

BS 8511:2010



BSI Standards Publication

Code of practice for the installation of solid fuel heating and cooking appliances in small craft

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ISBN 978 0 580 59973 6

ICS 97.100.30

The following BSI references relate to the work on this standard:

Committee reference RHE/28

Draft for comment 09/30169955 DC

Publication history

First published February 2010

Amendments issued since publication

Date	Text affected
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Foreword

Publishing information

This British Standard was published by BSI on 28 February 2010 and comes into effect on 28 February 2011. It was prepared by panel RHE/28/-/1, *Solid fuel appliances for small craft* on behalf of Technical Committee RHE/28, *Domestic solid fuel appliances*. A list of organizations represented on this committee can be obtained on request to its secretary.

NOTE Panel RHE/28/-/1 was constituted to include expertise from the boat industry and boat users, and representation from Technical Committee GME/33, Small craft.

Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

The figures in this British Standard are only illustrative of different installation methods. These are not intended to be implemented without first checking all the parameters specific to a particular installation.

Information about this document

In developing this British Standard, the responsible panel acknowledges that it is not always possible to install some appliances in a very limited space (e.g. in traditional narrowboat boatman's back cabins) strictly in accordance with this standard. However, in such instances, installers are encouraged to follow the recommendations of this standard to the most practicable degree.

In such installations, users have to be made aware that the level of safety, particularly the safety margin against damage of the surrounding structure due to over-firing, might be lower than for those which comply fully with this code of practice. End users have to be made aware that extra vigilance has to be exercised during the operation of the appliance.

Presentational conventions

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

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 code of practice covers the design, installation and operation of solid fuel heating and cooking appliances (hereafter referred to as appliances) which are suitable for fitting into small craft from 2.5 m to 24 m in length. These appliances can burn either natural or manufactured solid mineral fuels, or natural or manufactured wood logs.

This code of practice gives guidance on appliance selection, design considerations, installation requirements, inspection and testing, and preparing instructions for the end user of the appliance. Guidance is also provided on the necessary safety information to be provided to the end user concerning the maintenance and safe use of these appliances.

This code of practice only applies to freestanding appliances with closable doors, with and without legs.

This code of practice does not apply to the installation of appliances with a firebox volume of less than 0.01 m³ and a grate size smaller than 0.05 m², and where the dimensional recommendations of the installation cannot be met (e.g. in traditional narrowboat boatman's back cabins).

NOTE The basic principles in this code of practice can be used in installation of appliances outwith its scope.

Warnings on the provisions necessary for appliances with boilers are given in Annex D, but this code of practice does not cover the installation details of hot water systems.

This code of practice does not cover open fires, inset appliances, or portable or other open appliances such as barbecues.

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 41, *Specification for cast iron spigot and socket flue or smoke pipes and fittings*

BS 6999, *Specification for vitreous-enamelled low-carbon-steel flue pipes, other components and accessories for solid-fuel-burning appliances with a rated output of 45 kW*

BS EN 1443:2003, *Chimneys – General requirements*

BS EN 1856-1, *Chimneys – Requirements for metal chimneys – Part 1: System chimney products*

BS EN 1856-2, *Chimneys – Requirements for metal chimneys – Part 2: Metal liners and connecting flue pipes*

BS EN 10296-1, *Welded circular steel tubes for mechanical and general engineering purposes – Technical delivery conditions – Part 1: Non-alloy and alloy steel tubes*

BS EN 10297-1, *Seamless circular steel tubes for mechanical and general engineering purposes – Technical delivery conditions – Part 1: Non-alloy and alloy steel tubes*

BS EN 12815, *Residential cookers fired by solid fuel – Requirements and test methods*

BS EN 13240, *Roomheaters fired by solid fuel – Requirements and test methods*

BS EN 13384-1, *Chimneys – Thermal and fluid dynamic calculation methods – Part 1: Chimneys serving one appliance*

BS EN 10088-1:2005, *Stainless steels – Part 1: List of stainless steels*

3 Terms and definitions

3.1 smokeless fuel

solid mineral fuel of low smoke emission

NOTE Smokeless fuel can occur in the natural state or be manufactured.

3.2 bituminous coal

general term descriptive of coal, corresponding to black coals with a high percentage of volatile matter and carbon content of 80% to 93% (dry basis) that burn with a smoky yellow flame

3.3 boiler

vessel forming part of an appliance in which water is heated

3.4 chimney cap

cover placed over the chimney when appliance is not being used

3.5 chimney

tubular assembly that conveys the flue gasses into the atmosphere above the connecting flue pipe

NOTE An example of a chimney is shown in Figure 1.

3.6 chimney terminal

prefabricated chimney fitting which connects to the outlet end of the chimney and is designed to prevent ingress of moisture into the insulating annulus of the chimney section

NOTE An example of a chimney terminal is shown in Figure 1.

3.7 competent person

person with a combination of sufficient: skill, knowledge, practical experience and training commensurate with performing the activity concerned

3.8 connecting flue pipe

component or components that convey the flue gasses from the flue outlet to the chimney

NOTE An example of a connecting flue pipe is shown in Figure 1.

3.9 cooker

appliance primarily designed for cooking, incorporating one or more externally heated ovens and hotplates, heated from a fire by conduction or by circulating flue gases or both, which can also be fitted with a boiler

3.10 Design categories

NOTE The design categories applicable to new recreational craft up to 24 m long are set out in the Recreational Craft Directive [1].

3.10.1 category A (ocean)

craft designed for extended voyages where conditions may exceed wind force 8 and significant wave heights of 4 m and above might be experienced, but excluding abnormal conditions

3.10.2 category B (offshore waters)

craft designed for offshore voyages when conditions up to and including wind force 8 and significant wave heights up to and including 4 m might be experienced

3.10.3 category C (inshore water)

craft designed for voyages on coastal waters, large bays, estuaries, lakes and rivers when conditions up to and including wind force 6 and significant wave heights up to and including 2 m might be experienced

3.10.4 category D (sheltered waters)

craft designed for voyages on sheltered coastal waters, small bays, small lakes, rivers and canals when conditions up to and including wind force 4 and significant wave heights up to and including 0.3 m might be experienced, with occasional waves of 0.5 m maximum height

3.11 dry appliance

appliance that contains no boiler for the heating of water

3.12 efficiency

total heat output from an appliance expressed as a percentage of the total heat content of the fuel consumed during the test period

NOTE Efficiencies can be defined as "net" or "gross" depending on the lower or higher heating value respectively of the fuel.

3.13 fiddle rail

rail or batten around the edge of an appliance to prevent objects falling off during motion of the craft

3.14 fireguard

protective screen or grid placed around an appliance to prevent persons from accidentally touching the appliance or objects falling onto the appliance

3.15 flue

passage contained within connecting flue pipe and chimney to convey gases from the appliance to the atmosphere

3.16 flue outlet

position where the products of combustion exit the appliance

NOTE An example of a flue outlet is shown in Figure 1.

3.17 freestanding appliance

appliance designed to operate without being built into a fireplace recess, but which does require fixing to prevent movement

3.18 gross efficiency

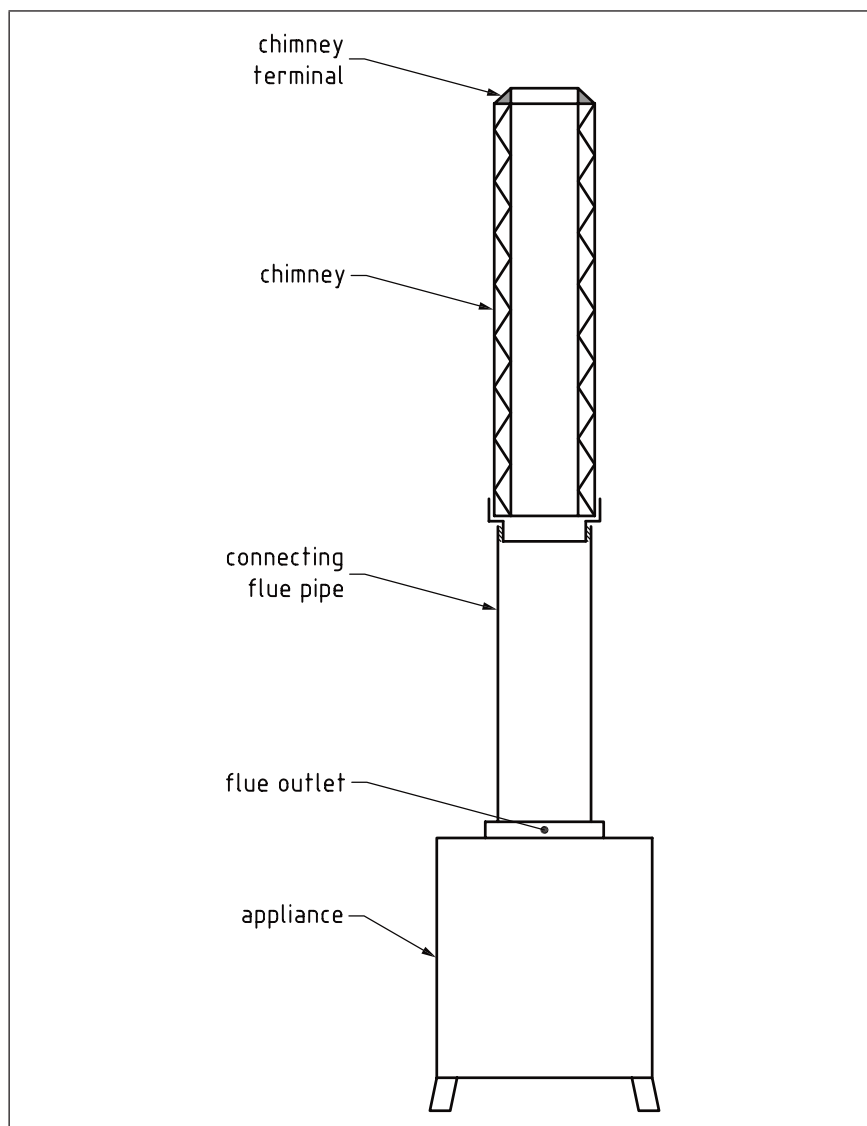
total heat output from an appliance expressed as a percentage of the total heat content of the fuel consumed during the test period, where the heat content of the fuel is given by the gross calorific value

3.19 hotplate

plate(s) provided on a cooker mainly for boiling, simmering or frying

- 3.20 hearth**
base of non-combustible material upon which an appliance stands
- 3.21 inset appliance**
appliance that is designed to be built into a fireplace recess
- 3.22 nominal output**
total heat output of the appliance quoted by the manufacturer and achieved under defined test conditions when burning the specified test fuel
- 3.23 over-fire**
firing the appliance beyond its design capacity, caused by opening the air controls wider than stipulated in the manufacturer's operating instructions or by leaving the appliance door or ash pit cover open
- 3.24 petroleum coke**
black solid residue, obtained mainly by cracking and carbonizing of petroleum derived feedstocks; consists mainly of carbon (90% to 95%) and has a low ash content
- 3.25 rain cap**
assembly to minimize water entering the flue and to minimize the effect of contrary winds or downdrafts, but not obstruct the emission of flue gases
- 3.26 rear flue outlet**
outlet positioned at the back (rear) of an appliance, through which exhaust gases (products of combustion) exit the appliance
- 3.27 roomheater stove**
appliance with a fully enclosed fire with firedoors that are usually glazed, that distributes heat by radiation and convection, and may sometimes be fitted with a boiler for heating water
- 3.28 seasoned wood**
wood with a maximum moisture content of 20% by mass
- 3.29 solid fuel**
fuel in solid form that includes coal, manufactured fuel, wood and peat
- 3.30 solid fuel heating and cooking appliance**
appliance
appliance that provides heat by burning solid fuel, with means of removing products of combustion
- 3.31 surrounding structure**
bulkhead, partition or sides of hull or cabin , and other fixtures in the vicinity of the appliance
- 3.32 top flue outlet**
outlet positioned on the top surface of an appliance, through which exhaust gases (products of combustion) exit the appliance
- 3.33 upstand**
small lip or raised projection normally fitted at the front, but may additionally be fitted around the sides, of the horizontal surface of a hearth and is designed to prevent either hot ash or fuel falling off the hearth; it may be tiled or be decorative, and may serve as a marking to indicate the approach to a hot appliance

Figure 1 Schematic diagram of a typical appliance installation



4 Appliance selection

4.1 Design and suitability

Consideration should be given to the size and construction of the space into which the appliance is to be installed, the appliance's claimed heat output, and the appliance's required frequency of attention. Manufacturer's leaflets and technical specifications should be consulted to verify the necessary information.

The selected appliance should be of a freestanding type only and be suitable in respect of design, construction, installation and safety for use on boats in accordance with manufacturer's instructions for installation on boats or with this code of practice.

NOTE 1 Appliances that conform to the construction and performance requirements of BS EN 13240 or BS EN 12815 would be suitable in respect of design, construction, installation and safety for use on boats.

The appliance should be fitted or provided with means by which it can be securely fixed to the hearth or the structure of the craft when in its final position (see also Clause 6 for further detail on hearths).

The appliance should be fitted with doors that can be securely fastened in their closed position but are capable of being opened to at least 90° for tending the fire.

The selected appliance should be fitted with a socket capable of allowing a suitably gas tight connection to be made between the appliance and the connecting flue pipe or suitable adaptor.

NOTE 2 A top flue outlet connection is preferable, for optimal flow of flue gases and ease of installation, and to make cleaning of the flue easier.

Suitable operating tools should be provided with the appliance, especially for operation and manipulation of hot components, e.g. de-ashing, refuelling. A suitable heat protective glove is considered a tool.

Consideration should be given to the internal flue diameter when selecting the appliance relevant to the intended fuel type use, as recommended in 8.2.

4.2 Heat output and efficiency

It is not easy to ensure the distribution of heat in narrow or long spaces, and the shape of the space to be heated and the positioning of the heating appliance should be carefully considered before deciding to use a single appliance, even if apparently of large enough heat output. In initial selection of an appliance an allowance of not less than the following should be taken:

- a) for spaces up to about 28 m³ capacity, use 0.10 kW/m³;
- b) for spaces from 28 m³ up to about 57 m³ capacity, use 0.09 kW/m³;
- c) for spaces from 57 m³ up to about 85 m³ capacity, use 0.08 kW/m³.

NOTE 1 For a 14 m (45 ft) narrowboat cabin the calculation would be as follows:

Occupied volume = 2 × 2 × 13 metres = 52 m³. Therefore, based on a factor of 0.09 kW/m³, the required heat output would be 4.7 kW.

NOTE 2 The precise value varies not only with capacity, but also according to the insulation and exposure of the craft and the temperature requirements. If the appliance is installed into a smaller space than the largest it can serve, it will, of course, burn less fuel and require less frequent refuelling. However it is important not to select an appliance with an output which is grossly too large or grossly too small for the space which it has to heat.

The heat output and efficiency of an appliance will depend upon the conditions under which it is used, and it should be noted that steady burning and avoidance of over-firing will provide the best service and reliability. For appliances with a firebox volume greater than 0.01 m³ and grate area greater than 0.05 m², in order to be energy efficient and reduce CO₂ emissions, the selected appliance should meet the minimum gross efficiency of 65% for stoves and 60% for cookers when tested to BS EN 13240 or BS EN 12815 respectively.

NOTE 3 A list of appliances meeting these minimum recommended efficiencies is published by HETAS Ltd and is available for viewing on their web site at www.hetas.co.uk.

4.3 Cookers

For craft intended for use on rough waters, an appliance with griddle plates, hot plates or boiling rings should be fitted with a fiddle rail constructed of metal. It should be of sufficient robustness and height to retain the cooking utensils in the event of the craft experiencing significant waves or wash.

5 Installation – General requirements

5.1 Siting appliance

Appliances should not be sited where they may cause obstruction, particularly to passages and escape routes. They should not be positioned where they could create a fire hazard or damage surrounding materials or fold-away furnishings such as beds and tables, whether these are folded away or in position for use.

NOTE 1 It is advisable to avoid a location near to a stepped entrance.

There should be no free-hanging combustible material, such as curtains or blinds (whether in their extended or folded-back positions), capable of coming within the safe distance specified by the manufacturer or, if no distance is specified, within 600 mm of the appliance and any uninsulated connecting flue pipe.

The appliance should be located so as to provide the best possible heat distribution throughout the space it is intended to heat.

NOTE 2 The layout of the space to be heated will affect the location of the appliance, but a central location within the space may give a more even heat distribution and thus be preferable.

5.2 Competent person

The appliance, connecting flue pipe and chimney should be installed by, or under the responsibility of, a competent person.

5.3 Securing appliance

To prevent its movement the appliance should be securely fastened either to the hearth or to the structure of the craft. Fixings should be of adequate strength to prevent appliance movement. The manufacturer's appropriate recommendations for fixing should be followed.

NOTE 1 Movement of the appliance can occur for a variety of reasons such as vigorous operation of the de-ashing mechanism, thermal expansion and contraction, and movement of the craft, particularly caused by waves, wash and collisions.

NOTE 2 Suitable methods to secure the base of the appliance to the hearth include using adequately sized non-combustible fixings.

6 Hearth

Hearths should be designed and constructed of suitable robust and non-combustible materials, which can support the weight of the appliance. They should be of appropriate dimensions such that, in normal use, they prevent appliances setting fire to the craft's fabric

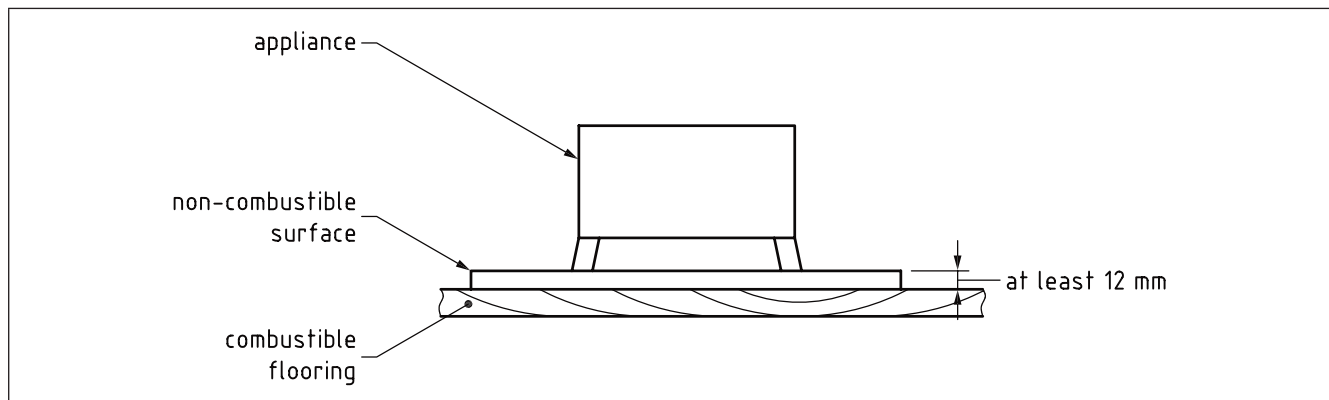
and furnishings, and limit the risk of people coming into contact with the appliance. The size of the hearth should be such that the proximity of the appliance to its edges will prevent damage to, or ignition of, other parts of the craft, e.g. floor coverings such as carpets, rugs and wood laminates.

The non-combustible hearth should be permanently fixed to prevent movement. The hearth should be designed to accept and transfer into the structure, without deflection or cracking, the thermal stresses and static loads imposed during use and the dynamic loads encountered during transport and use.

The required hearth design and/or construction is dependent on the performance of the appliance and should be installed as follows.

- a) For appliances tested according to BS EN 13240 for roomheaters/stoves and BS EN 12815 for cookers, which have been shown to give maximum hearth temperatures on the exposed surface not exceeding 100 °C (and documented as such in the manufacturer's instructions), the hearth should be of non-combustible board/sheet material and/or tiles with a combined thickness of at least 12 mm (see Figure 2) when placed on combustible material. Alternatively, the hearth should comprise the non-combustible hull structure (such as metal or concrete: see Figure 4b).

Figure 2 Example of a hearth for an appliance where the exposed surface of the hearth does not exceed 100 °C



- b) For other appliances, a non-combustible hearth should be provided, made of: solid material, e.g. concrete or masonry; or material of lightweight construction, but suitable for the weight of the appliance, e.g. vermiculite or calcium silicate boards suitably protected on their surface, if necessary, to maintain their integrity. The hearth should be at least 125 mm thick, including the thickness of any non-combustible floor and/or decorative surface. Combustible material should not be located beneath such hearths unless there is an air space of at least 50 mm between the underside of the hearth and the combustible material (see Figure 3). The hearth may be less than 125 mm if placed upon or comprising the non-combustible hull structure (such as metal or concrete; see Figure 4).