Unit 323HV: Understand complex cold water systems for industrial and commercial buildings

# Delivery guide

Unit information

This unit covers the knowledge and understanding of complex cold water systems. Learners will develop their knowledge of the specifics of the Water Supply (Water Fittings) Regulations and its requirements. Learners will develop their understanding of boosted cold water systems for industrial and commercial buildings and reclaimed water systems and will know the operation of control systems and components, which are required to allow the system to operate. Learners will understand the processes involved in selecting and sizing the pipework and components for industrial and commercial cold water systems. This unit does not provide learners with the full approved status to a recognised approved contractor scheme for the understanding of the Current Water Supply (Water Fittings) Regulations.

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

* How do the Water Regulations apply to cold water systems in industrial and commercial buildings?
* How can I determine the suitability of cold water systems to the building type?
* Why is it important to adequately size pipe work for cold water systems in industrial and commercial buildings?

Learning outcomes

1. Understand the requirements of the Water Supply (Water Fittings) Regulations
2. Understand the applications of complex systems, equipment, components and accessories in relation to the working environment
3. Understand the methods for determining the type and size of equipment, components and accessories for the system

Suggested resources

Textbooks

* Brown, R. (2014) *BSRIA Illustrated Guide to Hot and Cold Water Services (BG 33/2014)*. Berkshire: BSRIA.

ISBN 978-0-8602-2736-6

* Lloyd, S. (1998) *BSRIA Illustrated Guide Cold Water Storage Tanks* (TN 13/98). Berkshire: BSRIA.

ISBN 978-0-8602-2504-1

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

ISBN: 978-0-9539-7080-3

Websites

* [APHC | Support for Heating Contractors](https://www.aphc.co.uk/)
* [GOV.UK | The Water Supply (Water Fittings) Regulations 1999](https://www.legislation.gov.uk/uksi/1999/1148/contents/made)
* [Water Regulations | Water Regulations Guide](https://www.waterregsuk.co.uk/guidance/publications/water-regulations-guide/)
* [Water Regulations Approval Scheme | Homepage](https://www.wrasapprovals.co.uk/)

British Standards

* BS EN 806:2012. *Specification for installations inside buildings conveying water for human consumption (Parts 1–5*).
* BS 8558:2015. *Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 80*.

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
| --- | --- | --- |
| 1. Understand the requirements of the Water Supply (Water Fittings) Regulations | * 1. The requirements of the Water Regulations | * Learners to know about the following with regards to the Water Supply (Water Fittings) Regulations 1999: * scope of the regulations * restrictions * persons installing water fittings * penalties * water undertaker’s responsibilities * British and European Standards. * Learners to be familiar with Water Regulations Advisory Scheme (WRAS) guidance books and to be given short tasks to answer questions regarding its content and legal scope using the books for reference. * Learners to be able to explain the requirements for competence and how competence is achieved. |
| * 1. The key factors and terms within the interpretation of the Water Regulations | * Learners to know the main points within the Water Supply (Water Fittings) Regulations 1999 and that the regulations are designed to prevent: * undue consumption * waste * contamination * misuse and erroneous measurement. * Learners to be able to give examples of these terms and how they relate to installation projects. * Learners to be able to use the WRAS books to examine the definitions given within. * Learners to be set tasks to explain some of the terms and definitions referred to in the WRAS books. |
| * 1. Suitability of materials and substances for use with potable water installations | * Learners to know the suitability of a range of products and materials. * Learners to be familiar with the approved materials register for water fittings and to look at examples within. * Learners to know about the prohibited use of lead and bitumen-based materials within potable water systems and the following: * pipework materials * fittings * jointing compounds * above and below ground * plastics * corrosion * galvanic action * dezincification. * Learners to be shown examples of galvanic corrosion and dezincification on fittings. * Learners to know that plastics are not allowed for use underground within brownfield sites. |
| * 1. The requirements for installed water fittings | * Learners to be able to use the WRAS guidance books to examine the requirements for water fittings. * Learners to be allowed to investigate the specific requirements of installed water fittings via presentations and worksheets. * Learners to be set short research tasks in which they may use the WRAS books to identify specific guidance and requirements. |
| * 1. The notification requirements for the installation of water fittings | * Learners to use role play activities, presentations and scenarios to investigate the requirements of notification and the role of the local authority, building notification and water undertaker. * Learners to use Water Supply (Water Fittings) Regulations 1999 guidance books to investigate when notification is required, and the parties involved. |
| * 1. The different categories of water in relation to wholesome and non-wholesome water | * Learners to know what is meant by wholesome water and to be able to give examples of this. * Learners to know about cold water installations and to be able to explain which parts of the system would no longer be wholesome due to changes in its quality. |
| * 1. The backflow prevention fluid categories | * Learners to know the water fluid categories and to be able to give examples of each within an industrial and commercial scenario. * Learners to be able to look at system drawings of hot, cold, chilled water and Low Pressure Hot Water (LPHW) systems and highlight which part of each system is at risk of contamination from fluid categories 2–5. * Learners to know the minimum category of backflow prevention required for each example and to be able to offer suitable types of a backflow prevention device, both mechanical and non-mechanical, where required. |
| * 1. The requirements for backflow, back pressure and back siphonage prevention | * Learners to understand protection from contamination by discussing the physical types of mechanical and non-mechanical backflow prevention devices available. * Learners to be shown presentations and WRAS books to identify the level of protection against backflow, back pressure and back siphonage. * Learners to use WRAS books to research and select suitable backflow prevention types for given scenarios. * Learners to examine a range of mechanical backflow prevention devices within the centre and to know the requirements for the installation and commissioning of Reduced Pressure Zone (RPZ) valves. * Learners to be shown presentations and manufacturers’ instructions to explain: * accessibility of the mechanical backflow protection device * location * the installation of line strainers * the lowest point of discharge from the ground and termination with a Type AA air gap * upstream and downstream * mechanical * air gaps * whole site and * zone protection. |
| * 1. The requirements for the installation of cold water to appliances and water fittings | * Learners to know the specific requirements for the installation of: * sinks * wash hand basins (WHBs) * baths * water heaters * boilers * showers * WCs * cisterns * hot water systems * terminal fittings * urinals. * Learners to be shown physical examples and presentations to discuss the requirements for the installation of cold water to appliances and water fittings including: * physical clearances * connection requirements * backflow prevention methods * supports * access and * isolation requirements. * Learners to use WRAS guidance books and manufacturers’ literature to study the specific guidance relative to installation. |
| * 1. The requirements for water supplies for outside use | * Learners to understand the need for backflow prevention for outside outlets. * Learners to look at a range of examples of outdoor water outlets including agriculture, commercial use and domestic use. * Learners to be set tasks to find information and requirements of given examples. * Learners to be shown presentations and physical examples to explain the individual requirements of the Water Supply (Water Fittings) Regulations 1999. |
| * 1. The requirements for appliances that are supplied by or incorporate a pump | * Learners to be able to examine the water regulation guidance regarding boosted cold water systems. * Learners to know the limit at which water can be boosted directly from the mains. * Learners to be shown presentations and system drawings to explain the backflow prevention requirements and the control components used to control water levels. * Learners to be able to sketch and complete various boosted cold water system layouts incorporating storage cisterns and drinking water heaters. * Learners to be aware of break pressure cisterns and the regulations that apply to them. |
| * 1. The requirements for water supplies incorporating water re-use systems | * Learners to examine physical systems to develop their understanding of how water re-use systems operate and are controlled. * Learners to know the differences between greywater systems, blackwater systems and rainwater reuse. * Learners to use manufacturers’ literature and to watch videos to examine the specific requirements including filtration, chemical treatment, storage and backflow prevention. |
| * 1. The requirements for the provision, location, and operation of valve | * Learners to be shown system diagrams and schematics along with presentations to discuss the requirement for a range of valve types within the system including: * stop valves * drain off valves * servicing valves * pressure reducing valves * float operated valves * pressure flushing valves. * Learners to examine the WRAS guidance relevant to valves and to be set tasks to summarise the requirements for these valves in relation to the Water Supply (Water Fittings) Regulations 1999 whilst working in small groups. * Learners to be able to explain how these valves operate by examining and inspecting them as part of an installed system. |
| * 1. The prevention of dead legs within cold water pipework systems | * Learners to know what classifies as a ‘dead leg’ within a potable water system. * Learners to be given example images and to know how these examples may create issues within systems. * Learners to discuss temperatures and bacterial growth in dead legs and the use of regular maintenance. * Learners to know about how some healthcare facilities avoid the use of flexible hoses and to examine how pipework should be altered to avoid a lack of circulation. * Learners to be set tasks to inspect systems and report on dead legs whilst referring to guidance within the WRAS books. |
| * 1. The distribution temperature of cold water systems | * Learners to be aware of the temperatures that must be maintained within the cold water system, including storage and distribution. * Learners to be able to explain methods used to maintain temperatures below 20°C within distribution pipework, including insulation and positioning and the methods used to check these temperatures at the outlet. |
| 1. Understand the applications of complex systems, equipment, components and accessories in relation to the working environment | * 1. The installation layouts of industrial and commercial cold water distribution systems within the building | * Learners to know the design layouts of Industrial and Commercial (I&C) cold water systems within a building including: * direct systems * indirect systems * boosted systems * rainwater harvesting systems * greywater systems * blackwater systems. * Learners to be shown presentations, images and drawings to support learning and to be set tasks to produce or complete system drawings. |
| * 1. The control of boosted cold water systems | * Learners to know how boosted cold water systems are controlled in relation to: * storage cistern level * pump run and stop * low level warning at storage and break cisterns * pressure and flow. * Learners to be shown presentations and videos to explain control principles for these systems. |
| * 1. The operation of control devices and components used within boosted cold water systems | * Learners to be able to examine control devices which are used to control level, pressure and flow within a boosted cold water system. * Learners to watch videos of how delayed action float operated valves operate, to examine how pressure can be maintained on different floors of multi-storey buildings and the use of level switches to prevent over and under filling of cisterns and the prevention of damage to pumps. * Learners to know how accumulators work by using demonstration rigs or videos and to be able to explain how the following control devices and components operate within the system including: * pumps * pressure reducing valves * break cisterns * float operated valves * float operated switches * level switches * pressure switches * pressure vessels * automatic air vents * delayed action float valves * transducers * low level switches * accumulators. |
| * 1. The suitability of cold water systems relative to the building type | * Learners to know how different system designs are most suitable to relative building layouts. * Learners to be set scenario-based tasks to encourage group work and group discussions and to identify selection/design criteria which may impact on the system type including: * high demand * low demand * intermittent use * regular use * building height * building use * the requirement for storage * pressure requirements. |
| 1. Understand the methods for determining the type and size of equipment, components, and accessories for the system | * 1. The factors to be taken into consideration when designing a complex water system | * Learners to understand the principles of cold water system design. * Learners to know how designs take shape and what elements are considered before the design takes place. * Learners to gain an understanding of customer requirements through role play. * Learners to be set tasks to work in groups to list factors that may affect system design including: * daily consumption * maximum average flow rates required * availability of mains supply * variances and surges in pressure * environmental considerations. |
| * 1. The methods used to calculate the size of water pipework for cold water services | * Learners to know about systems and applications that assist in the sizing of cold water pipework. * Learners to be shown presentations to guide them through the process of pipe sizing. * Learners to be given copies of BS EN 806:2012 Specification for installations inside buildings conveying water for human consumption (Parts 1–5), the Water Supply (Water Fittings) Regulations 1999 and other relevant documentation for reference. * Learners to understand the process of using loading units and flow rates to determine pipe sizes and to be able to follow the examples given. * Learners to be set simple pipe sizing tasks to attempt before discussing the outcomes as a group. |
| * 1. The methods used to calculate the requirements of water system components | * Learners to be familiar with manufacturers’ literature, BS EN 806:2012 Specification for installations inside buildings conveying water for human consumption (Parts 1–5) and WRAS guidance books and to refer to them during the calculation of cold water system components including: * pump * accumulator * cistern. * Learners to be shown guided examples of the process within the class and to be set simple tasks to attempt the processes either in small groups or individually before checking the outcomes as a class. |