ZURICH
Resilience Solutions

Building property *resilience*

Design guide

November 2023

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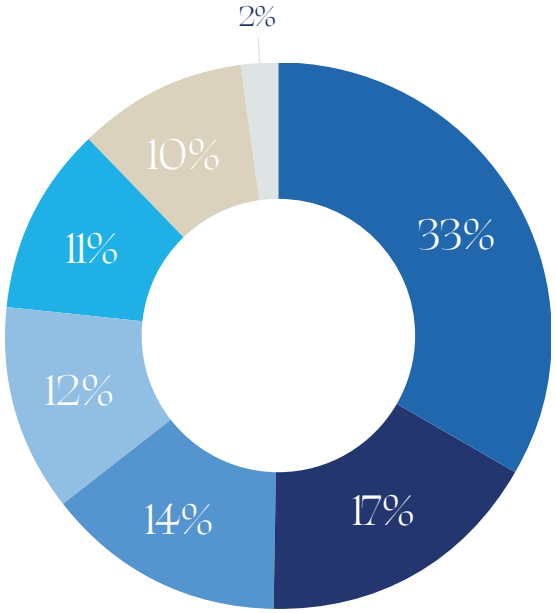
Contents

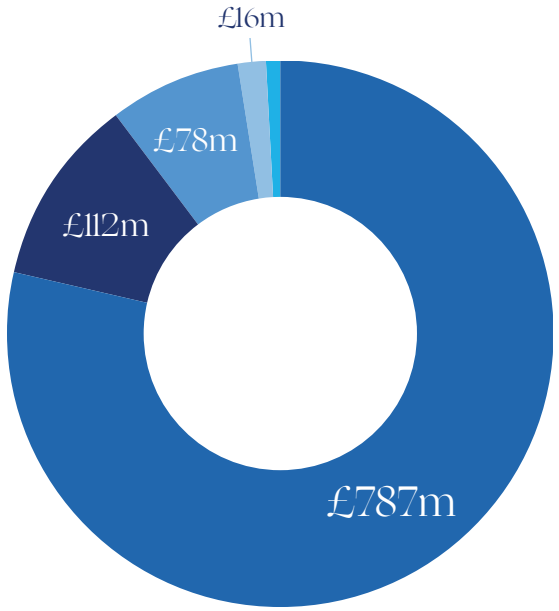
What can we learn from the past?

Many premises have been in existence for a significant time, and most will have survived for years without any serious material property loss. As insurers, however, we have a keen sense of the risks that the built environment faces and how this evolves over time. New build and major refurbishment projects present a golden opportunity to build in property resilience against a backdrop of a changing regulatory landscape, new technologies and climate resilience. To start the conversation, we have highlighted the top 3 causes of property insurance losses below.



Peril group

- Burst pipes/escape of water
- Accidental damage/loss
- Weather
- Fire and explosion
- Security
- Impact
- Subsidence



Peril group

- Fire and explosion
- Weather
- Burst pipes/escape of water
- Security
- Subsidence

Fire and explosion, although not making up the largest percentage in volume of claims, are still the highest costs with £787 million paid for the past 3 years.

In the past 3 years, 33% of claims related to escape of water and make up the third largest number of claims paid in this time.

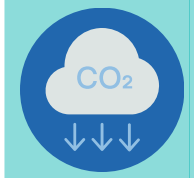
Weather related losses, comprised largely of flood and storm damage[1], make up the third highest number of claims by volume at 14%, and the second highest by value at £112m. This indicates that, whilst not as frequent, the damage caused by weather related loss is exponentially greater.

Sustainable construction

Reducing carbon emissions and achieving net zero is a key part of the UK's strategy to reduce the impact of the buildings on the environment.

For future developments there will be strong emphasis on creating buildings which are energy efficient, promote user health and wellbeing, improve local biodiversity and are resilient to future climate change.

At Zurich Resilience Solutions we are fully committed to supporting customers in managing this transition and helping to deliver a resilient built environment.

Trend	Overview
 **Low carbon building materials**	The UK's built environment sector is currently responsible for 25% of total UK greenhouse gas (GHG) emissions with common building materials (e.g. steel and concrete) significantly contributing to global GHG emissions. The embodied carbon emissions associated with concrete alone account for 25% of the embodied carbon of a typical construction process[1]. For the UK to meets its net zero carbon targets, construction will have to consider new materials and construction techniques which minimise the embodied carbon associated with construction.
 **Building retrofits and refurbs**	For the UK to meet its legally-mandated net zero carbon ambitions, there will have to be an accelerated national retrofitting program to reduce the energy demand of existing homes. For residential properties, these refurbs could include the installation of additional insulation, replacement of single glazing, draught proofing and replacement of inefficient electrical equipment and lighting[2]. The push for building retrofits will be supported by regulations and increasingly stringent energy performance certificate (EPC) standards for any rental properties in the UK. With the growing awareness of the upfront carbon emissions associated with new construction, many councils are now prioritising building retrofits and refurbs over new construction as a way of maximising the value of their existing assets and aligning with built environment embodied carbon targets.
 **Smart buildings**	Monitoring and measuring a building's performance through an integrated system of sensors and monitors can result in many benefits for building occupiers and managers. These can include reducing energy costs, personalising control of your immediate environment, measuring air quality and monitoring building efficiencies. Over the coming decade it is anticipated that more systems within a building will become integrated and customisable by the building user. This switch to smart buildings will require assets to have adequate capacity and connectivity to accommodate increasing data requirements.

References: 1. Trends in sustainable solutions for the built environment | UKGBC. 2. The six principles for retrofitting a house to meet net zero targets (architecture.com)

Sustainable construction

There will also be strong emphasis on air quality, climate risk analysis, renewable energy and biodiversity.

There are considered to be tremendous opportunities in this space and already many examples of solutions providing multiple benefits.

For example, sustainable drainage can not only reduce the risk of flooding, but it can include additional benefits of improving biodiversity and wellbeing too.

Trend	Overview
 **Air quality**	Coming out of Covid and with more people working from home, there is an increasing emphasis on indoor air quality and overall health and wellbeing of people and the spaces they occupy. For buildings, the indoor air quality can be improved in two ways, either actively through mechanical ventilation or passively through openable windows and air gaps. Wherever possible, passive ventilation is the preferable option as it reduces the energy demand of the property.
 **Climate risk analysis**	Although reaching net zero is critical it is also important to recognise that the climate is changing, and we will continue to experience climate-related impacts for the coming century. Both new and existing buildings will have to be designed, built and retrofitted to be resilient to these emerging risks. For the UK, the main climate risks relate to flooding and overheating. Recently released Part O building regulations have been developed to protect occupants from overheating in newly constructed residential homes. Part O covers overheating in domestic dwellings and residential properties such as care homes and student accommodation.
 **Renewable energy**	For UK homes to reach their net zero carbon ambitions, the large-scale adoption of on-site renewables will be required. For the residential sector this will involve the installation of on-site solar. Decarbonising residential heating is a challenge for UK properties and a major part of the UK being able to reach its commitments relies on the installation of heat pumps in all new properties and mass replacement of existing gas heating systems in existing housing.
 **Biodiversity**	Alongside climate change, the loss of biodiversity is projected to be one of the greatest challenges the global community will face over the coming century. It's recognised that high-quality greenspaces benefit nature, communities and the health and wellbeing of individuals. This is why councils are increasingly mandating the incorporation of greenspaces and biodiversity-enhancing features as part of the planning process. Upcoming legislation around Biodiversity Net Gains has been designed to contribute to the recovery of nature while developing land and will make sure that the habitat for wildlife is better because of the development.

Sustainable construction

Using building materials with a low embodied carbon content can help the construction sector reduce its carbon footprint.

Options include materials such as cross-laminated timber, often referred to as mass timber construction, can be used as an alternative to traditional concrete and steel load-bearing structures.

To support a resilient design, we need to manage the key property risks such as fire, weather-related losses and escape of water. From a property resilience perspective, we would argue that the current regulatory regime falls short.

Our experience of losses highlights the opportunity to raise the level of property resilience for the benefit of end users, their wellbeing and financial security.

Options and design solutions

In the table below we have provided a few common examples of the design challenges we see and the options available to improve property resilience. For further information, please see the relevant sections in this Guide.

Challenge	Solution
A mass timber building where all the timber elements are exposed	• Place wet services in a concrete core and extend the concrete into wet areas such as kitchens and bathrooms • Our research shows that encapsulating key parts of the mass timber only increases the carbon footprint between 1% to 3% • Install sprinkler protection
Solar panels placed on a Building Regulation compliant roof	• Place solar panels on either pebble ballast, concrete pavers, or on non-combustible board installed below the roof membrane
A school external wall is provided with 60 minutes fire resistance but externally clad in timber or combustible High Pressure Laminate panel	• Reduce the arson risk by selecting a timber-effect cement board cladding or other Euroclass A1/A2 panel to BS EN 13501-1
Basement car park that extends below one or more high rise blocks above	• Provide sprinkler protection in accordance with BS EN 12845 and the LPC Rules • Avoid combustible ceiling linings • Have four hours fire resistance to separate the car park from the floors above

Zurich insite – a smarter building

Unlocking the power of data is the key to achieving safer, smarter and sustainable buildings.

Transforming data to knowledge and action is a big challenge in the digital world.

Building Management Systems provide a wealth of data but how effectively can it be used to improve the performance of your buildings?

Zurich insite builds on our best-in-class risk engineering technical expertise to provide an innovative tool that listens to the data your building creates and provides insight to improve your building's performance.

Need help to understand your building's energy usage? Find out more about our Zurich insite tool:
www.zurich.co.uk/business/insite

What is Zurich insite?

A small self-installed device that listens to your Building Management System data. Additional sensors can be added to increase data intelligence.

Boiler and pump activity, temperature, temperature pressure, filter operation, heating systems, ventilation, cooling, frost protection, power metering, CO2 presence detection and fire suppression data can all be monitored for maximum impact.

Cost reduction

Develop a rich view of your data to inform efficiency programs and cost reductions. Zurich insite helps identify where current energy use is unnecessary or does not align to current needs.

Reduce carbon emissions

Meet carbon reduction targets by monitoring carbon use in buildings. Simple to identify energy saving opportunities to manage carbon usage and help meet carbon reduction targets and comply with sustainability regulations.

Risk management

The data collected is aligned to the Zurich risk grading methodology, enabling risk to be actively managed. This leads to safer environments and reduces business interruptions. Consult our best-in-class risk engineering teams for risk identification, assessment, insight and improvements.

Proactive preventative maintenance

Prolong the lifetime and efficiency of assets by using data to take a risk-based approach to maintenance.

Workplace safety

Monitor the operational status of safety equipment and the workplace environment including air quality.

Data analysis

Access to an easy-to-use dashboard to identify inefficiencies, potential improvements and monitor the impact of changes you have made. Customised notifications can be used to send alerts, and at day 65 you will receive a report baselining buildings performance and highlighting improvement areas.

Guidance on improving the energy performance of buildings can be found at The Energy Savings Trust

Design strategies

ZURICH Resilience Solutions

Understanding how products will perform in a fire is a challenge due to the complexity of fire testing options and what these mean in practice. From an escape of water perspective, there are solutions available to mitigate against losses, but the options are not always easy to select and specify. We expect weather-related losses will continue to rise and that regulation may fail to keep pace with change. So it is important that all parties involved tackle these issues head on at an early stage of the project.

Key questions for property fire resilience strategy:

1. Are combustible materials included in the structural frame?
2. Are combustible materials included on the external face or elements of the wall?

If yes:

3. What is the likely impact a fire will have on the building in the worst-case scenario?
4. How are combustible structural elements being protected from fire?
5. Can alternative non-combustible wall and insulation materials be used instead?

Key questions for the flood resilience strategy:

1. What type of flooding is the building exposed to e.g. river, coastal, surface water run-off, basement flooding from backing up of sewers or storm surge?
2. Whilst planning provides guidance on possible flood depths to consider, flood depths are expected to increase due to climate change and planning regulations may not consider these increased depths.
3. If a flood does occur, what is the likely damage and what strategies and solutions exist to mitigate against this?

Key questions for the escape of water resilience strategy:

1. How will an escape of water be detected if:
   a. It is a gradually operating leak, especially if located in a void or hidden area?
   b. It is a sudden burst pipe?
2. How quickly can the leak be isolated?
3. What will be the impact of a large escape of water leak, or a longer-term gradual leak, upon the construction materials of the building?
4. What physical, organisational and technological options are available to mitigate against the different types of escape of water leaks that could occur?

Construction materials

Some common building systems and materials are covered in this section. Whilst the list is limited in scope, the general principles of risk management identified can be applied to other building products and construction methods.

Based on our experience of construction surveys and reviews of independent construction survey assessments, there are some common observations that can be made. A particular concern with many of the points below is when construction errors and defects are combined with combustible construction:

1. Missing or incorrectly installed cavity barriers
2. Fire compartmentation being compromised by holes or inadequate or poorly installed fire stopping
3. Damage to lightweight surface materials that expose combustible materials behind
4. Combustible materials being installed in ways which were never tested, or the fire tests are small scale and not representative of how construction products are installed and perform under real-world fire conditions.

If we are to safely move towards a built environment with sustainable and resilient construction, it is important that we find ways to improve upon the entire built environment lifecycle.

Construction materials

How to determine combustibility and fire resistance of construction products?

It is difficult to give a simple answer to whether building products are combustible and to determine their fire resistance. This is partly because Building Regulations and test standards are complex and, from a property resilience perspective, can even be considered misleading.

Here are some examples:

1. When solar panels are placed onto a roof, they are not considered to be a construction product unless they are physically incorporated into the roof itself. In addition, the fire test for a roof within the Building Regulations is only via a small-scale fire test that does not consider the impact of placing solar panels upon the roof.
2. The fire resistance of large mass timber elements is achieved by testing a thick layer of mass timber in a test rig. As the mass timber is consumed by the fire, there remains sufficient layers in place to achieve the required fire resistance including structural loading.

   However, there is no consideration within the fire test of either the amount of energy generated by the burning timber or what happens to the timber after completion of the fire test e.g. any continued burning and charring that occurs.
3. Large scale wall fire tests do not replicate real-world features such as plastic vents that pass through the wall, the presence of combustible balconies or combustible storage on balconies.
4. A wall may achieve 60 minutes fire resistance or more, in terms of integrity and insulation, but it is still perfectly acceptable to then clad this wall externally with a combustible material provided other Regulations are not in place e.g. those that now apply to High Rise Residential Buildings.

Key takeaways for combustibility and fire resistance

1. If building products involve combustible materials, then classifications of fire resistance or fire performance within Building Regulations is not necessarily a good guide for property resilience.
2. Active fire suppression e.g. sprinkler installations, are extremely effective at controlling the fire size until the fire service can be brought in for final extinguishment.

   Unlike in the movies, most sprinkler systems will control a fire with no more than 4 or 5 heads operating, equivalent to no more than 60m^2.
3. Clients should be provided with transparent and easy to understand information about building combustibility and the measures taken to mitigate the risk.

   Plain language should be used and references to compliance with confusing fire test standards should be avoided.

Construction materials

Facades

The previous use of combustible wall elements in medium to high-rise residential buildings has come under intense scrutiny following the Grenfell tragedy. Regulatory changes have now been made but, as insurers, we still see that combustible materials can remain in place within the existing built environment. Even for certain classes of new buildings, combustible cladding continues to be used where non-combustible alternatives may be more appropriate.

Facade systems include rainscreen cladding to insulated render systems incorporating thick insulation layers.

Many of these systems with combustible elements have proven to be of concern, with the propensity to spread fire rapidly up the face of the building beyond the control of internal sprinkler systems or reach of firefighters.

Whenever possible, consider replacing facade systems containing combustible components with a non-combustible alternative.

Materials that give rise to concern include:

- **High pressure laminate (HPL) panels** – normally come in two varieties, a more combustible standard type panel and a fire-retardant panel which is still considered to be combustible.
- **SIPS (structural insulated panels)** – typically comprise of a rigid sandwich panel of a timber board (oriental strand board or OSB) with an insulation material between the two timber OSB sheets. The insulation layer is often polyisocyanurate (PIR), polyurethane (PUR) or expanded polystyrene (EPS). These are assessed as combustible or highly combustible depending upon the exact details.
- **Insulated brick slips** – a variety of product systems are available which may or may not be bonded to combustible insulation such as combustible rigid foam e.g. polyurethane (PUR).
- **Metal composite panels** – there is a variety of metal cladding panels that may or may not contain a combustible core e.g. aluminium, zinc, titanium, copper etc.
- **Insulated render systems** – externally insulated render systems, often containing highly combustible polystyrene insulation. Some systems pass the full-scale fire test, but extreme caution is needed when assessing these systems for existing high-rise buildings.
- **Any reference to combustible insulation materials** e.g. polystyrene, foil faced insulation boards containing Phenolic, PIR or PUR require careful specification and installation.

When assessing the importance of the facade in respect of property resilience, we consider several factors:

- Height and scale of the building.
- The rebuild cost and the costs of alternative accommodation, or business interruption exposure, as these can be very significant.
- The nature, likelihood and severity of common loss types e.g. fire, flood, escape of water and malicious damage risks.
- What is the remainder of the construction e.g. floors, framework etc. and whether these are combustible, non-combustible or have fire resisting construction.
- The extent to which combustible cladding materials are used and how they may contribute to fire spread.
- Whether there is active fire suppression that is correctly designed, installed and maintained.

Construction materials

External Insulated Finish Systems (EIFS)

For new buildings using an EIFS system, the use of a non-combustible insulation i.e. a material that meets the Euroclass A1/A2 definition, is advised irrespective of the occupancy.

When used in combination with a thin render, Zurich Resilience Solutions does not consider that full-scale fire tests involving the use of highly combustible expanded polystyrene (EPS) as being sufficiently robust to demonstrate property resilience against fire spread. Therefore, the use of EPS is not considered suitable in the use of external render systems.

In high footfall areas these thin render systems can be prone to accidental and malicious damage. This is considered to be more of a maintenance issue rather than a fire safety issue when non-combustible insulation materials are used. To minimise this risk, it is advised that more robust cladding materials are used in these high traffic areas.

Rainscreen cladding systems

Ventilated rainscreen cladding systems typically consist of external cladding on a support framework with a vapour membrane behind and is affixed to the main wall insulated framework.

Challenges may arise from:

- Access to the vapour membrane at the base of the ventilated facade can act as a wick for arson/wilful fire raising with a chimney fire effect if combustible materials are used.
- Breaches of the facade by vents are not considered in fire tests. These provide a ready route for fire spread from a flat or vice versa.
- Missing cavity barriers.

The solution to these issues is to either use non-combustible materials or use a robust system to enclose rigid foams e.g. 100mm thick pre-cast concrete panels, with a rigid foam core. Also provide fire-rated pipe collars and/or intumescent grilles to penetrations that maintain the fire resistance of the panel.

Building structures

Mass timber

The built environment is a key contributor towards global carbon emissions and for the UK to achieve net zero carbon emissions by 2050, the carbon footprint of a building must be reduced. To do this, new initiatives on how buildings are designed, constructed, maintained, operated and decommissioned must be embraced.

One of the design solutions being adopted is the use of lower embodied carbon materials such as mass timber.

There are some specific challenges for mass timber which relate to its fire performance, repairability and reaction to escape of water incidents. However, efforts are being made to improve the understanding of such structures and how to build in resilience.

Mass timber has been used previously with very little impact to building risk profile e.g. the use of glulam beams to provide large spans. However, the proposals we're seeing now are much more ambitious and these require careful consideration.

There is ongoing work by industry bodies and the insurance sector to help address these issues. One example being the Mass Timber Insurance Playbook with further work in progress.

Key challenges and key solutions

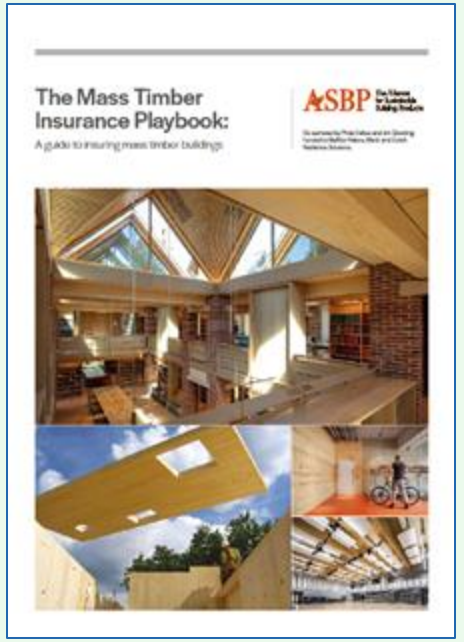
The preferred solution to limit fire, smoke and water damage is the installation of a sprinkler system. This is an extremely effective control that in 98% of cases will control the fire by the operation of no more than 5 sprinkler heads, equal to an area of 60m^2.

Encapsulation of the timber by two layers of fire-rated plasterboard has also been demonstrated, via fire testing, to be reasonably effective at limiting the fire damage to the mass timber elements.

There is a balance to be achieved between exposure of the timber and encapsulation which will be project dependent e.g. exposure in terms of values at risk, number of storeys, presence of a sprinkler system etc.

The use of concrete cores and placing areas with a high risk of escape of water within the concrete zone is considered good practice. This must be in addition to a comprehensive plan to mitigate against escape of water risks.

Care should also be taken to ensure that other risk features are adequately addressed. For example, solar panels should be installed over a gravel ballast, concrete pavers or a non-combustible separating board below the membrane layer.



Detailed guidance is available in the Mass Timber Insurance Playbook

Building structures

Multi-storey

For multi-storey and larger developments there is a clear need for non-combustible cladding and insulation.

Whilst legislation has now been put in place for residential risks, this does not apply to other occupancies such as offices and even sleeping risks such as hotels. For such developments, however, the recommendation is that only non-combustible cladding and wall insulation materials are used.

Modular and pod construction

Factory-built units may be considered by designers for ease of on-site construction and quality issues can also be factory controlled.

Modular construction can involve the entire residential unit being lifted into place or it can involve smaller elements of the construction such as a bathroom pod.

Modular construction is now being used in high rise developments. Typically, there are concrete cores, and the modular units are then craned into position.

Modular and pod construction

The challenge with high rise modular buildings is that:

- The fire resistance between units is often based on lightweight materials than can be inadvertently compromised by residents or contractors.
- Any voids created need to be carefully fire stopped with appropriate products.
- Water damage can be very problematic with such construction.

Modular and pod construction controls

To address the issues with high rise forms of this construction:

- Install a sprinkler system in accordance with BS EN 12845 incorporating the LPC Rules and Technical Bulletin 202 where residential accommodation is included.
- Water leak detection and isolation needs to be front and centre of the design process. A comprehensive review and mitigation plan needs to be considered a critical element.
- Ongoing controls regarding contractor controls and change management need to be considered at the design phase. This element is often given insufficient attention.

Building structures

Mass timber materials

Timber-framed

Timber-framed buildings have been around for hundreds of years, although the concept is now being used to create much larger and more innovative structures. The risks associated with larger and more complex structures include:

- Once a fire starts spreading into the voids between flats, it can be extremely difficult to tackle the fire.
- Evidence from fires indicates that if passive fire protection is compromised then fairly rapid fire spread can occur.

Where larger and more complex structures are proposed, then an appropriately designed, installed and maintained sprinkler protection is considered to be the best form of protection.

In addition to sprinkler protection:

- Use non-combustible insulation and non-combustible cladding throughout.
- Very careful consideration of roof soffit and roof construction and compartmentation. Fires that spread into combustible roof voids via plastic soffits can spread extremely rapidly.
- The use of photographic details produced at different stages of the construction project can aid understanding and demonstrate compliance with fire stopping measures.
- Ensure compliance with industry good practice e.g. Structural Timber Association, FPA/RISC Authority and HSE.

Timber cladding

The wall or facade of a building can have a material impact upon the arson/fire-raising and accidental fire risk e.g. a carelessly discarded cigarette setting fire to bins that spread to the building. It can also affect the fire spread, should a fire occur, and ultimately the extent of any loss.

Consideration should include:

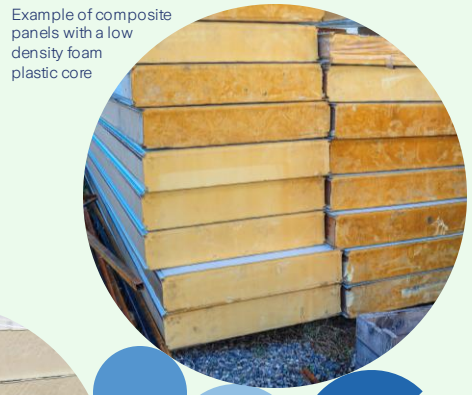
- Avoid timber cladding and combustible insulation materials in the first instance
- Use non-combustible timber effect boards instead
- Only use timber for low rise structures
- Place waste bins in secure areas
- Generally, there should be no overhanging soffits above the timber cladding into which a fire can spread. Where soffits exist above the cladding area, they must be appropriately fire protected.

Building structures

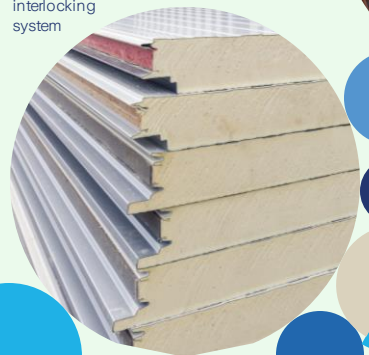
Composite panels

Composite panels, also known as sandwich panels, insulated panels, or white wall panels, are widely used as exterior walls of buildings or to separate spaces within buildings. The ideal composite panel, from a property resilience perspective, is formed from non-combustible components such as metal facers over a mineral wool core or has an appropriate third-party listing.

Read Risk Topic: Composite Panels



Example of composite panels with a low density foam plastic core



Tongue and groove interlocking system

Composite panel use externally

Composite panels are very commonly used in commercial and industrial buildings for wall and roof construction. We have also seen composite panels used at hospitals, offices, educational establishments, leisure risks, hotels and larger residential risks.

Composite panel use internally

Interior composite panels are typically used to subdivide a space and are quite common in the food industry. These may be used to subdivide manufacturing areas or as insulated panels for refrigerated sections of the building.

Food risks typically prefer rigid foam panels to avoid issues with fibre-based panels. It's important to note the fire resistance obtained for many of these rigid foam panels is based on the integrity of the thin metal sheet facing.

As an internal panel they may be subject to more penetrations and openings, exposing the combustible core and increasing the potential for a fire to involve combustible core materials.

Panel selection – use third party approved panels

A selection of commonly used third party approvals include:

- Composite panels with non-combustible cores such as mineral wool
- Panels with a LPS 1181 rating meet the minimum standard
- Panes with a LPS 1208 rating, not only do they meet LPS 1181, but they also have an increased fire performance standard
- Other acceptable third-party listings include FM 4880, 4881 and 4882
- Full scale tests such as NFPA 285 and BS 8414

For commercial and industrial buildings fires may occur due to:

- Electrical faults (transformers located adjacent to building walls, or photovoltaic panels on building roofs).
- Vehicle fires.
- Yard storage fires involving waste bins or pallets.
- Fires involving neighbouring buildings.

It is therefore important to select a third-party listed composite panel that, as a minimum, won't contribute to the initial fire development.

Composite panels are also available with increased fire resistance, and these should be considered where property and business resilience exposures justify the additional expenditure.

Building structures

Green roofs and green walls

There are many options relating to both green roofs and green walls. For green roofs this may include options for increased water storage, often referred to as a blue roof. For green walls there are different options based on support frames and irrigation systems.

Green roof guidance:

- Placing over concrete is preferred.
- For smaller exposures, a non-combustible board can be used to separate the green roof from the construction below.
- For areas with solar panels, only use gravel ballast or concrete pavers below.
- Ensure easy access is provided for maintenance or repair.
- Ensure fire breaks around openings such as roof lights.

Blue Roofs

As blue roofs involve the use of combustible plastic to retain water below the growing medium, there are some additional precautions to consider:

- Hot work must be avoided during the installation of such roofs.
- Internal plastic drains must have adequate and robust enclosure as they pass through the building e.g. blockwork enclosed riser with suitable fire-rated access hatches.
- As with green walls it is important to have inspections in place to ensure tree saplings have not self-seeded, drains remain clear and that there is a maintenance plan in place with trained individuals.

Green Walls

A concern with green walls is the use of combustible plastic frames and containers for the growing medium especially during the installation phase. A lack of maintenance can also increase the fire risk with the green wall. Precautions to consider:

- Hot work must be avoided during the installation of green walls.
- Once installed, hot work should still not take place above green walls or within 10 metres (35 feet) unless suitably protected.
- Green walls should not be placed where there is an arson risk e.g. waste bins should not be placed within 10 metres.
- Green walls contain combustible materials and are therefore not suitable for use on medium to high rise residential buildings.
- Green walls and balconies on existing buildings are also considered an increased fire risk from the inappropriate use of BBQs and carelessly discarded cigarettes. Appropriate action should be taken to mitigate this risk.

For additional details on green roofs, please see The GRO Green Roof Code or BDM01 A to Z of Essential Principles for the protection of buildings.

Building structures

Covered walkways/canopies

At educational locations, covered canopies are popular to both afford some protection from the elements and create outdoor learning spaces.

Often these are to be constructed in a variety of materials such as flexible plastics, PVC, ETFE or rigid materials.

Some important issues to consider:

- The design should not encourage or allow access onto the building roof.
- Combustible contents should not be stored outside overnight due to wilful fire raising and accidental ignition risk e.g. provide non-combustible containers as part of the design.
- Litter bins etc. within or beneath the canopy area must be avoided.
- Extend the sprinkler system to these areas via tail-end dry pendent sprinkler head.

Overhanging roof eaves and combustible soffits

Where there are roof eaves with combustible soffits, these can present greater problems for certain types of risk.

The main two being pavilions and blocks of flats with multiple dwellings. For pavilions it is the wilful fire-raising risk and for blocks of flats it's that combustible soffits, and unprotected attic vents, provide a rapid route of entry for fire into the roof space.

- For pavilions, the design should involve metal soffits with a roof construction that doesn't require soffit ventilation.
- For blocks of flats the eave and soffit design should involve non-combustible construction, preferably rated to 60 minutes with fire-rated vents.
- For blocks of flats, it is worth mentioning that roof compartmentation for pitched roof design should be of robust construction in the event that a fire does spread into the roof. Examples are commonly seen of mineral wool in a chicken wire mesh with holes or lightweight partitions that do not adequately protect fire spread between compartments.

Building structures

Atrium construction

The use of large open atria type spaces is a commonly seen design feature in a range of occupancies from low rise to high rise buildings.

One concern is that fire engineers may assume that the atrium is a sterile area without a fire load when modelling the fire risk. From our experience, end users often add to the fire load of the atrium without always realising the impact e.g. a school adds a library space to their atrium, a shopping centre adds electric show vehicles to the shopping mall. Fire engineers must be challenged about realistic and future fire load in the atrium space.

Some factors to consider with such designs are:

- Fire engineers should challenge assumptions that atriums will remain sterile and include the likelihood of end users adding to the fire load in the atrium space.
- Consider trying to reduce the risk of fire and smoke spread into the remainder of the building via the areas that face into the atrium.
- Install sprinkler protection to buildings with an atrium in order to minimise the risk of fire spread. Whilst smoke spread will occur, the sprinkler system will greatly limit the amount of smoke produced.

Ethylene Tetra Flouro Ethylene (ETFE) roof structures

Inflated ETFE roof structures can often be found above large open spaces or as an atrium roof.

There is not a great deal of evidence to indicate any increased risk from these roofs although there is still limited data available. If you are planning for an innovative or particularly large ETFE roof, it may be advisable to consult with Zurich Resilience Solutions.

A couple of additional points in respect of ETFE roofs:

- ETFE roofs should not be erected at a low level or be easily accessible by unauthorised persons.
- If the building is protected by a fire sprinkler system, the ETFE roofed area should also be protected. The requirement for this will depend on the circumstances, i.e., extent of areas open to the air, height, use within covered space etc. If it is decided that the ETFE covered area will not be suitable for the protection by a fire sprinkler system, then appropriate separation of this area from the sprinklered areas of accommodation must be provided.
- Ensure there is a comprehensive maintenance plan in place e.g. access for inspection and cleaning the ETFE roof, electrical maintenance of control panels, any back-up power and air pumps.

Building interiors

Compartmentation

The main objective of compartmentation is to limit the fire spread to one compartment.

Correctly installed and maintained compartmentation, including fire doors and fire stopping, can be extremely effective at limiting fire and smoke spread.

Aspects that need to be considered include:

- Where ductwork breaches compartment walls, fire shutters, linked to the fire detection system, will have to be installed. It is important that these shutters are located in the wall or immediately adjacent to it.
- Fire doors in buildings with heavy foot traffic tend to suffer ongoing damage by constant use. The use of fail-safe, electromagnetic contacts, linked to the fire alarm/detection system is strongly recommended.
- Compartment walls are to be marked on plans so that, if any future work is undertaken in the premises, a check can be made to ensure that holes or voids created are suitably fire stopped.
- Once compartmentation is provided, it is vital that this is maintained throughout the life of the building.

Fire stopping is often breached by contractors installing services, therefore final snagging checks of a project should always pay particular attention to the integrity of firebreaks within ceiling and roof voids.

Heating systems

We will increasingly see the transition away from fossil fuel heating systems to alternative solutions.

The introduction of new technologies requires careful consideration not only from a cost benefit and carbon reduction basis, but it's also important to consider.

- Installation and maintenance requirements
- Training and familiarisation for site managers
- Access to suitably skilled maintenance contractors
- Fire safety controls and compartmentation

Based on our experience of new building designs, the following common design requirements are summarised as:

- Not locating plantrooms in rooms with combustible construction. Ensure a minimum of 60 minutes' fire resistance using non-combustible materials.
- Location of fuel stores e.g. for biomass boilers, in a separate fire-rated room.
- Ensure all fuel and other safety cut-outs are correctly specified, installed and commissioned.

Natural ventilation systems and night cooling

With the requirement for greater insulation and heat conservation in building design, buildings are being designed to retain heat during the day and release this back into the building at night.

During summer months, heat commonly needs to be dissipated and this may be achieved by leaving windows or roof lights open at night. As a result, this presents an increased security risk in terms of intruders wishing to gain entry or arsonists/wilful fire-raisers throwing lighted material into the building.

The following should be considered:

- If low level openings are needed, minimise the size of these and provide with security mesh/grilles.
- Provide openings only at a high level.
- Provide sprinkler protection.

Construction risks

The construction of a building can influence the extent of any property-related loss to a dramatic degree. We have focused on a few key areas to assist designers and end users.

New buildings are designed, built and maintained to deliver low energy, comfortable spaces that are designed around their occupants and purpose.

New buildings should also be designed to adequately resist the range of hazards and perils they are exposed to such as fire, storm, flood and escape of water. Often, this will require designers and architects to go beyond compliance with minimum regulatory guidelines.

The benefits of going beyond minimum regulatory compliance are substantial. This includes reducing the risk of primary and secondary impacts such as mental health impacts following losses.

With the rising cost of materials and labour, however, decisions may be taken to reduce costs in other areas including compromising on property resilience measures.

Key construction tips

Project phasing
Project phasing is an extremely important concept to prevent major fire spread between multiple buildings or blocks or flats which are being constructed at the same time. When constructing multiple blocks, ensure fire spread between blocks is minimised by enclosing combustible elements before starting the next block.

Remove or isolate sources of ignition when the site is not in use
Switch off temporary electrical power supplies other than those for essential needs such as emergency lighting, fire detection and security.

Zero tolerance of smoking
All smoking materials – such as lighters and tobacco – must not be allowed on-site, with a zero-tolerance policy adopted.

Control of contractors and subcontractors
Contractors and their subcontractors can be the weak link in fire safety controls and enforcement; rigorous selection of contractors, subcontractors and induction procedures can assist in improving safety standards.

Routine inspections
Site deficiencies may be overlooked, especially when contracts are running behind plan; build into the contract an allowance and expectation for adequate and effective routine inspections through the principal contractor.

Contact **Zurich Resilience Solutions** to assist in hot work management

Permit-to-work systems
The issue of generic permits-to-work can dilute their effectiveness and allow mistakes to occur; tight control is essential. Particular consideration relating to hot work.
See What is a hot works permit and why do you need one? and our in-depth guide to hot works safety.

Waste control and storage of combustible materials
If the site space is restricted, daily waste collections and just-in-time deliveries may need to be factored into the contract

Security controls
Consider daytime and night-time access control measures.

Perimeter fencing
Effective fencing and gates need to include good quality locks; with consideration given to climbing aids next to fencing such as trees and street furniture, and the potential for unauthorised access by children, especially in residential areas.

Intruder alarms
These can include scaffold alarms and temporary alarm systems in the building and use remote signalling.

Security guarding
Check that the organisation is a Security Industry Authority (SIA) approved contractor, e.g. via the SIA, NSI or SSAIB websites and complies with BS 7499:2020 static site guarding and mobile patrol service code of practice.

Monitored CCTV
Temporary CCTV systems are now available with remote signalling and movement activation that are suitable for low-light conditions.

Choice of site

The vulnerability of the site to flood risk may be an issue where land is low lying and near a water course. Furthermore, dependent on the topography of the site and the land within the adjoining area, the premises could be placed at undue risk of flooding when surface water drainage in the locality is overcome by storm conditions.

Zurich's claims data reveals that 15% of all fires in commercial and industrial properties are caused by hot works

Refurbishments

With increasing pressures on budget allocations and funding streams, the concept of building refurbishment and reinstatement may be considered more viable and achievable if of affordable building provision.

Sustainability targets faced by building providers, designers and end users can present real challenges, and the concept of re-modelling existing building provision, upgrade of existing facilities, services, building envelope and the overall environment may in some cases offer the only viable and affordable solution.

Such concepts however must maintain focus towards achieving appropriate levels of property protection, something that is increasingly embedded into new building design. Whilst not aimed at achieving improved property protection, i.e. security provision or behaviour in fire, re-modelling presents not only challenges, but also opportunities in this regard.

The following guidance is aimed providing examples of key considerations as part of refurbishment and remodelling schemes. It should be noted that further guidance on these aspects is provided throughout the other sections of this guide and cross reference should be made.

Internal layouts and circulation

The existing building fabric may place constraints on internal layouts, with caution needed to ensure buildings can operate effectively and routinely without compromising security, for example.

In respect of fire, appropriate separation and compartmentation should be facilitated to limit potential fire losses, for the benefit of both life safety and property protection.

Refurbishment schemes can involve the opening internal spaces, the creation of more flexible environments or the removal of part of an upper floor to create an atria type feature.

Such improvements should embrace, maintain and ideally improve not only the environment and provision of facilities, but should be designed to avoid compromising security (both daytime and out of hours), and potential fire performance of the building.

Thermal performance

Where improvements are proposed in the energy performance of existing buildings, the provision of additional and/or replacement thermal insulation is likely, with this taking a variety of forms.

Where externally applied insulation systems are to be incorporated, or new cladding systems proposed, the fire performance of such materials can have a significant impact on the overall behaviour of the building in a fire condition.

In extreme cases, the application of combustible insulation products in such a manner could introduce unacceptable fire loads to the building and could potentially assist in leading to a total fire loss.

In the case of improved or upgraded roof insulation, it is often the case that roof voids are exposed to gain access for the installation of insulation materials. Extreme caution is required to ensure that any existing fire cavity barriers and fire stopping provision are not adversely affected.

The opportunity to introduce or improve the existing fire stopping provision should be considered within such works with appropriate reference to the Fire Risk Assessment or Building's Fire Strategy.

Refurbishments

Asbestos removal

Where refurbishment works involves the removal, treatment or encapsulation of asbestos within the fabric of the building, reference should be made to the building's fire strategy to determine the function of any asbestos linings, cavity barriers or ducting.

It may be necessary to re-introduce barriers or linings to maintain the fire performance of a building, which could have an impact on not only property protection, but also life safety measures within the building.

Refurbishment schemes may also need to remove pipe/service lagging that may contain asbestos. The removal of such products is considered best practice, however, appropriate alternative protection systems must be introduced, to avoid the freezing of pipes and subsequent escape of water losses and associated damage.

In some existing buildings, commonly those constructed in the 1960s and 1970s, asbestos linings may be present within cladding panels, for example beneath windows and around window reveals.

Where panels are removed as part of a refurbishment programme, appropriate replacement materials should be used, and ideally be non-combustible.

Building structure

Structural works that form part of any refurbishment or remodelling project should comply with current Building Regulations and Standards.

In some cases, it may be necessary to review the provision of fire protection to the elements of structure within the building. In the case of some system-built buildings, typically of the 1960s and 1970s, structural fire protection may not have been provided, resulting in a poor risk in relation to fire exposure.

In such cases, even relatively small-scale fires can result in disproportionate damage and in many cases, total loss of such buildings.

Existing fire protection afforded to a structure must be maintained, and in the case of major refurbishment programmes, enhancement of such protections may be considered appropriate.

The overall behaviour of the structure in relation to windstorm can be dramatically altered following refurbishment programmes, with choices of external wall treatments, curtain walling systems and rainscreen cladding potentially affecting the likely performance of the building.

External envelope

Refurbishment projects of a large scale can often involve upgrade works to the external envelope of the building with external cladding systems being applied, including rainscreen and external insulated finishing systems, for example.

Caution should be exercised when specifying such systems to ensure that these to do not adversely contribute to the fire load of the building, increase the vulnerability in terms of external fire spread, or introduce substantial combustible elements to the building fabric.

Where there is any doubt as to the potential impact of such treatments, reference should be made to Zurich Resilience Solutions.

Re-roofing is often required as part of refurbishment works to manage and control the lifecycle risks of the building and improve overall aesthetics of the facility.

It is not uncommon to see pitched type roofs being created over existing flat roofs, which is often desirable to limit the extent of disruption internally.

Such works can however introduce the potential for reduced fire performance, in that fires within the building may not be so readily vented and heat building up within the 'new' roof void can assist in rapid fire spread.

Current design standards and regulations must be observed to ensure appropriate fire compartmentation and separation is introduced.

Where green roofs are incorporated as part of the refurbishment programme, specialist design is required to assess the adequacy of the existing structure and the suitability of any existing roof decking retained.

Refurbishments

"Early consultation with Zurich Resilience Solutions is recommended to determine the suitability of existing and proposed service provision."

Building services – general

In most refurbishment schemes, it is likely that existing services will be impacted upon to varying degrees. Consideration should be given to the adequacy of the existing service provision and the need for and feasibility of replacement within the project.

Mechanical and Electrical services may form an integral element of the refurbishment, with the opportunity to install services being essential to avoid future short-to-medium term disruption to the facility.

Where emerging technologies are being considered, for example regarding heating and ventilation strategies, early discussions with Zurich Resilience Solutions should take place to agree likely acceptability of such technologies.

Building services – protection systems

In most refurbishment schemes, it is likely that existing services will be impacted upon to varying degrees. Consideration should be given to the adequacy of the existing service provision, with focus on both fire and intruder alarm systems. Often the re-modelling of a building will require a major overhaul of an intruder alarm system, owing to changes in layout and use of key areas.

Fire alarm systems in many existing buildings are often little more than manual break-glass type systems affording no measurable degree of property protection. The opportunity should be taken to incorporate updated and contemporary protection systems, to protect the refurbished facility for the foreseeable future.

It is unlikely that existing buildings being re-modelled will already incorporate existing sprinkler systems, though this should not detract from the possibility, feasibility and benefits of installing such systems.

Whilst it is recognised that the cost of installing sprinkler protection within existing buildings can in some cases be disproportionately high, for example where all internal finishes were being retained, it remains possible and beneficial to install sprinklers as part of major refurbishment schemes.

Where a building is being taken back to little more than a structural frame, and all ceilings are to be replaced, the installation of a 'retro-fit' sprinkler installation should be considered.

Existing fire protection afforded to a structure must be maintained, and in the case of major refurbishment programmes, enhancement of such protections may be considered appropriate.

The overall behaviour of the structure in relation to windstorm can be dramatically altered following refurbishment programmes, with choices of external wall treatments, curtain walling systems and rainscreen cladding potentially affecting the likely performance of the building.

External landscaping

Whilst not specifically building related, refurbishment works often incorporate external landscaping schemes. Such schemes present threats and opportunities in relation to the risk exposure for a building. Caution must be exercised to ensure that security strategies are not unduly compromised, for example, by the removal of inner security fencing, or the introduction of landscaping features that may allow easy roof access for intruders.

Such landscaping schemes may also present the opportunity to improve flood resilience of the building, particularly in respect of pluvial flooding, where large expanses of hard surfacing exist around the building.

Checks as to the adequacy of the existing drainage system should be carried out, and where necessary, additional drainage channels, attenuation facilities, or adjusted ground levels introduced.

Fire protection

All elements of service provision within a building require consideration at an early stage in the design process, to minimise the impact of these services on the construction process and in the operation of the completed building.

Sprinklers

Zurich recommends that early consideration is given to the provision of fire sprinkler installations within new build designs: for both the protection of property and indeed in terms of business continuity.

The provision of sprinklers within a range of buildings should not only to be considered beneficial in terms of property protection but can allow for unparalleled design freedom.

Conventionally, building design must meet the prescriptive requirements of the current building regulations together with their approved technical standards. However, such requirements have often dictated to designers the way a facility can be built, which in many cases limits the internal layout. The provision of a sprinkler system has the potential to offer increased freedom in this area and can ultimately result in better building design.

Several misconceptions still seem to exist regarding the operation of sprinkler systems. In general terms, sprinklers are operated by heat and only operate in the area of the fire, therefore not resulting in widespread water damage to the entire building.

Sprinkler systems are designed to control and suppress a fire, although in most cases they extinguish the fire without fire service intervention. A sprinkler head will typically discharge water at a rate of 60 litres per minute. This is approximately one tenth of that discharged by a typical single Fire and Rescue Service hose.

Design standards

For any fire sprinkler installation to be recognised for insurance purposes, it must be in accordance with the current standard: LPC Rules for Automatic Sprinkler Installations incorporating BS EN 12845.

It is a general requirement that all parts of a building are to be sprinkler protected. In certain cases – with the appropriate internal fire separation and the provision of automatic fire detection – consideration can be given to the inclusion of limited non-sprinklered areas where the discharge of water may present an additional hazard.

These areas could include main electrical switch rooms, IT server rooms, specific laboratories, etc. Such areas may need to be protected by Gaseous Suppression Systems. For specific guidance in this regard, please contact Zurich Resilience Solutions at the earliest opportunity.

The design and installation should be performed and supervised by either an LPS 1048 Level 3 or 4 certified contractor meeting Loss Prevention Certification Board approval, or a FIRAS certified contractor.

For assistance in sprinkler and other fixed fire protection, please reach out to **Zurich Resilience Solutions**. We have a team of qualified engineers who can assist you.

Fire protection

Others

Fire alarms

One of the major factors in the extent and costs of fires in buildings is their late detection. An automatic fire detection system can provide early detection of any fire occurring while a premises is unoccupied. It is necessary to have an automatic fire detection system.

Such a system should comply with BS 5839-1 and conform to design of category P1.

This class of system would provide detection throughout the building, in addition to manual call points. A monitored remote connection to a central alarm-receiving centre must be provided to enable swift attendance by the Fire Service outside normal working hours, unless an alarm activation can be confirmed by a 24-hour security staff presence at a premises.

It should be noted that although any sprinkler system would raise an audible alarm, it is recommended that automatic remote signalling is installed on the fire alarm system that's also capable of transmitting a signal from the sprinkler system as well. This would ensure a quicker transmission of the fire signal to the alarm-receiving centre.

Designing automatic fire alarm systems needs careful consideration to avoid false activation. False alarms are caused by malicious activation of call points, or the incorrect type of detector heads being installed.

To prevent unnecessary activation of call points, the following should be considered:

- Installing alarmed covers to the manual call points.
- If the fire service are agreeable, during hours of occupation only, a delay on the transmission of the alarm signal to the central alarm-receiving centre.

Some areas where there could be false activation of the smoke detectors include:

- Areas where there could be smoke/steam generated in the normal course of events, such as laboratories, engineering workshops, testing rig enclosures, areas using cooking implements, changing areas and kitchens. Here, heat detectors should be considered.
- Where heat detectors are installed in high temperature areas, the temperature rating should be appropriate to avoid false alarm activations.

These problems need to be addressed at the design stage and we would suggest that the installer undertakes an analysis of the problems prior to suggesting solutions, so that a suitable system, as per the British Standard, is specified for each area.

The installing contractor, designer and servicing contractor should be third party certificated by a certification body such as the Loss Prevention Councils LPS 1014 scheme or the BAFE SP 203 scheme.

Fire protection

Others

Gaseous fire suppression systems

Whilst for the majority of areas the provision of sprinklers are the preferred method of fire protection, it is appreciated that there may be certain areas of a building where the provision of sprinklers is not viewed as appropriate or acceptable.

Examples include research laboratories where electron microscopes or NMR scanners generating high magnetic fields may be present; within IT server rooms, electrical switchgear rooms or archive storage areas; or in rooms containing equally sensitive equipment, facilities or systems.

Consideration should be given to the provision of gaseous fire suppression systems in these circumstances, to afford appropriate and acceptable levels of protection to the provision.

It is important that the overall fire protection solution for a building or plant facility to be considered.

Gaseous extinguishants and systems form only a part, though an important part, of the available systems and it should not be assumed that their adoption necessarily removes the need to consider supplementary measures, such as a provision of portable fire extinguishers or other mobile appliances for first-aid or emergency use, or to deal with special hazards.

Appropriate protection of areas containing either high value or highly sensitive equipment, business critical service provision and systems, or other risks where more conventional fire protection methods must be highlighted and considered within the early stages of design.

Where new-build facilities are to contain such equipment or features, **early consultation should take place with Zurich Resilience Solutions** in respect of suitable protection measures.

Fire protection

Others

Kitchen fire extinguishing system incorporating UL300, NFPA 17A and NFPA 96

Where kitchens are present in buildings, cooking presents a significant fire risk. Fires can be controlled effectively through the correct installation of a kitchen fire extinguishing system, as well as the ongoing maintenance of cooking equipment and its associated extraction systems.

In today's commercial kitchens, higher temperature cooking oils and high efficiency, slow-cooking appliances – such as deep fat fryers – have combined to make fire suppression more challenging than in the past. The need to protect people and property from fire is crucial.

The kitchen extinguishing system is to be approved by Underwriter Laboratories (UL) 300 fire testing standards for testing of fire extinguishing system for the protection for restaurant cooking risks.

The system is to be provided with manual and automatic operation of the protection system to the cooking equipment. Discharge nozzles are to be strategically provided above all cooking appliances e.g. frying ranges, overhead canopies and ducting systems. This includes wall mounted grilles, such as salamander grilles. Installation and subsequent servicing is to be undertaken by a company approved by the manufacture of the extinguishing system.

The extinguishing system can be accepted as a Zurich Recognised Technology (ZRT) when the selected fire protection system:

- Is approved, certified or listed by a Zurich Recognised Testing Laboratory.
- Passes an acceptable test protocol (such as UL 300 test protocol).
- Is installed in accordance with a Zurich fire protection standard (such as NFPA 17A).
- Follows manufacture design, installation and operational guidelines.

The most common systems accredited to the UL300 standard are the Ansul R102 and Amerex KP systems. A system which is not listed by UL as having passed the UL 300 criteria may be acceptable, but only if independent test data has been provided to Zurich Resilience Solutions to demonstrate that the system has passed all of the UL 300 criteria but has not been specifically submitted to UL for official listing.

Fire protection

Others

Kitchen fire extinguishing system incorporating UL300, NFPA 17A and NFPA 96: Extinguishing system cause and effect (sequence of events)

Where kitchen extinguishing systems are installed, the configuration of the cause and effect sequence of events needs careful consideration at the design stage. Where systems are being installed the cause and effect on-site installation and/or configuration can be often inconsistently applied.

A written cause and effect matrix is required. Upon activation of the extinguishing system, typically, the fire protection system is configured as follows:

- Activation of the extinguishment systems will result in the immediate isolation of the fuel supply of all cooking appliances.
- Activation of the extinguishment system will result in the immediate isolation of the make up or supply fans, integral to the exhaust hood(s) being protected. (NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Appliances).
- Exhaust fans in the ventilation system will remain on upon system activation, as the forced draft of these fans assists in the movement of the extinguishment agent through the ventilation system, thus aiding the fire suppression process. These fans also provide a cooling effect in the plenum and duct after the fire suppression system has been discharged (NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Appliances).
- The extinguishment system should already be linked to the main fire alarm system to ensure that activation also triggers the main fire alarm for the site.
- Additionally, a design review will need to be undertaken by Zurich Resilience Solutions. This is to check if the discharge nozzles are placed directly above and are aligned with deep fat fryers and eye level grills are protected correctly at the mouth of the grill, not above
- Lastly, the system to be tested as part of the commissioning and signed off as per NFPA 17A (Standard for Wet Chemical Extinguishing Systems).

Emerging risks

Photovoltaic panels

1 The increased risks: Photovoltaic (PV) systems

- PV fires on exterior building surfaces that are beyond the reach of fire protection systems.
- Inadequately defined inspection and maintenance programmes.
- Introduction of additional combustibles that increase the burn rate of roof decks.
- Unexpected structural loads that exceed design codes and standards, such as snow or ice loads.

2 Main causes of losses: Panels and system components

- Overheating connectors are a particular issue, these connect the panel to the DC cabling.
- Fire in components either poorly installed, poor quality or incompatible components.
- Damaged panels either from mechanical damage or hot spots.

3 Solutions: Options

- Always install PV panels over non-combustible roofing materials or install a non-combustible barrier between the PV panels and roofing materials.
- Ensure designers and installers are competent for AC/DC systems and follow not only industry best practice, but also Zurich Resilience Solutions guidance and the RISC Authority.
- Clearly define inspection and maintenance requirements at the design stage to ensure the costs are accounted for in the overall system costs.

Read our Risk Insight: Roof mounted photovoltaic panels and systems

Emerging risks

Electrical vehicle (EV) charging points

1 Type of fire: thermal runaway

Lithium-ion batteries used in EV vehicles (fully electric, hybrids, E-bikes, E-scooters) are subject to mechanical or thermal failure. Electro-chemical abuse from overcharging the cell can also initiate thermal runaway.

Thermal runaway is caused by initially high temperatures that leads to the rapid decomposition of the battery materials.

2 Increased fire loads: plastics

Modern vehicles are constructed of 70% expandable plastics. So modern car parks have tonnes of highly combustible plastics stored together.

Structures such as car parks can be prone to partial collapse.

3 Solutions: options

- Try to install chargers externally 10 metres from buildings, or 7.5m from openings in non-combustible walls. Please refer to our ZRS EV risk topic.
- For internal car park areas, sprinkler protection to be designed to 12.5mm/min design density over 260m2, in accordance with BS EN 12845 and the LPC Rules.
- Try to achieve 120 minutes fire resistance (integrity and insulation) for internal charging areas.

Read our [Risk Insight: Electric vehicle charging]

Emerging risks

Underground car parks

1 Sources of ignition: vehicles and charging points

- EV charging and electric vehicles are high voltage electrical appliances that are subject to mechanical and electrical failure and a potential source of ignition.
- Any conventional vehicle is a source of ignition, with several high profile car park fires causes by electrical faults in combustion engine vehicles.

2 Type of fire: thermal runaway

- Lithium-ion batteries used in EV (fully electric, hybrids, E-bikes, E-scooters) have higher energy density to extend lifetimes.
- These batteries are subject to mechanical or thermal failure. Additionally, electro-chemical abuse from overcharging the cell can initiate thermal runaway.
- Thermal runaway is caused by initially high temperatures (such as a fire) that leads to the rapid decomposition of the battery materials.
- The higher the temperature, the more rapid the battery materials decompose, so the fire increases in ferocity. It's a self-feeding process.

3 Increased fire loads: plastics

- Modern vehicles are constructed of 70% expandable plastics. So modern car parks have tonnes of highly-combustible plastics stored together.
- The higher the fire load, the more rapidly a fire can spread, the higher the temperature may be and the longer it will burn for.

4 Car park design: lack of compartmentation

- Car parks are often wide, large open floor spaces with open connections to other floors via ramps, staircases and elevator shafts.
- Based on design and lack of compartmentation, most traditional car parks are essentially one single fire area that supports horizontal and vertical spread.

5 Car park protection: sprinkler protection

- Many car parks are not sprinkler protected. Therefore, the only way to control a fire is through fire brigade engagement and manual fire fighting.
- If thermal runaway and/or the fire is well developed, fire fighters are unlikely to fight the fire especially in enclosed underground spaces.

6 Building construction: combustibility

- If the building adjacent or above to the car park utilises combustible materials in its construction, a well-developed car park fire could easily spread vertically to the facade, via the walls or stairwells, without sufficient car park compartmentation or sprinkler protection.

Emerging risks

Lithium batteries

We use products containing lithium-ion batteries every day and may often not even be aware of it.

These lightweight, rechargeable battery packs are found in many electrical devices, such as laptops, tablets, mobile phones, e-cigarettes, power tools, drones, remote control cars, e-bikes, and e-scooters. Generally, they are used safely by millions of people every day.

At Zurich, we have seen claims for lithium battery fire claims triple over three years, with most caused by incorrect chargers, defective batteries and items being left on charge for too long.

Are lithium batteries dangerous?

When used properly, no. However, lithium batteries present a significant fire risk when overcharged, short-circuited, damaged, submerged in water or exposed to extreme temperatures. It's also very important to charge them safely. When used incorrectly, the cells can fail.

This failure leads to a chain of events starting with a heat reaction, followed by a thermal runaway, smoke, fire and often an explosion. The resulting blaze can reach a temperature of around 400 degrees celsius in a matter of seconds.

Electrical Safety First are campaigning against the unlawful sale of dangerous electronics and provide useful guidance on ways to stay safe when buying electrical goods.

In recent years, there have been a growing number of product recalls involving lithium-ion batteries. This is due to an increasing number of reported incidents involving overheating, fires and explosions relating to the use of this type of battery.

Advantages

Lithium-ion batteries have advantages over traditional batteries. For example, they:

- Are lighter in weight compared to other, similar types of rechargeable battery.
- Can hold their charge better and can handle an increased level of charge.
- Have a limited self-discharge, in comparison with similar types of battery.
- Have limited charge memory problems, since it is not necessary to completely discharge the battery prior to recharging.

Disadvantages

- Lithium-ion batteries tend to begin to degrade soon after their manufacture.
- The average lifespan of a lithium-ion battery is typically limited to 2 to 3 years from manufacture. The lifetime limitation will occur whether the battery is in use or not.
- Increased heat levels can cause lithium-ion batteries to break down faster than other batteries will. They have an increased sensitivity to high temperatures, which must be considered during use or storage.

  If the battery is not in use, then it is recommended that it is kept in a cool environment, which will help to reduce the aging and reduction in quality of the battery.

  Battery users should be aware of the recommended storage temperatures specified by the battery manufacturers and retain their batteries in the recommended environment.
- Lithium-ion batteries require a battery charge monitor that will manage the charging process. This will ensure that the batteries will be charged as safely, quickly, and fully as possible. However, it needs to be recognised that this monitor also drains power from the batteries during its use, which will cause the batteries to degrade and lose power over time.
- If a battery was to become completely discharged, it would then be ruined and unusable.
- Should the battery erode or be damaged, then there is a likelihood that it could overheat and catch alight, or even explode.


ZURICH

Disposal of lithium batteries: Fuelling the solution

Did you know?

Former London Fire Brigade Officer and Zurich Risk Engineer, Gareth Jones comments:

Click to open Risk Insight – Disposal of lithium batteries: Fuelling the solution

Emerging risks

Lithium batteries - overheating risk

Lithium-ion batteries contain an electrolyte which can be highly volatile and flammable. In the event of the battery overheating, it can cause the lithium-ion battery to experience a 'thermal runaway'.

This occurs when an exothermic reaction goes beyond control and drives the battery temperature higher and higher. Explosions can then occur if the flammable gases produced during the thermal runaway either mix with the remaining air within the battery enclosure, or when fresh air enters the battery enclosure from vents or openings.

There are several reasons why a battery can overheat, and these include the following:

- Damage to the battery.
- Manufacturing defects.
- Overcharging.
- Over-discharging.
- Short circuiting.
- Water ingress.
- Incorrect use of charger.
- Poor quality battery – cell faults.
- Poor battery condition – cell faults.
- Battery age.

The development of a thermal runaway occurs in the following stages

As lithium-ion batteries are made of a series of cells, the thermal runaway will typically start in one cell before expanding in a domino effect through the adjacent cells.

When undertaking a maintenance review, users should consider the following:

- Undertake a test and check procedure to ensure that no external damage has occurred to the battery and/or charging equipment. If damage has been recorded to either the battery or the charger, this should be noted, and the item should stop being used – with the battery or charging equipment being removed and replaced.
- Users should ensure there has been careful housekeeping undertaken throughout the life of the battery, including any time whilst spent in a storage facility.
- All electrical wiring and portable appliance testing should to be undertaken and completed as necessary, to ensure there are no failings or hot spots in the device.
- Lithium-ion batteries should be kept in a dry environment. Any water ingress can lead to the deterioration of the battery and create a chemical reaction that could lead to a potential fire or explosion.
- Using a thermographic camera, which will highlight any hotspots or weaknesses in the battery. This can indicate the condition of the battery and find out if there is an increased risk of fire occurring.
- Users should ensure that lithium-ion batteries are always maintained in a good condition. Any batteries that have any form of damage ought to be removed and isolated to ensure that no likelihood of fire or explosion can arise that could impact the storage environment.
- Lithium-ion batteries should be kept separate from all combustible items, whether in use or not.
- In the event of an issue arising with the charger, it should be shut down. Users should ensure the battery is cooled down in a safe and protected environment, ensuring there is no opportunity for overheating or a thermal runaway to occur.

Battery maintenance

Regular inspections and maintenance of the battery should be carried out. Battery maintenance will incorporate several tests and checks.

Emerging risks

Too tall, too dense storage challenges

For the past 60 years, final extinguishment of storage fires has been based upon two steps:

- **Step 1** - Sprinklers of adequate design control to suppress the fire
- **Step 2** - Firefighters achieve final extinguishment of the fire

Loss experience shows us some storage configurations are too challenging for Step 2. These configurations and their potential for uncontrolled fires need to be recognised.

Dense storage

Dense arrays may involve freestanding (piled) storage, multiple-row rack storage or robotic storage systems.

Freestanding (piled)

A challenge with freestanding goods is the pile area. While European sprinkler standards include pile area limits, other sprinkler standards, such as NFPA 13 (Standard for the Installation of Sprinkler Systems), do not.

Multiple-row rack

As with freestanding storage, multiple-row racks may allow burning goods to be located a significant distance from aisles.

Unlike freestanding storage, multiple-row racks have a metal structure that limits firefighter access and restrict the direction goods can be moved. As such, the needed manual firefighting effort is increased.

Auto Store robotic storage system (or similar)

Auto Store and similar systems present a very dense storage configuration. It creates a tightly packed array of stacked plastic totes. Each tote holds goods and with numerous stacks of tote, an array may hold billions of parts.

Tall storage

While freestanding storage can reach challenging storage heights, the tallest of storage arrays always involve rack structures to provide stability for the goods in storage.

For detailed guidance, please refer to the Risk Topic: Storage fires and final extinguishment

Fire and buildings

Legislation

In the aftermath of the tragic Grenfell Tower fire there have been many changes in the legislative framework.

Current regulatory framework

Fire Safety Order 2005

In England and Wales, the Regulatory Reform (Fire Safety) Order 2005 is the current general legal requirement for fire safety. Sometimes called the Fire Safety Order (FSO) or the RRO, it came into force in October 2006 and provides a framework for regulating fire safety in all non-domestic premises. This includes workplaces and the common areas of multi-occupied residential buildings.

The RRO has recently been amended by the Fire Safety Act 2021. This amending Act clarified that Responsible Persons (RPs) for multi-occupied residential buildings must manage and reduce the risk of fire for the structure and external walls of the building. This **includes** cladding, balconies and windows, and entrance doors to individual flats that open into common parts.

Building Safety Act 2022

The Building Safety Act 2022 brings into law many measures intended to make buildings and residents safer. The Act is divided into six parts with most of the substantive detail and reforms set out in parts two to five.

- **Part 1:** Introduction
- **Part 2:** The Regulator and its Functions
- **Part 3:** Building Act 1984
- **Part 4:** Higher-Risk Buildings
- **Part 5:** Other Provision about Safety, Standards, etc.
- **Part 6:** General.

The Act is designed to take forward a fundamental reform of the building safety system and address the issues identified by Dame Judith Hackitt DBE in her independent review, Building a Safer Future.

Full implementation of the Building Safety Act is due in October 2023, which means each building owner should have their building safety regime in place by this time.

Although not an exhaustive list, key areas of the Act are listed on the next page.

Scottish fire safety

Fire safety duties for the majority of non-domestic premises in Scotland are set out in the Fire (Scotland) Act 2005 and Fire Safety (Scotland) Regulations 2006. This legislation sets out the important responsibilities the Duty Holder (e.g. the employer or premises manager) must fulfil and continue to maintain.

Northern Ireland fire safety

The Fire and Rescue Services (Northern Ireland) Order 2006 and The Fire Safety Regulations (Northern Ireland) 2010 set out the important duties the 'appropriate person' (e.g. the employer/premises manager) must fulfil and continue to maintain.

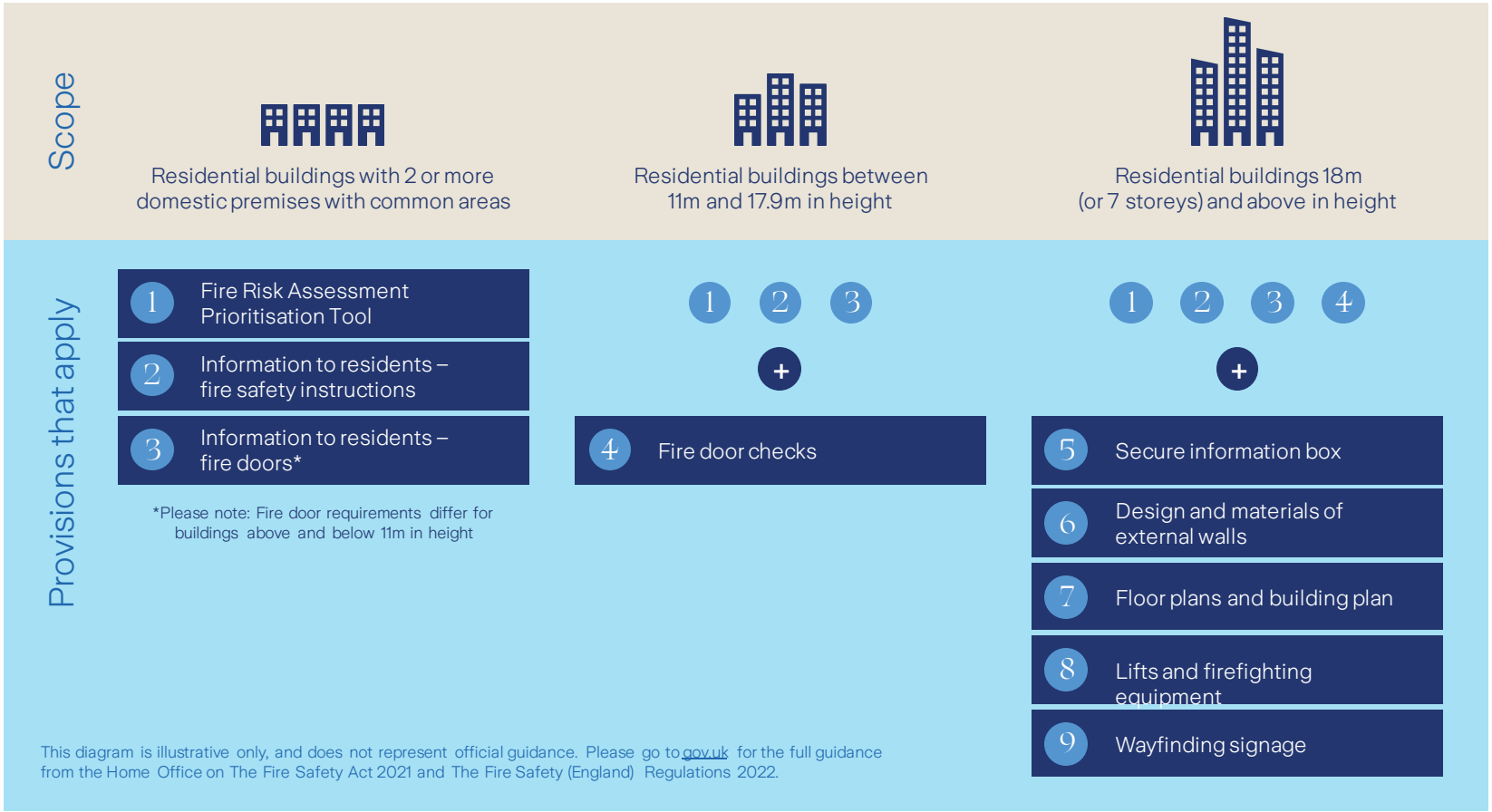
Fire and buildings

Legislation

Although not an exhaustive list, key areas of the Building Safety Act 2022 include:

Scope:

- "Higher-risk building" as a building in England that is at least 18 metres in height or has at least 7 storeys and, for the purpose of the part of the new regime that regulates occupied buildings, contains at least 2 residential units.
- The focus is on higher risk buildings (HRBs) that are at least 18 metres or seven storeys high. However, certain provisions relating to the remediation of relevant defects focus on self-contained buildings in England that contain at least two dwellings and are at least 11 metres, or have at least five storeys.



Golden thread - Dame Judith Hackitt, in her report Building a Safer Future, recommended the introduction of a 'Golden Thread' to support duty holders in designing, constructing and managing their buildings as holistic systems – taking into account building safety at all stages in their lifecycle. The golden thread is both the information that allows you to understand a building and the steps needed to keep the building and people safe, both now and in the future. The Act creates a legal duty on duty holders and Accountable Persons (AP's) to obtain, create, keep and give information or documents in accordance with prescribed standards.

Fire and buildings

Legislation: New roles and responsibilities

Regulator

The Government has named the Health and Safety Executive (HSE) as the new Building Safety Regulator (BSR). The HSE will regulate buildings with seven storeys or that are 18 metres or higher, and either:

- Have at least two residential units.
- Are hospitals or care homes (during design and construction).

There are several other responsibilities that the HSE will take on. These include:

- being a statutory consultee for planning applications
- providing duty holders with clear accountability and statutory responsibilities
- enshrining the golden thread of building information, as well as maintaining a register of occupied higher risk buildings and building inspectors and approvers.

Accountable Person (AP)

Part 4 of the Act identifies that the duty holder for occupied buildings is the Accountable Person (AP) or the Principal Accountable Person (PAP), where there's more than one Accountable Person. The AP is the person who is in possession of the common parts of a building, for example corridors or lobbies, or has the relevant repairing obligation. The purpose of the AP is to create a clear line of responsibility for the safety of a building.

Safety case report

In the Act, those responsible for occupied, high-rise residential buildings will be required to:

- Register their building with the Building Safety Regulator (BSR).
- Perform a building safety risk assessment.
- Introduce measures to manage building safety risks.
- Prepare a safety case report for their building to give to the BSR on request.

Planning Gateway	Description
1 ⇩	**There will be two key elements to this stage of the process:** **Gateway 1** HSE is established as a statutory consultee of local planning authorities for fire safety. Applicants will be asked to provide a fire statement – outlining the specific considerations made regarding fire safety in the development – for HSE to review and raise any concerns with the local planning authority.
2 ⇩	**Gateway 2** will occur prior to construction work beginning. It provides a 'hard stop' where construction cannot begin until the Building Safety Regulator is satisfied the design meets the functional requirements of the building regulations.
3 ✓	**Gateway 3** is where building work on a higher risk building has finished and the Building Safety Regulator assesses whether the work has been carried out in accordance with the building regulations. • Only once Gateway 3 has been passed can the new building be registered with the Building Safety Regulator and occupation of the building allowed to commence. • There is a proposed 12-week period for the HSE to approve the application for a Completion Certificate. It will be an offense for the building to be occupied without this certificate.

Escape of water

Escape of water claims increased to £368 million in Q4 2022, the highest for any quarter recorded by the ABI. A significant reason for such an increase was the 56% rise in total domestic and commercial escape of water claims, likely due to the freezing weather across winter causing pipes to burst. In addition, the cost of repair continues to increase and impact the average claims costs.

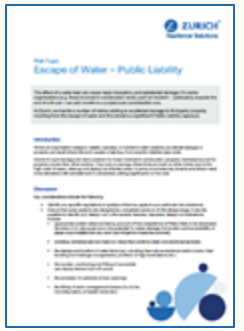
Escape of water continued to be a significant issue for both residential and commercial buildings in 2022, with a total of £987 million worth of claims made across the year – a 15% increase over 2021. This amounts to an average of around £2.7 million worth of escape of water losses every single day, not accounting for those where damage costs amounted to less than excess (please check the policy excess, as damage can fall under this amount), or the additional costs that may have come from loss of rent, business disruption and potentially liability costs for a property owner.

As an issue, escape of water is significant both in terms of regularity of claims and the severity of them – meaning they happen often and cost a lot to repair when they do. The cost of repair is something that has risen in the past few years, largely due to the cost-of-living crisis (which has seen an increase in the cost of labour and parts) but also due to the increased time needed for drying out where modern methods of construction materials have been used.

Zurich's Property Major Loss Team continues to see a significant volume of commercial escape of water claims, some of which run to seven figures. They are not only expensive but cause considerable disruption for our customers. One of the reasons why the impact is so huge is that offices often have large scale water systems, such as large heating systems, air conditioning, coffee machines and water coolers. Furthermore, commercial building architecture can turn a simple leak into an expensive loss. In addition, any loss can be undetected for some time if it occurs after working hours or at the weekend.

Escape of water: the perils of plastic

Over the years, plastic has replaced the likes of copper as the main material for pipework. Many of the losses involving plastic pipes have involved push-fit systems, which means making connections is quicker than the welds and solders that are often needed for metal pipework for example, and pipes are easily removed so they can be repositioned as required. However, despite the apparent ease of installation that may be associated with the name of the system, correct installation and fitting is key – with only a minor error by the plumber risking thousands of pounds worth of damage and huge disruption to the likes of homeowners or businesses.



Click to view our Risk Topic: Escape of Water – Public Liability

What is the problem?

According to leading forensic science firm Hawkins:

- Using the incorrect compound to seal gaps around pipes where they pass through walls appears to be of growing concern throughout the industry.
- Plasticization of pipes occurs when chemicals are absorbed into the polymer, interacting with the molecular chains that make up the polymer. This can cause the polymer to lose its rigidity and soften. When this happens in CPVC the polymer swells, resulting in a 'bubble' type appearance, which can eventually rupture.
- The cooling process during the manufacture of plastic pipes such as CPVC produces a temperature gradient across the thickness of the pipe, generating stresses on the plastic which could break.
- Pipes used for both hot and cold water or sprinklers in fire systems suffer stresses on the inside of the pipework, which is caused by the pressure of the water.

Escape of water

Leaks can vary from major bursts – which can result in flows of up to 60 litres of water per minute – to minor leaks, which may remain undiscovered for several months if the leak is in a concealed area not visible to the building resident, or where the building is unoccupied for long periods.

Research has shown there are many causes of escape of water loss, including:

- cold weather
- the height of the building
- poor workmanship
- faulty pipework and joints
- modern lifestyles
- lack of maintenance and even fraud.

A study conducted by forensic investigators of 1,200 escape of water claims over a 2-year period found that 67% of all incidents emanated from faulty pipe joints – all resulting from poor quality installation standards.

In this section, we're going to cover some common causes of escape of water in the home, how their impacts can differ and share what to look out for with seemingly simple day-to-day tasks.

Common causes of escape of water in property

- Kitchen appliances
- Leaks around baths and shower trays
- Waste soil pipes and joints
- Radiators
- Supply pipes and joints
- Freezing weather
- Workmanship

Top Solutions for Escape of Water Problems

Kitchen and utility room appliances
For medium to high rise locations select appliances with built in leak detection and shut-off devices. Provide an accessible water isolation valve for the kitchen and utility rooms. For new build provide sealed floors in these areas. For leak detection please see the next section.

Bathroom leaks
For medium to high rise new build provide a sealed floor. Provide an accessible water isolation valve for the bathroom. Consider leak detection and/or humidity sensors with a removable access panel. Alarms to be linked to a central building alarm system with engineer call out. Details to be included in resident handbooks For existing buildings retrofitting leak detection devices is an option.

Waste soil pipes
Where issues arise CCTV surveys, visual inspections and a design review of the capacity may be required. For new build ensure the installation is carried out as per the design with checkpoints and quality control of joints and sections passing through floors.

Pipe joints
A complex issue as defectively installed joints in a large building can cause numerous problems whether compression fittings on copper pipe to plastic push-fit. Use of the correct tools and compatible products may be obvious, but installation quality is vital. On-site audits at the time of the installation is a critical control to implement. Technology solutions for pipe joint failures are dealt with in the next section.

Freezing weather
For new build design out the risk by avoiding pipework in unheated spaces. For existing buildings has extra insulation been added in to loft spaces with pipework remaining in the loft space? If so, this can increase the risk of a burst pipe during a cold snap. Install a water flow monitoring device with an automatic shut-off valve.

Escape of water

What do you need to do?

- Risk assessment
- Occupant education
- Audit program
- Occupant controls
- Contractor procurement and control
- Leak detection and suppression devices

Implement a robust maintenance program for common areas, to include:

- Periodic inspection and testing of plumbing infrastructure in accordance with manufacturer and or industry guidelines.
- Condition monitoring of key plumbing equipment/infrastructure and protections.
- Component replacement program.
- Documented record of results, trending of readings and the specific maintenance procedure carried out.
- Work be undertaken by a suitably competent and qualified plumbing contractor, adhering to rigorous quality standards.
- Use of a formal Escape of Water Permit to Work procedure for the control and supervision of contractors working on plumbing infrastructure.
- Auditing of workmanship to ensure its quality meets the standards expected.

Top six things to look out for when choosing a contractor

- Does the supplier have adequate public liability insurance and are the cover limits sufficient? Record contractor insurance details to enable recovery if damage occurs.
- Does the company have a good reputation and a proven service record?
- Are the operatives certified and do they have the right skills?
- What guarantees and warranties are in place for both installation and products?
- What are the terms for post-construction guarantees?
- Is the plumbing to be subcontracted as part of the overall project? If so, then consider all of the above points in respect of the third party.

For large scale projects, also ask the following...

- What are the contract implications of the Joint Contracts Tribunal?
- Who has the insuring responsibility? Is there a waiver of subrogation? This could prevent an insurer from being able to recover costs in light of a claim against the supplier.

Managing contractors

- Think carefully about appointing your own Clerk of Works to oversee larger and more complex projects and ensure the quality of the entire execution and delivery.
- Create a Water Management plan: define responsibilities, procedures and specific actions to manage and mitigate the risk.
- Check an Escape of Water Permit is in place to control labour on live plumbing systems, filling, testing, commissioning, snagging and maintenance.

There is a specific joint code of practice for prevention and management of escape of water on construction sites, click here to read more.

Escape of water

What do you need to do?

Leak detection and suppression devices

Even where a suitable risk assessment has been undertaken and precautions have been put in place, escape of water incidents will still happen. However, alongside improved water risk management planning, technological advances mean that leak detection and suppression devices are now available that can be fitted into new or existing buildings to significantly reduce the impact of a leak or burst pipe, should it occur.

Leak detection and suppression devices comprise of various components used together in several configurations.

Device components include:

Leak cable or point sensor – Fitted in high-risk areas to detect burst pipes or drips.

Ultrasonic sensor – Fitted onto soil stack or drainage pipework to sense blockages.

Multi-point sensor – Grouping heat, humidity and water sensors in a single unit.

Water flow monitor – Fitted on or in the incoming mains supply pipe to measure flow rate, flow volume or water temperature.

Water shut-off valve – Fitted in the incoming mains pipe to manually or automatically shut off the water supply following a leak or burst pipe.

Control panel – Interface between the components.

Signalling & communication technology – Used to send an alarm and/or system data to computers and mobile devices.

Power supply – Leak devices that are powered via a combination of mains and battery supply.

Smart platform – Web-based applications that allow remote control of valves and water consumption monitoring.

Humidity – Devices that also measure humidity, which can be an early indicator of hidden damage.

Such devices are cheaper and simpler to install at the new build stage but are also effective when installed in established buildings at high risk of water damage, or those suffering from significant and persistent escape of water incidents.

Over recent years, Zurich has engaged with several device suppliers and manufactures, to learn more about the potential benefits of fitting such device at new build and retrofit stages. Several suppliers we've spoken to stated that for some properties, leak detection and suppression devices can potentially reduce the severity of claims by up to 80%.

Speak to Zurich before engaging a leak device company, we can discuss the pros and cons of your situation and help you make the right decision on a solution to your leaks.

Escape of water

What do you need to do?

- Always provide accessible water isolation valves - for new build and retrofit for existing buildings.
- Locate high risk areas e.g. bathrooms, in rooms designed to withstand water damage and prevent undetected leaks in voids and risers. Alternatively provide detection and automatic isolation capability.
- Always consider the consequences of an escape of water risk in the design - how quickly will it be detected, what are the consequences in terms of the damage potential and how quickly can it be isolated and repaired?
- Plantrooms with water services should be sealed, leak detection provided, floor openings with upstands and adequate drainage.
- Water tanks to have their own bunding, leak detection, high and low level alarms, main overflow to discharge externally, the indicator overflow to a floor drain can be fitted with a leak sensor.
- Water pipes to be routed down separate risers to electrical equipment Ensure those installing pipe joints are suitably qualified, that each joint is visually marked by the installing contractor and a third-party independent plumber is employed to have oversight of each type of plumbing joint being installed with a recorded audit trail of quality checks.
- Install an appropriate form of leak detection and automatic isolation based on the specific escape of water risks present for that particular property.
- There are numerous options on the market, and it is essential that the correct product is matched to the particular escape of water issues being addressed.
- Consideration of escape of water risks during construction is also needed. Please refer to the CIREG Managing Escape of Water Risk on Construction Sites for further details.
- Carefully consider the risks from freezing weather especially if you have water pipes in unheated areas or have retrofitted insulation that removes heat from loft areas for example.

Security

Building security for either a new building, a redeveloped one and the site in general requires consideration at the early stages to achieve a robust and effective solution. We've seen in the past that lack of consideration given to security within the design process, results in expensive, compromised and often less-than-desirable solutions.

The orientation of a building on a site, linked with the external profile of the structure, can present significant benefits in terms of security. By simply avoiding the provision of recessed doorways, concealed areas and low roofs, the security to the building is already likely to be improved.

Effective boundary treatment (with the use of security fencing to the site, or perhaps around the buildings only) will also assist in providing a secure environment both inside and outside hours of occupation.

Whilst it may be desirable from an occupancy perspective to allow easy and free access, the security risk must be balanced. For example, incorporating appropriate access control and remote authorisation of access, or limiting relatively open access to minimal areas may present suitable control measures.

Internal separation should be used so that it is possible to secure areas of the building in a robust manner, without compromise to the use of the premises.

Security

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Fencing and boundary treatments

Security fencing is arguably the most effective of all the measures commonly available to provide protection to a building against theft, malicious damage and deliberately set fire.

In some instances, the site or building layout and usage may make fencing or enclosing of buildings/sites an unviable option.

Consideration should however be given to appropriate fencing provision for the more sensitive areas, such as those parts of a building containing high value or highly desirable equipment, as well as secluded locations, i.e. recessed areas, courtyard areas etc.

Such provision can be as simple as providing secure gating to a recessed area and fencing off potential access routes to a low roof or secluded area at the rear of a building.

Fencing is available in a variety of different materials, heights and quality. Each premises and risk is likely to dictate the appropriate type of fencing or gating.

For effective security, fencing should be of security weld mesh, palisade or railings. The fencing should ideally be to a height of 2.4 metres and installed according to British Standard 1722.

The effectiveness of any security fence can be breached if it can be readily scaled by intruders: whether it's securing a building/site perimeter, or a very localised situation such as a secluded courtyard area.

Landscaping features such as low-level walls, bollards on pathways and adjacent planting can all have a negative impact on the level of resistance provided by security fencing. Such features should be sited so they do not provide climbing aids to gain access over fencing.

Gates within perimeter fences must be to the same quality and height as the fence. Particular attention should be given to the design of hinges and locking mechanisms, to avoid providing footholds to assist intruders in scaling the gates.

The design of the gates should be such that they cannot be lifted from its hinges and gaps beneath gates should be minimised to prevent intruders gaining access via this route. In certain cases, it may be necessary to incorporate additional security bars to close gaps beneath gates – particularly on steeply sloping sites.

In certain cases, the threat of vehicle access may be considered to be significant, and the use of robust security bollards should be considered, particularly in vulnerable areas.

Examples include sites where the building facade provides an element of the secure boundary, where unauthorised vehicular access or ram-raiding could become future risks.

Building recesses and courtyards

Whether these are simply recessed doors, covered entrance areas or service yards, there is a danger that they could provide a secluded and therefore vulnerable point where some form of damage can occur.

It is preferable that predominantly straight building lines are constructed wherever possible, enabling increased vision and natural surveillance. A building without recessed areas should be the objective, particularly if an external CCTV system is to be installed for day-to-day management of the building and in terms of the overall security strategy.

Security

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Roof access

Easy roof access allows intruders potential for easy access into a building, often out of view of neighbouring properties, or the public on the streets and pathways below. It is therefore important to reduce the risk of unauthorised access to roofs as much as possible.

Easy methods of preventing or limiting the potential for roof access can be applied within the design. For example, when considering rainwater down-pipes these should ideally be plastic, be square or rectangular in profile and be fitted immediately adjacent to the wall.

In more vulnerable areas consideration should be given to enclosing down pipes to prevent them being climbed. Without correct design of such elements, other, less desirable anti-climb measures may be needed (such as anti-scaling devices, anti-climb paint, etc.)

Care should also be taken to ensure designs do not incorporate features that will assist easy roof access, e.g. adjoining lower-level walls, gates, fences or other climbing aids. Where low eaves are unavoidable, consider carefully external door hardware, ventilation openings and window sill details that may allow easy access on to the roof.

Where low roof access cannot be designed out appropriately, it may be necessary to limit the extent or type of roof lights or other penetrations that offer potential access points.

Doors and windows

Where possible, doors and windows should comply with LPS1175 Specification for testing and classifying the burglary resistance of building components, strong points and security enclosures.

Windows are by far the favourite route of entry for intruders. Ground floor opening windows large enough to permit entry should be fitted with opening limiters, as well as key operated locks.

All windows facing publicly accessible areas should be fitted with laminated glass if less than 2.4m from ground level. It is however generally recommended that all ground floor windows and other easily accessible windows are fitted with laminated glass.

The use of robust restrictor devices is also recommended to opening windows, limiting the openings to a maximum of 100mm. It maybe necessary to install attack resistant glazing in key locations. All laminated glazing should be certified to BS EN 356. plate.

Security

Internally beaded aluminium windows are preferable to uPVC frames from a security perspective, but in both cases it is important to ensure frames are adequately secured to the building fabric and the opening areas are secured by multi-point locking.

In areas where levels of malicious damage and glass breakage may be high, external motorised steel security shutters may be considered necessary. Security shutters should comply with LPS1175 Specification for testing and classifying the burglary resistance of building components, strong points and security enclosures.

For doors, more use is being made of double-glazing, as well as laminated glass as a safety feature. In general, exit doors must be secured by good quality locks, i.e. those which conform to BS 3621, incorporating the appropriate metal box striking plate.

The locking mechanisms are to be a minimum of five levers. Alternatively, locks should be at least 6-pin cylinder mechanisms, with anti-drill inserts and comply with Grades 4 or 5 of BS EN 1303 (Building Hardware – Cylinder Locks - Requirements and Test Methods)

It is important that all external doors and their frames are installed to a good standard. The frames should be securely fixed to the surrounding construction.

Where there is a letter box, a fireproof container or enclosure must be fitted behind it to reduce the risk of arson. Alternatively, an external letterbox could be used. Conventional letter plates within doors must be avoided, owing to the likelihood of lock manipulation, fishing of mail or other items and the potential for fire setting.

In general, reliance for fire exit doors is made on the panic bar. The ease of activating the panic bars from the outside should be considered, particularly in areas where miscreants can work unobserved. All fire exit doors should have alarm contacts, or a movement detector within the vicinity of the door, to detect intrusion at the earliest possible stage.

Where improved security is needed, the door should be fitted with a high security fire exit multi-point locking device complying with BS EN 179 or BS EN 1125. The cylinder mechanism on the lock should have at least 5 pins and anti-drill inserts. It should be ensured that bolts fit properly into their boltholes and that there is no accumulation of dirt in the boltholes.

In some cases, electromagnetic locks are provided on doors. These are also a security feature, but they must not be regarded as the sole security of the door as they fail safe in the open position if the electric supply fails.

Security

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Intruder alarms

The security of buildings is important and where possible they should have intruder alarm protection. Detection should not just be aimed at those breaking in to steal, but at any intruder wishing to cause damage to the building fabric, as well as contents. The following points are relevant in respect of new installations:

The degree of occupancy of the building is pivotal to ensuring a robust alarm solution is achieved. Buildings that have potential 24-hour occupation may be unable to be protected or may have a system that is confined to monitoring entrances or exits (such as fire exit doors) not normally in use. Where part of a building has extended hours of occupation, alarm protection could be provided to those parts of a building that are not in use. Specific rooms that contain high-value equipment – such as IT server rooms – which are not normally occupied can be protected on a full-time basis.

Where a building is secured, intruder alarm detectors should be provided to cover:

- All rooms accessible from the outside, such as ground-floor rooms with external elevations, as well as upper floors accessible from external roofs.
- All ground floor circulation areas.
- External doors by contacts.

Upper floor circulation areas, high risk rooms and staircases should also be protected.

Any installer or service provider is to be certificated by a UKAS (United Kingdom Accreditation Service) accreditation certification body.

An alarm activation will need to be linked to a 24-hour, security staffed monitoring centre. A premises may operate its own security control centre, staffed by trained security staff, who are able to respond to any alarm activation speedily and confirm the reliability of the alarm activation.

Where there is no speedy confirmation of an alarm by an on-site security team, then an alarm will need to be relayed to a commercially-run Alarm Receiving Centre via some form of monitored path.

A Police response by a confirmed alarm system will normally be required. To be granted a Level 1 Police response an alarm system will be required to have audio, visual or sequential confirmation technology. Here, analysts at the Alarm Receiving Centre judge whether an alarm activation is genuine by listening in to microphones, viewing images forming part of the intruder alarm system, or by registering that least two detection devices have operated within a given time period.

The system design will need to comply to BS EN 50131-1. Under this standard systems, equipment and signalling are graded into categories divided between Low, Medium, High and Very High and Special Risk trades.

Individual components of alarm systems, such as detectors, control panels and methods of alarm transmission are also graded according to their performance, resistance to attack and other factors.

The Grade of the system will be governed by the lowest Grade component. Therefore, a system with a Grade 2 alarm transmission system, a Grade 3 control panel and detection will still be treated as Grade 2 overall.

As high-grade components will be more sophisticated, this could have a cost implication for the whole system and therefore care must be taken not to over-specify.

Grade 1: Low-risk system where intruders are expected to have little knowledge of intruder alarm systems and be restricted to a limited range of easily available tools.

Grade 2: Low to medium-risk system where intruders are expected to have a limited knowledge of intruder alarm systems and the use of a general range of tools and portable instruments.

Grade 3: Medium to high-risk system where intruders are expected to be conversant with intruder alarm systems and have a comprehensive range of tools and equipment.

Grade 4: High-risk system where security takes precedence over all other factors. Intruders are expected to have the ability or recourse to plan an intrusion in detail and have the full range of equipment, including means of substitution of vital components in the intruder alarm system.

Security

Closed circuit television (CCTV)

CCTV systems have had a mixed success rate for a variety of reasons and should not be considered as a universal solution to site and building security problems. These relate to the type of problems being experienced, the nature of the site or campus layout and the nature and quality of the installation.

Prior to the installation of any system, careful consideration should be given to exactly what is expected of the installation. This could include deterrence, identification, safety of public and staff, recording and monitoring (both onsite and offsite).

It is essential that a comprehensive stakeholder discussion takes place to determine the system requirements and the degree of reliance placed on the provision of CCTV systems within the security strategy and, in certain cases, in relation to the fire strategy of the buildings.

The criteria for use should govern the type of installation and it is suggested that specialist and, if possible, non-commercial informed advice is sought. Whatever the criteria, it is essential – if the full deterrent value is to be gained – for lighting to be adequate in the area of the cameras.

Any systems that operate purely on a record-only basis (a passive system) generally offer limited value in terms of an improved security strategy. It is recommended that where the security strategy places any reliance on the provision of a CCTV system, a fully monitored installation (an active system) is installed. The provision of these active CCTV systems offers significant benefits to the end user in both daytime and out-of-hours security.

It is appreciated that in many town and city centre locations there may be limited opportunity to install these protection systems around a building, owing to the buildings' interface with public rights of way, neighbouring properties and other factors.

CCTV systems should be installed to BS EN 62676 - Video surveillance systems for use in security applications. Any system incorporating the facility for the monitoring centre to interact with the protected site must be installed in accordance with BS8418 – The code of practice for the installation and remote monitoring of detector activated CCTV systems.

Business critical, attractive and valuable contents

Buildings containing high-value or attractive contents are by their nature likely to be the subject of ongoing security challenges.

Precautions should be considered at the building design stage relate to the security envelope of the building, or the area containing such contents. These will need discussion and risk assessment with stakeholders as to the degree of access allowable to staff and the general public.

Suitable access control by means of electronic or key systems can then be determined. Before considering the physical protection directly related to the vulnerable rooms, as a minimum the general public should not be able to directly reach any of the corridors or other circulation areas outside such rooms without encountering some form of access control.

Once the risk assessment has determined the attractiveness of the contents to thieves within a vulnerable room, appropriate protection measures can be determined. These should always include a measure of physical security to the room in question that would impede the progress of an intruder, as well as any electronic measures proposed, e.g. intruder alarms, CCTV, etc.

Security

Physical security

In general terms, it is advisable that any room enclosure utilises brickwork, dense concrete block or concrete to provide resistance against a forced attack. Other forms of enclosure, such as plasterboard, may be acceptable providing there is additional security by an internal sheet metal layer.

Some physical security measures – such as protection to doors and windows – may be necessary for internal doors, as well as any external doors. This is because forcing of internal doors to gain entry by thieves, who might have tailgated legitimate users to gain entry into otherwise access controlled internal corridors, is not uncommon.

Using internal doors (conforming to LPS 1175 Specification for testing and classifying the burglary resistance of building components), strong points and security enclosures will help to provide a satisfactory level of resistance.

However, with any door care must be taken that any glazing close to the door cannot be easily broken from outside and any internal door release mechanism, such as a thumb turn or push button release, cannot be easily reached from outside.

Glazing to any of the internal room security envelope, including that in doors, is a potential weak spot and is to be avoided where possible. Depending upon the risk assessment, the glazing is to be protected by LPS 1175 security grilles or shutters, but as a minimum should comprise of at least 7.5mm laminated glass – which is fire resistant if required.

Additional security to the roof structure may in some circumstances be required if an accessible lightweight roof design, including any roof lights, directly above a vulnerable area is proposed.

Lighting

Security lighting can often play a part in deterring criminal damage, as well as ensuring the safety of site users. However, each building location needs to be assessed on its own merits.

For example, good lighting is particularly effective in areas of the site which are easily visible from nearby properties, footpaths or roadways. To install lighting into areas of a site which are not overlooked can sometimes have the detrimental effect of attracting wrongdoers to gather.

Security lighting is only effective if it is working properly and switched on at appropriate times. An automatic form of control is usually the best option. Automatic controls include:

- Time switches, that switch lights on/off at predetermined times.
- Time switches, in conjunction with photoelectric cells, to ensure optimum effectiveness.
- Passive infrared movement detectors that switch on the light for a timed period whenever anyone enters the range of the detector.
- Connections to existing intruder alarm systems.

If a lighting system is to be used in conjunction with CCTV, additional factors have to be considered and it is recommended that a qualified engineer be consulted.

Careful consideration should be given to even distribution of light and the prevention of excessive shadowing, together with the avoidance of glare or unwanted light pollution. The choice of light fittings, siting/location, height and other similar factors will all impact on the successful lighting of the building and site.

Landscaping

Good surveillance potential can be enhanced or reduced by landscaping features such as ground contouring or the planting of vegetation.

Careful attention therefore needs to be given to ensure these factors do not impact on the security of the site. Advice regarding the long-term size, height and scale of any planting should be sought at design stage to obviate difficulties when planting reaches maturity. Such planting may adversely affect any natural surveillance offered and could impact on the effectiveness of any external CCTV provision.

Defensive planting may be desirable in key areas, for example where boundary or site security may be compromised because of neighbouring land levels, adjoining fence and wall lines etc. Such provision requires appropriate consideration, in order to balance between security risk and health and safety aspects.

It may be possible to incorporate additional hard landscaping features to the site perimeter, particularly the frontage – to prevent unauthorised vehicle access, as an example. Land levels and natural changes in level can often be incorporated to assist with security.

Weather events

Flood

Flood events in recent years have proved devastating to thousands of homeowners, tenants and housing providers. Robust and well considered risk management measures can help minimise the impact of flood losses.

Causes of flooding

Floods can occur following:

- Prolonged rainfall.
- Sudden heavy rainfall.
- Rapidly melting snow and ice.
- Storm surges (coastal locations only).

Typical sources from which floodwaters might result include:

- Coastal, including estuaries or tidal rivers.
- Rivers or other watercourses.
- Blocked, poorly maintained or overloaded drains, sewers and drainage ditches.
- Surface water run off from heavy localised rainfall.
- Rising groundwater.

Flood risk assessment

The National Planning Policy Framework sets strict tests to protect people and property from flooding. All local planning authorities are expected to follow these.

Sites should only be built in zones with a low flood risk, but the guidance does allow development in zones with a higher flood risk – provided certain criteria are met, as defined in the Exception Test.

There is a requirement to complete a site-specific flood risk assessment for new developments in: Flood Zones 2 and 3; in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); or for proposals of 1 hectare or greater in Flood Zone 1.

The objectives of a site-specific flood risk assessment are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether it will increase flood risk elsewhere.
- Whether the measures proposed to deal with these effects and risks are appropriate.
- The evidence for the local planning authority to apply (if necessary) the Sequential Test.
- Whether the development will be safe and pass the Exception Test, if applicable.

The completion of a Flood Risk Assessment or Flood Consequence Assessment for Wales by a specialist consultant will help assess the above criteria.

The Environment Agency flood maps classify Flood Zones as follows:

- Zone 1, low probability: land having a less than 1 in 1,000 annual probability of river or sea flooding.
- Zone 2, medium probability: land having between a 1 in 100 and a 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and a 1 in 1,000 annual probability of sea flooding.
- Zone 3a, high flood plain: land having a 1 in 100 or greater annual probability of river flooding; or land having a 1 in 200 or greater annual probability of sea flooding.
- Zone 3b: functional flood plain.

The Scottish Environment Protection Agency (SEPA) covers Scotland and has similar flood maps to the Environment Agency.

Reference also needs to be made to the Strategic Flood Risk Assessment (SFRA). The SFRA is a publicly available document that assesses the risk to an area from flooding – both now and in the future – including the impacts of climate change.

For assistance with Flood Risk Assessments, please contact: zrs.enquiries@uk.zurich.com.

"Flood prevention measures must be considered at an early stage within the design so they can be incorporated within the budgetary planning."

Click to view our Flood Emergency Response Plan Guidance

Weather events

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Flood defences

For new buildings, the most important aspect when considering flood risk is flood avoidance, i.e. constructing the building and its surrounds in such a way as to avoid it being flooded.

For existing sites, a combination of flood resistance and flood resilience measures may be more appropriate. Flood resistance, or dry proofing, stops water entering a building. Flood resilience, or wet proofing, accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly.

More detailed guidance regarding flood protection measures can be found in the government guide Improving the Flood Performance of New Buildings – Flood Resilient Construction.

Flood defence measures, when specified, should be designed into the building as a permanent feature. The use of removable barriers that require action by occupants to install, store and maintain them is not advised for new buildings.

Temporary flood protection products may be required to protect against flooding for existing buildings. Such products need to have BSI Kitemark approval as tested to the PAS 1188 series.

Temporary flood barriers may be of limited use if the flood threat comes from inundation from the sea or if the premises are in a hollow where water can be expected to flood the building to a depth of one metre or more.

Possible solutions to problems identified by a flood risk assessment include:

- Use of flood resistant building materials for external walls
- Ground-floor levels raised above the anticipated flood level
- Installation of non-return valves on sewers and private drainage
- Design of floor construction and foundations to prevent water ingress into the building
- Basement/sub-floor void protection
- Use of flood resilient floor coverings and internal partitions in vulnerable areas
- Raise electrical services above the anticipated flood level
- Location of plant equipment, boilers, heaters, etc. above the anticipated flood line

Landscaping schemes

Landscaping schemes may present the opportunity to improve the flood resistance of dwellings, particularly in respect of surface water flooding following torrential rain where large expanses of hard surfacing exist.

Checks on the adequacy of the existing drainage system should be carried out and, where necessary, additional drainage channels, attenuation facilities or adjusted ground levels may be appropriate.

Replacement boundary wall provision may present the opportunity to introduce surface water defences, and soft landscaping could include the provision of swales (shallow channels to store or direct water run-off) or other Sustainable Drainage Systems (SuDS) in areas where significant flooding may present a threat.

Previous flood history

From a Risk Analysis perspective it may not always be reasonable to suggest that because a particular area or property has never flooded in the past, there is no increased flood risk. The following could result in an increased flood risk at the premises:

- Possible future increase in the frequency and intensity of rainfall (climate change)
- Increased vulnerability to flooding due to flood defence improvements further upstream
- Changes in the characteristics and use of agricultural land resulting in increased surface water run-off. There is an increasing requirement for very large fields, unbroken by hedges, gullies and drainage channels. Also, topsoil can become compacted as a result of intensive farming and therefore less able to absorb sudden and heavy rainfall.
- Increased building development (including very large roof areas) and paving (including roads, car parks and walkways) in recent years. This can cause rainwater to 'run off' quickly, creating large accumulations of flowing water that would have otherwise soaked into the ground.
- Increased development can increase the demands on surface water drainage systems, increasing the potential for drains to surcharge.
- Condition of drainage systems and maintenance/upgrading regimes by water companies, statutory authorities or building owners or occupiers.
- Modern Methods of Construction and the use of materials being relatively new to the construction industry. Many modern buildings are less resilient to water damage than buildings constructed of more traditional materials. For example, requirements to improve the energy efficiency of new buildings, means that there is increased use of varying insulation materials, many of which may not be sufficiently resilient to water damage.

See our guidance on Designing flood resilience into new buildings

Weather events

Windstorm

As with the changing risk posed by flooding, as a result of climatic change we are continuing to see changes in storm risks faced by buildings. In recent years, buildings in many parts of the UK have been the subject of aggressive storm damage.

The result has again been costly claims and substantial disruption caused to building users and largely the wider communities too.

The materials used within the construction of all buildings must be appropriate to the risk. It is therefore essential the consideration is given to potential changes in the storm patterns throughout the UK. This key issue must be addressed at design stage; there will be no second chance within the life of a building to address this, other than after a storm incident or loss.

The exposure of the site in general should be considered initially and an assessment made as to the current perceived exposure. Issues such as wind speeds and likely behaviours need to be accounted for when selecting the orientation of the building, elevational details, external profile, materials and methods of construction. The situation of the building within a site can also have a significant impact on the potential exposure to storm. Within a built-up area for example, wind is likely to be diffused and filtered by nearby buildings, though conversely the geometry of the nearby buildings may channel wind towards the proposed building.

As with most property related risks, the more robust construction, generally the better resilience to storm-related damage. Heavy masonry type structures are generally perceived to offer much greater resistance than say lightweight panel construction.

Architectural details such as overhanging eaves, mono-pitch or irregular shaped roofs and lightweight construction, for example, may pose increased risks. The appropriate selection of materials, fixing details and on-site quality control can significantly improve such risks.

The correct selection of roofing and cladding systems can again reduce the storm risk presented with a completed building. A relatively recent storm related loss saw the peeling of a lightweight Externally Insulated Finish render system from a multi-storey building. The extent of the loss was significant in terms of property protection and in terms of potential danger to the public. Where such localised losses do occur, they automatically pose the question as to the adequacy of the remaining cladding system and its vulnerability to future losses.

Where lightweight Externally Insulated Finish cladding systems are utilised, their vulnerability to mechanical and malicious damage can also impact on the storm aspect. Where areas of weakness are present, for example, where malicious damage has resulted in the 'external skin' being broken, the entire system becomes less resilient to the effects of both wind and rain. This can in turn lead to the rapid degradation of the construction materials.

Key aspects to consider include:

- Is the building in an exposed location or position within the site?
- Height above sea level, contour of site and adjoining land.
- Location of and effect caused by neighbouring buildings.
- History of wind/storms in the area/exposure of site.
- Orientation of building/s within the site.
- Height of building/s.
- External profile, design features – overhanging eaves, recesses, canopies etc.
- Nature of construction – heavy traditional, lightweight modular, cladding systems etc.


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RiskTopics

Windstorm Emergency Response Plan

See our Windstorm Emergency Response Plan Guidance

Weather events

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Wildfires

Wildfires are becoming increasingly common in the UK and can cause harm and disruption to people, transport networks, rural areas and urban centres.

Organisational resilience requires anticipation, adaptation, preparation and responding to significant risks. Resilience to wildfires starts with understanding the nature of the hazard, your organisation's exposure and the effectiveness of controls you already have in place. Wildfire is one of many natural hazard and climate risks you need to prepare for.

The first line of defence against a wildfire:

There is a common misconception that a wildfire is like a tsunami that rolls through the forest and crashes through communities with unstoppable force, igniting everything in its path.

But this is not how wildfires spread.

Often the devastation from wildfires is not directly caused by the wildfire itself, but instead by wind-driven sparks and embers blown ahead of the wildfire. These ignite flammable materials located around properties, which then ignite the structure directly, or something else (like a wood shed or deck) that, in turn, sets fire to the property, which spreads to others nearby.

One of the key factors for properties destroyed in wildfires is the vegetation surrounding the properties.

Businesses can significantly reduce the exposure by following the do's and don'ts below:

Within 10 metres of your home:

Do

- Have plants with moist supple leaves and deciduous trees.
- Use non-combustible materials like stone, rock, brick and concrete pavers.
- Mow the lawn regularly and remove all debris.
- Remove all dry twigs, branches and leaves, including under the deck or on balconies and patios.
- Use non-combustible materials for fencing.

Don't

- Have evergreen trees and shrubs.
- Use wood chips and bark mulch.
- Locate burn barrels and fire pits near any structures.
- Allow combustible debris (e.g. rubbish, trade waste, vegetation waste) to accumulate.
- Stack firewood near your home or other structures.

Within 10 to 30 metres from your property:

Ensure all trees are spaced at least three metres apart. Deciduous trees are harder to ignite in a wildfire, but evergreen trees can remain if they are regularly trimmed and pruned. Remove all branches within two metres of the ground and regularly remove debris.

The area from 30 to 100 metres:

Consider taking wildfire measures for this area as it will provide greater protection. This includes increasing the spacing between trees, trimming lower branches and removing debris. These actions will reduce the intensity and speed of a wildfire approaching your building.

Access our infographic:
How to prepare for wildfires

Subsidence

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The Association of British Insurers (ABI) data showing the number of domestic subsidence claims notified across the industry in 2022 totalled 23,000.

Coincidentally, this is similar in number as recorded in 2018. 2021 saw 15,000 claims recorded due to the summer in the South East of England being much wetter and less sunny than average, so compared with 2021, 2022 saw a considerable uplift across the industry.

Interestingly, in a typical year, 60% of valid subsidence claims will be due to root induced clay shrinkage. 18% will be due to leaking drains/mains water supply pipe. 18% will be due to poor ground, infill and consolidation issues whilst the remaining 4% will be due to other causes such as heave, landslip, sinkholes or mining issues.

Prevention

- Drains – ensure drains and water mains are water tight
- Adopt common sense approach
- Tree maintenance for existing vegetation
- Appropriate landscape proposals for new developments

What is subsidence?

Subsidence is the downward movement of the ground beneath the building other than by settlement. Settlement being downward movement because of the soil being compressed by the weight of the buildings within ten years of construction.

Subsidence can occur when the clay soil contracts when moisture within it is lost. This is likely to be because of a lengthy period of dry weather combined with high temperatures. The issue can be exacerbated where there are nearby trees and other vegetation which will also take up substantial amounts of water from the ground during this period.

Subsidence can also occur because of other factors such as a leaking drain which can cause softening of clay soils or the washing away of a sandy soil. Earlier mining activities, decomposition of peat or a change to a groundwater course may also lead to subsidence.

Regardless of the cause, as the foundations of the property move downwards, this adds strain to the structure of the property and cracks appear, usually diagonal in nature and close to windows and doors or near to extensions. Other indicators can be windows and doors starting to 'stick' or rucking of wallpaper. Subsidence cracks are usually mirrored internally and externally and are normally found in concentrated areas. Cracks are widest towards the roof of the property and narrow towards ground level.

What to look for

- Vertical and diagonal cracking concentrated in specific areas and tapering in width between the top and bottom of the property.
- Cracks extending through the DPC down into the foundations.
- External cracking reflected internally.
- Rucking of wallpaper.
- Differential settlement – extensions, bay windows.
- Repointing of mortar joints.
- Cleanliness of a crack – historic damage.
- Distortion of openings – doors and windows sticking.
- Rotation of buildings towards trees on shrinkable clay soils.
- Seasonal opening and closing of cracks.

Read our guide: An in-depth look at subsidence

Climate change

Physical climate risks are the consequences of climate change. These include changes to weather patterns and to the frequency and/or severity of extreme weather events, but also other environmental manifestations of climate change such as sea-level rise.

The terminology for physical climate risks includes acute risks, which are extreme events such as tropical cyclones and severe flooding events, and chronic climate risks, which are gradual changes like rising sea levels that damage coastal property or sustained changes to temperature and precipitation that disrupt climate-sensitive activities.

These risks could have an impact through physical damage to sites, equipment or stock, disruptions to operations including to external supply networks and employee safety, among other impacts.

Physical risk

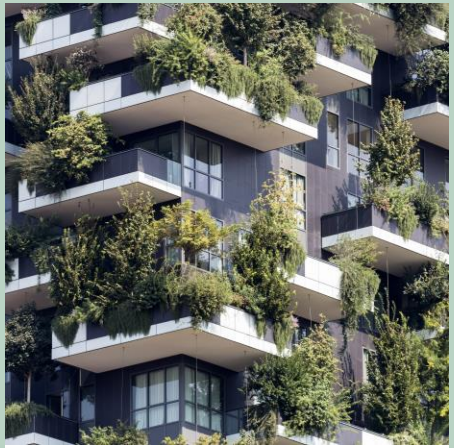
In 2022, there was USD 275 billion in global economic losses from natural disasters, of which 45% were insured*

*Swiss Re Institute, 2023

Regulation

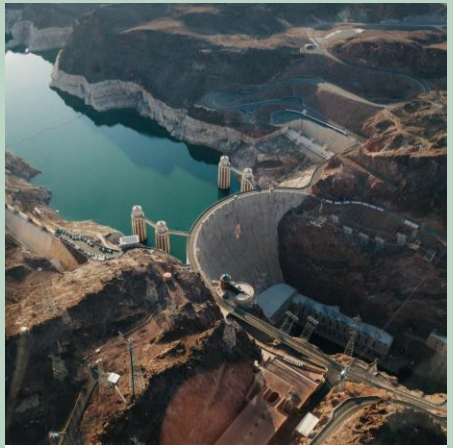
In the EU alone, the number of companies required to comply with Corporate Sustainability Reporting Directive (CSRD) will more than quadruple by 2025*

*International Tax Review, 2022



Stakeholder expectations

Customers, investors and employees expect organisations to demonstrate their Environmental, Social and Governance (ESG) commitments, which can have a significant influence on company reputation and valuation.



Insurability

By the end of 2022, traditional insurance capacity had reduced by 20-25% vs 2021*. It's crucial that organisations can demonstrate proactive management of physical and operational climate risk.

*Swiss Re Institute, 2023

Climate change

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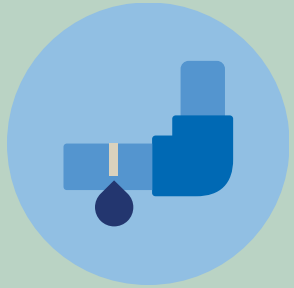
What does this mean for properties?

Extreme precipitation and sea level rise can increase the flood risk (pluvial, fluvial and coastal flooding) and lead to damage and increased costs for repairs, change in land values

Extreme heat events can lead to increased energy needs, maintenance costs, thermal exposure of building materials, change in tenants' preferences

Extreme wind can increase the risk of damage and cost for repairs and maintenance, potential disruption in the provision of utilities



Water scarcity can reduce resource availability and water quality concerns and change in tenants' preferences

Wildfires can lead to structural damage, disrupt energy and water supply, affect local air quality, change in land values, put people at risk

Deterioration and damage

Supply/ utilities disruption

Business impacts

Cost of repairs and replacements

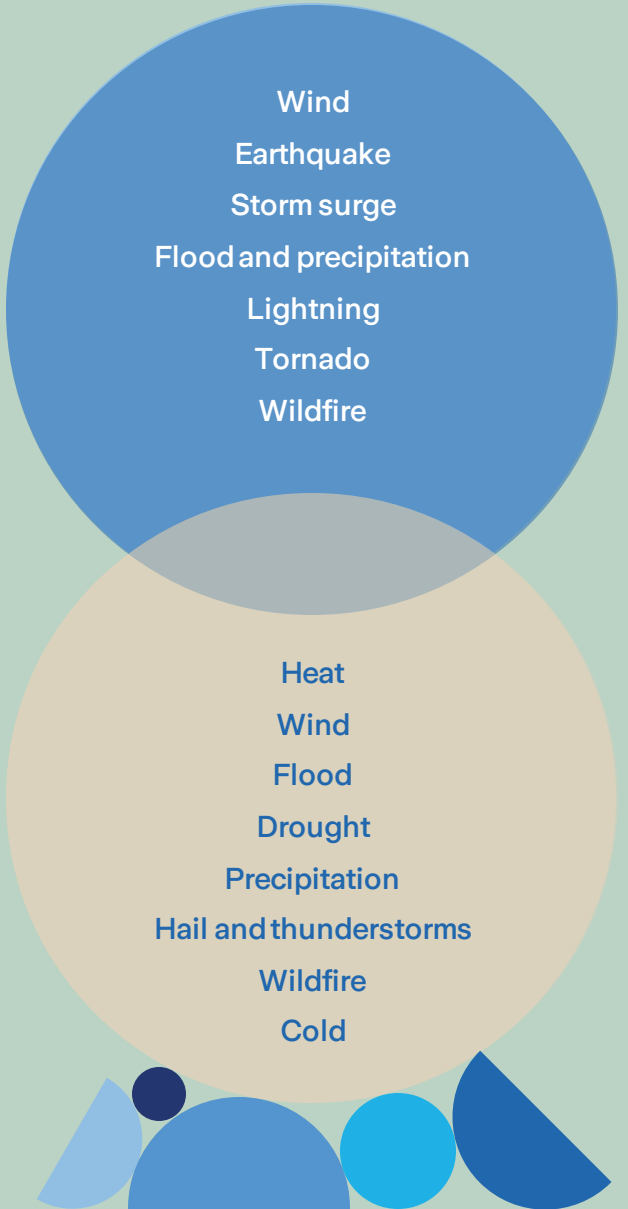
Maintenance and operational cost

Safety and health impacts

Brand and reputation

Policy and legal

Consumer trends



Natural hazards (current risk)

Climate change (future risk)

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Next steps: Let us help

Throughout this document we have aimed to provide guidance on building resilience into properties, however we acknowledge that the guidance may change as new risks or challenges emerges.

The document is intended as a general reference guide in the first instance, and you should always refer any specific design criteria and queries to your Zurich Resilience Solutions or usual insurance contact.

We encourage anyone reading this document to contact Zurich Resilience Solutions to discuss your new building or refurbishment project, or any property resilience measures you would like to introduce.

Zurich Resilience Solutions (ZRS) has been created to address a rapidly changing risk landscape, with a new, truly holistic approach to supporting your risk management and helping you to build your resilience.

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For more details on any of our solutions, please speak to your usual Zurich contact or email **zrs.enquiries@uk.zurich.com**

Zurich Resilience Solutions UK, Risk Support Services, 6th Floor, The Colmore Building, 20 Colmore Circus, Queensway, Birmingham B4 6AT

For further information about any of the topics mentioned in this document please speak to your local Zurich contact, or email Zurich Resilience Solutions at zrs.enquiries@uk.zurich.com or alternatively call this number: +44 (0) 121 697 9131.

For more information please visit www.zurich.co.uk/zurich-resilience-solutions

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