

Specification for

Safety of domestic gas appliances —

Part 7: Storage water heaters

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- British Gas Corporation*
- Chartered Institution of Building Services
- Department of Energy
- Department of the Environment*
- Heating and Ventilating Contractors' Association
- Institution of Gas Engineers*
- Liquefied Petroleum Gas Industry Technical Association*
- National Association of Plumbing, Heating and Mechanical Services Contractors
- Society of British Gas Industries*
- Water-tube Boilermakers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- British Non-Ferrous Metals Federation
- Consumer Standards Advisory Committee of BSI
- HEVAC Association
- Institution of Fire Engineers
- National Brassfoundry Association
- National Water Council
- Royal Society for the Prevention of Accidents

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Foreword

BS 5258 has been prepared, under the direction of the Gas Standards Committee, to meet the need for a standard specifying the safety requirements and associated methods of test for domestic gas appliances burning 1st, 2nd and 3rd family gases.

BS 1250 has specified safety and performance requirements for a range of domestic appliances burning 1st family gas while BS 2491, BS 2773 and BS 2883 have similarly covered a limited range of appliances burning 3rd family gas. The increased distribution of 2nd family gas and the development of a new generation of appliances, often designed to burn more than one family of gas, have necessitated the publication of new British Standards which relate to appliances burning 1st, 2nd and 3rd family gases and in which the requirements and methods of test for the three gas families have been, where technically appropriate, harmonized. BS 5258 specifies safety requirements and associated methods of test and therefore supersedes, in part, BS 1250, BS 2491, BS 2773 and BS 2883. Other, non-safety, aspects of appliances will be the subject of another British Standard now in course of preparation.

BS 5258 is being prepared in a number of Parts, each of which will apply to one particular type of appliance. In each Part, the sequence of the clauses and their subject matter are being arranged so that, as far as possible, a particular main clause number refers to the same aspect of the specification in all Parts. The following Parts are already published except for that marked with an asterisk, which is in course of preparation.

- *Part 1: Central heating boilers and circulators;*
- *Part 2: Cooking appliances;*
- *Part 3: Drying cabinets;*
- *Part 4: Fanned-circulation ducted-air heaters;*
- *Part 5: Gas fires;*
- *Part 6: Refrigerators and food freezers;*
- *Part 7: Storage water heaters;*
- *Part 8¹⁾: Combined appliances: Gas fire/back boiler.*

Some of the provisions of this standard are set deliberately high to make allowance for manufacturing tolerances and variations in the supply of fuel gases. Some of the tests are destructive and it follows that it is not practicable to check each appliance made against all the provisions of the standard. However, the intention of the standard is that if all its requirements are met when applied to a sample representing the average of production, this will ensure

- that all appliances claimed to be designed to it are safe in normal use when installed and maintained in accordance with the relevant British Standard codes of practice and with the manufacturer's instructions, and
- that such servicing as may be necessary to maintain the appliance in a safe condition can be carried out by a competent fitter without difficulty.

For this Part the relevant codes of practice are: CP 333-1, BS 5440-1¹⁾ and BS 5440-2, CP 338 and CP 339²⁾.

Further, attention is drawn to the requirements of the Gas Safety Regulations issued by the Department of Energy, of the Building Regulations and of the Model Water Bye Laws issued by the Department of the Environment and of the Building Standards (Scotland) (Consolidation) Regulations issued by the Scottish Development Department.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

¹⁾ In course of preparation.

²⁾ CP 338 and CP 339 will be superseded by BS 5482.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

0 Introduction

This Part of BS 5258 has been prepared by revising those clauses of BS 1250-1 and BS 1250-3 that relate to safety and adding requirements appropriate to appliances burning 2nd and 3rd family gases. While the requirements and methods of test follow existing UK practice, they are in no way intended to prejudice any future negotiations of a European Standard.

The constructional requirements for gas taps, specified in clause 19 to ensure continued safe operation of these components, are based on those in BS 1250. It is, however, recognized that with modern materials and methods of manufacture it is possible to obtain the desired level of performance by other designs and, in particular, without strict adherence to the dimensional criteria specified in 19.3. The Gas Standards Committee has therefore agreed that the technical committee responsible for gas cocks should prepare a separate standard for appliance gas taps, which will eventually supersede these requirements.

Section 1. General

1 Scope

This Part of BS 5258 specifies safety requirements and associated methods of test for storage water heaters with rated heat inputs up to and including 20 kW.

It does not cover the special requirements necessary for appliances with fan-powered combustion circuits or fan-assisted flues.

In specifying requirements for appliances burning 2nd family gases it is assumed that a meter governor will be fitted and for appliances burning 3rd family gases it is assumed that the gas supply from the container will be governed by a pressure regulator complying with the requirements of BS 3016.

Requirements for controls, given herein, relate to controls fitted as part of, or supplied with, particular appliances; they do not necessarily provide a complete specification for controls intended for general use.

This standard does not take into account the special hazards which exist in nurseries and other places where there are young children or aged or infirm persons without supervision; in such cases additional requirements may be necessary.

2 References

The titles of the publications referred to in this standard are listed on the page 20.

3 Definitions

For the purposes of this Part of this British Standard, the following definitions, together with those in BS 1179 and in the relevant British Standard codes of practice, apply.

3.1 adjustment pressure

the pressure, measured at the test point, that is required to obtain the rated heat input using the reference test gas

3.2 control thermostat

a thermostat intended to control the temperature of the stored hot water of a water-heating appliance when in normal operation. The temperature setting is usually, but not necessarily, adjustable by the user

3.3 minimum operational rate

the bypass rate or 70 % of the lowest heat input at which the appliance is intended to be operated, whichever is the greater

3.4 rated heat input

the manufacturer's declared heat input for the appropriate reference test gas

3.5 setting pressure

the pressure, measured at the test point, that is specified by the manufacturer for the purpose of adjusting the appliance heat input

4 Classification of appliances

4.1 By category. BS 4947 describes the category system of appliance classification by which an appliance is denoted by a category number I, II or III, according to the number of gas families that it is designed to burn and the families are identified by subscripts T, N and L for the 1st, 2nd and 3rd gas families respectively.

For the purposes of this Part, the following categories of appliances are permitted:

Category I_T, I_N, I_L, I_{L/B}, I_{L/P}

Category II_{TN}, II_{NL}, II_{NL/B}, II_{NL/P}

Category III, III_{TNL/B}, III_{TNL/P}

4.2 By flue type. For the purposes of this standard, appliances are also classified into the following types according to the flue system for which they are designed and the source of the combustion air:

type A: flueless appliances

type B: open flued appliances

- type C: room-sealed appliances
 type C₁: balanced flue appliances
 type C₂: Se-duct appliances.

The relevant definitions of these types of appliance are given in BS 1179. At present type C₂ appliances using 3rd family gases are not manufactured. Such appliances are not therefore covered by this standard.

5 General requirements

The appliance shall comply with the requirements of this standard when tested using the specified test gases of the appropriate gas family. Full details of the test gases are given in BS 4947.

Appliances designed to burn 1st family gases shall be suitable for gas groups G4 and G5 with or without a change of injectors or jets.

Notwithstanding the requirements specified in this standard, any new designs, materials and methods of assembly giving at least equivalent results are acceptable.

Any new features incorporated in an appliance for which no provision for testing is made in this standard shall be examined in the light of the manufacturer's claims and instructions. The claims shall be checked against the instructions and shall be valid.

6 General conditions of test

6.1 Test room. The room shall be adequately ventilated but free from draughts likely to affect the performance of the appliance. If the test results are influenced by the temperature of the ambient air, the room temperature shall be maintained at 20 ± 5 °C.

6.2 Preparation of appliance

6.2.1 All appliances. The appliance shall be set up on or against a wall taking due account of the manufacturer's instructions, with particular reference to minimum clearances around the appliance. It shall then be adjusted in accordance with the manufacturer's instructions, using the appropriate reference test gas at the following inlet pressure.

Family	Test gas	Inlet pressure
		mbar ^a
1st	TGA	17.5
2nd	NGA	20
3rd	LPGA	28
	LPGC	37

^a 1 mbar = 100 Pa 10^2 N/m².

Before any tests are made the appliance shall be operated at its full working temperature for a period sufficient to dry any insulation and remove any temporary finish which might interfere with observations.

6.2.2 Type A appliances. When an appliance can optionally be fitted with a flue, it shall also be tested as a type B appliance.

6.2.3 Type B appliances. Unless the test method specifically requires otherwise, appliances with a vertical flue outlet shall be tested with 1 m vertical secondary flue of the same nominal diameter as the flue outlet.

Appliances with a horizontal flue outlet shall be fitted in accordance with the manufacturer's instructions; these shall include the maximum length of horizontal run and the method of adaptation to a vertical flue; thereafter the vertical flue shall be fitted as above.

The vertical flue shall be made from uninsulated aluminium having a metal thickness less than 1 mm.

6.2.4 Type C₁ appliances. Except where otherwise stated, appliances shall be tested in still air conditions with the flue ducts and terminal assembled in accordance with the manufacturer's instructions. Due account shall be taken of variations in duct and/or terminal lengths.

6.2.5 Type C₂ appliances. Except where otherwise stated, appliances shall be tested in still air conditions with the connecting ducts assembled in accordance with the manufacturer's instructions, but not connected to a test duct. Due account shall be taken of variations in length of the ducts between the appliance and the Se-duct.

6.3 Test procedure. The test rig and appliance shall be examined for gas and water soundness both before and after the tests and the results are deemed invalid unless the system is sound. (See 8.1 and 8.2.)

The appliance shall be at room temperature at the start of each test unless otherwise stated.

During testing, the initial adjustment of the appliance shall not be altered unless specifically required by the test method.

Precautions shall be taken to prevent thermostats or other variable controls from acting to interfere with the gas flow, except as necessitated by the test.

In general, except for tests involving governor performance, the appliance governor, if any, may be put out of operation and the specified test pressure obtained by adjustment of the gas pressure at the inlet to the appliance.

Test pressures shall be measured correct to 0.2 mbar and controlled so that the variation does not exceed ± 0.2 mbar.

BS 4947 gives guidance on the measurement of heat input rate.

Tables giving details of the test gases (and, where appropriate, their conditions of application) to be used for each of the gas families are inserted in relevant clauses. For 3rd family appliances, test gases LPGA and LPGB are used with the appliance adjusted for butane and test gases LPGC and LPGE with the appliance adjusted for propane.

Section 2. Safety requirements and associated methods of test

7 General design and construction

7.1 Materials, fittings and finishes. Materials, fittings and finishes, the failure of which may affect the safe operation of the appliance, shall comply with the requirements of the relevant British Standards and shall be appropriate to the conditions arising in the part of the appliance in which they are used. The appliance shall be free from swarf, grit or other foreign matter.

7.2 Component location. Parts that are intended to be removable by the user, e.g. for cleaning, shall be readily accessible, shall not require the use of tools for their removal, shall be easy to assemble correctly and difficult to assemble incorrectly.

The burner shall be positively located and so arranged that it cannot be misaligned.

It shall not be possible to loosen complete burner jets or injectors without the use of tools.

7.3 Materials in contact with gas

7.3.1 Copper tubing. Copper tubing shall not be used where it would be exposed to temperatures above 100 °C.

7.3.2 Non-metallic materials — 3rd family gases. Diaphragms shall comply with the requirements of 3.3 1) and 3.3 6) of BS 3016:1972.

Valve pads shall comply with the requirements of 3.4 1), 3.4 4) and 3.4 5) of BS 3016:1972.

All non-metallic materials shall show no marked deterioration when subjected to an accelerated ageing test for 7 days at a temperature of 20 °C in excess of the manufacturers's maximum recommended temperature.

NOTE The requirements of the above three paragraphs may not be met by materials made of some silicone rubbers although these rubbers are claimed to be satisfactory. Criteria for testing silicone rubber materials are still under consideration and, in the meantime, components and appliances containing such a material will be considered acceptable provided that the appropriate manufacturer can demonstrate that it has proved satisfactory in use.

Jointing compounds shall comply with the requirements of BS 5292.

7.4 Aeration adjustment. There shall be no means of adjusting the primary aeration.

7.5 Insulation. Thermal or acoustic insulation shall be non-combustible (see BS 476-4), shall be securely located and shall be protected against mechanical damage and the effects of condensate.

7.6 Deposits from appliance. Appliances that give rise to deposits (either liquid or solid) shall be provided with effective means of collecting and retaining such deposits. Any deposits shall be easily removable.

8 Soundness

8.1 Gas soundness

8.1.1 General. All gas-carrying parts of the appliances shall be sound and, when connected, shall form a complete assembly which is sound. The basic tests shall be carried out on the complete assembly but additional and more stringent tests may be necessary for certain components to ensure an adequate margin of safety.

8.1.2 Complete assembly. The fully assembled appliance shall be sound at the internal air pressure given in the following table.

Family	Air pressure
	mbar
1st	30
2nd	40
3rd	150

This requirement shall be deemed to be met if the leakage rate (see note) does not exceed 85 cm³/h over a period of 1 min.

NOTE One convenient method of measuring the leakage rate is by the bubble leak indicator illustrated in Figure 1. A rate of six bubbles per minute should be equivalent to 85 cm³/h but this should be checked before the indicator is used.

Appliances for use on more than one gas family shall be tested at the highest appropriate pressure.

The method of test is as follows. Connect to the appliance inlet an air supply maintained constant at the appropriate pressure and embodying a suitable meter for measuring air flow.

Test the appliance under the following conditions:

- with all gas taps in the OFF position;
- with all gas taps turned to the ON position, the flame failure device being maintained by suitable means in the open position and all injectors and pilots capped off.