



Department of  
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# **Building Regulations (Northern Ireland) 2011**

## **Proposed Guidance Edition**

**of**

## **Technical Booklet P**

# **Sanitary appliances, unvented hot water storage systems and reducing the risk of scalding**

## **Draft for Consultation**

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Technical Booklet P

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# Introduction

## Technical Booklets

### Purpose of the Technical Booklets

This Technical Booklet is one of a series that has been prepared by the Department of Finance and Personnel (the Department) for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 20xx (the Building Regulations).

Technical Booklets give practical guidance for most of the more common building situations. If this guidance is followed there will be a presumption of compliance with the requirements of the Building Regulations covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance. For example, if one particular case is unusual in some way, then normal guidance may not be applicable. It is also important to note that there may be alternative ways of achieving compliance with the relevant requirements. There is therefore no obligation to follow the methods or comply with the standards set out in a Technical Booklet if you prefer to meet the requirements in some other way.

## This Technical Booklet

### Requirements

The guidance contained in this Technical Booklet relates only to the requirements of regulations P1, P5, and P6. Regulations P2, P3 and P4 are prescriptive regulations which do not require guidance to aid compliance. The work will also have to comply with all other requirements of the relevant Building Regulations.

### Diagrams

The diagrams in this Technical Booklet supplement the text. They do not show all the details of construction and are not intended to illustrate compliance with any other requirement of the Building Regulations. They are not necessarily to scale and should not be used as working details.

### British Standards and European Technical Specifications

The Building Regulations are made for the following specific purposes, securing the health, safety, welfare and convenience of people; furthering the conservation of fuel and power; furthering the protection and enhancement of the environment and promoting sustainable development. Standards and technical approvals are relevant guidance to the extent that they relate to these purposes. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Building Regulations.

In this introduction and throughout this Technical Booklet any reference to a British Standard shall be construed as a reference to —

- (a) a British Standard or a British Standard Code of Practice;

- (b) a harmonised standard or other relevant standard of a national standards body of any Member State of the European Economic Area;
- (c) an international standard recognised for use in any Member State of the European Economic Area;
- (d) any appropriate, traditional procedure of manufacture of a Member State of the European Economic Area which has a technical description sufficiently detailed to permit an assessment of the goods or materials for the use specified; or
- (e) a European Technical Approval issued in accordance with the Construction Products Directive,

provided that the proposed standard, code of practice, specification, technical description or European Technical Approval provides, in use, equivalent levels of safety, suitability and fitness for purpose as that provided by the British Standard.

The Department intends from time to time to review the guidance in its Technical Booklets to reflect emerging European harmonised standards. Where a national standard is to be replaced by a European harmonised standard, there will be a co-existence period during which either standard may be referred to. At the end of the co-existence period the national standard will be withdrawn.

### **Products conforming with a European Council Directive**

Any product designed and manufactured to comply with the requirements of a European Council Directive does not have to comply with any other standard or part of a standard, whether British, International or other, which relates to the same characteristic or specific purpose as the EC Directive.

### **CE marked construction products**

Any construction product (within the meaning of the Construction Products Directive) which bears a CE marking shall be treated as if it satisfied the requirements of any appropriate British Standard, British Standard Code of Practice or British Board of Agrément Certificate relating to such a product, where the CE marking relates to the same characteristic or specific purpose as the Standard, Code of Practice or Certificate.

(It is the intention of the Department to review this Introduction to recognise the implementation of new arrangements regarding construction products and CE marking under Regulation (EU) No 305/2011 which will come fully into effect on 1 July 2013.)

### **Named standards**

Where this Technical Booklet makes reference to a named standard, the relevant version of the standard is the one listed in Appendix A. However, if this version has been replaced or updated by the issuing standards body, the new version may be used as a source of guidance provided that it continues to address the relevant requirements of the Building Regulations.

## **Materials and workmanship**

Any work to which a requirement of the Building Regulations applies must, in accordance with Part B of the Building Regulations, be carried out with suitable materials and in a workmanlike manner. **You will find guidance in relation to this in Technical Booklet B (Materials and workmanship).**

## **Interaction with other legislation**

The provisions of this Technical Booklet relate to the requirements of the Building Regulations and do not include measures which may be necessary to meet the requirements of other legislation. Such other legislation generally operates when a building is brought into use and extends to cover aspects which are outside the scope of the Building Regulations.

### **The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993**

The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993 (the Workplace Regulations) contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see – The Workplace Regulations and the *Workplace Health, Safety and Welfare Approved Code of Practice*.

The Workplace Regulations apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this Part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.



# The Regulations

It should be noted that the following regulations are the requirements of Part P of the Building Regulations (Northern Ireland) 20XX. All parts of the regulation must be read in conjunction with Part A: Interpretation and general of those regulations.

## PART P

### Sanitary appliances, unvented hot water storage systems and reducing the risk of scalding

#### P1 Application and interpretation

(1) Regulation P6 applies when a dwelling is —

- (a) erected; or
- (b) formed by a material change of use.

(2) In this Part —

DOMESTIC HOT WATER means water that has been heated for ablution, culinary and cleansing purposes irrespective of the type of building;

SANITARY ACCOMMODATION means a room or space which contains a water closet or urinal whether or not it contains other sanitary appliances;

SANITARY APPLIANCES includes a water closet or urinal and a bath, shower, wash-hand basin, bidet or other fitting for ablutionary purposes;

SANITARY PIPEWORK and UNDERGROUND FOUL DRAINAGE have the meaning assigned to them by regulation N1; and

URINAL includes one or more slabs, stalls, troughs, bowls and other suitable receptacles.

#### P2 Provision of sanitary appliances

(1) A dwelling shall have at least one water closet, one wash-hand basin and one fixed bath or shower.

(2) A wash-hand basin shall be provided, in the case of—

- (a) a dwelling — either in the same room as a water closet or in an adjoining room; and
- (b) any other building — either in the same room as a water closet or in an adjoining room which provides the sole means of access to the room containing the water closet:

provided that where the wash-hand basin is located in the adjoining room, that room is not used for the preparation of food.

(3) A water closet fitted with a macerator shall not be provided in any building unless the building has another water closet, accessible to all occupants, which discharges directly to sanitary pipework or underground foul drainage.

#### P3 Sanitary appliances

(1) Every sanitary appliance shall have smooth and readily cleansed, non-absorbent surfaces and shall discharge through an effective trap of suitable dimensions.

(2) Every wash-hand basin, bath and shower shall have provision for the piped supply of hot and cold water and where a sequential single control mixer valve is provided it shall start from the cold supply.

(3) Every water closet and urinal shall have flushing apparatus capable of effectively cleansing the receptacle, no part of which shall be directly connected to any pipe other than a flush pipe or sanitary pipework.

(4) The outlet of an urinal shall have an effective grating.

(5) A sanitary appliance fitted with a macerator, pump and drainage pipe shall ensure the hygienic conveyance of foul water to an underground foul drainage system.

#### **P4 Sanitary accommodation**

(1) Sanitary accommodation in any building other than a dwelling shall not open directly into a room used for kitchen purposes.

(2) Any sanitary accommodation which can be entered directly from a room used for sleeping purposes, shall be so constructed that it can also be entered without passing through any such room, but this paragraph shall not apply if in the case of—

- (a) a dwelling — there is other such sanitary accommodation within the dwelling which can be entered without passing through any such room; or
- (b) any other building — there is within the building other such sanitary accommodation which is available for common use.

#### **P5 Unvented hot water storage systems**

(1) This regulation shall apply to any hot water storage system (other than a system or part of a system used solely for space heating or an industrial process) that has a storage vessel which—

- (a) has a capacity greater than 15 litres; and
- (b) does not incorporate a vent pipe to the atmosphere.

(2) A hot water storage system to which this regulation applies, whether heated directly or indirectly, shall incorporate—

- (a) safety devices to ensure that the temperature of the stored water does not exceed 100 °C at any time; and
- (b) devices to control the working pressure and to relieve excessive pressure.

(3) Any discharge from devices provided for the purpose of paragraph (2) shall be conveyed safely to where it can be seen readily and will cause no danger to people.

#### **P6 Reducing the risk of scalding**

(1) The domestic hot water distribution system shall be so designed and installed as to incorporate measures to ensure that the temperature of water that can be delivered is not excessive; and

(2) The hot water supply to any fixed bath shall be so designed and installed as to incorporate measures to ensure that the temperature of water that can be delivered to that bath does not exceed 48 °C.

## Guidance - Performance and introduction to provisions

It is the Department's view that the requirements of regulations in Part P will be met provided that the following provisions are made –

**Regulation**      **P2 Provision of sanitary appliances**  
**P3 Sanitary appliances**  
**P4 Sanitary accommodation**

0.1      These are prescriptive regulations that must be followed therefore no guidance is given in this Technical Booklet

**Regulation**      **P5 Unvented hot water storage systems**

0.2      Any hot water storage system with no vent pipe to the atmosphere (other than a system or part of a system used solely for space heating or an industrial process) with a capacity greater than 15 litres must –

- (a) be installed by a competent person;
- (b) have safety devices that –
  - (i) prevent the temperature of the stored water at any time to exceed 100 °C; and
  - (ii) control the working pressure and relieve excessive pressure; and
- (c) allow any discharge for the purposes of temperature and pressure relief (see paragraph 0.2(b)) to be conveyed safely to where it can be readily seen without causing danger to people in or about the building.

**Regulation**      **P6 Reducing the risk of scalding**

0.3      Any domestic hot water distribution system should be designed and installed, to include measures to minimise the risk of scalding.

## Section 1 General

- 1.1 This Section contains provisions for an unvented hot water storage system.
- All the components within the system **should** be of adequate strength and capable of safely withstanding the temperatures and pressures.

### Definitions

- 1.2 In this Technical Booklet the following definitions apply –

**Package** – an unvented hot water storage system having factory fitted safety devices together with a kit containing pressure and other devices supplied by the package manufacturer, to be fitted by the installer (see Diagram 1.1).

**Unit** – an unvented hot water storage system having safety devices and all other devices factory fitted by the unit manufacturer (see Diagram 1.2).

**Unvented hot water storage system** – includes a system with an unvented vessel for either –

- (a) storing domestic hot water for subsequent use; or
- (b) heating domestic hot water as it passes through an integral coil or pipe (e.g. water jacketed tube heater or combi boiler).

### Limitation on heating sources

- 1.3 An unvented hot water storage system should not be heated –
- (a) directly by a solid fuel heating appliance; or
  - (b) indirectly by a sealed primary circuit which is heated by a solid fuel heating appliance.

### Installation

- 1.4 The installation must be carried out by a person holding a current Registered Operative Identity Card for the installation of unvented hot water storage systems issued by –
- (a) the Association of Installers of Unvented Hot Water Storage Systems (Scotland and Northern Ireland);
  - (b) the Institute of Plumbing;
  - (c) the Construction Industry Training Board; or
  - (d) an equivalent body.

Diagram 1.1 Unvented hot water storage system — Package \*

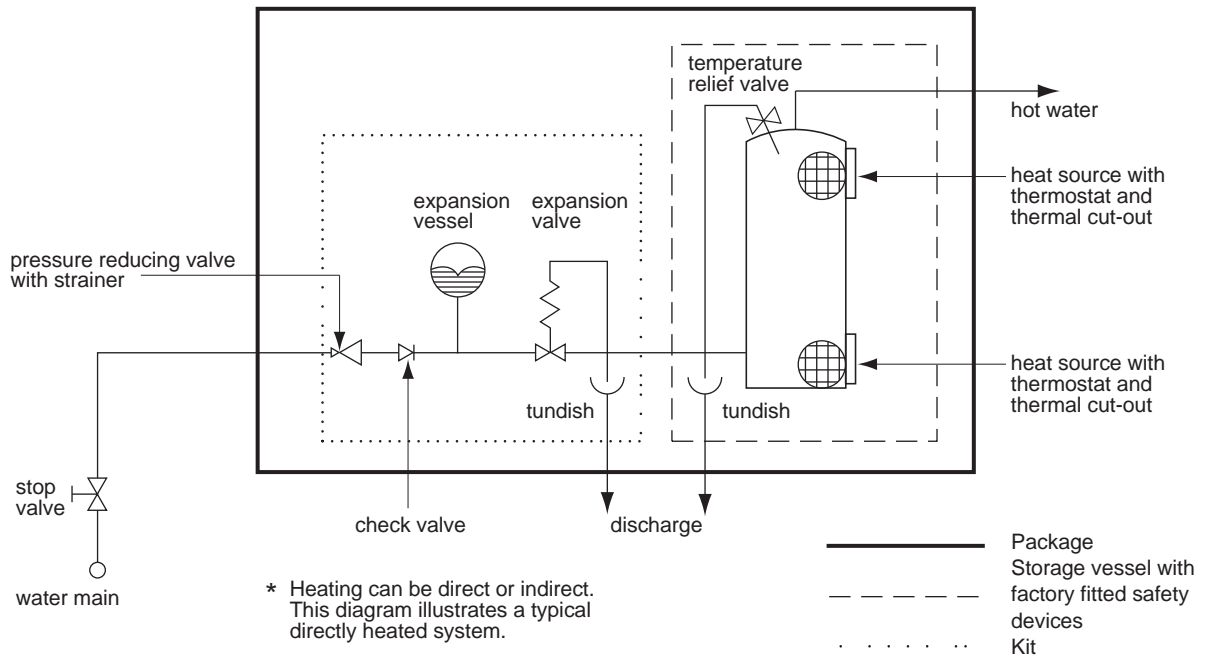
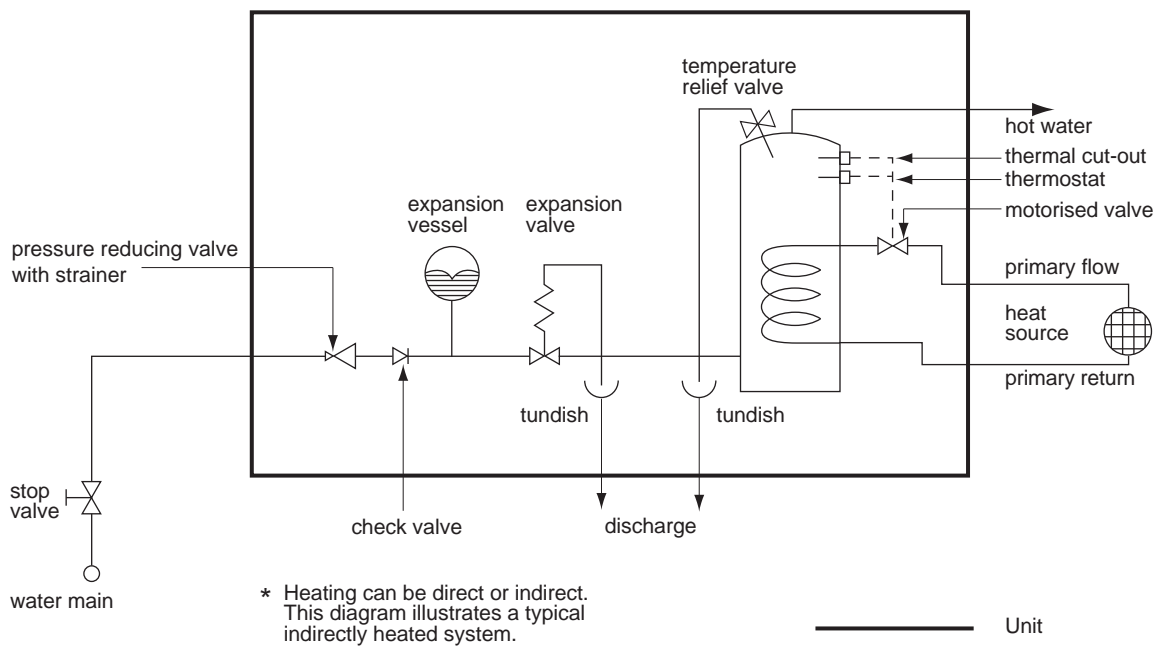


Diagram 1.2 Unvented hot water storage system — Unit \*



## Section 2 Unvented hot water storage systems

- 2.1 To minimise the danger from excessive pressure, unvented hot water storage systems should incorporate a minimum of two independent safety devices in addition to any thermostat provided to control the desired temperature of the stored water.

The selection of safety devices should take account of the physical location of the devices, and the design, configuration, location of components and performance characteristics of the system to which they are attached.

- 2.2 One approach might consist of –
- (a) a non self-resetting energy cut-out to disconnect the supply of heat to the storage vessel in the event of the storage system overheating; and
  - (b) a temperature relief valve or a combined temperature and pressure relief valve to safely discharge the water in the event of serious overheating.

Alternative approaches that provide an equivalent degree of safety may be acceptable.

- 2.3 Temperature relief valves and combined temperature and pressure relief valves should not be used in systems which have no provision to automatically replenish the stored water (e.g. unvented primary thermal storage vessels). In such cases there should be a second non self-resetting energy cut-out independent of the one provided at paragraph 2.2(a).
- 2.4 Any product designed and manufactured to comply with the requirements of a European Council Directive [e.g. 97/23/EC (Pressure Equipment Directive) or 2009/142/EC (Gas Appliances Directive), implemented by the Gas Appliances (Safety) Regulations 1995 (SI 1995/1629)], does not have to comply with any other standard or part of a standard, whether British, International or other which relates to the same characteristic or specific purpose as the EC Directive.

### SYSTEMS WITH A STORAGE VESSEL UP TO 500 LITRES AND 45 KW

- 2.5 The guidance under this heading contains provisions for an unvented hot water storage system, whether heated directly or indirectly, having a storage vessel which has a capacity of not more than 500 litres and a power input of not more than 45 kW.

#### Unvented hot water storage systems

- 2.6 An unvented hot water storage system should –
- (a) comply with BS 6700: 2006+ A1: 2009 or BS EN 12897: 2006;
  - (b) be a unit or package which has been certified –
    - (i) as meeting the relevant requirements of regulation P5 by a member body of the European Organisation for Technical Approvals (EOTA) operating a Technical Approvals Scheme (e.g. the British Board of Agrément under MOAT 38: 1986); or

- (ii) by a certification body having National Accreditation Council for Certification Bodies (NACCB) accreditation as complying with BS EN 12897: 2006;
- (c) have controls over the heating source or sources complying with paragraph 2.7;
- (d) have a tundish or tundishes complying with paragraph 2.13; and
- (e) have a suitable discharge pipe or pipes complying with paragraphs 2.14 to 2.17.

### Control on heating sources

- 2.7 Devices to control the heating source or sources should be supplied by the manufacturer as part of the unit or package, and should comply with paragraphs 2.9 and 2.10.

However, an indirectly heated system, which incorporates a boiler, may have the thermal cut-out on the boiler.

## SYSTEMS WITH A STORAGE VESSEL OVER 500 LITRES OR OVER 45 KW

- 2.8 An unvented hot water storage system, whether heated directly or indirectly, having a storage vessel which has a capacity of more than 500 litres or a power input of more than 45 kW will generally be an individual design for a specific project.

The system should generally comply with BS 6700: 2006+ A1: 2009 or BS EN 12897: 2006, as qualified by paragraphs 2.9 to 2.13.

## Safety devices

### Temperature

- 2.9 An unvented hot water storage system should have the following safety devices to limit the temperature of the stored water –
- (a) a non self-resetting thermal cut-out on each heating source, complying with either –
    - (i) BS EN 60335-2-73: 2003+ A2: 2009; or
    - (ii) BS EN 257: 2010, when the stored water is heated by a gas burning appliance; and
  - (b) one or more temperature relief valves to BS 6283 Part 2: 1991 or BS EN 1490: 2000 which have a total discharge capacity (measured in accordance with Appendix F of BS 6283: Part 2: 1991 or BS EN 1490: 2000) at least equal to the power input to the water.

These safety devices should be factory fitted and located directly on the storage vessel, operate in sequence as the temperature rises and be additional to any thermostatic device fitted to control the temperature of the stored water.

- 2.10 Where the system is indirectly heated the non self-resetting thermal cut-out should be wired to a motorised valve or some other device which is –
- (a) approved by a member of EOTA; or
  - (b) approved by a body having NACCB accreditation,
- as being capable of shutting off the flow to the primary heater.

However, an indirectly heated system, which incorporates a boiler, may have the thermal cut-out on the boiler.

### Pressure devices

- 2.11 An unvented hot water storage system should have the following devices to control the pressure within the system –
- (a) a pressure reducing valve complying with **BS EN 1567: 1999**; and
  - (b) an expansion valve complying with **BS EN1491: 2000**.

### Other devices

- 2.12 An unvented hot water storage system should also have –
- (a) a check valve complying with **BS EN 13959: 2004** to prevent the expansion of water to the cold supply; and
  - (b) an expansion vessel complying with BS 6144: 1990 sized to accommodate all the expansion of the water on heating.

### Tundishes

- 2.13 Each temperature relief valve and expansion valve should discharge through a metal pipe either individually, or via a manifold, to a tundish incorporating an air break.

Where the discharge is individual, the pipe size between the valve and the tundish, should be not less than the nominal outlet size of the valve.

Where a manifold is used it should be so sized that it can accept the total discharges from the valves connected to it.

Where discharges from safety devices may not be apparent (i.e. in dwellings occupied by people with impaired vision or mobility), consideration should be given to the installation of a suitable safety device to warn when discharge takes place (e.g. electronically operated).

The tundish should be located –

- (a) vertically;
- (b) not more than 500 mm horizontally from any valve discharging to it;
- (c) where it can be readily seen but not create a hazard; and
- (d) in the case of a temperature relief valve – in the same space as the storage vessel.

The tundish should be connected to a discharge pipe complying with **paragraphs 2.14 to 2.17**.

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## DISCHARGE PIPES FROM TUNDISHES

### General

- 2.14 A discharge pipe from a tundish should –
- (a) be made of –
    - (i) metal; **or**
    - (ii) other material that has been demonstrated to be capable of safely withstanding the temperatures of the water discharged and is clearly and permanently marked to identify the product and performance standard (e.g. as specified in the relevant part of BS 7291-1: 2006);
  - (b) be at least one pipe size larger than the outlet from the safety device or manifold discharging to the tundish;
  - (c) be no longer than the equivalent in hydraulic resistance of a straight 9 m length of pipe unless its size is increased in accordance with paragraph 2.15;
  - (d) have a vertical section of not less than 300 mm long below the tundish before any elbows or bends in the pipework (see Diagram 2.1); and
  - (e) have a continuous fall.

- 2.15 In calculating the hydraulic resistance of a discharge pipe the resistance of straight lengths, elbows and bends should be taken into account.

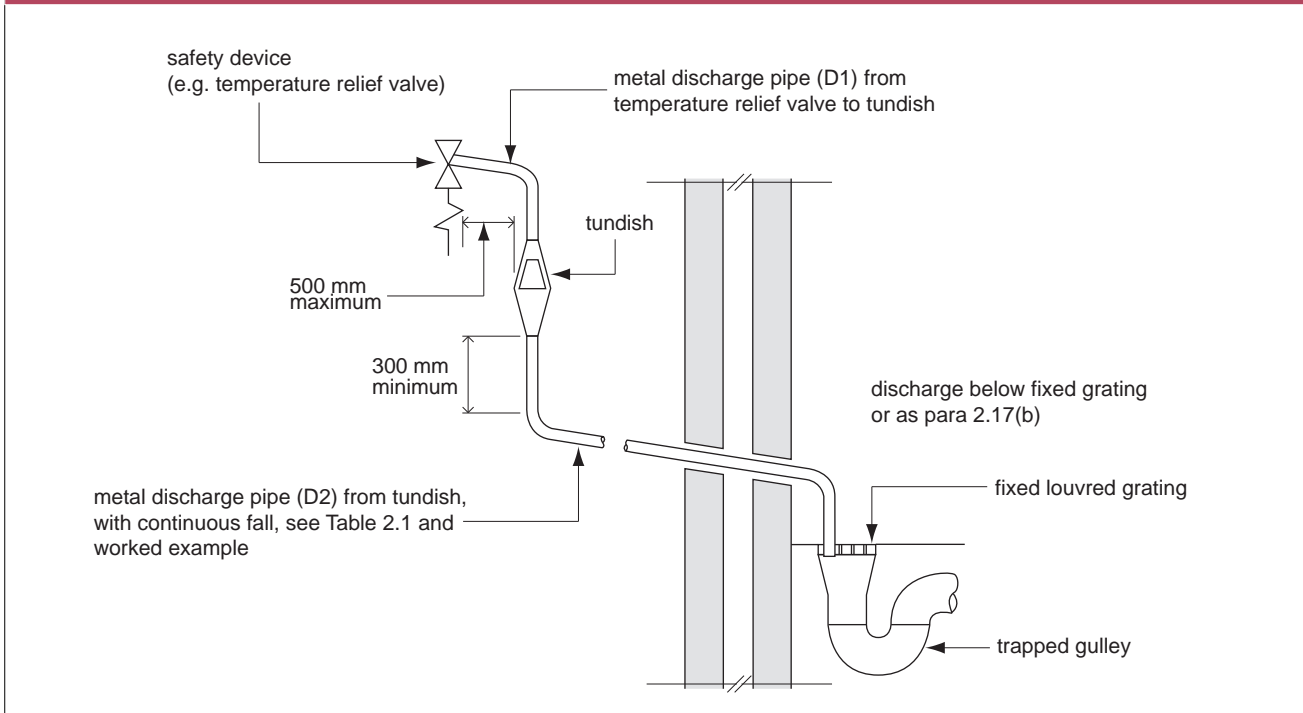
If a discharge pipe is of copper its size should be calculated using the values given in Table 2.1 and the method shown in the worked example.

### Visibility of discharge

- 2.16 The discharge from a safety device which may consist of scalding water and steam, should be visible at the tundish and should also be visible at the final point of discharge.
- 2.17 Acceptable discharge arrangements include –
- (a) below a fixed louvred grating and above the water seal in a trapped gulley (see Diagram 2.1); **or**
  - (b) downward discharge at low level but no less than 100 mm above external surfaces and having a wire cage or suitable guard to prevent contact.

Where a number of discharge pipes are grouped together each discharge pipe should be marked to make the system which is discharging readily identifiable.

**Diagram 2.1 Typical discharge pipe arrangement**



**Table 2.1 Sizing of copper discharge pipe ‘D2’ for common temperature relief valve outlet sizes**

Valve outlet size	Minimum size of discharge pipe D1*	Minimum size of discharge pipe D2* from tundish	Maximum resistance allowed, expressed as a length of straight pipe (ie. no elbows or bends)	Resistance created by each elbow or bend
G½	15 mm	22 mm 28 mm 35 mm	up to 9 m up to 18 m up to 27 m	0.8 m 1.0 m 1.4 m
G¾	22 mm	28 mm 35 mm 42 mm	up to 9 m up to 18 m up to 27 m	1.0 m 1.4 m 1.7 m
G1	28 mm	35 mm 42 mm 54 mm	up to 9 m up to 18 m up to 27 m	1.4 m 1.7 m 2.3 m

\* See paragraphs 2.9(b), Section 2 and Diagram 2.1.

**Worked example**

The example below is for a G½ temperature relief valve with a discharge pipe (D2) having 4 No elbows and a length of 7 m from the tundish to the point of discharge.

From Table 2.1.

Maximum resistance allowed for a straight length of 22 mm copper discharge pipe (D2) from a G½ temperature relief valve equates to: 9 m.

Subtract the resistance for 4 No 22 mm elbows at 0.8 m each = 3.2 m.

Therefore the maximum permitted length equates to: 5.8 m.

5.8 m is less than the actual length of 7 m therefore calculate the next largest size.

Maximum resistance allowed for a straight length of 28 mm pipe (D2) from a G½ temperature relief valve equates to: 18 m.

Subtract the resistance for 4 No 28 mm elbows at 1 m each = 4 m.

Therefore the maximum permitted length equates to: 14 m.

As the actual length is 7 m, a 28 mm (D2) copper pipe will be satisfactory.

## Section 3 Reducing the risk of scalding

### Prevention of excessive domestic hot water temperatures

- 3.1 Where the operating temperature of domestic hot water in the storage vessel in a dwelling is capable of exceeding 80 °C under normal operating conditions (a situation that may occur in vessels used as heat stores and those connected to solar heat collectors or solid fuel boilers that do not have intervening controls between the boiler and the vessel containing the hot water) the outlet from the storage vessel should be fitted with a device, such as an in-line hot water supply tempering valve in accordance with BS EN 15092: 2008. The in-line hot water tempering valve should be set/adjusted to ensure that the temperature supplied to the domestic hot water distribution system does not exceed 60 °C.

### Reducing the risk of scalding at bath

- 3.2 The hot water supply temperature to a bath should be limited to a maximum of 48 °C by the use of an in-line blending valve or other appropriate temperature control device, with a maximum temperature stop and a suitable arrangement of pipework.
- 3.3 The acceptability of in-line blending valves can be demonstrated by compliance with the relevant harmonised European Standard such as BS EN 1111: 1999 or BS EN 1287: 1999 to demonstrate that the maximum temperature of 48 °C cannot be exceeded in operation and that the product will fail-safe (i.e. not discharge water above the maximum temperature). Such valves should not be easily altered by building users.
- 3.4 In-line blending valves and composite thermostatic mixing valves (TMVs) should be compatible with the sources of hot and cold water that serve them.
- 3.4 The length of supply pipes between in-line blending valves and final outlets should be kept to a minimum in order to prevent colonisation by waterborne pathogens. Where intermittent use of a bath is anticipated, consideration should be given to high temperature flushing to allow for pasteurisation of the pipes and outlet fittings. This should be configured and operated in such a manner that prevents inadvertent high temperature use.
- 3.6 Further guidance on the use of in-line blending valves can be found in BRE Information paper IP14/03 *Preventing hot water scalding in bathrooms: using TMVs*.

## Appendix A Publications referred to

BS 6144: 1990 Specification for expansion vessels using an internal diaphragm, for unvented hot water supply systems.

BS 6283: Safety and control devices for use in hot water systems.

Part 2: 1991 Specification for temperature relief valves for pressures from 1 bar to 10 bar.

BS 6700: 2006+A1:2009 Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages Specification

BS 7291-1: 2006 Thermostatic pipes and fittings for hot and cold water for domestic purposes and heating installations in buildings. General requirements.

BS EN 257: 2010 Mechanical thermostats for gas-burning appliances.

BS EN 1111: 1999 Sanitary tapware. Thermostatic mixing valves (PN 10). General technical specification.

BS EN 1287: 1999 Sanitary tapware. Low pressure thermostatic mixing valves. General technical specification.

BS EN 1490: 2000 Building valves. Combined temperature and pressure relief valves. Tests and requirements.

BS EN 1491: 2000 Building valves. Expansion valves. Tests and requirements.

BS EN 1567: 1999 Building valves. Water pressure reducing valves and combination water reducing valves. Requirements and tests.

BS EN 12897: 2006 Water supply. Specification for indirectly heated unvented (closed) storage water heaters.

BS EN 13959: 2004 Anti-pollution check valves. DN 6 to DN 250 inclusive Family E type A, B, C and D.

BS EN 15092: 2008 Building Valves.

BS EN 60335-2-73: 2003+ A2:2009 Household and similar electrical appliances. Safety. Particular requirements for fixed immersion heaters.

British Board of Agrèment MOAT 38: 1986 The Assessment of Unvented Hot Water Storage Systems and the Approval and Surveillance of Installers.

BRE Information paper IP14/03 Preventing hot water scalding in bathrooms: using TMVs.

