

Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70 kW

ICS 91.140.65

Committees responsible for this British Standard

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- BG plc
- British Flue and Chimney Manufacturers' Association
- Centrica
- Combustion Engineers' Association
- Consumer Policy Committee of BSI
- Council for Registered Gas Installers
- Department of Trade and Industry
- Gas Consumers' Council
- Health and Safety Executive
- Institute of Domestic Heating and Environmental Engineers
- Institution of Gas Engineers
- Liquified Petroleum Gas Industry Technical Association
- Society of British Gas Industries
- Co-opted members

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Contents

	Page
Committees responsible	Inside front cover
Foreword	iii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Selection of equipment and pre-installation	5
4.1 Exchange of information and planning	5
4.2 Selection of water heating appliance and system	5
4.3 Condensing appliances	7
4.4 Materials and components	11
5 Installation	11
5.1 Design	11
5.2 Water supply	21
5.3 Gas supply	26
5.4 Electricity supply	26
5.5 Installation of instantaneous water heaters	26
5.6 Installation of combination boilers	27
5.7 Installation of vented storage water heaters	27
5.8 Installation of unvented storage systems of capacity exceeding 15 l	28
5.9 Circulator installations	30
5.10 Boiler installations	31
5.11 Water-jacketed tube heater installations	32
5.12 Open-vented systems	33
5.13 Showers	37
6 Post-installation	39
6.1 Inspection	39
6.2 Commissioning	39
6.3 Advice to user	40
Annex A (informative) CORGI registration and competency	41
Bibliography	42
Figure 1 — Connection of condensate drainage pipe to soil and vent stack	12
Figure 2a) — Connection of a condensate drainage pipe downstream of a sink waste trap	43
Figure 2b) — Connection of a condensate drainage pipe upstream of a sink waste trap	43
Figure 3 — External termination of condensate drainage pipe	15
Figure 4 — Example of a purpose-made soakaway	16
Figure 5 — Circulator installation in cylinder/airing cupboard	20
Figure 6 — Example of a cistern conforming to 5.2.2.1	22
Figure 7 — Examples showing the clear space needed above storage cisterns	23
Figure 8 — Typical large instantaneous water heater installation on cistern supply	27
Figure 9 — Example of an indirect unvented (vented primary) storage system	29
Figure 10 — Typical direct circulating system	31

Figure 11 — Temporary connection to primary circuit	32
Figure 12 — Typical indirect circulating system	34
Table 1 — Maximum lengths of uninsulated hot water pipes	24
Table 2 — Vertical distance between draw-off tap and spillover level	24

Foreword

This British Standard has been prepared by Technical Committee GSE/30. It supersedes BS 5546:1990, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**.

The structure has been modified to follow the systematic approach used in other gas installation standards. Requirements, with corresponding commentary and recommendations, are organized under the main headings of equipment selection and pre-installation, installation, and post-installation.

The requirements of this specification are supported by recommendations. To comply with this specification, it is necessary to comply with all its requirements. The installer may depart from recommendations, but would be expected to have good reasons for doing so.

This standard allows manufacturers' instructions to recommend a method of installation, testing, commissioning or maintenance which differs in points of detail from this standard. This reference to manufacturers' instructions is allowed only where it will result in at least an equivalent level of safety. In such circumstances, it is important that the manufacturers' instructions are followed.

Dimensions shown in the figures in this standard are in millimetres unless otherwise indicated.

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 does not of itself confer immunity from legal obligations.

Attention is drawn to the following statutory regulations. The regulations may be amended from time to time, and whichever regulations are currently in force at the time an installation is carried out are to be complied with. The commentary in this British Standard reflects the state of the regulations in 2005.

a) ***The Gas Safety (Installation and Use) Regulations*** [1].

These control all aspects of the ways gas-fired systems are installed, maintained and used, mainly in domestic premises, and the classes of persons who may undertake gas work.

b) ***Building regulations*** (for the appropriate legislative region).

These control work carried out in the construction of new buildings or the extension of existing buildings. Detailed advice for England and Wales is given in Approved Documents [2], and for Northern Ireland, in Technical Booklets [3]. The Building (Scotland) Regulations 2004 [4] are functional Regulations and detailed guidance on these Regulations, with regard to the environment, is given in the Technical Handbook for domestic application, section 3 [4a].

c) ***The Water Supply (Water fittings) Regulations 1999*** (as amended) [5], or relevant Byelaws.

d) ***The Health and Safety at Work etc. Act 1974*** (as amended) [6].

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iii, a blank page, pages 1 to 43 and a back cover.

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1 Scope

This British Standard specifies requirements for the selection, installation, inspection and commissioning of gas-fired water-heating appliances of rated net input not exceeding 70 kW, which supply hot water for domestic purposes. It applies to appliances which use 1st, 2nd or 3rd family gases.

This British Standard does not apply to hot water supply systems in multiple dwellings supplied from a central source.

NOTE 1 In this standard, heat input is expressed in terms of net calorific values (CV) unless stated otherwise. The ratio of gross to net heat input is approximately 1.11:1 for natural gas, 1.09:1 for propane and 1.08:1 for butane.

NOTE 2 It is essential that persons carrying out the installation of any gas appliance be competent to do so. Annex A gives information about the legal requirements which relate to approved installers of gas appliances.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 476-4:1970, *Fire tests on building materials and structures — Part 4: Non-combustibility test for materials*.

BS 476-22, *Fire tests on building materials and structures — Part 22: Methods for the determination of the fire resistance of non-loadbearing elements of construction*.

BS 1179-6, *Glossary of terms used in the gas industry — Part 6: Combustion and utilization including installation at consumers' premises*.

BS 1566-2, *Copper indirect cylinders for domestic purposes — Part 2: Specification for single feed indirect cylinders*.

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

BS 3198, *Specification for copper hot water storage combination units for domestic purposes*.

BS 5440-1, *Installation of flues and ventilation for gas appliances of rated input not exceeding 60 kW (1st, 2nd and 3rd family gases) — Part 1: Specification for installation of flues*.

BS 5440-2, *Installation of flues and ventilation for gas appliances of rated input not exceeding 60 kW (1st, 2nd and 3rd family gases) — Part 2: Specification for installation and maintenance of ventilation for gas appliances*.

BS 5449, *Specification for forced circulation hot water central heating systems for domestic premises*.

BS 5482-1, *Domestic butane- and propane-gas-burning installations — Part 1: Specification for installations at permanent dwellings*.

BS 5482-2, *Domestic butane- and propane-gas-burning installations — Part 2: Installations in caravans and non-permanent dwellings*.

BS 5871-1, *Specification for installation of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances — Part 1: Gas fires, convector heaters and fire/back boilers (1st, 2nd and 3rd family gases)*.

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 6283-3, *Safety and control devices for use in hot water systems — Part 3: Specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar*.

BS 6700, *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*.

BS 6798, *Specification for installation of gas-fired boilers of rated input not exceeding 70 kW net*.

BS 6891, *Specification for installation of low pressure gas pipework of up to 28 mm (R1) in domestic premises (2nd family gas)*.

BS 7206, *Specification for unvented hot water storage units and packages*.

BS 7671, *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition*.

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 1179-6 apply, together with the following.

3.1

air vent

non-adjustable purpose-provided unit or assembly that is designed to allow permanent ventilation

3.2

back circulator unit

appliance with a rated net input of less than 6 kW designed for the production of stored sanitary hot water by gravity circulation, and which is designed to fit into a fireplace recess or a builder's opening

3.3

circulator

appliance with a rated net input of less than 6 kW which is designed for the production of stored sanitary hot water by gravity circulation

3.4

cistern

fixed container for holding water at atmospheric pressure

3.5

cold feed pipe

pipe that connects from a feed cistern to a cylinder, storage vessel, or to the primary side of a closed circuit

3.6

combination boiler

boiler designed to provide domestic hot water and hot water for central heating without the need for additional secondary storage

NOTE A combination boiler may include primary or secondary storage.

3.7

compartment

enclosure specifically designed or adapted to house an appliance, and which is not a habitable space

3.8

condensing appliance

appliance designed to make use of the latent heat in the combustion products by condensing water vapour within the appliance

3.9

direct cylinder

vessel for storing hot water that has been directly heated in a boiler or circulator

3.10

indirect cylinder

vessel in which stored water feeding a secondary circuit is heated by hot water in the primary circuit via a heat exchanger, without mixing of the primary or secondary water

3.11

double-feed indirect cylinder

indirect cylinder that requires separate feed cisterns to the primary and the secondary circuits

3.12

single-feed indirect cylinder

indirect cylinder which has only one cold feed pipe connection to supply both the primary and secondary circuits, so designed that the formation of an air seal during filling prevents mixing and accommodates the expansion of the primary water

3.13**distributing pipe**

pipe, other than a warning pipe, overflow pipe or flush pipe, which conveys water from a cistern or from hot water apparatus supplied from a feed cistern, the water being under pressure from that cistern

3.14**domestic water**

water supplied by a water supplier for drinking, washing, cooking and sanitary purposes, including hot water supplied through any outlet

3.15**draining tap**

tap fitted to drain water from a water system pipe or vessel

3.16**feed cistern**

cistern used for supplying cold water to hot water apparatus, cylinder or tank

3.17**float-operated valve**

valve for controlling the flow of water into a cistern, the valve being operated by the vertical movement of a float

3.18**flow pipe**

pipe, in a primary hot water circuit, in which water moves away from the boiler or circulator

3.19**flueless appliance**

an appliance designed for use without connection to a flue, the products of combustion being allowed to mix with the air of the room or space in which the appliance is situated

NOTE This type of appliance is designated as “type A” in [\[A1\]](#) PD CR 1749:2001 [\[A1\]](#).

[\[A1\]](#) 3.19a**greywater**

“water originating from the mains potable water supply that has been used for bathing or washing, washing dishes . . . or laundering clothes”^{a)} [\[A1\]](#)

3.20**hot water storage combination unit**

either:

- a) hot water storage vessel with a cold water feed cistern immediately above it, the two being fabricated together as a compact unit; or
- b) hot water storage vessel with a cold water feed cistern beside it or inside it

3.21**hot water storage vessel**

vessel for storing hot water under pressure greater than atmospheric

3.22**instantaneous water heater**

appliance in which water is heated only as it is drawn off

[\[A1\]](#) ^{a)} Definition from Water Regulations Advisory Scheme publication. *Reclaimed Water Systems. Information about Installing, Modifying or Maintaining Reclaimed Water Systems* (No 9.02.04) [6a]. [\[A1\]](#)

3.23

open-flued appliance

appliance designed to be connected to an open-flue system, its combustion air being drawn from the room, space or enclosure in which it is installed

NOTE This type of appliance is designated as “type B” in [A1](#) PD CR 1749:2001 [A1](#).

3.24

primary circuit

assembly of water fittings in which water circulates between a boiler or other source of heat and a water-to-water heat exchanger

3.25

return pipe

pipe, in a primary hot water circuit, in which water returns to the boiler or circulator

3.26

room-sealed appliance

appliance whose combustion system is sealed from the room in which the appliance is located and which obtains air for combustion from a ventilated uninhabited space within the premises, or from the open air outside the premises, and which vents the products of combustion directly to open air outside the premises

NOTE This type of appliance is designated as “type C” in [A1](#) PD CR 1749:2001 [A1](#).

3.27

secondary circuit

assembly of water fittings in which water circulates between a water-to-water heat exchanger and draw-off branches

3.28

servicing valve

valve for stopping the flow of water in a pipe connected to a water fitting, to facilitate the maintenance or servicing of that fitting

3.29

stop valve

valve, other than a servicing valve, fitted in a pipeline to control or stop the flow of water

3.30

storage water heater

appliance in which a volume of water is heated under thermostatic control and stored, to be drawn off when required

3.31

storage system

system in which water is heated and held in a storage vessel

NOTE The water can be heated either directly in a boiler or circulator, or heated and stored in an indirect cylinder.

3.32

vent pipe

pipe connecting a water system to the atmosphere

3.33

warning pipe

overflow pipe positioned so that the discharge of any water from its outlet, whether inside or outside a building, is conspicuous

3.34

water-jacketed tube heater

appliance in which water for domestic purposes, in a secondary circuit, is heated inside a coil located within stored primary hot water

NOTE The primary hot water can also be used for space-heating.

4 Selection of equipment and pre-installation

4.1 Exchange of information and planning

Those concerned with the selection of the appliance and the design of the system shall collaborate with the installer, both at the planning stage and during the execution of the work.

COMMENTARY AND RECOMMENDATIONS ON 4.1

Liaison between various trades carrying out the work is essential for the safe and efficient installation of a water-heating appliance.

The following aspects of installation should be considered:

- a) the suitability of any existing gas supply and meter, or installation, where necessary, of a new gas supply and meter;*
- b) the suitability of any existing water supply, or the installation, where necessary, of a new water supply. Consideration may need to be given to available water supply pressure at times of peak demand;*
- c) the electrical requirements;*
- d) the physical size, design and position of the water heating appliance, and its relationship to structural support and combustible materials;*
- e) the type of building, form of construction and probable position of fixtures, furniture and curtains;*

NOTE Some installations will involve preliminary structural work to be completed at the building carcass stage.

- f) the size, height, type and route of flue and position of termination, including possible consequences of any plumbing, together with materials of construction;*

NOTE Suitable apertures or openings may be required for connection to a built-in flue or for a flue assembly to be installed with the appliance.

- g) the provision of adequate air for combustion and ventilation;*
- h) the position of any drains for the discharge of condensate or for discharge from a pressure/temperature relief valve.*

4.2 Selection of water heating appliance and system

4.2.1 System

COMMENTARY AND RECOMMENDATIONS

The system should be selected to suit the requirements of the user, taking account of locations, quantities, temperature, cost (including maintenance and fuel costs) water delivery rate and the characteristics of the different systems.

The manufacturer's instructions should be consulted for performance data.

Instantaneous appliances

In appliances without a thermal store, water is heated after the draw-off tap is turned on. As a consequence, there may be a short delay between the demand for hot water and its delivery. (See 4.2.2.2).

Storage

In systems with primary water storage, water to be drawn off passes through a coil immersed in the stored hot water (a water-jacketed tube heater). This gives a rapid response, but initially water may be delivered at a temperature close to that of the stored water (which could be the central heating flow temperature of 82 °C). In such cases, in hard water areas, it may be necessary to take precautions against scaling. (See 4.2.2.6 and 5.2.7).

In systems without primary storage, water for domestic purposes is stored and its temperature can be controlled according to delivery conditions.

Combination boilers

Combination boilers with no water storage capacity have typical hot water delivery rates between 6 l/min and 11 l/min with a 45 °C temperature rise. If the combination boiler incorporates primary water storage, the delivery rate depends on the pressure and flow rate available to the appliance, e.g. from the water mains, and the pipework resistance.

Hot water storage combination units

These comprise a hot water storage vessel with a cold water feed cistern above it, beside it or inside it, along with associated pipework, all fabricated as a compact unit.

4.2.2 Water heating appliance

4.2.2.1 A new water heating appliance selected for installation shall carry a CE mark.

A used water heating appliance selected for installation shall either carry a CE mark, or shall conform to an appropriate British Standard.

The appliance shall be installed in such a way as to prevent danger to any person. The appliance shall only be connected to and supplied with the gas for which it was designed.

COMMENTARY AND RECOMMENDATIONS ON **4.2.2.1**

For CE marked appliances

The installer should ensure that water heating appliances carry the CE mark on the data plate and that the appliance and the packaging are marked with at least the following information:

- a) the letters “GB”
- b) the type of gas and the pressure of utilization as follows:
 - 1) “G20 and/or natural gas 20 mbar”, for an appliance adjusted for natural gas;
 - 2) “G31 and/or propane 37 mbar”, for an appliance adjusted for propane;
 - 3) “G30 and/or butane 29 mbar”, for an appliance adjusted for butane;
 - 4) “G30, G31 and/or butane/propane 29/37 mbar”, for an appliance which will burn either gas at the correct pressure.

The data plate of a CE marked water heating appliance will carry the designation I_{2H} , I_{3P} , I_{3B} or I_{3+} respectively for cases 1), 2), 3) or 4). Where an appliance data plate carries the letters “Cat II” or “II” followed by the gas type designations H, P, B, then the appliance can be used for different types of gas when adjusted and converted to do so.

For appliances without a CE mark

If a used water heating appliance which does not carry the CE mark is to be installed, the installer should satisfy himself that the appliance is safe in construction and can be used without constituting a danger. The appliance should be fitted in accordance with the manufacturer’s instructions. If these instructions are not available, the installer should seek advice from the manufacturer before fitting the appliance.

An appliance conforming to BS 5258-1, 7, 8 or 15 or to BS 5386-1, 2 and 5, as appropriate, may be considered safe to install.

For all appliances

The installer should ensure that the appliance is correctly adjusted. Conversion to another gas, if necessary, should be carried out strictly in accordance with the appliance manufacturer’s instructions, using the manufacturer’s supplied kit of parts. If there is any doubt as to the suitability of an appliance for a particular gas, then the appliance manufacturer should be consulted.

The installer should check the data given with the appliance and confirm the basis on which the heat input rating is quoted, i.e. gross or net. The ratio of gross: net heat input is approximately 1.11: 1 for natural gas, 1.09: 1 for propane and 1.08: 1 for butane.

Further information on the labelling of gas appliances is given in DD 221:1997.

4.2.2.2 A flueless instantaneous water heater shall not be selected to supply a draw-off tap or other equipment (such as a washing machine) outside the room or space in which the water heater is installed.

COMMENTARY AND RECOMMENDATIONS ON **4.2.2.2**

Flueless instantaneous water heaters should have a label, attached in a prominent place, advising that the water heater should not be used continuously for more than 5 min.

Small flueless instantaneous water heaters, with an output of between 8 kW and 10 kW, will provide approximately 2.6 l/min of water raised through 50 °C. They normally supply hot water through a swivel spout. Some models have the additional facility for making a direct connection to a draw-off.

4.2.2.3 No instantaneous water heater, whether new or used, shall be installed unless it is either room-sealed or incorporates a safety control designed to shut down the appliance before there is a dangerous build-up of products of combustion in the room concerned.

4.2.2.4 Water heating appliances selected for installation in a bathroom or shower room shall be of a type which can be room-sealed.

COMMENTARY AND RECOMMENDATIONS ON **4.2.2.4**

Large instantaneous water heaters (which are always flued) have an output within the range of 17 kW to 35 kW, which will provide approximately 5 l/min to 10 l/min respectively, raised through 50 °C. They are appropriate for supplying hot water to a bath or to a number of draw-off points.

4.2.2.5 Water heating appliances selected for installation in a room intended to be used for sleeping accommodation shall be of a type which can be installed in accordance with **A1** 5.1.4.3 **A1**.

4.2.2.6 Where a water storage system is selected, the water capacity shall be sufficient for its intended use (see BS 6700).

COMMENTARY AND RECOMMENDATIONS ON **4.2.2.6**

Where only a sink or basin is to be supplied, a water heater of small storage capacity (up to about 10 l) may be used.

Where a storage system is required to supply a bath or a number of draw-off points, a water heating appliance which has a large water storage capacity should be used. Typical storage capacities range from 45 l to 120 l.

Where a suitable hot water storage vessel exists already, a circulator or back circulator unit may be most appropriate.

Where a water storage system is selected and a rapid recovery rate is required, a boiler should be used. The rated heat output of a boiler is not normally less than 10 kW, and it is therefore capable of providing a faster recovery rate than a circulator. This type of appliance is frequently used to provide a combined space-heating and hot water service (see BS 6798).

Where a higher flow rate or delivery pressure is sought, direct connection to the mains, pump-assisted systems or a high-head cistern should be used. Before any water-heating appliance is connected directly to the mains water supply, it should be ascertained that the mains water supply to the property is adequate to satisfy the expected demand.

Where a pump boosting system is to be used, refer to BS 6700.

A1 4.3 Condensing appliances

4.3.1 General

Appliances designed to be used in the condensing mode shall be installed in accordance with the manufacturer's installation instructions, or, if there are no specific instructions, the requirements in **4.3.2**, **4.3.3**, **4.3.4** and **4.3.5** shall be followed.

NOTE Attention is drawn to the Building Regulations for England and Wales, Part L1, which require that gas-fired boilers installed after 1 April 2005 are to be condensing boilers, whether they are replacements or new installations, with a few exceptions. The *Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings* [6b], issued by the Office of the Deputy Prime Minister, provides guidance on these exceptions.

COMMENTARY AND RECOMMENDATIONS ON **4.3.1**

The manufacturer's installation instructions should describe any particular requirements for the condensing appliance, e.g. a means for disposal of condensate, and the water temperature operating range.

4.3.2 The siting of the flue terminal

Where the plume from a flue terminal may cause a nuisance an extended vertical flue or high-level termination shall be considered. Reference shall be made to the boiler manufacturer's instructions, in case they contain special advice. In particular, the potential for the plume to cross the following situations shall be avoided:

- a public footpath;
- a frequently used access route;
- a frequently used area (such as a patio);
- a neighbouring dwelling.

It shall not be directed towards a window or door, or be sited close to a facing wall, boundary fence or neighbouring property.

COMMENTARY AND RECOMMENDATIONS ON 4.3.2

Condensing appliances will produce a visible plume of water vapour for a significant proportion of their operating time. At low level, this plume may cause nuisance.

Other aspects to consider when planning the flue terminal position include:

- *the need for a free passage of air to aid plume dispersal;*
- *in cold weather, the plume could cause a safety hazard if it freezes on pathways, or if it results in frost damage to surfaces;*
- *the plume could trigger infra-red security lighting if sited in the wrong place;*
- *the plume could affect the performance of external temperature sensors associated with energy management control systems;*
- *ensure flue terminals or plume do not obscure security camera field of vision;*
- *the flue terminal guards should be able to resist corrosive properties of the condensate.*

Further information on flue terminal siting for safety reasons is provided in BS 5440-1. For guidance on how to reduce the possibility of nuisance to neighbouring buildings, refer to the section on flue terminal siting in the Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings [6b], issued by the Office of the Deputy Prime Minister.

4.3.3 The choice of condensate drainage pipe

The condensate drainage pipe shall be run in a standard drainpipe material, e.g. poly(vinyl chloride) (PVC), unplasticized poly(vinyl chloride) (PVC-U), acrylonitrilebutadiene-styrene (ABS), polypropylene (PP) or chlorinated poly(vinyl chloride) (PVC-C).

Pipework shall be compatible with the condensate drain connection on the appliance. The connection shall have a nominal diameter of not less than 22 mm to promote the clearance of condensate.

For externally run condensate drainage pipe, extra care is necessary in order to reduce the risk of the condensate drainage pipe becoming blocked due to the condensate freezing. The length of condensate drainage pipe external to the dwelling shall be kept as short as possible and not more than 3 m, unless it is insulated.

Any trap in the condensate drainage pipe shall be fitted within the dwelling.

Many appliances have a siphon fitted as part of the condensate trap arrangement. This will significantly reduce the risk of condensate freezing where part of the condensate drainage pipe is run externally.

If an appliance does not include a siphon then any external condensate drainage pipe shall be increased to a minimum of 32 mm nominal diameter to reduce the risk of freezing. In exposed locations, the condensate drainage pipe shall be protected with waterproof pipe insulation.

COMMENTARY AND RECOMMENDATIONS ON 4.3.3

When an appliance is to be installed in an unheated location such as a garage, all condensate drainage pipes should be considered as external.

4.3.4 The positioning and termination of the condensate drainage pipe

Condensate drainage pipe shall be positioned and terminated such that it discharges the condensate safely away from the building.

All condensate drainage pipes and connecting pipework operating under gravity shall have a fall of at least 2.5° to the horizontal or approximately 45 mm per metre of condensate drainage pipe run. The number of bends and fittings shall be kept to a minimum in order to reduce the risk of condensate being trapped.

NOTE Where condensate cannot be removed under gravity, see 4.3.5 for guidance on condensate removal pumps.

Suitable condensate discharge arrangements are by connection to:

- a) a soil and vent stack (internal or external);
- b) an internal waste pipe;
- c) an external drain or gully;
- d) a rainwater hopper that is part of a combined system, i.e. a sewer that carries both rainwater and foul water;
- e) a purpose-made soakaway.

COMMENTARY AND RECOMMENDATIONS ON 4.3.4

Internal drainage points are preferred as they are less likely to become blocked (for example, by leaves or by frozen condensate).

If the condensate drainage pipe has to be run externally, then it is recommended that the condensate drainage pipe be insulated to minimize the effect of freezing. It should be noted that the connection of a condensate drainage pipe to a drain may be subject to local building controls.

The condensate drainage pipe should be supported at a maximum spacing of 0.5 m for near horizontal sections and 1.0 m for vertical sections.

4.3.4.1 Connection to a soil and vent stack (Figure 1)

4.3.4.1.1 Connection to an internal soil and vent stack

Provided that the condensate drainage pipe meets the requirements in 4.3.3 and 4.3.4, there is no length restriction.

The condensate drainage pipe shall incorporate a trap with a minimum condensate seal of 75 mm. Many condensing appliances will incorporate a condensate trap within the appliance. If this condensate trap has a condensate seal of less than 75 mm, then an additional trap of 75 mm shall be fitted. In this case a visible air break is necessary between the appliance and the additional trap.

The condensate drainage pipe shall not discharge into the internal soil and vent stack lower than 450 mm above the invert of the tail of the bend at the foot of the stack for single dwellings of up to three storeys. If this is not visible then the height shall be measured from the lowest straight section of the stack that is visible.

For multi-storey buildings this distance shall be increased as follows:

- for up to and including five storeys, the condensate drainage pipe should not discharge into the internal soil and vent stack less than 750 mm above the invert of the tail of the bend at the foot of the stack;
- for more than five storeys but not more than 20 storeys, ground-floor appliances should discharge into their own internal soil and vent stack or discharge directly to an external drain, gully or rainwater hopper;
- for more than 20 storeys, the ground-floor and first-floor appliances should discharge into their own internal soil and vent stack or directly to an external drain, gully or rainwater hopper.

The connection to the internal soil and vent stack shall not be made in a way that could cause cross flow into any other branch pipe or from that branch pipe into the condensate drainage pipe. This can be achieved by maintaining an offset between branch pipes of at least 110 mm on a 100 mm diameter stack and 250 mm on a 150 mm diameter stack.