Unit 303 Understanding combustion and properties of gas

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

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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.

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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.

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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.

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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.

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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.

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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.