

Specification for

Roomheaters burning solid mineral fuels

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- Association of British Solid Fuel Appliances Manufacturers
- British Ceramic Tile Council
- British Foundry Association
- Chartered Institution of Building Services Engineers
- Consumer Standards Advisory Committee of BSI
- Copper Cylinder and Boiler Manufacturers
- Domestic Solid Fuel Appliances Approval Scheme
- Greater London Council
- Incorporated Association of Architects and Surveyors
- Low Temperature Coal Distillers' Association of Great Britain Ltd.
- Metal Trades Organizations
- National Coal Board
- National Fireplace Council Manufacturers' Association
- National Society for Clean Air
- Solid Fuel Advisory Service
- Solid Smokeless Fuels Federation

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Foreword

This second revision of this British Standard has been prepared under the direction of the Solid Mineral Fuels Standards Committee and supersedes BS 3378:1972 which is withdrawn.

The main technical changes from the previous edition are:

- a) inclusion of smoke-reducing roomheaters;
- b) restriction to solid mineral fuels;
- c) inclusion of requirements for general construction;
- d) change of requirements for the ashpan;
- e) change of requirements for flueways and provision for chimney sweeping;
- f) inclusion of a smoke leakage requirement and test method;
- g) change in marking requirements.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, 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.

Section 1. General

1.1 Scope

This British Standard specifies the constructional and performance requirements and describes methods of test for roomheaters (including smoke-reducing roomheaters) designed to burn solid mineral fuels (i.e. bituminous coal, anthracite, Welsh dry steam coal or manufactured smokeless fuels derived from these coals). The standard covers roomheaters with or without a boiler and with manual or thermostatic control.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

1.2 Definitions

For the purposes of this standard, the definitions given in BS 1846-1, BS 6100-1.5.1 and BS 3323 apply together with the following.

1.2.1

target burning rate of front fed roomheaters

for test purposes, the average burning rate required to burn a stated proportion of the fuel capacity for the particular fuel during the refuelling interval

1.2.2

target burning rate of hopper fed roomheaters

for test purposes, the average burning rate required to burn the whole of the fuel capacity of the hopper during the refuelling interval

1.2.3

normal draught

a draught arising from a pressure differential of $0.125 \text{ mbar}^{1)}$ or such greater draught necessary to be applied in the flue loss test rig to achieve the target burning rate

NOTE For details of the flue loss test rig, see BS 3250-1.

1.2.4

high draught

a draught arising from a pressure differential of $0.5 \pm 0.02 \text{ mbar}^{1)}$ applied in the flue loss test rig to simulate installation of an appliance with a tall chimney

1.3 Calculation of rated output of roomheaters

The rated outputs in terms of water heating and direct room heating of roomheaters shall be expressed in kilowatts to the nearest 0.1 kW. The water heating rated output W (in kW) and direct room heating rated output D (in kW) shall be calculated from the following equations:

$$W = 2.78 TCE_W \times 10^{-6} \quad (1)$$

$$D = 2.78 TCE_D \times 10^{-6} \quad (2)$$

where

- T is the target burning rate, on a dry fuel basis (in kg/h), (see 1.4);
- C is the gross calorific value, on a dry fuel basis (in kJ/kg), (see note 1);
- E_W is the water heating efficiency (in %), (see note 2);
- E_D is the direct room heating efficiency (in %), (see note 2).

NOTE 1 For coke, $C = 30\,240 \text{ kJ/kg}$. For anthracite and bituminous coal, C is determined by analysis of the batch of test fuel used (see BS 1016-5).

NOTE 2 For tests carried out according to BS 3250-1:1973, E_W is the boiler efficiency B , determined as in 6.7 of that standard and E_D is given by $E - B$, where E is the total efficiency, determined as in 6.3 of that standard.

For tests carried out according to BS 3250-2:1961, E_W is the boiler efficiency E_b , determined as in clause 25 of that standard and E_D is given by $E_c + E_r$, where E_c and E_r are the convection and radiation efficiencies, determined as in clauses 23 and 24 respectively of that standard.

1.4 Calculation of the target burning rate

The target burning rate, T , on a dry fuel basis, (in kg/h) shall be calculated and expressed to the nearest 0.01 kg/h from equation (3):

$$T = \frac{fxy}{z} \quad (3)$$

where

- f is the maximum proportion by volume (see below) of the firebox capacity to burn during the refuelling interval for the particular fuel;
- x is the bulk density of fuel, on a dry fuel basis (in kg/dm^3) (see note);
- y is the firebox capacity of the appliance (in dm^3) for front fed appliances, or the hopper capacity (in dm^3) for hopper fed appliances;
- z is the refuelling interval (in h).

NOTE The bulk density of each test fuel is determined individually (see A.1).

The maximum permissible proportions of firebox capacity by volume, f , shall be:

- 0.648 for test fuel B of dry bulk density 0.445 kg/dm^3
- 0.670 for anthracite
- 0.750 for coal

Examples of the calculation for an appliance with a firebox capacity of 21.3 dm^3 are given in Table 1.

¹⁾ $1 \text{ mbar} = 100 \text{ N/m}^2 = 100 \text{ Pa}$.

1.5 Refuelling interval

The refuelling interval of front loaded appliances shall be not less than 4 h.

For hopper fed appliances and appliances intended to burn anthracite or smokeless fuels whose bulk density exceeds 0.640 kg/dm³, the refuelling interval shall be not less than 6 h.

1.6 Firebox capacity of roomheaters

When determined by the method described in A.1 using the appropriate fuel specified in Appendix B, the firebox capacity, expressed to an accuracy of 0.10 dm³ shall be not less than 10.0 dm³. If the appropriate fuel is to be coke, this shall be sized 19 mm to 31.5 mm square hole.

Table 1 — Examples of target burning rate calculations

Appliance type	Test fuel	<i>f</i>	<i>x</i> kg/dm ³	<i>y</i> dm ³	<i>z</i> h	<i>T</i> kg/h
Front fed	Test fuel B	0.648	0.445	21.3	4	1.54
	Anthracite	0.670	0.77	21.3	6	1.83
	Coal	0.750	0.61	21.3	4	2.44
Hopper fed	Test fuel B	1	0.445	21.3	6	1.58
	Anthracite	1	0.77	21.3	6	2.73
	Coal	1	0.61	21.3	6	2.17

Section 2. Construction

2.1 General

The body of the appliance shall be constructed of cast iron or steel plate.

Materials for construction of parts of the appliance that are in contact with the fuel or flue gases and are not water-backed shall comply with the minimum thickness requirements given in Table 2.

Provision shall be made for parts which form a seal to be located securely to prevent the leakage of air or combustion products between the firebox, the flue and the convection chamber. Joints between metal surfaces in the firebox or flue gas passageway shall be air-tight and shall be welded, seam welded, riveted, or bolted. No joint shall depend primarily on fire cement for air-tightness. Where a seal is to be made with fire cement, the gaps shall be small and the cement shall be well supported by the adjacent metal surfaces.

Component parts known to require periodic replacement shall be so designed that they cannot be fitted incorrectly and shall bear identifying marks to facilitate replacement.

NOTE 1 Such parts should be easily replaceable.

Provision shall be made for fixing the roomheater to the hearth.

The finish shall show no crazing or melting during the testing for compliance with the performance requirements (see section 4).

NOTE 2 The finish should be durable and such that it can be easily cleaned.

2.2 Front firebars

Front firebars shall be:

- a) either:
 - 1) horizontal when considered from side to side of the fire; or
 - 2) vertical;
- b) replaceable;
- c) of a design such that they can neither be incorrectly fitted nor be accidentally dislodged.

In the case of horizontal front firebars, the design shall be such that a 19 mm diameter rod cannot be inserted horizontally either between adjacent bars or between the firebars and the lower edge of the firefront opening. When considered from the front to the back of the fire, the top surface of the bars shall slope down towards the fuel bed.

In the case of vertical front firebars, the distance between the bars shall not exceed 15 mm.

For appliances without separate charging doors, the distance between the top firebar and the upper edge of the firedoor opening shall be at least 100 mm to facilitate charging.

2.3 Bottomgrate

The bottomgrate shall be capable of being removed and shall be designed or marked to ensure correct assembly.

It shall be fitted with a de-ashing mechanism which shall be capable of de-ashing the fuel bed.

NOTE The preferred design should allow de-ashing to be carried out with the firedoor(s) and any ashpit cover closed. The de-ashing operation should be accomplished without undue effort.

If it is necessary to open the firedoor(s) or to remove the ashpit cover to de-ash the fire, the appliance shall be designed such that there is no undue spillage of ash or fuel from the appliance during the de-ashing operation.

2.4 Ashpan

The ashpan shall be constructed of steel of minimum thickness 0.91 mm. The capacity, when assessed geometrically, shall be not less than 20 % of the firebox capacity of the appliance.

NOTE The ashpan should be designed to ensure that:

- a) it effectively collects the ash from the whole area of the bottomgrate;
- b) it can be easily and safely withdrawn when hot, using the tools provided, without undue spillage of ash;
- c) it does not distort to an extent that makes it unsuitable for use.

Table 2 — Minimum thicknesses of non water-backed materials

Component	Cast iron	Low carbon steel	Stainless steel ^a	Vitreous enamelled steel ^b
	mm	mm	mm	mm
Firebox				
without refractory lining	5	4.72	Not suitable	Not suitable
with refractory lining	3	2.75	0.9	Not suitable
Flueways	3	2.75	0.9	1.8

^a Grades 316S11, 316S13, 316S31, 316S33 of BS 1449-2:1985.

^b Enamelled both sides; acid resistant to BS 3831.