Unit 304 Understanding buildings, services and structures

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

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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.

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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.

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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.

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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.

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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.

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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.

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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.