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- Code of practice

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Introduction

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Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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Water treatment for small volume heating and cooling systems in residential dwellings (including apartments) – Code of practice

Version 7

DPC

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Foreword

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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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

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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.

This is a new standard which is designed to assist installers and can be read in conjunction with BS 7593. In particular, BS 8693 relates to new systems:

- offering advice to designers;
- clarifying cleaning methodologies; and
- clarifying requirements for validation of water quality at handover or practical completion.

1 Scope

This British Standard gives recommendations on good practice for the preparation of new systems circulating water in open vented closed systems or sealed heating and cooling systems. The systems can be individual domestic premises or as part of a commercial enterprise, residential development or district heating and cooling system.

This British Standard covers design, material selection, pre-commission cleaning and validation of water quality at handover or practical completion of heating and cooling systems and can be used by designers, installers, project managers and water treatment companies.

This British Standards applies to individual heating and cooling circuits within individual dwellings in single or multiple residential premises with a maximum system volume of 250 l.

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

NOTE 1 For specified 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 2 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 [13].

2 Normative references

The following referenced documents are indispensable for the application of this document. 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 7593:2019, *Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling systems*

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*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this British Standard the following definitions apply.

3.1.1 2-port control valve

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

3.1.2 batch work flushing

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

3.1.3 cooling interface units (CIU)

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

3.1.4 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.

3.1.5 dead-leg

any 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

3.1.6 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

3.1.7 heat interface units (HIU)

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

3.1.8 flushing rig

temporary pipework and pumps used to flush and clean systems

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

3.1.9 foul water drainage

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

3.1.10 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.

3.1.11 open vented closed system

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

3.1.12 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

3.1.13 premises

private domestic accommodation either owned or rented

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

3.1.14 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 against system pressure changes as flow to other units on the system open or close to flow.

3.1.15 sealed system

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

3.1.16 terminal unit

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

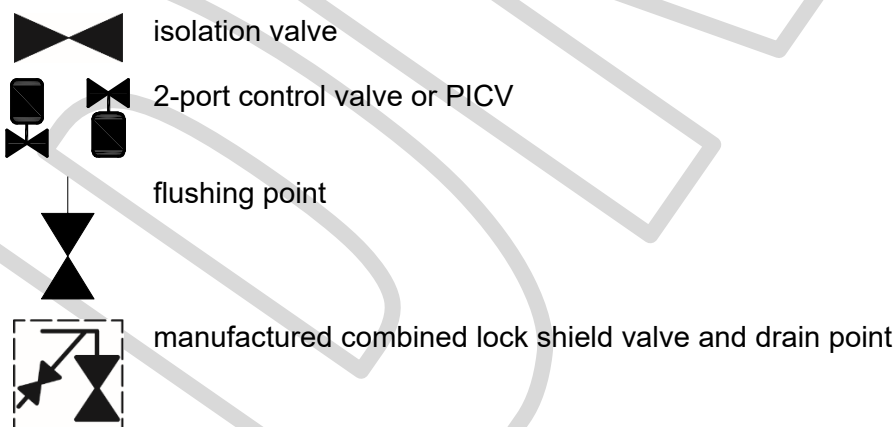
NOTE 1 Examples include radiators, towel rails, fan coil units (FCUs), underfloor heating zones and chilled beams or radiant panels.

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

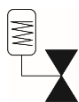
3.1.17 thermostatically controlled radiator valve (TRV)

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

3.2 Symbols



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thermostatic radiator valve



manual adjusted diverting valve

DRAFT

4 System design and installation

4.1 General

Systems should be designed and installed in such a way as to facilitate flushing and cleaning.

4.2 Accessibility and maintainability

4.2.1 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, using buckets to catch residues need to fit below the strainer.

All pipework and valves should be labelled to facilitate maintenance.

4.2.2 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.

4.2.3 Air vents and drain points

COMMENTARY ON 4.2.3

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

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 or 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 and should be located 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.

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

NOTE 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.

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

All water treatment cleaning regimes should include dynamic flushing.

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

4.3 Protection for sensitive plant and terminal units

4.3.1 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.

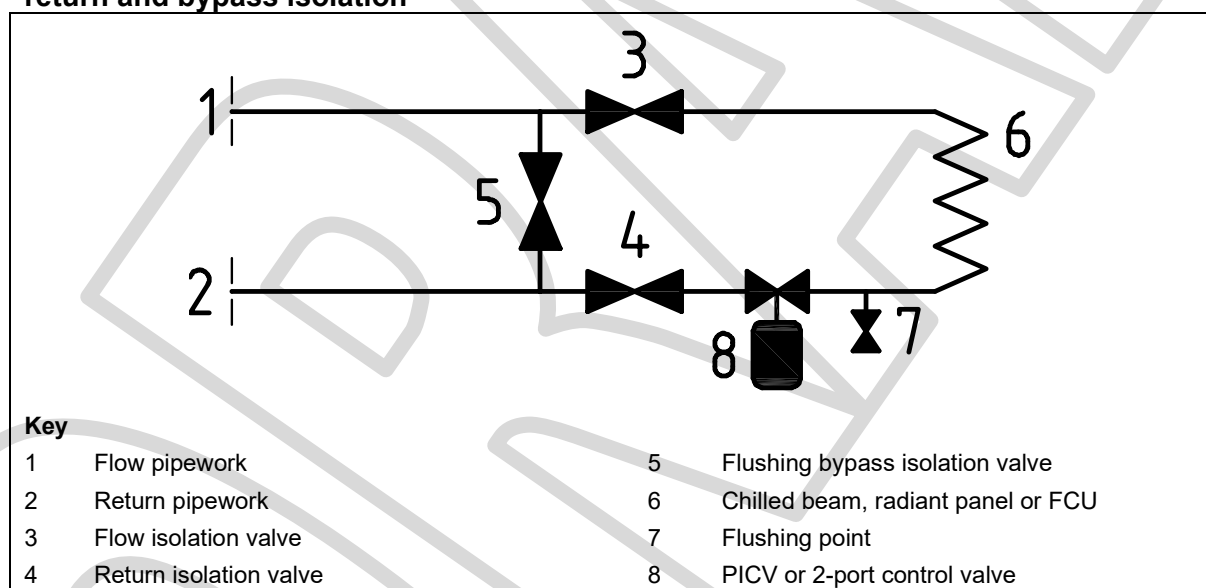
4.3.2 Bypasses for terminal units and plant items

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, HIU, CIU and boilers and separate isolation of the bypass.

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.

NOTE 4 If this is not possible the installer or water treatment company need to 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 where the operation of the isolation valve does not prevent water from entering the coil

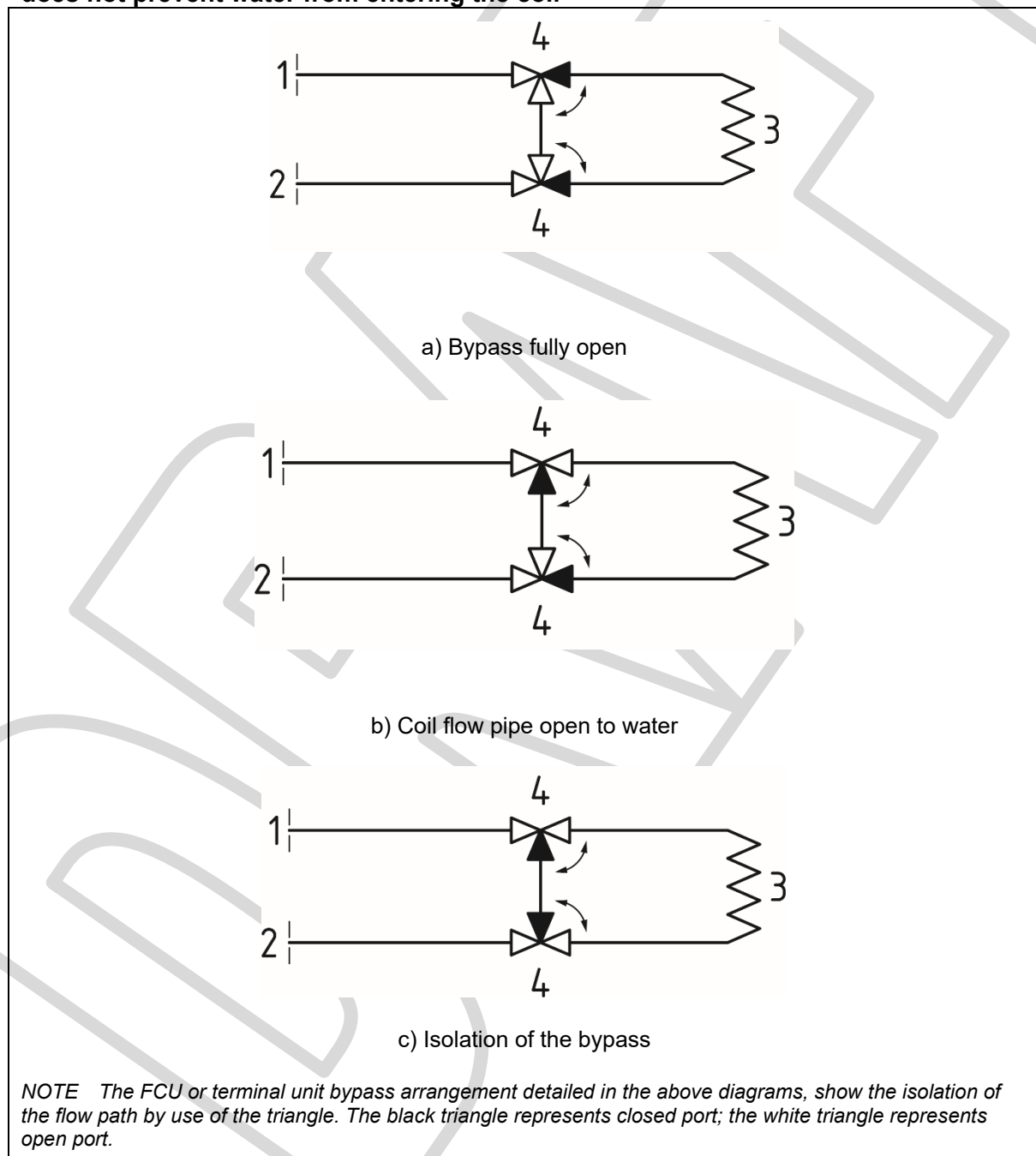


Figure 2 – Flushing bypass arrangement where the operation of the isolation valve does not prevent water from entering the coil

(a) Figure 2a shows isolation of the terminal unit, bypass fully open.

(b) Figure 2b shows isolation of the flushing bypass, which opens the coil flow pipe open to water.

(c) Figure 2c shows full flow through the coil and isolation of the bypass.

Key

- 1 Flow pipework
- 2 Return pipework
- 3 Chilled beam, radiant panel or FCU
- 4 Manual diverting valve

Terminal units should not be filled until they are incorporated into the final flush which is undertaken after the pipework has been cleaned.

4.3.3 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).

The 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 which should be 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.

4.3.4 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

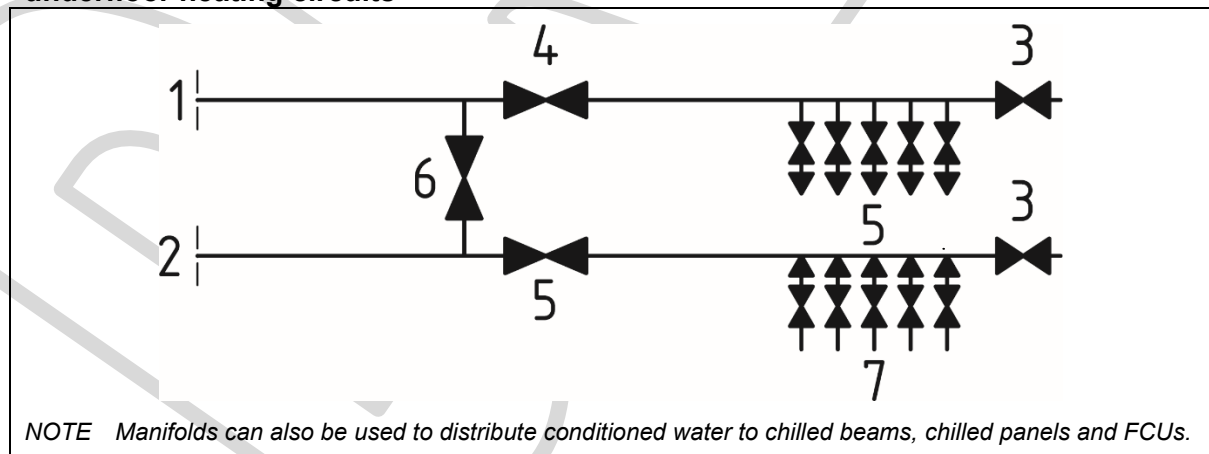


Figure 3 – Flushing bypass arrangement for manifold distribution system serving underfloor heating circuits

Key

- | | |
|---|--|
| 1 | Flow pipework |
| 2 | Return pipework |
| 3 | Flushing point |
| 4 | Flow isolation valve |
| 5 | Return isolation valve |
| 6 | Bypass isolation valve |
| 7 | Manifold connections to underfloor heating circuits (header) |

Where underfloor circuits have been filled 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.

NOTE 1 Underfloor circuits might need to be filled for a long period of time before the system is cleaned. This is because following installation and pressure test, the installers monitor the pipework integrity by reviewing the pipeline pressure. Also, it might be necessary to condition the screed flooring well in advance of the flushing and cleaning. A temporary boiler can be used to gradually heat up the circuits.

NOTE 2 Uncleaned and untreated circuits are susceptible to growth of bacteria and biofilm growth. Once the circuits are connected to the remainder of the system, the bacteria will distribute into the circulating water.

NOTE 3 Primary flushing through the headers using a temporary or permanent bypass at the end of headers is not recommended if debris can fall out of suspension and deposit on the back of isolation valves to each sub-circuit which are generally located in the vertical pipe below the headers.

4.3.5 Flushing facilities for radiators

4.3.5.1 General

During the flushing of the heating system the radiators and associated valves should be protected from the ingress of debris.

Radiators should not be used as flushing routes during dynamic flushing due to the risk that debris will accumulate in them. The pipework serving the radiators should be configured to include circuit bypass(es) to enable the distribution pipework to be correctly dynamic flushed without having radiators on-line.

To avoid the early onset of corrosion and stagnation of water, radiators should not be filled before the final terminal unit flush stage. See Clause 7.

4.3.5.2 Radiators

COMMENTARY ON 4.3.5.2

Traditionally, radiators have not been viewed as vulnerable terminal units and attention has not been given to radiators including associated sensitive components when designing a water treatment program. Debris that is forced into radiators or valves can be extremely difficult to remove, and stagnation of water within a radiator might encourage the growth of bacteria or initiate corrosion or both.

Steel panel radiators are susceptible to corrosion when water conditions within the radiator are poor. These conditions can arise during manufacture, transport and storage and during installation or after pressure testing.

Radiators are usually controlled by thermostatically controlled radiator valves (TRVs), typically installed on the flow connection of the radiator, with lock-shield valves (LSVs) installed on the opposite ends.

TRVs provide two operations: firstly to control the flow of heating water to the radiator, responding to the increase or decrease in room air temperature – opening or closing the valve as required; secondly to isolate the radiator, although for absolute isolation the TRV head needs to be removed and replaced by an isolating cap.

LSVs also provide two operations: firstly, to balance flow between radiators; secondly to isolate the radiator.

To enable proper control (TRVs) and balancing (LSVs) the control seat and orifices of both valve types are very small and thus prone to blockage from debris.

Certain brands of TRV need to be installed on the return ends of radiators, and others are bi-directional (allowing installation at either end).