The Guide to Environmentally Sustainable Façades and Fire Safety

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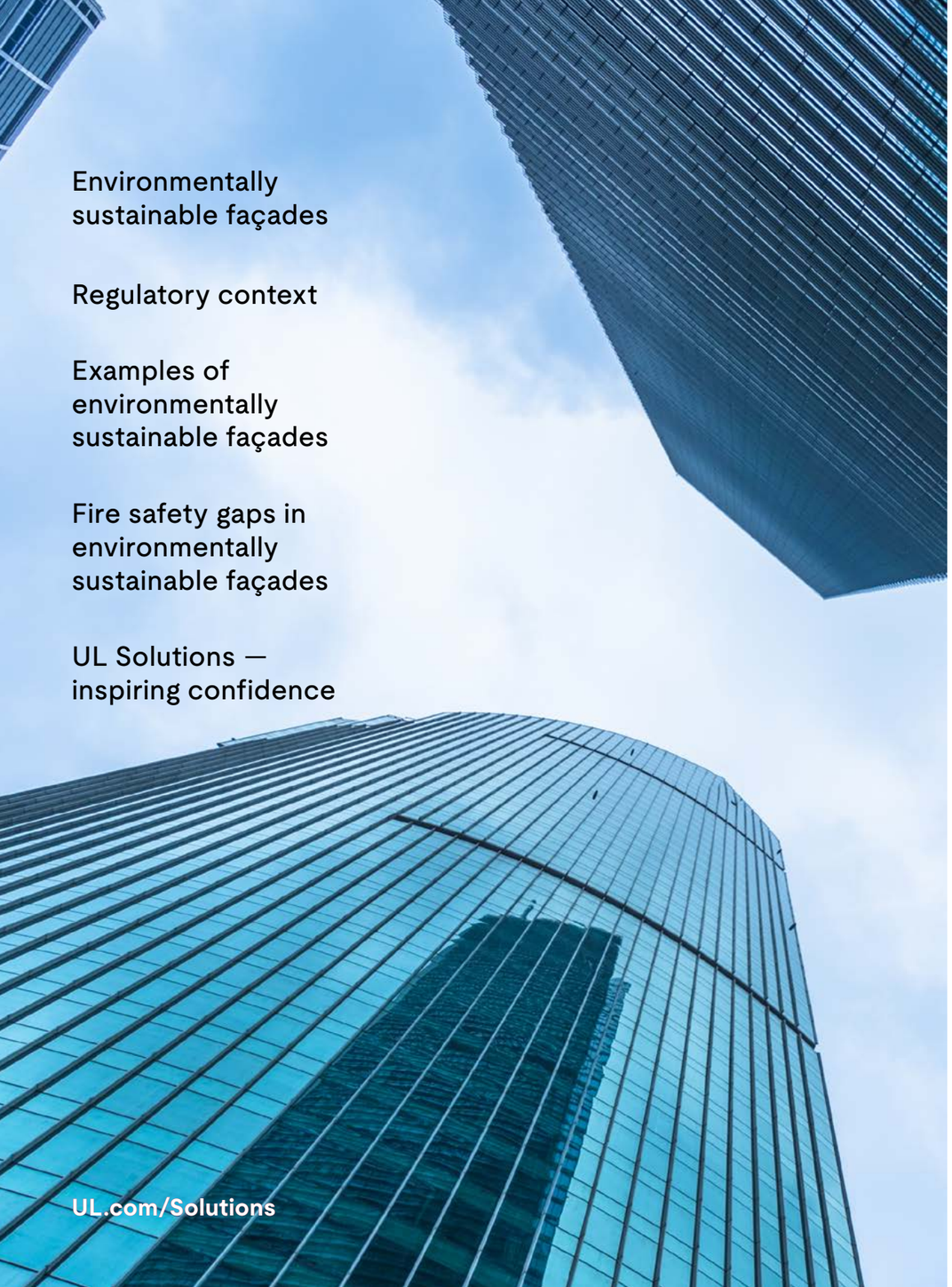

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Welcome to the Guide to Environmentally Sustainable Façades and Fire Safety.

This guide is written to help you understand the impact environmentally sustainable façades can have on the fire safety of a building. It covers the regulatory context and the technical standards, testing, inspection and certification processes that help promote trust in environmentally sustainable façades. The guide focuses on England in particular, but parts of the new fire safety regime do also apply in Scotland, Wales and Northern Ireland.

UL Solutions is a global independent safety science company with more than a century of expertise in standards development, testing and certification. Our ground-breaking innovations in safety, sustainability, renewable energy and nanotechnology illustrate our dedication to promoting safe products and people-friendly living and working environments. To learn more about us, visit www.ul.com. This guide is intended to provide general information only and does not offer any specific legal or regulatory guidance.

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Environmentally sustainable façades

A building's façade is often its most striking and visible part and helps to protect the structure from the elements. But what makes a façade sustainable?

It is not simple to define as many factors contribute to the sustainability of a building. Its thermal efficiency, durability and recyclability; the carbon impact of transport and maintenance; and wastage during manufacturing all play a part. However, in this document, we will focus on the environmental impact that façades have and will define a sustainable façade as **a low-carbon product that can easily be recycled or reused at the end of a building's life cycle.**

Depending on the type of façade system, environmentally sustainable façades can help reduce air pollution, improve a building's thermal performance, boost biodiversity and promote well-being.

As the U.K. works towards the targets of the international Net Zero Government Initiative, environmentally sustainable façades will only become more commonplace, so it is crucial that the construction industry understands how to balance aesthetics, innovation and sustainability with adequate fire resistance.

Types of environmentally sustainable façades

In recent years, major progress has been made in achieving exterior façades with improved environmentally sustainable attributes.

External living wall systems
Green buildings increased in popularity in London after the launch of the technical report Living Roofs and Walls Technical Document: Supporting London Plan Policy in 2008, which outlined the benefits gained when developers and landscapers build living roofs and walls.

Architects are commonly introducing three main types of living walls into their designs:

- Climbing plants
  Planting ground-based climbing plants, like ivy, is encouraged to grow on a façade, either with or without a dedicated trellis system, to create a green wall.
- Hydroponic green walls
  Plants are placed in geotextiles or horticultural mineral wool in supporting frames and grown in a hydroponic nutrient solution rather than soil.
- Modular green walls
  Planting modules are fixed to a wall or frame with a growth medium, like soil, to create a growing wall section that retains moisture.

According to guidance published by Biotecture and ANS Global, one way to reduce the risk of fire is by selecting plants that are flame resistant and don't reach high temperatures when they burn.

The guidance states that living walls should also have remotely sensed and controlled irrigation systems to prevent plants from drying out. As green façades are an emerging type of environmentally sustainable façade, fire-safety standards have not yet been developed specifically for them, but they can be assessed against other regulations.

Out-of-plane façades

Out-of-plane façades are passive systems that help reduce the heat concentration in tall buildings. They can be made of recycled content to further improve their environmental impact.

These façades optimise window-to-wall ratios; the horizontal overhang or depth of windows; the aspect ratio of the height of a building's vertical side wall to its width; window orientation; blind or shutter use and angles; and the use of innovative façade designs.

Out-of-plane façades can increase fire risk if building owners do not consider fire safety during the design phase. For example, spandrel glass can be used to conceal structural building components and create a more seamless finish, but it can also increase the severity of a fire by reducing the rate of heat energy transfer through the façade (heat flux), which forces the fire to move away and into the building fabric.

Double-skin façades

Double-skin façades consist of two layers of material that create a cavity through which air can flow to improve a building's thermal efficiency. The gap between the materials can vary from 20 centimetres to a few metres wide, depending on the desired amount of insulation and sound suppression.

Building owners need to be aware that double-skin façades can change the thermal characteristics of the fire compartment during burning. The gap between the façade materials can form a sort of chimney through which vertical smoke and flame can spread. Such potential problems can be addressed during the design process if planners consider fire compartmentation and how the building components would interact in a fire.

Timber façades

Timber cladding is one of the most common environmentally sustainable materials used on a façade. Timber is a naturally renewable material and helps embody carbon as the trees grow because they absorb CO_2 from the surrounding atmosphere, reducing the impact of the carbon used to mill and transport timber to the construction site.

Using wood as a façade is challenging from a fire safety perspective. Most untreated wood-based materials normally have a Euroclass D or E rating and can cause higher heat release rates and flame spread. Fortunately, timber façades can be enhanced to a Class C or B with a quality-assured flame retardant.

Applying flame retardant using a brush or spray can make it difficult to assure quality control, so factory application is important to maintain safety.

Regulatory context

Since the Grenfell Tower tragedy in 2017, regulations regarding building façades and materials have changed significantly.

The following year, the U.K. government issued Building (Amendment) Regulations 2018, implementing a ban on using combustible materials in the external walls of certain high-rise buildings in England.

Building owners and developers need to understand the changing regulations and guidance that could influence the products they use. Table 1 lists standards, regulatory documents, and testing and assessment methods relevant to façades.

Table 1. Regulations and guidance that apply to façades

	New Buildings	Existing Buildings
Under 11 m	BS 8414	
Above 11 m up to 18 m	BS 8414 Euroclass standards Approved Document B	PAS 9980:2022
Over 18 m	Euroclass standards Regulation 7 Approved Document B	PAS 9980:2022 External Wall System (EWS1)

Euroclass standards

The European Reaction to Fire Classification System — commonly referred to as the Euroclass system — was introduced to harmonise standards across the EU.

It categorises products from glass to plastic sheeting into one of seven reaction-to-fire classes ranging from A1, noncombustible, to F, the worst combustibility performance. Each product is individually tested. All cladding and exterior building features for buildings over 11 metres are tested following the Euroclass standards and using the relevant BS EN 13501-1 fire classification.

It is still uncertain if a living product, like a plant on a green wall, can be classified under Euroclass fire performance standards.

British Standard 8414

BS 8414 established a large-scale two-part testing method that evaluates the fire performance of cladding components tested in combination. This assesses the impact of the building design and the effect of each component on the others, excluding products like windows and air conditioners.

These testing methods are currently being reviewed by the British Standard Institute to include the wider building fabric, like vents and windows, to assess the fire performance of all components.

Approved Document B

The revised version of Approved Document B (ADB) was published in June 2022 and added further guidance and clarifications about testing.

One revision that impacts façades is the ban of combustible materials in and on the external walls of buildings. This includes an updated provision for Sections 10 and 12 of the previous volumes that now applies to residential buildings with a storey 11 metres or more in height.

Clause 10.4 was updated to highlight that consideration should be given to the choice of materials used for the external wall, or attachments to the wall, to reduce the risk of fire spreading over the wall, regardless of height or use.

Other façade references in ADB include Section 9.6, which focuses on the importance of locating terminals of exhaust points away from cladding materials that achieve B-s3, d2 or worse and open into the building.

Requirement B4, which covers fire spread from building envelopes, states that: “The external envelope of a building should not contribute to undue fire spread from one part of a building to another part.” This applies to buildings between 11 and 18 metres that have gone through BS 8414 testing.

Regulation 7

Regulation 7 of the Building Regulations covers materials and workmanship and is referenced throughout Approved Document B.

The key things to note in relation to external wall insulation (EWI) in Regulation 7 are that external surfaces of external walls and materials (e.g., specified attachments, insulation, etc.) should be no less than class A2-s1, d0, and that the minimum applies to the entire external wall construction, not just the cladding.

Regulation 7(4) simply provides clarity on the definition for “relevant building” — a building with a storey at least 18 metres above ground level that contains one or more dwellings, an institution or a room for residential purposes.

Fire Performance of Green Roofs and Walls

The UK Department for Communities and Local Government published guidance about green wall fire safety, cited in Regulation 7. It states that no significant fire testing of green wall systems has been done.

There are no specific exemptions for green walls, and it is generally thought that current green wall systems cannot meet the requirements of Regulation 7(2) because they cannot guarantee the Euroclass.

The current guidance available for review is mainly from the United States and mainland Europe, such as:

- FM [Factory Mutual] Global Property Loss Prevention Data Sheets 1 to 35 — Green Roof Systems (2007)
- ANSI/SPRI VF-1 2017 External Fire Design Standard for Vegetative Roofs
- The GRO Green Roof Code (2021)

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Retrofit regulations in more detail

External wall system

For existing residential buildings taller than 18 metres — including blocks of flats, student accommodations, dormitories, assisted living, care homes and Houses in Multiple Occupation (HMOs) — the EWS1 form is a new certification process implemented by the Royal Institution of Chartered Surveyors (RICS).

The EWS process and form allow a building owner to confirm that an external wall system on residential buildings has been assessed for safety by a suitable expert, in line with government guidance.

Not every building will require an EWS1 form, depending on its height, type and, in some circumstances, quantity of cladding.

PAS 9980:2022

PAS 9980:2022 provides a methodology for the fire risk appraisal of external wall construction and cladding of existing multistorey and multi-occupied residential buildings.

It can appraise and assess the scope for and risk from fire spread via external wall construction and cladding on existing blocks of flats.

The Regulatory Reform (Fire Safety) Order

The Regulatory Reform (Fire Safety) Order (FSO) came into force on 1 October 2006 and is the main piece of legislation governing fire safety in buildings in England and Wales.

It places obligations on anyone in control of these premises (the “responsible person” — usually the owner or landlord) to undertake a fire risk assessment and put in place and maintain general fire precautions.

It was updated as part of the Fire Safety Act - addendum in 2021 to include: “where a building contains two or more sets of domestic premises … the FSO applies to: the building’s structure and external walls (including windows, balconies, cladding, insulation and fixings) and any common parts.”

Examples of environmentally sustainable façades

Saughall Massie Fire Station

Timber clad fire station

In 2019, a fire station clad in PEFC-certified European Redwood was completed in Birkenhead, England.

As the project specification developed, all timber cladding was treated to ensure it was Euroclass B-s1, d0.

According to NORclad's findings, the fire treatment process was a success and the untreated wood moved from Euroclass D-s2, d0 to the final result of B-s1, d0.

Chester Northgate

Going green

In 2023, the sustainability architects ANS Global created an exterior living wall for a car park in the middle of the city centre in Chester.

The project consisted of small rectangular sections of living wall interspersed among three other façade panel types to improve ventilation in the building. The car park boasts 59,616 plants across its façade, which spans more than 600 square metres, and will produce 1,055 kilograms of oxygen per year and trap more than 80 kilograms of dust.

ANS Global designed the wall with fire safety in mind. All their designs achieve a Class B-s2-d0 rating as tested to BS EN 13501-1, proving the fire safety of their walls.

No. 1 Angel Square

Double-skin safety

No. 1 Angel Square, the headquarters of Co-operative Group HQ, is a 15-storey building with a double-skin façade that was constructed between 2010 and 2013.

Built to a BREEAM® Outstanding rating and designed to save 40% to 60% of the current energy cost incurred by traditional head office buildings, it is now one of the most sustainable large buildings in Europe.

During construction, specialist fire engineering services were supplied by Buro Happold to ensure fire safety was prioritised throughout the design and build.

Fire safety gaps in environmentally sustainable façades

Guillermo Rein, professor of fire science at Imperial College London, stated in an IFSEC Insider article that: “Regulation is not the be all and end all of fire safety. The Titanic complied with all codes; lawyers can make any device legal, but only engineers can make it safe.”

Since the Grenfell Tower tragedy, there have been large leaps forward in building safety regulations, but there are clear gaps that need to be considered to improve safety further.

Regulations keeping up with innovation

When thinking about fire safety standards and regulations, the goal is to achieve a consensus based desired end state or at least a minimum performance level, if not more.

As innovative materials continue to help improve sustainability, the built environment should include safety considerations when starting to use materials before regulations have caught up.

Think fire safety

Fire safety issues are just one point on a long list of building safety considerations.

Unfortunately, apart from regulation compliance, additional fire safety, such as retrofitting sprinklers or installing centrally controlled smoke detectors, may fall to the bottom of the list, especially when environmentally sustainable solutions are included.

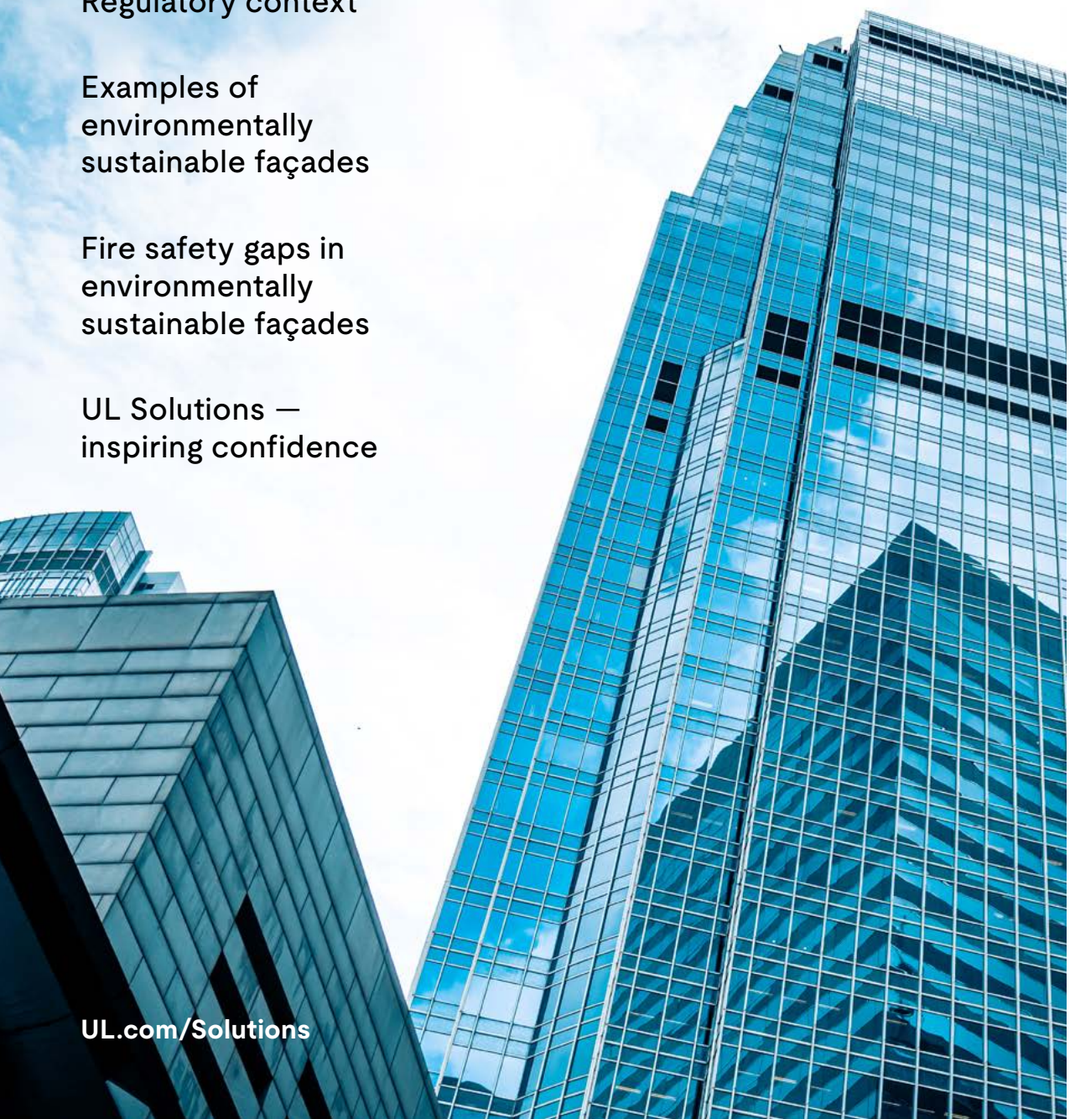
Fire safety does not commonly enhance a sustainable construction approach, so it can be seen as a regulatory hurdle to overcome. However, the industry should seize the opportunity to include fire safety in sustainable discussions without seeing it as a competing approach.

Access to product testing

The façade industry faces continual regulatory changes, so testing providers should adapt their practices and expand their testing facilities to provide greater access and availability to British businesses in the U.K.

Currently, only a handful of test and certification organisations offer appropriate services in the U.K. that can provide longer-term product conformity assessments and certification.

The fire industry needs to help meet the growing demand for testing. Demand will only increase as new guidance and regulations are implemented over the next few years. The fire testing industry must pull together to provide businesses with quicker and easier access to testing. This is key to helping to maintain a safer and more compliant industry.



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UL Solutions — inspiring confidence

UL Solutions is stepping up to meet the rising demand for environmentally sustainable façade testing.

Our building envelope and façade performance testing services help industry enhance the quality of a building's envelope and façade, mitigate risks with building envelope components, and demonstrate that products meet project specifications and regulatory requirements.

We can also carry out performance mock-up and façade testing to help save time and costs by identifying areas of potential concern like leakages and structural performance issues.

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UL Solutions' Telford Centre of Excellence remains the only testing laboratory and certification body to offer a combined test and certification solution of curtain walling, rainscreen cladding and brick slip systems against the Centre for Window & Cladding Technology (CWCT) and the National House Building Council (NHBC) requirements. Our team helps manufacturers assess their products to demonstrate compliance without sending their products to multiple locations nationwide.

Learn more about UL Solutions testing capacities.

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