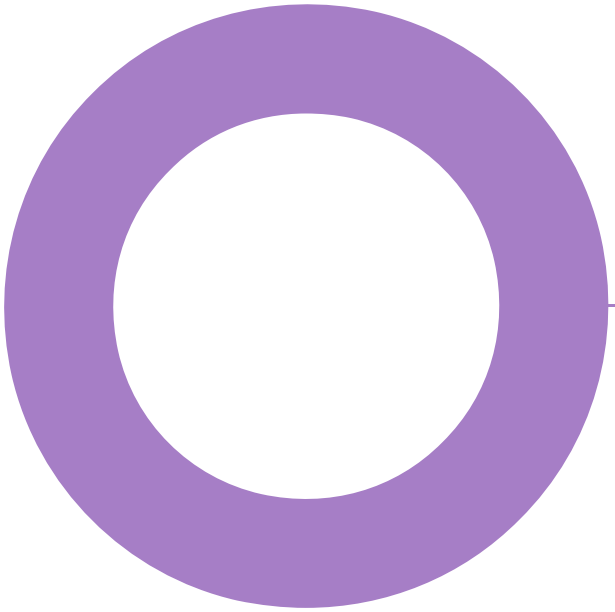
HOARE LEA

Living Wall Fire Strategy. Various Locations. ANS Global.

FIRE ENGINEERING
LIVING WALL FIRE SAFETY MEMO

REVISION 02 – 29 MARCH 2021



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	19/03/21	First Issues	ES	IH	SB
01	23/03/21	Providing more information on open-sided car parks	ES	IH	SB
02	29/03/21	Revised open sided car park details	IH	-	SB

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Contents.

1. Introduction.

The purpose of the memo is to highlight the design considerations when designing an external living wall of a building in relation to the fire safety requirements for different buildings (e.g. residential, non-residential) with regards to the prescriptive guidance as follows:

- Approved Document B Volume 1 (England and Wales),
- Approved Document B Volume 2 (England and Wales),
- BS 9991:2015,
- BS 9999:2017,
- BB 100 - *Design for fire safety in schools*,
- HTM 05-02: *Fire safety in the design of healthcare premises*
- Domestic and Non domestic Scottish Technical Handbooks.

This document considers the factors related to compliance with Regulation B4 (External Fire Spread) only.

This document is designed to provide general considerations when deciding if it is possible for an external living wall to be included on a scheme. It is recommended that if you require further guidance that a proposed living wall will comply with the fire strategy for the building, you should consult a fire engineer.

2. Surface Spread of Flame Testing Requirements.

If a living wall is to be used in a location where a specific surface spread of flame rating is required, the wall should meet the relevant European classification rating.

The European classifications are defined in BS EN 13501-1: 2002, Fire classification of construction products and building elements, Part 1 – Classification using data from reaction to fire tests. Typically, the wall would also be tested to EN ISO 19925-2 also, which is a small flame test.

The passing criteria for each class is based on both testing methods is shown below:

Table 1- European Surface Spread of Flames Requirements

Class	Test method(s)	Classification criteria	Additional classification
A1	EN ISO 1182 [a] and	$\Delta T \leq 30$ °C; and $\Delta m \leq 50$ %; and $t_f = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	$PCS \leq 2{,}0$ MJ/kg [a] and $PCS \leq 2{,}0$ MJ/kg [b c] and $PCS \leq 1{,}4$ MJ/m^2 [d] and $PCS \leq 2{,}0$ MJ/kg [e]	-
A2	EN ISO 1182 [a] or	$\Delta T \leq 50$ °C; and $\Delta m \leq 50$ %; and $t_f \leq 20$ s	-
	EN ISO 1716 and	$PCS \leq 3{,}0$ MJ/kg [a] and $PCS \leq 4{,}0$ MJ/m^2 [b] and $PCS \leq 4{,}0$ MJ/m^2 [d] and $PCS \leq 3{,}0$ MJ/kg [e]	-
	EN 13823	$FIGRA \leq 120$ W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 7{,}5$ MJ	Smoke production [f] and Flaming droplets/particles [g]
B	EN 13823 and	$FIGRA \leq 120$ W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 7{,}5$ MJ	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i]: Exposure = 30 s	$F_s \leq 150$ mm within 60 s	
C	EN 13823 and	$FIGRA \leq 250$ W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 15$ MJ	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i]: Exposure = 30 s	$F_s \leq 150$mm within 60 s	
D	EN 13823 and	$FIGRA \leq 750$ W/s	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i]: Exposure = 30 s	$F_s \leq 150$ mm within 60 s	
E	EN ISO 11925-2 [i]: Exposure = 15 s	$F_s \leq 150$ mm within 20 s	Flaming droplets/particles [h]
F	No performance determined		

3. Surface Spread of Flame Requirements.

Both BS 9999, BS 9991 and BB 100 were issued prior to the most recent changes to the Building Regulations and the guidance for external wall design in the 2019 Edition of Approved Document B. Therefore, t is recommended that the guidance for the surface spread of flame for external walls from Approved Document B is applied, irrespective of the principal design document.

The external surfaces (i.e. outmost external material) of external walls should comply with the provisions listed below and summarised in Table 2. The required performance of the façade will depend on the building height

3.1 Approved Document B, BB 100, BS 9999 & BS 9991

Within both volumes of Approved Document B, there are three categories of building which have prescribed surface spread of flame requirements, as follows:

- Relevant buildings,
- Assembly and Recreation buildings
- Other buildings.

3.1.1 Relevant Buildings

Relevant buildings are defined in Regulation 7(4) as a residential building with a storey height at of at least 18m or above, measured from the lowest Ground level, which contains one or more dwellings, an institution or a room for residential purposes (excluding and room in a hotel, hostel or a boarding house).

For relevant buildings, all materials which become part of an external wall or specified attachment should achieve a minimum pf Class A2-s1, d0 other than materials exempted by Regulation 7(3).

A specifed attachment inlcudes any of the following:

- A balcony attached to an external wall
- A device for reducing heat gain within a building by defecting sunlight which is attached to an external wall
- A solar panel attached to an external wall.

It is noted that within the Scottish Technical handbook, that specified attachments should achieve Class A1 or A2 on buildings with a storey height more than 11m.

The following elements of the façade are considered exempt from the relevant building requirements under Regulation 7(3).

a. Cavity trays when used between two leaves of masonry
b. Any part of the roof (other than any part of the roof which falls within paragraph (iv) of regulation 2(6) if that part is connected to an external wall);
c. Door frames and doors;
d. Electrical installation;
e. Insulation and waterproofing materials used below ground;
f. Intumescent and fire stopping material where the inclusion of such materials is necessary to meet the requirements of Part B of Schedule 1;
g. Membranes;
h. Seals, gaskets, fixings, sealants and backrods;
i. Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
j. Window frames and glass. This does include window spandrel panels or infill panels.

Living walls are considered a part of the external wall, thus need to be considered in residential buildings more than 18m in height. The requirement for a Class A2-s1,d0 or greater surface spread of flame rating applies to the whole façade, not just that above that above the 18m threshold.

On this basis, it is recommended that any living wall system is reviewed in detail before being applied to the façade for a relevant building.

3.1.2 Residential Buildings Less than 18m in Height
A residential building less than 18m in height is not considered a relevant building and therefore the façade is required to comply with the guidance noted in Section 3.1.5 below.

3.1.3 Assembly and Recreation (including Schools and Retail)
Within BS 9999, the assembly and recreation requirements within Approved Document B are considered to apply to buildings with a B2 (Occupants are awake and unfamiliar with the building and a medium fire growth rate) or B3 (Occupants are awake and unfamiliar with the building and a fast fire growth rate) risk profile which are more than one storey.

Schools designed under BB100 would also be classed as Assembly and Recreation.

On this basis:

- If the external wall is located less than 1000mm, regardless of height, the surface spread of flame on the external walls surface should achieve Class B-s3,d2 or better.
- For buildings with a storey height more than 18m and a boundary distance greater than 1000mm, the surface spread of flames between Ground level to 18m should achieve Class C-s3,d2 or better. Any external wall above 18m should achieve Class B-s3,d2 or better.
- For buildings with a storey height less than 18m and a boundary distance greater than 1000mm, the surface spread of flames between Ground level to 10m should achieve Class C-s3,d2 or better. If the wall is located above a roof or any part of the building to which the public have access, the wall up to 10m above these areas, measured from the top surface of the roof/ external areas, should achieve Class C-s3, d2 or better. Any elements of the wall above 10m are not required to achieve a surface spread of flame requirement (unless it is required a part of the external fire spread assessment between buildings).

3.1.4 Open-Sided Car Parks
There are some parts of the external wall which may be required to achieve a specific surface spread of flame rating for reasons other than external fire spread. When designing an open-sided car park to Approved Document B or BS 9999, all materials used in the construction should be class A1 rated in accordance with BS EN 13501-1.

Approved Document B Volume 2 allows for the following to not be constructed from A1 materials:

- Any surface finish applied to a floor or roof of the car park (or within any building, compartment or separated part adjoining the structure enclosing it), if the finish meets the requirements B2 and B4.
- Any fire doorset
- Any attendant's kiosk not exceeding 15m^2 in area
- Any shop mobility facility.

Current living walls systems do not achieve a Class A1 rating. The provision of a living wall to a multi-storey car park designed as open sided could impact the following:

- Structural Fire Resistance – elements of structure would be required to increase from 15 minutes to 60 minutes.
- Space Separation – less favourable separation distance would be permitted. Alternatively, this may require fire resisting construction to be provided to certain elevations which would reduce the ventilation area available.

On this basis, it is recommended that any living wall system is reviewed in detail before being applied to the façade car park. This will require a fire engineered solution provided by a qualified fire engineer to justify the

use of a living wall on a car park, whilst also maintaining an open sided classification. This justification would require approval via the Statutory Authorities, but there is no guarantee that such a solution would be accepted.

The restrictions for 'Other Buildings' will apply if the car park is not considered to be open sided.

3.1.5 Other Buildings

For all other buildings, if the external wall is located less than 1000mm, regardless of height, the surface spread of flame on the external walls surface should achieve Class B-s3,d2 or better.

For buildings with a storey height more than 18m and a boundary distance greater than 1000mm, the surface spread of flames between Ground level to 18m should achieve Class C-s3,d2 or better. Any external wall above 18m should achieve Class B-s3,d2 or better.

For buildings with a storey height less than 18m and a boundary distance greater than 1000mm, there is no surface spread of requirements (unless it is required as part of the external fire spread assessment between buildings).

3.2 Scottish Technical Handbook Requirements.

For all buildings with a storey height more than 11m, the surface spread of flame required to the external wall surface should achieve either Class A1 or A2.

For all buildings less than 11m, if the boundary distance is less than 1000mm, then the surface spread of flame also has to achieves Class A1 or A2 (except for housing, as discussed in Section 4.3.1).

3.2.1 Domestic Buildings

For residential buildings with a storey height less than 11m and located more than 1000mm from the boundary, the surface spread of flame on the external walls surface can achieve Classes B, C, D or E. However, it should be noted that if the material is more than 1mm,for the external fire spread assessment, the protected areas of the wall should achieve Class A1 or A2.

It is noted that for houses with an external wall located within 1000mm of the boundary, a minimum of Class B is required, on the condition that the wall behind the cladding must have the appropriate fire resistance duration from both sides.

For houses located more than 1000mm from the boundary, the wall can achieve Classes B, C, D or E, but unlike other residential buildings, it can be considered as a protected area for the external fire spread assessment if it achieves Class B.

3.2.2 Non-Domestic Buildings

For Entertainment and Assembly Buildings with a total storey area not more than 500m^2, a storey height less than 11m and a boundary distance greater than 1000mm, the surface spread of flame on the external walls surface can achieve Classes B, C, D or E. However, it should be noted that for the external fire spread assessment, the protected areas of the wall should achieve Class A1 or A2.

For entertainment and Assembly buildings greater than this height or with a greater total storey area, the surface spread of flame on the external walls surface is required to achieve Class A1 or A2 regardless of the boundary distance.

For Hospital and residential care building with a total storey area not more than 200m^2, a storey height less than 11m and a boundary distance greater than 1000mm, the surface spread of flame on the external walls surface can achieve Classes B, C, D or E. However, it should be noted that for the external fire spread assessment, the protected areas of the wall should achieve Class A1 or A2.

For Hospital and residential care buildings greater than this height or with a greater total storey area, the surface spread of flame on the external walls surface is required to achieve Class A1 or A2 regardless of the boundary distance.

For other buildings with a storey height less than 11m and located more than 1000mm from the boundary, the surface spread of flame on the external walls surface can achieve Classes B, C, D or E. However, it should be noted that for the external fire spread assessment, the protected areas of the wall should achieve Class A1 or A2.

3.3 HTM 05-02: Fire Code

It is noted that when designing a healthcare building within England that the wall is required to achieve a surface spread of flame Class B-s3,d2 or better, regardless of building height or distance from the boundary.

4. Summary

Table 2- Reaction to fire performance of external surface of walls

Guidance Document	Building Type	Building Height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
All Guidance Approved Document B (Volumes 1 and 2)*	'Relevant Buildings' as defined in Regulation 7(4)		A2-s1,d0 or A1.	A2-s1,d0 or A1.
	Assembly and Recreation (including schools) and any buildings classed as B2 or B3 in BS 999	More than 18m	Class B-s3,d2 or better***	From ground level to 18m: Class C-s3,d2 or better** From 18m in height and above: Class B-s3,d2 or better***
		18m or less	Class B-s3,d2 or better***	Up to 10m above Ground level: Class C-s3, d2 or better** Up to 10m above a roof or any part of the building to which the public have access: Class C-s3, d2** or better**** From 10m in height and above: no minimum performance
	Any other building	More than 18m	Class B-s3,d2 or better***	From ground level to 18m: Class C-s3,d2 or better** From 18m in height and above: Class B-s3,d2 or better***
		18m or less	Class B-s3,d2 or better***	No Provisions
HTM 05-02	Healthcare	All heights	Class B-s3,d2 or better	Class B-s3,d2 or better
Scottish Technical Handbook (Non-Domestic)	Entertainment and Assembly Buildings	All heights	A2 or A1	A1 or A2
	Entertainment and Assembly Buildings with a total storey area not more than 500m^2	11m	A2 or A1	B, C, D or E
	Hospital and residential care building	All heights	A2 or A1	A1 or A2
	Hospital and residential care building with a total	11m	A2 or A1	B, C, D or E

Guidance Document	Building Type	Building Height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
	storey area not more than 200m^2			
	Any other building	More than 11m	A2 or A1	A1 or A2
		Not more than 11m	A2 or A1	B, C, D or E
Scottish technical Handbook (Domestic)	Residential Buildings	More than 11m	A2 or A1	A1 or A2
		Not more than 11m	A2 or A1	B, C, D or E
	Houses	Not more than 11m	B*****	B, C, D or E

**Also considered to apply to BS 9999:2017, BS 9991:2015 and BB100 (guidance for schools) since these documents have not been updated since the Regulation 7 changes.*

*** Timber cladding at least 9mm thick is also acceptable*

**** Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable*

***** 10m is measured from the top surface of the roof*

****** wall behind the cladding must have the appropriate fire resistance duration from both sides*

5. ANS Global Living Wall Uses

ANS Global are able to provide a living wall system which achieves a rating of have stated that they have an external living wall design which achieves Class B-s2-d0 as tested to BS EN 13501-1.

Therefore, this living wall may be used under the following circumstances:

- Residential buildings designed to Approved Document B and BS 9991 with a height less than 18m.
- Assembly and Recreation buildings designed to Approved Document B, BB 100 or BS 9999, regardless of distance away from the boundary or building height.
- Any non-residential buildings (excluding open-sided car parks) designed to Approved Document B or BS 9999, regardless of distance away from the boundary or building height.
- Any healthcare buildings designed to HTM 05-02 regardless of distance away from the boundary or building height.
- Domestic and non-domestic buildings with a height less than 11m designed based on the Scottish Technical Handbook, as long as the area is not required to be protected area due to the space separation calculations and the elevation is located more than 1000mm from the boundary
- Houses designed to Scottish Technical Handbook, regardless of distance to the boundary.

Any other arrangements, such as residential buildings over 18m in height and open sided car parks will require a higher surface spread of flame rating (i.e. Class A2 or A1).

Therefore, careful consideration will be required prior to designing a living wall system for any residential buildings over 18m in height or an open sided car parks. It is recommended that a fire engineer or other suitable qualified person is consulted prior to providing living wall systems to either of these types of development.

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