Unit 307PH: Understand cold water systems

# Delivery guide

Unit information

The purpose of this unit is for learners to explore cold water systems within a domestic property and industrial and commercial building and the knowledge that underpin work on the different systems. Learners will understand how to:

* install and test cold water systems.

Learners may be introduced to this unit by asking themselves questions such as:

* How do you get a cold water supply to a domestic property?
* Why are there different types of cold water systems?
* How do you install a cistern, bath, wash hand basin or toilet to cold water supply?
* How do you test a cold water system?

Learning outcomes

1. Understand the applications, advantages and limitations of cold water systems
2. Understand the applications, advantages and limitations of appliances, components and accessories in relation to the working environment
3. Understand the methods and techniques for fitting, fixing and connecting the selected appliances, components and accessories
4. Understand the appropriate testing procedures for confirming the systems’ integrity

Suggested resources

Textbooks

* Maskrey, M. (2019) *The City & Guilds Textbook: Plumbing Book 1 for the Level 3 Apprenticeship (9189), Level 2 Technical Certificate (8202) & Level 2 Diploma (6035) (City & Guilds Textbooks).* London: Hodder Education.

ISBN 978-1-5104-1648-2

* Tanner, P. and Stephen, L. (2019) *The City & Guilds Textbook: Plumbing Book 2 for the Level 3 Apprenticeship (9189), Level 3 Advanced Technical Certificate (8202) & Level 3 Diploma (6035) (City & Guilds Textbooks).* London: Hodder Education.

ISBN 978-1-5104-1646-8

* Young, L. and Graham, M. (2000) *Water Regulations Guide*. Water Regulations Advisory Scheme. Stockport: WRAS.

ISBN 978-0-9539-7080-3

Websites

* [BSI | Specifications for installations inside buildings conveying water for human consumption - Operation and maintenance](https://d.docs.live.net/0654c38050dc99c9/Desktop/Just%20Content/C%5e0G%20Apprenticeship%20Delivery%20Guides/Apprenticeship%20-%20BSE/Plumbing%20and%20heating/2%20Edited%20units%20for%20review/Checked%20against%20HB%20and%20edited/BSI%20|%20Specifications%20for%20installations%20inside%20buildings%20conveying%20water%20for%20human%20consumption%20-%20Operation%20and%20maintenance)
* [Pegler Yorkshire | Homepage](https://www.pegleryorkshire.co.uk/)
* [Plasson | Homepage](http://www.plasson.co.uk/)
* [Toolstation | Brassware, valves and taps](https://www.toolstation.com/plumbing/brassware-valves-taps/c183)
* [WRAS | Homepage](https://www.wras.co.uk/)

British Standards

* BS EN 806 *Specification for installations inside buildings conveying water for human consumption* (Parts 1–5).

Legislation

* Building Regulations 2010 Approved Document A: Structure. Newcastle upon Tyne: NBS. ISBN 978-1-8594-6508-0
* *Building Regulations Approved Document G: Sanitation, Hot Water Safety and Water Efficiency*. Newcastle upon Tyne: NBS.

ISBN 978-1-8594-6600-1

* [GOV.UK | Private Water Supply Regulations (Wales) 2017](https://www.legislation.gov.uk/wsi/2017/1041/contents/made)
* [GOV.UK | The Water Supply (Water Fittings) Regulations (England and Wales) 1999](https://www.legislation.gov.uk/uksi/1999/1148/contents/made)

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Understand the applications, advantages and limitations of cold water systems | * 1. The two main types of water supply to dwellings and how these are regulated | * Learners to understand the main types of cold water supply to dwellings. * Learners to know how the property is connected to the mains via the service pipe and connection types. * Learners to understand the different types of cold water systems, including direct and indirect systems and to be able to state the advantages and disadvantages of each type and typical applications. * Learners to be able to describe the two main types of water supply to dwellings: * mains water supplies * private water supplies. * Learners to be aware of the contents of the Private Water Supplies (Wales) (Amendment) Regulations 2017 and the Water Supply (Water Fittings) Regulations 1999. * Learners to know that: * private water supplies are inspected by the local authority * mains water supplies are inspected by the water undertaker. * Learners to be able to identify the various sources of water used for both private water supplies and the mains water supplies. Surface sources include: * lakes * reservoirs * rivers * streams * underground sources * deep and shallow wells * artesian wells * bore-holes * springs. |
| * 1. The fluid categories of water and uses of water supplied to dwellings | * Learners to be able to identify the five fluid categories and to provide examples of each category including: * Fluid category 1: wholesome water supplied by a water undertaker * Fluid category 2: water in FC1 whose aesthetic quality is impaired due to a change in colour, odour or temperature * Fluid category 3: fluid that represents a slight health hazard * Fluid category 4: fluid that represents a significant health hazard * Fluid category 5: fluid that represents a serious health hazard. * Learners to be able to identify examples of use for each fluid category. |
| * 1. The mains water treatment process and typical mains water distribution system from treatment works to property | * Learners to be able to describe the mains water treatment process and typical mains water distribution system from treatment works to property including: * filtered * ionized * chlorinated * ultraviolet (UV) treatment * aeration. * Learners to be able to identify key elements of the water distribution system including: * pumping station * treatment works * trunk main * service main * local mains. * Learners to be aware of typical pipework sizes and pipework materials used for the distribution network. |
| * 1. The mains water service to the property and isolation points | * Learners to be able to describe the mains water service to the property and isolation points including: * connection methods to the main * communication pipe detail * service pipe detail * main external stop valve location and meter housings * installation requirements * methods of entry of the service pipework to a property. * Learners to be able to identify the different types of water meter installations including underground, external to the building, internal within the building. * Learners to be able to describe the methods of operation of key isolation valves such as supply stop taps and the property stop tap. * Learners to be able to describe the methods of entry of the service pipework to a property. |
| * 1. The requirements to provide water whilst preventing waste, undue consumption, misuse or contamination | * Learners to be able to describe the legal requirements to provide water whilst preventing waste, undue consumption, misuse or contamination as laid down in the Water Regulations. * Learners to be able to describe the key contamination issues in plumbing systems such as cross connection and the use of non-approved materials. * Learners to be able to explain the need for point-of-use backflow protection. * Learners to be able to refer to the negative impact of dead legs in systems including bacteria growth and legionella. |
| * 1. The advantages and disadvantages of cold water systems | * Learners to be able to describe the advantages and disadvantages of direct and indirect cold water systems in relation to: * flow rates * cost * installation requirements * lifespan * supply pressures * suitability for the property * length of pipes * colour of pipes and fittings available * design requirements. |
| * 1. The types and typical pipe sizes used in cold water systems within dwellings | * Learners to be able to describe the types of pipework and typical pipe sizes used in domestic properties including: * Medium-density Polyethylene (MDPE) * R250 copper * Polybutylene * minimum cold water rising main diameter (15mm) * minimum pipe size for a distribution pipe from a cold water storage cistern (22mm). * Learners to be able to describe common MDPE pipe sizes (20mm, 25mm). * Learners to be aware that lead pipework is still in existence and to be aware of approved connection methods (Leadloc). |
| 1. Understand the applications, advantages and limitations of appliances, components and accessories in relation to the working environment | * 1. The working principles of cold water systems, positioning fixing, connection and operation of components | * Learners to be aware of the working principles, including the positioning, fixing, connection and operation of the following components: * appliances * taps, outlets and valves. * Learners to be able to identify types, layout features and working principles of the following cold water systems: * direct cold water system * indirect cold water system * borehole * boosted. * Learners to be able to describe the working principles of cold water systems, positioning fixing, connection and operation of the following components: * sanitary appliances such as baths, basins, sinks, washing machines and dishwashers * taps, outlets and valves such as mixer taps, bib taps, pillar taps * gate valves, float-operated valves, drain valves, servicing valves, stop taps and ceramic disc taps * water meters * showers including gravity, electric instantaneous, bath shower mixers and installation of shower pumps * water treatment components including softeners and water filters.   Note that, whilst not assessed at level 3, a learner would be expected to have prior knowledge of these systems as a prerequisite.   * Learners to be able to describe the layout and installation requirements for protected plastic storage cisterns. * Learners to be able to explain the requirements for positioning drain valves in cold water plumbing systems. * Learners to be shown the operation of float operated valves used in cisterns. |
| 1. Understand the methods and techniques for fitting, fixing and connecting the selected appliances, components and accessories in accordance with:  * the plumbing and heating system’s design * the working environment * manufacturers’ instructions | * 1. How to fill and vent cold water systems | * Learners to be able to list the stages of filling the system with water and the additional fitting that will have to be added prior to the soundness test. * Learners to know the methods of filling and venting a cold water system including: * opening the kitchen cold tap and slowly opening the mains cold water stop valve * allowing the water to flow into the kitchen sink to clear any debris that may have collected in the pipework * closing the cold tap on the kitchen sink and allowing the system to fill to full standing pressure * turning on the isolation valves to the Fixture Shutoff Valve (FOV) in the WC cisterns and allowing the cistern to fill to the water line and adjusting the water level as necessary * flushing the WC and checking for leaks * filling any cisterns in the roof space and adjusting the water level at the FOV as necessary * opening any taps and terminal fittings fed from the cistern and clearing any air in the system * allowing the water to run to clear any debris. * Learners to be able to be give examples of filling and venting cold water systems in a variety of settings such as domestic and commercial buildings. |
| * 1. The insulation requirements, system frost protection and prevention of undue warming of cold water systems | * Learners to be able to explain the reasons for insulating cold water systems pipework and components to provide frost protection and prevent undue warming. * Learners to have a basic knowledge of the requirements of the Water Regulations related to frost protection of cold water pipework and cisterns, what sections of pipework are most vulnerable during cold conditions and basic methods of protection including trace heating. * Learners to be able to describe insulation types and areas of the building where pipework must be insulated. * Learners to be able to explain the requirements for pipework positioning to prevent undue warming, for example running hot water pipework above the cold water pipework. |
| * 1. The positioning and fixing of pipework within the building fabric | * Learners to be able to identify different types of building fabric and the precautions to be taken when installing pipework and components within them. * Learners to be able to describe the positioning and fixing of pipework within the building fabric in line with current industry requirements and applicable regulations including: * suspended timber floors * solid floors * embedded in walls * in areas of the building subject to frost. * Learners to be able to describe how to cater for the weight distribution of cisterns and heavy components such as cylinders within a building. * Learners to know the maximum pipework clipping distances to be covered for vertical and horizontal cold water system pipework as laid down in the Water Regulations. * Learners to be able to reference the requirements for notching and drilling holes in timber joists including the maximum depth and permitted zones. * Learners to know the maximum depth of pipe chases in walls. |
| * 1. How to install cold water systems | * Learners to know the industry standard methods of connecting system pipework to the outlets and components, how to interpret a typical installation drawing showing outlets identified and how to produce a fitting schedule. * Learners to know how to install the following components in compliance with the manufacturer instructions, industry requirements and current regulations and standards: * cisterns * baths * wash hand basin (WHB) * water closet (WC) * plastic and copper pipework. * Learners to be aware of how to connect cold water pipework to components using plastic and copper pipework. |
| 1. Understand the appropriate testing procedures for confirming the systems’ integrity | * 1. The visual inspection of a cold water system to confirm that it is ready to be soundness tested | * Learners to know the process of and reasons for a visual inspection prior to filling a cold water system with water and to be aware of some of the types of problems that the inspection might uncover. * Learners to be able to explain the steps taken during a visual inspection to confirm the cold water system is ready to be soundness tested as follows: * check that all joints have been made correctly * check that all pipework is secure * check the installation conforms to the regulations * check any open ends of pipes have been fitted with cap ends * check any cisterns are supported * check service valves have been fitted correctly * check drain off valves have been closed off * check tap and tank connections are fully tightened * check the inside of any cisterns installed to ensure that they are free of debris. * Learners to be aware that any problems, such as insufficient clipping of pipes and missing or incorrectly installed service valves, are to be rectified before testing begins. |
| * 1. A soundness test to industry requirements on cold water systems pipework and components | * Learners to know the equipment used for pressure testing and the British Standard soundness test including stabilisation time for rigid and plastic pipe. * Learners to be able to describe a soundness test to industry requirements on cold water systems pipework and components as follows: * visual inspection * notifying occupants * initial fill * stabilisation * testing to required pressure * checking for leaks * checking pressures after test period * completing documentation and notifying as required. * Learners to be made of aware the equipment used and the types of tests for both rigid and plastic pipework including test pressure and test durations as detailed in the Water Regulations and appropriate British Standards. * Learners to be informed of the requirements for flushing a cold water system following soundness testing. * Learners to know how to use hydraulic test equipment. |