Unit 71: Plumbing Technology in Building Services Engineering

Unit code: Y/600/0437

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

The aim of this unit is to enable learners to gain an understanding of above ground drainage systems and gas installations, knowledge of the provision of cold water and the skills needed to design hot and cold water systems.
Learners will explore the role of the plumbing engineer in providing water distribution and disposal systems. They will explore the importance of meeting the requirements of the user and conforming to current water industry regulations.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes	Assessment criteria
1 Know how cold water is sourced, cleansed to the required standard and distributed to the consumer	1.1 Identify the main sources of cold water
	1.2 Describe the process by which cold water is cleansed before distribution
	1.3 State the required standards for wholesome water
	1.4 Describe how cold water is distributed to the consumer
2 Be able to design hot and cold water systems for installation in low-rise buildings	2.1 Describe the appliances, components, materials and jointing methods used in cold water systems
	2.2 Design functional cold water systems for low-rise buildings

	2.3 Describe the appliances, components, materials and jointing methods used in hot water systems for low-rise buildings
	2.4 Design functional hot water systems for low-rise buildings
3 Understand the design and installation of above ground drainage systems	3.1 Describe the materials and jointing methods used in above ground drainage systems
	3.2 Discuss the factors that influence the design of above ground drainage systems
	3.3 Explain the installation requirements for above ground drainage systems for low-rise buildings
4 Understand the design and characteristics of gas installations	4.1 Describe how to design gas installations
	4.2 Discuss the features and characteristics of natural gas installations for low-rise buildings
	4.3 Explain the application of the regulations and standards relevant to gas installations

Unit content

1 Know how cold water is sourced, cleansed to the required standard and distributed to the consumer

Sources of cold water: water cycle; sources of water (reservoirs, lakes, shallow and deep wells, artesian wells, springs); types of soft and hard water supplied; effect of soft and hard water on plumbing systems; private supplies by companies for purposes such as cooling

Cleansing process: methods of cleansing water for use by customers; levels and types of water filter; medium used; addition of chemicals to water supplies; cleansing and filtering of private water supplies

Required standard of wholesome water: World Health Organization (WHO) standards; Supply of Water Regulations; effects of contaminated supplies on a district

Distribution to the consumer: main connection; service pipes; communication and supply pipes; applicable legislation including water regulations; responsibility of water authority and householder; water pressure and flow rates to meet demand

2 Be able to design hot and cold water systems for installation in low-rise buildings

Hot and cold water installations: appliances and components; materials and jointing methods; hot water systems; cold water systems; design of hot and cold water systems

Appliances and components: types, features, materials and installation requirements (including requirements of regulations); typical connections; pressure and water supply requirements of the various appliances (eg washbasins, WCs, baths, bidets, urinals, shower valve arrangements for instantaneous and storage systems); requirements for and means of temperature control on showers and sanitary appliances; domestic and commercial kitchen appliances (eg sinks, washing machines, dishwashers, water boilers); cleaning and healthcare appliances (eg cleaners' sinks, slop hoppers, bucket sinks); drinks provisions (eg water coolers, drinking fountains, automatic drinks dispensers); luxury and 'lifestyle' appliances (eg spas and whirlpool baths, pumped shower arrangements and variations, hot tubs, steam rooms); production of sanitary and appliance schedules including ancillary components associated with the above appliances (brackets, handles, fixings, seats, decor and mounting panels); characteristics and operational features of valves (eg stopcocks, isolation, drain, float operated); filters; water conditioners; devices to prevent unnecessary urinal flushing and other devices to minimise water usage; criteria for selection

Materials and jointing methods: copper tube; capillary fittings, compression fittings, push-fit, crimped and brazed joints; galvanised low carbon steel (threaded and compression joints); polyethylene and other acceptable plastic pipes, fusion welding and solvent jointing methods

Cold water systems: direct and indirect systems; environmental impact

Hot water systems: instantaneous single- and multi-point water heaters; atmospheric direct and indirect hot water storage vessels; methods of heating domestic hot water; maximising energy efficiency in hot water generation; systems and methods for the distribution of domestic hot water for single and multiple dwellings and small commercial and industrial buildings; use of unvented domestic hot water systems in accordance with current building regulations; prevention of bacterial growth (eg Legionella) within systems; environmental impact

Design of hot and cold water systems: location of appliances; pipework systems and arrangements; features of good pipework design; pipework accommodation and routing; prevention of noise problems; provision for commissioning and maintenance; reasons for commissioning hot and cold water installations; provision of means of isolation, draining, flushing and sterilisation; prevention of corrosion and frost damage; system calculations (loading units, flow rates, pressure losses and pipe sizes); recognised procedures and published charts and graphs; calculations for gravity- and mains-fed distribution pipework, primary and secondary circulation pipework; calculating storage vessel sizes

3 Understand the design and installation of above ground drainage systems

Above ground drainage systems: discharge to separate, combined and partially separate systems of underground drainage; soakaways; cesspits; septic tanks

Types of above ground drainage systems: one-pipe; two-pipe; modified single-stack; stub-stack systems; ventilated stacks; use of air-admittance valves; requirements of current regulations and standards affecting the design and installation of above ground drainage systems; *rainwater systems*: provision for the disposal of rainwater (gutters, roof arrangements, rainwater pipes); materials used in the construction of these systems; grey water/rainwater harvesting systems; environmental impact

Design of above ground drainage systems: need for and types of traps; causes and prevention of loss of seal; connections to above ground drainage systems of domestic sanitary appliances (shower arrangements, washbasins, WCs, baths, sinks, urinals); ranges of appliances; macerator units

Installation of above ground drainage systems: materials and jointing method for above ground drainage; materials, jointing and fixing associated with modern and traditional above ground drainage and rainwater systems; procedures for testing; need for and procedures used for performance testing of above ground drainage to current regulations and standards; testing for trap seal retention

4 Understand the design and characteristics of gas installations

Design of gas installations: calculation of flow rates from heat inputs; use of charts and tables to determine the size of natural gas pipe to comply with standards and legislation; requirements of flues (conventional flue and room-sealed flue arrangements, natural draught and fan-assisted flues); flue routes and terminal requirements; requirements for flues passing through buildings; ventilation requirements (need for ventilation, types of vent allowed/not allowed for gas-burning appliances, ventilation requirements for various appliance/flue arrangements/appliance locations); calculation of required ventilator size; location of ventilator; requirements for ventilator construction; requirements of current regulations and standards affecting the provision of combustion air and ventilation for gas-burning appliances; sources of natural gas and combustion; extraction of natural gas supplies; transportation systems; LPG gas supplies; distribution systems; materials used for the transport of natural gas; constituents of gas; properties and combustion characteristics of natural gas and commercial LPG; combustion process; products of

complete combustion; causes, effects and prevention of incomplete combustion; environmental impact

Features and characteristics of natural gas installations: types of common gas appliance found in domestic properties (cookers, space heaters, central heating boilers, instantaneous hot water heaters); structure, layout, components and materials to be used (pipework materials, jointing and assembly, types of valves, pressure control); requirements of current regulations and standards affecting the design, installation and use of gas installations; procedures for testing and purging of domestic installations

Regulations and standards: The Gas Safety (Installation and Use) Regulations 1998