

# Unit 38: Plumbing Technology in Building Services Engineering

NQF Level 3: BTEC National

Guided learning hours: 60

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## Unit abstract

The supply of water to a building has long been an accepted practice, and is usually considered to be the most essential utility serving 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. This, set against a background of increased user expectations, the importance of energy-efficiency and regional water shortages means that the need for sophisticated and efficient plumbing installations never been greater.

Learners will understand that the role of the plumbing engineer is to provide water distribution and disposal, and energy-efficient central heating systems, meeting the requirements of the user and conforming to current regulations governing the water industry.

The unit gives learners a basic understanding of water supply systems and the ways in which water is distributed around a building in order to provide supplies suitable for drinking, cooking and washing, to provide supplies of hot water for thermal comfort, and to assist in the safe and efficient disposal of waste water. It also provides learners with a basic introduction to natural gas systems, and an opportunity to apply appropriate regulations in scenarios relating the design and installation of gas systems for domestic buildings.

## Learning outcomes

On completion of this unit a learner should:

- 1 Be able to describe the various sources of cold water supply and the cleansing processes used to achieve the required standard of wholesome water
- 2 Understand the technology of hot and cold water systems and be able to design systems for domestic and non-complex commercial and industrial buildings
- 3 Understand the provision of above ground drainage and rainwater systems and outline the implications of the various below ground drainage systems
- 4 Understand the technology of gas installations and be able to apply appropriate regulations to the design and installation of gas systems in domestic buildings.

## Unit content

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**1 Be able to describe the various sources of cold water supply and the cleansing processes used to achieve the required standard of wholesome water**

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

*The cleansing process:* methods of cleaning 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

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

*Connections to water mains:* service pipes; communication and supply pipes; legislation; water regulations; water authority and owner's responsibility; water pressure and flow rates to meet demand

**2 Understand the technology of hot and cold water systems and be able to design systems for domestic and non-complex commercial and industrial buildings**

*Domestic cold water systems:* direct and indirect systems of cold water supply for single and multiple dwellings and small commercial and industrial buildings

*Domestic hot water storage and supply 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

*Appliances and associated components:* types, features, materials and installation requirements (including requirements of regulations); typical connections; pressure and water supply requirements of the various appliances associated with hot and cold water installations for domestic and non-domestic buildings, 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, and steam rooms; production of sanitary and appliance schedules including ancillary components associated with the above appliances (brackets, handles, fixings, seats, décor and mounting panels)

*Materials and jointing methods:* suitable materials and jointing techniques; 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

*Hot and cold water ancillary components:* characteristics and operational features of hot and cold water installation items such as valves, eg stop cocks, isolation, drain, float operated; filters; water conditioners; devices to prevent unnecessary urinal flushing and other devices to minimise water usage; criteria for selection

*Design of hot and cold water installations:* 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 for single and multiple dwellings and small commercial and industrial buildings:* use of loading units; determining flow rates, pressure losses and pipe sizes using recognised procedures and published charts and graphs for, eg gravity and mains fed distribution pipework, primary and secondary circulation pipework; calculating storage vessel sizes

*Graphical detailing:* production of appropriate drawings and sketches as required to communicate hot and cold water system detailed designs; use of drawing symbols and annotation

**3 Be able to demonstrate a detailed understanding of above ground drainage and rainwater systems and outline the implications of the various below ground drainage systems**

*Types of underground drainage scheme:* separate, combined, partially separate systems of underground drainage schemes; soakaways, cesspits, septic tanks

*Types of above ground drainage schemes:* one pipe; two pipe; modified single stack; stub stack systems to domestic dwellings and small commercial and industrial buildings up to four floors; ventilated stacks; use of air admittance valves; requirements of current regulations and standards affecting the design and installation of above ground drainage systems

*Sanitation appliances:* need for and types of traps, causes and prevention of loss of seal, connections to above ground drainage systems of the various domestic sanitary appliances, to include shower arrangements, washbasins, WCs, baths, sinks, urinals, ranges of appliances and macerator units

*Materials and jointing methods:* materials, jointing and fixing associated with modern and traditional above ground drainage and rainwater systems

*Rainwater systems:* provision for the disposal of rainwater through gutters, roof arrangements, rainwater pipes; materials used in the construction of these systems; grey-water/rainwater harvesting systems.

*Design and installation of:* above-ground drainage systems suitable for domestic dwellings and small commercial or industrial buildings up to four storeys high

*Soundness and performance:* 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 technology of gas installations and be able to apply appropriate regulations to the design and installation of gas systems in domestic buildings

*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

*Natural gas pipe installations within domestic property:* types of common gas appliance found in domestic property, including cookers, space heaters, central heating boilers, instantaneous hot water heaters, leisure appliances eg barbecues and warm air units; structure, layout; components and materials used for the installation of gas installations within dwellings including 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, including pipework, meters, appliances, need for and procedures used for testing and purging of domestic installations

*System calculations:* calculation of flow rates from heat inputs; use of charts and tables to determine the size of natural gas pipe required to comply with standards and legislation

*Flue types and requirements:* conventional flue and room sealed flue arrangements; natural draught and fan assisted flues; construction; 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 ventilator size required; 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

## Grading grid

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all of the learning outcomes for the unit. The criteria for a pass grade describes the level of achievement required to pass this unit.

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:
P1 identify sources of water to be used for distribution to consumers and describe the process by which the water arrives at the premises fit for purpose	M1 produce comprehensive designs and specifications for cold water installations for dwellings and small commercial premises	D1 propose and evaluate techniques and strategies for reducing the environmental impact of hot and cold water, soil and waste disposal installations for given buildings and explain methods of reducing bacterial growth.
P2 design basic, functional and workable cold water distribution systems within dwellings and small commercial premises	M2 produce comprehensive designs and specifications for energy and water efficient domestic hot water installations for dwellings and small commercial premises	D2 analyse and justify the design rationale used in the production of soil, waste and rainwater disposal designs including how the proposed design is influenced by the methods of underground drainage, meets the requirements of legislation and the needs of the client and their building.
P3 design basic, functional hot water systems for dwellings and small commercial premises	M3 produce designs and specifications for appropriate above ground drainage and rainwater installations for dwellings and small commercial premises	

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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>P4 describe the features and characteristics of the common above ground drainage systems for domestic buildings and small commercial buildings including materials, jointing techniques, fixing, installation, testing, service and maintenance requirements</p> <p>P5 describe the features and characteristics of gas installations for domestic buildings and recognise the application of appropriate regulations and standards.</p>	<p>M4 produce designs and specifications for appropriate natural gas appliance and installation network (including associated flues and ventilation) for use in dwellings.</p>	

## 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 strongly linked and form a logical and progressive structure in which water is sourced and used effectively within buildings. This unit is designed to reflect whole life cycle in that water is taken from a source, cleaned 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 the problems of dealing with waste water as the 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 provide a balance between the 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 consequent need for 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 possess 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 are provided with equal experiential and assessment opportunities.

**Health, safety and welfare issues are paramount and should be strictly reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken prior to practical activities. Centres are advised to read the *Delivery approach* section on page 24, and *Annexe G: Provision and Use of Work Equipment Regulations 1998 (PUWER)*.**



## 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 employed, and tutors are encouraged to consider and adopt these where appropriate. Some examples of possible 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. General guidance on the design of suitable assignments is available on page 19 of this specification.

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. Guidance on their use is provided on the Edexcel website.

The assessment for this topic area could take the form of a well-designed single project, or several smaller projects based on the design and specification of plumbing, gas and waste water disposal installations for real buildings. The project/s should be based around the supply and distribution of water to a dwelling or a small commercial or industrial building up to four floors high. The building(s) should not be too complex but should contain a variety of activities that support a wide range of appliances to allow the learner the opportunity to consider options, make decisions and demonstrate knowledge and understanding.

In addition to the written text of the assessment tasks and grading criteria, learners should be given a range of architectural drawings for them to 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 strategic 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 five pass criteria listed in the grading grid.

For P1, learners must identify sources of water to be used for distribution to consumers and describe the process by which the water arrives at the premises fit for purpose. They are expected to identify the treatment required for it to achieve required standards, the distribution to premises, the types of water associated with the various sources and their effect on hot and cold supplies within a building.

For P2, learners must design basic, functional and workable 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 also expected to produce basic drawings and reports to support their design for a basic, functional cold water installation to all the appliances and fittings requiring a cold water supply. Designs should include all necessary items, must not contravene legislation and standards and must show that factors such as water economy, pipework routing, accommodation and appearance have all been considered.

For P3, 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 of domestic hot water. Learners are expected to produce basic drawings and reports to support their design for a basic, functional hot water installation to all the appliances and fittings requiring a hot water supply. Designs should include all necessary items, must not contravene legislation and standards and must show that factors such as water economy, energy efficiency, pipework routing, accommodation and appearance have all been considered.

For P4, learners must describe the features and characteristics of the common above ground drainage systems for domestic buildings and small commercial buildings including materials, jointing techniques, fixing, installation, testing, service and maintenance requirements. Learners must include details of materials, jointing, fixings, installation, service and maintenance requirements.

For P5, learners must describe the features and characteristics of gas installations for domestic buildings and recognise the application of appropriate regulations and standards. A system layout should be provided showing learners' knowledge of positioning and sizing of natural gas pipework, ventilation facilities, location of appliances and conformance with associated regulations.

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

For M1, learners must produce comprehensive designs and specifications for cold water installations for dwellings and small commercial premises. The designs should include details of all items of plant and equipment and their locations. There should be clear evidence that learners have carefully considered all aspects of the proposed design. 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 M1, learners are expected to produce clear and accurate answers to calculations required to size the various mains and cistern fed pipework and main items of equipment. They should also select and produce specifications for pipework materials, appropriate valves and storage cisterns. Drawings should include layout and schematic drawings. All drawings and reports must be well produced, detailed and unambiguous. This is a natural qualitative extension of the work carried out for P1 and P2.

For M2, learners must produce comprehensive designs and specifications for energy and water efficient domestic hot 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 demand of the consumer. There should be clear evidence that learners have carefully considered all aspects of the proposed design. 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 M2, learners are expected to produce clear and accurate calculations required to size the pipework, hot water storage and other items of equipment. They must also select and produce specifications for pipework materials, appropriate valves and hot water storage/generation equipment. Drawings and reports should be of a good standard, detailed and unambiguous. This could be a natural extension of the work carried out for P3.

For M3, learners must produce 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 P4.

For M4, learners must produce designs and specifications for appropriate natural gas appliance and installation network (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 P5.

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 and evaluate techniques and strategies for reducing the environmental impact of hot and cold water, soil and waste disposal installations for given buildings and explain methods of reducing bacterial growth. They should clearly identify the aspects of these installations which have health and/or environmental implications and evaluate alternative strategies for minimising the impact. Learners should include a range of strategies including techniques for reducing water wastage and energy requirements, recycling (eg grey-water, rain-water harvesting schemes), maintaining wholesome supplies and prevention of infestation with pathogens (eg Legionella). Evaluations should be contextualised to actual applications including evaluating their practicability and benefit within given dwellings or small commercial premises. This could be a natural extension of the work carried out for P1, P2, P3, P4, M1, M2 and M3.

For D2, learners must analyse and justify the design rationale used in the production of soil, waste and rainwater disposal designs including how the proposed design is influenced by the methods of underground drainage, meets the requirements of legislation and the needs of the client and their building. In justifying the design, learners must clearly show how a proposed design meets the needs of the building and client. As part of the justification, learners are expected to show how the features of the design of the above ground drainage and disposal installations are influenced by the methods of below ground drainage. This could be a natural extension of the work carried out for P4 and M3.

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

The learning outcomes in this unit are closely linked with, for example, *Unit 2: Construction and the Environment*, *Unit 4: Science and Materials in Construction and the Built Environment*, *Unit 8: Graphical Detailing in Construction and the Built Environment*, *Unit 32: Building Services Control Systems*, *Unit 33: Building Services Science* and *Unit 36: Fluids Static and Dynamic in Building Services Engineering*, together with similar units at Higher National and degree level.

This unit may have links to the Edexcel Level 3 Technical and Professional NVQs for Construction and the Built Environment. Updated information on this, and a summary mapping of the unit to the CIC Occupational Standards, is available from Edexcel. See *Annexe D: National Occupational Standards/mapping with NVQs*.

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, 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 and Unit SST/NOS 7: Provide Technical and Functional Information to Relevant People.

Summit Skills N-SVQ Level 4: Building Services Engineering Technology and Project Management. In particular, Unit SSTE/NOS 7: Prepare and Advise on Building Services Engineering Project Design Recommendations and Unit SSTE/NOS 8: Prepare and Agree Detailed Building Services Engineering Project Designs.

This unit presents opportunities to demonstrate key skills in application of number, communication, information and communication technology, improving own learning and performance, problem solving and working with others. Opportunities for satisfying requirements for Wider Curriculum Mapping are summarised in *Annex F: Wider curriculum mapping*.

### **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 highly 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 to 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.

### Indicative reading for learners

#### Textbooks

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

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

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

#### Journals

*Heating, Ventilation and Plumbing* magazine

*Plumbing and Heating* magazine

*The Gas Installer* magazine

#### Websites

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

BPEC Plumbing Skills

[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 the Building Services Engineering

[www.trustcorgi.com](http://www.trustcorgi.com)

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## Key skills

Achievement of key skills is not a requirement of this qualification but it is encouraged. Suggestions of opportunities for the generation of Level 3 key skill evidence are given here. Tutors should check that learners have produced all the evidence required by part B of the key skills specifications when assessing this evidence. Learners may need to develop additional evidence elsewhere to fully meet the requirements of the key skills specifications.

Application of number Level 3	
When learners are:	They should be able to develop the following key skills evidence:
<ul style="list-style-type: none"> <li>producing comprehensive designs and specifications for cold water installations for dwellings and small commercial premises.</li> </ul>	<p>N3.1 Plan an activity and get relevant information from relevant sources.</p> <p>N3.2 Use this information to carry out multi-stage calculations to do with:</p> <ul style="list-style-type: none"> <li>a amounts or sizes</li> <li>b scales or proportion</li> <li>c handling statistics</li> <li>d using formulae.</li> </ul> <p>N3.3 Interpret the results of your calculations, present your findings and justify your methods.</p>

Communication Level 3	
When learners are:	They should be able to develop the following key skills evidence:
<ul style="list-style-type: none"> <li>identifying sources of water to be used for distribution to consumers and describing the process by which the water arrives at the premises fit for purpose.</li> </ul>	<p>C3.1a Take part in a group discussion.</p> <p>C3.1b Make a formal presentation of at least eight minutes using an image or other support material.</p> <p>C3.2 Read and synthesise information from at least <b>two</b> documents about the same subject.  Each document must be a minimum of 1000 words long.</p> <p>C3.3 Write <b>two</b> different types of documents, each one giving different information about complex subjects.  One document must be at least 1000 words long.</p>
Information and communication technology Level 3	
When learners are:	They should be able to develop the following key skills evidence:
<ul style="list-style-type: none"> <li>describing the features and characteristics of gas installations for domestic buildings and recognising the application of appropriate regulations and standards.</li> </ul>	<p>ICT3.1 Search for information, using different sources, and multiple search criteria in at least one case.</p> <p>ICT3.2 Enter and develop the information and derive new information.</p> <p>ICT3.3 Present combined information such as text with image, text with number, image with number.</p>

<b>Improving own learning and performance Level 3</b>	
<b>When learners are:</b>	<b>They should be able to develop the following key skills evidence:</b>
<ul style="list-style-type: none"> <li>designing basic, functional and workable cold water distribution systems within dwellings and small commercial premises.</li> </ul>	<p>LP3.1 Set targets using information from appropriate people and plan how these will be met.</p> <p>LP3.2 Take responsibility for your learning, using your plan to help meet targets and improve your performance.</p> <p>LP3.3 Review progress and establish evidence of your achievements.</p>
<b>Problem solving Level 3</b>	
<b>When learners are:</b>	<b>They should be able to develop the following key skills evidence:</b>
<ul style="list-style-type: none"> <li>proposing and evaluating techniques and strategies for reducing the environmental impact of hot and cold water, soil and waste disposal installations for given buildings.</li> </ul>	<p>PS3.1 Explore a problem and identify different ways of tackling it.</p> <p>PS3.2 Plan and implement at least one way of solving the problem.</p> <p>PS3.3 Check if the problem has been solved and review your approach to problem solving.</p>
<b>Working with others Level 3</b>	
<b>When learners are:</b>	<b>They should be able to develop the following key skills evidence:</b>
<ul style="list-style-type: none"> <li>designing basic, functional hot water systems for dwellings and small commercial premises.</li> </ul>	<p>WO3.1 Plan work with others.</p> <p>WO3.2 Seek to develop co-operation and check progress towards your agreed objectives.</p> <p>WO3.3 Review work with others and agree ways of improving collaborative work in the future.</p>