

Unit 67: Low Temperature Hot Water Heating in Building Services Engineering

Unit code: M/600/0380

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

The aim of this unit is to give learners skills and understanding of low temperature hot water (LTHW) heating required for designing and specifying efficient installations for buildings.

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 Be able to establish heating requirements for buildings	1.1 Produce pre-design appraisals of the heating requirements of buildings
	1.2 Establish heating system design data and parameters for buildings
	1.3 Establish the thermal performance properties of building fabric and infiltration rates
	1.4 Perform calculations to determine building total heat loss
2 Understand the operational characteristics of low temperature hot water heating equipment and plant	2.1 Describe the operational characteristics of plant and equipment associated with LTHW heating systems
	2.2 Explain how the operational characteristics of LTHW plant and

	equipment influence their application
3 Be able to design low temperature hot water heating installations	3.1 Plan heating installation pipework configuration and design layouts
	3.2 Plan simple boiler/heat generation plant arrangements and configurations
	3.3 Produce appropriate design drawings of proposed LTHW installations
4 Be able to size, select and specify heating installation pipework, plant and equipment	4.1 Select design parameters and calculate consequent mass flow rates, pipe sizes and circuit resistances for LTHW distribution networks
	4.2 Perform the calculations required to select circulation pumps for LTHW heating circuits
	4.3 Specify boilers and other heat-generation plant in terms of efficiency and sustainability

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Unit content

1 Be able to establish heating requirements for buildings

Heating requirements: reasons for heating buildings or zones for domestic, commercial, industrial and public-sector applications; client, user and environmental requirements and considerations; effect of building occupation times and patterns; identifying likelihood of future changes; quality/life expectancy of the installation; planning restrictions; locations with special heating requirements

Design conditions: factors used to select internal design temperatures; thermal indices; use of regulations, codes of practice, standards and guidance notes when selecting design conditions for winter heating; exercising judgement when selecting design temperatures for non-standard locations; environmental implications of design decisions; selection of external design temperatures for winter heating; inclusion of geographical location, thermal response and risk of exceedance: infiltration rates for winter heating applications

Heat losses: identification and selection of U values for building fabric; calculation of simple heat losses; use and validity of 'rules-of-thumb'; legislative constraints; energy standards; environmental implications of heating energy requirements; methods of reducing energy requirement

2 Understand the operational characteristics of low temperature hot water heating equipment and plant

LTHW plant and equipment: heat emitters; pipework and jointing systems; heating pumps; boiler plant and heat generators; expansion accommodation devices; ancillary components

Heat emitters: eg panel, sectional, low temperature, natural and fan convectors, unit heaters, radiant panels, underfloor heating; characteristics, appearance, operation, installation and application of heat emitters; heat emissions; control of output; selection criteria

Pipework and jointing systems: pipework sizes; jointing characteristics; assembly; installation; criteria for selecting materials eg properties, application, costs versus benefits

Heating pumps: single and twin head pumps; direct and indirect drives; glands and seals; connection to pipelines; methods to alter rotation speed; effect on pump duty

Boiler plant and heat generators: types; characteristics; operational features; applications; boiler mountings; installation; firing; flue arrangements; fuel storage requirements; regulations; standards; environmental issues; maximising energy efficiency

Expansion accommodation devices: characteristics; natural pipe flexibility; loops; bellows; sliding joints; flexible connections; anchors; guides; supports

Ancillary components: characteristics and features of eg air-removal devices; valves (isolation, drain, float operated); flexible diaphragm expansion vessels; regulating valves; flow-measurement devices; test points

3 Be able to design low temperature hot water heating installations

Design of LTHW heating installations: arrangement of components; design of boilers and heat-generation plant; commissioning and maintenance; drawings

Arrangement of components: location of heat emitters and pipework systems; one-pipe, two-pipe and reverse-return systems; good pipework circuit design; criteria and methods for zoning installations; use and arrangement for constant and variable temperature circuits; relationship of cold feed, vent pipe and pumps; pipework accommodation and routing; arrangements for initial fill, top-up and accommodation of expansion water; location of pipework expansion devices; prevention of noise problems

Design of boilers and heat-generation plant: space requirements for single and multiple boiler configurations; structural and building work requirements to accommodate heat-generation plant; connection of circuits to heat-generation plant eg pipework headers, primary circuits

Commissioning and maintenance: reasons for commissioning heating pipe networks; types and location of flow regulation and metering devices; provision of means of isolation, air removal and draining; location of filters and dirt-removal devices; prevention of corrosion; methods and equipment used for chemical treatment of installations

Drawings: communication of detailed designs; use of drawing symbols and annotation; production of appropriate drawings and sketches

4 Be able to size, select and specify heating installation pipework, plant and equipment

Pipework circuits: selection of pipework design parameters; use of manual calculations and computer software for calculation of mass flow rates; selection of pipe sizes; calculation of pipework emission and temperature distribution in one- and two-pipe circuits; total resistance of index circuits; methods of producing balanced systems and absorbing excess pressure at branches; establishing commissioning data for pipework distribution networks

Plant and equipment: pumps; heat emitters; boilers and heat generators; expansion devices and other components

Pumps: application of pump margins; determining pump duty; selection of pumps from manufacturers' data; pump and system characteristics; efficiency and operational features; cause, effect and prevention of cavitation; production of pump schedules; commissioning data

Heat emitters: selection; variation of emitter output with mean water temperature; hydraulic resistance; production of heat emitter specifications and schedules

Boilers and heat generators: selection; hydraulic resistance; maintaining minimum flow rates; combustion, ventilation, fuel/energy requirements; boiler specifications and schedules

Expansion devices and other components: selection of components from manufacturers' data; production of specifications and schedules