

# Unit 38: Plumbing Technology in Building Services Engineering

<b>Unit code:</b>	<b>Y/600/0437</b>
<b>QCF Level 3:</b>	<b>BTEC Nationals</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

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.

## ● Unit introduction

Supplying cold water to buildings has long been accepted practice, and cold water is usually considered to be the most essential primary utility provided to a building. Developments in the water industry have improved both the supply of water to a building and the disposal of waste water from it. Increased user expectations, the increasing importance of energy efficiency, and the issues highlighted by recent regional water shortages, all imply a need for increasingly more sophisticated and efficient plumbing installations.

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.

This unit provides learners with knowledge and understanding of water supply systems and the methods used to distribute water around a building. They will explore the use of cold water supplies for drinking, cooking and washing and the methods used to provide hot water for washing and thermal comfort.

Learners will investigate the techniques used to dispose of waste water to below ground drainage system safely and efficiently.

Plumbers also need a knowledge and understanding of natural gas systems. The unit gives learners an opportunity to apply appropriate regulations to the design and installation of gas systems for domestic buildings.

## ● Learning outcomes

**On completion of this unit a learner should:**

- 1 Know how cold water is sourced, cleansed to the required standard and distributed to the consumer
- 2 Be able to design hot and cold water systems for installation in low-rise buildings
- 3 Understand the design and installation of above ground drainage systems
- 4 Understand the design and characteristics of gas installations.

# Unit content

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## 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 health care 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, décor 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

## Assessment and grading 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 for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> identify the main sources of cold water [IE1, IE2, IE4, IE6]	<b>M1</b> analyse the properties of drinking water taken from two different sources	<b>D1</b> propose strategies for reducing the environmental impact of hot and cold water systems
<b>P2</b> describe the process by which cold water is cleansed before distribution [IE1, IE2, IE4, IE6, CT2, RL2, RL3]		
<b>P3</b> state the required standards for wholesome water [IE1, IE2, IE4, IE6]		
<b>P4</b> describe how cold water is distributed to the consumer [IE1, IE2, IE4, IE6]		
<b>P5</b> describe the appliances, components, materials and jointing methods used in cold water systems [IE1, IE2, IE4, IE6]	<b>M2</b> develop specifications for hot and cold water systems	
<b>P6</b> design functional cold water systems for low-rise buildings [IE1, IE2, IE4, IE6, CT1, CT4, CT5, CT6, SM2, SM3]		
<b>P7</b> describe the appliances, components, materials and jointing methods used in hot water systems for low-rise buildings [IE1, IE2, IE4, IE6, CT2, RL2, RL3]		
<b>P8</b> design functional hot water systems for low-rise buildings [IE1, IE2, IE4, IE6, CT1, CT4, CT5, CT6, SM2, SM3]		

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<p><b>P9</b> describe the materials and jointing methods used in above ground drainage systems [IE1, IE2, IE4, IE6, CT2, RL2, RL3]</p>	<p><b>M3</b> develop designs and specifications for above ground drainage systems</p>	<p><b>D2</b> propose strategies for reducing the environmental impact of drainage and the use of natural gas.</p>
<p><b>P10</b> discuss the factors that influence the design of above ground drainage systems [IE1, IE2, IE4, IE6, CT2, RL2, RL3, RL4, RL6]</p>		
<p><b>P11</b> explain the installation requirements for above ground drainage systems for low-rise buildings [IE1, IE2, IE4, IE6, CT2, RL2, RL3]</p>		
<p><b>P12</b> describe how to design gas installations [IE1, IE2, IE4, IE6, CT2, RL2, RL3]</p>	<p><b>M4</b> develop designs and specifications for natural gas installations including flues and ventilation.</p>	
<p><b>P13</b> discuss the features and characteristics of natural gas installations for low-rise buildings [IE1, IE2, IE4, IE6, CT2, RL2, RL3]</p>		
<p><b>P14</b> explain the application of the regulations and standards relevant to gas installations. [IE1, IE2, IE4, IE6, CT2, RL2, RL3, EP3]</p>		

**PLTS:** This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills which are embedded in the assessment of this unit. By achieving the criteria, learners will have demonstrated effective application of the referenced elements of the skills.

<b>Key</b>	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

# Essential guidance for tutors

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## Delivery

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, seminar presentations, site visits, supervised practicals, research using the internet and/or library resources and the use of personal and/or industrial experience are all suitable. Delivery should stimulate, motivate, educate and enthuse learners. Visiting expert speakers could add to the relevance of the subject.

The learning outcomes are closely linked and form a logical and progressive structure where water is sourced and used effectively within buildings. This unit is designed to reflect the whole life cycle in that water is taken from a source, cleansed for use, transported to the point of use, used for various purposes and then disposed of back to the water cycle where in time the process will repeat itself.

Teaching and learning strategies should reinforce an integrated, learner-centred approach. The importance of water conservation, energy efficiency and environmental impact needs to be emphasised both in the supply of water and in the problems of dealing with waste water as demand grows.

The method of delivery should, as far as possible, be activity based. Learning activities could include the use of case studies, site visits, product investigations and design exercises. The unit should not be perceived as an academic exercise and should at all times be based on real-life applications and reflect industry best practice. Delivery should balance calculations, knowledge, understanding, creativity and application.

Reference should be made to appropriate regulations and standards wherever necessary. Learners should be encouraged to use them to make informed decisions relating to the design of plumbing and gas installations and help them understand the consequences of their decisions. The use of current manufacturers' product information is also encouraged to help learners apply principles and procedures to real-life situations. This does not imply that the mechanistic use of manufacturers' data, with little understanding, is always acceptable.

The focus of this unit is on linking principles with practical applications and this, in turn, implies that learners will have achieved a basic understanding of science and analytical methods before starting this unit. Even if learners do not have this knowledge and understanding on entry, there will be no delivery and/or assessment issues if the relevant core units are delivered early in the programme.

Group activities are permissible, but tutors will need to ensure that individual learners have equal experiential and assessment opportunities.

**Health, safety and welfare issues are paramount and should be reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken before practical activities are taken. Centres are advised to read the *Delivery approach* section in the specification, and *Annexe H: Provision and Use of Work Equipment Regulations 1998 (PUWER)*.**

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
<p>Introduction by tutor</p> <p>Whole-class, tutor-led discussion of sources of cold water, cleansing processes used to treat water for drinking purposes, required standard of wholesome water as defined by World Health Organization (WHO) standards and Supply of Water Regulations, effects of contaminated supplies on a district</p> <p>Individual learner work on distribution to the consumer including mains connection, service pipes, communication and supply pipes</p> <p>Small-group work on applicable legislation – topics to cover water regulations, responsibility of water authority and householder, water pressure and flow rates to meet demand. Short presentations to whole-class with summary and comprehensive handouts from the tutor after presentations</p>
<p>Whole-class, tutor-led discussion of hot and cold water installations, including appliances, components, materials and jointing methods. Difference between direct and indirect systems</p> <p>Site visit to work in progress, either on site or in centre workshops</p> <p>Visit to plumbers' merchant</p> <p>Individual learner work on design of hot and cold water systems, including line drawings of effective systems. Tutor to correct as and where appropriate</p>
<b>Assignment 1: Hot and Cold Water Systems</b>
<p>Whole-class, tutor-led discussion of above ground drainage systems, types and design</p> <p>Individual learner work to interpret and produce drawings of effective systems</p> <p>Visit to see installation of above ground drainage systems as work in progress, on site or centre workshops as available</p>
<p>Whole-class, tutor-led discussion of features and characteristics of natural gas installations and regulations and standards including Gas Safety (Installation and Use) Regulations 1998</p> <p>Individual learner work on design of gas installations including line drawings of effective systems. Tutor to correct as and where appropriate</p> <p>Visit to see installation of gas systems as work in progress, on site or centre workshops as available</p>
<b>Assignment 2: Drainage and Gas</b>
<p>Review of unit and assignment feedback</p>



## Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies or reports of practical assignments. There are many suitable forms of assessment that could be used, and tutors are encouraged to consider and adopt these where appropriate. Some example assessment approaches are suggested below. However, these are not intended to be prescriptive or restrictive, and are provided as an illustration of the alternative forms of assessment evidence that would be acceptable. Some criteria can be assessed directly by the tutor during practical activities. If this approach is used suitable evidence would be observation records or witness statements.

Assessment could take the form of one well-designed project or, preferably, two smaller projects based on the design and specification of plumbing, gas and waste water disposal installations for real buildings. These can be further broken down into smaller stages if more helpful for learners. The project/s should be based around the supply and distribution of water to a dwelling or small commercial or industrial building up to two floors high. The building(s) should not be overly complex but should contain a variety of activities that support a wide range of appliances so that learners can consider options, make decisions and demonstrate knowledge and understanding.

In addition to written text, learners should be given a range of architectural drawings from which they can extract the required information. These could be plans, elevations, sections and/or details. Where centres intend to use buildings of their own design, the buildings must meet current building design standards and should contain the same information as would be present in professionally produced architectural drawings. Centres are encouraged to consider the use of integrated assignments as there is considerable scope for integrating the assessment of this unit with outcomes from other units. For example, assessments associated with fluid flow, pressure loss in pipes, properties of materials and thermal comfort can be integrated within an assessment instrument designed to meet the grading criteria for this unit.

To achieve a pass grade learners must meet the 14 pass criteria listed in the grading criteria grid.

For P1, learners must identify sources of water to be used for distribution to consumers. They should make reference to the hardness of the water from each source and the effect of each on hot and cold supplies.

For P2, learners must describe the process by which cold water is cleansed before distribution. This should include reference to physical process such as filtration and sedimentation, biological processes such as slow sand filters or activated sludge and chemical process such as flocculation and chlorination.

For P3, learners must state the required standards for wholesome water. This should relate to the desired quality of the drinking water and freedom from contaminants. The main contaminants should be identified, and their effect on the water supply to a district described. Learners do not need to identify the permissible levels of contaminants or understand any of the chemistry involved.

For P4, learners must describe how cold water is distributed to the consumer ie the process by which the water arrives at the premises fit for purpose. This should refer to the arrangement of pipes that convey water from the mains to the home but need go no further than the stopcock. It should be clear where the water company's responsibility ends and the householder's begins.

For P5, learners must describe the appliances, components, materials and jointing methods used in cold water systems. This should be linked to the designs produced for P6.

For P6, learners must design basic, functional cold water distribution systems within dwellings and small commercial premises. They should select the most appropriate cold water system for these building types. Learners are expected to produce basic drawings and reports to support their design for a basic, functional cold water installation to all appliances and fittings requiring a cold water supply. Designs should include all necessary items, should comply with relevant legislation and standards and must show that water economy, pipework routing, accommodation and appearance have all been considered.



For P7, learners must describe the appliances, components, materials and jointing methods used in hot water systems. This should be linked to the designs produced for P8.

For P8, learners must design basic, functional hot water systems for dwellings and small commercial premises. Types of domestic hot water supply should include centralised, secondary and point-of-use systems. Learners are expected to produce basic drawings and reports to support their design for a basic, functional hot water installation to all appliances and fittings requiring a hot water supply. Designs should include all necessary items, should comply with relevant legislation and standards and must show that factors such as water economy, energy efficiency, pipework routing, accommodation and appearance have all been considered.

For P9, learners must describe the materials and jointing methods used in above ground drainage systems. This should be linked to the evidence for P10 and P11.

For P10, learners must discuss the factors that influence the design of above ground drainage systems. Evidence should include the need for traps, the need to prevent loss of seal, the nature and number of domestic appliances (sanitary and otherwise) to be connected to the drainage system and the size and intended purpose of the building.

For P11, learners must explain the installation requirements for above ground drainage systems for low-rise buildings, including fixing, testing, service and maintenance requirements.

For P12, learners must describe how to design gas installations. There should be evidence of understanding of the factors and issues identified for learning outcome 4, but learners are not required to design an actual system in order to achieve this criterion. The different arrangements used for natural gas and liquefied petroleum gas (LPG) should be clearly described.

For P13, learners must describe the features and characteristics of natural gas installations for low-rise domestic buildings. A system layout should be provided to demonstrate learner knowledge of positioning and sizing of natural gas pipework, ventilation facilities and the location of appliances.

For P14, learners must explain the application of the regulations and standards relevant to gas installations for domestic buildings. The evidence for P12 and P13 should be extended to demonstrate how the installations comply with relevant legislation and regulations.

To achieve a merit grade learners must meet all of the pass grade criteria and the four merit grade criteria.

For M1, learners are expected to analyse the properties of drinking water taken from two different sources. These two sources should clearly have different properties. It is not helpful to select two different sources of water that happen to have similar properties. There should be evidence of an understanding of the differences due to the source of the water and the chemical changes experienced as the water falls through the atmosphere as rain and percolates through soil and rocks in the ground, before treatment. There is no requirement for values of chemical concentrations in the water, and the evidence could make relative comparisons of one source of water against the other and against the required standards for drinking water.

For M2, learners must develop comprehensive specifications for energy and water efficient domestic hot and cold water installations for dwellings and small commercial premises. They should include details of domestic hot water plant items and their location with respect to supply and consumer demand. There should be clear evidence that learners have considered all aspects of the proposed design carefully. This includes the main features and constraints of the building, legislative requirements and standards, the client's requirements and the need for maintenance and commissioning.

For M3, learners must develop designs and specifications for appropriate above ground drainage and rainwater installations for dwellings and small commercial premises. Calculations should be included to size and determine the disposal system. This should also include provision for rainwater disposal where calculations and specifications can be demonstrated to ascertain the correct size of the rainwater disposal system. This could be a natural extension of the work carried out for P9, P10 and P11.

For M4, learners must develop designs and specifications for appropriate natural gas appliance and installation networks (including associated flues and ventilation) for use in dwellings. They are expected to size, position and route natural gas pipework systems to a dwelling or similar premises, position appliances, locate flue arrangements and provide ventilation. Learners should show how their proposals demonstrate compliance with current regulations and recognised standards. Drawings and reports should be of a good standard and be detailed and unambiguous. This could be a natural extension of P12, P13 and P14.

To achieve a distinction grade learners must meet all of the pass and merit grade criteria and the two distinction grade criteria.

For D1, learners must propose strategies for reducing the environmental impact of hot and cold water systems for given buildings. They should clearly identify the aspects of these installations which have health and/or environmental implications and evaluate alternative strategies for minimising their impact. Learners should include a range of strategies including techniques for reducing water wastage and energy loss, recycling (grey water, rainwater harvesting schemes) and maintaining wholesome supplies. Proposals should be contextualised to actual applications including a consideration of their practicability and benefit in given dwellings or small commercial premises. This could be a natural extension of the work carried out for P1, P2, P3, P4, M1 and M2.

For D2, learners must propose strategies for reducing the environmental impact of drainage and the use of natural gas. They should clearly identify the aspects of these installations which have health and/or environmental implications and evaluate alternative strategies for minimising their impact. Learners should include a range of strategies including those designed to ensure adequacy of capacity, continuity of flow, security of water seals and prevention of leakage for drainage and oxygen supply, and ventilation requirements for gas work, together with the consequences of CO<sub>2</sub> as a product of combustion. The strategies should be contextualised to actual applications including evaluating their practicability and benefit in given dwellings or small commercial premises. This could be a natural extension of the work carried out for P9, P10, P11, P12, P13, P14, M3 and M4.

### Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, P5, P6, P7, P8, M1, M2, D1	Hot and Cold Water Systems	You are employed as a building services technician with a firm that subcontracts to a major construction company. You have been asked to produce a training manual for the site managers employed by the major construction company on the provision made for hot and cold water in their buildings. This should cover everything from sourcing the water to design of the systems.	Report, accompanied by sketches, drawings, graphs, charts, tables, specifications, calculations and text as appropriate.
P9, P10, P11, P12, P13, P14, M3, M4, D2	Drainage and Gas	As above, but for above ground drainage and gas installations.	Report, accompanied by sketches, drawings, graphs, charts, tables, specifications, calculations and text as appropriate.

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Construction and the Built Environment sector suite. This unit has particular links with the following unit titles in the Construction and the Built Environment suite:

Level 1	Level 2	Level 3
		Sustainable Construction
		Science and Materials in Construction and the Built Environment
		Graphical Detailing in Construction and the Built Environment
		Building Services Control Systems
		Building Services Science
		Fluids – Static and Dynamic in Building Services Engineering

The learning outcomes in this unit provide a basis for study of the units at Higher National and degree level. This unit has links to the Level 3 National Occupational Standards in BE Design.

The content of this unit also covers some of the knowledge and understanding associated with SummitSkills National Occupational Standards, in particular Unit 1: Design Domestic Plumbing Systems.

There are also links with Summit Skills N/SVQ Level 3 Building Services Engineering Technology and Project Management. In particular with:

- Unit SST/NOS 3: Apply Design Principles to Building Services Engineering Projects
- Unit SST/NOS 5: Monitor Commissioning and Testing Procedures for Building Services Engineering Projects
- Unit SST/NOS 7: Provide Technical and Functional Information to Relevant People.

There are also links with Summit Skills N/SVQ Level 4 Building Services Engineering Technology and Project Management. In particular with:

- Unit SSTE/NOS 7: Prepare and Advise on Building Services Engineering Project Design Recommendations
- Unit SSTE/NOS 8: Prepare and Agree Detailed Building Services Engineering Project Designs.

### Essential resources

Centres that deliver plumbing and other mechanical engineering craft courses may have sufficient resources to deliver this unit. Learners may wish to visit the workshop facilities to see the processes and procedures being implemented by others. Site visits and installation drawings showing plumbing systems and appropriate architectural features will also enhance delivery. The use of readily available visual aids (such as the range of plumbing plant and components) is considered to be advantageous. These can be either in the form of sectioned models and/or as part of live installations. Centres should have access to sets of architectural drawings, plumbing system installations and schematic drawings to support the learning process and facilitate assessments. Where these drawings are used as part of the assessment process, it is recommended that repeated use of the same building is avoided to maintain the freshness of the assessment process.

## Employer engagement and vocational contexts

Support to enable centres to initiate and establish links to industry, and to networks arranging visits to industry and from property practitioners is given below:

- Learning and Skills Network – [www.vocationallearning.org.uk](http://www.vocationallearning.org.uk)
- National Education and Business Partnership Network – [www.nebpn.org](http://www.nebpn.org)
- Summit Skills – [www.summitskills.org.uk](http://www.summitskills.org.uk)
- Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – [www.warwick.ac.uk/wie/cei/](http://www.warwick.ac.uk/wie/cei/)

## Indicative reading for learners

### Textbooks

Thompson J – *Plumbing NVQ and Technical Certificate Level 2* (Heinemann Educational Publishers, 2005) ISBN 0435401947

Treloar R – *Plumbing Encyclopedia, 3rd Edition* (Blackwell Publishing, 2003) ISBN 1405106131

Treloar R – *Plumbing: Heating and Gas Installations, 2nd Edition* (Blackwell Science, 2000) ISBN 0632053321

### Journals

*The Gas Installer magazine* – CORGI

*Heating, Ventilation and Plumbing magazine* – Hemming Information Services

*Plumbing and Heating magazine* – Unity Media PLC

### Websites

[www.bpec.org.uk](http://www.bpec.org.uk)

BPEC Plumbing Skills

[www.gassaferegister.co.uk](http://www.gassaferegister.co.uk)

Gas Safe Register

[www.iphe.org.uk](http://www.iphe.org.uk)

Institute of Plumbing and Heating Engineering

[www.summitskills.org.uk](http://www.summitskills.org.uk)

Sector Skills Council for Building Services Engineering

## Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
<b>Independent enquirers</b>	identifying questions to answer and problems to resolve, planning and carrying out research, analysing and evaluating information and supporting conclusions using reasoned arguments and evidence, as they: <ul style="list-style-type: none"> <li>● identify the main sources of cold water</li> <li>● describe the process by which cold water is cleansed before distribution</li> <li>● state the required standards for wholesome water</li> <li>● describe how cold water is distributed to the consumer</li> <li>● describe appliances, components, materials and jointing methods used in hot and cold water systems, above ground drainage and gas installations</li> <li>● design functional hot and cold water systems, above ground drainage systems and gas installations for low-rise buildings</li> <li>● explain the application of regulations and standards relevant to gas installations</li> </ul>
<b>Creative thinkers</b>	generating ideas and exploring possibilities, asking questions to extend their thinking and adapting ideas as circumstances change, as they: <ul style="list-style-type: none"> <li>● describe the process by which cold water is cleansed before distribution</li> <li>● describe appliances, components, materials and jointing methods used in hot and cold water systems, above ground drainage and gas installations</li> <li>● design functional hot and cold water systems, above ground drainage systems and gas installations for low-rise buildings</li> <li>● explain the application of regulations and standards relevant to gas installations</li> </ul>
<b>Reflective learners</b>	evaluating experiences and learning to inform future progress and communicating their learning in relevant ways for different audiences, as they: <ul style="list-style-type: none"> <li>● describe the process by which cold water is cleansed before distribution</li> <li>● describe appliances, components, materials and jointing methods used in hot and cold water systems, above ground drainage and gas installations</li> <li>● design functional hot and cold water systems, above ground drainage systems and gas installations for low-rise buildings</li> <li>● explain the application of regulations and standards relevant to gas installations</li> </ul>
<b>Self-managers</b>	organising time and resources and prioritising actions, as they: <ul style="list-style-type: none"> <li>● describe appliances, components, materials and jointing methods used in hot and cold water systems</li> <li>● design functional hot and cold water systems</li> </ul>
<b>Effective participators</b>	proposing practical ways forward and breaking these down into manageable steps, as they: <ul style="list-style-type: none"> <li>● explain the application of regulations and standards relevant to gas installations</li> </ul>

## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Use ICT systems</b>	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using the internet to research into water cleansing saving material electronically  using email to communicate with the tutor and other learners
Manage information storage to enable efficient retrieval	downloading and saving internet files and their own work electronically
<b>ICT – Find and select information</b>	
Select and use a variety of sources of information independently for a complex task	using the internet to research water cleansing saving material electronically  using email to communicate with the tutor and other learners
<b>ICT – Develop, present and communicate information</b>	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> <li>• text and tables</li> <li>• images</li> <li>• numbers</li> <li>• records</li> </ul>	producing reports and presentations for both formative and summative assessment purposes
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to communicate with the tutor and other learners
<b>Mathematics</b>	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Draw conclusions and provide mathematical justifications	

Skill	When learners are ...
<b>English</b>	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting, for example gas installation designs
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	researching water cleansing practices from books, journals, CD ROMs and websites
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing reports for assessment purposes