



Building Control Consultants
Corporate Approved Inspectors

2 Blue Prior Business Park
Redfields Lane
Church Crookham
Fleet
Hampshire
GU52 0RJ
Tel: 01252 616631
Fax: 01252 622707
email: info@gsabc.co.uk
web: www.gsabc.co.uk

Sonair installations – Assessment of Fire Safety Mitigation Measures

The main concern with any installation that penetrates or ducts through the external walls of a building is the potential to connect any voids within the depth of the wall, or to facilitate fire spread through the exposure of combustible materials.

Whilst a detailed survey of the external wall constructions would be desirable (to provide confidence that the existing compartmentation and associated cavity barrier provisions are suitably compliant to Requirement B3 of the Building Regulations or those applicable at the time of build), this would be unrealistic in the majority of cases. However, the following approach would suitably mitigate any fire safety concerns;

Discussion

Requirements B3 (3) and B3 (4) of the Building Regulations require both the suitable sub-division of buildings with fire resisting construction, and measures to inhibit the unseen spread of smoke and fire within concealed spaces within the structure and fabric of the building. Suitable measures (ie. cavity barriers and/or fire-stopping as appropriate) should be in place within the fabric to prevent fire and smoke from by-passing any lines of compartmentation between dwellings, and additionally there is a requirement to adequately close cavities around openings in external walls (whether they be windows/doors/or ducts), thereby reducing the potential for unseen fire spread.

The means of cavity closure around openings depends on the construction of the wall, and if the leaves of the wall are masonry, it may only be necessary to close the cavity by any suitable means. In all other cases suitable cavity barriers will be needed, to maintain at least 30 minutes fire resistance at these locations (as specified in Table A1 item 15 Approved Document B Volume 2), providing 30 minutes integrity and 15 minutes Insulation criteria when tested to the relevant part of BS 476 and BS EN 1366. There are a range of proprietary certified intumescent products on the market that can be used to perform this function, but the practicalities of installing such products needs careful consideration. They work by expanding and crushing plastic pipes upon exposure to fire, whereby the intumescent material forms an insulating barrier which reduces heat transfer and seals any gaps to stop the spread of smoke, fire and gases.



Passive fire dampers (typically actuated when heat from a fire causes the room temperature to rise above 74 degrees centigrade thereby melting the fusible link that holds the damper open), could also be used to perform a similar function, however these can realistically only be installed on the room side of any Sonair penetration through an external wall, and could therefore not perform the cavity barrier function identified above. Also their ability to restrict the spread of smoke and gases would be similar to the performance of an equivalent intumescent product.

There may also be fire safety concerns in relation to Requirement B4 of Schedule 1 of the Building Regulations, specifically external fire spread from one building to another. This relates specifically to the areas of non-fire resisting external wall areas on the façade, and typically given the space separation that exists between blocks of high rise flats, and between typical street properties by virtue of separating roads and gardens, this is very rarely a concern that needs addressing. Fire spread across the face of the building is also a consideration, especially in relation to exposing combustible elements within the build-up of the wall.

Lastly there may be fire safety concerns in relation to Requirement B1 of Schedule 1 of the Building Regulations, in relation to the protection of common escape routes typically in flat developments with open sided balcony or deck approaches. This would only be relevant to dead end and/or single stair conditions, where there is a requirement to provide at least 30 minutes fire resistance up to a height of 1.1m above finished floor level, to enable escape past the flat of fire origin. BS 9991:2015 (which supersedes BS 5588-1) is the reference source for such situations. Entrance doors to flats would typically be required to be self-closing with a minimum FD30 certified fire rating, but are not required to be fitted with smoke seals. This is based on the accepted principle that unless 2.0m or wider, such balcony/deck approaches are at minimal risk of becoming smoke logged.

Table 1 below indicates the fire mitigation measures for differing types of wall construction

Solution

In order to maintain suitable fire separation and cavity barrier provisions within the depth of external walls through which the Sonair ventilation units are to be ducted, it is proposed that suitably certified fire resisting intumescent sleeves are to be inserted through the cored holes. These are to be tight fitting and extend for the full depth of the wall construction, with the plastic ducting for the Sonair units passing through these with minimal clearance. This will ensure that should a fire situation develop within an affected dwelling, the fire resisting integrity of the external wall construction will not be compromised.

G A J Sinden MRICS

Guy Shattock Associates Ltd

Corporate Approved Inspectors



FIRE MITIGATION REQUIREMENT	CAVITY WALL		SOLID WALL	CLADDED WALL
	Masonry Leaves	Non- Masonry Leaves		
Cavity Closure (any suitable means)	✓	✗	N/A	✗
Cavity Barrier (30 minutes integrity/15 minutes insulation)	✗	✓	N/A	✓
Protection of Escape Route (balcony/deck approach – see report text)	✓	✓	✓	✓

Table 1 – Fire mitigation measures for differing types of wall

Revision A. April 2019



Table A1 continued

Part of building	Minimum provisions when tested to the relevant part of BS 476 ⁽¹⁾ (minutes)			Minimum provisions when tested to the relevant European standard (minutes) ⁽²⁾	Method of exposure
	Loadbearing capacity ⁽³⁾	Integrity	Insulation		
10. Firefighting shafts	120	120	120	REI 120	From side remote from shaft
a. construction separating firefighting shaft from rest of building;	60	60	60	REI 60	From shaft side
b. construction separating firefighting stair, firefighting lift shaft and firefighting lobby	60	60	60	REI 60	Each side separately
11. Enclosure (which is not a compartment wall or described in item 9) to a:					Each side separately
a. protected lobby;	30	30	30 ⁽⁴⁾	REI 30 ⁽⁵⁾	
b. protected corridor.	30	30	30 ⁽⁴⁾	REI 30 ⁽⁵⁾	
12. Sub-division of a corridor	30	30	30 ⁽⁴⁾	REI 30 ⁽⁵⁾	Each side separately
13. Fire-resisting construction:					
a. enclosing places of special fire hazard (see 8.12);	30	30	30	REI 30	Each side separately
b. between store rooms and sales area in shops (see 5.58)	30	30	30	REI 30	
c. fire-resisting subdivision described in Section 2, Diagram 16(b)	30	30	30	REI 30	
d. enclosing bedrooms and ancillary accommodation in care homes (see 3.48 and 3.50)	30	30	30	REI 30	
14. Enclosure in a flat to a protected entrance hall, or to a protected landing.	30	30	30 ⁽⁴⁾	REI 30 ⁽⁵⁾	Each side separately
15. Cavity barrier	Not applicable	30	15	E 30 and EI 15	Each side separately
16. Ceiling Diagram 35	Not applicable	30	30	EI 30	From underside
17. Duct described in paragraph 9.16e	Not applicable	30	No provision	E 30	From outside
18. Casing around a drainage system described in Section 10, Diagram 38	Not applicable	30	No provision	E 30	From outside
19. Flue walls described in Section 10, Diagram 39	Not applicable	Half the period specified in Table A2 for the compartment wall/floor	Half the period specified in Table A2 for the compartment wall/floor	EI half the period specified in Table A2 for the compartment wall/floor	From outside
16. Fire doors	See Table B1			See Table B1	

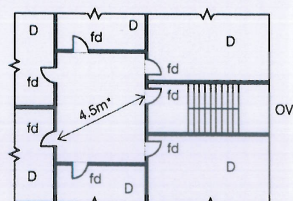
Notes:

- Part 21 for loadbearing elements, Part 22 for non-loadbearing elements, Part 23 for fire-protecting suspended ceilings, and Part 24 for ventilation ducts. BS 476-8 results are acceptable for items tested or assessed before 1 January 1988.
 - Applies to loadbearing elements only (see B3.11 and Appendix E).
 - Guidance on increasing the fire resistance of existing timber floors is given in BRE Digest 208 *Increasing the fire resistance of existing timber floors* (BRE 1988).
 - A suspended ceiling should only be relied on to contribute to the fire resistance of the floor if the ceiling meets the appropriate provisions given in Table A3.
 - The guidance in Section 12 allows such walls to contain areas which need not be fire-resisting (unprotected areas).
 - Unless needed as part of a wall in item 5a or 5b.
 - Except for any limitations on glazed elements given in Table A4.
 - See Table A4 for permitted extent of uninsulated glazed elements.
 - The National classifications do not automatically equate with the equivalent classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.
- ⁽¹⁾ 'R' is the European classification of the resistance to fire performance in respect of loadbearing capacity; 'E' is the European classification of the resistance to fire performance in respect of integrity; and 'I' is the European classification of the resistance to fire performance in respect of insulation.

B1 MEANS OF ESCAPE FROM FLATS

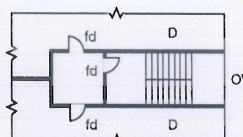
Diagram 9 Common escape route in small single stair building

See para 2.21



a. SMALL SINGLE STAIR BUILDING

*If smoke control is provided in the lobby, the travel distance can be increased to 7.5m maximum (see Diagram 7, example b).



b. SMALL SINGLE STAIR BUILDING WITH NO MORE THAN 2 DWELLINGS PER STOREY

The door between stair and lobby should be free from security fastenings.

If the dwellings have protected entrance halls, the lobby between the common stair and dwelling entrance is not essential.

Notes:

1. The arrangements shown also apply to the top storey.
2. If the travel distance across the lobby in Diagram 9a exceeds 4.5m, Diagram 7 applies.
3. Where, in Diagram 9b, the lobby between the common stair and the dwelling is omitted in small single-stair buildings, an automatic opening vent with a geometric free area of at least 1.0m² is required at the top of the stair, to be operated on detection of smoke at any storey in the stair.

Key

- Fire-resisting construction
- OV Openable vent at high level for fire service use (1.0m² minimum free area) see paragraph 2.21e
- D Dwelling
- fd Fire door

Flats with balcony or deck access

2.22 The provisions of paragraph 2.20 may also be modified in the case of flats with balcony or deck approach. Guidance on these forms of development is set out in clause 13 of BS 5588-1:1990.

Table 1 Limitations on distance of travel in common areas of blocks of flats (see paragraph 2.23)

Maximum distance of travel (m) from flat entrance door to common stair, or to stair lobby ^{1a}

Escape in one direction only	Escape in more than one direction
7.5m ^{1a2}	30m ^{2a3}

Notes:

1. Reduced to 4.5m in the case shown in Diagram 9.
2. Where all flats on a storey have independent alternative means of escape, the maximum distance of travel does not apply. However, see paragraph 16.3 (BS) which specifies Fire and Rescue Service access requirements.
3. For sheltered housing, see paragraph 0.29.
4. Where travel distance is measured to a stair lobby, the lobby must not provide direct access to any storage room, flat or other space containing a potential fire hazard.

Planning of common escape routes

2.23 Escape routes in the common areas should comply with the limitations on travel distance in Table 1. However, there may be circumstances where some increase on these maximum figures will be reasonable.

Escape routes should be planned so that people do not have to pass through one stairway enclosure to reach another. However, it is acceptable to pass through a protected lobby of one stairway in order to reach another.

Protection of common escape routes

2.24 To reduce the risk of a fire in a flat affecting the means of escape from other flats and common parts of the building, the common corridors should be protected corridors.

The wall between each flat and the corridor should be a compartment wall (see Section 8).

Smoke control of common escape routes

2.25 Despite the provisions described in this Approved Document, it is probable that some smoke will get into a common corridor or lobby from a fire in a flat, if only because the entrance door will be opened when the occupants escape.

Lifts should not be used for escape from fire unless an assessment shows that evacuation lifts are required. If evacuation lifts are to be installed, they should be in accordance with 8.4.

NOTE The misuse or malfunctioning of lifts can cause deaths, attributed amongst other things to failure of the power supply or from lifts being called to or held at the fire floor.

Where a fire alarm system covers the common areas and has a suitable electrical output signal, lifts other than fire-fighting and evacuation lifts should be recalled to an exit floor and then taken out of service in accordance with BS EN 81-73. Where there is no suitable fire alarm system, the lift should be recalled from a manual recall device in accordance with BS EN 81-73.

7.2 Alternative exits from flats and maisonettes

Alternative exits from flats and maisonettes should:

- a) be in accordance with the relevant recommendations of Clause 9 as appropriate to the type of building;
- b) be sited away from the main entrance door to the dwelling such that it can still be used as an escape route;
- c) be in accordance with the approaches illustrated in Figure 2, Figure 3, Figure 4, Figure 12 (see 9.4.2) or Figure 15 (see 9.4.3 and 9.4.4);
- d) lead to a final exit or common stair:
 - 1) via a door leading onto an access corridor, common balcony or deck at the same or another level; or
 - 2) via a protected stairway leading to an access corridor, common balcony or deck at another level; or
 - 3) via a door leading onto an external stair or a protected stairway; or
 - 4) via a door leading onto an escape route across a flat roof leading to the head of a common or external stair.

The internal arrangement of any dwelling having an alternative exit should be such that access is possible from all habitable rooms either to the main entrance or to the alternative exit. Fire-resisting separation should be provided, to safeguard the occupants who need to use the alternative exit.

NOTE It is not normally advisable to link balconies or install doors between dwellings to provide escape via a flat roof into an adjoining building.

7.3 Escape routes from flats and maisonettes with balcony approach or deck approach



In general there is little risk of a balcony or deck becoming smoke-logged and there is thus no need to impose a limitation on the travel distance from the dwelling entrance to the stairway, although account should be taken of the needs of the fire and rescue service, such as the distance between the nearest connection to a fire main and the flat or maisonette (see 50.1.3 and 51.1).

NOTE 1 Where an approach is via a balcony or deck having a width of more than 2 m, or via a balcony that is adjoined to the building wall only where there is an entrance to a flat or maisonette, there is a risk that the balconies might become smoke-logged both laterally along the balcony and upon levels above.

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BS EN 1366-3:2009 Fire resistance tests for service installations. Penetration seals

BS EN 1366-3 specifies a method of test and criteria for the evaluation (including field of application rules) of the ability of a penetration seal to maintain the fire resistance of a separating element at the position at which it has been penetrated by a service.

Penetration seals used to seal gaps around chimneys, air ventilation systems, fire rated ventilation ducts, fire rated service ducts, shafts and smoke extraction ducts are excluded from this standard except for mixed penetration seals.

The purpose of BS EN 1366-3 is to assess:

- The effect of such penetrations on the integrity and insulation performance of the separating element concerned
- The integrity and insulation performance of the penetration seal
- The insulation performance of the penetrating service or services, and where necessary, the integrity failure of a service.

No information can be implied by the test concerning the influence of the inclusion of such penetrations and sealing systems on the loadbearing capacity of the separating element.

It is not the intention of this test to provide quantitative information on the rate of leakage of smoke and/or hot gases or on the transmission or generation of fumes. Such phenomena are only to be noted in describing the general behaviour of test specimens during the test.

This test is not intended to supply any information on the ability of the penetration seal to withstand stress caused by movements or displacements of the penetrating services. The risk of spread of fire downwards caused by burning material, which drips through a pipe downwards to floors below, cannot be assessed with this test.

Contents of BS EN 1366-3:

- Foreword
- Introduction
- Scope
- Normative references
- Terms and definitions
- Test equipment
- Test conditions
- Heating conditions
- Pressure conditions
- Test specimen
- Size and distances
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