

BS 6230:2011



BSI Standards Publication

Specification for installation and maintenance of gas fired forced convection air heaters for commercial and industrial space heating (2nd and 3rd family gases)

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Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 July 2011. It was prepared by Subcommittee GSE/30/-/14, *Forced convection air heaters for commercial and industrial space heating (60 kW–2 MW)*, under the authority of Technical Committee GSE/30, *Gas installations (1st, 2nd and 3rd family gases)*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 6230:2005, which is withdrawn.

Information about this document

This British Standard allows manufacturers' instructions to specify 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 results in at least an equivalent level of safety. In such circumstances, it is important that the manufacturer's instructions are followed.

In particular, attention is drawn to the following regulations.

- a) The Gas Appliances (Safety) Regulations [1]. This British Standard only applies to appliances falling within the scope of these regulations.
- b) The Gas Safety (Installation and Use) Regulations 1998 [2].

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

NOTE 1 These regulations currently do not apply to industrial premises, except those parts used for domestic purposes and sleeping accommodation.

- *Gas Safety (Installation and Use) Regulations 1998 [2], as amended and applied by the Isle of Man Gas Safety (Application) Order 1996 [3].*
- *Gas Safety (Installation and Use) (Northern Ireland) Regulations 2004 [4].*
- *Health and Safety (Gas) (Guernsey) Ordinance 2006 [5].*

NOTE 2 Legislation can vary nationally or under local authorities. Information and advice can be obtained from regulating authorities such as the HSE, the Environment Agency and local authorities. Further advice can be sought, for example, from the relevant professional bodies and industry associations.

- c) The Building Regulations (for the appropriate legislative region) [6], [7], [8].

NOTE 3 These control work carried out in the construction of new buildings or the extension and/or refurbishment of existing buildings. Detailed advice for England and Wales is given in approved documents [9], [10] and for Northern Ireland, in technical booklets [11, 12]. The Building Scotland Regulations 2010 [8] are accompanied by methods that are deemed to satisfy them.

- d) The Water Supply (Water fittings) Regulations 1999 [13].
- e) The Health and Safety at Work etc. Act 1974 [14].
- f) The Electricity at Work Regulations 1989 [15].

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

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

Contractual and legal considerations

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

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

1 Scope

This British Standard specifies the installation requirements for direct and indirect gas-fired forced convection air heaters for space heating that are designed for commercial or industrial applications and to which The Gas Appliances (Safety) Regulations 1995 [1] apply.

This British Standard applies to the installation and maintenance of appliances that are designed to utilize gases of Group H of the 2nd family (e.g. natural gas), gases of Group P of the 3rd family (e.g. propane) as well as gases of Group B of the 3rd family (e.g. butane) when supplied under the conditions of the third family pressure couple (see BS EN 437:2003+A1:2009).

NOTE 1 This British Standard does not specifically cover LPG/air for which additional requirements might be necessary.

This British Standard applies to the installation of direct gas-fired air heaters within the scope of BS EN 525:2009 and to indirect gas-fired forced convection air heaters within the scope of BS EN 621:2009, BS EN 1020:2009 and, where appropriate, BS EN 1196:1998. These standards cover air heaters having a net heat input not exceeding 300 kW. This standard also applies to the installation of direct gas-fired air heaters within the scope of BS 5990:2006 and to indirect gas-fired forced convection air heaters within the scope of BS 5991:1998. These standards cover air heaters having a gross heat input greater than 330 kW but not exceeding 2 MW (1.8 MW net).

NOTE 2 For the purposes of this British Standard, installation includes design, inspection and commissioning. It is recognized that each of the tasks can be performed at the same time by different persons.

NOTE 3 The ratio of gross to net heat input is approximately 1.11:1 for Group H (natural gas), 1.09:1 for Group P (propane) and 1.08:1 for Group B (butane).

NOTE 4 The ventilation rates in cm³/kW of heat input given in this British Standard are based on the net calorific value.

This British Standard also applies to air heaters designed to supply make-up air, door curtain heaters, transportable air heaters and heat exchange modules (i.e. air heaters without a main air movement fan) where such heat exchange modules are used in environmental non-process applications such as air handling units. It also covers installation of heaters in areas where petroleum or other flammable heavier-than-air vapours can be present (see 5.1.2).

It does not include the safety requirements for installation where flammable dusts, toxic gases or flammable lighter-than-air gases might be present in significant quantities.

NOTE 5 In such cases it is important that liaison takes place with the Health and Safety Executive.

This British Standard does not apply to the installation of air heaters to which The Gas Appliances (Safety) Regulations 1995 [1] apply, or that are designed for the sole use in domestic premises.

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 476-20, *Fire tests on building materials and structures – Part 20: Method for determination of the fire resistance of elements of construction (general principles)*

BS 476-21, *Fire tests on building materials and structures – Part 21: Methods for determination of the fire resistance of loadbearing elements of construction*

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

BS 476-23, *Fire tests on building materials and structures – Part 23: Methods for determination of the contribution of components to the fire resistance of a structure*

BS 5925, *Code of practice for ventilation principles and designing for natural ventilation*

BS 5990:2006, *Specification for direct gas-fired forced convection air heaters with rated heat inputs greater than 330 kW but not exceeding 2 MW for industrial and commercial space heating – Safety and performance requirements (excluding electrical requirements) (2nd family gases)*

BS 5991:2006, *Specification for indirect gas-fired forced convection air heaters with rated heat inputs greater than 330 kW but not exceeding 2 MW for industrial and commercial space heating – Safety and performance requirements (excluding electrical requirements) (2nd family gases)*

BS 6501-1, *Metal hose assemblies – Part 1: Guidance on the construction and use of corrugated hose assemblies*

BS 8494, *Electronic portable and transportable apparatus designed to detect and measure carbon dioxide in indoor ambient air – Requirements and test methods*

BS EN 437:2003+A1:2009, *Test gases – Test pressures – Appliance categories*

BS EN 525:2009, *Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW*

BS EN 621:2009, *Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products*

BS EN 1020:2009, *Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW incorporating a fan to assist transportation of combustion air or combustion products*

BS EN 1196:1998, *Domestic and non-domestic gas-fired air heaters – Supplementary requirements for condensing air heaters*

BS EN 50543, *Electronic portable and transportable apparatus designed to detect and measure carbon dioxide and/or carbon monoxide in indoor ambient air – Requirements and test methods*

BS EN 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

BS EN ISO 10380, *Pipework – Corrugated metal hoses and hose assemblies*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS EN 525:2009, BS EN 621:2009, BS EN 1020:2009, BS EN 1196:1998, BS 5990:2006, BS 5991:1998 and the following apply.

3.1 condensing appliance

air heater in which, under normal operating conditions, the water vapour in the combustion products is totally or partially condensed in order to make use of the latent heat in the water vapour for heating purposes

- 3.2 damper**
device to regulate, direct or stop the flow of gases or fluid through an opening or duct
- 3.3 direct gas-fired air heater**
forced convection air heater in which the products of combustion mix with the heated air being supplied to the heated space
- 3.4 enclosure**
space in which an air heater(s) is installed which is not large enough to permit access for work other than maintenance
- 3.5 forced convection air heater**
appliance that provides space heating from a single source by distributing heated air by means of an air-moving device, either through ducting or directly into the heated space
- 3.6 grille**
non-closable fitment for an opening through which air passes
- 3.7 hazardous area**
space in which explosive gas-air mixtures are present or are expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus and fuel-fired appliances
NOTE See BS EN 60079-10-1 which also defines hazardous areas.
- 3.8 indirect-fired air heater**
forced convection air heater in which the products of combustion are separately vented and do not mix with the heated air being supplied to the heated space
- 3.9 plant room**
room which houses plant or machinery including air heaters
- 3.10 plenum chamber**
chamber for receiving air before delivery to a heated space or a combustion system
- 3.11 recirculation air**
air returned to a forced convection air heater from the space being heated and expressed as a percentage of the total air delivered by the heater, under the same temperature conditions
- 3.12 transportable direct-fired air heater**
trolley or skid-mounted direct-fired forced convection air heater designed to operate with a maximum air temperature rise through the appliance of up to 55 K

4 Selection of equipment and pre-installation

4.1 Exchange of information and planning

4.1.1 General

COMMENTARY ON 4.1.1

At the time of publication, the body with HSE approval to operate and maintain a register of businesses who are "members of a class of persons" is the Gas Safe Register.

Persons deemed competent to carry out gas work are those who hold a certificate of gas safety competence acceptable to Gas Safe Register, which includes (without limitation) the National Accredited Certification Scheme for Individual Gas Fitting Operatives and the Gas Services S/NVQ that has been aligned with the National Accredited Certification Scheme. However, some ACOP certification for industrial installations might continue for some time.

Persons carrying out design, installation, commissioning, servicing or maintenance associated with and/or impacting on "gas work", "electrical installation", "drainage" or "ventilation provision" for warm air heating appliances shall be competent.

NOTE 1 *The qualifications which persons need to have to be deemed competent to carry out gas work relevant to this British Standard are given in Table 1.*

It is a statutory requirement that all gas work be carried out by a business or self-employed person(s) that is a member of a "class of persons" registered with a registration body which has been approved by an approval body to operate and maintain such a register.

NOTE 2 *The statutory regulations, registration bodies and approval bodies applicable to Great Britain, the Isle of Man, Northern Ireland and Guernsey are given in Table 2.*

Table 1 **Competence requirements by country/territory**

Qualifications	Great Britain and Isle of Man	Northern Ireland	Guernsey
Current certificate(s) of competence in the type of gas work to be conducted, issued by an awarding body accredited by the United Kingdom Accreditation Service (UKAS) (ACS certification)	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned in matters of gas safety	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned under the HSP ACop arrangement ^{A)} as approved with the registration body	✓	✓	✗
Any other scheme recognized by the gas registration body for registration purposes	✓	✓	✓

^{A)} Health and Safety Commission's Approved Code of Practice (ACoP) (CoP20) [16].

4.1.2 Design considerations

The design shall be such that the installation is in accordance with the heater manufacturer's instructions.

NOTE 1 *In case of doubt, contact the heater manufacturer.*

Table 2 Registration and approval bodies by country/territory

Country/territory	Gas registration body	Approval body	Statutory regulations
Great Britain	Gas Safe Register	Health and Safety Executive (HSE)	Gas Safety (Installation and Use) Regulations 1998 [2]
Isle of Man	Gas Safe Register	Health and Safety Inspectorate (HSWI)	Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) Order 1996 [3]
Northern Ireland	Gas Safe Register	Health and Safety Executive Northern Ireland (HSENI)	Gas Safety (Installation and Use) (Northern Ireland) Regulations 2004 [4]
Guernsey	Gas Safe Register	Health and Safety Executive for the States of Guernsey [HSE (Guernsey)]	Health and Safety (Gas) (Guernsey) Ordinance 2006 [5]

Persons who design the system or installation shall have a knowledge and understanding of the standards and regulations that apply to ensure that the completed plans produce a safe and satisfactory installation.

Those concerned with the design, installation and operation both at the planning stage and during the execution of work, shall work in collaboration with each other and take the following matters into account when carrying out the work:

- type of building and form of construction;
- sizes and purposes of rooms and working areas;
- size, height and route of flue (if any) and the position of termination, including the possible consequences of any plumbing, together with the materials of construction ¹⁾;
- provision of adequate air for combustion and ventilation;
- assessment of heat losses and heat gains;
- gas pressures and the availability of supplies;
- electrical supplies;
- liaison with fire insurers;
- liaison with building owner/operator;
- transmission of noise and vibration;
- any hazardous area classification of the system's location;
- the position of any drains for condensate.

¹⁾ Guidance on chimney and flue design is given in Appendix 3 of IGE /UP/10, Part 1 [17].

NOTE 2 Attention is drawn to statutory regulations and local byelaws, e.g. Building Regulations Approved Document L [18] and Local Air Quality Management Schemes.

Designers shall make customers aware, by providing them with the following list in writing, that it is the customer's responsibility to ensure that:

- 1) the local authority is consulted with regard to planning application requirements;
- 2) the fire authority and/or the enforcing authority under the Health and Safety at Work etc. Act 1974 [14], as appropriate, is consulted in respect of fire precautions;
- 3) the fire insurers are notified of any proposed changes in the means of heating;
- 4) the responsible gas conveyor is advised of the proposed installation of any gas booster or compressor which is either part of the appliance, or an addition to it;
- 5) the gas conveyor is consulted to ensure that the gas service is suitable to supply all of the gas to the complete installation at the correct pressure, including any existing load.

NOTE 3 Main contractors might need to draw their customers' attention to 1), 2), 3), 4) and 5).

4.1.3 Environmental considerations

Consideration and planning shall be agreed for the following areas.

- a) Disposal/recycling of existing appliances and systems materials to be removed.
- b) Disposal/recycling of new appliance and system components packaging.
- c) Minimization of energy usage through appliance selection.
- d) Minimization of harmful emissions discharge.

4.2 Selection of air heaters

4.2.1 General

The operative shall ensure that the heater or multi-burner system for installation carries a CE mark, and is supplied with installation, maintenance and user instructions.

NOTE 1 Attention is drawn to the EC unit verification procedures in The Gas Appliances (Safety) Regulations 1995 [1].

The air heater shall only be connected to and supplied with the gas for which it was designed.

The installer shall ensure that the air heater is correctly adjusted in accordance with the manufacturer's instructions. Conversion to another gas, if necessary, shall be carried out strictly in accordance with the air heater manufacturer's instructions, using the manufacturer's supplied kit of parts.

The air heater shall only be fitted with external control devices of a type recommended by the air heater manufacturer. In case of doubt, the air heater manufacturer shall be consulted.

NOTE 2 Attention is drawn to HSE publication L56 [19].

In particular the installer shall ensure that the air heater and the packaging, if any, are marked with at least the following:

- a) the letters "GB";

b) the type of gas and the pressure of utilization indicated as follows:

- 1) "G20 – natural gas – 17.5 mbar (or 17.5–20 mbar)" for an air heater adjusted for natural gas;
- 2) "G31 – propane – 37 mbar (or 50 mbar)" for an air heater adjusted for propane;
- 3) "G30 – butane – 29 mbar (or 28–30 mbar)" for an air heater adjusted for butane. This identification only applies when a category I₃₊ (or category II_{2H3+}) air heater, which is capable of utilizing butane and propane at different pressures, is adjusted for butane use.

NOTE 3 The data plate of a CE marked air heater will carry one of the following designations CAT: I_{2H}, I_{3P}, I₃₊, II_{2H3P} or II_{2H3+} to identify the appliance category.

NOTE 4 Full details on the appliance category scheme are given in BS EN 437.

In all, four items of information shall be given, which, dependent on the appliance or system category and the appliance or system adjustment or state of conversion, shall be one of the alternatives listed in Table 3.

The installer shall check the data provided with the air heater to confirm that the air heater is appropriate for the installation, and shall confirm the basis on which the nominal heat input, or heat input rating, is quoted, i.e. gross or net.

NOTE 5 The ratio of gross to net heat input is approximately 1.11:1 for group H (natural gas), 1.09:1 for group P (propane) and 1.08:1 for group B (butane).

NOTE 6 Further information on the labelling of gas appliances is given in CR 1472:1997.

Table 3 Air heater categories/adjustment for UK gas supply conditions

Alternatives ^{A)}	Country code	Type of gas	Gas pressure ^{B)} mbar	Air heater category
a)	GB	G 20, natural gas	17.5 or 17.5 to 20	I _{2H}
b)	GB	G 20, natural gas	17.5 or 17.5 to 20	II _{2H3P} or II _{2H3+} (when adjusted to use natural gas)
c)	GB	G 31, propane	37 or 50	I _{3P} or II _{2H3P} (when adjusted to use propane)
d)	GB	G 31, propane	37	I ₃₊ or II _{2H3+} (when adjusted to use propane)
e)	GB	G 30, butane	29 or 28 to 30 ^{C)}	I ₃₊ or II _{2H3+} (when adjusted to use butane)

^{A)} If the information on the appliance, its packaging or the data plate is not in accordance with alternatives a), b), c), d) or e), or if there is any doubt about the suitability of the air heater for a particular gas, the appliance manufacturer should be consulted prior to installation.

^{B)} If the gas pressure is not as indicated in Table 3, the gas conveyor should also be consulted prior to installation.

^{C)} Appliances in categories I₃₊ or II_{2H3+}, when adjusted for butane, could be used without adjustment at the specified supply pressures of 28 mbar to 30 mbar.

4.2.2 Indirect gas-fired air heaters

4.2.2.1 General

Products of combustion from indirect-fired heaters shall discharge into a flue which terminates outside the building (see 5.10).