

BS 8558:2015



BSI Standards Publication

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 806

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2015. It was prepared by Sub-committee B/504/2, *Internal systems and components*, under the direction of Technical Committee B/504, *Water Supply*. A list of organizations represented on these committees can be obtained on request to their secretary.

Supersession

This British Standard supersedes BS 8558:2011, which is withdrawn.

Information about this document

The content of this British Standard was originally taken from BS 6700:2006+A1:2009, which was withdrawn on publication of BS EN 806 (all parts). This is a full revision of the standard to keep it up to date.

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Presentational conventions

The guidance in this standard is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

In particular, attention is drawn to the following statutory regulations which may be amended from time to time.

- The Water Industry Act 1981 [1];
- The Water and Sewerage Services (Northern Ireland) Order 2006, as amended [2];
- The Water (Scotland) Act 1980, as amended [3];
- The Workplace (Health, Safety and Welfare) Regulations 1992 [4];
- The Electricity Safety, Quality and Continuity Regulations 2002, as amended [5];
- The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012 [6];
- The Control of Asbestos at Work Regulations 2002 [7];
- The Control of Asbestos at Work Regulations (Northern Ireland) 2003 [8];

- The Water Industry Act 1999 [9];
- The Health and Safety at Work etc. Act 1974 [10];
- The “Water Quality Regulations”, which set out provisions for the quality of drinking water provided by a public water supplier (water undertaker):
 - The Water Supply (Water Quality) Regulations 2000, as amended, in England [11];
 - The Water Supply (Water Quality) Regulations 2010, as amended, in Wales [12];
 - The Water Supply (Water Quality) Regulations (Northern Ireland) 2007, as amended, in Northern Ireland [13];
 - The Public Supply Water Supplies (Scotland) Regulations 2014, in Scotland [14];
- The “Private Water Supplies Regulations”, which set out provisions for the quality of water from a private supply:
 - The Private Water Supplies Regulations 2009, as amended, in England [15];
 - The Private Water Supplies (Wales) Regulations 2010, as amended, in Wales [16];
 - The Private Water Supplies (Scotland) Regulations 2006, in Scotland [17];
 - The Private Water Supplies (Northern Ireland) Regulations 2009, as amended, in Northern Ireland [18];
- The “Water Fittings Regulations”, which set out provisions for plumbing systems in premises to which a supply of public mains water has been provided:
 - The Water Supply (Water Fittings) Regulations 1999, in England and Wales [19];
 - The Water Supply (Water Fittings) (Scotland) Byelaws 2014, in Scotland [20];
 - The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009, in Northern Ireland [21];
- The “Building Regulations”:
 - The Building Regulations 2010 [22];
 - The Building (Scotland) Regulations 2004, as amended [23];
 - The Building Regulations (Northern Ireland) 2012, as amended [24].

0 Introduction

Table 1 provides cross references to the BS EN 806 series and this British Standard.

Table 1 Cross references to the BS EN 806 series and this British Standard (1 of 3)

BS EN 806 part and clause	BS 8558 clause
BS EN 806-1:2000+A1:2002	
Scope, Clause 1	No additional guidance
Normative references, Clause 2	No additional guidance
Objectives, Clause 3	No additional guidance
Competence and duties for design, construction and operation, Clause 4	No additional guidance
Terms and definitions, Clause 5	
distributing pipe, 5.3.4	3.1.13
service pipe, 5.3.1	3.1.28
service stopvalve, 5.4.2	3.1.29
supply pipe, 5.3.2	3.1.36
supply stopvalve, 5.4.3	3.1.37
Graphic symbols and abbreviations, Clause 6	No additional guidance
Examples for the use of graphic symbols, Annex A	No additional guidance
BS EN 806-2:2005	
Scope, Clause 1	No additional guidance
Normative references, Clause 2	No additional guidance
General requirements, Clause 3	No additional guidance
Private water supplies, Clause 4	No additional guidance
Acceptable materials, Clause 5	4.2.1 and 4.2.3
Choice of material, 5.1	4.2.2
Components, Clause 6	No additional guidance
Pipework inside buildings, Clause 7	No additional guidance
Cold potable water services, Clause 8	No additional guidance
Hot water systems, Clause 9	No additional guidance
Prevention of bursting, Clause 10	
Discharge pipes, 10.2.5	4.2.3
Guidelines for water meter installations, Clause 11	No additional guidance
Water conditioning, Clause 12	No additional guidance
Acoustics, Clause 13	No additional guidance
Protection of systems against temperatures external to pipes, fittings and appliances, Clause 14	No additional guidance
Boosting, Clause 15	No additional guidance
Pressure reducing valves, Clause 16	No additional guidance
Combined drinking water and fire fighting services, Clause 17	No additional guidance
Prevention of corrosion damage, Clause 18	No additional guidance
Additional requirements for vented cold and hot water systems, Clause 19	No additional guidance
List of acceptable materials (non-exhaustive), Annex A	No additional guidance
Aspects for water conditioning, Annex B	No additional guidance
Supplementary guidance	4.3

Table 1 Cross references to the BS EN 806 series and this British Standard (2 of 3)

BS EN 806 part and clause	BS 8558 clause
BS EN 806-3:2006	
Scope, Clause 1	No additional guidance
Normative references, Clause 2	No additional guidance
Terms, symbols and units, Clause 3	No additional guidance
Principles of pipe sizing calculations, Clause 4	No additional guidance
Simplified method of pipe sizing, Clause 5	4.3.30 and Annex C
Special-installations, Clause 6	No additional guidance
Example for the determination of pipe sizes for standard installations, Annex A	No additional guidance
Design flow rates in relation to total flow rates, Annex B	No additional guidance
List of national pipe sizing methods, Annex C	No additional guidance
BS EN 806-4:2010	
Scope, Clause 1	No additional guidance
Normative references, Clause 2	No additional guidance
Terms and definitions, Clause 3	No additional guidance
Work on site, Clause 4	
General, 4.1	5.1.1
General, 4.4.1	5.1.2
Pipe materials and jointing methods, 4.4.2	5.1.3
Underground pipe laying, 4.6	5.2.1
Allowances for thermal movement and prevention of noise, 4.7.1	5.1.4
Fixings for insulated piping, 4.7.2.6	5.1.5
Piping passing through structures, 4.7.4	5.1.6
Valves and taps, 4.8	5.1.7
Record of installation, 4.9.3	5.1.8
Dissimilar metals, Clause 5	No additional guidance
Commissioning, Clause 6	
General, 6.1.1	5.1.9
Pipe system material specifications, jointing procedures and pipe installation for different types of materials, Annex A	No additional guidance
Calculation and compensation for thermal effects of pipes, Annex B	No additional guidance
Recommended maximum spacings of fixings for metal pipes, Annex C	No additional guidance
Supplementary guidance	5.2
BS EN 806-5:2012	
Scope, Clause 1	No additional guidance
Normative references, Clause 2	No additional guidance
Terms and definitions, Clause 3	No additional guidance
General, Clause 4	6.1.1 and 6.1.2
Documentation, Clause 5	No additional guidance
Operation, Clause 6	6.1.2 and 6.1.3
Interruptions to operation and disconnection, Clause 7	No additional guidance
Resumption of supply, Clause 8	No additional guidance
Damage and faults, Clause 9	
Change in water quality, 9.1	6.1.4
Alterations, extensions and refurbishment, Clause 10	No additional guidance
Accessibility of fittings, Clause 11	No additional guidance
Maintenance, Clause 12	No additional guidance

Table 1 Cross references to the BS EN 806 series and this British Standard (3 of 3)

BS EN 806 part and clause	BS 8558 clause
Additional requirements for vented systems, Clause 13	
Cisterns, 13.1	6.1.5
Inspection and maintenance, Clause 14	No additional guidance
Recommended frequencies for inspection and maintenance of components for drinking water installations, Annex A	No additional guidance
Inspection and maintenance procedures, Annex B	
Pipework, B.22	6.1.6
Specific inspection and maintenance procedures for water conditioning devices, Annex C	No additional guidance
Supplementary guidance	6.2

1 Scope

This British Standard provides complementary guidance to BS EN 806. It is a guide to the design, installation, alteration, testing, operation and maintenance of services supplying water for domestic use within buildings and their curtilages.

BS EN 806 does not cover underground pipework, but this British Standard gives guidance on underground pipework within the curtilage of a building.

This British Standard does not cover:

- a) the detailed methods of chemical treatment and maintenance of water distribution systems;
- b) workmanship; or
- c) space heating systems.

NOTE Annex A gives examples of pumped systems. Annex B provides guidance on the calculation of hot water storage systems, while Annex C provides calculations for pipe sizing.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 1010-2, *Specification for draw-off taps and stopvalves for water services (screw-down pattern) – Part 2: Draw-off taps and above-ground stopvalves*¹⁾

BS 1710, *Specification for identification of pipelines and services*

BS 2456, *Specification for floats (plastics) for float operated valves for cold water services*

BS 2580, *Specification for underground plug cocks for cold water services*¹⁾

BS 3251, *Specification – Indicator plates for fire hydrants and emergency water supplies*

BS 4991, *Specification for propylene copolymer pressure pipe*

¹⁾ Withdrawn.

BS 5114, *Specification for performance requirements for joints and compression fittings for use with polyethylene pipes* ²⁾

BS 5163-2, *Valves for waterworks purposes – Part 2: Stem caps for use on isolating valves and associated water control apparatus – Specification*

BS 5268-3, *Structural use of timber – Part 3: Code of practice for trussed rafter roofs* ²⁾

BS 5391-1, *Acrylonitrile-butadiene-styrene (ABS) pressure pipe – Part 1: Specification*

BS 5392-1, *Acrylonitrile-butadiene-styrene (ABS) fittings for use with ABS pressure pipe – Part 1: Specification*

BS 5422, *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range –40 °C to +700 °C*

BS 5433, *Specification for underground stopvalves for water services*

BS 5493, *Code of practice for protective coating of iron and steel structures against corrosion* ³⁾

BS 5955-7, *Plastics pipework (thermoplastics materials) – Part 7: Recommendations for methods of thermal fusion jointing* ²⁾

BS 5970, *Thermal insulation of pipework, ductwork, associated equipment and other industrial installations in the temperature range of –100 °C to +870 °C*

BS 6144, *Specification for expansion vessels using an internal diaphragm, for unvented hot water supply systems*

BS 6280, *Method of vacuum (backsiphonage) test for water-using appliances*

BS 6283-2, *Safety and control devices for use in hot water systems – Part 2: Specifications for temperature relief valves for pressures from 1 bar to 10 bar*

BS 6283-4, *Safety and control devices for use in hot water systems – Part 4: Specification for drop-tight pressure reducing valves of nominal size up to and including DN 50 for supply pressures up to and including 12 bar* ²⁾

BS 6920-1, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 1: Specification*

BS 6920-2, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 2: Methods of test*

BS 6920-3, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 3: High temperature tests*

BS 6920-4, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 4: Method for the GCMS identification of water leachable organic substances*

BS 7291-1, *Thermoplastics pipe and fitting systems for hot and cold water for domestic purposes and heating installations in buildings – Part 1: General requirements*

²⁾ Withdrawn.

³⁾ This standard also gives an informative reference to BS 5493:1977.

BS 7291-2, *Thermoplastics pipe and fitting systems for hot and cold water for domestic purposes and heating installations in buildings – Part 2: Specification for polybutylene (PB) pipe and associated fittings*

BS 7291-3, *Thermoplastics pipe and fitting systems for hot and cold water for domestic purposes and heating installations in buildings – Part 3: Specification for crosslinked polyethylene (PE-X) pipes and associated fittings*

BS 7671, *Requirements for Electrical Installations – IET Wiring Regulations*

BS EN 681-1:1996, *Elastomeric seals – Material requirements for pipe joint seals used in water and drainage applications – Part 1: Vulcanized rubber*

BS EN 806-1:2000, *Specification for installations inside buildings conveying water for human consumption – Part 1: General*

BS EN 806-2:2005, *Specification for installations inside buildings conveying water for human consumption – Part 2: Design*

BS EN 806-3:2006, *Specifications for installations inside buildings conveying water for human consumption – Part 3: Pipe sizing – Simplified method*

BS EN 806-4:2010, *Specifications for installations inside buildings conveying water for human consumption – Part 4: Installation*

BS EN 806-5:2012, *Specifications for installations inside buildings conveying water for human consumption – Part 5: Operation and Maintenance*

BS EN 1057:2006+A1:2010, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 1213, *Building valves – Copper alloy stopvalves for potable water supply in buildings – Tests and requirements*

BS EN 1254-1, *Copper and copper alloys – Plumbing fittings – Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes*

BS EN 1254-2, *Copper and copper alloys – Plumbing fittings – Part 2: Fittings with compression ends for use with copper tubes*

BS EN 1254-3, *Copper and copper alloys – Plumbing fittings – Part 3: Fittings with compression ends for use with plastics pipes*

BS EN 1254-5, *Copper and copper alloys – Plumbing fittings – Part 5: Fittings with short ends for capillary brazing to copper tubes*

BS EN 1452-1, *Plastics piping systems for water supply – Unplasticized poly (vinyl chloride) (PVC-U) – Part 1: General*

BS EN 1452-2, *Plastics piping systems for water supply – Unplasticized poly (vinyl chloride) (PVC-U) – Part 2: Pipes*

BS EN 1452-3, *Plastics piping systems for water supply – Unplasticized poly (vinyl chloride) (PVC-U) – Part 3: Fittings*

BS EN 1452-4, *Plastics piping systems for water supply – Unplasticized poly (vinyl chloride) (PVC-U) – Part 4: Valves and ancillary equipment*

BS EN 1452-5, *Plastics piping systems for water supply – Unplasticized poly (vinyl chloride) (PVC-U) – Part 5: Fitness for purpose of the system*

BS EN 1490, *Building valves – Combined temperature and pressure relief valves – Tests and requirements*

BS EN 1491, *Building valves – Expansion valves – Tests and requirements*

BS EN 1567, *Building valves – Water pressure reducing valves and combination water reducing valves – Requirements and tests*

BS EN 1995-1-1, *Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings*

- BS EN 10224, *Non-alloy steel tubes and fittings for the conveyance of water and other aqueous liquids – Technical delivery conditions*
- BS EN 10255, *Non-alloy steel tubes suitable for welding and threading – Technical delivery conditions*
- BS EN 10312, *Welded stainless steel tubes for the conveyance of water and other aqueous liquids – Technical delivery conditions*
- BS EN 12201-3, *Plastics piping systems for water supply, and for drainage and sewerage under pressure – Polyethylene (PE) – Part 3: Fittings*
- BS EN 12828, *Heating systems in buildings – Design for water-based heating systems*
- BS EN 13076, *Devices to prevent pollution by backflow of potable water – Unrestricted air gap – Family A – Type A*
- BS EN 13077, *Devices to prevent pollution by backflow of potable water – Air gap with non-circular overflow (unrestricted) – Family A – Type B*
- BS EN 13959, *Anti-pollution check valves – DN 6 to DN 250 inclusive Family E, type A, B, C, and D*
- BS EN 14336, *Heating systems in buildings – Installation and commissioning of water based heating systems*
- BS EN 14814, *Adhesives for thermoplastic piping systems for fluids under pressure – Specifications*
- BS EN 14451, *Devices to prevent pollution by backflow of potable water – In-line anti-vacuum valves DN 8 to DN 80 – Family D, type A*
- BS EN 14623, *Devices to prevent pollution by backflow of potable water – Air gaps with minimum circular overflow (verified by test or measurement) – Family A, type G*
- BS EN 29453, *Soft solder alloys – Chemical compositions and forms*
- BS EN 60079-30-1, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements*
- BS EN 62395-1, *Electrical resistance trace heating systems for industrial and commercial applications – Part 1: General and testing requirements*
- BS EN ISO 1452-3, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure – Part 3: Unplasticized poly(vinyl chloride) (PVC U) – Fittings*
- BS EN ISO 15493, *Plastics piping systems for industrial applications – Acrylonitrile-butadiene-styrene (ABS), unplasticized poly (vinyl chloride) (PVC-U) and chlorinated poly (vinyl chloride) (PVC-C) – Specifications for components and the system – Metric series*
- BS EN ISO 15877-1, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 1: General*
- BS EN ISO 15877-2, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 2: Pipes*
- BS EN ISO 15877-3, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 3: Fittings*
- BS EN ISO 15877-5, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 5: Fitness for purpose of the system*

BS EN ISO 17672, *Brazing – Filler metals*

BS EN ISO 21003-2, *Multilayer piping systems for hot and cold water installations inside buildings – Part 2: Pipes*

BS ISO 17885, *Plastics piping systems – Mechanical fittings for pressure piping systems – Specifications*⁴⁾

3 Terms and definitions

For the purposes of this British Standard, the terms, definitions and symbols given in BS EN 806-1 apply, together with the following.

3.1 Terms and definitions

3.1.1 backflow

movement of the fluid from downstream to upstream within an installation contrary to the intended direction of flow

3.1.2 building

structure (including a floating structure) of a permanent character or not, and movable or immovable, connected to a water supply

3.1.3 cavity wall

structural or partition wall, formed by two upright parts of similar or dissimilar building materials, suitably tied together with a gap formed between them, which might (but need not) be filled with insulating material

3.1.4 chase

recess cut into an existing structure

3.1.5 cistern

fixed, vented container for holding water at atmospheric pressure

3.1.6 communication pipe

part of a service pipe for which the water supplier is responsible

NOTE See 3.1.28, Figure 1.

3.1.7 composite fitting

combination of fittings or valves incorporated into one body

3.1.8 contamination

reduction in chemical or biological quality of water due to a change in temperature or the introduction of polluting substances

3.1.9 cover

panel or sheet of rigid material fixed over a chase, duct or access point, of sufficient strength to withstand surface loadings appropriate to its position

NOTE Except where providing access to joints or changes of direction (i.e. at an inspection access point), a cover may be plastered or screeded over.

3.1.10 cut-off end

redundant or disconnected/capped pipework or a short length of disconnected/capped pipework

⁴⁾ In preparation.

3.1.11 dead leg

length of pipe (spur or branch) to a draw-off fitting where little or no flow can occur

NOTE This might include:

- *seldom or infrequently used fittings and cisterns; and*
- *hot water distributing pipe leading to taps that are not part of a secondary circulation system.*

3.1.12 disinfection

process which removes or renders inactive pathogenic microorganisms or parasites

3.1.13 distributing pipe

pipe (other than a warning, overflow or flushing pipe) conveying water from a storage cistern or from hot water apparatus supplied from a cistern and under pressure from that cistern

[SOURCE: BS EN 806-1:2000, 5.3.4, modified]

3.1.14 duct

enclosure designed to accommodate water pipes and fittings, and other services if required

3.1.15 dwelling

premises, buildings or part of a building providing accommodation

NOTE This includes a terraced house, a semi-detached house, a detached house, a flat in a block of flats, a unit in a block of maisonettes, a bungalow, a flat within any non-domestic premises, a maisonette in a block of flats or any other habitable building, and any caravan, vessel, boat or houseboat that can accommodate a single family unit connected to the water supplier's mains.

3.1.16 expansion valve

pressure-activated valve designed to release expansion water from an unvented water heating system

3.1.17 feed and expansion cistern

cistern for supplying cold water to a hot water system without a separate expansion cistern

3.1.18 flushing cistern

cistern provided with a valve or device for controlling the discharge of the stored water into a water closet pan or urinal

3.1.19 inspection access point

position of access to a duct or chase allowing inspection of the pipe or pipes therein by removal of a cover fixed by removable fastenings that does not necessitate the removal of surface plaster, screed or continuous surface decoration

3.1.20 overflow pipe

pipe from a cistern in which water flows only when the level in the cistern exceeds a predetermined level

3.1.21 potable water

water suitable for human consumption that meets minimum legal requirements for wholesome water from mains or private extraction

NOTE Potable water is also known as "wholesome water".

3.1.22 pressure relief valve

pressure-activated valve that opens automatically at a specified pressure to discharge fluid

3.1.23 primary circuit

assembly of water fittings in which water circulates between a heat source and a primary heat exchanger inside a hot water storage vessel, and includes any space heating system

3.1.24 removable fastening

fastening that can be removed readily and replaced without causing damage, including turn buckles, clips, magnetic or touch latches, coin-operated screws and conventional screws, but not nails, pins or adhesives

3.1.25 responsible person

individual(s) appointed to take day-to-day responsibility for water quality and the control of any identified risk, including *Legionella* or other waterborne bacteria

NOTE The appointed "responsible person" can be a manager or director, or have similar status and sufficient authority, competence and knowledge of the installation to ensure that all operational procedures are carried out in a timely and effective manner with a clear understanding of their duties and the overall health and safety management structure and policy in the organization.

3.1.26 secondary circuit

assembly of water fittings in which water circulates in supply pipes or distributing pipes of a hot water storage system

3.1.27 self-regulating trace heating system

assembly of self-regulating heating cables and associated controls used for the purposes of:

- frost protection/freeze prevention of piped services in exposed or unheated parts of a building; and
- hot water temperature maintenance of a single pipe domestic hot water system without secondary return

3.1.28 service pipe

water pipe which supplies water from the local main to the potable water installation

[SOURCE: BS EN 806-1:2000, 5.3.1]

NOTE In the UK, the WRAS Water Regulations Guide [25] defines "service pipe" as "so much of a pipe which is, or is to be, connected with a water main for supplying water from that main to any premises as is to be subjected to water pressure from that main, or would be so subject but for the closing of some valve" (see Figure 1).

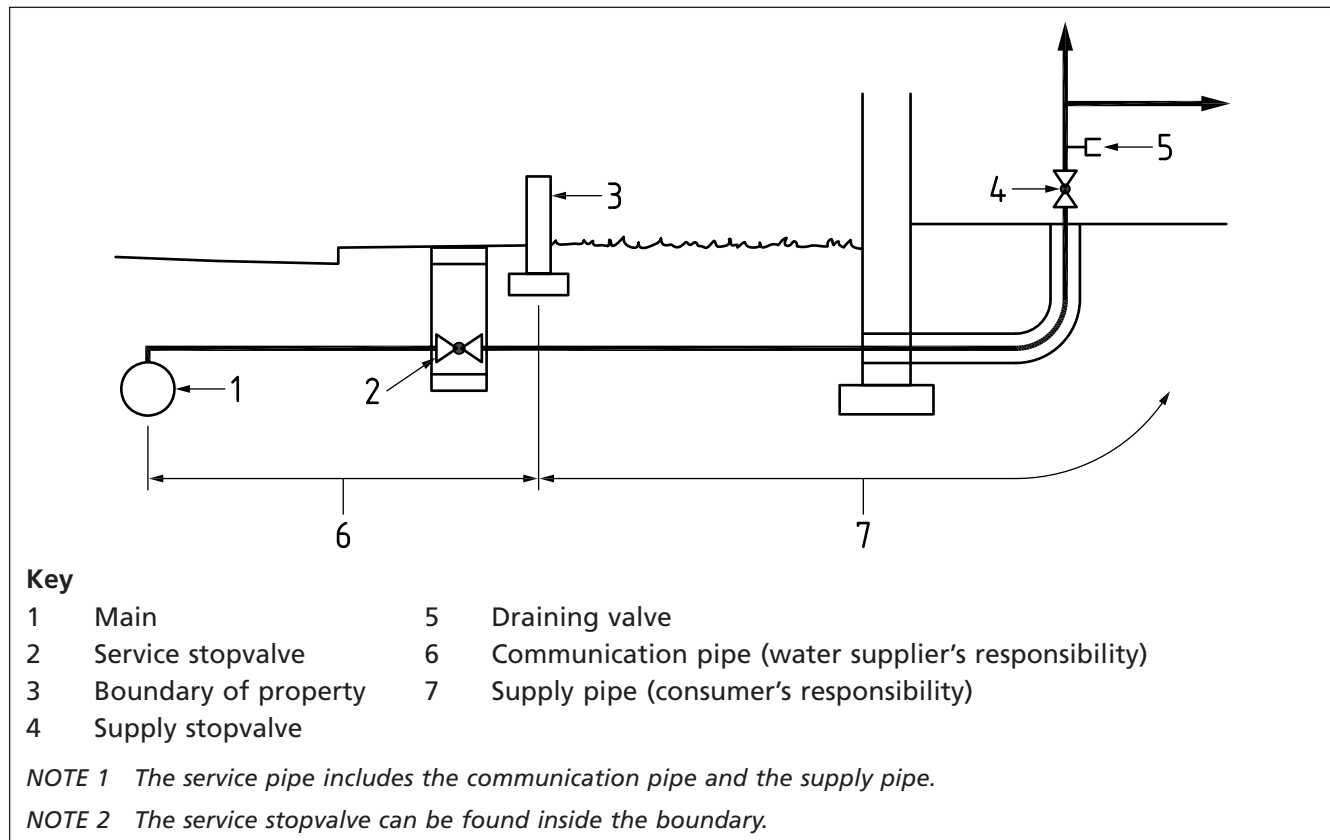
3.1.29 service stopvalve

water supplier's stopvalve which is the first valve in the service pipe after or included in the connection point to the main

NOTE A stopvalve is usually fitted at the end of the communication pipe at or near to the boundary of the property served (see Figure 1).

[SOURCE: BS EN 806-1:2000, 5.4.2, modified]

Figure 1 Example of service pipe

**3.1.30 servicing valve**

valve for shutting off, for the purpose of maintenance, the flow of water in a pipe connected to a water fitting or appliance

3.1.31 sleeve

enclosure of tubular or other section of suitable material designed to provide a space through an obstruction to accommodate a single water pipe and to which access to the interior can be obtained only from either end

3.1.32 stagnation

process by which water quality deteriorates due to very low or zero movement

3.1.33 stagnant water

water stored with very low or no movement resulting in water quality deviation outside recommended control values

3.1.34 stopvalve

valve, other than a servicing valve, used for shutting off the flow of water in a pipe

3.1.35 storage cistern

cistern for storing water for subsequent use, not being a flushing cistern

3.1.36 supply pipe

water pipe that conducts water from the supply stopvalve to connection draw-off points and connection points of appliances

[SOURCE: BS EN 806-1:2000, 5.3.2]

NOTE A supply pipe can also be defined as that part of any service pipe for which the water supplier is not responsible (see Figure 1).

3.1.37 supply stopvalve

first stopvalve in the premises which controls the downstream supply and may be included in a water meter assembly

[SOURCE: BS EN 806-1:2000, 5.4.3]

NOTE The first stopvalve in the building or premises to which it supplies controls the whole of the supply to the building without shutting off the supply to any other premises (see Figure 1).

3.1.38 tank

closed vessel holding water at greater than atmospheric pressure

3.1.39 temperature relief valve

valve that opens automatically at a specified temperature to discharge fluid

3.1.40 terminal fitting

water outlet device

3.1.41 tundish

funnel for catching overflow or discharge

3.1.42 vent pipe

pipe, open to the atmosphere, which exposes the system to atmospheric pressure

3.1.43 walkway (or crawlway)

enclosure similar to a duct, but of such size as to provide access to the interior by people through doors or manholes, and which accommodates water pipes and fittings and other services if required

3.1.44 warning pipe

pipe from a cistern in which water flows only when the level in the cistern is about to exceed the predetermined overflow level to warn of impending overflow

NOTE Cisterns over 1 000 L require both a warning pipe and an overflow pipe.

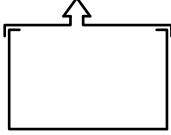
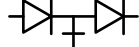
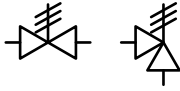
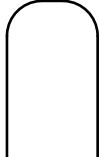
3.1.45 water age

duration for which a unit volume of water entering the building is retained within the distribution system before use

3.2 Symbols

The symbols used in this British Standard are described in Table 2.

Table 2 Drawing symbols for BS 8558

Name	Symbol
Air release valve	
Check valve or non-return valve	
Circulating pump	
Cold water storage cistern/feed cistern	
Double-check valve	
Draining valve	
Expansion (pressure) relief valve	
Expansion vessel	
Feed and expansion cistern	
Float operated valve	
Heat exchanger	
Hot water storage vessel (cylinder)	
Servicing valve	
Stopvalve	
Pressure reducing (limiting) valve	
Temperature relief valve	
Tundish	

4 Guidance on BS EN 806-2

4.1 Preliminary investigations

COMMENTARY ON 4.1

Where water is to be supplied by a public water supplier, the Water Fittings Regulations [19], [20] and [21] apply. The Water Fittings Regulations [19], [20] and [21] apply whenever the work involves either a new service or the modification or disconnection of existing services.

For information on the control of Legionella, refer to the Health and Safety Executive's (HSE) Approved Code of Practice L8, Legionnaires' disease: The control of Legionella bacteria in water systems [26] and BS 8580. Further guidance is available for specific areas (see [27] and [28]).

The following factors should be accounted for in the design:

- a) the water supplier's requirements, including those of notification;
- b) the estimated daily consumption and the maximum and average flow rates required, together with the estimated time of peak flow;
- c) the location of the available supply;
- d) the quality, quantity and pressure required and the available pressures at various times during a typical day;
- e) the cold water storage capacity required;
- f) the likelihood of ground subsidence, e.g. due to mining activities;
- g) the likelihood of contamination of the site;
- h) transient or surge pressures that might arise during the operation of the system; and
- i) the risk of heat gain during the summer.

4.2 Guidance on specific BS EN 806-2 requirements

4.2.1 BS EN 806-2:2005, Clause 5: Acceptable materials

COMMENTARY ON 4.2.1

Where the system is receiving water from a public supply the material in contact with the water needs to conform to the Water Fittings Regulations [19], [20] and [21]. Where the water is exclusively provided from a private source, such as a well or borehole, the Private Water Supplies Regulations [15], [16], [17] and [18] apply.

4.2.1.1 The influence on water quality of the materials used in the construction of the water service installation, and of those in contact with the installation, is explained in BS 6920 (all parts).

4.2.1.2 Materials should be selected depending on the present and reasonably foreseeable character of the water supply and its intended use. Information on the character of the water supply is available from the local water supplier.

4.2.1.3 Internal corrosion leading to premature failure of metal pipes can occur with certain waters. External corrosion of pipes and fittings laid below ground can be a serious local problem depending on the particular ground conditions. Pipes and fittings should be protected against corrosion by using an internal lining, an external coating or a corrosion-resistant material. Where contamination of the soil is suspected, or where knowledge of the site raises concerns, an analysis of the soil should be obtained. Extended use of biocides can adversely affect both metal and plastic piping.

4.2.1.4 In all cases, care should be taken to avoid the use of incompatible materials supplying the same installation, particularly where dissimilar metals are in contact.

4.2.1.5 Only suitably approved materials or coatings should be used. The water supplier may be consulted for advice on the choice of an effective lining or coating material.

4.2.2 BS EN 806-2:2005, 5.1: Choice of materials

4.2.2.1 Lead

4.2.2.1.1 No pipe or other water fitting or storage cistern made from lead or internally lined with lead should be used in new installations or repairs on plumbing systems supplying water for domestic purposes.

4.2.2.1.2 Metallic pipes and fittings should not be connected to existing lead pipework without appropriate protection against electrolytic action.

4.2.2.1.3 Where an insertion of non-metallic pipe or fitting is used, continuity of electrical earth bonding should be maintained.

4.2.2.1.4 Repairs to existing lead services should be made with materials other than lead (see also **4.3.31.1**).

4.2.2.1.5 Lead, or any substance containing lead, should not be used in the jointing of pipes or fittings.

NOTE The WRAS Water Regulations Guide [25], G2.1, states, "Particular materials unsuitable for use in contact with water intended for domestic or food production purposes include lead and bitumastic coatings derived from coal tar."

4.2.2.2 Copper

4.2.2.2.1 Users of this British Standard are advised to consider the desirability of selecting copper tubes for which independent quality assurance certification to BS EN 1057:2006+A1:2010 has been obtained. Generally, copper is resistant to corrosion and is suitable for hot and cold water applications. Where supply waters are capable of dissolving an amount of copper such that unacceptable green staining is produced on pipework and fittings, consideration should be given to the use of water treatment or alternative materials.

4.2.2.2.2 In certain specialized installations, such as hospitals in aggressive water areas, the use of copper might not be appropriate due to the risk of contamination resulting from pitting of copper.

4.2.2.3 Copper alloys

Copper cannot corrode by dezincification because it does not contain zinc. Other recommended materials are gunmetal, which is also immune to dezincification, and brasses inhibited and treated to be highly resistant to this form of corrosion. For alloys in the latter category, a specific test of dezincification resistance is given in BS EN ISO 6509. For ease of identification, fittings manufactured from grade A dezincification-resistant brasses are marked with the recognized dezincification symbol "CR" or "DRA".

4.2.2.4 Stainless steel

The Water Fittings Regulations [19], [20] and [21] preclude the use of adhesive for the jointing of metal pipes laid below ground. However, it is an acceptable method of connection for above-ground pipework including, where accessible, pipework installed in a chase or duct. Although mixed copper and stainless steel systems may be used, jointing small copper areas to large stainless steel areas should be avoided due to corrosion risks. Jointing should be made using stainless-steel or copper capillary, or compression, push-fit or press fittings (see 5.1.3.3). Jointing of stainless steel tubes by adhesive bonding may only be used where the water temperature does not exceed 85 °C.

4.2.2.5 Steel

4.2.2.5.1 Where used above ground for distributing pipes from a storage cistern, steel tube should be medium grade in accordance with BS EN 10255. Steel pipes should be internally lined with an approved material and, where appropriate, externally protected against corrosion. Guidance and recommendations on the zinc coating for corrosion protection are given in BS EN ISO 14713 (all parts).

4.2.2.5.2 Galvanizing offers only marginal protection against corrosion. Welded or brazed joints should not be used as this damages the galvanizing.

4.2.2.6 Plastics

4.2.2.6.1 General selection criteria and relevant standards

4.2.2.6.1.1 Coefficients of expansion for plastics pipes are greater than those for metal pipes, but this is generally not a problem where pipes are buried.

4.2.2.6.1.2 Below ground and in concealed locations above ground that are not accessible with hand tools, mechanical joints should be used rather than solvent cement joints due to the difficulty in making satisfactory solvent cement joints in such adverse conditions. Where mechanical joints are made with copper alloy fittings, they should be corrosion-resistant or immune to dezincification. Where there is adequate access in positions above ground, solvent cement joints may be used.

4.2.2.6.1.3 Plastics pipework systems for pressure applications are not automatically inter-compatible, and there are no British Standards for connector dimensions or methods of achieving a joint. Any plastics fittings and pipework should be compatible with each other. All non-metallic materials should conform to BS 6920 (all applicable parts).

4.2.2.6.2 Acetal

Fittings, mostly terminal water fittings, made from acetal are suitable for cold water applications. Jointing carried out by mechanical or push-fit methods is suitable.

4.2.2.6.3 Polybutylene (PB)

4.2.2.6.3.1 Pipes and fittings made from polybutylene (PB) and conforming to BS 7291-1 and BS 7291-2 or BS EN ISO 15876 (all parts) are suitable for hot and cold water applications. PB pipes provide good resistance to freezing, but should still be provided with thermal insulation for frost protection.

4.2.2.6.3.2 PB cannot be solvent welded, but may be jointed by push-fit or crimped fittings, other mechanical joints, or by thermal fusion.

4.2.2.6.4 Polyethylene (PE)

4.2.2.6.4.1 The use and installation of polyethylene (PE) pipelines for the supply of drinking water should be in accordance with BS 5955-7 ⁵⁾. Requirements for pipes are specified in BS EN 12201-2. Copper alloy compression fittings for use with PE pipe should be in accordance with BS EN 1254-3 and joints should conform to BS 5114.

4.2.2.6.4.2 PE cold water storage cisterns conforming to BS 4213 are suitable for storage and expansion purposes.

4.2.2.6.4.3 PE cannot be solvent welded, but may be jointed by push-fit or crimped fittings, other mechanical joints, or by thermal fusion.

4.2.2.6.5 Propylene copolymer (PP)

4.2.2.6.5.1 Polypropylene pipe for drinking water use should conform to series 1 of BS 4991.

4.2.2.6.5.2 Propylene copolymer (PP) cannot be solvent welded. Cold water storage cisterns in PP conforming to BS 4213 are suitable for storage and expansion purposes.

4.2.2.6.5.3 Floats in PP for float-operated valves should conform to BS 2456.

4.2.2.6.6 Crosslinked polyethylene (PE-X)

4.2.2.6.6.1 Pipes and fittings made from crosslinked polyethylene (PE-X) conforming to BS 7291-1 and BS 7291-3 or BS EN ISO 15875 (all parts) are suitable for hot and cold water applications. PE-X pipes provide good resistance to freezing, but should still be provided with thermal insulation for frost protection.

4.2.2.6.6.2 PE-X cannot be solvent welded, but may be jointed by push-fit or other mechanical joints, crimped fittings, or by thermal fusion. These include fittings made from a plastics material that meets the applicable requirements of BS 7291 (all parts), and copper and copper-alloy compression fittings conforming to BS EN ISO 21003-3, BS EN 1254-2 and/or BS EN 1254-3.

⁵⁾ Withdrawn.

4.2.2.6.7 Unplasticized polyvinyl chloride (PVC-U)

4.2.2.6.7.1 PVC-U should be used only for cold water applications.

4.2.2.6.7.2 PVC-U pipe should conform to BS EN 1452-2 and the solvent cements to be used with the pipe should conform to BS EN 14814.

4.2.2.6.7.3 As PVC-U pipes become increasingly brittle with reducing temperatures, particular care should be taken in handling them at temperatures below 5 °C.

4.2.2.6.7.4 PVC-U may be solvent welded or jointed by push-fit or other mechanical joints, or by thermal fusion.

4.2.2.6.8 Chlorinated polyvinyl chloride (PVC-C)

4.2.2.6.8.1 PVC-C pipe should conform to BS EN ISO 15877 (all parts) and the solvent cements to be used with the pipe should conform to BS EN 14814.

4.2.2.6.8.2 As PVC-C pipes become increasingly brittle with reducing temperatures, particular care should be taken in handling them at temperatures below 5 °C.

4.2.2.6.8.3 PVC-C may be solvent welded or jointed by push-fit or other mechanical joints, or by thermal fusion.

4.2.2.6.9 Acrylonitrile butadiene styrene (ABS)

4.2.2.6.9.1 Pipes and fittings made from acrylonitrile butadiene styrene (ABS) conforming to BS 5391-1 and BS 5392-1 or to BS EN ISO 15493 are suitable for cold water applications.

4.2.2.6.9.2 ABS may be solvent welded or jointed by push-fit or other mechanical joints.

4.2.2.7 Coating and lining materials

4.2.2.7.1 For the prevention of contact of water with unsuitable materials, see 4.3.31.1. BS 5493 gives recommendations for the protective coating of iron and steel structures, including pipes, fittings and cisterns, which should be consulted where detailed guidance is required. BS 5493 deals with non-saline water and is applicable to domestic water installations. It provides typical times to first maintenance and general descriptions of recommended coatings and their thicknesses. Tables give more detailed information about the coating systems. Of particular relevance is BS 5493:1977, Table 3, note n), which concerns fittings used with drinking water.

4.2.2.7.2 Internal protection of steel pipes should be in accordance with BS EN 10224.

4.2.2.8 Elastomeric materials

4.2.2.8.1 The materials of elastomeric sealing rings in contact with drinking water should conform to BS EN 681-1:1996, types WA, WB or WE (see also 4.3.31.1).

4.2.2.8.2 For health care premises, the Trust should be consulted about any specific requirements relating to ethylene propylene diene monomer (EPDM) rubber components.

4.2.3 BS EN 806-2:2005, Clause 5: Acceptable materials and 10.2.5: Discharge pipes

Discharge pipes connected via a tundish to temperature or expansion-relief valves in hot water systems should be capable of withstanding intermittent hot water or steam discharges at system malfunction temperatures of 95 °C.

4.3 Supplementary guidance to BS EN 806-2

4.3.1 Extensions

If the existing supply is part of a common supply pipe (i.e. the supply pipe serves several properties), any additional demand, such as extending the plumbing system or property, can have an adverse effect on pressure/flow and quality, so the water supplier might require a separate service pipe to be provided. Where properties are being supplied with a new service from a water supplier's main, a separate service pipe(s) should be provided wherever feasible. The water supplier normally requires this.

4.3.2 Water mains

Full information about proposals should be supplied as early as possible to the water supplier. Site plans should be supplied showing the layout of roads, footpaths, buildings and boundaries. The work programme should provide for the water supplier not laying a main until at least the line and level of the kerb are permanently established on site.

4.3.3 Ground movement

4.3.3.1 Ground movement can occur due to underground mining operations, natural movements of the earth's strata or movement of superficial deposits. These movements can occur in both the horizontal and vertical planes, and vary in magnitude over the affected area. The effects of undermining can be predicted with reasonable accuracy by an appropriately qualified professional, such as a surveyor or geotechnical engineer, who should be consulted for advice on the adoption of precautionary measures. Movement of superficial deposits can be due to seasonal swelling and shrinkage, settlement (especially where fibrous organic soils are encountered) or slope stability failures. To enable an assessment of likely ground movement, a site investigation should be conducted to determine the ground conditions existing along the line of a proposed construction.

4.3.3.2 The extent of movements of superficial deposits can only be assessed by consideration of the findings of a site investigation. Where ground or groundwater level can move, a suitable type of flexible pipework should, where practicable, be "snaked" or undulated in the trench to accommodate movement. Where the pipes or the joints are not sufficiently flexible to accommodate movement in pipelines laid in recently disturbed ground, continuous longitudinal support should be provided.

4.3.3.3 When selecting the type of pipe or storage cistern, components of brittle materials should be more carefully protected from movement than inherently flexible materials.

4.3.3.4 Telescopic joints may be used to provide for thermal movement in pipelines. Angular deflections should be compensated for by using flexible type joints. The continuity of gradient towards washouts and air valves can be affected by subsidence. Where such a situation could occur, pipelines should be supported and reasonable gradients between high and low points on the pipeline should be ensured. Pipes passing through walls should be free to deflect.

4.3.4 Contamination

4.3.4.1 Contaminated land

Where assessing a site, advice should be sought from the local authority, the site owner and the water supplier. The previous uses of the site should be assessed.

NOTE See UK Water Industry Research Ltd.'s (UKWIR), Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites [29].

4.3.4.2 Hygiene

4.3.4.2.1 Drinking water points should be located in areas intended for food preparation and consumption, as well as in rooms provided for beverage making. Where beverage-making facilities are not provided, drinking water points should be sited in the vicinity of, but not inside, toilet areas or outside buildings.

4.3.4.2.2 All drinking water fountains should be of the shrouded nozzle type, discharging above the spillover level of the bowl (see BS 6465-1).

NOTE Attention is drawn to the Workplace (Health, Safety and Welfare) Regulations 1992 [4] with respect to drinking water provision in offices and other commercial buildings. For recommendations for collecting and investigating samples, where to sample and the selection of laboratory or on-site testing, see BS 8554.

4.3.5 Dead legs

4.3.5.1 General

4.3.5.1.1 To reduce the risk of stagnation, the layout of pipework should be arranged, where possible, so that fittings downstream of a drinking water point have regular use. To ensure efficient use of water and the maintenance of water quality, cold water should not be warmed above 25 °C, and ideally 20 °C, and hot water should be delivered at or above 50 °C to the water outlet within 1 min of running the water [see also a) and b)]. This should provide the most efficient water conservation measure. However, an overriding design consideration should be the control of *Legionella* bacteria in all water systems. Where possible, terminal pipe lengths to outlets and appliances should be designed such that they meet the following minimum thermal performance criteria.

a) Cold water

To control *Legionella* the water temperature should be below 20 °C after running the water for up to 2 min.

However, due to environmental factors, the incoming water temperature at some sites can become abnormally warm. The building user should be advised accordingly so that the information is available at the time the system is handed over and *Legionella* risk assessments are carried out.

b) Hot water

To ensure suitable *Legionella* management in all buildings the water temperature at an outlet should be at least 50 °C within 1 min of running the water.

The water supply to any thermostatic mixing valve (TMV) should be at a temperature of at least 50 °C within 1 min of running the water.

Where appropriate, for water leaving and returning to a calorifier or hot water storage cistern, the outgoing water temperature should be at least 60 °C and returned to at least 50 °C or 55 °C.

NOTE 1 Where it is not practical to use pipework to recirculate hot water back to the calorifier, or where the minimum return temperature cannot be guaranteed, a single pipe system with electrical self-regulating trace-heating cables may be installed to ensure temperature maintenance of at least 50 °C, which will also enable the elimination of the deadleg, providing temperature maintenance to the draw-off point.

Trace heating might be necessary when the length of hot water pipework and the volume of water the pipework contains become such that it would take an unreasonable length of time to draw off the cool water

NOTE 2 For more detailed information, refer to the HSE's Approved Code of Practice L8, Legionnaires' disease – The control of Legionella bacteria in water systems [26], HSG274 part 2 [30] and BS 8580. See also the Water Fittings Regulations [19], [20] and [21].

4.3.5.1.2 Except in a dwelling, all taps that are supplied with cold water that is not drinking water should be labelled "Not Drinking Water". An alternative approach is to undertake a risk assessment to identify specific labelling requirements.

4.3.5.1.3 To minimize the amount of water drawn off before sufficiently hot or cold water arrives at the tap, dead legs should be insulated and be as short as practicable.

NOTE This guidance is based on balancing thermal efficiency and is not necessarily a recommendation for reducing microbiological risks (see Approved Code of Practice L8, Legionnaires' disease – The control of Legionella bacteria in water systems [26] and HSG274 Part 2 [30]).

4.3.5.1.4 Dead legs of secondary circulation (hot water) should not exceed a volume of 0.5 L. This also reduces the risk of stagnation which can lead to a reduction in water quality.

4.3.5.1.5 If it can be reasonably foreseen that sections of the distribution circuits will be used at relatively low frequency compared to those pipe runs serving kitchens or showers, check valves should be fitted to prevent backflow from entering flow drawn past the unions. Such design practice reduces the risk of relatively stagnant water contributing to biofilm colonization of such sensitive outlets and minimizes the associated contribution to *Legionella* and other microbiological contamination.

NOTE For recommendations for collecting and investigating samples, where to sample and the selection of laboratory or on-site testing, see BS 8554.

4.3.5.2 Cut-off ends

Where systems are modified and services are removed from either hot or cold water distribution networks, capped tails should be avoided. Where this is not practicable, tails should be cut as short as possible.

4.3.6 Water softeners

A separate, unsoftened mains-fed drinking water tap is recommended to ensure that drinking water is always available and that it serves two purposes (see Figure 2). Firstly, it enables samples to be taken to verify the quality of the incoming supply either by the occupier or the water supplier. The water supplier has an obligation to carry out compliance samples at mains water taps within consumer premises for compliance with the Water Quality Regulations [11], [12], [13] and [14]. Secondly, the Department of Health recommends that unsoftened water should be available for infant feed preparation and for those individuals on a medically-supervised low-sodium diet.

NOTE 1 For further information on the installation of ion exchange water softeners, see WRAS IGN 9-07-01, Information for Installation of Ion Exchange Water Softeners for Systems Supplying Water for Domestic Purposes [31].

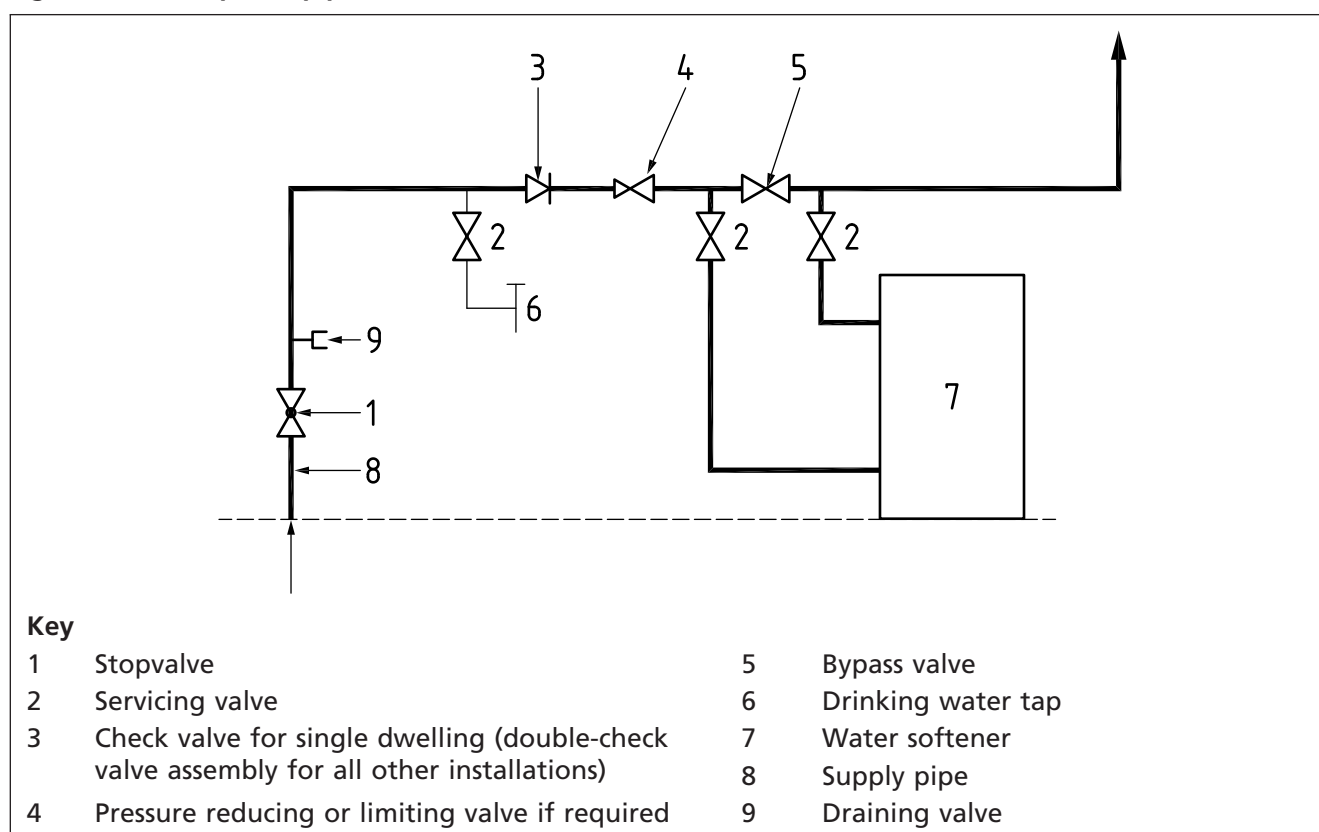
NOTE 2 The Water Fittings Regulations [19], [20] and [21] require that "All premises supplied with water for domestic purposes should have at least one conveniently situated tap for the drawing of drinking water."

NOTE 3 The parametric value for sodium of 200 mg/L stipulated in the Water Supply (Water Quality) Regulations [11], [12], [13] and [14] is only exceeded when it is softened in areas where the water supply is extremely hard, i.e. greater than 435 mg/L as CaCO₃ (assuming zero sodium in the mains supply).

The provision of an unsoftened drinking water tap is essential where the hardness of the public supply and its sodium content as supplied would result in the softened water exceeding 200 mg/L sodium limit.

For further guidance see The Building Regulations 2000: Approved Document G, Sanitation, Hot Water Safety and Water Efficiency [32].

Figure 2 Example of pipework for installation of domestic water softener



4.3.7 Type of system

4.3.7.1 Where the pressure within the water mains is reliable and sufficient for the peak flow within the dwelling, a Type A (mains-fed) system should be installed as it has a lower installation cost and creates less risk of water stagnation and contamination. Where a Type A system cannot meet the system's requirements, the following options should be used as appropriate:

- a proprietary pump-assisted supply (subject to agreement by the water supplier); or
- an interposed ("break") cistern and conventional booster pump; or
- a Type B (gravity) supply from a storage cistern.

4.3.7.2 Direct supply from a water main is recommended as inhalation of droplets or aerosols can occur when using supply via a storage system (see **4.3.31.2** on *Legionella*). Pressure and reliability of supply, particularly where dwellings are located at the extremity of the mains distribution system, should be assessed and documented.

4.3.7.3 The characteristics of direct supply from a water main are:

- a) smaller pipes can be used in most cases;
- b) the higher pressure that is usually available is more suitable for instantaneous type shower heaters, hose taps and mixer fittings used in conjunction with a high-pressure (unvented) hot water supply;
- c) where single-outlet mixer fittings are used, measures to prevent backflow are necessary; and
- d) where there is a lack of pressure, a pumped supply pipe might be necessary, requiring the written consent of the water supplier where the flow pump rates would exceed 0.2 L/s (directly or indirectly).

4.3.7.4 The characteristics of supply via a storage cistern are:

- a) availability of a reserve of water for use in case of interruption of the mains supply;
 - b) additional protection of the mains from contamination;
 - c) reduced risk of waterhammer and reduced noise from outlets, but additional noise generated by the float-operated valve controlling the water supply to the cistern;
 - d) constant low pressure with reduced risk of leakage which is suitable for mixer fittings in conjunction with low-pressure (vented) hot water supply;
- NOTE The pressure available might be insufficient for some types of taps and might be insufficient for satisfactory showering in the absence of a booster pump depending on the type of shower and the needs of the user.*
- e) risk of frost damage;
 - f) space occupied and cost of storage cistern, structural support and additional pipework; and
 - g) need to ensure that the cistern is continuously protected against the ingress of any contaminant.

4.3.7.5 A combination of the two methods of supply (Type A and Type B) might be the best arrangement. For example, in a dwelling the ground floor cold outlets and any outside taps can be supplied under mains pressure while all other cold water outlets could be fed from a storage cistern. In these cases, precautions are necessary to prevent cross-connections and backflow.

NOTE BS 8515 and BS 8525-1 specify requirements for rainwater and greywater harvesting systems, which are unwholesome supplies of water.

4.3.8 Buildings other than dwellings

For small buildings where the water consumption is likely to be comparable to that of a dwelling, the characteristics listed in **4.3.7** should be assessed. For larger buildings, drinking water should be taken directly from the water supplier's main wherever practicable [using a pump system where necessary (see **4.3.9**)] or, when circumstances dictate otherwise, from a cistern protected in accordance with **4.3.12**.

4.3.9 Pump systems

Where the available pressure is insufficient to supply the whole of a building, a pumped system should be installed. The pumped system can serve either parts or the whole of the building. If the pump is intended to draw water directly from the water mains, the water suppliers do not normally allow the pump flow rate to exceed 2.0 L/s. However, in large systems the booster pump normally draws water from an interposed (break) cistern, in which case there is no limit on the pump capacity (see Figure A.1 to Figure A.3).

4.3.10 Cisterns

4.3.10.1 Cisterns should be made from corrosion-resistant material or coated internally with an approved non-toxic, corrosion-resistant material conforming to BS 6920-1.

4.3.10.2 Care should be taken to avoid undue heating of the water.

4.3.11 Storage cisterns

4.3.11.1 All cold water distributing pipes from a cistern should be connected at the lowest practicable point on the cistern and arranged to promote the movement of water within the cistern. Connections to pipes feeding hot water apparatus should be set at a level at least 25 mm above connections to cold water distributing pipes and should be for the supply of hot water apparatus only.

4.3.11.2 The water supply to the cistern should be fitted on the opposite side to the distribution pipes to promote movement of water. Consideration should be given to the use of delayed action inlet valves.

4.3.11.3 Storage capacity in relation to turnaround time should be considered at the design stage (see Annex B).

NOTE 1 For further information on thermal streaming, see AWWA's Passive Mixing Systems Improve Storage Tank Water Quality [33] and AWWA's Physical Modelling of Mixing in Water Storage Tanks [34].

NOTE 2 If correctly designed and balanced, the distribution can be more effective than other methods at delivering water of the desired quality throughout the whole distribution system.

4.3.12 Large storage cisterns (over 1 000 L nominal capacity)

4.3.12.1 To avoid interruption of the water supply, storage may be provided by a system of split compartments or multiple cisterns to facilitate repairs or maintenance. In such situations the water volume and the shape of each water storage compartment should be identical to ensure there is equal turnover of the stored water. Where more than one water storage compartment or cistern is to be used, the inlet and outlet piping should be arranged to stimulate equal water flow.

4.3.12.2 A washout pipe with the valve incorporated as close as practicable to the cistern should not be connected to a drain, but may be arranged to discharge into open air above a drain in accordance with the requirements of a type AA air gap.

4.3.12.3 A washout pipe should be provided flush with the bottom of the cistern at its lowest point. Where practicable, the floor of the cistern should be laid to a slight fall to the washout pipe for cleaning purposes. The washout pipe outlet should be controlled by a suitable fullway valve and blanked off with a plug or flange when not in use.

4.3.12.4 Where it is not practical to operate delayed action ball valves to effect maximum turnover on refilling, recirculating pump arrangements may be installed internally. This ensures that full mixing is induced and thermal column separation does not occur due to diurnal heating effects, which allows streaming of cold inlet water to track to diagonally opposite low-level outlets.

4.3.12.5 These features are necessary to prevent localized columns of stagnant water in large cisterns and to maximize the distribution of disinfectant within the vessel. Correct use of these techniques can help assess the efficacy of the disinfection dosing equipment. They also allow a more robust determination of the impact of water age on the residual disinfectant concentration at the extremes of the distribution system.

4.3.12.6 Sometimes, particularly for a complex of buildings, because of the larger volume of storage required or to provide the necessary head, it might be necessary to support the cistern in an independent structure outside the building(s). Although such a storage facility is often referred to as a tank or water tower, it is by definition a cistern.

4.3.12.7 Any cistern mounted outside a building, whether fixed to the building or supported on an independent structure, should be enclosed in a well-ventilated, but draughtproof, housing constructed to prevent ingress of birds, animals, and insects. It should also allow access to the interior of the cistern by authorized persons for inspection and maintenance.

4.3.12.8 When installed below ground level, cisterns for storing water for domestic use are notifiable to the water supplier and consultation is essential before installation.

4.3.12.9 To maximize water turnover in buildings that have variable occupancy rates, e.g. schools over summer holidays or phased occupation of premises, a variable height ball/control valve should be installed.

4.3.13 Warning and overflow pipes

4.3.13.1 Where overflow and warning pipes discharge externally, they should be arranged to prevent the inward flow of cold air, for example, by turning down the warning pipe into the cistern and below the water line, except where this could interfere with the operation of the flushing mechanism or float-operated valve in a WC flushing cistern (see the WRAS, *IGN 9-04-04, Cold Water Storage Cisterns – Design Recommendations for Mains Supply Inlets* [35]).

4.3.13.2 Siting of the exit of the overflow (and warning) pipe should be in a safe, visible position and discharged via a type AA airgap.

4.3.14 Stopvalves

4.3.14.1 Stopvalves fitted to supply pipes should conform to the applicable standard in Table 3.

Table 3 British Standards for stopvalves

Nominal size of pipe	British Standard	
	Above ground	Below ground
50 mm or smaller	BS 1010-2 (BS EN 1213)	BS 2580 ^{A)}
	BS 2580 ^{A)}	BS 5433
50 mm or larger	BS 5163-2	BS 5163-2

^{A)} Withdrawn, but pipes conforming to this might still be encountered.

NOTE Other stopvalves which satisfy the relevant requirements of the regulators' specification may be used.