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Introduction

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BS 8693, Water treatment for small volume heating and cooling systems in residential dwellings (including apartments) – Design, installation, handover and validation – Code of practice

DRAFT

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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 **XX Month 202X**. It was prepared by Technical Committee EH/3, *Water quality*. A list of organizations represented on this committee can be obtained on request to its secretary.

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Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its 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.

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Particular attention is drawn to the following specific regulations:

- The Water Supply (Water Fittings) Regulations 1999 [1]
- The Health and Safety at Work, etc. Act 1974 [2]

- The Control of Substances Hazardous to Health Regulations 2002 [3]
- The Building Regulations 2000, as amended (particularly Approved Document L1) [4]
- The Building (Scotland) Regulations 2004 [5]
- The Building Regulations (Northern Ireland) Statutory Rules 2000 [6]
- The Trade Effluent (Proscribed Processes and Substances) Regulations 1989 [7]
- The Hazardous Waste (England and Wales) Regulations 2005 [8]
- The Special Waste Regulations 1996 [9]
- The Hazardous Waste (Wales) Regulations 2005 [10]
- The Hazardous Waste Regulations (Northern Ireland) 2005 [11]

Introduction

In order to promote the longevity of pipework and plant and to minimize energy consumption it is important to design systems for ease of cleaning, select materials that minimize the risk of ongoing corrosion and clean the systems effectively. It is also important that water conditions are validated on completion of the work.

This is a new standard which is designed to assist system designers and specifiers, project managers and installers and can be read in conjunction with BS 7593. BS 8693 relates to newly installed systems:

- offering advice to designers and specifiers for closed water systems;
- offering advice for installers of closed systems; and
- clarifying requirements for record keeping and validation of water quality at handover or practical completion.

The standard is not applicable to the cleaning of systems after they have been put into regular use after handover or practical completion. The type of debris present in new systems differs from contaminants in existing operational systems. However, if system design or installation is poor this can impact on the outcome of remedial cleaning on fouled operational systems.

1 Scope

This British Standard gives recommendations for the design, installation and preparation of pipework and other components in new systems circulating water in open vented recirculating systems or sealed heating and cooling systems prior to their handover to occupiers or developers. The standard recommends validation methods and records to accompany the handover of new systems. The systems can be in an individual residential dwelling or within a commercial enterprise, residential development or indirectly connected to a district heating and cooling system.

This British Standard applies to individual heating and cooling circuits in single or multiple residential premises with a maximum system volume of typically less than 250 l.

This British Standard can be used by system designers, specifiers, installers, project managers and water treatment companies.

NOTE 1 Where cleaning is referred to in this document it is intended that it refers to the removal of manufacturing debris and residues, engineering residues such as cutting swarf, solder and flux, and mill scale and incidental debris created during the construction of a system.

This British Standard does not apply to commercial multiple residential premises served by one common circuit.

NOTE 2 For specialized closed circuits, such as those containing solar thermal panels and ground source heat pump loops, refer to the manufacturer's instructions. See also BS 5918 (for solar thermal) and MIS 3005 [12] (for ground source heat pumps).

NOTE 3 For larger closed systems (>250 l) such as found in commercial or municipal premises, or the primary/secondary systems on residential developments, refer to BSRIA BG 29 Pre-Commission Cleaning of Pipework Systems [N1].

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 1212-2, *Specification for diaphragm type float operated valves (copper alloy body) (excluding floats)*

BS 2879, *Specification for draining taps (screw-down pattern)*

BS 8552:2012, *Sampling and monitoring of water from building services closed systems – Code of Practice*

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

BS EN 10305-3, *Steel tubes for precision applications – Technical delivery conditions – Welded cold sized tubes*

BS ISO 5667-3, *Water quality – Sampling – Preservation and handling of water samples*

Other publications

[N1] PARSLOE, C., RONCERAY, M. BG 29/2021 Pre-Commission Cleaning of Pipework Systems, Amended 6th edition. BRACKNELL: Building Services Research and Information Association (BSRIA Ltd): 2021

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply.

3.1.1 2-port control valve

valve to control the flow of water into a terminal unit depending on the space temperature requirement

3.1.2 batch work

process of maximizing flows in each section of pipework in sequence as part of the dynamic flushing procedure

3.1.3 boiler

appliance that heats the circulating water in a domestic central heating system

NOTE This does not actually raise steam (i.e. boil the water).

3.1.4 chemical cleaning

process involving the use of appropriate chemicals to remove materials adhered to surfaces that cannot be removed by flushing alone

3.1.5 chilled beam

ceiling panel with meandering copper pipe containing chilled water adhered to its underside

3.1.6 cleaning

process whereby unwanted materials which would impede the use and function of a pipework system are removed by physical and/or chemical means

3.1.7 cooling interface unit (CIU)

plant that provides hydraulic separation between the primary and secondary, or secondary and tertiary, cooling system and allows thermal transfer from the primary to the secondary system or the secondary to tertiary system

3.1.8 cooling system

configuration of interconnected components that uses the distribution of water below ambient temperature to provide space cooling to buildings, or parts thereof

NOTE This is also known as chilled water.

3.1.9 dead-leg

section of closed system pipe that is more than three internal pipe diameters in length, is not subject to routine circulation and will allow stagnation of water

3.1.10 dynamic flushing

removal of debris by means of flushing at a velocity greater than the operating velocity expected for the installation

3.1.11 flash corrosion

rapid corrosion when metals are exposed to damp aerated conditions

3.1.12 flow measuring device

valve or fitting with a fixed orifice or variable orifice, complete with high and low pressure test points to enable measurement of the differential pressure across the device

NOTE This is achieved by plotting the pressure loss on the manufacturers flow coefficient curves to allow the flowrate to be determined.

3.1.13 heat interface unit (HIU)

plant that provides hydraulic separation between the primary and secondary or secondary and tertiary heating system and allows thermal transfer from the primary to the secondary system or the secondary to tertiary system

3.1.14 heating system

configuration of interconnected components that uses water as a heat transfer medium to distribute centrally generated heat to heat emitters for the space heating of buildings, or parts thereof

3.1.15 filtration cleaning

debris removed by cleaning from a system by recirculation filtration instead of passing the contaminated water to drain

3.1.16 flushing rig

temporary pipework and pumps used to flush and clean systems

NOTE These can include valves, strainers, fill and drain points, filters and flow measuring devices.

3.1.17 foul water drainage

contaminated water discharging to a sewer system, septic tank or cesspool

3.1.18 lock shield valve (LSV)

isolating valve installed to a radiator which provides regulation for balancing purposes

NOTE The LSV, once regulated during the balancing process, is tamperproof and not readily adjustable to the operator.

3.1.19 open vented recirculating system

closed system in which the heat transfer medium is open to the atmosphere via a feed and expansion tank

3.1.20 practical completion

point in a building contract when the building and supporting systems are practically complete and the building is operational, having passed all statutory measures, and is considered ready for occupation or handover to the developer's team

3.1.21 pre-commission water treatment

water treatment undertaken on a heating or cooling circuit after installation and before it is commissioned and put into operation

3.1.22 premises

private domestic accommodation either owned or rented

NOTE Examples of individual domestic premises are houses, flats, apartments and penthouses.

3.1.23 pressure independent control valve (PICV)

valve which modulates to control the flow of water into a terminal unit depending on the space temperature requirement

NOTE These valves also provide flow control through a commissioned setting and downstream pressure control, modulating in response to system pressure changes as flow to other units on the system open or close to flow.

3.1.24 radiant panel

heating or cooling system that is installed within a wall or ceiling or suspended at high level within a space

3.1.25 sealed system

system in which the heat transfer medium is closed to the atmosphere

3.1.26 terminal unit

device that heats or cools the indoor temperature of an enclosed space to a desired level

NOTE 1 Examples include radiators, towel rails, fan coil units (FCUs), underfloor heating zones and chilled beams or radiant panels.

NOTE 2 A terminal unit can also be referred to as an emitter.

3.1.27 thermostatic radiator valve (TRV)

valve installed to a terminal unit that controls the air temperature of a space by modulating the water flow/heat output of the terminal unit in response to the adjustable set point of the valve

NOTE Modern varieties of these valves can include integral electronic controls and timing functions within the self-contained device.

3.1.28 total viable count (TVC)

total bacterial colony count in water incubated at 22 °C

3.1.29 trench heating

heating system that is installed within the floor with a convector unit connected

3.1.30 water treatment

process that improves the quality of water to make it appropriate for use in a system

NOTE This can include the conditioning of pipework surfaces.

3.2 Symbols



isolation valve



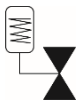
2-port control valve or PICV



flushing point



manufactured combined lock shield valve and drain point



thermostatic radiator valve



manual adjusted diverting valve

4 System design and installation

4.1 Accessibility and maintainability

4.1.1 Location and labelling

CIU, HIU, boilers, terminal units, isolation valves, controls, air vents, dosing pots, magnetic cleaners, strainers and energy meters should be located in readily accessible positions.

Access should be designated to provide working room and safe use of tools to clean strainers, in-line filters and magnetic traps.

NOTE For example, buckets to catch residues need to fit below the strainer.

All pipework and valves should be labelled to facilitate maintenance.

4.1.2 Isolation of plant and equipment

Equipment that needs draining before removal for maintenance or replacement should have isolation valves on both sides to reduce the amount of water lost from the system during these processes.

4.1.3 Air vents and drain points

COMMENTARY ON 4.2.3

Heating and cooling systems require venting during the initial fill, water treatment, subsequent commissioning and water make-up in operation.

Air vents should be located at all high points within the system.

Automatic air vents should also be installed where necessary in plant locations to provide continuous venting during operation of the systems, and the installation should include an isolation valve.

Air vents should also be installed for radiators, distribution points such as underfloor heating manifolds and heat/cooling interface units (HIU/CIU).

Heating and cooling systems should include drain points to allow draining/flushing of equipment as required.

Drain points should be located at the lowest points in the system and on the equipment side of isolation valves to allow flushing of the various items of equipment.

NOTE This is especially important for radiators and radiant panels.

Draincocks should be of lock shield type A to BS 2879.

4.1.4 Flushing connections

COMMENTARY ON 4.2.4

Flushing connections are required to facilitate the water treatment process, the complexity of which depends in part on the materials of construction in the system.

Flushing connections should be line size for the flow and return pipe serving terminal units, boilers, HIUs or CIUs.

Flushing connections for boilers CIU and HIU should be installed as close as possible to the plant item (see 4.3.2, Figure 10).

Flushing connections for water in and out of the system should be quarter-turn ball valves that, in the full-open position, avoid any restriction to the flow of flushing water.

NOTE 1 It is advised that draincocks are not used as flushing connections because draincocks are designed to allow water out of a system when draining it and are not designed for putting water back into a system. When water is forced in through a draincock, the rubber seal can partially or fully block the water way as it is pressed against the valve seat, thereby reducing the effectiveness of the flush.

The flushing connections should be located adjacent to the heat or cooling source isolation valves so that all pipework is included in the flushing exercise.

A proprietary plug should be fitted into the ball valve upon completion of the flushing regime and disconnection of the flushing hoses to mitigate any accidental operation of the valve and subsequent system water loss.

In residential buildings containing multiple dwellings, or on district heating systems where residences have hydraulic separation from primary circuits, the flushing exercise within the residence should be undertaken from the HIU/CIU out to the terminal unit bypasses.

The primary circuits should be cleaned in accordance with BG 29 [N1].

NOTE 2 Flushing connections are always needed to allow connection of a make-up water supply hose and an effluent drain hose or filtration pump rig.

4.2 Protection for sensitive plant and terminal units

4.2.1 Sensitive plant and terminal units

Sensitive equipment such as HIUs, CIUs, boilers, radiators, radiant panels, underfloor heating manifolds and FCUs should be protected from the ingress of debris during water treatment activities.

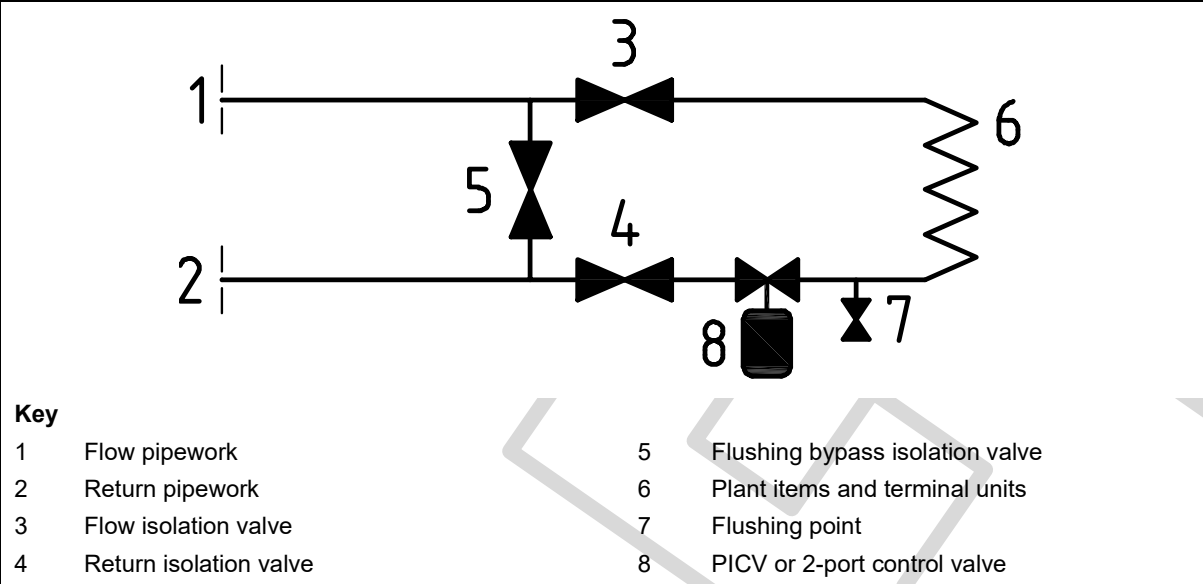
4.2.2 Bypasses for terminal units

Systems should be installed in such a way that terminal units and plant items have a line size bypass with ball type valves to isolate the flow and return to the plant and emitter. The bypass should also have a ball type valve to isolate the flow through the bypass.

NOTE 1 This protects the terminal units and plant items from the ingress of debris during flushing.

Prefabricated bypass and valve arrangements should have individual valves on the flow and return to provide emitter isolation and bypass isolation (see Figure 1).

Figure 1 – Preferred flushing bypass arrangement with individual valves for flow, return and bypass isolation



A bypass should be used throughout the water treatment process when flushing pipework serving plant items and terminal units.

NOTE 2 This prevents debris from entering sensitive terminal units and control valves.

The bypass arrangement should provide separate isolation of the flow and return pipes feeding terminal units.

NOTE 3 This prevents the coil from being filled before the terminal unit flushing stage of the water treatment process (after the pipework has been cleaned).

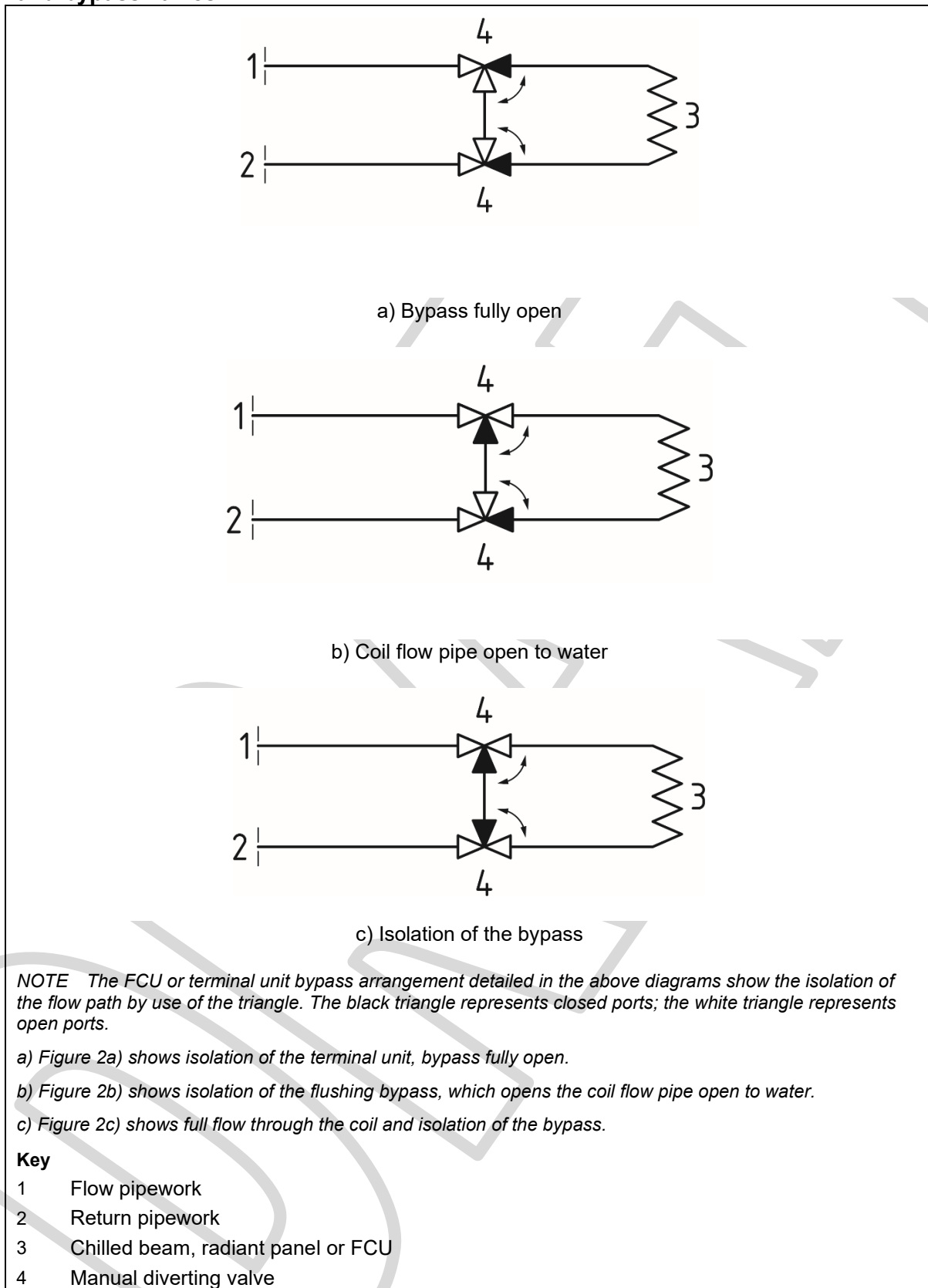
Fixed or temporary full-bore bypasses should be provided as close as possible to the plant items they are protecting in order to maximize the amount of pipework available for the initial flush before terminal units are opened to the system.

All sensitive plant items should be isolated for the initial flush and chemical clean of the pipework utilizing flushing bypasses.

If this is not possible the installer or water treatment company should obtain approval from the plant manufacturer on the flushing process and proposed chemicals before undertaking the cleaning process through the terminal unit.

Valve arrangements with manufactured combination flushing and bypass valves that cannot prevent water entering the emitter when the bypass is being isolated should be avoided (see Figure 2).

Figure 2 – Flushing bypass arrangement with manufactured combination flushing and bypass valves



Terminal units should only be filled when they are flushed after the pipework is cleaned, unless they need to be pressure tested before flushing due to the activities of other trades.

NOTE This is to avoid the accumulation of contaminants which will later be difficult to remove.

4.2.3 Flushing facilities for chilled beams, radiant panels and FCUs

COMMENTARY ON 4.3.3

Chilled beams, radiant panels and FCUs typically have prefabricated flushing bypass and valve arrangements.

The control of chilled beams or radiant panels and FCUs in operation is usually via an automatic electronic control system and as such the control valves are typically 2-port control valves or PICV (pressure independent control valve).

2-port control valves or PICVs and the coils associated with these items are sensitive to debris and therefore the flushing process should bypass the unit and the associated valve.

The valve arrangement should include a flushing point located between the coil and the control device (2-port control valve or PICV).

The installation of a flow measuring device should be adjacent to the PICV or 2-port control valve on the terminal unit.

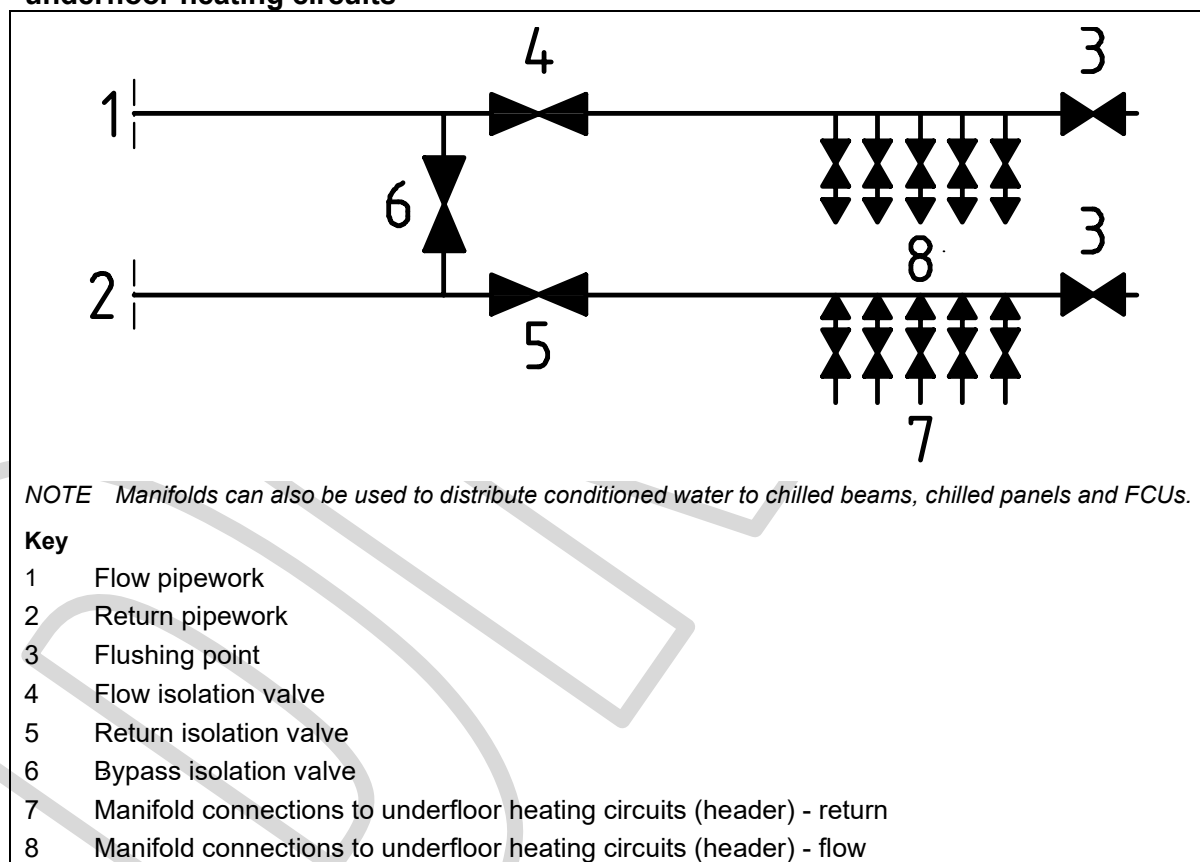
NOTE This is to avoid additional restrictions to the terminal unit flush velocity.

4.2.4 Flushing facilities for underfloor heating systems

Manifolds for underfloor heating should have isolation valves on the flow and return pipework serving the flow and return headers, and a flushing bypass between the flow and return pipework located before these headers.

Flushing points should be installed on the end of the flow and return headers to enable flushing of each individual sub-circuit served by the manifolds (see Figure 3).

Figure 3 – Flushing bypass arrangement for manifold distribution system serving underfloor heating circuits



Where underfloor circuits have been filled and left static for a period of time before the rest of a system is flushed and cleaned, a biocide wash should be included in the cleaning of these circuits.