

Living Walls – Design and Installation

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Living, or green walls, are becoming a common building design feature across towns and cities, and whilst providing a number of environmental benefits, need to be carefully designed and installed to help minimize the risks of fire, water damage and other related losses.

This Loss Prevention Standard outlines the main risk concerns and provides guidance to reduce the risks of loss or damage associated with living walls during the design and installation stages.



Living Walls – Design and Installation



Introduction

Living walls are becoming increasingly popular across towns and cities as designers and architects seek to create aesthetically pleasing properties, whilst harnessing the environmental advantages of green walling.

The installation of external living walls can lower temperatures, not only by [helping reduce the amount of heat loss through walls](#), but also by being [considerably cooler than conventional walls](#), by up to as much as 32°C in some cases. In addition to the obvious aesthetic benefits, buildings with living walls can reduce the surrounding air temperature by up to 4°C; provide a degree of pollution abatement; sound attenuation and can help promote biodiversity.



However, whilst attractive aesthetically and environmentally beneficial, living walls can present a number of risks which need to be carefully considered within the design and installation phases.

The presence of green walling increases the risk of fire ignition and growth, as demonstrated by a [fire at the Mandarin Hotel](#) in London in 2018. A [fire at a tower block](#) in Ealing, West London in August 2018, thought to have been started by cigarette waste, was aided by the presence of a living roof and wall system.

This Loss Prevention Standard outlines the main areas of concern and provides useful guidance on minimising the risks associated with living walls during the design and installation stages. Loss Prevention Standard **Living Walls – Ongoing Care**, provides useful guidance on inspecting and maintaining the structure post installation.

Note: This document relates to living walls and is focussed on Property loss prevention and related risk management guidance. It is not intended to address Liability exposures. The presumption is that all regulatory requirements, such as Fire Risk Assessments and compliance with local building regulations, codes, or standards, have or will be met.

Understanding the Risks

There are three main types of vertical living wall:

- **Simple climbing plants.** These are the simplest means of installing a living wall, with climbing plants grown from the ground, or contained receptacles/pots, directly onto trellising, webbing, or wiring systems up external and internal wall facades.
- **Hydroponic living walls.** Constructed from plastic mesh, fabrics or similar, these are mounted to a frame or board, or directly to the building façade. Plants are housed in pockets or slits and rely on nutrients added to irrigation water, there being no soil or other growing medium. These systems can be used as external or internal wall finishes, typically within atrium areas benefiting from natural lighting.
- **Modular living walls.** These are generally panel based systems which affix to a support framework, often providing the main external cladding/rainscreen cover of a building. Typically made from plastic and/ or metal and are either in the form of a cassette or built up system with inserts for plants and soil. These systems can also be used externally and internally.

In addition, horizontal planting can be undertaken via troughs mounted/stacked, typically against the facing of the building.

Fire Risks

Fire can start on/with the living wall or spread to the living wall from another ignition source or internal area. Once a living wall is ignited however, the fire will normally be expected to spread and may develop into a significant fire event. Ignition risks associated with living walls include, but are not limited to the following:

- **Arson.** Deliberate ignition of combustible components, dry foliage, or materials in proximity can spread to, or rapidly along the living wall. This includes civil unrest type events.
- **Electrical.** Damaged, faulty, incompatible, incorrectly installed or maintained electrical equipment can lead to ignition of combustible plastic components and foliage, particularly during dry spells when vegetation is dry.
- **Hot works.** Poorly managed hot works such as brazing, welding, grinding etc., undertaken in proximity to living walls, e.g. any hot work job that is closer than 10m horizontally to the living wall, can ignite combustible components and foliage.
- **Smoking.** Discarded smoking waste can ignite trailing or low level foliage and the components that make up the construction of the living wall, especially in warm/dry periods. Particular attention should be paid in some occupancies that may have:
 - ✓ External cigarette waste receptacles fixed to the building at ground level. These should be removed if a live wall is installed.
 - ✓ External balconies where people may smoke on a balcony and discard waste on/into the live wall.
 - ✓ Where people may smoke and discard waste through an open window into the live wall.
- **Electric Vehicle Charging.** Charging equipment should not be located on, within or near living walls.
- **Lighting.** Integrated lighting systems can fail, potentially leading to heat accumulation, sparking etc.
- **Heating.** Inappropriate fixed or temporary heating systems in proximity can radiate to living wall materials.
- **Exposures.** Fire can spread from other sources e.g. from within the building; waste receptacles below; adjacent property or yard storage; extraction ducts passing close to or through the living wall; extraction ducts/boiler flues exit points; plant room ventilation; wall, or roof mounted equipment etc. Also:
 - ✓ **Balconies.** The presence of combustible balconies, and storage of combustible goods/flammable materials, smoking etc., on such balconies can increase the potential for fire events.
 - ✓ **Fireworks.** Either accidentally lodging within a live wall or maliciously fired at/placed in proximity to the living wall.
 - ✓ **Barbecues.** Barbecues should not be permitted within 10m of a living wall?
 - ✓ **Parked vehicles.** Parked cars should ideally not be permitted within 10m of a living wall?
- **Lightning.** Lightning strike should be considered as a potential ignition source. Any resultant electrical surges can also damage electrical hardware, IT/comm's equipment.

The potential for fire growth and spread can be aided by:

- **Irrigation Systems.** This is one of the most significant concerns in respect of fire development and spread. Damaged, unbalanced, under designed or poor performing irrigation systems and/or long dry periods (hose pipe bans etc.), can result in living walls drying and becoming susceptible to ignition, and aiding rapid fire spread across the wall.
- **Combustibility.** Living walls should always be considered as combustible construction. This can be heightened during prolonged periods of dry/hot weather.

- **Inappropriate Plants.** Some plants are more combustible than others and may be inadvertently used, increasing the potential for fire growth, and spread in the event of ignition.
 - ✓ Some seasonal plants can perish, making them easier to ignite and exposing the systems components.
 - ✓ Some plants that were appropriate for the wall when it was constructed may now be unsuitable e.g. shadowed by other developments in the area.
- **Firestopping.** Fire can breach openings such as ventilation panels and windows, potentially aiding fire spread within and throughout the property. The plastic components used in modular systems are typically combustible, aiding ignition and fire spread.
 - ✓ In some designs, cavities between the living wall and building façade may be missing, or have inadequate firestopping, designed to help prevent vertical fire spread.
- **Fire Penetrations.** Air bricks, vents, irrigation systems, electrical systems, poorly secured mountings etc., can bypass fire barriers and inadequate or defective fire stopping can allow fire to spread into the property.

Water Related Damage

Living walls will invariably feature automated irrigation systems, comprising plastic pipework and drip lines into the plants rooting systems. Associated risks include:

- **Leaks.** Whether due to fault, damage or wear and tear, undetected leaks from the irrigation system can lead to water penetrating facades and causing structural damage, particularly to any timber construction materials present. Damaged or faulty irrigation systems can also leak onto electrical components or equipment potentially leading to electrical fires.
- **Control System Failure.** Most irrigation systems are automated and programmed to operate at set times. Loss or damage to control/monitoring equipment, wi-fi connectivity etc., could potentially lead to failure to water the wall potentially resulting in failure of the wall and the creation of combustible dried plant material, along with exposure of other combustible components.
 - ✓ The failure to formalise and adopt contingency measures in the event of primary irrigation system failure can lead to rapid drying of the living wall with the associated increase in combustibility.
- **Freezing.** Some irrigation systems should be isolated or limited during winter months. Failure to do so can result in freezing during periods of very cold weather and added burden to the living wall, potentially leading to structural damage if not properly assessed during the design stages.
- **Rain and Inundation.** If the living wall is not designed, installed, or maintained to drain correctly, rain could collect in the wall (along with irrigation water) and as such cause water to 'pond vertically' so exposing the building to potential weight related issues, potentially damaging the wall and/or the building.

Other Risks

- **Root Damage** - Roots systems in ground planted climbing systems can damage foundations and structural components.
- **Windstorm** - Inappropriately secured living wall systems can break free during storm conditions, potentially leading to significant property damage.
- **Corrosion.** Some pesticides/feeds may be corrosive to system components.

Design Considerations

Assessing the likely risk exposures during the design stage can help with planning a safe and efficient living wall installation and help mitigate the main risk related concerns.

General

- **Loss Assessment.** An assessment of the anticipated financial losses, for both the material damage and income/business interruption exposures, in the event of a significant or catastrophe loss event should be undertaken to ensure the risk controls are proportionate and reflective of the potential loss estimates.
- **Fire Risk Assessment.** The premises Fire Risk Assessment should be reviewed to ensure fire safety arrangements will remain adequate. Any actions generated should be addressed promptly. Guidance on maintenance, inspection, fire protections etc., are provided in this document, and other Aviva Loss Prevention Standards.
- **Designer Competence.** Ensure competent and experienced living wall designers and installers are utilised.
 - ✓ Systems and components should be reputable and suited for the type and size of the installation.
 - ✓ Early engagement with experienced architects and fire risk engineers can help ensure the project is designed and built to comply with regulatory building requirements, standards, or codes.
- **Property Insurer and Broker.** Engage with your property insurer and broker as soon as possible. They can provide guidance on further enhancing the building resilience via more robust construction with improved fire resistance.
- **Accessibility.** All critical parts of the Green Wall should be easily accessible.
 - ✓ Living walls require regular access to undertake plant replacement, repairs, and inspection. Consider how this will be done, what additional equipment and resource will be required and ensure adequate facilities are provided, such as appropriate surfaces and access for lifting platforms etc.
- **Planting Plan.** Create a 'Planting Plan' consistent with the building height, aspect, and potential future developments in the area (e.g. new buildings that then obstruct the sun).
 - ✓ Some plants and foliage retain more moisture than others, conversely some have a high oil content which increases combustibility and the risks of fire development.
 - ✓ Some plants thrive in shade or direct sunlight, whilst others will quickly die. Those containing a high moisture content, low oil content are preferable.
 - ✓ A number of plant species are more vulnerable to pests and disease, these plants will require increased levels of maintenance and cost.
 - ✓ Consider whether pesticides or fertilisers are suited for the system.
 - Some planting materials may degrade the frame of the living wall or potentially the building structure.
- **Monitoring**
 - ✓ Ensure a good quality monitoring system is utilised.
 - ✓ Whilst monitoring systems offer a range of features, the following are deemed critical:
 - Water levels in the substrate or cassette etc.
 - Temperature – to deliver added water during hot spells or vice versa.
 - Pressure levels within pipework – to detect drops or rises in pressure that may indicate and issue or fault.
 - Relative humidity – critical to avoid disease and damage to certain plants.
 - Leaf wetness – to help prevent fungal and bacterial diseases to susceptible planting.

Fire

The following fire management guidance should be considered when designing and installing a living wall:

- **Integrity.** The integrity of the structural wall to which the living wall will be installed.
 - ✓ Living walls systems can be heavy and a structural engineer should be engaged early in the design to ensure the weight of the living wall system will not lead to structural, or other associated damage to the property.
 - ✓ Minimise the use of plastic fixings, aim to use more robust metal products wherever possible.
- **Fire Resistance.** The framework, structural panels, rainscreen covers, cassettes, backing boards and insulation materials etc., used within the system should be non-combustible, and have an adequate fire resistance rating of between 90 and 120 minutes, or in accordance with national building regulations, standards or codes where higher fire resistance ratings are required.
 - ✓ All penetrations should be appropriately firestopped with materials achieving a commensurate fire resistance rating.
 - ✓ Plastic artificial plants should not be used in living wall arrangements.

Note: National building regulations, standards and codes typically focus on life safety. The use of construction products with improved fire resistance ratings provides enhanced property resilience.

- **Cavities.** Design should minimise the creation of cavities between façade and the living wall.
 - ✓ External living wall systems can be similar to rainscreen systems with cavities running from ground to roof. These cavities should have cavity barriers at floor levels in accordance with local building regulations, standard or codes, however, where installed should achieve a minimum fire resistance rating of between 90 and 120 minutes at each level.
 - ✓ Consider the use of fire breaks across the living wall to slow the development of fire.
- **Penetrations.** Penetrations to any external or internal walling should be adequately firestopped to the same fire resistance rating (insulation and integrity) as the supporting wall where applicable.
 - ✓ This includes irrigation pipework or services openings or ducts, air bricks, vents, window surrounds, soffits etc.
- **Balconies.** Balconies should be of non-combustible construction.
 - ✓ Ignition source management of any balconies within or adjacent to the living wall requires careful consideration. Aviva Loss Prevention Standard - **Balcony and Terrace Safety: Residential Buildings** provides further guidance.
- **Hot Work.** Hot work should be the last resort within 10m of living walls. The Aviva Loss Prevention Standard – **Hot Work Operations** should be followed where hot works are unavoidable during the installation, and thermographic cameras used throughout the process and during fire watches.
 - ✓ Fire watches should be undertaken for 240 minutes after the hot works, and only reduced where supported by a specific risk assessment. A minimum fire watch period of 120 minutes should be enforced.
- **Electrical Installations.** Electrical installations, including any outlets, lighting and electrically powered monitoring equipment should be suitably rated for use in wet living wall installations.
 - ✓ All replacement electrical parts are similarly rated for use in potentially wet environments.
 - ✓ Ensure adequate clearance of the living wall from any roof mounted photovoltaic/solar systems.
- **Lighting.** Lighting types should be low heat omitting to reduce the potential for ignition of foliage or other components.

- **Smoking.** Smoking and the installation of smoking shelters should not be permitted within 10m of the living wall structure and on balconies.
 - ✓ There should be no cigarette waste receptacles fixed to the outside of the building within 10m of the living wall.
- **Fire Spread.** A fire across the living wall would generate significant heat and may radiate heat through the wall to the opposing face.
 - ✓ Any fittings, furniture or finishings planned or present should be non-combustible or resistant to fire.
 - ✓ Critical installations, such as IT/server rooms, plant rooms etc., should also be relocated to an area of lower hazard where possible.
- **External Exposures.** Consider neighbouring properties. There should be at least 10 metres between the living wall and adjacent properties to help avoid fire spread.
 - ✓ The space between properties should be maintained sterile, as far as achievable, to avoid fire bridging. This includes car and vehicle parking, yard storage etc.
- **Waste Management.** Bin stores or other combustible storage should not be located in proximity to any living wall. This can help reduce the fire load and exposure to arson or accidental fire starting.
- **Heating.** Ensure consideration has been given to heating systems in proximity to internal living walls.
 - ✓ These should be suitable for use near potentially combustible living wall systems.
 - ✓ Consider the likelihood of inappropriate temporary heaters being used during poor weather or failure of the normal heating systems.
- **Vehicle Charging.** Electric vehicle or E-Bicycle chargers etc., should only be mounted to non-combustible building surfaces.
 - ✓ Charging equipment should not be located within 10 metres of a living walls.
- **Lightning.** Ensure adequate lightning protections are installed to the wall and ancillary equipment, or existing protections extended from the property to the structure, where living wall construction elements increase the potential for lightning strike.
 - ✓ A lightning risk assessment should be completed by a competent person or company, preferably a member of a recognised quality scheme or body. Such as The Association of Technical Lightning and Access Specialists (ATLAS) in the United Kingdom.
 - ✓ Any lightning protection systems should be installed in accordance relevant standards, such as **BS EN 62305 pts 1 to 4 – Protection Against Lightning** in the United Kingdom

Water Hazards

Water related incidents are a leading cause of loss and damage to buildings and other property, and failure of the irrigation systems is a primary cause of damage to the living wall. The following guidance should be considered:

- **Irrigation System.** This should be engineered to deliver adequate volumes of water to ensure the structure can maintain sufficient moisture. Periods of time in direct sunlight and the built environment will impact this.
 - ✓ Separating irrigation systems into a number of zones, capable of separate isolation, can help prevent drying of the whole wall during protracted maintenance and repairs.
 - ✓ Ensure the irrigation systems are adequately monitored and flow rates accessible to responsible and trained persons.
 - ✓ Install and monitor water level meters in the living wall to help ensure water levels remain within required thresholds.
 - ✓ Drip line systems should not be used for recirculating water supplies.

- **Water Tanks.** Consider the location of the water tank for the irrigation system.
 - ✓ If this is in an elevated position, consider whether the structure is capable of taking the additional weight and the potential for escape of water and freezing.
 - ✓ Locate in a position that is accessible for maintenance and inspection.
 - ✓ Install the tank as close to the living wall as possible to help minimise pipework runs in the installation.
- **Cold Weather.** The risks of freezing should also be considered.
 - ✓ Irrigation systems should be programmed to automatically adjust for seasonal requirements.
 - ✓ Pipes which supply water to the irrigation system should be lagged or otherwise protected against frost. Trace heating should be considered for areas that are prone to freezing temperatures.
 - ✓ Leak detection devices on supply pipework should be installed to help promptly recognise water escape, and isolation switches easily accessible.
- **Escape of Water.** All potential penetrations should be adequately sealed and monitored. Any leaks which develop during installation and commissioning should be quickly investigated.
 - ✓ Emergency drainage should be considered for larger installations to redirect escaped water safely.
- **Water Hardness.** Ensure appropriate water treatments are utilised to prevent the build-up of mineral deposits.
- **Impairments.** An effective impairment plan should be established and implemented in the event the irrigation system fails. Irrigation systems not only provide water to the living wall but may also help provide limited protection from developing fires.

Other Exposures

- **Impact.** Ensure adequate impact protection is installed around the living wall.
 - ✓ This may be achieved by normal kerbing where present, however fixed posts should be considered where the living wall is considered particularly vulnerable to vehicular damage.
- **Malicious Damage.** Ensure appropriate surveillance has been considered. Whilst most city centres are busy during daytime hours, they inevitably become quieter in the evening and overnight, and are more exposed to vandalism and malicious damage incidents.
 - ✓ The use of a detector activated Video Surveillance Systems (VSS) is recommended, preferably monitored via on site security personnel, or an approved and accredited Remote Video Response Centre.
 - ✓ To achieve level 1 police response in the United Kingdom, the system will need to be installed, maintained, and monitored to the requirements of **BS8418: Design, Installation, Commissioning and Maintenance of Detection-Activated Video Surveillance Systems (VSS). Code of Practice.**
 - ✓ To ensure the best quality of service, the Installer and RVRC should be members of a third-party accreditation/approval scheme, such as those provided by the National Security Inspectorate (NSI), or the Security Systems and Alarms Inspection Board (SSAIB). This is required for any VSS requiring a police response in the United Kingdom.
- **Windstorm.** Ensure the risks of windstorm are fully assessed in the design stage, ensuing support systems are adequate for anticipated average and extreme wind conditions.

Fire Detection and Protections

Automatic Fire Detection

- Ensure automatic fire detection extended to all plant rooms and is compliant with relevant standards, such as in the UK category L1 or P1 of **BS 5839-1:2017 - Fire detection and fire alarm systems for buildings - Code of practice for design, installation, commissioning, and maintenance of systems in non-domestic premises.**
- A means of manually raising the fire alarm should also be provided.

Alarms

Alarms associated from the above should raise a site fire alarm to ensure there is an appropriate emergency response and escalation if needed. If not already in place you may wish to consider connecting the alarm to a constantly attended location or an approved Alarm Receiving Centre. An accredited fire alarm installer can provide further guidance and assistance.

Interlocks

The use of interlocks may help reduce the potential for fire damage. As such, and where possible, the actuation of any fire alarms should be interlocked to de-energise electrical power to the living wall for lighting etc., but not irrigation systems – the water supply into the living wall may help slow fire development and spread. The interlocks should be tested at least annually and restored following any impairment to the fire protection and alarm systems.

Automatic Fire Protection

A recognised standard for automatic fire protection is not available for externally sited living walls. As such, any active protection system would need to be bespoke to the application and be based on an exposure related design (e.g. 10mm/min over the entire surface area). As such, this would place significant demands on any existing stored water supplies for any internal sprinkler installations. It is highly unlikely any such protection would ever be recommended or installed.

Likewise, whilst any fire protection systems, that protect the living wall may be beneficial, they do not protect the whole property. A fire originating in another part of the building or spreading into the building, not benefitting from sprinkler coverage, or from a fire involving the living wall, may well develop and lead to a significant, or catastrophe loss event.

Any plans to change the existing fire detection or fire protection systems for internally sited living walls, or to receive guidance on the suitability of such systems for either internal or external living walls, should be discussed with your Property Insurer and Insurance Broker.

Fire and Rescue Service

The height of the building, size of the living wall and the impact of weather conditions and especially wind on an external fire, especially one with a high surface area can significantly impact the rate of fire spread. Local Fire and Rescue Services are often amenable to inspecting premises to evaluate fire risk exposures, firefighting response and offer guidance.

It is important to maintain suitable access for the Fire and Rescue Services and consider the distances and location to the nearest source of fire water or hydrant that they may need to use.

- The location and number of fire hydrants in the proximity of the premises should be documented in an emergency response plan or shown on appropriate drawings.

It is also good risk management practice to know what water supplies are available for the Fire and Rescue Service to use. Therefore, site management should always establish:

- What fire water is available.
- With static pressure, flows and residual pressure test results.
- Whether additional resources, such as a private hydrant system or water storage tanks are necessary.

Please refer to the Aviva Loss Prevention Standard **Manual Fire Fighting Water Supplies** for further guidance.

Business Continuity Planning

Business Continuity Plans should be reviewed to ensure disaster recovery and continuity arrangements remain adequate. Any actions generated should be addressed promptly. Please refer to the Aviva Loss Prevention Standard **Business Continuity** for further guidance.

Emergency Response

An emergency response plan should be produced specifically developed to outline key responsibilities and actions in an emergency event including failure of the primary irrigation system. The emergency response plan should include responses to all likely property and business interruption related events as described in this Loss Prevention Standard. It should also include the actions key individuals should take during emergency events.

The emergency response rules should be formally documented, and appropriate training provided.

Please see the Aviva Loss Prevention Standard **Emergency Response Teams**.

Key Action Steps

- Ensure competent and experienced design engineers/architects are utilised to design the system and where the living wall forms part of the building structure, ensure all relevant regulatory requirements are addressed.
- Enhance the resilience of the building to fire via the use of construction materials with increased fire resistance ratings.
- Where the living wall forms the external rainscreen cladding, and where the design allows, ensure cavities between the living wall structure and building, along with any openings, vents etc., are adequately firestopped.
- The drying of the living wall and subsequent increased combustibility of the plant material is one of the most significant risk concerns. Ensure reputable, good quality equipment in the living wall structure, irrigation, and monitoring systems is utilised and appropriate contingency watering plans are in place in the event of failure of the primary irrigation system.
- Carefully consider the potential for water related damage and ensure isolation devices are accessible and drainage systems are in place to remove excessive water safely.
 - ✓ Formalise inspection, servicing and maintenance plans and routinely audit to check compliance with site rules/procedures.
 - ✓ Install leak detection to irrigation systems where possible.
 - ✓ Inspections may need to be increased during prolonged periods of hot or freezing weather.
 - ✓ Ensure adequate firefighter access and water supplies are available.
 - ✓ Seek advice from your Property Insurer and Insurance Broker when considering automatic fire detection and fire protection systems.
 - ✓ Introduce emergency procedures and provide appropriate training to relevant staff.

Checklist

A **Living Wall Design and Installation Checklist** is included in Appendix 1 which can be tailored to your own organisation.

Specialist Partner Solutions

Aviva Risk Management Solutions can offer access to a wide range of risk management products and services at preferential rates via our network of Specialist Partners, including:

- Fire risk assessment: [Cardinus Risk Management.](#)
- Electrical/Lightning installation testing: [Bureau Veritas.](#)
- Thermographic imaging and PAT testing: [PASS](#)
- Automatic fire detection: [SECOM](#)
- Leak detection: [Leaksafe](#)

For more information please visit: [Aviva Risk Management Solutions – Specialist Partners](#)

Sources and Useful Links

- Risk Authority guidance document [Green and Living Walls as External Cladding - A Joint Guide to Managing Risk](#)
- Industry best practice guide [External Cladding: Living Walls and Fire Safety.](#)

Note: Whilst UK standards and legislation are referenced in this document, other international standards and legislation should be referenced where applicable.

Additional Information

Relevant Aviva Loss Prevention Standards include:

- **Living Walls – Ongoing Care**
- **Fire Safety Inspections.**
- **Fire Compartmentation.**
- **Escape of Water and Fluid Leakage**
- **Fire Safety Legislation.**
- **Electrical Installations - Inspection and Testing.**
- **Emergency Response Teams**
- **Housekeeping - Fire Prevention.**
- **Maintenance Regimes.**
- **Heat and Smoke Venting Systems.**
- **Hot Work Operations.**
- **Thermographic Surveys.**
- **What is Environmental, Social and Governance.**

To find out more, please visit [Aviva Risk Management Solutions](#) or speak to one of our advisors.



Email us at riskadvice@aviva.com or call 0345 366 6666.*

*The cost of calls to 03 prefixed numbers are charged at national call rates (charges may vary dependent on your network provider) and are usually included in inclusive minute plans from landlines and mobiles. For our joint protection telephone calls may be recorded and/or monitored.

Appendix 1 – Living Walls Design and Installation Checklist



Location	
Date	
Completed by (name and signature)	

	General Design	Y/N	Comments
1.	Have competent and experienced living wall designers and installers been utilised to design the structure?		
2.	Have architects, structural engineers and where necessary, fire safety engineers assisted with structural considerations and regulatory requirements e.g. building regulations etc?		
3.	Have your Property Insurers and Broker been consulted and have recommendations been addressed?		
4.	Have reputable and proven living wall systems and components been utilised, including structural elements, irrigation equipment and monitoring systems?		
5	Does the irrigation system design separate the installation into a number of independently supplied and contained zones, capable of separate isolation?		
6.	Do monitoring systems include: <ul style="list-style-type: none"> ▪ Water levels in the substrate or cassette etc? ▪ Temperature – to deliver added water during hot spells or vice versa? ▪ Pressure levels within pipework – to detect drops or rises in pressure that may indicate and issue or fault? ▪ Relative humidity – critical to avoid disease and damage to certain plants? ▪ Leaf wetness – to help prevent fungal and bacterial diseases to susceptible planting? 		
7.	Has a planting plan been compiled detailing the most appropriate balance of planting for the living wall location and size to reduce the risks of drying, high oil content/flammability, susceptibility to disease etc?		

LOSS PREVENTION STANDARDS

	Fire – Design and Structural	Y/N	Comments
8.	<ul style="list-style-type: none"> Are any combustible structural elements and components utilised in the living wall system? If so, have these materials been reviewed and the possibility of replacing with non-combustible elements considered? 		
9.	If the living wall forms part of the building's structural integrity, has a fire resistance rating (insulation and integrity) of 90 to 120 minutes been achieved?		
10.	Where the design allows, have cavities between the living wall and building been fire stopped at every floor level to the same fire resistance rating?		
11.	Are any balconies non-combustible?		
12.	Have other opening such as vents, airbricks, window surrounds etc., been adequately fire stopped?		
13.	Have the fire stopping installations been audited post install, and any remedial recommendation actioned?		
14.	Has at least 10 metres separation been maintained between the living wall and adjacent properties to help avoid fire spread?		
15.	Have appropriate lightning protections been installed to the wall and ancillary equipment, where recommended in a lightning risk assessment completed by a competent and experienced company?		
16.	Are any electric vehicle or E-Bicycle chargers etc., planned or mounted within 10 metres of a living wall?		
17.	<ul style="list-style-type: none"> Are any smoking shelters planned or located at least 10 metres from the living wall? Are smoking waste receptacles planned or mounted to the building within 10 metres of the living wall? 		
18.	Are any bins stores or other combustible storage planned or located within 10 metres proximity to the living wall?		

	Property – General	Y/N	Comments
19.	<ul style="list-style-type: none"> Are hot works prohibited within 10 metres of the living wall during the installation phase? If not, are alternative options considered before any hot work? Where undertaken, will hot works be carried out in accordance with the Aviva Loss Prevention Standard – Hot Work Operations? Will hot work permits be regularly checked for adequacy? 		
20.	<ul style="list-style-type: none"> Is all electrical equipment and components utilised in the living wall rated for use in potentially wet environments? Is there a procedure for ensuring all replacement electrical parts are similarly rated for use in potentially wet environments? 		
21.	Is lighting equipment low heat emitting?		
22.	<ul style="list-style-type: none"> Will smoking or vaping be prohibited in proximity to the living wall structure or on balconies? Are any smoking waster receptacles planned or sited in proximity to the living wall? 		
23.	<ul style="list-style-type: none"> Are any fittings, furniture or finishings planned on the inner side of the living wall structure that are vulnerable to ignition in the event of radiated or conducted heat from a fire in the living wall? Are any critical installations planned on the inner side of the living wall structure, such as IT/server rooms, plant rooms etc., that could be relocated to an area of lower hazard? 		
24.	<ul style="list-style-type: none"> Are there any malicious damage, or vandalism concerns in the immediate area? If so, what actions have been taken to reduce the potential for damage to the living wall upon installation? 		
25.	<ul style="list-style-type: none"> Have suitable and sufficient impact protections been commissioned? 		
26.	<ul style="list-style-type: none"> Are any Video Surveillance Systems planned? Will any such systems be installed an accredited installer? Will the system be adequately monitored? 		

	Water Systems	Y/N	Comments
27.	<ul style="list-style-type: none"> • Have irrigation systems, feeding systems and flow rate monitoring systems been commissioned with no ongoing faults? • Are irrigation systems automatically adjusted to meet seasonal requirements? Has this been checked (software updates, component changes etc., make have cancelled programming) • Are water level meters installed in the living wall working correctly? • Are alert systems working correctly? • Are responsible persons trained to deal with emergency events such as loss of pressure, leaks etc? 		
28.	<ul style="list-style-type: none"> • Are water tanks and pipework suitably lagged? • Have components been checked for leaks and damage prior to handover? • Are trace heating systems installed, and working correctly? • Are leak detection systems installed, and working correctly? 		
29.	Are water treatment procedures in place?		
30.	Is a formal contingency plan in place in the event of failure of the primary irrigation system?		

31.	Additional comments:		
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Please Note

This document contains general information and guidance only and may be superseded and/or subject to amendment without further notice. Aviva has no liability to any third parties arising out of ARMS' communications whatsoever (including Loss Prevention Standards), and nor shall any third party rely on them. Other than liability which cannot be excluded by law, Aviva shall not be liable to any person for any indirect, special, consequential, or other losses or damages of whatsoever kind arising out of access to, or use of, or reliance on anything contained in ARMS' communications. The document may not cover every risk, exposure or hazard that may arise, and Aviva recommend that you obtain specific advice relevant to the circumstances.

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LOSS PREVENTION STANDARDS