# Services for leisure accommodation vehicles and transportable accommodation units—

Part 2: Code of practice for the installation of solid fuel fired heating in park homes and transportable accommodation units

Confirmed November 2008



## Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Basic Data and Performance Criteria for Civil Engineering and Building Structures Standards Policy Committee (BDB/-) to Technical Committee BDB/6, upon which the following bodies were represented:

Association of British Solid Fuel Appliances Manufacturers

British Holiday and Home Parks Association Limited

Building Employers' Confederation

Caravan Club

Chartered Society of Designers

Chief and Assistance Chief Fire Officers' Association

Consumer Policy Committee of BSI

Department of Health

Department of the Environment

Department of Transport

Fibre Building Board Organisation (FIDOR)

Home Office

Institute of Building Control

Institution of Electrical Engineers

Institution of Environmental Health Officers

Institution of Fire Engineers

Liquefied Petroleum Gas Industry Technical Association (UK)

Local Authority Organizations

National Caravan Council Limited

National Prefabricated Building Association Ltd.

Royal Institute of British Architects

Society of Motor Manufacturers and Traders Limited

Solid Fuel Advisory Service

Trades Union Congress

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#### **Foreword**

This Part of BS 6762 has been prepared under the direction of the Basic Data and Performance Criteria for Civil Engineering and Building Structures Standards Policy Committee. It is a revision of BS 5601-2:1978, which is withdrawn. It is one of a series that is being published for leisure accommodation vehicles and transportable accommodation units.

The other Parts of BS 6762 are:

- Part 1<sup>1)</sup>: Ventilation;
- Part 3: Oil-fired heating systems;
- Part 4<sup>1)</sup>: Liquefied petroleum gas installations;
- Part 5: Low voltage electrical installations;<sup>1)</sup>
- Part 6<sup>1)</sup>: Water supply;
- Part 7<sup>1)</sup>: Drainage.

This standard aligns with the other Parts of BS 6762. Its main purpose is to provide increased safety for occupants of park homes and transportable accommodation units by lessening the risk of fire and reducing the likelihood of accidents caused by escaping fumes. It is recommended that open fires should not be installed in park homes nor transportable accommodation units. This revision is specifically limited to the installation of closed heating appliances which are solely used for burning solid smokeless mineral fuel; this was implicit in the previous edition of the standard but not stated. The British Standards published for park homes and transportable accommodation units are, respectively, BS 3632 and BS 6492-1 and BS 6492-2.

Since the publication of the previous edition, uninsulated chimneys have generally been superseded by combined units and by factory-made insulated chimneys because of their safety and convenience. In view of these advantages, this revision deals solely with the installation of factory-made insulated chimneys complying with BS 4543, which limits the rated output of any one appliance, or of combined units comprising a cast iron flue with an insulating outer pipe, to 45 kW.

It should be noted that the requirements of BS 4626 and BS 4989 do not permit the installation of solid fuel fired heating appliances in touring trailer caravans or in holiday caravans, nor should they be installed in motor caravans.

Insulating materials consisting of asbestos reinforced cement or other asbestos based products should not be used to provide non-combustible surfaces or for other purposes.

NOTE The manufacture and use of all asbestos based products is covered by the requirements of the Control of Asbestos at Work Regulations 1987, introduced on 1 March 1988. These set out comprehensive provision covering work activities involving exposure to asbestos. Advice on how to comply with these regulations can be obtained from the manufacturers of the material, from the Asbestos Information Centre, St Andrew's House, 22-28 High Street, Epsom, Surrey, KT19 8AH, from the local area office of the Health and Safety Executive or from the Environmental Department of the Local Authority.

WARNING. Breathing asbestos dust is dangerous to health and precautions have to be taken during the manufacture and use of these products.

Particular note has to be taken of the Asbestos Products (Safety) Regulations 1985 and the Asbestos Products (Safety) (amendment) Regulations 1987, made under the Consumer Safety Act 1978, and also of the Asbestos (Prohibitions), Regulations 1985<sup>2)</sup> and the Asbestos (Prohibitions) (amendment) Regulations 1988 made under the Health and Safety at Work etc Act 1974, which prohibit the supply of products containing amosite or crocidolite ("brown" asbestos and "blue" asbestos respectively) and set out requirements for the labelling of all products containing asbestos.

All the above legislation implement European Directives.

 $^{\circ}$  BSI 04-1999 $^{\circ}$ 

 $<sup>^{1)}</sup>$  In preparation.

 $<sup>^{2)}\,\</sup>mathrm{Parallel}$  regulations for Northern Ireland came into force on 6 March 1986.

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 10, 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.

iv blank

#### 1 Scope

This Part of BS 6762 gives recommendations for the installation in park homes and transportable accommodation units of closed heating appliances having a rated output of up to and including 45 kW, burning solid smokeless mineral fuel and fitted with factory-made insulated chimneys or combined chimney units. It covers room heaters, with or without boiler, cookers with integral boilers and independent boilers that provide heating or hot water. It covers safety precautions and includes details of relevant sizes. It does not cover the installation of open fires.

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

#### 2 Definitions

For the purposes of this Part of BS 6762 the definitions in BS 1846-1, BS 6760 and BS 6100-3.1 apply.

#### 3 Ventilation

General ventilation should be provided in accordance with the recommendations of BS 5601-1. For additional ventilation required for combustion and details of the air inlets see **6.4** and **6.6**.

#### 4 Appliance output

Heating appliances installed should have an output that provides, without over-running and when the external temperature is 0 °C, a temperature within living areas of 20 °C and within halls and passages, etc. of 13 °C.

#### 5 Materials and components

#### 5.1 General

Materials and components used should comply with the following British Standards as appropriate:

| pipe threads                      | BS 21                     |  |  |
|-----------------------------------|---------------------------|--|--|
| cast iron flue pipes and fittings | BS 41                     |  |  |
| copper tube fittings              | BS 864-2                  |  |  |
| cookers with integral boilers     | $BS\ 1252$                |  |  |
| brazing                           | BS 1723                   |  |  |
| back boilers                      | BS 3377                   |  |  |
| room heaters                      | BS 3378                   |  |  |
| solid smokeless fuel boilers      | BS 4433-1 or<br>BS 4433-2 |  |  |
| factory-made insulated chimneys   | BS 4543-2                 |  |  |

#### 5.2 Chimneys and appliance connections

#### 5.2.1 Chimneys

Each appliance should be provided with a chimney, taken through the roof. This may be a factory-made insulated chimney that complies with BS 4543-2 when tested in accordance with BS 4543-1, or a combined chimney unit consisting of a cast iron flue that complies with BS 41 with an insulating pipe made of material that is classified as non-combustible when tested in accordance with BS 476-4.

#### 5.2.2 Connection to appliance

Materials for fittings for connections between an appliance and its chimney should be in accordance with the recommendations of **6.1** of BS 6461-2:1984.

#### 5.2.3 Access for cleaning

Provision should be made for the flue and chimney to be swept easily and efficiently and for flue deposits to be cleaned from the appliance.

#### 5.2.4 Size of flue

The size of the flue should be not less than that of the cross-sectional area of the outlet of the appliance and should be in accordance with the recommendations of Table 1 of BS 6461-2:1984.

#### 5.3 Fuel storage

It is essential that no provision be made for fuel to be stored in or under a park home or transportable accommodation unit.

#### 6 Installation

#### 6.1 Siting of appliances

Heating 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.

#### 6.2 Appliances

All appliances should be installed in accordance with the recommendations of BS 8303 and should comply with the following British Standards as appropriate:

| cookers with integral boilers | BS 1252      |
|-------------------------------|--------------|
| back boilers                  | BS 3377      |
| room heaters                  | BS 3378      |
| solid smokeless fuel boilers  | BS 4433-1 or |
|                               | BS 4433-2    |

An operating tool or tools should be provided so that hot surfaces do not have to be touched by hand.

#### 6.3 Pipework

#### 6.3.1 Branch connections

Connections for branches from a boiler to water service pipes should be made only with pipe fittings.

#### 6.3.2 Ferrous pipes

Where ferrous pipes or pipe fittings with screw threads are used, all threads should comply with BS 21.

#### 6.3.3 Copper pipes

Where copper pipes or pipe fittings are used, joints should comply with BS 864-2.

#### 6.3.4 Other joints

Where joints are not made in accordance with **6.3.2** and **6.3.3**, soldering, welding or brazing should be used. Brazing should be in accordance with BS 1723.

#### 6.3.5 Identification of pipelines

Where there is risk of confusion, pipelines should be marked with appropriate identification colours as specified in BS 1710.

#### 6.4 Air for combustion

For all appliances, whether free-standing, inset or built-in, air for combustion should be provided by means of an air inlet or inlets at low level through the base of an external wall or through the floor and positioned as closely as possible to the appliance. All such inlets should be covered with mesh screens that will give a total free area of ventilation of not less than 550 mm²/kW of the rated output of the appliance. Such screens should have apertures of not less than 6 mm nor more than 9 mm in any direction and they should be accessible for cleaning. Fine mesh should not be used as it is liable to become blocked.

#### 6.5 Draught stabilizers

Where an appliance is fitted with a draught stabilizer or where one is fitted to a chimney in the same room as the appliance, an additional air inlet or inlets should be provided from the exterior with a total free area of ventilation of at least 300 mm<sup>2</sup>/kW of the rated output of the appliance. All such inlets should be fitted with mesh screens as described in **6.4**.

#### 6.6 Ventilation of appliance enclosures

Where an appliance is built into an enclosed space, air inlets should be provided at or near the bottom of the enclosed space with a minimum free area of ventilation of 500 mm<sup>2</sup>/kW of the rated output of the appliance. All such inlets should be covered with mesh screens as described in **6.4**. The air outlet from the enclosed space, which includes the appliance and its chimney, should be through the castellations in the roof collar (see **6.9.2**).

#### 6.7 Protection of combustible material

Provision should be made to protect any combustible material adjacent to any appliance, flue or forced air duct to ensure that its temperature does not exceed 100 °C when tested in accordance with Appendix A. At no time should the temperature at the position of sensor 1 in Figure 1 exceed 300 °C. It is essential that any method of protection be verified for its effectiveness, in at least one model of each range produced, by a means of a practical test carried out in accordance with Appendix A. Where effectiveness is so proved, other models in the range employing the same system can be deemed to be acceptable.

#### 6.8 Hearth

An appliance should stand on and be firmly bolted to a reinforced concrete hearth designed to accept and transfer into the structure, without deflection or cracking, the thermal stresses, the static loads imposed during use and transportation and the dynamic loads encountered during transportation. The hearth should extend at least 150 mm at each side of an appliance and at least 300 mm at the front, or 150 mm if a 50 mm upstand is provided. The size of the tongue of the hearth at the rear of an appliance should be greater than the base of the appliance (see Figure 2).

There should be no combustible material below or within 150 mm of the base of the appliance. Where protection is provided at the side of an appliance, the hearth may form part of the floor of the park home or transportable accommodation unit.

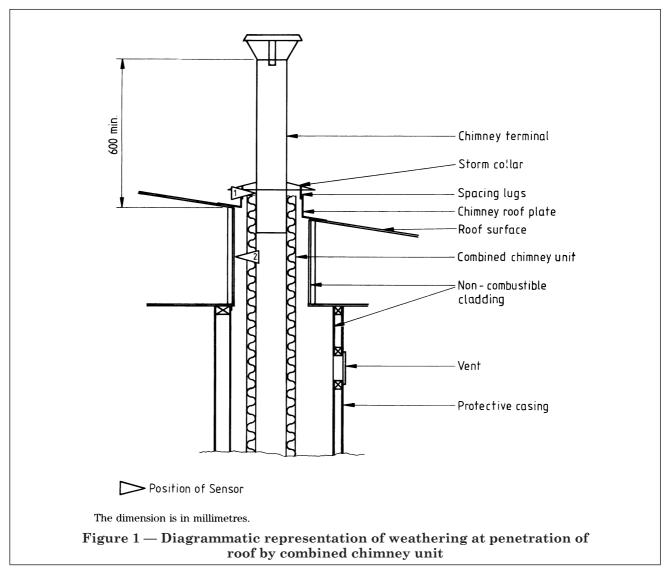
#### 6.9 Chimney

#### 6.9.1 Fitting

A factory-made insulated chimney should be installed in accordance with the recommendations of BS 6461-2 and with the manufacturer's installation instructions and should be taken through a roof as shown in Figure 3. Combined chimney units should be taken through a roof as shown in Figure 1. If required, there should be a maximum length of 150 mm of uninsulated flue pipe between the flue outlet of an appliance and either a factory-made insulated chimney or a combined chimney, in addition to any spigot insulation required by **6.7** (see Figure 4).

#### 6.9.2 Roof flashing

A preformed roof flashing should be fitted where a chimney passes through a roof. This flashing should be flanged and sealed to the roof and should give watertight protection to a height of at least 50 mm above the roof. The upper edge of the flashing of a combined chimney unit should be castellated as shown in Figure 1, scalloped or provided with holes above the 50 mm level sufficient to allow the unimpeded escape of cooling air from the flue assembly (see also **6.6**). The minimum combined area of these outlets should be 500 mm²/kW of the rated output of the appliance.



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#### 6.9.3 Storm collar

A storm collar should be fitted to the chimney above the roof flashing and should extend at least 75 mm from the chimney.

#### 6.10 Chimney terminal

A detachable chimney terminal should be fitted. This should minimize the amount of rain entering the chimney but should not obstruct the emission of smoke or fumes. The products of combustion should be discharged at least 600 mm above a roof. This height is measured on the shorter side of a chimney when passing through a sloping roof (see Figure 3).

#### 6.11 Protective casing

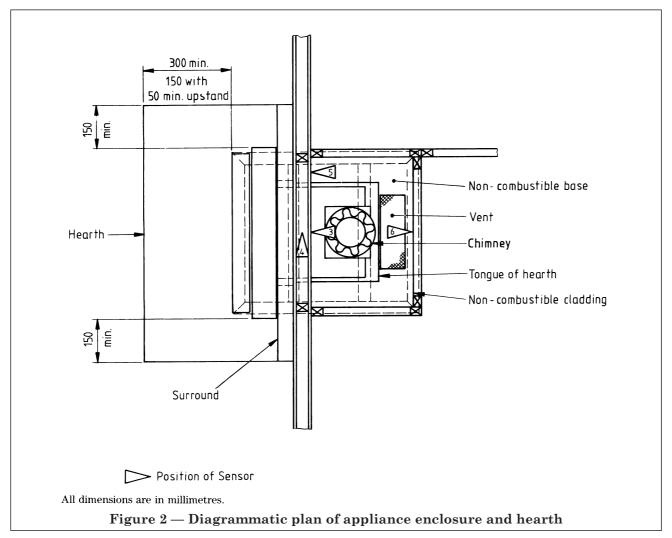
The whole chimney assembly within the park home or transportable accommodation unit should be cased. This casing should be left open horizontally at the bottom. It should not be possible for the space within to be used as a cupboard. All internal surfaces of the casing should be of non-combustible material and the temperature of any external surface should not exceed 65 °C.

#### 6.12 Dampers

No damper should be fitted to a chimney.

#### 6.13 Accessibility of chimney assembly

Means should be provided to allow periodic inspection of the whole circumference and length of the chimney. Panels or parts of the structure should be removable by means of a simple tool such as a screwdriver.



#### 7 Warning plate

#### 7.1 Fitting

A permanent warning plate, with wording as given in 7.2, should be supplied and securely fixed on or near to an appliance to discourage the dangerous practice of burning ordinary house coal, uncarbonized briquettes or other smoke producing long flamed solid fuel, or wood other than for kindling. If the warning plate is fixed by the appliance manufacturer, it should be on or immediately above the charging door. If it is fixed later, it should be fitted in a position on or near to the appliance so that it is easily visible when charging.

#### 7.2 Wording

The warning plate should carry the following wording.

#### "WARNING

Use only smokeless fuel of a type and size recommended by the manufacturer. Keep all appliance doors shut except when re-fuelling or de-ashing."

#### 7.3 Size of lettering

The height of the lettering for the word "WARNING", which should be printed in red, should be not less than 6 mm and that for the other text not less than 3 mm.

#### 8 Users' handbook

## 8.1 Information on operation, maintenance and safety

It is essential that the manufacturer of a park home or transportable accommodation unit should provide a users' handbook which should contain the information for operation, maintenance and safety given in 8.2 to 8.4.

## 8.2 Maintenance and general instructions for the owner

The instructions should include the following.

- a) The chimney should be swept at least at six-monthly intervals. Chemical cleaners should not be used as a substitute for sweeping.
- b) The chimney installation should be inspected, at least once a year, throughout its length, for corrosion or obstruction. The flue should be replaced if any sign of perforation is found, ensuring that the replacement is of an approved type.
- c) Refractory lining material, e.g. fire bricks, should be examined at least annually and replaced if not in good condition.

d) It is essential to arrange for prompt repair or replacement when any defect is revealed in the heating appliance or chimney assembly.

Replacement for the assembly should be by materials recommended in **5.1**.

e) Cleaning and maintenance of the appliance should be in accordance with the appliance manufacturer's instructions.

#### 8.3 Operating instructions for the occupant

The instructions should include the following:

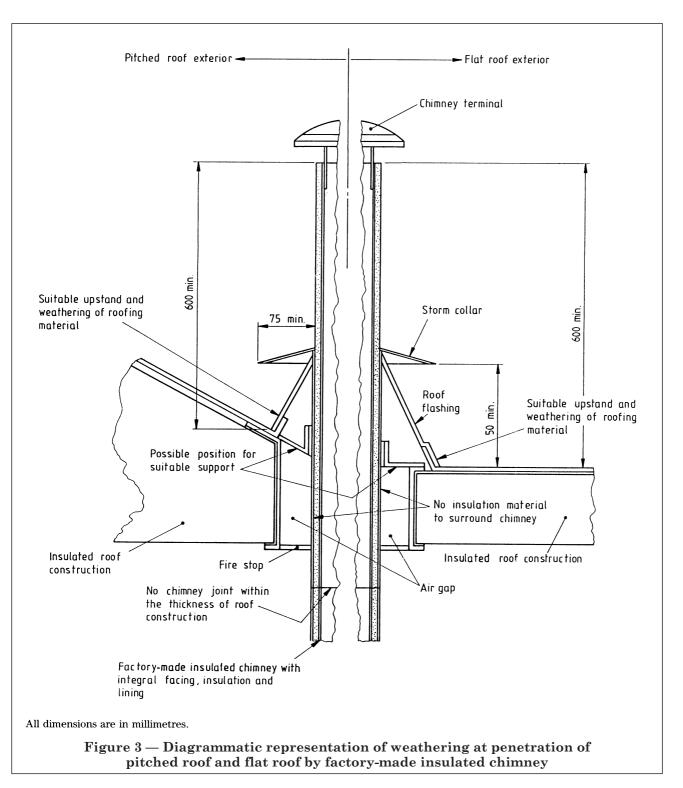
- a) the appliance manufacturer's operating instructions;
- b) details of recommended fuels;
- c) the reason for keeping the fire doors and the top charging lid closed;
- d) a reminder to ensure that, when a boiler is fitted, the water supply is turned on and the system filled;
- e) details of the location of the air vents, the method of cleaning them and the importance of not obstructing them;
- f) information on how to protect the water boiler and supply pipes from frost damage should be given in accordance with clause **10** of BS 6700:1987;
- g) when pipes are colour coded, a key to the coding should be given.

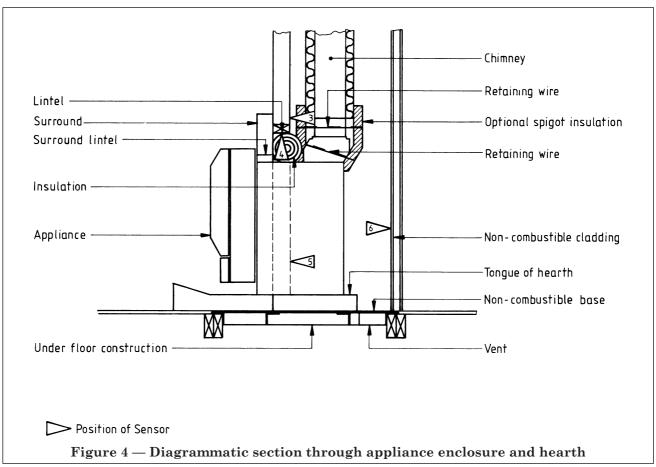
#### 8.4 Safety precautions for the occupant

The following warnings for the safety of occupants should be included.

- a) Use only the recommended smokeless fuels.
- b) Do not leave the ashpit cover off when the fire is alight, particularly when the park home or transportable accommodation unit is left unoccupied. Follow the manufacturer's operating instructions.
- c) Do not use the heating appliance as an incinerator for waste materials.
- d) Do not store fuel in or under the park home or transportable accommodation unit nor near the appliance.
- e) Do not use chemical cleaners as a substitute for sweeping.
- f) Dispose of hot ash safely as recommended in the operating instructions.
- g) Provide a fire guard complying with BS 6539 to protect children and elderly or infirm people.
- h) Never use or adapt the area around the chimney as an airing cupboard.

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- i) Fume emission is dangerous and is not to be tolerated. If fume emission persists, the following immediate actions should be taken.
  - 1) Open doors and windows to ventilate room.
  - 2) Let the fire out and remove and safely dispose of fuel from the appliance.
  - 3) Check the flue or chimney for blockage and clean if required.
  - 4) Do not attempt to relight the fire until the cause of the fume emission has been identified and corrected. If necessary seek expert advice.

# Appendix A Test for determination of temperature of adjacent combustible material

#### A.1 Preparation

**A.1.1** Carry out the tests on a fully constructed park home or transportable accommodation unit. Commence with the heating appliance at or below ambient temperature.

**A.1.2** Use the test fuel specified in the British Standard with which the heating appliance complies (see **6.2**).

NOTE Details of suppliers of the test fuel can be obtained from British Coal Marketing Department, Eastwood Hall, Eastwood, Nottingham.

#### A.2 Instrumentation

**A.2.1** Fix temperature sensors to the finished surfaces of the enclosure in positions 1 to 5 as shown in Figure 1, Figure 2 and Figure 4 with an additional sensor in position 6, as shown in Figure 2 and Figure 4 if the heating appliance being tested does not have a water jacket.

A.2.2 The positions of temperature measurement shown in Figure 4 have been identified as the hottest in a typical installation. The manufacturer of the park home or transportable accommodation unit should obtain from the manufacturer of the heating appliance details of the positions of maximum temperature on each surface of the room heater and, if necessary, fix temperature sensors additional to those shown in Figure 2 and Figure 4 on the enclosure wall at positions so identified.

**A.2.3** Record the temperature of the surfaces given by the sensors.

#### A.3 Method of test

**A.3.1** Light the heating appliance in accordance with the instructions of its manufacturer, set air control to maximum burning rate and allow the appliance to run for not less than 2.5 h. Ensure that adequate heat dissipation is possible; this may mean periodically running off water from the hot water cylinder.

**A.3.2** At the end of the warm-up period described in **A.3.1**, immediately de-ash the heating appliance thoroughly and re-fuel to capacity.

**A.3.3** Leave the air control at maximum and, where appropriate to the design of the heating appliance, open the ashpit door fully or remove the ashpit cover to obtain the fiercest fire. For those heating appliances not so designed and where this would not result in the fiercest fire, set air controls to produce such a fire, provided that these conditions can be obtained by the user.

#### A.4 Temperature measurements

Start recording the temperatures of the temperature sensors immediately after the appliance has been de-ashed and at 10 min intervals until the maximum temperature has been passed and sufficient readings have been taken to establish a continuing downward trend.

#### A.5 Recording of readings

Record details of the temperature readings in tabular form as shown in Table 1.

#### A.6 Calculation of results

If a temperature recorded on the surface of the non-combustible lining to the enclosure exceeds 110 °C, the surface temperature of the combustible material beneath has to be calculated. Data on thermal resistance of the insulation material should be obtained from its manufacturers and the interface temperature of the combustible material beneath calculated, assuming steady state conditions, as described in Appendix B.

Table 1 — Temperature readings of sensors in °C

| Time  | Elapsed time | Sensor 1 | Sensor 2 | Sensor 3 | Sensor 4 | Sensor 5 |  |  |
|---|--------------|----------|----------|----------|----------|----------|--|--|
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
|   |              |          |          |          |          |          |  |  |
| NOTE Further columns should be added according to the number of sensors used. |              |          |          |          |          |          |  |  |

# Appendix B Calculation of hot face temperature and additional insulation thickness

#### B.1 Calculation of the maximum hot face temperature of a construction that will not raise the internal temperature at a given point above a critical value

When there is a steady flow of heat from the flue, through the system, to the atmosphere (see Figure 5), the exposed surface temperature of the system above ambient,  $\theta_E$  (in K), can be calculated from the equation

$$\frac{\theta_E}{\theta_T} = \frac{R_{\rm I,1} + R_{\rm T} + R_{\rm I,2} + R_{\rm C}}{R_{\rm T} + R_{\rm I,2} + R_{\rm C}}$$
(1)

where

 $R_{\rm C}$  is the thermal resistance to cooling of 1 m<sup>2</sup> of cold face (in m<sup>2</sup> ·K/W);

 $R_{I,1}$  is the thermal resistance of 1 m<sup>2</sup> of exposed facing (in m<sup>2</sup>·K/W);

 $R_{I,2}$  is the thermal resistance of 1 m<sup>2</sup> of cold face (in m<sup>2</sup>·K/W);

 $R_{\rm T}$  is the thermal resistance of 1 m<sup>2</sup> of combustible supporting construction (in m<sup>2</sup>·K/W);

 $\theta_T$  is the temperature above ambient of exposed face of combustible supporting construction (in K).

NOTE Thermal resistance, R (in m<sup>2</sup>·K/W), of 1 m<sup>2</sup> is the product of thermal resistivity [reciprocal of thermal conductivity, k (in W/m·K)] and thickness, t (in m). R = t/k.

For example, a maximum temperature of 100 °C (80 °C above ambient of 20 °C) is not to be exceeded in the case of a timber stud 56 mm thick, faced on both sides with 6 mm thick non-combustible insulating board. The temperature rise,  $\theta_{\rm T}$ , of the timber stud is 80 K.

Using a typical thermal conductivity value of 0.11 W/m·K at 100 °C it may be assumed that  $R_{\rm T}$  = 0.51 m<sup>2</sup>·K/W.

Similarly  $R_{\rm I,2} = 0.04~{\rm m}^2$  K/W based on thermal conductivity value of 0.17 W/m K. The value of  $R_{\rm I,1}$  will be slightly less because of the increase in thermal conductivity values at higher temperatures. Because the figure is not available from published data the value of  $R_{\rm I,1}$  is assumed to be the same as  $R_{\rm I,2}$ .

Assuming that the thermal resistance of the cold surface,  $R_{\rm C}$ , is 0.12 m<sup>2</sup>·K/W and substituting these values in equation (1) gives

$$\theta_{\rm E} = \frac{0.04 + 0.51 + 0.04 + 0.12}{0.51 + 0.04 + 0.12} \times 80 \tag{2}$$

= 85 K (above ambient)

Hence, if  $\theta_{\rm E}$  does not exceed 85 K or a temperature of 85 + 20 = 105 °C, the timber temperature will not exceed 100 °C.

## B.2 Calculation of required additional insulation if $\theta_{\rm E}$ exceeds the maximum permissible value

The required additional resistance can be provided by increasing the original thickness of the insulating board or by inserting mineral wool in the space between the chimney or flue and the insulating board.

If the exposed face temperature,  $\theta_{\rm E}$ , is known, the total resistance,  $R_{\rm I,1}$ ', i.e. the combined thermal resistance of 1 m² of surface of additional insulation and exposed facing (in m²·K/W), required to maintain  $\theta_{\rm T}$  below 80 K can be calculated as follows.

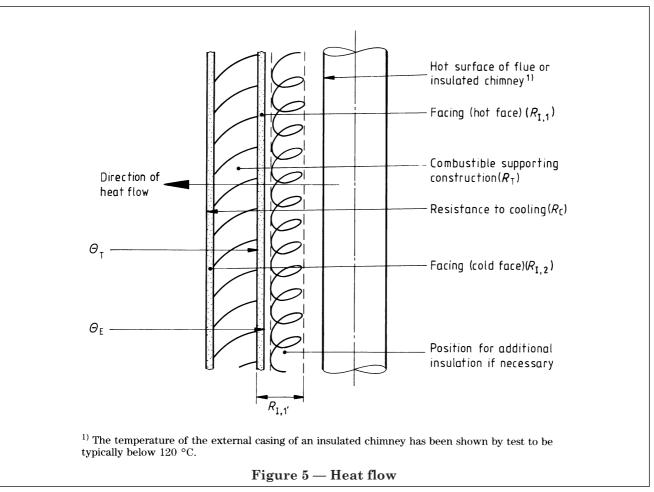
Rewriting equation (1) gives

$$R_{\rm I,1}' + [R_{\rm T} + R_{\rm I,2} + R_{\rm C}]$$
  
=  $[R_{\rm T} + R_{\rm I,2} + R_{\rm C}] \times \frac{\theta_{\rm E}}{\theta_{\rm T}}$  (3)

or

$$R_{\mathrm{I,1}'} = [R_{\mathrm{T}} + R_{\mathrm{I,2}} + R_{\mathrm{C}}] \times \left[\frac{\theta_{\mathrm{E}}}{\theta_{\mathrm{T}}} - 1\right]$$

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Substituting the values for  $R_{\rm T}, R_{\rm ,I,2}$ , and  $R_{\rm C}$  given in the example in **B.1** and assuming  $\theta_{\rm E}$  is 100 K then the required resistance of  $R_{\rm I,1}{}'$  (in m $^2$ ·K/W) to maintain  $\theta_{\rm T}$  at 80 K is

$$R_{\text{I, 1}}' = (0.51 + 0.04 + 0.12) \times$$
  
  $\times \left[\frac{100}{80} - 1\right]$   
  $= 0.17 \text{ m}^2 \cdot \text{K/W}$ 

If the thermal conductivity, k, of the non-combustible board at 110 °C is 0.17 W/m·K then a total thickness of 29 mm is required. This value is obtained by multiplying the thermal conductivity, k, by the total resistance,  $R_{\mathrm{I},1}$ ',  $\times$  1 000. If the existing thickness is 6 mm then an additional 23 mm is needed.

Alternatively, if mineral wool is used for the additional protection, then a nominal thickness of at least 10 mm is needed, based on its thermal conductivity of  $0.05~\text{W/m}\cdot\text{K}$  at 110~°C.

Any other insulant may be used, provided the combined resistivity of  $R_{\rm I,1}{}'$  is at least 0.17 m $^2$  ·K/W.

#### Publications referred to

BS 21, Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads..

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

BS 476, Fire tests on building materials and structures.

BS 476-4, Non-combustibility test for materials.

BS 864, Capillary and compression tube fittings of copper and copper alloy.

BS 864-2, Specification for capillary and compression fittings for copper tubes.

BS 1252, Specification for solid-fuel free-standing cookers with integral boilers.

BS 1710, Specification for identification of pipelines and services.

BS 1723, Brazing.

BS 1846, Glossary of terms relating to solid fuel burning equipment.

BS 1846-1, Domestic appliances.

BS 3377, Specification for boilers for use with domestic solid mineral fuel appliances.

BS 3378, Specification for roomheaters burning solid mineral fuel.

BS 3632, Specification for park homes (mobile homes)<sup>3)</sup>.

BS 4433, Specification for solid smokeless fuel boilers with rated outputs up to 45 kW.

BS 4433-1, Boilers with undergrate ash removal.

BS 4433-2, Gravity feed boilers designed to burn small anthracite.

BS 4543, Factory-made insulated chimneys.

BS 4543-1, Methods of test for factory-made insulated chimneys.

BS 4543-2, Specification for chimneys for solid fuel fired appliances.

BS 4626, Specification for touring trailer caravans<sup>3</sup>).

BS 4989, Specification for permanent holiday caravans<sup>3</sup>).

BS 5601, Code of practice for ventilation and heating of caravans.

BS 5601-1, Ventilation.

BS 6100, Glossary of building and civil engineering terms.

BS 6100-3, Services.

BS 6100-3.1, Energy sources and distribution.

BS 6461, Installation of chimneys and flues for domestic appliances burning solid fuels (including wood and peat).

BS 6461-2, Code of practice for factory-made insulated chimneys for internal applications.

BS 6492, Transportable accommodation units<sup>3)</sup>.

BS 6492-1, Recommendations for design and construction.

BS 6492-2, Recommendations for transportation and siting, with guidance on occupancy.

BS 6539, Specification for fireguards for use with solid fuel appliances.

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

BS 6760, Glossary for leisure accommodation vehicles.

BS 8303, Code of practice for the installation of domestic heating and cooking appliances burning solid mineral fuel.

<sup>3)</sup> Referred to in the foreword only.

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