of the gas meter and regulator installation and provide them with their copy of the any literature.

Unit 318 Install gas meters and regulators 2.5 to 1076m³/hr

Outcome 6 Be able to use and communicate data and information to carry out de-commissioning, installation and commissioning work

Assessment Criteria

The learner can:

- 6.1 liaise with the property occupier and other people who will be affected by the work during:
 - planning
 - de-commissioning
 - installation
 - commissioningto minimise disturbance to the job
- 6.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructions for the gas meter, regulator and componentsto ensure the work is completed in accordance with the specification
- 6.3 advise of any delays to the work to any persons who are affected by the delay
- 6.4 report any delays in the work schedules to the line manager responsible for the job
- 6.5 advise the designated person of any unsafe situations and actions required to remedy those situations
- 6.6 check that the customer is satisfied with the finished job
- 6.7 complete documentation to confirm the safe commissioning of the gas meter, regulator and components and components
- 6.8 complete gas meter and system de-commissioning records.

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 7	Be able to resolve problems which could affect the de-commissioning, installation and commissioning process

Assessment Criteria

The learner can:

- 7.1 rectify and report deficiencies in gas and earthing input services
- 7.2 resolve problems in accordance with approved procedures where pre-commissioning checks and tests reveal gas meter, regulator, gas systems and component defects
- 7.3 resolve problems in accordance with approved procedures when gas meter, regulator, gas systems and component being commissioned do not meet design requirements
- 7.4 report problems in accordance with approved procedures when the:
 - gas meter
 - regulator
 - gas systems
 - component
 defects cannot be restored to full performance.

Unit 318	Install gas meters and regulators 2.5 to 1076m ³ /hr
Outcome 8	Be able to install, commission and decommission gas meters and regulators on low pressure and medium pressure gas systems

Assessment Criteria

The learner can:

- 8.1 describe the health, safety and environmental factors which need to be incorporated in risk assessment for the domestic installation process
- 8.2 explain safe access and working at heights procedures
- 8.3 specify and use the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.4 describe the methods of working which protect the building décor, customer property and existing systems and components
- 8.5 state the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.6 state the tools, equipment, materials and components required for the gas meter and regulator system installation, commission and de-commission, – ordering, supplying, advising, checking and delivery procedures
- 8.7 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.8 describe the potential hazards that could arise from all de-commissioning, installation and commissioning activities and the checks to be carried out before work takes place
- 8.9 explain the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, installation and commissioning activity
- 8.10 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to the specification and industry standards
- 8.11 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 8.12 explain how to measure and record installation and site details for prefabrication purposes
- 8.13 explain how to confirm that the gas supply and earthing supply and ventilation requirements are adequate for the installation of the new gas meter, regulator and components for both low and medium pressure
- 8.14 explain how to confirm that the gas supply, earthing supply and ventilation requirements are adequate for extending the system or adding components to both low and medium pressure
- 8.15 state safe isolation methods, tests, and procedures for temporary and permanent de-commissioning of gas meters, regulators, gas systems and components, including the use of temporary continuity bonds

- 8.16 describe the precautions to ensure that de-commissioned gas meters, regulators, gas systems and components do not prove a safety hazard
- 8.17 describe measures to prevent de-commissioned gas meters, regulators, gas systems and components being brought into operation utilising safety and warning notices
- 8.18 describe how to liaise with others whose procedures or routines may be affected by the suspension of the gas meters, regulators, gas systems and components operation
- 8.19 summarise the points in the de-commissioning, installation and commissioning process where co-operation and liaison with other trades and property occupier may be required
- 8.20 identify gas meter installations that incorporate non-return valves and the manufacturers' and industry standards' installation
- 8.21 identify both low and medium pressure installations and the manufacturers' and industry standards' installation requirements
- 8.22 identify gas meter installations that incorporate a bypass
- 8.23 explain the industry practices and work standards for fabricating and installing emergency control valves (ECV's) and meter inlet valves (MIV's)
- 8.24 outline the procedures and work methods for connecting to input services including; gas, earthing systems and ventilation systems
- 8.25 state the industry practices and work standards for fabricating and installing domestic and non-domestic positive displacement meters, regulators as a primary or secondary meter installation
- 8.26 state the industry practices and work standards for fabricating and installing domestic and non-domestic positive displacement meters, regulators and components on both low and medium pressure installations to comply with manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulation
- 8.27 describe the positioning and fixing requirements for domestic and non-domestic positive displacement meters, regulators and components on both low and medium pressure installations to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 8.28 identify gas meter installations that incorporate a meter bypass
- 8.29 describe the industry practices and work standards for de-commissioning, installation and commissioning positive displacement gas meters and regulators with a bypass
- 8.30 describe the industry practices and work standards for fabricating and installing filters and pressure test points
- 8.31 state the industry practices and work standards for fabricating and installing domestic and non-domestic positive displacement gas meters, regulators and components in meter housings and compartments, including both low and medium pressure installations
- 8.32 state the industry practices and work standards for siting of the gas supplies and other services that may affect the installation i.e. proximity to electrical switch gear, heating or process equipment
- 8.33 describe the industry practices and work standards for the provision of ventilation when installing domestic and non-domestic positive displacement gas meters and regulators
- 8.34 state the industry practices and work standards for fabrication and installing protection against mechanical damage to domestic and non-domestic positive displacement gas meters, regulators and components

- 8.35 describe the process and procedures, equipment and legislative requirements for applying tightness testing and purging of domestic and non-domestic positive displacement gas meters, regulators, gas systems and components on both low and medium pressures
- 8.36 describe the routines and sequences for commissioning domestic and non-domestic positive displacement gas meters, regulators and components in accordance with manufacturers' specification and industry standards
- 8.37 state the procedures for checking the correct operation and performance of domestic and non-domestic positive displacement gas meters, regulators and components and checking against the design specification and British Standards for low and medium pressure installations
- 8.38 state the procedures for checking the operation of domestic and non-domestic positive displacement gas meters, regulators and components to ensure they function safely and operate in accordance with manufacturers' instructions and industry standards
- 8.39 state the procedures for checking that rotary displacement meter installations are correctly oiled in accordance with manufacturers' instructions
- 8.40 state the procedures for checking and confirming the gas system operating pressure is correct and actions to take if incorrect
- 8.41 describe the procedures for making adjustments to meter regulators
- 8.42 explain how to complete all domestic and non-domestic gas meter installation and commissioning documentation, labels and records to be left with the property occupier e.g. benchmark, landlord/home owner gas safety record, recording meter details for gas supplier on job documentation and meter label, emergency notices, ECV labels, medium pressure labels, etc
- 8.43 describe system handover procedures and explain the operation of domestic and non-domestic positive displacement gas meters, regulators and components to end users
- 8.44 summarise the steps to take when problems arise in the work activities
- 8.45 describe Job management structures and methods of reporting and recording job progress or problems delaying progress
- 8.46 describe how to safely collect and dispose of system contents that may be hazardous to health or the environments i.e. waste products including asbestos and insulation materials
- 8.47 demonstrate how and where to access the required information, i.e. Industry regulations regarding the safe disposal of system contents that may be hazardous to health or the environment i.e. Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations
- 8.48 explain how to isolate unsafe gas appliances, gas systems and components and apply the gas industry unsafe situations procedure.

Unit 319

Dealing with reported upstream gas emergencies

Level: 3
Credit value: 32
URN: Y/502/8373

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to deal with reported gas upstream emergencies.

The scope of work covered by this unit defines the competences required to assess, prioritise and minimise risks and hazards to life, property and the environment during upstream gas emergencies. It involves making sure that all the work is carried out safely in accordance with industry specific operational procedures and systems associated with risk reduction and removal. This work activity is normally carried out by Gas Emergency First Call Operatives.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to receive, use and communicate information and data
2. Be able to use approved gas detection and safety equipment
3. Be able to assess risks to life, property and the environment during gas emergencies
4. Be able to eliminate, remove, minimise risks to life, property and the environment during gas emergencies
5. Be able to undertake site surveys to determine the extent and levels of gas escape concentrations
6. Be able to final investigation, leaving the immediate work site safe
7. Be able to resolve problems which could affect the emergency situation
8. Know how to deal with reported gas upstream emergencies

Guided learning hours

It is recommended that **149** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.15 Dealing with Reported Gas Upstream Emergencies

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 319

Dealing with reported upstream gas emergencies

Outcome 1

Be able to receive, use and communicate information and data

Assessment Criteria

The learner can:

- 1.1 receive the job information regarding the reported escape noting the details of:
 - the type of escape
 - the location of the escape
 - who reported the escape
- 1.2 confirm the job information details with emergency dispatch control centre to ensure the correct transfer of information
- 1.3 notify emergency dispatch control centre if unable to get to the reported escape within standards:
 - vehicle breakdown
 - traffic problems
 - other reasons
- 1.4 report arrival on site and make contact with person(s) who reported the escape; obtain all information about the report from the person(s)
- 1.5 access maps of utilities plant to establish positions and locations of:
 - gas supplies
 - other services and utilities.
 - IGT sites and areas of special interest
- 1.6 use the job information when on site to assist in effective location and isolation of the escape
- 1.7 communicate with emergency dispatch control centre both during and after location of the gas escape to ensure they are kept informed of the situation on site and all the ongoing information
- 1.8 in incident situations summon additional resources and support from:
 - police
 - fire service
 - ambulance service
 - local authority
 - social services
 - others as appropriate
- 1.9 communicate with the engineering repair team, when handing over to them, to ensure they have all the job information regarding the reported escape including any additional evidence gathered from the work site
- 1.10 liaise with and update external bodies:
 - police
 - fire service
 - HSE
 - others, etc

- the property occupier
 - other people who will be affected by the work during the upstream gas emergency process
- to minimise disturbance to the job and work site
- 1.11 ensure that information provided is:
- clear
 - concise
 - accurate and up to date
- 1.12 advise of any delays to the work to any persons who are affected by the delay
- 1.13 report any delays in the work schedules to the job supervisor and emergency dispatch control centre
- 1.14 complete documentation recording the results of testing activities and actions taken:
- using company reporting systems and documentation
 - in accordance with statutory requirements.

Unit 319	Dealing with reported upstream gas emergencies
Outcome 2	Be able to use approved gas detection and safety equipment

Assessment Criteria

The learner can:

- 2.1 check and confirm all materials, tools and test equipment necessary for the upstream gas emergency activities are available as required and are fit for purpose
- 2.2 where other gases are identified and involved e.g. LPG, the appropriate actions for gas detection are carried out in accordance with company policies and procedures
- 2.3 select and use the correct tools and equipment for gas emergency activities
- 2.4 check that the gas detection equipment is approved, in date, correctly calibrated and is suitable for the proposed upstream gas emergency activity.

Unit 319

Dealing with reported upstream gas emergencies

Outcome 3

Be able to assess risks to life, property and the environment during gas emergencies

Assessment Criteria

The learner can:

- 3.1 proceed to the reported escape or other emergency situation (i.e., explosion or suspected CO/fumes) without delay to meet the minimum response standards
- 3.2 position vehicle and equipment to avoid ignition dangers
- 3.3 ensure safety equipment and PPE is available for use in accordance with the work site specific risk assessment
- 3.4 utilise all appropriate PPE and safety equipment throughout the proposed upstream gas emergency activities
- 3.5 carry out visual observations and checks on site
- 3.6 check for smells and gas ingress to all properties and voids adjacent and opposite to the reported escape in accordance with industry standards and procedures
- 3.7 take and record both high and low level atmosphere samples from internal spaces and voids in accordance with industry standards and procedures
- 3.8 following industry procedures:
 - evacuate personnel
 - isolate gas and electricity supplies
 - ventilate properties as appropriate
- 3.9 take precautionary steps to prevent the unauthorised re-entry to evacuated areas by utilising:
 - barriers
 - tape
 - and warning signs
- 3.10 take and record appropriate gas samples from no access properties and voids in accordance with industry standards and procedures
- 3.11 use company and industry procedures to make a forced entry in order to gain access to locked and unoccupied properties
- 3.12 locate underground plant using plant avoidance tools and equipment; following these checks make bar holes as required using correct methods and equipment
- 3.13 take and record appropriate external gas samples in all adventitious openings including:
 - from bar holes
 - in voids
 - in drains
 - in ducts
 - in sewers
 - in telecommunication ducts
 - in or around plant and street furniture
 - in or around governor housings and chambersin accordance with industry standards and procedures

- 3.14 ascertain the extent of the escape or other emergency situation (i.e., explosion or suspected CO/fumes); how many properties are affected or potentially affected, number of people, etc
- 3.15 identify and assess:
 - any hazards
 - their level of risk and their severity
 - record findings
- 3.16 locate the escape or handover to engineering repair team
- 3.17 continue to monitor the escape or other emergency situation (i.e., explosion or suspected CO/fumes) and check all gas concentrations outside and inside the affected properties during and after the repairs have been carried out
- 3.18 use tightness testing procedures to confirm the integrity of any installed gas system
- 3.19 work safely at all time in accordance with Health & Safety and Environment Regulations, and approved industry practices and procedures including:
 - the individual and others
 - organisational requirements
 - regulatory requirements
 - statutory requirements
 - company policies and risk assessments.

Unit 319

Dealing with reported upstream gas emergencies

Outcome 4

Be able to eliminate, remove, minimise risks to life, property and the environment during gas emergencies

Assessment Criteria

The learner can:

- 4.1 prior to any site activity being undertaken a site-specific risk assessment must be undertaken that incorporates:
 - safety provisions on the work site
 - access to the work site
 - movement of the people on the worksite
 - movement and safe storage of materials, tools and equipment for the job
- 4.2 survey the work site prior to upstream gas escape activities, for any damage or defects to existing building features and record them
- 4.3 advise the property occupier of any defects found
- 4.4 protect the work site and the building fabric against possible damage being caused during the upstream gas emergency process
- 4.5 prioritise hazards and take action to minimise the risk, in order of priority:
 - to safeguard life;
 - to safeguard property
 - to safeguard the environment
- 4.6 take prompt action to make safe identified hazards that can be safely rectified including:
 - evacuation
 - forced entry
 - minimising escapes
 - ventilating
 - creating safety zones
 - preventing smoking
 - having fire extinguishers ready
 - utilising all appropriate PPE and safety equipment and wetting the work area (where appropriate)
- 4.7 monitor the effectiveness of the risk control measures and take prompt additional action as necessary
- 4.8 establish and maintain a safe working area
- 4.9 identify both sources and potential sources of ignition and eliminate or minimise the risk
- 4.10 ventilate the property(s) including:
 - voids
 - ducts
 - drains
 - other street furniture as necessary

- 4.11 monitor and recheck work site regularly and record any additional hazards
- 4.12 locate the escape and follow industry procedures for the handover to engineering repair team
- 4.13 use designated safe isolation methods, tests, and procedures to de-commission unsafe gas systems and components as necessary
- 4.14 take precautionary actions to ensure that temporarily de-commissioned gas systems and components do not present a safety hazard
- 4.15 permanently remove and disconnect unsafe gas systems and components as required
- 4.16 undertake temporary repair(s) as necessary
- 4.17 request assistance as and when required
- 4.18 monitor, recheck and record levels of gas concentration both externally and inside the property(s) or work site regularly as required or requested
- 4.19 reports of interruptions to gas supplies and poor pressures due to:
 - water ingress
 - pipe failure
 - pipe blockage
 - human error
 - equipment failure
 - external damage
- 4.20 assess the emergency implications, undertake hazard assessment and agree action to be taken in consultation with senior person on site; team leader, first line manager, etc.

Unit 319

Dealing with reported upstream gas emergencies

Outcome 5

Be able to undertake site surveys to determine the extent and levels of gas escape concentrations

Assessment Criteria

The learner can:

- 5.1 establish a site survey and risk assessment of the gas escape situation considering the following:
 - determine whether it is natural gas or LPG
 - is the escape controlled or uncontrolled
 - what is the spread of gas concentrations and readings
 - is the escape external to the properties or tracking internally into them, what is the level of gas concentrations and readings
 - what is the location of the nearest properties
 - identify the location of any confined spaces
 - identify the presence of other utilities where gas can track availability and access to gas isolation controls
 - presence of ignition sources
 - level of ventilation
 - any electrical concerns
 - what is the density of motorized and pedestrian traffic
 - what is the gas pipe material
 - is there an escape history
 - are there any visual signs of previous work
 - what are the weather and ground conditions
 - are there any previous no trace result
- 5.2 from the site survey results:
 - categorise the outcome
 - take the necessary actions required for escape prioritisation of any unsafe situations in accordance with industry standards and procedures
- 5.3 carry out visual observations and recheck maps of gas system(s)
- 5.4 confirm the location and siting of other services around the work site by utilising a CAT and GENNY survey.

Unit 319	Dealing with reported upstream gas emergencies
Outcome 6	Be able to final investigation, leaving the immediate work site safe

Assessment Criteria

The learner can:

- 6.1 check and record levels of gas concentration internally and externally to the property(s) or work site to ensure it is safe to leave site and re-occupy the property(s) as necessary
- 6.2 follow industry procedures and criteria to establish and confirm that the work site is safe to leave following the repair of the work and in cases of no leak detected
- 6.3 report findings, details and actions to senior person on site; team leader, first line manager, etc
- 6.4 report findings, details and actions to emergency dispatch control centre.

Unit 319

Dealing with reported upstream gas emergencies

Outcome 7

Be able to resolve problems which could affect the emergency situation

Assessment Criteria

The learner can:

- 7.1 report the details of any deficiencies in the gas system(s) and components and, actions taken to emergency dispatch control centre, senior person on site; team leader, first line manager, etc
- 7.2 resolve problems in accordance with approved procedures where upstream gas emergency activities reveal gas system or component defects
- 7.3 resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance.

Unit 319

Dealing with reported upstream gas emergencies

Outcome 8

Know how to deal with reported gas upstream emergencies

Assessment Criteria

The learner can:

- 8.1 describe the regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 identify legislation covering the general responsibilities of the operative for their own safety and that of others
- 8.3 recall the knowledge and application of the relevant operational procedures for dealing with gas escapes and other emergencies
- 8.4 state the health, safety and environmental factors which need to be incorporated in risk assessment for the upstream gas emergency activities
- 8.5 describe safe access and working at heights
- 8.6 describe the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.7 explain the methods of working which protect the building, customer property and existing gas systems and components
- 8.8 describe the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.9 describe the tools, equipment, materials and components required for the upstream gas emergency activities – ordering, supplying, advising, checking and delivery procedures
- 8.10 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.11 outline the steps to take should materials, components, tools and equipment not be available at the site to commence the upstream gas emergency activity
- 8.12 identify the potential hazards that could arise from all upstream gas emergency activities and the checks to be carried out before work takes place
- 8.13 explain the company standards of service for attending; uncontrolled and controlled gas escapes and faulty meter jobs
- 8.14 explain the industry practices and procedures for carrying out upstream gas emergency activities on low, medium, intermediate, and high pressure whilst complying with; industry standards and procedures, Gas Safety (Installation and Use) Regulations and British Standards
- 8.15 describe the industry practices and procedures for carrying out upstream gas emergency activities on low, medium, intermediate and high pressure including; reported gas escapes, emissions of fumes from gas appliances, fire or explosion where gas is thought to be the cause and loss of gas supply situations
- 8.16 explain the industry practices and procedures relating to “one person working
- 8.17 state the Gas Safety (Rights of Entry) Regulations and it’s implementation including; accessing properties, notification to emergency dispatch control centre and line manager and the implications
- 8.18 state the Confined Spaces Regulations and it’s implementation including working in voids, chambers, pits, trenches, sewers, flues, wells, etc

- 8.19 recall knowledge of building construction and plans for both domestic and small commercial properties including types of: foundations; walls; floors; ceilings; roofs; and other services entering properties
- 8.20 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British and European Standards and company procedures for upstream gas emergency activities, to ensure the work is done to the specification and industry standards
- 8.21 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British and European Standards and company procedures for upstream gas emergency activities
- 8.22 describe health and safety obligations for First Call Operatives – 1.safeguard life, 2. safeguard property, 3.locate and secure the escape, 4.carry out final investigation of site, 5.initiate follow up work as necessary
- 8.23 state industry practices, procedures and actions to make safe identified hazards that can be safely rectified including; evacuation, forced entry, minimising escapes, ventilating and creating safety zones
- 8.24 describe the precautionary measures and actions to be taken within a potentially gaseous environment including; minimising risk of ignition, maximisation of ventilation, positioning of vehicles and equipment, use of temporary continuity bonds, preventing smoking, having fire extinguishers ready, utilising all appropriate PPE and safety equipment and wetting the work area
- 8.25 describe how to recognise potential sources of ignition; street lighting, electric street signs, motor vehicles, balanced flue chimneys, electric switches, industrial process plant, mobile phones, overhead power lines, etc.
- 8.26 state the procedures, precautionary measures and actions to be taken within a potentially carbon monoxide environment including CO alarm operations; evacuation, forced entry and maximisation of ventilation
- 8.27 describe the effects and symptoms of carbon monoxide and key advice to be given to people who may be affected by fumes
- 8.28 state the industry practices, techniques and procedures for carrying out barholing
- 8.29 state the requirements of NRSWA after completing barholing activities
- 8.30 describe the selection and operation of gas detection equipment
- 8.31 describe the industry techniques and procedures for use of gas detection equipment
- 8.32 explain the selection and operation of underground plant avoidance tools and equipment, e.g., Cat & Genny, etc.
- 8.33 state the industry techniques and procedures for use of underground plant avoidance tools
- 8.34 state the industry techniques and procedures for confirmation of electrical safety – absence of electricity
- 8.35 describe the industry techniques and procedures for use of electric detection equipment e.g. "Voltstick"
- 8.36 state the industry practices and procedures regarding the minimum extent of investigation area when dealing with reported upstream gas escapes
- 8.37 describe safe isolation methods, tests, and procedures to de-commission gas systems and components
- 8.38 describe the procedures for temporary and permanent de-commissioning of gas systems and components including use of temporary continuity bonds
- 8.39 explain the precautions to ensure that de-commissioned gas systems and components do not prove a safety hazard
- 8.40 describe the measures required to prevent de-commissioned gas systems and components being brought into operation utilising safety and warning notices

- 8.41 explain the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system(s) and components
- 8.42 describe the measures required to prevent uncommissioned gas systems being brought into operation utilising safety and warning notices
- 8.43 identify the points in the upstream gas emergency activities where co-operation and liaison with emergency services, other trades and property occupiers may be required
- 8.44 explain the procedures and work methods for re-connecting to gas input services
- 8.45 describe the methods of connecting components to gas systems
- 8.46 state the application, scope, requirements and procedures for tightness testing and purging to: IGE/UP/1; IGE/UP/1A; and IGE/UP/1B
- 8.47 describe the process and procedures, equipment and legislative requirements for applying gas tightness tests and purging to gas systems and components
- 8.48 explain how to record the results of testing activities and actions taken using company reporting systems and documentation, in accordance with statutory requirements for all upstream gas emergency activities
- 8.49 explain the routines and sequences for commissioning gas systems
- 8.50 state the industry practices and procedures for dealing with fires and explosions that may or may not be as a result of gas escaping including the requirements of RIDDOR
- 8.51 state the industry practices and procedures for dealing with escapes from national or local transmission systems (high pressure escapes) from both pipelines and above ground installations
- 8.52 state the industry practices and procedures for escalation of gas escapes – when, how and who to report to
- 8.53 state the industry practices and procedures for re-occupation of properties following evacuations
- 8.54 state the industry practices and procedures for dealing with gas clouds
- 8.55 state the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports (water ingress, pipe failure, pipe blockage, human error, equipment failure, external damage, etc.) – assessing the emergency implications, undertaking hazard assessments and agreeing action to be taken in consultation with senior person on site; team leader, first line manager, etc
- 8.56 explain the industry techniques and procedures for extraction of water from services including the use of water extraction equipment
- 8.57 describe the industry practices and procedures for supplying alternative heating and cooking appliances where the conveyance of gas to a property is discontinued
- 8.58 describe the characteristics and properties of LPG
- 8.59 state the industry practices and procedures for dealing with gas escapes, fires and explosions from LPG
- 8.60 state the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports on LPG
- 8.61 state the industry practices and procedures for dealing with gas escapes, fires and explosions at non domestic properties
- 8.62 state the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports at non domestic properties
- 8.63 describe the industry practices and procedures for dealing with suspected theft of gas
- 8.64 state the industry practices and procedures for dealing with no trace situations including re-checks
- 8.65 state the industry practices and procedures for site handover and leaving the site
- 8.66 describe the industry techniques and procedures for exchanging emergency control valves (ECV's) and meter inlet control valves (MIV's)

- 8.67 explain how to deal with no access to properties
- 8.68 outline the steps to take when problems arise in the work activities
- 8.69 describe how to isolate unsafe gas systems and components and application of the gas industry unsafe situations procedure
- 8.70 state how to apply the current version of the Industry Unsafe Situations Procedure including the following situations; concern for safety, at risk, immediately dangerous and RIDDOR
- 8.71 describe the industry practices and procedures for dealing with gas incident investigations
- 8.72 explain the statutory requirements for recording the results of testing activities and actions taken and, using company reporting systems and documentation
- 8.73 describe the job management structures and methods of reporting and recording job progress or problems delaying progress i.e., emergency dispatch control centre, senior person on site, team leader, first line manager, etc
- 8.74 explain how to safely collect and dispose of system contents that may be hazardous to health or the environment e.g. waste products such as asbestos, insulation, etc
- 8.75 explain how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.

Unit 320

Dealing with reported downstream gas emergencies

Level: 3
Credit value: 32
URN: T/502/8378

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary to deal with reported gas downstream emergencies.

The scope of work covered by this unit defines the competences required to identify, control, monitor and rectify downstream gas emergencies. These activities are carried out to protect life, property, secure the escape and leave the site safe. This work activity is normally carried out by Gas First Call Operatives.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to receive, use and communicate information and data
2. Be able to use approved gas detection and safety equipment
3. Be able to assess risks to life, property and the environment during gas emergencies
4. Be able to eliminate, remove, minimise risks to life, property and the environment during gas emergencies
5. Be able to undertake site surveys to determine the extent and levels of gas escape concentrations
6. Be able to final investigation, leaving the immediate work site safe resolve problems which could affect the emergency situation
7. Be able to resolve problems which could affect the emergency situation
8. Know how to deal with reported gas downstream emergencies

Guided learning hours

It is recommended that **150** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards) Gas Utilisation and Gas Safety
NOS DSG 3.16 Dealing with Reported Gas Downstream Emergencies

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 320

Dealing with reported downstream gas emergencies

Outcome 1

Be able to receive, use and communicate information and data

Assessment Criteria

The learner can:

- 1.1 receive the job information regarding the reported escape noting the details of:
 - the type of escape
 - the location of the escape
 - who reported the escape
- 1.2 confirm the job information details with emergency dispatch control centre to ensure the correct transfer of information
- 1.3 notify emergency dispatch control centre if unable to get to the reported escape within standards:
 - vehicle breakdown
 - traffic problems
 - other reasons
- 1.4 report arrival on site and make contact with person(s) who reported the escape. Obtain all information about the report from the person(s)
- 1.5 use the job information when on site to assist in effective location and isolation of the escape
- 1.6 communicate with emergency dispatch control centre both during and after location of the gas escape to ensure they are kept informed of the situation on site and all the ongoing information
- 1.7 in incident situations summon additional resources and support from:
 - police
 - fire service
 - ambulance service
 - local authority
 - social services
 - others as appropriate
- 1.8 liaise with and update external bodies:
 - police
 - fire service
 - HSE
 - others, etc
 - the property occupier
 - other people who will be affected by the work during the upstream gas emergency process

to minimise disturbance to the job and work site
- 1.9 ensure that information provided is:
 - clear
 - concise

- accurate and up to date
- 1.10 advise of any delays to the work to any persons who are affected by the delay
- 1.11 report any delays in the work schedules to the job supervisor and emergency dispatch control centre
- 1.12 complete documentation recording the results of testing activities and actions taken:
 - using company reporting systems and documentation
 - in accordance with statutory requirements
- 1.13 complete systems de-commissioning records where applicable
- 1.14 if escape is found to be an upstream emergency - communicate with the engineering repair team when handing over to them to ensure they have all the job information regarding the reported escape including any additional evidence gathered from the work site.

Unit 320	Dealing with reported downstream gas emergencies
Outcome 2	Be able to use approved gas detection and safety equipment

Assessment Criteria

The learner can:

- 2.1 check and confirm all materials, tools and test equipment necessary for the upstream gas emergency activities are available as required and are fit for purpose
- 2.2 where other gases are identified and involved e.g. LPG, the appropriate actions for gas detection are carried out in accordance with company policies and procedures
- 2.3 select and use the correct tools and equipment for gas emergency activities
- 2.4 check that the gas detection equipment is approved, in date, correctly calibrated and is suitable for the proposed downstream gas emergency activity.

Unit 320

Dealing with reported downstream gas emergencies

Outcome 3

Be able to assess risks to life, property and the environment during gas emergencies

Assessment Criteria

The learner can:

- 3.1 proceed to the reported escape or other emergency situation (i.e., explosion or suspected CO/fumes) without delay to meet the minimum response standards
- 3.2 establish positions and locations of:
 - gas supplies
 - other services and utilitiesalso access maps of gas systems where applicable
- 3.3 ensure safety equipment and PPE is available for use in accordance with the work site specific risk assessment
- 3.4 utilise all appropriate PPE and safety equipment throughout the proposed downstream gas emergency activities
- 3.5 carry out visual observations and checks on site
- 3.6 check for smells and gas ingress in and around the property where the reported escape is and, if applicable, adjacent properties to the reported escape in accordance with industry standards and procedures
- 3.7 take and record both high and low level atmosphere samples from internal spaces and voids in accordance with industry standards and procedures
- 3.8 following industry procedures:
 - evacuate personnel
 - isolate gas and electricity supplies
 - ventilate properties as appropriate
- 3.9 take precautionary steps to prevent the unauthorised re-entry to evacuated areas by utilising:
 - barriers
 - tape
 - and warning signs
- 3.10 take and record appropriate gas samples from no access properties and voids in accordance with industry standards and procedures
- 3.11 use company and industry procedures to make a forced entry in order to gain access to locked and unoccupied properties
- 3.12 check for gas ingress to properties and voids from incoming services and utilities and record findings in accordance with industry standards and procedures
- 3.13 take and record appropriate internal and external gas samples in all adventitious openings including:
 - from bar holes
 - in voids
 - in drains
 - in ducts
 - in sewers

- In cellars
 - in telecommunication ducts
 - in or around plant and street furniture
 - in or around governor housings and chambers
 - in accordance with industry standards and procedures
- 3.14 ascertain the extent of the escape or other emergency situation (i.e., explosion or suspected CO/fumes); how many properties are affected or potentially affected, number of people, etc
- 3.15 identify and assess:
- any hazards
 - their level of risk and their severity
 - record findings
- 3.16 continue to monitor the escape or other emergency situation (i.e., explosion or suspected CO/fumes) and check all gas concentrations inside and outside the affected properties during and after the repairs have been carried out
- 3.17 use tightness testing procedures to confirm the integrity of any installed gas system and appliances
- 3.18 locate the escape or handover to engineering repair team, where necessary
- 3.19 work safely at all time in accordance with Health & Safety and Environment Regulations, and approved industry practices and procedures including:
- the individual and others
 - organisational requirements
 - regulatory requirements
 - statutory requirements
 - company policies and risk assessments.

Unit 320

Dealing with reported downstream gas emergencies

Outcome 4

Be able to eliminate, remove, minimise risks to life, property and the environment during gas emergencies

Assessment Criteria

The learner can:

- 4.1 prior to any site activity being undertaken a site-specific risk assessment must be undertaken that incorporates:
 - safety provisions on the work site
 - access to the work site
 - movement of the people on the worksite
 - movement and safe storage of materials, tools and equipment for the job
- 4.2 survey the work site prior to downstream gas escape activities, for any damage or defects to existing building features and record them
- 4.3 advise the property occupier of any defects found
- 4.4 protect the work site and the building fabric against possible damage being caused during the downstream gas emergency process
- 4.5 prioritise hazards and take action to minimise the risk, in order of priority:
 - to safeguard life
 - to safeguard property
 - to safeguard the environment
- 4.6 take prompt action to make safe identified hazards that can be safely rectified including:
 - evacuation
 - forced entry
 - minimising escapes
 - ventilating
 - creating safety zones
 - preventing smoking
 - having fire extinguishers ready
 - utilising all appropriate PPE and safety equipment and wetting the work area (where appropriate)
- 4.7 monitor the effectiveness of the risk control measures and take prompt additional action as necessary
- 4.8 establish and maintain a safe working area
- 4.9 identify both sources and potential sources of ignition and eliminate or minimise the risk
- 4.10 ventilate the property(s) including:
 - voids
 - ducts
 - drains
 - cellars as necessary

- 4.11 monitor and recheck work site regularly and record any additional hazards
- 4.12 use tightness testing procedures to confirm the integrity of the installed gas system and appliances
- 4.13 locate the escape, and repair where practicable, and achievable within a 30 minute job duration following industry procedures
- 4.14 locate the escape and follow industry procedures for the handover to engineering repair team as necessary
- 4.15 use designated safe isolation methods, tests, and procedures to de-commission unsafe gas appliances, gas systems and components as necessary
- 4.16 take precautionary actions to ensure that temporarily de-commissioned gas appliances, gas systems and components do not present a safety hazard
- 4.17 permanently remove and disconnect:
 - unsafe gas appliances
 - gas systems and components as required
- 4.18 undertake temporary repair(s) as necessary
- 4.19 respond to reports of asphyxiation, gassing or fumes and carry out the necessary test and checks to industry requirements. Summon assistance in the event of incidents and fatalities
- 4.20 request assistance as and when required
- 4.21 monitor, recheck and record levels of gas concentration both inside and externally around the property(s) or work site regularly as required or requested
- 4.22 reports of interruptions to gas supplies and poor pressures due to:
 - water ingress
 - pipe failure
 - pipe blockage
 - human error
 - equipment failure
 - external damage
- 4.23 assess the emergency implications, undertake hazard assessment and agree action to be taken in consultation with senior person on site; team leader, first line manager, etc
- 4.24 respond to reports of fluctuating supplies, identify and rectify problems or request the attendance of engineering team
- 4.25 respond to reports of no gas and take appropriate action to restore gas supplies
- 4.26 respond to reports of birds and animals behind appliances and take appropriate action to free them
- 4.27 utilise and apply the current version of the industry unsafe situations procedure where required

Unit 320

Dealing with reported downstream gas emergencies

Outcome 5

Be able to undertake site surveys to determine the extent and levels of gas escape concentrations

Assessment Criteria

The learner can:

- 5.1 establish a site survey and risk assessment of the gas escape situation considering the following:
 - determine whether it is natural gas or LPG
 - is the escape controlled or uncontrolled
 - what is the spread of gas concentrations and readings
 - is the escape external to the properties or tracking internally into them
 - what is the level of gas concentrations and readings
 - what is the location of the nearest properties
 - identify the location of any confined spaces
 - identify the presence of other utilities where gas can track
 - availability and access to gas isolation controls
 - presence of ignition sources
 - level of ventilation
 - any electrical concerns
 - what is the gas pipe material
 - is there an escape history
 - are there any visual signs of previous work
 - what are the weather and ground conditions
 - are there any previous no trace result
- 5.2 from the site survey results, categorise the outcome and take the necessary actions required for escape prioritisation of any unsafe situations in accordance with industry standards and procedures
- 5.3 carry out visual observations and recheck maps of gas system(s) as necessary
- 5.4 procedures and criteria to establish and confirm that the site is safe to leave after the repair work has been carried out

Unit 320	Dealing with reported downstream gas emergencies
Outcome 6	Be able to final investigation, leaving the immediate work site safe

Assessment Criteria

The learner can:

- 6.1 check and record levels of gas concentrations:
 - Internally
 - externally to the property(s) or work site
 to ensure it is safe to leave site and re-occupy the property(s) as necessary
- 6.2 use tightness testing and purging procedures to re-confirm the integrity of the installed gas system and appliances
- 6.3 select and use the correct tools and equipment for re-commissioning activities
- 6.4 check that conditions within the gas system will permit safe re-commissioning
- 6.5 re-establish and purge gas supply to the system and appliances
- 6.6 check and confirm the gas system operating pressures meet industry standards
- 6.7 check the combustion performance visually as required
- 6.8 re-confirm that purpose provided ventilation is present and free from blockage
- 6.9 follow industry procedures and criteria to establish and confirm that the work site is safe to leave following the repair of the work and in cases of no leak detected
- 6.10 report findings, details and actions to:
 - senior person on site
 - team leader
 - first line manager, etc
 where necessary
- 6.11 report findings, details and actions to emergency dispatch control centre.

Unit 320

Dealing with reported downstream gas emergencies

Outcome 7

Be able to resolve problems which could affect the emergency situation

Assessment Criteria

The learner can:

- 7.1 rectify and report the details of any deficiencies in the gas appliances, gas system and components and, actions taken, to emergency dispatch control centre, senior person on site; team leader, first line manager, etc
- 7.2 resolve problems in accordance with approved procedures where downstream gas emergency activities reveal gas appliances, gas system and component defects
- 7.3 resolve problems in accordance with approved procedures when the:
 - gas appliances
 - gas system and componentscannot be restored to full performance.

Unit 320 Dealing with reported downstream gas emergencies

Outcome 8 Know how to deal with reported gas downstream emergencies

Assessment Criteria

The learner can:

- 8.1 describe the regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 8.2 identify legislation covering the general responsibilities of the operative for their own safety and that of others
- 8.3 recall the knowledge and application of the relevant operational procedures for dealing with gas escapes and other emergencies
- 8.4 state the health, safety and environmental factors which need to be incorporated in risk assessment for the downstream gas emergency activities
- 8.5 describe safe access and working at heights
- 8.6 describe the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 8.7 explain the methods of working which protect the building, customer property and existing gas systems, appliances and components
- 8.8 describe the care and maintenance requirements of tools and equipment, and checks for safe condition
- 8.9 describe the tools, equipment, materials and components required for the downstream gas emergency activities – ordering, supplying, advising, checking and delivery procedures
- 8.10 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 8.11 outline the steps to take should materials, components, tools and equipment not be available at the site to commence the downstream gas emergency activity
- 8.12 identify the potential hazards that could arise from all downstream gas emergency activities and the checks to be carried out before work takes place
- 8.13 explain the company standards of service for attending; uncontrolled and controlled gas escapes and faulty meter jobs
- 8.14 explain the industry practices and procedures for carrying out downstream gas emergency activities on both low and medium pressure whilst complying with; industry standards and procedures, Gas Safety (Installation & Use) Regulations and British Standards
- 8.15 describe the industry practices and procedures for carrying out downstream gas emergency activities on both low and medium pressure including; reported gas escapes, emissions of fumes from gas appliances, fire or explosion where gas is thought to be the cause and loss of gas supply situations
- 8.16 explain the industry practices and procedures relating to “one person working”
- 8.17 state the Gas Safety (Rights of Entry) Regulations and it’s implementation including; accessing properties, notification to emergency dispatch control centre and line manager and the implications
- 8.18 state the Confined Spaces Regulations and it’s implementation including working in voids, chambers, pits, trenches, pipes, sewers, flues, wells, etc

- 8.19 recall knowledge of building construction and plans for both domestic and small commercial properties including types of: foundations; walls; floors; ceilings; roofs; and other services entering properties
- 8.20 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British and European Standards and company procedures for downstream gas emergency activities, to ensure the work is done to the specification and industry standards
- 8.21 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British and European Standards and company procedures for downstream gas emergency activities
- 8.22 describe Health & Safety obligations for First Call Operatives – 1.safeguard life, 2. safeguard property, 3.locate and secure the escape, 4.carry out final investigation of site, 5.Initiate follow up work as necessary
- 8.23 state industry practices, procedures and actions to make safe identified hazards that can be safely rectified including; evacuation, forced entry, minimising escapes, ventilating and creating safety zones
- 8.24 describe the precautionary measures and actions to be taken within a potentially gaseous environment including; minimising risk of ignition, maximisation of ventilation, positioning of vehicles and equipment, use of temporary continuity bonds, preventing smoking, having fire extinguishers ready, utilising all appropriate PPE and safety equipment and wetting the work area
- 8.25 describe how to recognise potential sources of ignition for downstream gas emergency activities; lighting, balanced flue chimneys, electric switches, mobile phones, damaged electric cables, etc
- 8.26 describe the procedures, precautionary measures and actions to be taken within a potentially carbon monoxide environment including CO alarm operations; evacuation, forced entry and maximisation of ventilation
- 8.27 explain the effects and symptoms of carbon monoxide and key advice to be given to people who may be affected by fumes
- 8.28 describe the selection and operation of gas detection equipment
- 8.29 describe the industry techniques and procedures for use of gas detection equipment
- 8.30 describe the industry techniques and procedures for confirmation of electrical safety – absence of electricity
- 8.31 explain the industry techniques and procedures for use of electric detection equipment e.g. 'Voltstick'
- 8.32 state safe isolation methods, tests, and procedures to de-commission gas systems, appliances and components
- 8.33 state the procedures for temporary and permanent de-commissioning of gas systems, appliances and components including use of temporary continuity bonds
- 8.34 describe the precautions to ensure that de-commissioned gas systems, appliances and components do not prove a safety hazard
- 8.35 explain measures which prevent de-commissioned gas systems, appliances and components being brought into operation utilising safety and warning notices
- 8.36 explain the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system(s), appliances and components
- 8.37 describe measures which prevent un-commissioned gas systems, appliances and components being brought into operation utilising safety and warning notices
- 8.38 identify the points in the downstream gas emergency activities where co-operation and liaison with emergency services, other trades and property occupiers may be required
- 8.39 describe the procedures and work methods for re-connecting to gas input services
- 8.40 describe the methods of connecting components to gas systems

- 8.41 state the process and procedures, equipment and legislative requirements for applying gas tightness tests and purging to gas systems and components
- 8.42 state the application, scope, requirements and procedures for tightness testing and purging to: IGE/UP/1; IGE/UP/1A; and IGE/UP/1B
- 8.43 state the process and procedures, equipment and legislative requirements for applying gas tightness tests and purging to gas systems and components
- 8.44 demonstrate how to record the results of testing activities and actions taken using company reporting systems and documentation, in accordance with statutory requirements for all downstream gas emergency activities
- 8.45 outline the routines and sequences for re-commissioning gas systems and appliances
- 8.46 describe how to confirm that gas, chimney and ventilation input services are adequate for existing gas systems, appliances and components
- 8.47 describe installation and jointing methods of open-flues chimney systems and room-sealed appliances
- 8.48 describe the industry practices and procedures for dealing with fires and explosions that may or may not be as a result of gas escaping including the requirements of RIDDOR
- 8.49 explain the industry practices and procedures for escalation of gas escapes – when, how and who to report to
- 8.50 state the industry practices and procedures for re-occupation of properties following evacuations
- 8.51 state the industry practices and procedures for dealing with gas clouds
- 8.52 state the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports; water ingress, pipe failure, pipe blockage, human error, equipment failure, external damage, etc – assessing the emergency implications, undertaking hazard assessments and agreeing action to be taken in consultation with senior person on site; team leader, first line manager, etc
- 8.53 describe the industry techniques and procedures for extraction of water from services including the use of water extraction equipment
- 8.54 outline the industry practices and procedures for supplying alternative heating and cooking appliances where the conveyance of gas to a property is discontinued
- 8.55 explain the characteristics and properties of LPG
- 8.56 describe the industry practices and procedures for dealing with gas escapes, fires and explosions from LPG
- 8.57 explain the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports on LPG
- 8.58 state the industry practices and procedures for dealing with gas escapes, fires and explosions at non domestic properties
- 8.59 state the industry practices and procedures for dealing with interruptions to gas supplies and poor pressure reports at non domestic properties
- 8.60 state the industry practices and procedures for dealing with suspected theft of gas
- 8.61 describe the industry practices and procedures for dealing with no trace situations including re-checks
- 8.62 describe the industry practices and procedures for site handover and leaving the site
- 8.63 explain the industry practices and procedures for dealing with birds and animals behind appliances
- 8.64 describe the industry techniques and procedures for exchanging emergency control valves (ECV's) and meter inlet control valves (MIV's)
- 8.65 explain the industry techniques and procedures for installation of natural gas meters and gas meter housings and compartments
- 8.66 outline procedures for dealing with no access to properties

- 8.67 describe the steps to take when problems arise in the work activities
- 8.68 describe how to isolate unsafe gas systems, appliances and components and application of the gas industry unsafe situations procedure
- 8.69 state how to apply the current version of the Industry Unsafe Situations Procedure including the following situations; concern for safety, at risk, immediately dangerous and RIDDOR
- 8.70 explain the industry practices and procedures for dealing with gas incident investigations
- 8.71 state the statutory requirements for recording the results of testing activities and actions taken and, using company reporting systems and documentation
- 8.72 describe job management structures and methods of reporting and recording job progress or problems delaying progress i.e., emergency dispatch control centre, senior person on site, team leader, first line manager, etc
- 8.73 state how to safely collect and dispose of system contents that may be hazardous to health or the environment e.g. waste products such as asbestos, insulation, etc
- 8.74 demonstrate how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc.

Unit 321

Strength testing, gas tightness testing and direct purging –IGE/UP/1A

Level: 3
Credit value: 12
URN: M/502/8380

Unit aim

The aim of this unit is to assess the competence of individuals to recognised national occupational standards. The unit supports workforce development and describes the competencies necessary for strength testing, tightness testing and direct purging of small, low pressure industrial and commercial natural gas installations. This standard covers the work activities of planning, de-commissioning and commissioning gas installations.

The scope of work covered by this unit is 'Small, low pressure industrial and commercial natural gas installations'. It refers to Natural Gas Systems and Components downstream of an emergency control valve (ECV). The installation shall have; a volume not exceeding 1.0m³ including any meter and any allowance for fittings, a maximum operating pressure (MOP) not exceeding 40mbar at the outlet of the primary meter regulator, a supply (MOP) not exceeding 75mbar, a nominal bore not exceeding 150mm.

This unit will provide evidence of competence to enable an individual to apply for a 'licence to practice' from the gas industry registrar, currently Gas Safe Register.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Be able to plan and prepare work activities for strength testing, tightness testing and direct purging - IGE/UP/1A
2. Be able to de-commission gas systems and components to industry standards
3. Be able to carry out strength testing, tightness testing and direct purging of gas systems and components to industry standards - IGE/UP/1A
4. Be able to use and communicate data and information to carry out de-commissioning, strength testing, tightness testing and direct purging to industry standards
5. Be able to resolve problems which could affect de-commissioning, strength testing, tightness testing and direct purging
6. Know how to carry out strength testing, tightness testing and direct purging - IGE/UP/1A

Guided learning hours

It is recommended that **58** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit of assessment relates directly to Energy & Utility Skills Sector Performance Standards (approved National Occupational Standards)

NOS DSG 3.17 Strength Testing, Tightness Testing and Direct Purging - IGE/UP/1A

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit will be assessed by:

- A portfolio of evidence

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 1	Be able to plan and prepare work activities for strength testing, tightness testing and direct purging - IGE/UP/1A

Assessment Criteria

The learner can:

- 1.1 produce a risk assessment and method statement that incorporates:
 - safety provisions on the work site
 - access to the work site
 - movement of people on the worksite
 - movement and safe storage of materials, tools and equipment for the job
- 1.2 survey the work site for:
 - any damage
 - defects to existing building features
 - record details of any features that may affect the installation
- 1.3 advise the property occupier of any damage and defects found
- 1.4 protect the work site and the building fabric against possible damage being caused during the:
 - strength testing
 - tightness testing
 - direct purging process
- 1.5 get confirmation from the property occupier before the job starts to ensure that they agree the planned work
- 1.6 confirm the siting of the gas supply and the provision of ventilation meets the requirements for:
 - strength testing
 - tightness testing
 - direct purging
 - IGE/UP/1A
- 1.7 check and confirm all materials, tools and test equipment necessary for:
 - de-commissioning
 - strength testing
 - tightness testing
 - direct purging process
 are available as required and are fit for purpose
- 1.8 check and confirm that the:
 - gas supply
 - earthing supply
 - provision of ventilation
 meet the industry standards' requirements for the installation
- 1.9 carry out all necessary checks and tests to confirm the gas supply meets the industry requirements for the installation

- 1.10 check existing installation for any unsafe:
 - appliances
 - system components
- 1.11 apply the gas industry unsafe situations procedures to any identified unsafe situations.

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 2	Be able to de-commission gas systems and components to industry standards

Assessment Criteria

The learner can:

- 2.1 check that conditions within the gas system will permit safe de-commissioning
- 2.2 select and use the correct tools and equipment for de-commissioning activities
- 2.3 use designated safe:
 - isolation methods
 - tests
 - procedures
 to de-commission gas systems and components
- 2.4 take precautionary actions to ensure that temporarily de-commissioned:
 - appliances
 - gas systems
 - components
 do not present a safety hazard
- 2.5 permanently remove and disconnect appliances and gas system components as required
- 2.6 measure, calculate and record gas system installation volumes for direct purging activities to carry out permanent de-commissioning of the installed gas system
- 2.7 use purging procedures to confirm the safe permanent de-commissioning of the installed gas system by purging of gas with air.

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 3	Be able to carry out strength testing, tightness testing and direct purging of gas systems and components to industry standards - IGE/UP/1A

Assessment Criteria

The learner can:

- 3.1 confirm the complete pipework installation complies with:
 - the manufacturers' specification
 - industry standards
- 3.2 carry out preparatory work for:
 - strength testing
 - tightness testing
 - direct purging
 to meet industry standards
- 3.3 check that conditions within the gas system will permit safe:
 - strength testing
 - tightness testing
 - direct purging activities
- 3.4 select and use the correct tools and equipment for:
 - strength testing
 - tightness testing
 - direct purging activities
- 3.5 measure, calculate and record gas system installation volumes for:
 - strength testing
 - tightness testing
 - direct purging activities
- 3.6 ensure ventilation for strength testing, tightness testing and direct purging activities meets industry standards' requirements
- 3.7 remove and bypass existing gas appliances and gas components as required
- 3.8 ensure existing gas systems are clean and free of debris
- 3.9 carry out:
 - strength testing
 - tightness testing
 - direct purging
 - processes minimising damage to customer property and building features
- 3.10 use strength testing procedures – IGE/UP/1A to confirm the integrity of the newly installed gas system
- 3.11 if the installation fails the strength test:
 - trace and repair the escape and retest, or
 - isolate unsafe gas system and components and apply the gas industry unsafe situations procedure

- 3.12 use tightness testing procedures – IGE/UP/1A to confirm the integrity of the new and existing gas system and , where applicable, new and existing appliances to ensure the installation doesn't exceed the maximum permissible pressure drop allowed for the installation
- 3.13 use tightness testing procedures – IGE/UP/1A to confirm the integrity of the gas system where the maximum operating
- 3.14 if the installation fails the tightness test:
 - trace and repair the escape and retest, or
 - isolate unsafe gas appliances, gas system and components and apply the gas industry unsafe situations procedure
- 3.15 replace any gas appliances and components removed from the pipework installation and remove bypasses as required
- 3.16 measure, calculate and record gas system installation volumes for direct purging activities
- 3.17 use purging procedures – IGE/UP/1A to confirm the safe supply of gas to the installed gas system and appliances
- 3.18 if the direct purge fails then carry out indirect purging using nitrogen, identify and rectify the cause of direct purge failure and repeat the purge
- 3.19 instruct the property occupier on the correct operation of the gas system, valves and components and provide them with their copy of the any literature
- 3.20 take precautionary actions to prevent the unauthorised use of:
 - uncommissioned gas appliances
 - gas systems and componentsby isolation procedures and use of warning notices

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 4	Be able to use and communicate data and information to carry out de-commissioning, strength testing, tightness testing and direct purging to industry standards

Assessment Criteria

The learner can:

- 4.1 liaise with the property occupier and other people who will be affected by the work during the:
 - planning
 - de-commissioning
 - strength testing
 - tightness testing
 - direct purging
 activities to minimise disturbance to the job
- 4.2 use:
 - normative documents
 - industry standards
 - British Standards
 - information from manufacturers' instructions
 applicable to the gas system and the appliance to ensure the work is done to the specification
- 4.3 advise of any delays to the work to any persons who are affected by the delay
- 4.4 report any delays in the work schedules to the job supervisor
- 4.5 advise the designated persons of any unsafe situations and actions required to remedy those situations
- 4.6 check that the customer is satisfied with the finished job
- 4.7 complete documentation confirming:
 - safe strength testing
 - tightness testing
 - direct purging
 of gas systems and components
- 4.8 complete gas system de-commissioning records

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 5	Be able to resolve problems which could affect de-commissioning, strength testing, tightness testing and direct purging

Assessment Criteria

The learner can:

- 5.1 rectify and report deficiencies in gas and earthing input services
- 5.2 resolve problems in accordance with approved procedures where pre- tightness testing and direct purging checks and tests reveal gas system or component defects
- 5.3 resolve problems in accordance with approved procedures when gas systems and components being tightness tested and purged do not meet design requirements
- 5.4 resolve problems in accordance with approved procedures when the gas system and components cannot be restored to full performance.

Unit 321	Strength testing, gas tightness testing and direct purging –IGE/UP/1A
Outcome 6	Know how to carry out strength testing, tightness testing and direct purging - IGE/UP/1A

Assessment Criteria

The learner can:

- 6.1 describe regulations and guidance governing health and safety in the workplace, environmental protection and the use of risk assessments
- 6.2 state legislation covering the general responsibilities of the operative for their own safety and that of others
- 6.3 describe health, safety and environmental factors which need to be incorporated in risk assessment for non-domestic strength testing, tightness testing and direct purging process
- 6.4 explain safe access and working at heights
- 6.5 describe the tools and equipment necessary to provide safe access to work at heights, or in confined spaces
- 6.6 explain the methods of working which protect the building décor, customer property and existing systems and components
- 6.7 identify the tools, equipment, materials and components required for de-commissioning, strength testing, tightness testing and direct purging processes – ordering, supplying, advising, checking and delivery procedures
- 6.8 describe the care and maintenance requirements of tools and equipment, and checks for safe condition
- 6.9 explain how to safely secure and store tools, equipment, materials and components to minimise loss or wastage
- 6.10 state the potential hazards that could arise from all de-commissioning, strength testing, tightness testing and direct purging activities and the checks to be carried out before work takes place
- 6.11 outline the steps to take should materials, components, tools and equipment not be available at the site to commence the de-commissioning, strength testing, tightness testing and direct purging activity
- 6.12 demonstrate how and where to access the required information, i.e. normative documents, industry standards guidance documents, British Standards and manufacturers' instructions applicable to the gas system and appliance, to ensure the work is done to industry standards
- 6.13 demonstrate how to read and interpret the information contained in normative documents, industry standards guidance documents, British Standards and manufacturers' instructions
- 6.14 describe safe isolation methods, tests, and procedures to de-commission gas systems or components
- 6.15 state the procedures for temporary and permanent de-commissioning of gas systems including use of temporary continuity bonds
- 6.16 explain the precautions to ensure that de-commissioned gas systems do not prove a safety hazard
- 6.17 describe the measures to prevent de-commissioned gas systems being brought into operation utilising safety and warning notices

- 6.18 state the purging procedures to confirm the safe permanent de-commissioning of the installed gas system by purging of gas with air -IGE/UP/1A
- 6.19 describe the need to liaise with others whose procedures or routines may be affected by the suspension of the gas system operation
- 6.20 identify the points in the de-commissioning, strength testing, tightness testing and direct purging process where co-operation and liaison with other trades and property occupier may be required
- 6.21 state the industry practices and work standards for fabricating and installing gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 6.22 state the types of pipe materials suitable for carrying gas - steel, malleable iron, copper, trappipe, polyethylene and lead, etc.
- 6.23 state the types of pipe fittings suitable for carrying gas – capillary, compression, push-fit, union joints and screwed joints
- 6.24 describe the industry practices and work standards for jointing materials and fittings suitable for carrying gas, including connecting to lead composition pipes
- 6.25 state the positioning and fixing requirements for gas pipework, valves, systems and components to comply with the manufacturers' specification, industry standards, Gas Safety (Installation and Use) Regulations, British Standards and Building Regulations
- 6.26 explain the procedures and work methods for connecting to input services including; gas, earthing systems and ventilation
- 6.27 explain the procedures and work methods of connecting pipework, valves and components to both new and existing gas systems and appliances
- 6.28 describe how to confirm that the gas supply and ventilation are adequate for de-commissioning, strength testing, tightness testing and direct purging of the gas system, appliance(s) and components – IGE/UP/1A
- 6.29 explain how to measure, calculate and record gas system installation volumes for strength testing, tightness testing and direct purging activities – IGE/UP/1A
- 6.30 describe the test equipment and legislative requirements for applying strength testing, tightness testing to gas systems, appliances and components – IGE/UP/1A
- 6.31 state how to remove or bypass existing gas appliances and components prior to carrying out strength testing, tightness testing and purging activities
- 6.32 inform the strength testing procedures - IGE/UP/1A to confirm the integrity of newly installed gas system and, where applicable, new and existing appliances
- 6.33 inform the tightness testing procedures (IGE/UP/1A) to confirm the integrity of newly installed and existing gas systems and, where applicable, new and existing appliances to ensure the installation doesn't exceed the maximum permissible pressure drop
- 6.34 recognition of medium pressure regulator sets – IGE/UP/1A 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
- 6.35 inform tightness testing procedures – IGE/UP/1A to confirm the integrity of gas systems where the maximum operating pressure (MOP) at the outlet of the emergency control valve (ECV) is above 75mbar but not exceeding 2bar and, where a meter inlet valve (MIV) is fitted or, no meter inlet valve is fitted
- 6.36 describe the process and procedures for tracing and repairing escapes if the installation fails the strength test and tightness test
- 6.37 describe the process and procedures, equipment and legislative requirements for applying direct purging of gas systems, appliances and components – IGE/UP/1A

- 6.38 inform the routines and sequences for direct purging of gas systems, appliances and components – IGE/UP/1A
- 6.39 explain the process and procedures if the direct purge fails – identifying the cause of direct purge failure and carrying out indirect purging using nitrogen
- 6.40 inform the routines and sequences for commissioning gas systems, valves and components to industry standards
- 6.41 state the measures to prevent uncommissioned gas systems being brought into operation utilising safety and warning notices
- 6.42 describe how to complete all strength testing, tightness testing and direct purging documentation and records to be left with the property occupier – IGE/UP/1A i.e., Gas Testing and Purging Certificate, benchmarks, landlord/home owner gas safety record, etc
- 6.43 explain the system handover procedures and demonstrating the operation of gas systems and components to end users
- 6.44 outline the steps to take when problems arise in the work activities
- 6.45 describe job management structures and methods of reporting and recording job progress or problems delaying progress
- 6.46 explain how to safely collect and dispose of system contents that may be hazardous to health or the environments e.g., waste products such as asbestos, insulation, etc
- 6.47 state how and where to access the required information, i.e. Industry Regulations regarding the safe disposal of system contents that may be hazardous to health or the environment e.g., Special Waste Regulations, Hazardous Waste Regulations, Control of Asbestos at Work Regulations, etc
- 6.48 explain how to isolate unsafe gas appliances, gas systems and components in accordance with the gas industry unsafe situations procedure.

Level: 3
Credit value: 13
URN: J/502/8465

Unit aim

This unit aims to provide learners with the knowledge and understanding of water science, water processes, water principles and environmental considerations and requirements. This unit is required for working on water systems in the gas industry.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Know the energy conservation legislation that applies to the building services industry
2. Know the applications of energy sources used in the building services industry
3. Know the importance of energy conservation when commissioning building services systems
4. Know the methods of reducing waste and conserving energy while working in the building services industry
5. Know how to safely dispose of materials used in the building services industry
6. Know the methods of conserving and reducing wastage of water within the building services industry
7. Know the principles of plumbing science and how to apply them in the workplace
8. Know plumbing processes and how to apply them in the workplace

Guided learning hours

It is recommended that **90** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit applies to all the National Occupational Standards in gas utilisation.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Energy & Utility Skills

Assessment

This unit is assessed by:

- A portfolio of evidence

Unit 322

Water compulsory core

Outcome 1

Know the energy conservation legislation that applies to the building services industry

Assessment criteria

The learner can:

- 1.1 state the aims of energy conservation legislation
- 1.2 state the requirements of the Building Regulations Part L1 and how to apply them to the building services industry
- 1.3 describe the responsibilities of members of the construction team under energy conservation legislation
- 1.4 describe the following environmental factors, responsibilities, initiatives and regulations to include:
 - the importance of energy conservation
 - the main requirements of environmental legislation
 - the application of Part L1 Building Regulations
 - the Standard Assessment Procedure (SAP) for Energy Rating of Buildings
 - the application of the Water Regulations
 - how the plumbing/heating industry can contribute to energy conservation
 - the planning requirements for the integration of environmental technology within systems in new build situations and as additions to existing buildings
 - the responsibilities of members of the construction team under energy conservation legislation:
 - clients (customers)
 - designers
 - employers.

Unit 322

Water compulsory core

Outcome 2

Know the applications of energy sources used in the building services industry

Assessment criteria

The learner can:

- 2.1 state three types of high carbon energy used in properties
- 2.2 state four types of Low carbon energy used in properties
- 2.3 state three types of Zero carbon energy used in properties
- 2.4 describe the basic operating principles of installations containing environmental energy sources including:
 - solar thermal
 - solid fuel (biomass)
 - heat pumps (water, air and ground source):
 - o combined heat and power (CHP)
 - o combined cooling, heat and power (CCHP)
 - o underfloor heating
- 2.5 state where to find information on alternative energy sources
- 2.6 name organisations which give guidance and advice on energy saving and conservation techniques
- 2.7 explain how to use energy rating tables and their effect on component selection
- 2.8 describe renewable and non renewable energy sources to include:
 - types of energy – high carbon non-renewable:
 - o natural gas / LPG
 - o fuel oils
 - o solid fuels (coal and peat)
 - o electricity – generated from fossil fuels
 - types of energy – low carbon renewable:
 - o solar thermal
 - o solid fuel (biomass)
 - o hydrogen fuel cell
 - o heat pumps (ground and air source)
 - o combined heat and power (CHP)
 - o combined cooling heat and power (CCHP)
 - types of energy – zero carbon renewable:
 - o electricity - wind
 - o electricity - tidal
 - o hydroelectric
 - o solar photovoltaic
 - uses and basic operating principles of environmental technologies:
 - o underfloor heating
 - o solar hot water heating
 - o heat pumps (water, ground and air source)
 - o biomass
 - o combined heat and power (CHP)

- o combined cooling heat and power (CCHP)
 - uses of other environmental technologies:
 - o solar photo voltaic
 - o wind energy system
 - o micro hydro
 - Building Regulations (including energy efficiency requirements for new dwellings)
 - the general advice that can be given on methods of reducing waste of resources, and effecting savings, including environmental technologies - Energy Savings Trust
 - Central Heating System Specification (CHeSS)
 - SEDBUK Rating of Boilers
- 2.9 Explain the importance of energy efficiency, and where relevant, water efficiency considerations when selecting systems, equipment or components.

Unit 322

Water compulsory core

Outcome 3

Know the importance of energy conservation when commissioning building services systems

Assessment criteria:

The learner can:

- 3.1 describe the role of the commissioning process in conserving energy usage
- 3.2 explain the advice to be given during the system handover procedure to the customer that will contribute to conserving energy usage
- 3.3 explain the following factors affecting energy conservation when commissioning building services systems:
 - customer advice for energy conservation
 - the importance of ensuring that installed systems and components are correctly commissioned and customers are informed on key operating requirements
 - sources of information and advice:
 - information that needs to be passed to relevant people to ensure the correct and economical use of energy dependant systems
 - manufacturers' instructions
 - operating procedures
 - customer / client advice
 - using principles that minimise the usage of energy in installed systems and components
 - using principles that minimise the usage of water in installed systems and components.

Unit 322

Water compulsory core

Outcome 4

Know the methods of reducing waste and conserving energy while working in the building services industry

Assessment criteria

The learner can:

- 4.1 describe three working practices that can be employed to conserve energy and protect the environment
- 4.2 state three methods of reducing material wastage
- 4.3 describe the work methods which reduce waste and conserve energy whilst working in the building services industry:
 - environmental protection measures:
 - o planning work activities
 - o reducing over ordering of materials
 - o minimising damage to stored materials
 - o minimising the wastage of equipment and materials
 - o accurate measuring, cutting, bending and jointing
 - o minimising Loss and theft of materials on-site
 - o choosing and using materials that can be readily recycled.

Unit 322

Water compulsory core

Outcome 5

Know how to safely dispose of materials used in the building services industry

Assessment criteria

The learner can:

- 5.1 state the statutory legislation for waste management on construction sites
- 5.2 state what is required when conducting carriage of waste by roads
- 5.3 explain the approved processes for recycling materials i.e., metals, plastics, wood and cardboard
- 5.4 state the purpose of the regulations covering the safe disposal of materials used in the building services industry to include:
 - The Controlled Waste Regulations
 - Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations
 - Control of Asbestos at Work Regulations
 - Packaging Regulations
 - The Waste Electrical and Electronic Equipment Regulations (WEEE)
- 5.5 describe the disposal requirements of potentially hazardous materials i.e., asbestos, electrical and electronic equipment and refrigerants (fluorinated gases)
- 5.6 state the regulations which cover the disposal of hazardous waste and outline the actions to take if work activities endanger the environment, to include:
 - The Special Waste Regulations
 - The Hazardous Waste Regulations
 - licensed waste disposal sites
 - specialist waste disposal requirements e.g. asbestos
 - carriage of waste by roads – waste carriers license
 - Water Supply Regulations methods of disposing of waste.

Unit 322

Water compulsory core

Outcome 6

Know the methods of conserving and reducing wastage of water within the building services industry

Assessment criteria

The learner can:

- 6.1 state the statutory legislation for water wastage and misuse
- 6.2 state the criteria for water efficiency calculations for new dwellings
- 6.3 state two methods of reducing water wastage in dwellings
- 6.4 explain the methods available for capturing surface water and recycling used water
- 6.5 describe the uses of captured and recycled water in properties
- 6.6 describe the methods of conserving and reducing wastage of water within the building services industry to include:
 - The Application of the Water Regulations
 - The Application of Part L1 of the Building Regulations
 - methods of reducing water wastage in new and existing buildings utilising:
 - flow reducing valves
 - spray taps
 - low volume flush WC
 - the basic working principles of captured and recycled water systems
 - rain water harvesting
 - grey water systems
 - the planning requirements for the integration of environmental technology within systems in new build situations and as additions to existing buildings.

Unit 322

Water compulsory core

Outcome 7

Know the principles of plumbing science and how to apply them in the workplace

Assessment criteria

The learner can:

- 7.1 state the boiling and freezing point of water
- 7.2 describe the change of state and molecular changes of water when converting to ice and steam/super heated steam
- 7.3 describe the principles of mass, weight and density in relation to liquids including density at differing temperatures
- 7.4 explain the meaning of water hardness – soft, temporary hard and permanently hard
- 7.5 explain pH values and the effects of corrosion on plumbing systems and components
- 7.6 describe capillary action and siphonage
- 7.7 state the units of force, volume and pressure used in water based systems
- 7.8 describe the meaning of force, volume and pressure head in water based systems
- 7.9 describe simple pressure calculations to determine the static pressure and dynamic pressure of a water based system
- 7.10 science: describe the following:
 - properties of water:
 - o boiling and freezing point
 - o change of state and molecular change
 - o density at differing temperatures
 - o relative density
 - o capillarity
 - o acidity and alkalinity
 - o pH value of water
 - o water hardness: soft water; hard water - temporary and permanent
 - force and pressure in water based systems:
 - o units of force and pressure
 - o atmospheric pressure
 - o principle of the siphon
 - o acceleration due to gravity
 - o simple force calculations
 - o pressure head
 - o simple pressure calculations: static pressure; bynamic pressure
- 7.11 state the units of velocity and flow rate used in water based systems
- 7.12 explain the effects on velocity and flow rate of water due to reducing pressures, increasing/reducing pipe sizes and pipework friction
- 7.13 describe the difference between heat and temperature
- 7.14 explain simple heat calculations using specific heat capacity
- 7.15 explain the meaning of the term electrolytic action and corrosion
- 7.16 describe two methods of preventing corrosion
 - velocity and flow rate in water based systems:
 - o units of velocity and flow rate

- o effect of reducing pressure in systems on velocity and flow rate
 - o effect of increasing/reducing pipe size on velocity and flow rate at constant pressure
 - o resistance to the flow of water – changes of direction, pipe size, roughness of material surface and constrictions such as valves
- temperature, energy and heat:
 - o temperature measurement devices used in plumbing and heating
 - o simple energy calculations
 - o simple heat calculations (using specific heat capacity)
- corrosion in plumbing and heating systems:
 - o atmospheric corrosion
 - o dissimilar metals in the presence of water
 - o water property issues e.g. acidity, alkalinity, salt levels, etc.
 - o stagnation and its effects i.e. blue water
 - o erosion corrosion
 - o methods of preventing corrosion.

Unit 322

Water compulsory core

Outcome 8

Know plumbing processes and how to apply them in the workplace

Assessment criteria

The learner can:

- 8.1 explain the plumbing application of both R220 soft coils and R290 hard lengths of copper pipework
- 8.2 describe two methods of jointing R220 soft coils and R290 hard lengths of copper pipework
- 8.3 describe two types of clips/brackets suitable for R220 soft coils and R290 hard lengths of copper pipework
- 8.4 explain the correct methods of bending low carbon steel
- 8.5 state two methods of jointing LCS pipework
- 8.6 describe two types of clips/brackets suitable for LCS pipework
- 8.7 explain the plumbing application of both thermo plastics and thermo-setting plastics
- 8.8 describe two methods of jointing polypropylene pipework
- 8.9 describe two types of clips/brackets suitable for polypropylene pipework
- 8.10 processes, describe the following pipework materials to include:
 - copper (up to 28mm):
 - R220 soft coils
 - R290 hard lengths
 - types of fittings suitable for R220 soft coils and R290 hard lengths of copper pipework
 - jointing methods of R220 soft coils and R290 hard lengths of copper pipework
 - pipe clips/brackets for R220 soft coils and R290 hard lengths of copper pipework
 - LCS (up to 25mm):
 - light grade
 - medium grade
 - heavy grade
 - bending methods of the above types of LCS pipe
 - types of fittings suitable for the above types of LCS pipework
 - jointing methods of the above LCS materials and fittings:
 - threaded joints
 - compression type joints e.g. Viking
 - pipe clips/brackets suitable for the above types of LCS pipework
 - types of plastics:
 - thermo plastics
 - thermo-setting plastics
- 8.11 describe two methods of jointing UPVC/ABS pipework
- 8.12 describe two types of clips/brackets suitable for UPVC/ABS pipework
- 8.13 processes for pipework jointing:
 - plastic pipe (up to 28mm):
 - polythene
 - polybutylene

- polyethylene
 - polypropylene
 - hot and cold
 - central heating
- types of fittings suitable for the above plastic materials
- jointing methods of the above plastic pipework
- pipe clips/brackets for the above plastic pipework
- plastic (above ground sanitation):
 - UPVC
 - ABS
- types of fittings suitable for the above plastic materials
- pipe clips/brackets for the above plastic pipework
- jointing methods of the above plastic pipework:
 - push fit joints
 - compression joints
 - ring seal joints
 - solvent weld joints.

Unit 323/023 Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques

Level: 3
Credit value: 9
URN: K/502/8930

Unit aim

This combination unit provides learning in the design, maintenance, and commissioning of a complex range of cold water system/component types in dwellings including those in multi-storey properties and single occupancy dwellings fed by private water supplies. The unit covers compliance with the requirements of the Water Supply (Water Fittings) Regulations and Building Regulations applicable to this type of system.

Learning outcomes

There are **eleven** learning outcomes to this unit. The learner will:

- 1 Know the legislation relating to the installation and maintenance of cold water supplied for domestic purposes
- 2 Know the types of cold water system layout used in multi-storey dwellings
- 3 Know the types of cold water system layout used with single occupancy dwellings fed by private water supplies
- 4 Know the requirements for backflow protection in plumbing systems
- 5 Know the uses of specialist components in cold water systems
- 6 Know the design techniques for cold water systems
- 7 Be able to apply design techniques for cold water systems
- 8 Know the fault diagnosis and rectification procedures for cold water systems and components
- 9 Be able to diagnose and rectify faults in cold water systems and components
- 10 Know the commissioning requirements of cold water systems and components
- 11 Be able to commission cold water systems and components

Guided learning hours

It is recommended that **76** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M8, M14, M15, M25, M27

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 1	Know the legislation relating to the installation and maintenance of cold water supplied for domestic purposes

Assessment criteria

The learner can:

- 1.1 interpret the legislation controlling the installation and use of water systems:
 - supplied from a water undertaker
 - supplied from a private source
- 1.2 clarify the notification requirements for work on wholesome and recycled water systems:
 - water undertaker
 - building control or self-certification
- 1.3 differentiate between installer and user responsibilities under water legislation.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 2	Know the types of cold water system layout used in multi-storey dwellings

Assessment criteria

The learner can:

- 2.1 state the cold water system component layout features for multi-storey dwellings:
 - supplied direct from the main
 - using break cistern arrangements
 - providing drinking water
- 2.2 state the system layout features for large scale storage cisterns used in multi-storey cold water systems for dwellings:
 - warning/overflow pipe
 - alternative filling methods using:
 - float switches and solenoid valves
 - specialist inlet valves
 - interlinking multiple cisterns
 - use of sectional cisterns
- 2.3 state the system layout features for break cisterns used in multi-storey cold water systems for dwellings
- 2.4 define the function of components used in boosted cold water systems in multi-storey dwellings:
 - booster pumps:
 - sets with integral controls
 - self assembled sets
 - pressure/expansion vessels
 - pressure switch (transducer)
 - float switch.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 3	Know the types of cold water system layout used with single occupancy dwellings fed by private water supplies

Assessment criteria

The learner can:

- 3.1 propose the methods of providing private water supplies to single occupancy dwellings:
 - pumped from wells and boreholes
 - collected from surface water sources – streams and springs
 - use of externally sited break cisterns
- 3.2 propose the methods of treating water for use in single occupancy dwellings:
 - localised water filtration units
 - localised water treatment units – ultra violet
- 3.3 state the system layout features for cold water systems fed from private water supplies:
 - conventional direct or indirect systems from an incoming supply
 - boosted (pumped) supply from a well or borehole
 - boosted (pumped) supply from a low level internal or external break cistern
- 3.4 define the method of operation of the components used in a boosted (pumped) cold water supply system from private sources for single occupancy dwellings:
 - small booster pump sets which incorporate all controls and components
 - boosted system with separate controls and components
 - use of accumulators in increasing system flow rate.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 4	Know the requirements for backflow protection in plumbing systems

Assessment criteria

The learner can:

- 4.1 interpret the five fluid risk levels as laid down in water legislation
- 4.2 define terminology used when selecting and applying backflow prevention devices:
 - point of use protection
 - whole site or zone protection
- 4.3 propose the installation situations in which non-mechanical backflow prevention devices may be used:
 - Type AA – air gap with unrestricted discharge above spill over level
 - Type AB – air gap with weir overflow
 - Type AD – air gap with injector
 - Type AG – air gap with minimum size circular overflow
 - Type AUK1 – air gap with interposed cistern
 - Type AUK2 – air gaps for taps and combination taps
 - Type AUK3 – air gaps for taps and combination taps
 - Type DC pipe interrupter with permanent atmospheric vent
- 4.4 propose the installation situations in which mechanical backflow prevention devices may be used:
 - Type BA – reduced pressure zone valve
 - Type CA – non verifiable disconnecter
 - Type DB – pipe interrupter with permanent atmospheric vent and moving element
 - Type EA/EB – single check valves
 - Type EC/ED – double check valves
 - Type HA – hose union backflow preventer
 - Type HUK1 – hose union tap with double check valves
 - Type HC – diverter with automatic return
- 4.5 determine methods of preventing cross connection in systems that contain non-wholesome water sources.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 5	Know the uses of specialist components in cold water systems

Assessment criteria

The learner can:

- 5.1 analyse the working principles of cold water system components:
 - infra-red operated taps
 - concussive taps
 - combination bath tap and shower head
 - flow limiting valves
 - spray taps
 - urinal – water conservation controls
 - shower pumps – single and twin impellor
 - pressure reducing valves
 - shock arrestors/mini expansion vessels
- 5.2 evaluate the use of components in cold water systems to overcome temperature and pressure effects caused by the installation of backflow prevention devices.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 6	Know the design techniques for cold water systems

Assessment criteria

The learner can:

- 6.1 interpret information sources when undertaking design work on cold water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 6.2 clarify how to take measurements of building features in order to carry out design calculations:
 - from plans, drawings and specifications
 - from site
- 6.3 calculate the size of cold water system components used in single occupancy dwellings:
 - cistern
 - pipework
 - pump
 - pressure vessel
- 6.4 clarify how to present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 7	Be able to apply design techniques for cold water systems

Assessment criteria

The learner can:

- 7.1 use information sources when undertaking design work for cold water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 7.2 calculate the size of cold water system components used in single occupancy dwellings:
 - cistern
 - pipework
 - pump
 - pressure vessel
- 7.3 present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 323/023 Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques

Outcome 8 Know the fault diagnosis and rectification procedures for cold water systems and components

Assessment criteria

The learner can:

- 8.1 state the methods of obtaining details of system faults from end users
- 8.2 interpret manufacturer instructions and industry standards to establish the diagnostic requirements of cold water system components
- 8.3 propose routine checks and diagnostics on cold water system components as part of a fault finding process:
 - checking components for correct operating pressures and flow rates
 - cleaning system components (including dismantling and reassembly)
 - checking for correct component operation:
 - pumps
 - pressure switches (transducers)
 - float switches
 - expansion and pressure vessels
 - gauges and controls
 - checking for correct operation of treatment devices:
 - water filters
 - water softeners
- 8.4 specify methods of repairing faults in cold water system components:
 - pumps
 - expansion/pressure vessels
 - pressure switches (transducers)
 - float switches
 - gauges and controls
- 8.5 specify methods of safely isolating cold water systems or components to prevent them being brought into operation before the work has been fully completed
- 8.6 define procedures for carrying out diagnostic tests to locate faults in cold water system components:
 - booster (pump) set to a system
 - backflow prevention devices
- 8.7 specify methods for diagnosing and preventing corrosion within cold water system pipework:
 - electrolytic corrosion
 - blue water corrosion.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 9	Be able to diagnose and rectify faults in cold water systems and components

Assessment criteria

The learner can:

- 9.1 use manufacturer instructions and industry standards to establish the diagnostic requirements of cold water system components
- 9.2 isolate cold water systems or components to prevent them being brought into operation before the work has been fully completed
- 9.3 carry out diagnostic tests to locate faults in cold water system components and carry out repair work:
 - booster (pump) set to a system
 - backflow prevention devices.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 10	Know the commissioning requirements of cold water systems and components

Assessment criteria

The learner can:

- 10.1 interpret information sources required to complete commissioning work on cold water systems
- 10.2 state the checks to be carried out during a visual inspection of a boosted cold water system to confirm that it is ready to be filled with water
- 10.3 state how to fill cold water pipework with water at normal operating pressure and check for leakage
- 10.4 identify how to conduct a soundness test on cold water systems:
 - metallic systems
 - plastic pipework systems
- 10.5 specify the disinfection procedures for cold water systems and the circumstances in which disinfection should be applied
- 10.6 state the flushing procedure for cold water systems and components
- 10.7 clarify how to take flow rate and pressure readings from new and existing cold water systems
- 10.8 specify the actions that must be taken when commissioning reveals defects in cold water systems:
 - dealing with systems that do not meet correct installation requirements
 - micro-biological contamination within a cold water systems
 - remedial work associated with defective components
- 10.9 state the procedure for notifying works carried out to the relevant authority
- 10.10 propose the range of information that would be detailed on a commissioning record for a cold water system
- 10.11 propose the points to be covered when handing over a completed system to the end-user.

Unit 323/023	Understand and apply domestic cold water system installation, commissioning, service and maintenance techniques
Outcome 11	Be able to commission cold water systems and components

Assessment criteria

The learner can:

- 11.1 carry out a visual inspection of a boosted cold water system to confirm that it is ready to be filled with water
- 11.2 charge cold water pipework with water at normal operating pressure and check for leakage
- 11.3 perform a soundness test to industry requirements on cold water systems pipework and components
- 11.4 perform a disinfection procedure on a cold water system to industry requirements
- 11.5 flush the system with wholesome water on completion of soundness testing
- 11.6 use test instruments to take readings of the water supply pressure and flow rate
- 11.7 adjust and set controls to achieve system design requirements:
 - pressure at outlets
 - flow rate at outlets.

Unit 324/024 Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques

Level: 3
Credit value: 9
URN: K/502/9155

Unit aim

This combination unit provides learning in the design, installation, maintenance, and commissioning of a complex range of hot water system/component types in single occupancy dwellings. The unit also covers the requirements of statutory legislation for the installation, maintenance and commissioning of unvented hot water storage systems.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

- 1 Know the types of hot water system and their layout requirements
- 2 Know the uses of specialist components in hot water systems
- 3 Know the design techniques for hot water systems
- 4 Be able to apply design techniques for hot water systems
- 5 Know the installation requirements of hot water systems and components
- 6 Be able to install hot water systems and components
- 7 Know the fault diagnosis and rectification procedures for hot water systems and components
- 8 Be able to diagnose and rectify faults in hot water systems and components
- 9 Know the commissioning requirements of hot water systems and components
- 10 Be able to commission hot water systems and components

Guided learning hours

It is recommended that **76** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M8, M14, M15, M25, M27

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 1	Know the types of hot water system and their layout requirements

Assessment criteria

The learner can:

- 1.1 compare the types of hot water supply systems used in dwellings:
 - centralised systems:
 - unvented hot water systems
 - open vented hot water systems
 - localised systems:
 - unvented point of use heaters
 - instantaneous heaters
- 1.2 identify hot water system pipework layout features for dwellings:
 - centralised unvented hot water systems
 - larger systems requiring a secondary circulation system
- 1.3 confirm the recommended design temperatures within hot water systems:
 - hot water storage vessel
 - hot water outflow
 - secondary return
 - at point of use:
 - instantaneous heaters
 - storage system
 - thermostatic mixing valve installations
- 1.4 evaluate the various types of unvented hot water system:
 - indirect storage systems
 - direct storage systems:
 - electrically heated
 - gas or oil fired
 - small point of use (under sink)
- 1.5 clarify the use of cold water accumulators in unvented hot water systems
- 1.6 define the function of components in unvented hot water systems:
 - safety devices:
 - control Thermostat
 - overheat thermostat (thermal cut-out)
 - temperature relief valve
 - functional devices
 - line strainer
 - pressure reducing valve
 - single check valve
 - expansion device (vessel or integral to cylinder)
 - expansion relief valve

- o tundish arrangements
 - o application of composite valves
- 1.7 specify the layout features for temperature and expansion relief pipework in unvented hot water systems
- 1.8 specify the layout features for pipework systems incorporating secondary circulation:
 - pump type and location
 - timing devices
 - prevention of reverse circulation
 - methods of balancing circuits
- 1.9 state how trace heating can be used as an alternative to a secondary circulation system.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 2	Know the uses of specialist components in hot water systems

Assessment criteria

The learner can:

- 2.1 analyse the working principles of hot water system components
 - infra-red operated taps
 - concussive taps
 - combination bath tap and shower head
 - flow limiting valves
 - spray taps
 - shower pumps – single and twin impellor
 - pressure reducing valves
 - shock arrestors/mini expansion vessels
- 2.2 evaluate the use of components in hot water systems to overcome temperature and pressure effects caused by the installation of backflow prevention devices.

Unit 324/024 **Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques**

Outcome 3 **Know the design techniques for hot water systems**

Assessment criteria

The learner can:

- 3.1 define the factors which affect the selection of hot water systems for single occupancy dwellings
- 3.2 state the criteria used when selecting hot water system and component types:
 - customers needs
 - building layout and features
 - suitability of system
 - energy efficiency
 - environmental impact
- 3.3 interpret information sources when undertaking design work on hot water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 3.4 clarify how to take measurements of building features in order to carry out design calculations:
 - from plans, drawings and specifications
 - from site
- 3.5 calculate the size of hot water system components used in single occupancy dwellings:
 - cistern
 - hot water storage vessel
 - pipework
 - secondary circulation pump
 - booster pump (shower and full system)
- 3.6 clarify how to present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 4	Know the design techniques for hot water systems

Assessment criteria

The learner can:

- 4.1 use information sources when undertaking design work for hot water systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 4.2 calculate the size of hot water system components used in single occupancy dwellings:
 - cistern
 - cylinder
 - pipework
 - secondary circulation pump
 - booster pump (shower and full system)
- 4.3 present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 5	Know the installation requirements of hot water systems and components

Assessment criteria

The learner can:

- 5.1 define the terms balanced and unbalanced supply pressures in unvented hot water storage systems
- 5.2 specify the positioning and fixing requirements of components in unvented hot water systems:
 - safety devices:
 - control thermostat
 - overheat thermostat (thermal cut-out)
 - temperature relief valve
 - functional devices:
 - line strainer
 - pressure reducing valve
 - single check valve
 - expansion device (vessel or integral to cylinder)
 - expansion relief valve
 - tundish arrangements
 - application of composite valves
- 5.3 state the pipe size and positioning methods for safety relief pipework connected to unvented hot water cylinder safety valves:
 - D1 section
 - Tundish
 - D2 section
- 5.4 state how to position, fix and connect new hot water safety relief pipework:
 - D1 pipework
 - Tundish
 - D2 pipework
 - correct termination
- 5.5 state the positioning and fixing requirements of components of secondary circulation systems:
 - system pipework
 - pump
 - control valves
 - timing devices
 - reverse circulation control valves
 - pipework insulation.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 6	Be able to install hot water systems and components

Assessment criteria

The learner can:

- 6.1 connect pipework to an unvented hot water system:
 - incoming supply pipework:
 - o line strainer
 - o pressure reducing valve
 - expansion vessel
 - storage cylinder
 - check valve
- 6.2 position, fix and connect new hot water safety relief pipework:
 - D1 pipework
 - Tundish
 - D2 pipework
 - correct termination.

Unit 324/024 Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques

Outcome 7 Know the fault diagnosis and rectification procedures for hot water systems and components

Assessment criteria

The learner can:

- 7.1 specify the periodic servicing requirements of hot water systems
- 7.2 state the methods of obtaining details of system faults from end users
- 7.3 interpret manufacturer instructions and industry standards to establish the diagnostic requirements of hot water system components
- 7.4 propose routine checks and diagnostics on hot water system components as part of a fault finding process:
 - checking components for correct operating pressures, temperatures and flow rates
 - cleaning system components (including dismantling and reassembly)
 - checking for correct operation of system components:
 - o thermostats
 - o pumps
 - o timing devices
 - o expansion and pressure vessels
 - o gauges and controls
 - checking for correct operation of system safety valves:
 - o temperature relief
 - o expansion relief
- 7.5 specify methods of repairing faults in hot water system components:
 - pumps
 - expansion/pressure vessels
 - safety valves:
 - o temperature relief
 - o expansion relief
 - thermostats
 - gauges and controls
- 7.6 specify methods of safely isolating hot water systems or components to prevent them being brought into operation before the work has been fully completed
- 7.7 define procedures for carrying out diagnostic tests to locate faults in hot water system components:
 - shower booster pump unit
 - safety devices
 - expansion devices
 - thermostats.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 8	Be able to diagnose and rectify faults in hot water systems and components

Assessment criteria

The learner can:

- 8.1 use manufacturer instructions and industry standards to establish the diagnostic requirements of hot water system components
- 8.2 isolate hot water systems or components to prevent them being brought into operation before the work has been fully completed
- 8.3 carry out diagnostic tests to locate faults in hot water system components and carry out repair work:
 - shower booster pump unit
 - safety devices
 - expansion devices
 - thermostats
- 8.4 carry out the periodic service of an unvented hot water storage system.

Unit 324/024 Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques

Outcome 9 Know the commissioning requirements of hot water systems and components

Assessment criteria

The learner can:

- 9.1 interpret information sources required to complete commissioning work on hot water systems
- 9.2 state the checks to be carried out during a visual inspection of an unvented hot water storage system to confirm that it is ready to be filled with water
- 9.3 state how to fill hot water pipework with water at normal operating pressure and check for leakage
- 9.4 identify how to conduct a soundness test on hot water systems:
 - metallic systems
 - plastic pipework systems
- 9.5 state the flushing procedure for hot water systems and components
- 9.6 clarify how to take flow rate and pressure readings from new and existing hot water outlets
- 9.7 state how to balance a secondary circulation system during commissioning activities
- 9.8 specify the actions that must be taken when commissioning reveals defects in hot water systems:
 - dealing with systems that do not meet correct installation requirements
 - remedial work associated with defective components
- 9.9 state the procedure for notifying works carried out to the relevant authority
- 9.10 propose the range of information that would be detailed on a commissioning record for a hot water system
- 9.11 propose the points to be covered when handing over a completed system to the end-user.

Unit 324/024	Understand and apply domestic hot water system installation, commissioning, service and maintenance techniques
Outcome 10	Be able to commission hot water systems and components

Assessment criteria

The learner can:

- 10.1 carry out a visual inspection of an unvented hot water system to confirm that it is ready to be filled with water
- 10.2 charge hot water pipework with water at normal operating pressure and check for leakage
- 10.3 perform a soundness test to industry requirements on hot water systems pipework and components
- 10.4 flush the system with wholesome water on completion of soundness testing
- 10.5 use test instruments to take readings of the water supply pressure and flow rate
- 10.6 adjust and set system controls to achieve system design requirements:
 - pressure at outlets
 - flow rate at outlets.

Unit 325/025 Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques

Level: 3
Credit value: 12
URN: M/502/9156

Unit aim

This combination unit provides learning in the design, installation, maintenance, and commissioning of a complex range of central heating system/component types in single occupancy dwellings. The unit also covers the requirements of statutory legislation relating to the energy conservation of heating systems. The scope of the unit also covers underfloor heating systems, complex control systems and multiple boiler installations in larger dwellings using low loss headers.

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will:

- 1 Know the types of central heating system and their layout requirements
- 2 Know the design techniques for central heating systems
- 3 Be able to apply design techniques for central heating systems
- 4 Know the installation requirements of central heating systems and components
- 5 Be able to install central heating systems and components
- 6 Know the fault diagnosis and rectification procedures for central heating systems and components
- 7 Be able to diagnose and rectify faults in central heating systems and components
- 8 Know the commissioning requirements of central heating systems and components
- 9 Be able to commission central heating systems and components

Guided learning hours

It is recommended that **98** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M8, M14, M15, M25, M27

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

Unit 325	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 1	Know the types of central heating system and their layout requirements

Assessment criteria

The learner can:

- 1.1 define the space heating zoning requirements under statutory legislation for larger single occupancy dwellings
- 1.2 define the function of components used in central heating systems:
 - zone control valves for multiple space heating applications with appropriate time and temperature control arrangements
 - controllers:
 - weather compensation
 - delayed start
 - optimum start
 - home automation systems
- 1.3 analyse the operating principles of environmental heat sources used in conjunction with central heating systems:
 - heat pumps:
 - ground source
 - air source
 - micro combined heat and power
- 1.4 identify the layout features of underfloor central heating systems
- 1.5 analyse the working principles of underfloor central heating system pipework and components:
 - use of manifolds
 - controls system application - time and temperature to space heating zones
 - underfloor pipework arrangements from manifold to room
- 1.6 identify the system layout features for multiple boiler installations incorporating low loss headers
- 1.7 analyse functional flow wiring diagrams to determine the method of control operation for central heating systems:
 - pumped heating only systems
 - pumped heating systems with combination boilers
 - pumped heating with gravity hot water systems
 - fully pumped incorporating 3 port valves – mid position and diverter valves
 - fully pumped incorporating 2 x two port valves
 - fully pumped incorporating hot water and multiple space heating zones
 - fully pumped incorporating weather compensation, optimum start or delayed start controllers
 - multiple boiler controls application
 - application of frost thermostats and boilers with pump overrun facility.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 2	Know the design techniques for central heating systems

Assessment criteria

The learner can:

- 2.1 define the factors which affect the selection of central heating systems for dwellings
- 2.2 state the criteria used when selecting heating system and component types:
 - customers needs
 - building layout and features
 - suitability of system
 - energy efficiency
 - environmental impact
- 2.3 interpret information sources when undertaking design work on central heating systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 2.4 clarify how to take measurements of building features in order to carry out design calculations:
 - from plans, drawings and specifications
 - from site
- 2.5 justify the selection of system and control types for single family dwellings
- 2.6 state the principles of heat loss and gain in dwellings:
 - through the building fabric
 - due to ventilation
- 2.7 evaluate the heating requirements of rooms in dwellings when designing a central heating system:
 - room size
 - temperature required – indoor to outdoor
 - air change rate
- 2.8 specify the methods of sizing pipework and circulators for central heating systems:
 - pipe sizing calculations – space heating and hot water circuits
 - pump sizing calculations
- 2.9 justify the selection criteria for boilers in dwellings:
 - space heating load
 - hot water heating load
 - heat loss from pipework
 - factors for intermittent heating
- 2.10 clarify how to size expansion vessels for sealed central heating systems and feed and expansion cisterns for open vented systems

- 2.11 clarify the design principles for underfloor central heating systems:
 - combined with radiators
 - stand alone
- 2.12 calculate the size of central heating components used in single occupancy dwellings:
 - heat emitter size
 - hot water heating load
 - pipe size
 - pump size
 - boiler size
- 2.13 clarify how to present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 3	Be able to apply design techniques for central heating systems

Assessment criteria

The learner can:

- 3.1 use information sources when undertaking design work for central heating systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
 - verbal and written feedback from the customer
- 3.2 calculate the size of central heating components used in single occupancy dwellings:
 - heat emitter size
 - hot water heating load
 - pipe size
 - pump size
 - boiler size
- 3.3 present design calculations in an acceptable format:
 - using basic not to scale line drawings
 - details for insertion into a quotation or tender for work in a small-scale dwelling.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 4	Know the installation requirements of central heating systems and components

Assessment criteria

The learner can:

- 4.1 specify the positioning and fixing requirements of components in underfloor central heating systems:
 - manifolds
 - pipework arrangements (cabling)
 - pipework installation techniques:
 - o solid floor
 - o suspended timber floor
- 4.2 specify the positioning, fixing and connection requirements of new central heating components for sealed central heating systems:
 - connections to a boiler
 - fully pumped central heating control components – mid position or 2 x two port valve arrangement
 - sealed system components
 - connections to panel radiators or underfloor heating manifold
 - connections to hot water cylinder
- 4.3 specify the positioning and fixing requirements of multiple boiler installations with low loss headers.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 5	Be able to install central heating systems and components

Assessment criteria

The learner can:

- 5.1 connect pipework to an underfloor central heating system
- 5.2 position, fix and connect new central heating components for a sealed central heating system:
 - connections to a boiler
 - fully pumped central heating control components – mid position or 2 x two port valve arrangement
 - sealed system components
 - connections to panel radiators or underfloor heating manifold
 - connections to hot water cylinder.

Unit 325/025 Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques

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

Assessment criteria

The learner can:

- 6.1 specify the periodic servicing requirements of central heating systems
- 6.2 state the methods of obtaining details of system faults from end users
- 6.3 interpret manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components
- 6.4 propose routine checks and diagnostics on central heating system components as part of a fault finding process:
 - 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:
 - o circulating pumps
 - o control components
 - o expansion vessels
 - o pressure relief valves
 - o feed and expansion cisterns
- 6.5 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:
 - o motorised valves
 - o timing devices
 - o thermostats
 - o specialist controls – weather compensation, delayed and optimum start
 - blockages in heat emitters and pipework by power flushing
- 6.6 specify methods of safely isolating central heating systems or components to prevent them being brought into operation before the work has been fully completed
- 6.7 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.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 7	Be able to diagnose and rectify faults in central heating systems and components

Assessment criteria

The learner can:

- 7.1 use manufacturer instructions and industry standards to establish the diagnostic requirements of central heating system components
- 7.2 isolate central heating systems or components to prevent them being brought into operation before the work has been fully completed
- 7.3 carry out diagnostic tests to locate faults in central heating system components and carry out repair work:
 - replacement of a circulating pump
 - sealed heating system components
 - control components
 - clean system components using power flushing equipment
- 7.4 carry out the periodic service of a central heating system.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 8	Know the commissioning requirements of central heating systems and components

Assessment criteria

The learner can:

- 8.1 interpret information sources required to complete commissioning work on central heating systems
- 8.2 state the checks to be carried out during a visual inspection of a central heating system to confirm that it is ready to be filled with water
- 8.3 state how to fill central heating pipework with water at normal operating pressure and check for leakage
- 8.4 identify how to conduct a soundness test on central heating systems:
 - metallic systems
 - plastic pipework systems
- 8.5 specify the flushing requirements including the use of chemical treatments for new and existing central heating systems:
 - cold and hot flushing
 - power flushing
 - system additives:
 - o neutralisers
 - o cleansers
 - o corrosion inhibitors
- 8.6 specify the method required to balance a central heating system during commissioning activities
- 8.7 specify the actions that must be taken when commissioning reveals defects in central heating systems:
 - dealing with systems that do not meet correct installation requirements
 - defects in the connection of components in systems
 - unbalanced systems – poor circulation
 - poor boiler connection into a low loss header
 - remedial work associated with defective components
- 8.8 propose the range of information that would be detailed on a commissioning record for a central heating system
- 8.9 state the procedure for notifying works carried out to the relevant authority
- 8.10 propose the points to be covered when handing over a completed system to the end-user.

Unit 325/025	Understand and apply domestic central heating system installation, commissioning, service and maintenance techniques
Outcome 9	Be able to commission central heating systems and components

Assessment criteria

The learner can:

- 9.1 carry out a visual inspection of a central heating system to confirm that it is ready to be filled with water
- 9.2 charge central heating components with water at normal operating pressure and check for leakage
- 9.3 perform a soundness test to industry requirements on central heating systems pipework and components
- 9.4 flush and treat a central heating system with appropriate additives:
 - system cleanser/neutraliser
 - system inhibitor
- 9.5 balance a central heating system to meet design requirements.

Unit 326

Install, commission, service and maintain domestic heating systems

Level: 3
Credit value: 3
URN: A/502/8933

Unit aim:

This performance unit is to demonstrate the correct selection of system types and components, the installation of domestic heating and hot water systems, the commissioning, diagnostic of faults and the rectification of those faults. The correct preparation of the working area for all such work must also be demonstrated.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Be able to select domestic heating and hot water systems and components for application in the workplace
2. Be able to prepare work sites for the installation of domestic heating and hot water systems and components in the workplace
3. Be able to install domestic heating and hot water systems and components in the workplace
4. Be able to commission domestic heating and hot water systems in the workplace
5. Be able to diagnose faults in domestic heating and hot water components in the workplace
6. Be able to rectify faults in domestic heating and hot water components in the workplace

Guided learning hours

It is recommended that **4** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by

- A portfolio of evidence

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 1

Be able to select domestic heating and hot water systems and components for application in the workplace

Assessment criteria

The learner can:

- 1.1 obtain details of the customer job requirement:
 - by face to face site visit
 - by taking details from plans, drawings and specifications
- 1.2 discuss and agree initial system and component options with the customer:
 - hot water systems
 - central heating systems
- 1.3 calculate the size and quantities of components required for systems installation
- 1.4 present design calculations and information to the customer
- 1.5 obtain agreement from the customer to progress domestic heating and hot water work:
 - items of small jobbing (maintenance) type work
 - full system/component installation work
- 1.6 apply changes to customer job requirements and obtain customer agreement to those changes.

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 2

Be able to prepare work sites for the installation of domestic heating and hot water systems and components in the workplace

Assessment criteria

The learner can:

- 2.1 use job information to plan the installation work
- 2.2 confirm the position of pipework and components with other persons before commencing the installation work
- 2.3 comply with health and safety requirements when carrying out the installation work
- 2.4 prepare a safe and unobstructed access route to the work areas to carry out the installation work
- 2.5 arrange for all tools, equipment and materials to be available to undertake the installation work
- 2.6 use job information to identify the location of the building fabric that requires preparatory work to be carried out
- 2.7 report any pre-existing damage to the building fabric or customer property to other persons before carrying out the installation work
- 2.8 provide protection to the building fabric or customer property as the work progresses
- 2.9 carry out preparatory work to the building fabric.

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 3

Be able to install domestic heating and hot water systems and components in the workplace

Assessment criteria

The learner can:

- 3.1 confirm that the incoming or outgoing main supplies meet the requirements of the system or component being installed
- 3.2 measure and mark out the position of the components to be installed:
 - system pipework
 - main system components
 - system controls
- 3.3 make pipework and component fixings to the building fabric
- 3.4 position and fix pipework and components to the building fabric:
 - copper
 - plastics
- 3.5 connect pipework to system controls and main components:
 - hot water systems
 - central heating systems
- 3.6 connect system pipework to incoming supplies
- 3.7 carry out installation work minimising the wastage of equipment and materials
- 3.8 take precautions to ensure that the system cannot be brought into operation before the installation work is fully completed.

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 4

Be able to commission domestic heating and hot water systems in the workplace

Assessment criteria

The learner can:

- 4.1 carry out a visual inspection of the system to be tested to make sure that it is ready to be filled with water
- 4.2 charge the system to normal operating pressure and check for leakage:
 - hot water systems
 - central heating systems
- 4.3 perform a soundness test to industry requirements on the installed system:
 - hot water systems
 - central heating systems
- 4.4 flush the system with cold water on completion of soundness testing
- 4.5 rectify any leakage from the system found during the soundness test procedure
- 4.6 re-fill the system treating the contents with additives as appropriate
- 4.7 operate the system and take performance readings in order to compare them to the design specifications:
 - mechanical component readings
 - electrical component readings
- 4.8 adjust system controls to establish that the system operates to its design specifications
- 4.9 carry out remedial work to systems when commissioning reveals that the system does not work to the design specifications
- 4.10 prepare commissioning records for completed systems
- 4.11 instruct the customer in the efficient and effective operation of the system.

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 5

Be able to diagnose faults in domestic heating and hot water components in the workplace

Assessment criteria

The learner can:

- 5.1 use job information to plan the fault diagnosis work
- 5.2 comply with health and safety requirements when carrying out fault diagnosis work
- 5.3 prepare a safe and unobstructed access route to the work areas to carry out the fault diagnosis work
- 5.4 arrange for all required tools, equipment and materials to be available to undertake the fault diagnosis work
- 5.5 report any pre-existing damage to the building fabric or customer property to other persons before carrying out the fault diagnosis work
- 5.6 provide protection to the building fabric or customer property as the work progresses
- 5.7 establish details of the fault from other persons
- 5.8 test the component to diagnose the cause of the fault.

Unit 326

Install, commission, service and maintain domestic heating systems

Outcome 6

Be able to rectify faults in domestic heating and hot water components in the workplace

Assessment criteria

The learner can:

- 6.1 liaise with other persons to reach agreement on the rectification work to be carried out
- 6.2 isolate unsafe components that are not to be rectified and leave the component in a safe condition
- 6.3 isolate the component from the supply source:
 - turn off the electricity supply and fuel supply source to the component
 - turn off the water supply to the component
- 6.4 drain the component contents
- 6.5 take precautions to ensure that the component cannot be brought back into operation before the rectification work is complete
- 6.6 carry out the rectification or replacement of the component to industry requirements
- 6.7 reinstate the supply or service to the component
- 6.8 test the component for effective operation
- 6.9 advise other persons that work on the system or component has been successfully completed
- 6.10 complete the details contained in a maintenance record for the system or component.

Unit 327/027 Understand and carry out electrical work on domestic plumbing and heating systems and components

Level: 3
Credit value: 12
URN: T/502/9157

Unit aim

This combination unit provides learning in work preparation, installation, inspection, testing and fault diagnosis/rectification of electrical components, equipment and connections to Domestic MES systems. This unit also cover the requirements for completing associated documentation required upon completion of electrical installation, inspection, testing and maintenance activities.

Learning outcomes

There are **thirteen** learning outcomes to this unit. The learner will:

1. Know the electrical standards that apply to the mechanical services industry
2. Know the principles of electricity supply to dwellings
3. Know the layout features of electrical circuits in dwellings
4. Understand the electrical industry safe isolation procedure
5. Be able to carry out the electrical industry safe isolation procedure
6. Know the site preparation techniques for the electrical connection of mechanical services components in dwellings
7. Be able to apply site preparation techniques for the electrical connection of mechanical services components in dwellings
8. Understand the installation and connection requirements of electrically operated mechanical services components
9. Be able to install and connect electrically operated mechanical services components
10. Know the inspection and testing requirements of electrically operated mechanical services components
11. Be able to inspect and test electrically operated mechanical services components
12. Know the procedures for safely diagnosing and rectifying faults in electrically operated mechanical services components
13. Be able to safely diagnose and rectify faults in electrically operated mechanical services components

Guided learning hours

It is recommended that **102** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the

Mechanical Services Industry: SummitSkills NOS M32

Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- An on-line knowledge assessment and externally set assignments.

See **Appendix 2** in the **6014-03-04 L3 Diploma Qualification Handbook** for the list of approved materials for use in open book examination.

A learner who completes this unit is **not** competent to inspect and test a complete electrical installation. The competencies identified in the unit and demonstrated by the learner are only applicable to **electrically operated mechanical services components and controls** up to 230V single phase supply.

Individuals responsible for the delivery and/or assessment of this unit must provide auditable evidence that, as a minimum, they have the competencies that equate with the **Learning Outcomes and Assessment Criteria** of the unit.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 1	Know the electrical standards that apply to the mechanical services industry

Assessment criteria

The learner can:

- 1.1 state the statutory legislation and guidance information that applies to electrical supply and control of domestic mechanical services systems and their components:
 - general legislation
 - construction specific legislation
 - mechanical services specific legislation
 - professional body guidance:
 - codes of practice
 - manufacturer installation and service/maintenance instructions
 - manufacturer user instructions
- 1.2 identify the range of information that would be detailed on a minor works certificate for an electrical system or component
- 1.3 specify the procedure for notifying works carried out to the relevant authority.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 2	Know the principles of electricity supply to dwellings

Assessment criteria

The learner can:

- 2.1 specify the methods by which electricity is generated:
 - basic power station operation
 - principles of generation
 - types of supply: single phase; three-phase and neutral
- 2.2 specify the methods by which generated electricity is distributed to non dwellings and commercial properties:
 - basic operation of the national grid and local distribution systems:
 - o sub-stations
 - o supply transformers
 - o local distribution of three – and single-phase supplies to premises
- 2.3 state the purpose of electrical components at entry to the property:
 - main fuse (single phase) and cable head connection
 - meter
 - consumer unit
 - main earth terminal.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 3	Know the layout features of electrical circuits in dwellings

Assessment criteria

The learner can:

- 3.1 define the system layout features for electrical circuits in dwellings:
 - ring main circuit
 - radial circuit
 - fixed equipment supplies: Spurs and fused outlets
- 3.2 specify the types of cables and conductors used for the installation of electrical equipment in mechanical services systems
- 3.3 state the applications and limitations of the types of cable and conductors used for the installation of electrical equipment in mechanical services systems
- 3.4 clarify the difference between class 1 and class 2 electrical equipment
- 3.5 define the function of electrically operated components used in mechanical services systems:
 - flame rectification devices
 - flame suppression devices
 - solenoid valves
 - thermistors
 - thermocouples
 - micro switches
 - relays
 - printed circuit boards
 - pressure switches
 - pumps
 - fans
 - leak detection
 - control components:
 - thermostats
 - programmers/timers
 - electrically operated control valves (actuators)
 - sensors
 - wiring centres
 - switches:
 - rocker plate (with/without cpc) – single and double pole
 - pull cord
 - pressure operated
 - DP lockable isolators
- 3.6 define the operating principles of electrical circuit protection devices:

- miniature circuit breakers
 - residual current devices including RCBOs
 - fuses: re-wireable; cartridge, high breaking capacity
- 3.7 clarify the need for, and requirements of earthing systems:
- main earthing systems: TT system, TN-S system, TN-C-S system
 - protective equipotential bonding
 - high risk rooms (zones) in dwellings
 - supplementary earthing (bonding)
 - temporary continuity bonding
- 3.8 identify the warning notices to be applied.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 4	Understand the electrical industry safe isolation procedure

Assessment criteria

The learner can:

- 4.1 identify the test equipment required to prove that circuits to be worked on are dead:
 - approved voltage indicating device
 - proving unit
- 4.2 specify the electrical industry agreed procedure for safe isolation of electrical circuits:
 - select the approved voltage indicating device and test on a known supply
 - locate and identify the isolation point for the equipment to be worked on
 - isolate the supply and prevent re-energisation
 - verify that the equipment is dead
 - fit warning labels
 - re-check the approved voltage indicating on a known supply for correct function
- 4.3 clarify the methods of ensuring that circuits cannot be re-activated while work is taking place on them:
 - use of locking devices
 - device retention (fuse removal).

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 5	Be able to carry out the electrical industry safe isolation procedure

Assessment criteria

The learner can:

- 5.1 check to ensure that test equipment is safe to be used
- 5.2 carry out the safe isolation procedure to industry standards.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 6	Know the site preparation techniques for the electrical connection of mechanical services components in dwellings

Assessment criteria

The learner can:

- 6.1 identify the required sources of information when carrying out work on electrical systems:
 - statutory regulations
 - industry standards
 - manufacturer technical instructions
- 6.2 identify the preparatory work required to be carried out to the building fabric in order to install, commission, decommission or maintain electrical systems or components
- 6.3 state the types of pre-existing damage to the existing building fabric or customer property that may be encountered before commencing work on electrical systems and components:
 - building wall/floor surfaces
 - existing electrical system components
 - building décor and carpets
- 6.4 identify the protection measures to be applied to the building fabric or customer property, during and on completion of work on electrical systems and components:
 - building wall/floor surfaces
 - existing and new electrical systems and kitchen furniture / components and hygiene
 - building décor and carpets
- 6.5 identify the cable, materials and fittings required to complete work on electrical systems
- 6.6 identify the hand and power tools required to complete work on electrical systems.

Unit 327/027 Understand and carry out electrical work on domestic plumbing and heating systems and components

Outcome 7 Be able to apply site preparation techniques for the electrical connection of mechanical services components in dwellings

Assessment criteria

The learner can:

- 7.1 check the safety of the work location in order for the work to safely proceed:
 - safe access and exit
 - immediate work location e.g. tripping hazards
 - appropriate risk assessments/ method statements are followed
- 7.2 wear Personal Protective Equipment relevant to the installation, decommissioning, servicing or maintenance tasks being carried out.

Unit 327/027 Understand and carry out electrical work on domestic plumbing and heating systems and components

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

Assessment criteria

The learner can:

- 8.1 define the method used to identify that existing electrical supplies and circuits are suitable for the proposed installation of electrical equipment used in domestic mechanical services systems
- 8.2 state the procedure for sizing electrical materials and components:
 - basic cable sizing procedure type cables and conductors
 - basic circuit protection device sizing procedure –circuit types
- 8.3 specify the method used to select suitable cables and cords for components and circuits:
 - selection of appropriate multi-core cables
 - selection of appropriate multi-core cords
 - selection of pvc single conductors
- 8.4 specify the requirements for protecting cables installed in the building fabric and terminating in enclosures:
 - protection methods in wall and floor surfaces:
 - embedded (sheathing) – depth of cover, application of RCD protection
 - exposed (mini-trunking)
 - within ducting
 - within timber stud partitions
 - within timber floor structures
 - junction boxes
 - switch/socket boxes:
 - countersunk
 - pattresses
 - surface mounted
 - wiring centres
- 8.5 define the types of cable termination methods approved for use in dwellings:
 - screw terminals
 - pillar terminals
 - claw and washer terminals
 - crimping
 - strip connectors
- 8.6 specify the method of installation and wiring termination for fixed electrical appliances:
 - from consumer unit:
 - macerator WC
 - central heating control system

- o instantaneous shower
 - o immersion heater
 - o shower pump/jacuzzi
- from fused-spur connection unit:
 - o macerator WC
 - o central heating control system
 - o shower pump/jacuzzi
- from existing appliance supply point:
 - o macerator WC
 - o central heating control system
 - o shower pump/jacuzzi
 - o immersion heater
 - o shower.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 9	Be able to install and connect electrically operated mechanical services components

Assessment criteria

The learner can:

- 9.1 carry out the electrical wiring of a central heating control system from an existing fused spur connection unit:
 - fully pumped system incorporating all necessary control components
 - positioning and fixing of all necessary enclosures, switches and circuit protection devices
 - correct routing, installation and termination of appropriate cables and cords to control system components
 - correct earthing provision for all components and exposed metallic parts of the system
- 9.2 carry out the replacement of electrical cords from an existing isolation point to the fixed appliance:
 - immersion heater
 - WC macerator unit
 - shower pump
- 9.3 apply temporary continuity bonding to metallic pipework prior to making pipework connections.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 10	Know the inspection and testing requirements of electrically operated mechanical services components

Assessment criteria

The learner can:

- 10.1 specify the requirements of a visual inspection of completed electrical installation work for mechanical services systems prior to electrical inspection and testing
- 10.2 define the equipment used for electrical testing of mechanical services components and its calibration requirements
- 10.3 identify the importance of carrying out tests on dead circuits wherever possible
- 10.4 state the purpose of the electrical testing procedures for new and existing circuits:
 - polarity
 - earth continuity
 - insulation resistance
 - earth fault loop impedance
 - residual current device
- 10.5 clarify the requirements for carrying out functional testing of electrical components
- 10.6 clarify the procedure for final handover of electrical circuits that supply electrically operated domestic mechanical services components:
 - installation completion of certification
 - demonstration to the user.

Unit 327/027	Understand and carry out electrical work on domestic plumbing and heating systems and components
Outcome 11	Be able to inspect and test electrically operated mechanical services components

Assessment criteria

The learner can:

- 11.1 carry out the inspection and testing of a completed mechanical engineering services control system:
 - visual inspection
 - selection and use of appropriate test equipment
 - appropriate circuit testing:
 - polarity
 - earth continuity
 - insulation resistance
 - functional testing
 - completion of a minor works certificate
- 11.2 carry out the inspection and testing of existing electrical circuits following replacement of electrical cords:
 - immersion heater
 - WC macerator unit
 - shower pump.

Unit 327/027 Understand and carry out electrical work on domestic plumbing and heating systems and components

Outcome 12 Know the procedures for safely diagnosing and rectifying faults in electrically operated mechanical services components

Assessment criteria

The learner can:

- 12.1 state the methods of obtaining details of system faults from end users
- 12.2 identify and use manufacturer instructions and industry standards to establish the diagnostic requirements of electrical system components
- 12.3 identify the electrical test equipment used to undertake fault diagnostics
- 12.4 identify the situations in which dead testing of components can be carried out
- 12.5 identify the situations in which live testing of components may be necessary and the safety precautions required
- 12.6 define how to perform a range of routine checks and diagnostics on electrical system components as part of a fault finding process. Checking for correct operation of:
 - appliance components:
 - o flame rectification devices
 - o flame suppression devices
 - o solenoid valves
 - o thermistors
 - o thermocouples
 - o micro switches
 - o relays
 - o pressure switches
 - o printed circuit boards
 - o pumps
 - o fans
 - o leak detection
 - control components:
 - o thermostats
 - o programmers/timers
 - o electrically operated control valves
 - o wiring centres
 - switches:
 - o rocker plate (with/without cpc) - single and double pole
 - o pull cord
 - o pressure operated
 - o DP lockable isolators

- 12.7 state the methods of correcting deficiencies in electrical components:
- inadequate earthing provision
 - defective cable positioning (aged cables/ proximity to other services)
 - failed electrical components
 - incorrect polarity
 - provision of inadequate circuit protection devices.

Unit 327/027 Understand and carry out electrical work on domestic plumbing and heating systems and components

Outcome 13 Be able to safely diagnose and rectify faults in electrically operated mechanical services components

Assessment criteria

The learner can:

- 13.1 safely isolate electrical systems or components to prevent them being brought into operation before the work has been fully completed
- 13.2 carry out diagnostic checks to electrical circuits:
 - inadequate earthing provision
 - defective cable routing
 - defective termination
 - incorrect polarity
 - provision of inadequate circuit protection devices
- 13.3 carry out diagnostic tests to locate faults in electrical components and carry out repair work:
 - replacement of a motorised valve head gear
 - boiler components replacement:
 - o thermistor
 - o thermocouples
 - o pressure switches
 - control components:
 - o thermostats
 - o programmers/timers
 - shower control components.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Level: 3
Credit value: 3
URN: T/504/1602

Unit aim

The aim of this unit is to 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

- To enable existing workers in the occupation to update their professional competence
- To extend their range of work

On achievement of this unit candidates may apply for approval status to one of the recognised Approved Contractor Schemes operating in the UK.

Learning outcomes

There are **fifteen** learning outcomes to this unit. The learner will:

1. Understand the requirements of the Water Supply (Water Fittings) Regulations and Water Byelaws
2. Understand terminology used to confirm requirements of the water regulations
3. Know the suitability of materials and substances in contact with water
4. Understand the requirements for water fittings
5. Know the design and installation requirements for a water supply system
6. Know the requirements for the prevention of cross connection to unwholesome water
7. Know the backflow prevention fluid categories
8. Know the requirements for backflow prevention
9. Understand the guidance clauses relating to backflow prevention
10. Know the installation requirements for cold water services
11. Know the installation requirements for hot water services
12. Know the installation requirements for WC's, flushing devices and urinals approved for use
13. Know the types of bath, sink, showers taps location and installation requirements
14. Know the consumption limitations for washing machines, dishwashers and other appliances
15. Know the requirements for water supplied for outside use.

Guided learning hours

It is recommended that **8** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Summit Skills, the Sector Skills Council for the building services engineering (BSE) sector

Assessment

This unit is assessed by:

- An on-line multiple choice test

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 1	Understand the requirements of the Water Supply (Water Fittings) Regulations and Water Byelaws

Assessment Criteria

The learner can:

- 1.1 explain the requirements of the Water Regulations/Byelaws (Part 1)
 - a) within the domestic environment
 - b) within the commercial, industrial environment
- 1.2 explain the requirements of the Water Regulations/Byelaws (Part 2) in relation to:
 - a) the restriction on installation of water fittings
 - b) the requirements for water fittings
 - c) the notification requirements relating to any person who proposes to install a water fitting
 - d) approved contractors
- 1.3 explain the requirements of the Water Regulations/Byelaws (Part 3) in relation to:
 - a) penalties for contravening the Water Regulations
 - b) relaxation of the Water Regulations
 - c) dispute with a water undertaker.

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 2	Understand terminology used to confirm requirements of the water regulations

Assessment Criteria

The learner can:

- 2.1 explain the meanings of the **key factors** within the interpretations of the Water Regulations
- 2.2 identify the different types of water treatment apparatus available to dwellings.

Range

Key Factors

Backflow, cistern, combined feed and expansion cistern, combined temperature and pressure relief, contamination, distributing pipe, expansion cistern/vessel, expansion valve, flushing cistern, overflow pipe, pressure relief valve, primary circuit, secondary circuit, secondary system, servicing valve, stopvalve, storage cistern, temperature relief valve, terminal fitting, vent pipe.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 3

Know the suitability of materials and substances in contact with water

Assessment Criteria

The learner can:

- 3.1 describe situations where **materials** or substances either alone or in combination are likely to cause contamination of water
- 3.2 identify suitable **fittings** for use above and below ground
- 3.3 identify suitable jointing materials and compounds.

Range

Materials

Different classes of steel pipes, copper tubes and their connections above and below ground, unplasticised PVC, polyethylene pipes, stainless steel pipes

Fittings

Stopvalves, drain off vales, servicing valves.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 4

Understand the requirements for water fittings

Assessment Criteria

The learner can:

- 4.1 state the fitness for purpose of water fittings in relation to
 - a) British Standards or equivalent
 - b) immunity and protection from galvanic action
- 4.2 state the **requirements** for installed water fittings
- 4.3 describe the requirement for pressure testing
 - a) metallic pipework systems
 - b) plastic pipework systems
- 4.4 explain how surges within a pipework system can **affect system performance**
- 4.5 state the connection requirements for the **installation of a pump** on a supply pipe
- 4.6 state the connection requirements for the **installation of a pumped shower**
- 4.7 state the installation **requirements for pipes and operational fittings**
- 4.8 state the installation **requirements for pipes entering a building**
- 4.9 state the installation requirements for **underground pipework**
- 4.10 explain the terms 'concealed fitting' and 'dezincification resistant material'.

Range

Requirements

Water tightness, prevention of ingress from contaminants, prevention from damage by freezing and other causes, prevention from deterioration by permeation, the supporting pipework, the fixings for water fittings

Affect system performance

Water hammer, relief valve discharge, pneumatic accumulators

Installation of a pump

Permissible pump output capacity
permitted siting of a pump

Installation of a pumped shower

Permissible pump output capacity, recommended siting of a pump

Requirements for pipes and operational fittings

Located in the cavity of a cavity wall, embedded in any wall or solid floor, located below a suspended floor, below a solid floor at ground level, location and accessibility to operational fittings

Requirements for pipes entering a building

Depth of pipework, insulation requirements, protection of pipework

Underground pipework

Pipes laid underground, pipes laid over an underground obstruction, pipes under an underground obstruction, pipes supplying water to a building below street level, pipes beneath a stream

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 5

Know the design and installation requirements for a water supply system

Assessment Criteria

The learner can:

- 5.1 state **factors** to be taken into consideration in the design of a water supply system
- 5.2 describe **types of distribution system** available within a dwelling
- 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 stopvalves to **premises**
- 5.6 state the installation requirements for the provision, operation and location of **servicing valves**
- 5.7 state the **installation requirements** for the provision 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**
- 5.10 explain the reason for the flushing of a system installation
- 5.11 state when system disinfection is required.

Range

Factors

Total daily consumption, maximum and average flows required, availability of mains supply, mains pressure variance, water storage capacity where needed, transient or surge pressures, environmental issues surrounding area and supply

Types of distribution system

Direct fed system, indirect fed system, combination of direct and indirect fed systems

Premises

Individual property, location within premises supplied with water, block of flats supplied from a common supply pipe, block of flats with separate supply pipes to each flat

Servicing valves

Inlet to Float Operated Valve (FOV), outlet of storage cisterns, inlet to appliances, accessibility of servicing valves, methods of operation

Installation requirements

Location, accessibility, types of draining taps

Systems

Systems that do not include any plastic, systems that include plastic pipes

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 6

Know the requirements for the prevention of cross connection to unwholesome water

Assessment Criteria

The learner can:

- 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 in relation to:
 - 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 system.

Unit 328

Water Supply (Water Fittings) Regulations
and Water Byelaws in the UK

Outcome 7

Know the backflow prevention fluid categories

Assessment Criteria

The learner can:

7.1 define the five fluid categories.

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 8	Know the requirements for backflow prevention

Assessment Criteria

The learner can:

- 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.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 9

Understand the guidance clauses relating to backflow prevention

Assessment Criteria

The learner can:

- 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
- 9.5 state the requirements for appliances supplied through or incorporating a pump.
- 9.6 state the requirements for the **installation of a bidet** or appliance using a hand held spray
- 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 in relation to
 - a) single outlet taps
 - b) combination tap assembly outlets
 - c) fixed shower heads over basins, baths and bidets
- 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) a dwelling
 - b) a 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 relation to
 - a) a dwelling
 - b) a non-dwelling
- 9.13 state the requirements for the installation of hose pipes for
 - a) a house garden
 - b) commercial installations
- 9.14 explain when whole site and zone protection are required
- 9.15 state the requirements for **fire protection systems**
- 9.16 state the requirements when applied to **miscellaneous commercial and industrial applications.**

Range

Installation requirements

Accessibility of the mechanical backflow protection device, location within the premises, not to be buried in the ground, vented and verifiable, or devices with relief outlets not to be installed in chambers below ground or where liable to flooding, the installation of line strainers, the lowest point of discharge from the ground and termination with a Type AA air gap

Installation of a bidet

Ascending spray type, over rim type, spray handset fittings used with bidets and WC's

Fire protection systems

Direct fed sprinkler systems with no additives, direct fed sprinkler systems with additives, elevated storage cisterns with or without additives by gravity, elevated storage cisterns with pumped outlet with or without additives, dual feed cisterns with water from the water undertaker and from another source

Miscellaneous commercial and industrial applications

Pumped supply to laboratory fittings, separation of wholesome water from supplementary sources, separation of wholesome water from water that has been used, water supply taken directly from a supply pipe to a ship, water supply taken by gravity from storage on a quayside, water supply pumped from storage on a quayside, water taken from a hose union tap on a quayside.

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 10	Know the installation requirements for cold water services

Assessment Criteria

The learner can:

- 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.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 11

Know the installation requirements for hot water services

Assessment Criteria

The learner can:

- 11.1 describe the installation requirements and methods of connection for **water fittings**
- 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.

Range

Water fittings

Directly heated unvented hot water systems, indirectly heated unvented hot water systems, independent water heaters, methods of accommodating expanded water in a hot water system, maximum temperature within a hot water system, hot water distribution temperatures, temperature of hot water at terminal fittings and surfaces of hot water pipes.

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 12

Know the installation requirements for WC's, flushing devices and urinals approved for use

Assessment Criteria

The learner can:

12.1 identify the **installation methods and requirements** for the operation of WC pans

12.2 explain **methods for flushing urinals**

12.3 describe **methods for filling a urinal cistern**

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.

Range

Installation methods and requirements

Single flush cisterns, dual flush cisterns, single flush siphonic outlet, dual flush siphonic outlet, drop and flap valve, dual flush cistern capacities, operating instructions for dual flush cisterns, pressure flushing valves, cistern water line mark, requirements for warning pipes, internal overflows

Methods to flush urinals

Manually operated cistern, automatically operated cistern, pressure flushing valves

Methods to fill a urinal cistern

Manual infill, electronic sensor, pressure pad, time switch, frequency of flushing.

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 13	Know the types of bath, sink, showers taps location and installation requirements

Assessment Criteria

The learner can:

13.1 state the requirements for drinking water points in premises

13.2 state the requirements for **drinking water supplies**

13.3 state the requirements for waste outlets from appliances.

Range

Drinking water supplies

Water supplied from a supply pipe, water supplied from a pumped supply pipe, water supplied from a storage cistern, water that has been softened used for drinking purposes.

Unit 328	Water Supply (Water Fittings) Regulations and Water Byelaws in the UK
Outcome 14	Know the consumption limitations for washing machines, dishwashers and other appliance

Assessment Criteria

The learner can:

- 14.1 state the upper limits of water consumption for domestic:..
 - a) horizontal axis washing machines
 - b) washer – driers
 - c) dish washers

Unit 328

Water Supply (Water Fittings) Regulations and Water Byelaws in the UK

Outcome 15

Know the requirements for water supplied for outside use

Assessment Criteria

The learner can:

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 329

The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations

Level: 3
Credit value: 1
URN: D/504/1545

Unit aim

The purpose and aim of this unit is to enable learners to develop the underpinning knowledge and skills required:

- Prior to progressing to assessment of occupational competence.
- To enable existing workers in the occupation to update their professional competence
- To extend their range of work
- Where appropriate lead to the issue of a licence to practice.

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will:

16. Understand the types and configurations of vented/unvented hot water systems including the design installation requirements
17. Know the types and operation of specialist components used in hot water systems
18. Understand the design requirements for hot water systems
19. Know the installation and safety features of hot water systems and components
20. Know the requirements for the installation of cold water components associated with hot water systems
21. Be able to diagnose faults in hot water systems and components
22. Know the commissioning requirements of hot water systems and components in accordance with design specifications
23. Be able to carry out the commissioning of hot water systems
24. Be able to confirm that unvented hot water systems have been serviced in accordance with manufacturer's instructions

Guided learning hours

It is recommended that **10** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Support of the unit by a sector or other appropriate body

This unit is endorsed by Summit Skills the Sector Skills Council for the building services engineering (BSE) sector.

Assessment

This unit is assessed by:

- An on-line multiple choice test covering the knowledge (329) and an assignment covering practical skills (330).

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 1	Understand the types and configurations of vented/unvented hot water systems including the design installation requirements

Assessment Criteria

The learner can:

- 1.1 explain types of domestic hot water supply systems:
 - a) Centralised systems
 - i. Unvented hot water systems
 - ii. Open vented hot water systems
 - b) Localised systems
 - i. Unvented point of use heaters
 - ii. Instantaneous heaters
- 1.2 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
- 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) Thermal stores
 - e) Combination boilers
 - f) Secondary circulation
 - i. Location of pump and type
 - ii. Automated timing devices
 - iii. Methods of balancing systems
- 1.4 state the recommended design temperatures within hot water systems:
 - a) Hot water storage vessels
 - b) Hot water delivery
 - c) Secondary return
 - d) Point of use
 - i. Instantaneous heaters
 - ii. Storage system
 - iii. Fixed bath

iv. Basin

v. Blending valve installations

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

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 2	Know the types and operation of specialist components used in hot water systems

Assessment Criteria

The learner can:

- 2.1 state methods of preventing stored water from exceeding 100o 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

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 3	Understand the design requirements for hot water systems

Assessment Criteria

The learner can:

- 3.1 identify factors affecting the selection of hot water systems for domestic use
- 3.2 explain how to minimise bacterial growth in hot water systems
- 3.3 state the criteria for selecting hot water system and component types:
 - a) Occupiers needs or usage (Max usage of water per person per day)
 - b) Building layout and features
 - c) Suitability of system
 - d) Water efficiency
 - e) Environmental impact
 - f) Energy efficiency
- 3.4 state which regulation applies to the installation of unvented hot water systems of more than 45KW and a capacity of 500 litres
- 3.5 state which documents should be used when designing domestic hot water systems.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 4	Know the installation and safety features of hot water systems and components

Assessment Criteria

The learner can:

- 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 identify the positioning and fixing requirements of components used in unvented hot water systems:
 - a) Control thermostat
 - b) Overheat thermostat
 - c) Temperature relief valve
 - d) Line strainer
 - e) Pressure reducing valve
 - f) Check valves
 - g) Expansion device
 - h) Expansion relief valve
 - i) Composite valves
 - j) Tundish arrangements
- 4.5 state the installation, fixing and sizing requirements for safety relief pipework:
 - a) Discharge D1
 - b) Discharge D2
 - c) Tundish
 - d) Multiple discharge pipe arrangements from safety devices
 - e) Termination.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 5	Know the requirements for the installation of cold water components associated with hot water systems

Assessment Criteria

The learner can:

- 5.1 describe the installation and siting requirements of cold water cisterns
- 5.2 describe the requirements for positioning a cold water pipe in relation to sources of heat.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 6	Be able to diagnose faults in hot water systems and components

Assessment Criteria

The learner can:

6.1 carry out diagnosis of hot water systems installation and component faults:

- a) Thermostats
- b) Expansion and pressure vessels
- c) Temperature relief
- d) Expansion relief
- e) Discharge pipework

6.2 confirm the correct operation of system components and safety valves:

- a) Thermostats
- b) Expansion and pressure vessels
- c) Temperature relief
- d) Expansion relief
- e) Discharge pipework

6.3 confirm the actions required to rectify the diagnosed faults.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 7	Know the commissioning requirements of hot water systems and components in accordance with design specifications

Assessment Criteria

The learner can:

- 7.1 state the checks to be carried out during a visual inspection
- 7.2 describe the commissioning procedure for an unvented hot water system
- 7.3 describe the procedure for carrying out a soundness test on a hot water system:
 - a) Metallic systems
 - b) Plastic pipework systems
- 7.4 describe the flushing procedure after completion of a soundness test.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 8	Be able to carry out the commissioning of hot water systems

Assessment Criteria

The learner can:

- 8.1 carry out the commissioning of a hot water system.

Unit 329	The installation, commissioning and safety aspects of hot water systems for domestic use in accordance with UK building regulations
Outcome 9	Be able to confirm that unvented hot water systems have been serviced in accordance with manufacturer's instructions

Assessment Criteria

The learner can:

- 9.1 demonstrate service procedures on an unvented hot water storage system.

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