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Code of practice for

Draught control of existing doors and windows in housing using draughtstrips

ICS 91.120.10

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/540, Energy performance of materials components and buildings, to Subcommittee B/540/5, Draught control of installed doors and windows, upon which the following bodies were represented:

Association for the Conservation of Energy

Association of Metropolitan Authorities

British Plastics Federation

Department of the Environment (Building Research Establishment)

Department of the Environment (Property and Buildings Directorate)

Department of the Environment (Housing and Urban Monitoring and Analysis Directorate)

Draught Proofing Advisory Association Ltd.

Energy Action Grants Agency

Neighbourhood Energy Action

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Contents

Foreword

This British Standard has been prepared by Subcommittee B/540/5. It principally concerns the proper fitting of the draughtstrip materials specified in BS 7836 *Specification for draughtstrips for the draught control of existing doors and windows in housing*. Particular care was taken whilst drafting this code to ensure that, wherever possible, the performance of draughtstrips is not compromised by recommendations resulting in incorrect product selection, poor preparation of the door or window, or inappropriate fitting of the product. A fundamental requirement of a draughtstrip is that it should be flexible enough to maintain a good seal whilst the size of the gap which it seals alters due to dimensional changes in the door or window. These dimensional changes arise from the seasonal variations in climatic and indoor environmental conditions. A further requirement of a draughtstrip is that its fitting does not result in difficulty in opening or closing a door or window. These two requirements form a basis for the advice given in this code.

This British Standard also recognizes that there is a group of products which are not covered by BS 7386 and which are commonly used in specific situations, particularly on steel windows and doors. Recommendations for the application of these products, usually known as sealants, are therefore included in this code.

Whilst the fitting of draughtstrips can bring benefits of energy savings and improved thermal comfort for the occupants, this should not be at the expense of safety. This code therefore also contains important advice on maintaining adequate air supply to combustion appliances. The need to maintain adequate ventilation for the removal of indoor pollutants and the prevention of condensation and mould growth is also addressed.

This British Standard is particularly directed at specifiers, installers and manufacturers of draughtstrip products, and householders.

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 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.

Introduction

Draught control by fitting draughtstrips or sealants to doors and windows in dwellings can be a simple and effective means of improving energy efficiency and occupant comfort. Although the task is relatively straightforward and often carried out on a "do it yourself" basis, there are a number of precautions and simple instructions which should be heeded if draught control is to be both safe and effective. Particular attention is drawn to the need to maintain an adequate air supply to combustion appliances.

On average, perimeter gaps around doors and windows account for about 16 % of the total area of ventilation openings in dwellings. Only rarely do these gaps account for more than 50 % of the total area in individual dwellings so the fitting of draughtstrips or the application of sealants can significantly reduce ventilation, but will rarely eliminate it. Furthermore, fresh air requirements and the ventilation rates found in practice vary enormously from one dwelling to another, so any guidance relating to draught control should of necessity be general in nature and based on a conservative approach.

The recommendations given in this code are based on the general assumption that little will be known about the ventilation characteristics of the dwelling, other than can be deduced from simple visual inspection. Where a specialized examination of the dwelling has been carried out (see Annex B) the general guidelines given here still apply but the extent to which draught control should be carried out in the dwelling should then be judged in the light of the recommendations given in Annex B.

1 Scope

This British Standard gives recommendations for the draught control of existing doors and windows in housing where this is carried out as a retro-fit measure. The guidance given mainly concerns the fitting of draughtstrips to doors and windows using the types of draughtstrip specified in BS 7386 but guidance is also given on the fitting of draughtstrips to loft hatches and the use of sealants.

The fitting of draughtstrips as smoke control seals and the installation of secondary glazing as a draught control measure for windows are outside the scope of this standard.

A list of advisory bodies is given in Annex A and notes on air leakage testing in dwellings in Annex B.

2 References

2.1 Normative references

This standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by updating or revision.

2.2 Informative references

This standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this standard the following definitions apply:

3.1
carrier

part of the draughtstrip designed to hold and fix the working section in its operating position

3.2
combustion appliance

device which produces heat by the combustion of fuel in air. This includes cooking, water heating and space heating appliances, with or without flues

3.3
door

combination of both a door leaf and the surrounding frame into which it is fixed

3.4
draughtstrip

product with dynamic characteristics for closing perimeter gaps when the door leaf or window sash is shut, in particular for retrospective fitting to existing doors and windows that were not originally designed to receive such products. The draughtstrips have to be attached either to the frame or door leaf/window sash and may consist entirely of a working section or the working section may be attached to a carrier

3.5
perimeter gap

air leakage gap remaining between a door leaf or window sash and its frame when the leaf/sash is shut

3.6
sealants

through-curing gap filling and in situ gasket materials applied in viscous liquid form

3.7
size and dynamic characteristics

attributes of draughtstrip products which enable them to fill a range of gap sizes without undue resistance and follow seasonal changes in gap size. These embrace cross-sectional dimensions and the ability to deflect, compress and recover. Where relevant, they also include an ease of sliding against opposing surfaces

3.8
working section

part of the draughtstrip which exhibits the dynamic characteristics

4 Ventilation requirements

NOTE 1 Recommendations on the principles which should be observed when designing for the natural ventilation of buildings for human occupation are given in BS 5925.
NOTE 2 Recommendations on the principles which should be observed to control condensation in buildings are given in BS 5250.

4.1 Fresh air supply

Fresh air in dwellings is required for breathing, for the safe and efficient operation of combustion appliances and for the removal of pollutants. Substances which can be regarded as pollutants when found in dwellings include the following: body odour, carbon dioxide, carbon monoxide and other products of combustion, formaldehyde, pesticides and other organics, radon, landfill gases (such as methane, carbon dioxide and hydrogen sulfide), tobacco smoke, non-viable organisms and micro-organisms. When considering an individual dwelling it should be recognized that the fresh air requirements depend on the rate of production of these pollutants and the occupancy habits of the household. In general however, the "key" pollutants are water vapour and the products of combustion appliances. In general, ventilation from sources other than the gaps around windows and doors fitted with draughtstrips will restrict these pollutants to an acceptable level and be more than adequate to cope with the other pollutants.

4.2 Radon

In dwellings which have, or are suspected of having, an annual mean indoor radon concentration which is close to or greater than the "action level" set by the Department of the Environment, specialist advice should be sought from the local Environmental Health Officer before fitting draughtstrips to any door or window.

4.3 Combustion appliance requirements

4.3.1 *Air supply openings*

The fuels burnt in combustion appliances include mains gas, liquid petroleum gas (LPG) from a cylinder or piped from a tank, paraffin, oil and solid fuels such as coal, wood and peat. Whatever the fuel it is essential to maintain an adequate supply of fresh air to the appliance: firstly to ensure that combustion of the fuel is as complete as possible and secondly to ensure the dilution and removal of the products of combustion. These products are predominantly water vapour and carbon dioxide with small quantities of other gases such as oxides of nitrogen, carbon monoxide, formaldehyde and sulfur dioxide, depending on the type of fuel and burner.

In the UK, about 50 people die each year as a result of carbon monoxide poisoning; the number increasing during severe winters. Most fatalities are caused by faulty appliances and blocked flues or chimneys so it is essential that care should be taken to ensure that appliances and their flues or chimneys are properly maintained. In some deaths however, an inadequate air supply to a combustion appliance is a contributory factor. If adequate air supply is not provided or inadequate provision is made for the discharge of combustion products, circulation of carbon monoxide will occur within the dwelling possibly at fatal concentrations. It is therefore essential that draughtstripping measures do not restrict the ventilation necessary for correct and safe appliance operation.

There are three broad categories of combustion appliance.

a) *Balanced-flue and room-sealed appliances,* which take their combustion air directly from outside the building and discharge their products of combustion directly to the outside of the building. The interior of the appliance is sealed from the room and there are therefore no specific implications for draught control, other than to ensure that the external terminal is not blocked or covered. However, where a gas burning appliance is fitted inside a compartment, e.g. a broom cupboard, care should be taken to ensure that the compartment is ventilated at both high and low level either to outside or to an adjoining room (see Table 1).

b) *Open-flued appliances,* which draw their combustion air from the room in which they are situated and discharge their products of combustion to the outside of the building via a flue. In most cases, a purpose provided air opening is required and it is essential to ensure that required openings are in fact present and not covered or blocked. However for certain smaller appliances, adventitious openings in the building fabric are relied upon to provide an adequate supply of fresh air to the appliance. In the latter case, care should be taken to ensure that draught control is not so extensive as to seal off all air leakage paths. Practical guidance is given in Table 1.

c) *Flueless space heating appliances,* often portable, which draw their combustion air from the room and discharge their products of combustion into the room; for example, paraffin heaters. Use of such appliances results in high rates of moisture production because all products of combustion are discharged into the room. Where such appliances are known to be in use, draughtstrips and sealants should not be installed unless appropriately sized permanent vents are provided (see Table 1 and Table 2).

NOTE These three broad categories of combustion appliance are further subdivided in Table 1 and Table 2 according to fuel type and design of appliance.

Before any draught control treatment is considered, it is essential that the draughtstrip or sealant installer should ensure that any required permanent openings to the outside of the building are provided. Where the required opening is present, of adequate size, and is not blocked or covered then draughtstrip fitting may proceed subject to precautions with extract fans (see **4.3.2**) and condensation and mould (see **4.4**).

Where the required opening(s) is not present, is of inadequate size, or has been obstructed or blocked, the installer should take all reasonable steps to warn the occupier of the need to provide sufficient ventilation for the safe operation of combustion appliances. The occupier should be recommended to contact the appropriate fuel advisory organization (see Annex A) for further advice. It may be possible to fit limited draughtstrips and sealants in the dwelling, i.e. deliberately omitting the fitting of some draughtstrips and sealants. In cases where draughtstrips or sealants have been deliberately omitted the installer should make the occupier aware of the reasons and of the importance of maintaining the gaps left open.

Practical guidance on the fitting of draughtstrips and sealants in dwellings with open-flued space heating appliances is given in Table 1, and for flueless domestic gas appliances in Table 2. Following the installation of draughtstrips a combustion product spillage test, as described in Annex C, should be carried out in all cases where the air supply opening to an open-flued combustion appliance is not present, or is inadequate, blocked or covered. Where the required permanent air supply opening is present, of adequate size, and is not blocked or covered then a combustion product spillage test is not necessary. Installers may also wish to carry out an initial spillage test to satisfy themselves that the appliance(s) operate correctly before draughtstrip installation work starts.

It should be noted that the omission of draughtstrips is not an acceptable means of providing an air supply for a combustion appliance when that appliance is being installed or replaced. Omission of draughtstrips is no more than a precaution in respect of safe and effective draught control where an existing appliance installation has an inadequate air supply and until such time as any required permanent air supply opening is fitted.

Although appliances in kitchens and bathrooms have to be checked for a suitable air supply, it is recommended that draughtstrips and sealants are not fitted to the windows of kitchens and bathrooms in any dwelling. Even if there are no combustion appliances in these rooms, ventilation is still required for other purposes (see **4.4**).

For most combustion appliances the requirements for permanent openings in the form of airbricks or fixed vents, are statutory. Detailed information may be found in the relevant parts of the following:

a) The Building Regulations 1991. Approved Document J, *Heat producing appliances,* 1990 edition (for England and Wales) as amended [1];

b) The Building Standards (Scotland) Regulations 1990 (as amended): Part F [2];

c) The Building Regulations (Northern Ireland) 1990. *Technical booklet L, Heat producing appliances,* July 1992 [3];

d) The Gas Safety (Installation and Use) Regulations 1994, Statutory Instruments 1994 No. 1886, (amended 1996) [4].

Relevant British Standards include BS 5410 for oil fired appliances, BS 5440 and BS 5871 for gas appliances and BS 8303 for solid mineral fuel appliances.

A problem arises when fitting draughtstrips, in that building regulations and standards etc. are updated from time to time, but the requirements are not retrospectively applied to existing dwellings. Vents found in dwellings therefore may vary according to their age and when appliances have been installed or replaced. Therefore, the air supply requirements for the most common types of space heating combustion appliances and flueless domestic gas appliances which are summarized in Table 1 and Table 2 respectively are those deemed to apply for the purposes of this code of practice only. They may differ from those statutory requirements which currently apply or were applicable when the appliance was originally installed.

Table 1 — Guidance on air supply requirements for space heating combustion appliances and fitting draughtstrips

Type of appliance	Requirements for permanent opening to the outside air in the room or space containing the appliance[a]	Guidance on fitting draughtstrips and sealants where opening is not present, or is inadequate, blocked or covered
Balanced-flue and room-sealed appliance	None; air supply provided directly from outside (but see note 1 below)	Draughtstrips may be fitted subject to other guidelines in **5.2** c) and Table 4
Open-flued gas appliance, including gas boiler and gas fire with back boiler but excluding room gas fire and decorative fuel effect gas fire	A permanent opening with a free area of 450 mm^2(4.5 cm^2) for every kW of input rating over 7 kW (but see note 1 below) [For heat inputs up to 7 kW, purpose provided ventilation is not normally necessary as it is assumed there is adventitious ventilation of 3 500 mm^2(35 cm^2)]	Leave a minimum of 8 m of window perimeter without draughtstrips or sealants in the room containing the appliance (see note 5 below). Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling. Where the window perimeter is less than 8 m, both the window and the internal door from the appliance room to the hallway, stairway or passage which serves the room shall not be fitted with draughtstrips or sealants. Where the external door enters the room containing the appliance via a draught lobby which serves no other room, the draught lobby should not count as a hallway, stairway or passage and draughtstrips or sealants should be omitted from another internal door from the appliance room. Where the 8 m of draughtstrip or sealant omitted does not include the space at the bottom of the internal door then a door bottom draughtstrip may be fitted.
Decorative fuel effect gas fire	Air supply requirements for these appliances vary. Some special designs do not require a purpose provided opening. If in doubt, consult an appropriate fuel advisory organization or assume that the appliance requires a permanent opening with a free area of at least 10 000 mm^2(100 cm^2)	
Room gas fire, open-flued, of rated input over 7 kW	A permanent opening with a free area of 450 mm^2(4.5 csm^2) for every kW of input rating over 7 kW [For heat inputs up to 7 kW, purpose provided ventilation is not normally necessary as it is assumed there is adventitious ventilation of 3 500 mm^2(35 cm^2)]	
Room gas fire, open-flued, of rated input up to 7 kW	No requirement for permanent opening; it is assumed that there is a minimum adventitious area of 3 500 mm^2(35 cm^2) (see note 2 below)	Leave at least 2.5 m of window perimeter without draughtstrip or omit draughtstrips from internal door between the room containing the appliance and the hallway, stairway or passage (see note 2 below). Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.

Table 1 — Guidance on air supply requirements for space heating combustion appliances and fitting draughtstrips

Type of appliance	Requirements for permanent opening to the outside air in the room or space containing the appliance[a]	Guidance on fitting draughtstrips and sealants where opening is not present, or is inadequate, blocked or covered
Oil burning open-flued boiler or range Solid fuel burning independent boiler or range	Permanent opening of free area at least 550 mm^2(5.5 cm^2) for each kW of rated output above 5 kW	Leave a minimum of 8 m of window perimeter without draughtstrips or sealants in the room containing the appliance (see note 5 below). Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling. Where the window perimeter is less than 8 m both the window and the internal door from the appliance room to the hallway, stairway or passage which serves the room should not be fitted with draughtstrips or sealants. Where the external door enters the room containing the appliance via a draught lobby which serves no other room, the draught lobby should not count as a hallway, stairway or passage and draughtstrips or sealants should be omitted from another internal door from the appliance room. Where the 8 m of draughtstrip or sealant omitted does not include the space at the bottom of the internal door then a door bottom draughtstrip may be fitted.
Open solid fuel fire, with or without back boiler	a) for ordinary open fireplaces up to 400 mm wide (16 inches) a permanent opening with a free area of at least 10 000 mm^2(100 cm^2) or b) for larger open fires and inglenook fireplaces at least 50 % of the throat opening area (see note 3 below)	Leave a minimum of 8 m of window perimeter without draughtstrips or sealants in the room containing the appliance (see note 5 below). Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.
Other solid fuel open-flued appliance, including room heater and glass fronted fire with or without integral/back boiler, but excluding independent solid fuel boiler or range	A permanent opening with a free area of at least 550 mm^2(5.5 cm^2) per kW of rated output above 5 kW. Where a flue draught stabilizer is used the total free area should be increased by 300 mm^2(3 cm^2) for each kW of rated output. (If in doubt assume 10 000 mm^2(100 cm^2) is required)	Where the window perimeter is less than 8 m both the window and the internal door from the appliance room to the hallway, stairway or passage which serves the room should not be fitted with draughtstrips or sealants. Where the external door enters the room containing the appliance via a draught lobby which serves no other room, the draught lobby should not count as a hallway, stairway or passage and draughtstrips or sealants should be omitted from another internal door from the appliance room. Where the 8 m of draughtstrip or sealant omitted does not include the space at the bottom of the internal door then a door bottom draughtstrip may be fitted.

Table 1 — Guidance on air supply requirements for space heating combustion appliances and fitting draughtstrips

Type of appliance	Requirements for permanent opening to the outside air in the room or space containing the appliance[a]	Guidance on fitting draughtstrips and sealants where opening is not present, or is inadequate, blocked or covered
Flueless gas space heater (fixed)	a) In a room, permanent opening of at least 10 000 mm^2(100 cm^2) plus 5 000 mm^2(50 cm^2) for every kW by which the appliance rated input exceeds 3 kW and an openable window or equivalent is required. b) In a hall, passageway, etc. (not in a room) 10 000 mm^2(100 cm^2) plus 2 500 mm^2(25 cm^2) for every kW by which the appliance rated input exceeds 6 kW and an openable window or equivalent is required. Appliance should not be fixed in a bedroom or bathroom. (see note 4 below)	Do not fit draughtstrips or sealants anywhere in the dwelling until air supply opening has been provided.
Mobile flueless space heating appliances (LPG, paraffin)	A permanent ventilation opening is not required by regulations but for the purposes of this code of practice assume that a permanent opening of at least 9 500 mm^2(95 cm^2) is required (see note 4 below)	Where the appliance is used only in one room do not fit draughtstrips to any door or window in that room. Where the appliance is used in more than one room, or in a hallway, do not fit draughtstrips anywhere in the dwelling.

NOTE 1 Balanced-flue, room-sealed and open-flued gas heating appliances may be installed in a compartment, e.g. a broom cupboard. The compartment is required to be ventilated via permanent non-adjustable vents at high and low level with areas specified as mm^2/kW (and cm^2/kW) heat input to appliance, as follows:

open-flued appliance:

ventilated to an adjacent room, 900 mm^2/kW (9 cm^2/kW) high level, 1 800 mm^2/kW(18 cm^2/kW) low level;

ventilated direct from outside, 450 mm^2/kW (4.5 cm^2/kW) high level, 900 mm^2/kW (9 cm^2/kW) low level.

balanced-flue or room-sealed appliance:

ventilated from adjacent room, 900 mm^2/kW (9 cm^2/kW) high level, 900 mm^2/kW (9 cm^2/kW) low level;

ventilated direct from outside, 450 mm^2/kW (4.5 cm^2) high level, 450 mm^2/kW (4.5 cm^2) low level.

Where the appliance is open-flued, the adjacent room also requires the permanent ventilation specified in Table 1.

NOTE 2 The guidance given for gas fires which do not usually require a permanent opening is designed to ensure a minimum adventitious opening (i.e. an opening not purpose provided as is the case with airbricks, trickle ventilators and other ventilators) of 3500 mm^2(35 cm^2). This is based on an assumed average gap width of 1.5 mm around the window, so that if 2.5 m of window perimeter is left without draughtstrips or sealants the open area is 3 750 mm^2(37.5 cm^2). In cases where draughtstrips or sealants are deliberately omitted, occupants should be made aware of the reasons and of the importance of maintaining these gaps.

NOTE 3 Building regulations which came into effect in 1985 require the opening given in the table for air supply to solid fuel open fires. However, the requirement does not apply to dwellings which were built before the regulations came into effect, so many rooms will be found in which an open fire is fitted without a permanent air supply opening. Where draughts are deliberately omitted, occupants should be made aware of the reasons and of the importance of maintaining these gaps.

NOTE 4 Flueless space heaters should not be used in unventilated rooms.

NOTE 5 The guidance given to omit at least 8 m of draughtstrip from windows and/or doors is based on an assumed average gap width of 1.5 mm, so that if 8 m of draughtstrip or sealant is omitted then the free area of the gaps totals 12 000 mm^2(120 cm^2). This would be sufficient for most gas decorative fuel effect fires, other gas appliances of up to 19 kW rated input and oil fired or solid fuel appliances of up to 15 kW rated output. In cases where draughtstrips or sealants are deliberately omitted, occupants should be made aware of the reasons and of the importance of maintaining these gaps. It should be noted that the omission of draughtstrips is not an acceptable means of providing an air supply for a combustion appliance when that appliance is being installed or replaced. Omission of draughtstrips is no more than a precaution in respect of safe and effective draught control where an existing appliance installation has an inadequate air supply and until such time as any required permanent air supply opening is fitted.

[a] The requirements stated are those deemed to apply for the purposes of this code of practice only. They are not necessarily the same as current or past statutory requirements.

Table 2 — Guidance on air supply requirements for flueless domestic gas appliances (taken from BS 5440-2:1989) and fitting draughtstrips (see also Table 1)

Type of appliance	Room volume (m^3)	Requirements for permanent opening to outside air	Guidance on fitting draughtstrips and sealants (see note 1)
Domestic oven, hotplate, grill or any combination thereof (any rated input) (see note 3)	< 5 5 to 10 > 10	10 000 mm^2(100 cm^2) 5 000 mm^2(50 cm^2) or external door No permanent opening required	Windows in room containing gas cooker should not be fitted with draughtstrips
Instantaneous water heater (up to 12 kW rated input) (See notes 2, 3 and 4)	5 to 10 11 to 20 > 20	10 000 mm^2(100 cm^2) 5 000 mm^2(50 cm^2) No permanent opening required	Windows in room containing appliance should not be fitted with draughtstrips
Refrigerator, single boiling ring (any rated input)	Any size room	No permanent opening required	Draughtstrips may be fitted subject to other guidelines in **5.2** c) and Table 4

NOTE 1 This guidance takes into account not only the combustion products from the appliances but also the ventilation requirements for dealing with water vapour production from cooking, clothes drying and other household activities.
NOTE 2 Installation of these appliances is not recommended in rooms with volume less than 5 m^3.
NOTE 3 Rooms containing these appliances are required to have an openable window.
NOTE 4 Water heaters in bathrooms are now required to be room-sealed (or balanced-flued). Flueless water heaters are no longer permitted to be installed in bathrooms. Wash boilers/machines are only permitted in kitchens or utility rooms.

4.3.2 *Extract fans*

Extra care should be taken when fitting draughtstrips in dwellings which have fan extract devices such as extract fans, extract type cooker hoods and fan assisted open-flued combustion appliances. There is a risk that a fan extract device in the same room as an open-flued appliance, or in an adjacent room, may cause combustion products to spill from the appliance into the room when draughtstrips are fitted. The installer should therefore check if there are any fan extract devices in the dwelling which might cause combustion products to spill from open-flued combustion appliances and omit draughtstrips and sealants to minimize that risk according to the practical guidance in Table 3. In all cases a combustion product spillage test, as described in Annex C, should be carried out after completing all draughtstrip installation in the dwelling. This test should be done irrespective of whether the appliance air supply opening is adequate or not.

Unless specifically mentioned in Table 3, other rooms in the dwelling may be fitted with draughtstrips or sealants in accordance with procedures described elsewhere in this code of practice except for the doors leading off a linking hallway without stairs.

4.4 Condensation

The presence of water vapour in indoor air is essential for a comfortable environment but if relative humidity levels exceed 70 % for prolonged periods, there is a high probability of condensation occurring on cold external walls. If damp conditions persist, conditions may be conducive to the germination of mould fungi, with resultant growth of mould on surfaces and on clothes in cupboards.

About 2.5 million dwellings in the UK are believed to suffer from problems of serious surface condensation and mould, resulting in damage to decorations, floors, carpets and furniture. A much greater number are troubled by condensation on window panes but its effects are usually far less damaging than on other surfaces. Four factors usually combine to cause condensation: inadequate ventilation; inadequate heating; poor standards of thermal insulation; and excessive moisture generation. Inadequate ventilation alone can lead to condensation problems and it is therefore vital to ensure, as far as possible, that draught control does not reduce ventilation to such an extent that relative humidity levels rise above 70 % for prolonged periods.

Average ventilation rates of between 0.5 and 1.5 air changes per hour, with increased ventilation in kitchens and bathrooms during or immediately after periods of moisture generation, will in general ensure the satisfactory removal of moisture. However, measurement of ventilation rates, or even air leakage rates, cannot be carried out prior to each draught control installation. Guidance should be based on a subjective assessment of the severity of the dwelling's existing condensation or mould. Routine draught control will usually be an effective measure and should not lead to condensation problems. Guidelines on the extent to which draughtstrips and sealants should be fitted in dwellings already affected by condensation are given in Table 4.

NOTE In some cases, excessive rather than inadequate ventilation may be one of the factors causing a condensation problem, since it results in low internal temperatures. Where a dwelling is clearly over ventilated, for example, having doors and windows which all have very wide gaps around them, draught control should be carried out on a trial basis over the winter months. If the condensation problem has worsened, specialist advice should be sought. Further information on the causes and effects of condensation in buildings and recommendations for its control are given in BS 5250.

5 Inspection of dwelling

5.1 Purpose of inspection

Before any installation work is undertaken an inspection of the dwelling should be made in order to:

a) identify any windows, doors and hardware which are in need of repair or adjustment before the fitting of draughtstrips or sealants;

b) decide on the amount of draught control work to be carried out;

c) identify suitable materials to conform to BS 7386 and estimate the quantities needed.

5.2 Inspection procedure

The procedure to be used will depend on whether the work is being carried out by the householder himself on a DIY basis, by a contractor for individual householders, or by a contractor as part of a contract for a large number of similar properties. In the latter case it may be worth considering measurement of dwelling air leakage rates using the fan pressurization technique. The extent to which draught control should be carried out in each dwelling should then be judged in the light of the recommendations in Annex B which also describes the measurement technique.

In the case of individual dwellings the inspection will involve making decisions about each window and door and, except in DIY installations, extensive consultation with the householder. Remember that it is worth fitting draughtstrips where perimeter gaps are small because the gaps may open up due to seasonal movement. The following procedure is recommended for individual dwellings.

a) Each room should be inspected to check that doors and windows open, close and lock easily. The householder should be asked if, at any time of the year, they experience difficulty in operating locks and bolts at the top or bottom of external doors, if the doors are ever difficult to close and if they notice the doors warping.

b) In each room, the type of heating used should be noted and it should be ensured that any ventilators required for the provision of combustion air are fitted and are not blocked. If there is any uncertainty as to the type of combustion appliance, the appropriate fuel advisory organization (see Annex A) should be consulted. The presence of mould or severe condensation should be checked at this stage.

c) If there are no problems of ventilation and windows and doors are in need of draught control the following is recommended:

1) draughtstrips or sealants should be fitted on all external doors;

2) draughtstrips or sealants should be fitted on all windows except those in the kitchen and bathroom;

3) draughtstrips should be fitted on the loft hatch. Fasteners may also be fitted to ensure a correct compression of the draughtstrip;

4) draughtstrips should be fitted on the bathroom door and the door between the kitchen and the rest of the dwelling to minimize transfer of moisture from these rooms.

NOTE If there are problems of restricted ventilation the above should be modified by omitting lengths of materials as shown in Table 1 and Table 3.

d) An appropriate material should be chosen to conform to BS 7386 for each window and door as detailed in clause **6**.

Table 3 — Guidance on fitting draughtstrips and sealants in dwellings fitted with both fan extract devices and open-flued combustion appliances (see note 1)

Fan extract location	Relative location of open-flued combustion appliance(s)	Guidance on fitting draughtstrips and sealants
Bathroom	Appliance in any other room	Draughtstrips are not fitted to windows in bathrooms. Extract fans fitted to bathrooms are usually small and do not normally interact with appliances in adjacent rooms. Carry out a combustion product spillage test (see Annex C) after completing all draught-strip installation in the dwelling.
WC	Appliance in any other room	Extract fans fitted to WCs are usually small and do not normally interact with appliances in adjacent rooms. Draughtstrips may be fitted in the WC. Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.
Kitchen or utility room	Appliance in same room	Do not fit draughtstrips or sealants to any door or window in the room. Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.
	Appliance(s) in one adjacent room linked by a door or serving hatch (see note 2)	Do not fit draughtstrips or sealants to any door or window in the room containing the fan nor the adjacent room containing the appliance(s). Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling. Subject to air supply requirements of the appliance(s) being satisfied, draughtstrips or sealants may be fitted to the door and/or serving hatch linking the two rooms.
	Appliances in two or more adjacent rooms which are linked to the room containing the extract fan by door(s) or a serving hatch (see note 2)	Do not fit draughtstrips or sealants to any door or window in the room containing the fan, nor in the rooms containing the appliances. Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling. Do not fit draughtstrips or sealants to any door or serving hatch between the room containing the fan extract device and a room containing an appliance
	Appliance(s) in room(s) linked to the room containing the extract fan only by a hallway which includes stairs giving access to other rooms in the dwelling (see note 3)	Draughtstrips or sealants may be fitted in accordance with the procedures described elsewhere in this code of practice. Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.
Kitchen or utility room	Appliance(s) in room(s) linked to the room containing the extract fan only by a hallway without stairs	Treat as if linked directly by a door, or serving hatch as described above. Carry out a combustion product spillage test (see Annex C) after completing all draughtstrip installation in the dwelling.

NOTE 1 Fan extract devices include extract fans (which may be connected to the room only via a duct), extractor type cooker hoods (but not recirculating types) and fan assisted open-flued combustion appliances.
NOTE 2 Where a room containing a fan extract device is linked to an adjacent room (or rooms) by an open archway or where the door has been removed then the rooms should be treated as one room.
NOTE 3 Does not include a stairway with a door at the top and/or bottom (e.g. a stairway protected by fire doors).

Table 4 — Condensation and fitting of draughtstrips

Severity of problem (see BRE Digest 297 [5])	**Guidance on fitting of draughtstrips**
Severe condensation/mould in living room or bedrooms	Dwelling should not be fitted with draughtstrips
Condensation/mould (severe or light) in kitchen or bathroom only	Living rooms and bedrooms may be fitted with draughtstrips. Occupants should be advised of the need to remove moisture at source.
Small areas in living rooms or bedrooms affected by condensation/light mould; easily removed with damp cloth and no stain remaining.	If affected rooms have permanent ventilation opening, fit draughtstrips. If no permanent ventilation, leave at least 2 m of window perimeter without draughtstrips.
NOTE For the purposes of this table condensation and mould growth need only be assessed on walls, floors and ceilings. Condensation on single glazing is very difficult to avoid and should be ignored in the above assessment unless there is evidence that it is persistent in living rooms and bedrooms. Significant condensation on double glazing would be expected to be accompanied by evidence of condensation and mould on other surfaces in the room.	

Where work is being carried out on a contract basis in a large number of similar dwellings, a specification of the extent of draught control and the materials to be used should be agreed between the parties concerned. A detailed inspection of the dwellings should be made to ensure that there are no specific problems in individual houses which will affect the extent of installation of draughtstrips or sealants; e.g. flueless heaters such as portable paraffin or gas heaters, the presence of mould growth, or differences in the door and window type and gap size which would render the product specified as unsatisfactory.

6 Selection of draught control materials

6.1 General

BS 7386 specifies a number of properties which materials need to have to operate effectively over a long period of time. The relative importance of other properties, such as appearance or cost, is a matter of subjective judgement for the purchaser.

Products conforming to BS 7386 are classified as follows:

a) *class 1,* products intended for use on poorly fitting external hinged doors which have maximum perimeter gaps greater than 2 mm and/or have large seasonal movements;

NOTE An indication of large seasonal movement might be, for example, particular difficulty in operating locks and bolts at the door head and door bottom at certain times of the year.

b) *class 2,* products intended for use on domestic loft hatches and internal or well fitting external hinged wood doors which have maximum perimeter gaps less than 2 mm and have small seasonal movements;

NOTE An indication of small seasonal movement might be, for example, slight difficulty in operating locks and bolts at the door head and door bottom at certain times of the year.

a) *class 3,* products intended for use on hinged wood and steel windows and sliding wood windows.

It is unlikely that there would be one product which is ideal for all types of doors and windows. For instance, a class 1 draughtstrip designed to meet the stringent requirements of external doors which have large seasonal movements may be too bulky to have an acceptable appearance on a window and could be unnecessarily expensive when compared to a material designed especially for windows.

NOTE A list of desirable properties of draught control materials is given in BRE Digest 319 [6].

6.2 Product information

Product information should be supplied by the manufacturer in accordance with BS 7386.

6.3 Types of draughtstrip

Draughtstrips can be designed to fit within a leakage gap such as the rebate of a door or window frame, or externally to it by fixing to the frame or opening section. Products which fit within a leakage gap have the advantage of being out of sight when the door or window frame is closed and are likely to be less prone to accidental damage or vandalism. Coping with varying gaps is a problem and normally involves fitting draughtstrips of different cross-sections into the various gaps. The extra compression needed where inappropriately sized draughtstrips are fitted into small gaps can lead to high closing forces.

Products which fit externally to the leakage gap usually consist of two distinct parts: a carrier, which is fixed to the frame or other part of the door or window; and a working section, which provides the seal and is attached to the carrier. Carrier based products are suitable for small gaps or where the gap varies around the perimeter of the door or window. Variations in gap from zero up to the maximum for which the product is designed can be accommodated by adjusting the position of the carrier during fitting.

Choice of draughtstrip may also be influenced by the risk of contamination by paint during redecoration. A draughtstrip which has been painted is unlikely to maintain the performance it achieved in its unpainted state because of chemical attack on the draughtstrip materials and/or because its size and dynamic characteristics may be altered by the dry paint film. However, some types of draughtstrip are more tolerant of intentional or adventitious painting than others. Advice on painting should be supplied by the manufacturer in accordance with BS 7386.

6.4 Gap fillers (in situ gaskets)

BS 7386 specifies products which have the dynamic characteristics to cope with the seasonal changes in leakage gaps around doors and windows due to humidity and temperature variations. There is a group of products which do not have dynamic characteristics and are used largely, but not exclusively, on steel windows. These are sealant materials which undergo a chemical "cure" after being squeezed into the perimeter gap. The frame of the window is treated to ensure good adhesion of the sealant whilst the opening part of the window is coated with a non stick release agent which may be a suitable liquid, thin film or low tack tape. When the sealant has cured, the window can be opened leaving the sealant as an in situ gasket formed to perfectly fill the original gap. However, the seasonal changes of the perimeter gap and lack of dynamic characteristics make these products unsuitable for general use. For wooden windows and doors, carrier based or rebate-fixed draughtstrips are available to cover all sizes of gap likely to be encountered.

In the case of steel windows, compression or deflection of the seal can lead to high closing forces where the gap size is very small. Where closing forces are particularly important, as in the case of elderly or disabled householders, the use of a gap filler may be the only practical method. As a guide, where the gap is less than 1 mm over 75 % of the opening perimeter, it is suggested that a gap filler be used if low closing forces are especially important.

6.5 Less common door and window designs

Less common types of door and window can often be fitted with the same draughtstrips or gap filling sealants as are used for the more common types included within the scope of BS 7386. The selection of draught control materials for the less common types involves the same criteria as specified in BS 7386.

7 Installation

7.1 Prior to fitting

Care should be taken to remove all breakable items from the working area and protection to the work and surrounding area should be provided, by means of a dust sheet or similar.

7.2 Preparation

Care should be taken to ensure that the door or window to be fitted with draught control materials opens and closes easily and is in good working order before any work is carried out.

Examples of minor repairs that may need to be carried out are as follows:

a) freeing of jammed sliding windows and replacement of catches or fasteners where necessary;

b) planing of timber doors and windows to fit aperture and painting or protective treating of exposed wood;

c) adjustment of striking plates;

d) clearing of excess paint, lubricating, adjusting or replacing hinges, catches and fasteners;

e) removal of any existing draught control materials and cleaning of the exposed surfaces;

f) fitting of fasteners to loft hatches;

g) cleaning and preparation (according to manufacturers' instructions) of surfaces to which sealants and adhesive fixed draughtstrips will be fixed.

Because of the more complex construction of sliding sash windows and the sections of timber used, the work required to ensure such a window is in good working order may be sufficiently major to be beyond that which is reasonable for the purposes of fitting draughtstrips. It is recommended that such cases are a matter for discussion between the householder or owner of the dwelling and the person responsible for the fitting of draughtstrips. Badly fitting windows may impair the effectiveness of draughtstrips and, conversely, the fitting of draughtstrips may impair the operation of badly fitting windows.

7.3 Fitting

Manufacturers' instructions should be followed. The following are intended to be helpful guidelines, particularly to those with little experience, of fitting draught control materials. Subclauses **7.3.1** and **7.3.2** deal with the fitting of draughtstrips only, whilst subclause **7.3.3** gives guidance on the fitting of sealants.

Where carrier based products are used, initial compression of the draughtstrip, by 3 mm for class 1 draughtstrips or 1.5 mm for class 2 and class 3 draughtstrips will give acceptable closing forces whilst maintaining the effectiveness of the seal during seasonal movement. The recommended gap sizes given by the manufacturer assume this compression on fitting and take into account the need to avoid fixing positions too close to the edge of timber sections.

There are many methods of ensuring the correct compression of the working section where the compression is achieved by adjustment of the fixing position of a carrier. One example of a simple method is to offer up the draughtstrip so that the working section just touches, along its length, the door or window and then to mark the carrier position in pencil on the frame. The draughtstrip is then removed and new pencil marks made, displaced towards the gap by the appropriate amount of compression. The draughtstrip is then fixed in line with the new pencil marks. Other methods include marking through the fixing pin holes (all pin holes should be used) or the use of specially made compression gauges supplied by the manufacturer.

There should be fixings within 25 mm of the end of each length of material. Corners should be butt, mitred or notch cut as appropriate to ensure a good seal at the join.

It is sometimes difficult to fit carrier based products around window and door furniture. Where this occurs it may be possible to fit a rebate fixed product in the area of the item of window or door furniture and a carrier based product around the remaining window or door perimeter. Where this is done the rebate and carrier based products should overlap by approximately 25 mm to help maintain a good seal.

The sizes of rebate fixed products should be chosen to be within the maximum/minimum gap size recommended by the manufacturer and should take into account the amount of timber available for any grooving recommended.

7.3.1 *External and internal doors*

Care should be taken to prevent draught control materials from interfering with the closing and locking mechanism and at all stages the door should be checked for ease of opening and closing.

It is common for a door between a kitchen and an adjacent room to be fitted with draughtstrips to reduce movement of moist air from the kitchen to the rest of the dwelling. Smoke alarms are often fitted close to the door in the adjacent room and are assumed to respond to a fire in the kitchen (smoke alarms are not normally fitted in the kitchen itself because of false alarms during cooking and grease contamination). Draughtstrips do not have an adverse effect on the operation of such smoke alarms and therefore lengths of draughtstrip should not be omitted from a kitchen door purely to allow smoke to reach the alarm.

NOTE 1 A well sealed door will assist in containing the fire by helping to reduce the supply of oxygen. If the fire does become established then sufficient smoke will usually still escape to set off the detector alarm with sufficient time to escape (normally about 10 min to 15 min before the fire breaks through the door). If draughtstrips are omitted smoke will pass through the remaining gaps. However, although the alarm may be actuated, the gap will allow an increasing amount of smoke to pass which will generally prevent escape within a few minutes.

NOTE 2 Draughtstrips should not be fitted to doors with intumescent seals without prior consultation with the fire authority and unless specifically designed as such, draughtstrips should not be fitted as smoke control seals.

7.3.2 *Wooden windows*

Draughtstrips should be fitted to wooden casement windows according to the guidance in **7.3** and **7.3.1**.

Sliding sash windows are more difficult to fit with draughtstrips than casement types and care should be taken to ensure that the meeting rail draughtstrip does not interfere with horizontal glazing bars. Sometimes only the bottom sash and meeting rail can easily be fitted with draughtstrips. Draughtstrips can be fitted to the top sash from the outside or alternatively can be attached to the inside of the sash. In the latter case, a slot will need to be cut at each end of the meeting rail to allow the draughtstrip to pass the bottom sash.

Centre pivot windows can be fitted with draughtstrips in the same way as for casement windows but one half of the window will be the reverse of the other. Draughtstrips for that part of a centre pivot window which moves inward when opened may require fitting from outside. Draughtstrips which are fitted inside the rebate can usually be fitted to all parts of the window from within the dwelling.

7.3.3 *Steel windows*

7.3.3.1 *Sealant systems*

Durable seals rely on the strength of the adhesive bond between the frame and the sealant. Correct preparation of surfaces, strictly according to the manufacturer's instructions, is therefore essential.

A release agent should be applied to all parts of the opening window that will be in contact with the sealant. This will prevent the window from being sealed shut.

The sealant should be applied and the door or window pulled shut, fully closing the handle of the catch or fastener. Curing and final finishing should be according to the manufacturer's instructions.

7.3.3.2 *Other seals*

Other seals for steel windows, i.e. those not using sealants, should be fitted in accordance with the manufacturer's instructions and compressed by 1.5 mm.

8 Advice to occupants

The occupants should be advised of the following.

a) The work which has been carried out seals the gaps around doors and windows to keep draughts out and heat in. However, every room needs some ventilation so it is important that ventilators for boilers, heaters and fires are not blocked up. Draughtstrips or sealants may have been omitted from some windows and doors to ensure an adequate air supply to heating appliances or in rooms where condensation already occurs.

b) Condensation and dampness may occur if there is not enough controlled ventilation particularly where flueless space heating appliances are used and it is more likely to happen in steamy rooms like the bathroom and kitchen. It is essential that the steam is allowed to escape, which is why the kitchen and bathroom windows have not been fitted with draughtstrips. Extract fans are recommended in all moisture producing areas if they do not affect the operation of combustion appliances; trickle ventilators can also aid ventilation.

c) Kitchen and bathroom doors should be kept shut when somebody is in these rooms so that water vapour does not move to other rooms. Opening windows or using extract fans will help to remove water vapour from these rooms.

d) When redecorating, care should be taken to prevent paint being applied to the draughtstrips because this can make some types less effective.

Annex A (informative) Advisory bodies

Draught Proofing Advisory Association Ltd.
PO Box 12, Haslemere,
Surrey
GU27 3AN

NEA
National Office,
St. Andrews House,
90 to 92 Pilgrim Street,
Newcastle-Upon-Tyne
NE1 6SG

Mains Gas	CORGI 4 Elmwood Chineham Business Park Basingstoke Hants RG2 4WG
Solid fuel	HETAS (Heating Equipment Testing and Approval Scheme) PO Box 37 Bishop's Cleave Gloucestershire GL52 4TB
or	Solid Fuel Association helpline: 0800 600 000
LPG	CORGI 4 Elmwood Chineham Business Park Basingstoke Hants RG2 4WG
Oil	Oil Firing Technical Association for the Petroleum Industry (OFTEC) Century House 100 High Street Banstead Surrey SM7 2NN

Information can also be obtained from the Fuel Industry Association (at the same address as OFTEC above) or from the Gas Consumers Council (regional offices are listed in telephone directories).

Annex B (informative) Notes on air leakage testing in dwellings

The recommendations given in this British Standard are based on a visual assessment of the dwelling, the only option likely to be available in most cases. An assessment based on measurement is obviously to be preferred but the equipment and expertise required are currently available in only a few UK organizations. However, simple testing techniques are likely to become more widely available in the not too distant future. Fan pressurization is such a technique and, whilst it cannot be used to measure the natural infiltration rate, it can be used to measure the overall air leakage characteristics of a dwelling. A portable fan assembly is sealed into an external door or window opening and the air flow rates required to maintain a series of pressure differences, between inside the dwelling and outside, in the range 10 Pa to 60 Pa are measured. (The pressures acting on a dwelling as a result of the natural effects of wind and internal/external temperature difference usually average no more than about 8 Pa.)

The measurements are made with external doors and windows closed, but internal doors are left open to permit free movement of air within the dwelling. Chimneys and flues are sealed to prevent soot from being dislodged and falling into the rooms. In its simplest form, the test can take less than 1 h to complete, but should not be done on windy days because it would be difficult to maintain a constant and evenly distributed pressure difference over the whole dwelling.

The air leakage rate, calculated from the measurements, is often expressed as air changes per hour (ach) at an applied pressure difference of 50 Pa. Although air leakage rate cannot be interpreted directly in terms of natural air infiltration rate, for most dwellings an air leakage rate at 50 Pa of between 10 ach and 20 ach (with doors and windows closed and flues sealed) is likely to correspond to an acceptable average air infiltration rate. In dwellings with lower air leakage rates it is likely that natural infiltration would be inadequate for a high proportion of the time, unless the occupants made regular use of controllable ventilation openings and/or extract fans. In dwellings with higher air leakage rates, natural infiltration is likely, on average, to be in excess of requirements.

As fan pressurization testing becomes a more widely available and accepted technique, it promises to have potential for identifying the extent to which draught control products should be fitted in dwellings. However, the initial checks for provision of air to combustion appliances and for the existence of condensation/mould should still be made.

Fan pressurization testing has been used to determine the relative importance of different air leakage paths in dwellings and thus to identify the most appropriate draught control treatments. Measurements to date have found that windows (with and without draught control) can account for up to 45 % of whole dwelling air leakage (at 50 Pa), although 10 % to 30 % is a more representative range. So in many dwellings, less obvious leakage paths account for the major proportion of ventilation heat loss, whilst in others the fitting of draughtstrips or sealants will lead to relatively large reductions in natural infiltration rates.

Annex C (informative) Combustion product spillage tests

C.1 General

This annex describes methods of carrying out combustion product spillage tests to verify that combustion products are completely discharged through the appliance and chimney or flue to atmosphere. The test is relatively straightforward in principle, though some appliances require more care than others, and it can be inconvenient to have to light a solid fuel appliance to carry out the test during the summer.

Work by the Building Research Establishment (BRE) has found that the test can also be affected by the strength of the wind outside. BRE Information papers IP 21/92 [7] and IP 7/94 [8] recommend that the test should be conducted on a day when the wind is light, say 4 m/s or less, so that the effect of the wind causing extra draught up the flue is not too great. (4 m/s is Force 3 on the Beaufort Scale of wind speed, classed as a gentle breeze. It will "extend a light flag and keep leaves and twigs in constant motion".)

C.2 Spillage test for gas-fired and oil-fired appliances

C.2.1 *General*

The following spillage test method is adapted from that given in BS 5440-1, which is carried out whenever an open-flued gas appliance is installed in a dwelling. The same method may also be used for oil-fired appliances. Note that fan-assisted open-flued appliances (e.g. most pressure jet oil-fired boilers) are often unaffected by restricted air supply openings and fan extract devices but combustion products may leak out into the room if the appliance casing and/or flue are not properly sealed.

C.2.2 *Procedure*

a) Close all doors and windows in the room and operate any fan in the room which may adversely affect the performance of the appliance.

b) With the appliance in operation check that the appliance clears its products of combustion using the method described in the manufacturer's instructions.

c) Where the appliance manufacturer's instructions are not available, with the appliance in operation carry out a flow visualization check using a smoke producing device, e.g. smoke match, puffer or joss stick. The device should produce an even trace so that the flow can be observed and the venting of the combustion products assessed.

1) Check the appliance performance at the draught break (draught diverter or draught stabilizer) or gas fire canopy within 5 min of lighting. There should be no spillage.

2) If spillage occurs leave the appliance operating for a further 10 min and then recheck.

d) Where there is a fan in an adjoining or adjacent room then an additional test shall be carried out with interconnecting doors open and that fan switched on (to ensure that the worst case is covered).

If spillage still occurs at stage c) 2) in any test then the householder should be instructed not to operate the appliance and advised to contact the relevant fuel advisory organization to have the fault rectified (which may involve corrective work on the chimney/flue, or the appliance, or the fitting of an adequate air supply opening).

C.3 Spillage test for solid fuel appliances

Solid fuel appliances are more difficult to test than other types because they do not burn at a constant rate and cannot be turned on and off instantly. They fall into one of three broad categories:

a) independent boilers (which often incorporate a combustion air fan);

b) open fires; and

c) room heaters, closed stoves and cookers.

Independent boilers can spill from around the refuelling door or through the flue draught stabilizer (if fitted). Any spillage from an open fire is likely to occur from the top of the fire opening. Spillage from room heaters, closed stoves and cookers is likely to occur around the maim door and air inlet port. Some solid fuel appliances have sensors which switch a combustion air fan off (causing the fire to go out) if the chimney is blocked. These sensors are not designed to safeguard against spillage of combustion products caused by inadequate air supply to the room.

The following spillage test method is adapted from that given in BRE Information Paper IP 7/94 [6].

a) With the appliance burning in a stable, low output condition (which may take several hours to establish after initial light-up or refuelling), close all windows and doors in the room and operate any fan in the room which may adversely affect the performance of the appliance.

b) Place a smoke producing device, e.g. smoke match, puffer or joss stick, next to the likely points of spillage. Spillage is indicated by smoke being blown away from this area.

c) Where there is a fan in an adjoining or adjacent room then an additional test should be carried out with interconnecting doors open and that fan switched on (to ensure that the worst case is covered).

If spillage occurs in any test then the householder should be instructed not to operate the appliance and advised to contact the relevant fuel advisory organization to have the fault rectified (which may involve corrective work on the chimney/flue, or the appliance, or the fitting of an adequate air supply opening).

List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 7386:1990, *Specification for draughtstrips for the draught control of existing doors and windows in housing (including test methods).*

Other publications

[5] BRE Digest 297. *Surface condensation and mould growth in traditionally-built dwellings*[1)].

Informative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 5250:1989, *Code of practice for control of condensation in buildings.*

BS 5410, *Code of practice for oil firing.*

BS 5410-1:1977, *Installations up to 44 kW output capacity for space heating and hot water supply purposes.*

BS 5410-2:1978, *Installations of 44 kW and above output capacity for space heating, hot water and steam supply purposes.*

BS 5410-3:1976, *Installations for furnaces, kilns, ovens and other industrial purposes.*

BS 5440, *Installation of flues and ventilation for gas appliances of rated input not exceeding 60 kW (1st, 2nd and 3rd family gases).*

BS 5440-1:1990, *Specification for installation of flues.*

BS 5440-2:1990, *Specification for installation of ventilation for gas appliances.*

BS 5871, *Specification for installation of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances.*

BS 5925:1991, *Code of practice for ventilation principles and designing for natural ventilation.*

BS 8303, *Installation of domestic heating and cooking appliances burning solid mineral fuels.*

BS 8303-1:1994, *Specification for the design of installations.*

BS 8303-2:1994, *Specification for installing and commissioning on site.*

BS 8303-3:1994, *Recommendations for design and on site installation.*

Other publications

[1] The Building Regulations 1991. Approved Document J, *Heat producing appliances,* 1990 edition (for England and Wales) as amended.

[2] The Building Standards (Scotland) Regulations 1990 (as amended): Part F.

[3] The Building Regulations (Northern Ireland) 1990: Technical booklet L, *Heat producing appliances,* July 1992.

[4] The Gas Safety (Installation and Use) Regulations 1994, Statutory Instruments 1994 No. 1886, (amended 1996).

[6] BRE Digest 319. *Domestic draughtproofing: materials, costs and benefits*[1)].

[7] BRE Information Paper IP 21/92. *Spillage of flue gases from open-flued combustion appliances*[1)].

[8] BRE Information Paper IP 7/94. *Spillage of flue gases from solid-fuel combustion appliances*[1)].

[1)] Obtainable from Construction Research Communication Limited, 151 Rosebery Avenue, London EC1 4QX.

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