

External Cladding: Living Walls and Fire Safety

Best Practice Guide

December 2022



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Introduction

This guidance details industry best practice for Living Walls to maximise fire safety and demonstrate compliance with the regulations regarding fire safety and external cladding.

It includes recommendations on specifications, material selection, including plants as well as detailing robust irrigation and maintenance procedures to assure of continued compliance.

Approved Document B of the National Building Regulations of England and Wales was updated by the UK government in June 2022 to clearly define the requirements of external cladding relating to fire safety for different building types. This provides a clear strategy for minimising fire risk and now includes a complete ban on combustible materials used on the external walls of residential buildings over 11 metres in height.

The purpose of this Best Practice Guidance is two-fold:

1. To clarify details of the June 2022 update to Approved Document B with specific reference to Living Walls as external cladding
2. To allow any regulatory or other body to specify and condition Living Walls as external cladding with confidence.



Living Walls

Living Walls, also known as Green Walls, can take many forms. They can be simple, ground bearing and grow up the wall either as climbers or stackable modular systems in locations such as construction site hoardings, private gardens and public realm sites. They can also include sophisticated accredited rainscreen cladding elements with integrated remote sensed and monitored irrigation systems that form part of the external cladding of buildings.

(Note: this Best Practice Guidance is written specifically with regards to the reaction to fire and the classification of Living Wall Systems as external cladding to buildings and structures).

Living Walls are becoming an increasingly important part of green infrastructure to boost biodiversity in our cities, reduce air pollution, promote wellbeing, and help to lay the foundations for a more sustainable future. Within our cities living walls can be targeted to the very locations where they can have the maximum impact and added value.

Numerous scientific studies confirm that Living Walls help to clean the air by removing significant amounts of nitrogen dioxide, trapping particulate matter including black carbon and thus helping to mitigate climate change and reduce serious cardiovascular disease. Living Walls can also reduce flooding by attenuating stormwater, enrich our environment through biodiversity gain and improve the thermal performance for buildings through insulation and shading, helping to reduce the urban heat island effect. These are all necessary to combat the climate emergency and the predicted temperature spikes that are to come in the next few decades.

These benefits are being noted by policy makers, with mandatory Green Infrastructure targets increasingly being enacted through policy to respond to the climate emergency. Under the Environment Act 2021 all planning permissions granted (with a few exceptions) will have to deliver at least 10% biodiversity net gain which is expected from November 2023. In London, for example, as part of the Urban Greening Factor, London Plan Policy G5 requires all major developments to include urban greening as a fundamental element of site and building design.

Therefore, Living Walls can and should play an important role in greening the UK's cities to positively impact the health and wellbeing of people living and working in urban areas as well as helping the UK to achieve its targets in the fight against climate change.



BioPanel Living Wall System, Biotecture, MTV studios, Camden

Summary of Best Practice Guidance

A Living Wall as external cladding should:

1. Comply with the relevant requirements of Table 10.1 (see appendix) of Approved Document B; June 2022 update in accordance with independent third-party testing of the whole system including plants through whole system Engineering Assessments
2. Only include materials and plants that have been incorporated in destructive third-party Engineering Assessments or that are demonstrably similar in nature in reaction to fire to those that have been part of full system Engineering Assessment tests as stated in this guide
3. Include an irrigation system that has been designed, installed, and operated in accordance with this Best Practice Guidance
4. Always have a proactive maintenance contract in place with a proven supplier who can demonstrate experience of ensuring continued compliance for Fire Safety



BioPanel Living Wall System, Biotecture, Lord's Cricket Ground, London

The legal framework

Approved Document B, June 2022 Update and its relevance to Living Walls

On 1 June 2022 the government introduced a package of measures to further strengthen and clarify building regulations and fire safety guidance as part of wider reforms to building safety.

The update to Approved Document B sets clearer, stronger standards which in turn sets limits on the combustibility of materials used in the external walls of buildings. This June 2022 Update was the culmination to a series of events with regards to fire safety compliance requirements for external cladding:

December 2018 - in response to the Grenfell tragedy the Government introduced a ban on combustible materials in and on the external walls of residential buildings over 18 metres in height. As a result, materials that become part of an external wall or specified attachment of a Relevant Building must be of European Classification A2-s1, d0 or Class A1 (i.e. non-combustible). At that time a Relevant Building was simply defined as a residential building.

January 2020 - the Government issued a technical consultation paper reviewing the 2018 ban on the use of combustible materials in and on the external walls of buildings including attachments. Members of the Green Wall External Cladding Industry responded as part of this consultation.

June 2022 – the Government published their update on the building regulations and fire safety guidance in response to the 2020 technical consultation paper and as part of wider reforms to building safety.

The new statutory guidance determines the maximum protection in terms of a ban on non-combustibles which now applies to hotels, hostels and boarding houses in addition to blocks of flats, hospitals, care homes, student accommodation and dormitories in boarding schools.

The update also reduces the height of the requirement for non-combustibles as part of the external cladding from 18 metres to 11 metres for all building types that confirm to building types classified as residential purpose groups.

The full set of requirements per building type are confirmed in the updated table 10.1 of the Approved Document B: June 2022 update as follows:

Table 10.1 Reaction to fire performance of external surface of walls

Building type	Building height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
'Relevant buildings' as defined in regulation 7(4) (see paragraph 10.14)		Class A2-s1, d0 ⁽¹⁾ or better	Class A2-s1, d0 ⁽¹⁾ or better
All 'residential' purpose groups (purpose groups 1 and 2)	More than 11m	Class A2-s1, d0 ⁽²⁾ or better	Class A2-s1, d0 ⁽²⁾ or better
	11m or less	Class B-s3, d2 ⁽²⁾ or better	No provisions
Assembly and recreation	More than 18m	Class B-s3, d2 ⁽²⁾ or better	From ground level to 18m: class C-s3, d2 ⁽³⁾ or better From 18m in height and above: class B-s3, d2 ⁽²⁾ or better
	18m or less	Class B-s3, d2 ⁽²⁾ or better	Up to 10m above ground level: class C-s3, d2 ⁽³⁾ or better Up to 10m above a roof or any part of the building to which the public have access: class C-s3, d2 ⁽³⁾ or better ⁽⁴⁾ From 10m in height and above: no minimum performance
Any other building	More than 18m	Class B-s3, d2 ⁽²⁾ or better	From ground level to 18m: class C-s3, d2 ⁽³⁾ or better From 18m in height and above: class B-s3, d2 ⁽²⁾ or better
	18m or less	Class B-s3, d2 ⁽²⁾ or better	No provisions

NOTES:

In all cases all the following provisions apply.

- Regulation 7(1A) prohibits the use of relevant metal composite materials in the external walls of all buildings of any height (see paragraphs 10.11 and 10.12).
- The advice in paragraph 10.4 should always be followed.

In addition to the provisions within this table, buildings with a storey 18m or more above ground level should also meet the provisions of paragraph 10.6.

In addition to the provisions within this table, buildings with a storey 11m or more above ground level should also meet the provisions of paragraph 10.7.

- The restrictions for these buildings apply to all the materials used in the external wall and specified attachments (see paragraphs 10.13 to 10.16 for further guidance).
- Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.
- Timber cladding at least 9mm thick is also acceptable.
- 10m is measured from the top surface of the roof.

Extract from The Building Regulations 2010, Amendments to the Approved Documents, June 2022

Building types (purpose groups) are defined as follows:

1. Residential – dwellings
2. Residential – institutional
3. Offices
4. Shops and commercial spaces
5. Assembly and Recreation
6. Industrial
7. Storage and other non-residential (including car parks)

Table 10.1 of Approved Document B confirms the requirements per building type with regards to the required reaction to fire performance of the surface of the external walls.

The requirements for Living Walls are therefore as follows:

Building Type 1 or 2 buildings over 11 metres in height:

Because of organic matter being a necessary part of the system living walls cannot achieve class A2 or A1 and so living walls should not be included as part of external cladding of residential buildings in purpose groups 1 or 2 that are above 11 metres in height.

Building Type 1 or 2 buildings under 11 metres in height & other Purpose Group Buildings (ie. non residential) irrespective of height:

Living Walls should be permitted providing the Living Wall in is compliance with Class B-s3,d2 or better.

Note: there are also less stringent requirements for buildings where the external surface of the walls are 1000mm or more from the relevant boundary. In this case, as per Table 10.1, the requirements are clear and vary according to building Purpose Group and height.

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There are a number of factors that Living Wall designers, installers and maintainers should take into consideration to assure continued compliance with Class B-s3,d2 or better throughout the lifetime of the Living Wall.

1. Demonstrably compliant Living Wall Systems

Any products and systems used in external wall cladding must be rigorously tested in accordance with BS EN 13501-1. To achieve fire certification a product or system must be in a smooth and dry condition to undergo these tests.

Green Walls are neither smooth nor dry and so their reaction to fire performance can only be assessed by Engineering Assessment reports which includes fully destructive testing. Each Living Wall system to be considered for inclusion as External Cladding should be shown to be demonstrably compliant by an appropriately qualified independent third party that oversees the testing of their Living Walls to ensure it is validated.

The incorporation of a Living Wall into the external cladding design of a building needs to be carefully considered in terms of compliance and interfaces. The backing structure and inner lining of the Living Wall should be part of the third-party engineering assessment and non-combustible backing materials can also be considered.

2. Defining plants to use and avoid

Destructive Engineering Assessments have been carried out on a range of plants to minimise reaction to fire and inform the selection of specific plants for Living Walls.

Through plant selection, Living Wall installers should select plants with low calorific value and propensity for heat to ensure minimal risk. Untested plants with high calorific value should be avoided. The plant table in the appendix details plants that have been tested and validated by independent assessments and are suitable for use in Living Walls.

3. Effective irrigation systems

Commercial grade Living Walls should be designed and installed complete with a sophisticated remote sensed and controlled irrigation system. This will enable an ongoing maintenance process of watering that stops the Living Walls drying out making them a lower risk of ignition.

Living Wall irrigation systems include a number of emitters (or drippers) and each of these is a precision device that emits water at a prescribed rate. These emitters must be pressure compensated and non-drain (PCND). *Pressure Compensated means that they will drip at this same rate regardless of the pressure in the irrigation line meaning a steady watering process. ND stands for Non-Drain which means that the drippers will shut off immediately if the pressure drops and the irrigation line will therefore remain fully charged until the next irrigation cycle. This ensures that the right amount of irrigation water is reaching the whole of the wall at the same time.*

Living Walls should be designed into separate irrigation zones to suit requirements. At the time of the design the anticipated flow rates should be accurately prescribed and each zone operated by separate solenoid valves and be able to be monitored remotely in terms of flowrate.

When in operation, the flowrates should be constantly monitored by an irrigation controller which in turn communicates remotely. The controller should be set up to remotely report on any significant deviations from expected flows.

The irrigation to the living wall should be operated remotely to ensure it is sufficiently watered. Any high or low flow faults must be reported by the controller and acknowledged and actions determined within one working day.

4. Proactive maintenance contracts

The Living Wall system should be capable of being demonstrably designed and maintained to remain within the parameters that satisfy the operational conditions of the independent Engineering Assessment of Reaction to Fire.

A well-documented proactive maintenance schedule should be based on reportable performance criteria. This should include the issuing of timely reports on routine maintenance tasks to provide satisfaction that the irrigation system is being maintained in a fully operational condition. Best practice guidance also requires that regular tasks are undertaken as part of routine maintenance and are fully documented and reported on including:

- 1.** Bi-monthly (6 times per year) visual inspection of the irrigation plant room
- 2.** Annual inspection and service of all irrigation components
- 3.** Annual flushing of all irrigation lines

Further considerations to assure both the maintenance of Living Walls and the requirements of building insurers may include:

- 1.** Maintaining critical spares for the irrigation system either on site or in stock to minimise down time and negate any potential procurement issues
- 2.** Linking the Irrigation Controller to the Building Management System (BMS) to allow for independent review of the irrigation flowrates
- 3.** Installing and monitoring water content meters in the Living Wall to monitor the water content in the living wall growing medium

Appendix

The following plants are suitable for use externally and were included in Engineering Assessment Reports on Living Wall Systems that conformed to the minimum rating requirement of B-s3,d2.

- *Acorus gramineus* 'Ogon'
- *Armeria maritima*
- *Asplenium scolopendrium* (SYN. *Phyllitis scolopendrium*)
- *Bergenia* 'Baby Doll'
- *Bergenia cordifolia* 'Winterglow'
- *Bergenia purpurascens*
- *Buxus* spp.
- *Carex* 'Ice Dance'
- *Carex morrowii* 'Irish Green'
- *Contoneaster* spp.
- *Convolvulus cneorum*
- *Erysimum* 'Bowls' Mauve'
- *Euonymus* spp.
- *Euphorbia* spp.
- *Geranium* spp.
- *Hebe* spp.
- *Hedera* spp.
- *Helleborus* spp.
- *Heuchera* spp.
- *Iris foetidissima*
- *Lavender* spp.
- *Liriope* spp.
- *Lonicera* 'May Green' (syn. L. 'Mai Grun')
- *Pachysandra* spp.
- *Phlox douglasii* 'Lilac Cloud'
- *Polypodium vulgare*
- *Polystichum* spp.
- *Saracococca* spp.
- *Soleirolia soleirolii*
- *Tellima* spp.
- *Vinca* spp.
- *Viola odorata*
- *Waldsteinia ternata*

References

Approved Document B: Fire Safety - Amendments

June 2022 – The Government published their update on the building regulations and fire safety guidance in response to the 2020 technical consultation paper and as part of wider reforms to building safety

<https://www.gov.uk/guidance/approved-document-b-2022-update>

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1080214/ADB_amendment_booklet_June_2022.pdf

Living Wall System Engineering Assessments

(Full systems complete with plants that demonstrate Class B compliance)

ANS Global Living Wall System™

<https://www.ansgroupglobal.com/blog/all-you-need-to-know-about-living-wall-fire-regulations>

Biotope BioPanel™ System

<https://source.thenbs.com/literature/engineering-assessment-of-biotope-living-wall-system-with-respect-to-reaction-to-fire-classification/mYqvP38xECcm9iNofqMc2H/mYqvP38xECcm9iNofqMc2H>



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