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Resilience Solutions

Convective Storm Toolkit

Understanding and preparing your business for this increasing risk

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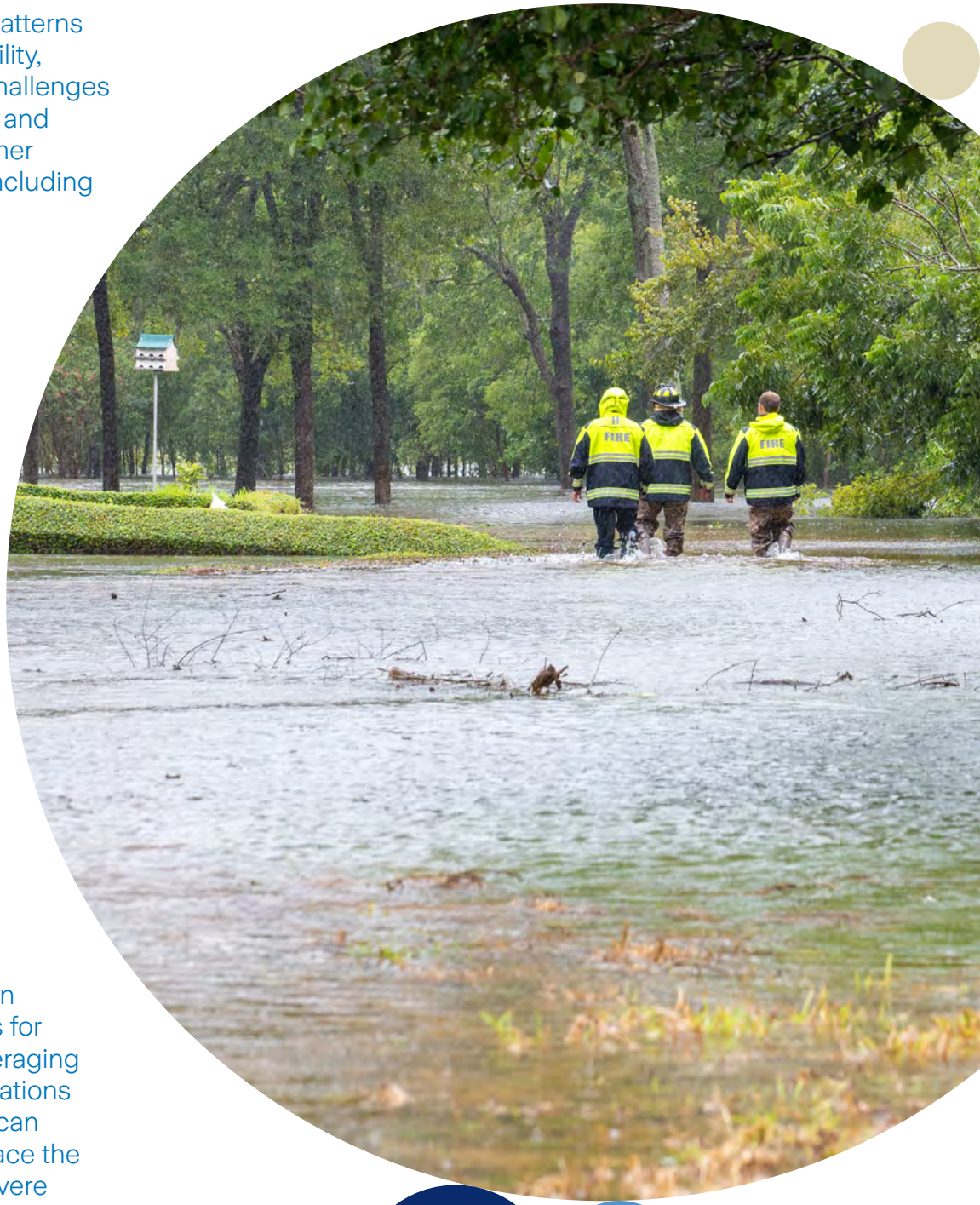
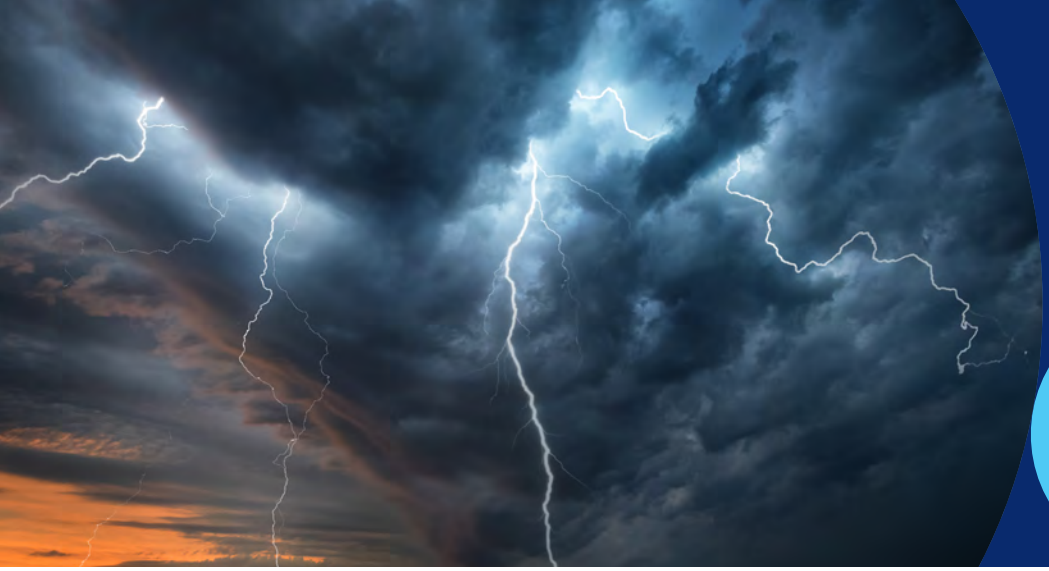
Introduction

In an era of shifting climate patterns and increasing weather volatility, businesses face mounting challenges in protecting their properties and operations from severe weather events. Convective storms, including thunderstorms, hailstorms, tornadoes, and lightning, are becoming more frequent and intense, leading to significant property damage and financial losses. The impact of these storms is not limited to immediate destruction; secondary perils such as flash flooding and power outages can exacerbate the damage, disrupting business continuity and recovery efforts.

This resource document aims to provide comprehensive guidance on understanding and mitigating the risks associated with convective storms. It compiles essential information on the formation and impact of these storms, practical steps for preparation and response, and strategies for enhancing resilience. By leveraging the insights and recommendations presented here, businesses can better equip themselves to face the growing threats posed by severe weather events and safeguard their people, property, and operations.





Rise in severe convective storms increases risk

What are convective storms? How can severe thunderstorms lead to lightning strikes, hailstorms, flash flooding and tornadoes?

If you live anywhere in the United States, you likely have received a severe thunderstorm warning from the National Weather Service. Such a warning indicates there is imminent danger to life and property and that individuals should take shelter in a substantial building.

Thunderstorms are part of what are more broadly known as convective storms. Severe convective storms are among the most common and most damaging natural catastrophes in the United States.

Thunderstorms form when warm, moist air rises into cold air. The warm air becomes cooler, which causes water vapor to condense into small water droplets. This circuit of rising and falling air is called a convection cell. And the perils that can result run the gamut — strong wind gusts and straight-line winds, lightning strikes, hailstorms, flash flooding and — most fearsome of all — tornadoes.

Severe convective storms can develop quickly and strike with little warning. The Great Plains and the Midwest are known to be hotbeds of storm activity, but, in reality, convective storms occur everywhere in the United States.

Economic impact

Convective storms rank among the costliest natural disasters both in the United States and worldwide. In the first half of 2024, these events led to insured losses totaling USD 42 billion globally. In the United States alone, 12 storms each resulted in losses of USD 1 billion or more, underscoring the significant loss potential of this hazard. This period has been recorded as the second most expensive on record for insured losses due to severe thunderstorms, with the USD 42 billion figure being 87% higher than the 10-year average. Severe thunderstorms, primarily occurring in the United States, accounted for 70% of the global insured losses[5].

Tornadoes

Tornadoes are among the most violent and destructive storms, with wind speeds that can reach more than 200 miles per hour. The United States typically averages over 1,200 tornadoes annually, with 2025 recording a preliminary count of 1,559 tornadoes. Spring into summer is the peak season for tornadoes, but they can form any time of the year. Above average activity was reported from March through June 2025, with a three-day stretch in May alone accounting for at least 124 confirmed tornadoes. 2025 even saw an EF-5 tornado confirmed in the United States for the first time in over 12 years. This tornado struck overnight near Enderlin, North Dakota, and grew to be over a mile wide, sadly resulting in three fatalities.[6] While many tornadoes occur in sparsely populated regions east of the Rocky Mountains, tornadoes have been recorded in all 50 states.

Lightning

Lightning is a giant spark of electricity that originates in clouds or air. Cloud-to-ground lightning strikes happen when the negative electricity originating in the atmosphere connects with the positive charge of an object below. When this atmospheric electrical charge is less than a hundred yards from the ground, objects such as trees or buildings send up sparks to meet it. When those sparks connect, the resulting channel creates a huge electric current surge that rapidly travels downward, producing the flashing bolt we see as lightning.

Lightning can strike anywhere outdoors, but especially on elevated and open areas, near water or tall, isolated objects, such as trees.

More than 25 million cloud-to-ground strikes occur each year in the United States, according to the National Weather Service[7].

Direct lightning strikes in residential and non-residential properties combined cause millions of dollars in fire damages every year, according to the Insurance Information Institute. The Lightning Protection Institute notes that total business losses related to lightning, either directly or indirectly, can run into the billions. In 2024 alone, over $1 billion in lightning claims were paid to more than 55,000 policy holders[8].

Additionally, in the United States, two-thirds of the area burned by wildfires is caused by lightning strikes.

Hail

Tornadoes garner most of the attention because of their destructive force. But hail may be the costliest of the convective storm perils. According to the National Severe Storms Laboratory, "Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere, where they freeze into ice."

Most hailstorms are relatively harmless. A simple handheld umbrella can keep small ice pellets at bay. But when widespread hailstorms with "golf ball-sized" or "softball-sized" chunks of ice start falling from the sky, nothing on the ground is safe. Auto dealers are particularly vulnerable, as hail can damage an entire fleet of new cars on the lot. But homes, commercial buildings, industrial properties and crops can also suffer from significant losses.

Hailstones form when moist, warm air rises into the upper atmosphere on powerful convective wind currents, allowing water vapor to freeze around specs of dust. As ice particles grow heavier, they fall to lower altitudes where strong winds may lift them higher once again, collecting more layers of ice. The cycle continues until the hailstones are too heavy to remain airborne and fall with varying levels of force, depending on their size.

Flash flooding

Severe convective storms can lead to extremely heavy rainfall, which can create flash flooding.

Flash floods are among the most dangerous kind of floods because they combine the destructive power of a flood with incredible speed. Flash floods occur when heavy rainfall exceeds the ability of the ground to absorb it. They also occur when water fills normally dry creeks or streams or enough water accumulates for streams to overtop their banks, causing rapid rises of water in a short amount of time.

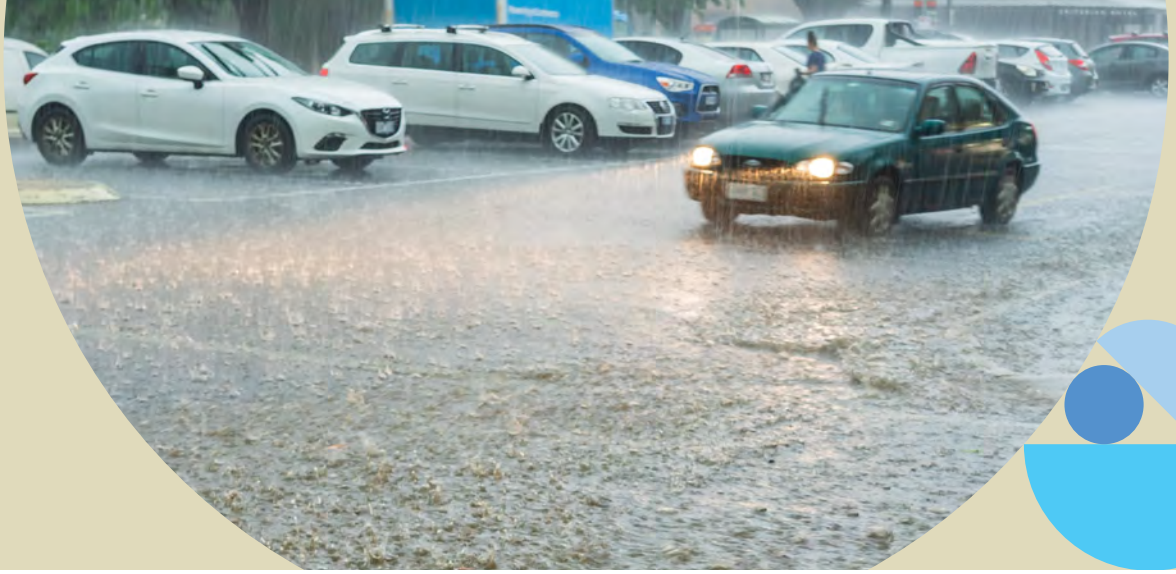
The intensity of the rainfall, the location and distribution of the rainfall, the land use and topography, vegetation types and growth/density, soil type, and soil water-content all determine just how quickly flash flooding may occur.

Urban areas are prone to flooding in short timespans because the impervious surfaces in the urban areas do not allow water to infiltrate the ground, and the water runs off to the low spots very quickly.

Fire and water

Large wildfires can sometimes lead to severe convective storms. When fires get big enough, they can create their own weather systems. Pyrocumulonimbus clouds are formed by the same forces that generate typical convective storms — heat from the ground, driving moisture upward until it forms clouds. This weather process may produce rain, but it may just as likely produce lightning and powerful winds that can increase the fire's intensity.

It may be difficult to discern if convective storm activity is increasing, but it's clear that losses from these storms is definitely on the rise.



Prepare for the growing risk of damaging hail

Increasingly strong and more frequent convective storms suggest the potential for a rise in the number of serious hail events.

While hurricanes and tropical storms have earned their fearsome reputations, increasingly frequent severe convective storms are the leaders in property damage. Powerful thunderstorms and squalls can boil up virtually anywhere on the continent, although the Great Plains of the central U.S. are ground zero for some of the worst. Especially during the spring and summer months, thunderheads spawned by the sun's energy rise miles high, dragging warm, moist air into the stratosphere on powerful convective currents. Convective storms can birth dangerous lightning, massive downpours, devastating tornadoes, and even straight-line winds briefly rivaling the power of a tropical storm. However, when it comes to property losses to businesses, homes, schools, vehicles and more, no single feature of severe convective storms can match the toll exacted by hail.

According to data compiled by Aon, a major, global insurance broker, hail-related insured losses in 2023 totaled $118 billion which is higher than the 21st century average ($90 billion) and the decadal mean ($110 billion)[1]. During 2023, the National Oceanic and Atmospheric Administration's (NOAA) Severe Storms database recorded 10,006 severe hailstorms with 1,477 storms with hail 2.00+ inches[2]. By one recent estimate, 10 million U.S. properties were affected by one or more hail events in 2023[3].

The sky is falling

Hailstones form when moist, warm air rises into the upper atmosphere on powerful convective wind currents, allowing water vapor to freeze around specs of dust. As ice particles grow heavier, they fall to lower altitudes where strong winds may lift them higher once again, collecting more layers of ice. The cycle continues until the hailstones are too heavy to remain airborne and fall with varying levels of force, depending on their size. And the size can be truly astonishing. Following an April 28, 2021, hailstorm in Hondo, Texas, hail experts from the Insurance Institute for Business and Home Safety (IBHS) coordinated with the National Weather Service office in San Antonio to perform a three-dimensional scan of a hailstone measuring 6.4 inches in diameter and weighing 1.26 pounds.[4] Imagine the damage such an object might cause to a rooftop HVAC unit, a car windshield or, even worse, and unprotected individual.

With many experts predicting that changing weather patterns will generate more recurrent and powerful convective storms, along with expanding urban sprawls and other developments, it is likely that major hail events will become more frequent and damaging. As a result, businesses may need to adjust to a future in which the potential for severe hail damage will be an ever-present and growing possibility.

Mitigation – Before the storm

Knowing what your vulnerabilities may be prior to a hail event is critical to understanding the potential impacts it might have on your business. Hail can damage any unshielded building feature, including:

- Roof coverings
- Roof-mounted equipment
- Skylights and other glazing systems
- Photovoltaic power generating systems
- Outdoor storage

Depending on age and condition prior to a severe hailstorm, the roof assembly will be the most vulnerable aspect of any commercial building. Over time, weathering due to UV-degradation from sunlight; wind forces; temperature extremes; expansion and contraction forces; contaminants; and even foot traffic may seriously weaken the performance of roof coverings during a hailstorm and heavy downpour. Even in the absence of other factors, the age of the roof will be a key concern.

Damage resulting from hail can be mitigated and even prevented before it occurs by selecting roofing materials, assemblies and other components with adequate hail-impact ratings, or by providing ballast or pavers to give additional protection to the roof assembly.

Annual roof inspections are one of the best ways to ensure a roof assembly will perform well during a hail event. Studies of roof-related losses show that loss rates are much less for locations where annual, visual roofing inspections are in place and performed.

Another serious vulnerability a commercial building may have is roof-mounted heating ventilation and air-conditioning (HVAC) equipment. The most vulnerable equipment will be roof-mounted with exposed and unprotected coils and fins, such as those used by air conditioning units.

External equipment commonly damaged by hail may include:

- Roof-mounted air-conditioning condenser coils, fins and fan blades
- Cooling tower fan blades and fill media
- Upright/vertical heat exchanger coils
- Make-up air unit/air handlers and exhaust vents
- Rooftop exhaust fans
- Ductwork and other piping

The solution for protecting vulnerable rooftop equipment with exposed coils and fins will be to provide rigid hail guards of strong mesh or metal that will disperse the impact of large hail. Where heat transfer or air movement is a concern, the guards may be mounted at an angle (30-35 degrees) to allow for unrestricted airflow while protecting against hail impacts. Always consult with an HVAC professional before installing hail guards on your equipment.

Roof-mounted skylights also represent serious weak points against hail. Skylight glazing materials most capable of withstanding serious hail impacts include:

- Acrylic
- Polycarbonate
- Tempered glass
- Laminated glass

Once again, the age of a skylight and the materials employed when first installed will be important concerns.

Special attention should also be given to roof drainage systems that may come under stress during a serious hailstorm and associated downpour. Ice damming from significant hail accumulation can back up rainwater even in well-maintained drainage systems. If a roof drainage system is already compromised by debris, leaves and other obstacles, the threat posed by temporary hail accumulation will be amplified.

Preparation – Darkening skies

A stormfront is approaching. Warnings have been issued over television, commercial and weather-alert radio frequencies that conditions are right for severe thunderstorms with the potential for large hail. It's time to activate severe weather preparations.

- Remove and bring indoors any equipment or property that could become wind-driven projectiles in high winds.
- Whenever possible, cover or take other steps to protect vulnerable equipment that cannot be moved.
- If possible, move any vehicles indoors or to any available shelter.
- Idle equipment that could be impacted by power surges or spikes; make sure any computer files being worked on are saved.
- Make certain that all personnel are indoors and in secure areas.

Response – The storm is here

If you are on the road:

- Stop driving and pull completely off the highway.
- If you see a safe place close by (a garage, carwash bay or service station awning), drive under cover if you can.
- Do not leave the vehicle until hail stops.
- If your vehicle is being hit by large hail, protect your eyes against the possibility of broken glass.
- Do not drive through deep, standing water.

If inside a building:

- Stay indoors, away from windows.
- Direct occupants to safe areas, as severe convective storms can produce tornadoes as well as hail.
- Do not exit the building until the storm passes and the danger is over.

If caught outside:

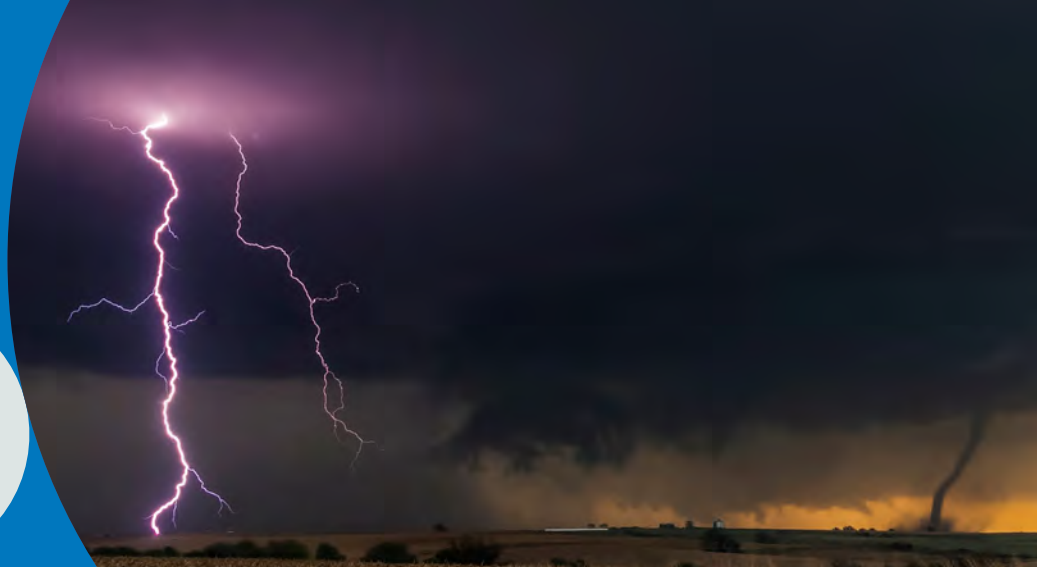
- Seek shelter immediately.
- If you are unable to protect your entire body, do your best to protect your head from hail impacts.
- Be aware that sheltering under trees is risky; trees may lose limbs during severe storms and present elevated lightning risk.
- Be cautious about low-lying areas that may be subject to flash flooding.

Recovery – Assessing the impact

- Once the storm is over, safely perform an immediate inspection of any damage to your property.
- Check for ice dams in gutters and drains that could cause rainwater to back up on your roof deck.
- Inspect roofing for hail damage that may allow leaks into your building.
- Inspect building exterior and siding for hail damage.
- Check all windows and skylights for damage.
- Inspect roof-mounted HVAC and electrical equipment.
- Carefully remove any branches or limbs that may present risks to employees and others on your property.
- Reach out to contractors with whom you have relationships to ensure you will be promptly scheduled for necessary repairs.
- Notify your broker and insurance carrier that your facility has experienced storm damage.

Winds of Change

Changing weather patterns and trends suggest that strong convective storms may become more frequent, stronger and potentially damaging, which means hail events may become more damaging in the future. Understanding the risk potential presented by hail, historically the costliest severe weather event on an annual basis, can help your business recover and build resilience when the sky falls.



Tornado safety and resilience for businesses

Tornadoes can be devastating but following the four phases of an Emergency Response Plan (ERP) can help protect your people and property before, during and after the storm.

Whether in person or only via television news reports, we have all seen the aftermath of the devastating power of tornadoes: leveled buildings and homes, trees toppled, vehicles upturned, debris scattered and — in the worst cases — lives lost. Tornadoes are among the most violent and destructive storms we experience, with wind speeds that can go higher than 200 miles per hour and recorded damage paths up to one mile in width and up to 50 miles in length.

Adding to worries for businesses is that a tornado doesn't have to come close to maximum severity to do potentially serious harm to your operations. Even if your company's property goes untouched, a long-lasting power outage can impact communications with customers, vendors and suppliers. Or if area streets and highways are closed due to storm damage, your fleet may be delayed for days in getting shipments out.

While businesses in tornado-prone regions need to be most aware of their risks, tornadoes and derechos in big cities like Washington, D.C. and Chicago show these types of storms are not restricted to lower-population areas or the Great Plains. They can occur anywhere in the world and develop very quickly, so every business needs an Emergency Response Plan (ERP) for tornadoes.

What causes tornadoes?

The NOAA's National Severe Storms Laboratory defines a tornado as "a narrow, violently rotating column of air that extends from a thunderstorm to the ground"[9]. They are spawned by collisions of warm, wet air masses with cool, dry ones. Of course, not all thunderstorms lead to tornadoes. What makes twisters particularly menacing is that they form quickly, with little warning. Spring through Summer is peak tornado season, but they can occur any time of the year.

What is an Emergency Response Plan for tornadoes?

As with most ERPs for natural hazards, a company's ERP for tornadoes can be divided into four phases: **mitigation**, **preparedness**, **response** and **recovery**. The plan should be developed with risk specialists and communicated to all employees, with response plan actions assigned as needed to specific teams or workers. Make sure the ERP is in writing and easily accessible. Required testing and training related to the ERP is also a good precaution to ensure your people are ready if and when a tornado strikes.

1. How can you mitigate tornado risks?

This is the ongoing work to keep your people and property as shielded from the impacts of a tornado as possible. Mitigation can range from long-term, high-investment work on building structures to much simpler, low- or no-cost steps. Your ERP should include these mitigation actions:

- Have architectural/engineering evaluations of your existing property performed.

- Upgrade existing structures as needed based on those evaluations.
- For new construction, work with an architect or contractor to incorporate wind-mitigation techniques and high wind-rated products.
- If possible, have a thoroughly tornado-proofed shelter or "safe room" installed near or inside your business property. There are three basic types:
  - *Underground shelters* – Constructed from reinforced steel or concrete and typically installed near a structure, these are designed for maximum survivability during a tornado. They protect those inside from falling or flying debris that still could be a threat in a basement. Underground shelters should be situated close enough to your building to be quickly and readily accessible during already difficult weather conditions, as when a tornadic storm may be approaching.
  - *Shelters built into the facility* – If ground conditions such as high local water tables or the likelihood of flooding preclude underground shelters, a suitable alternative can be a safe room built inside a facility during initial construction or renovation. Constructed of reinforced concrete or steel, these should be self-contained and firmly anchored to the foundation to prevent overturning or dislodging during a storm.
  - *Prebuilt shelters* – If the first two options are impractical, manufacturers of pre-built shelters can provide installations made from sturdy steel frames and panels that can be retrofitted into existing structures. Once again, the shelter must be firmly anchored to the building's foundation for maximum effectiveness.
- Situate network servers and other vital equipment in protected areas of a building, preferably in tornado-resistant rooms.
- Have a well-maintained and fueled generator to supply your facility with emergency power during an outage.
- Review your current insurance coverages to ensure they reflect your exposures.

2. How should you prepare for potential tornado impacts?

These preparation steps need to be in place before any storm is imminent.

Preparing your people

- Identify the safest areas in a building for people to shelter in the event of a tornado warning. If you do not have a specially designed safe room as described in the mitigation section above, this safest area will often be in the basement or the level that is the lowest point in your building.
- Post signs in buildings to direct employees, customers and visitors to safe areas.
- Designate roles and responsibilities of supervisors and employees, including the appointment of tornado wardens.
- Practice your sheltering plan so you know how long it takes to move everyone to safety. The average warning time is 13 minutes, but tornadoes are unpredictable.
- Practice an evacuation plan for the potential of authorities putting evacuation orders into effect.
- Stay informed by keeping tabs on official warnings issued by the National Weather Service (and consider purchasing a NOAA Weather Radio with a tone alert feature), and local TV and radio weather broadcasts.
- Be aware of changing weather conditions around you, such as darkening skies; high, gusty winds; low-lying clouds; sharply defined front lines and wall clouds; and hail.

Preparing your property

If an official tornado watch is in effect, or if there has been enough volatile weather to indicate one might go into effect soon, the following actions are recommended:

- Remove and secure outdoor gear and small equipment.
- Secure outbuildings to prevent them from becoming airborne missiles.
- Remove or secure any construction scaffolding.
- Reinforce any vulnerable areas of a building, such as building openings.
- Stock up on emergency supplies, including flashlights and batteries, drinking water, first aid kits.

Preparing for business continuity

As mentioned near the start of this article, whether your business experiences severe property damage or not, operational and/or supply chain interruptions can occur in the aftermath of a tornado. These steps can help make sure your business is prepared to forge ahead with the response and recovery phases of your ERP:

- Plan for communication among employees and management if your facility experiences significant damage, such as dedicated channels for cell phone calls and text messaging via mobile devices. Cell towers can also be damaged during tornadoes, however, so it can be prudent to have non-cellular wireless devices, or so-called "walkie-talkies," ready as backups.
- Work with your company's IT and cyber specialists on back-ups and restoration plans for data and information technology.
- Determine how supply chain logistics will be maintained or restored as needed.
- If possible, plan to move manufacturing and other critical business operations to other facilities until a damaged building is repaired or replaced.

3. How should you respond when a tornado is imminent or active?

If a tornado warning is in effect or it is clear a threat is imminent, the first priority must be keeping people safe. Most injuries and deaths during tornadoes are caused by flying debris from structural damage, so these three precautions are key:

- *Take shelter* – Ensure all employees, customers and visitors are inside. If employees are on an outdoor job site, in a vehicle or unable to get to the company's best-protected property, they should get to the nearest substantial structure as quickly as possible. Remaining outside, exposed to wind-driven debris is a recipe for disaster.
- *Stay low* – Once inside, all employees, customers and visitors should move to the shelter area designated during the preparation phase of your ERP. If a safe room, basement or lowest-level shelter is not accessible, move people to an internal hallway with best structural integrity to withstand tornado-force winds. Move everyone away from all windows, doors and other openings.
- *Take cover* – All building occupants should take cover underneath anything that may provide increased protection — a table, desk, pillows, a mattress or whatever can safely come between you and airborne debris. Have occupants wear hardhats and other protective gear if available.

4. What are the key recovery actions to take after a tornado?

Even when the skies have cleared, safety has to be job number one as your business works to recover following a tornado. Management, employees and all other occupants of the building need to be cognizant of multiple hazards that can be created from the effects of tornado damage. Similarly, off-site employees must be informed when the property and surrounding region is safe for them to return to the workplace. There are two key components for safe recovery efforts: *communication* and *caution*.

Communication

- The preparation phase of an ERP includes planning for emergency communication channels. If there are power outages, downed telephone lines or damage to buildings that people need to be alerted to, now is the time to use those channels — cell phone calls, "walkie-talkies," texting, email, etc. — to pass information about current conditions.
- Notify local media outlets of conditions so they might broadcast that information, hopefully reaching anyone who might be away from the area who is planning to return to it before conditions are safe.

Caution

For those inside the building:

- If the building you are occupying was damaged, use extreme care when exiting.
- If you smell gas or sense flammable liquids may be present, do not use an open flame, such as matches or cigarette lighters.
- Anyone trapped should remain calm and text or call for help. If possible, bang on a wall or exposed pipe to attract attention.

For those outside the building:

- Do not enter any damaged structures until they are deemed structurally stable by first responders.
- Watch for, avoid and report downed power lines.
- During cleanup in the days following the storm, use care when using chainsaws and removing debris.
- Wear appropriate footwear and gloves to protect against sharp edges, exposed nails and other hazards.
- With a proper tornado Emergency Response Plan in place, your business will be better prepared to avoid the most severe consequences of these very common and dangerous storms, or at least be in a strong position to respond and recover more quickly from the damage they inflict. Good business planning means good resilience planning. Make this ERP a part of it.

Lightning damage to buildings: Addressing the risk

How to protect your commercial property from the damage lightning causes. Consider these tips to prevent and recover from this severe weather event.

"When lightning strikes" is often used as a euphemism for a rare occurrence. Unfortunately, lightning strikes are far more common than many of us realize — more than 25 million cloud-to-ground strikes occur each year in the U.S., reports the National Weather Service. Their impact to property can be substantial. Direct lightning strikes in residential and non-residential properties combined cause millions of dollars in fire damages every year, notes the Insurance Information Institute. But that's just the tip of the lightning bolt. The Lightning Protection Institute (LPI) notes that total business losses related to lightning, either directly or indirectly, can run into the billions. In 2023 alone, over $1 billion in lightning claims were paid to nearly 70,000 policy holders.

Although this article is focused on addressing property damage, it's vital to recognize lightning's danger to people. Although the odds of being struck by lightning are extremely low, it remains one of the leading causes of weather-related fatalities, notes the Centers for Disease Control and Prevention[10].

What is lightning and how is it formed?

Lightning is a giant spark of electricity that originates in clouds or air. The National Severe Storms Laboratory explains that in-cloud lightning, which constitutes the majority of lightning events, occurs entirely within a cloud or clouds or between a cloud and the air. The dangerous cloud-to-ground lightning strikes happen when the negative electricity originating in the atmosphere connects with the positive charge of an object below. When this atmospheric electrical charge is less than a hundred yards from the ground, objects such as trees or buildings send up sparks to meet it. When those sparks connect, the resulting channel creates a huge electric current surge that rapidly travels downward, producing the flashing bolt we call lightning. And it's fast: Lightning travels at the speed of light or, as NASA notes, 186,000 miles per second.

Lightning can strike anywhere outdoors, but especially on elevated and/or open areas, near water or tall, isolated objects, such as trees. However, it's important to understand that the tallest object isn't always the target.

How does lightning damage commercial property?

Lightning can heat the air it passes through to 50,000 degrees Fahrenheit[7]. That's five times hotter than the sun's surface.

A lightning bolt can not only cause fires, it also can wreak havoc on exposed equipment on a rooftop or exterior work areas, as well as indoors. Lightning is capable of sending electricity through metal pipes used for plumbing, electrical wires such as landline telephones, and metal reinforcements in concrete floors and walls, the CDC warns[11].

Complex electronic equipment and computer systems may have an increased exposure to lightning and associated lightning surges. For example, in North America, electronics are designed to use around 120 volts of electricity and can withstand up to 169 volts. A power surge from lightning contains millions of volts, capable of quick destruction.

Does your business include open spaces? Think of airfields, playgrounds, livestock fields and ballparks. Although specific objects, such as airplanes, can be designed to repel lightning, the only way to protect your employees is to make sure they go indoors when lightning is a threat. Thunder is nature's warning signal for anyone who is outdoors to go inside immediately. Lightning can strike miles from the center of a storm, notes the National Weather Service.

How do you protect property from lightning?

Most property losses can be dramatically reduced and possibly even eliminated by using proper lightning protection for structures. Guidelines from the National Fire Protection Association (NFPA) and its Code 780 for installing lightning protection systems are considered the national standard by the LPI. These systems create a network of low-resistance paths that can intercept lightning's destructive electricity and direct it to the ground without impacting the structure and its occupants.

The LPI outlines five elements that need to be in place for an effective lightning protection system. Its "Lightning Protection Overview" includes more detailed information on each of these elements:

- *Strike termination devices* must be able to accept direct lightning attachment and strikes before the lightning can reach insulated building materials.
- *Cable conductors* direct the lightning current over and through construction, without damage, between the strike terminations at the top and the grounding electrode system at the bottom.
- Below-grade *grounding electrode systems* must be able to efficiently move the lightning to its ultimate destination, safely away from the structure and its contents.
- *Bonding*, i.e., the interconnection of the lightning protection system to other internal grounded metallic systems, must be able to prevent lightning to side flash internally — in other words, stop it from jumping to a lower object (e.g., an individual or another object in the building).
- *Surge protection devices* must be installed at every service entrance to stop lightning from infiltrating utility lines and transfer the energy into the ground[12].

Each of these five elements depends upon careful attention to placement, use of proper materials and other considerations. Installation by qualified professionals is crucial.

Every business is unique, but these areas should be evaluated as potentially vulnerable to lightning. Consider ways to mitigate potential damage:

- Critical rooftop equipment
- Complex electronic equipment: Do you have sufficient surge protection for all of these systems?
- Processes, systems or features (such as yard storage of flammable or combustible liquids in tanks, as well as vehicles) that could be set on fire. These should be placed at least 100 yards from the building.
- Solar arrays, or panels
- Tall equipment, such as construction cranes

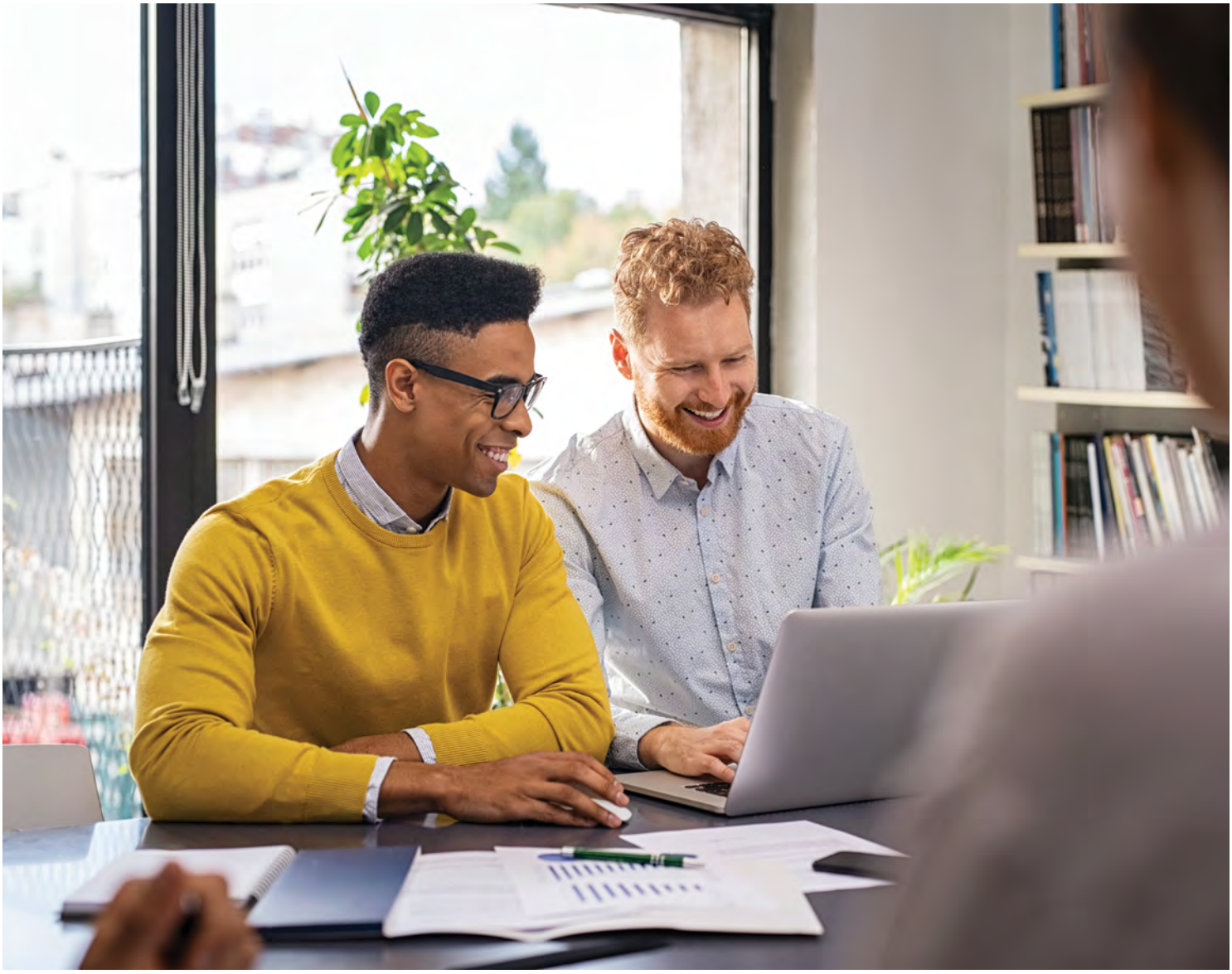
How should a business respond to damage from lightning?

The best response plan is to be prepared long before an event sidelines your business. Contingency plans should be developed for emergencies, such as fire and severe weather. Plans should include defined duties and functions of various employees and adequate training should be provided.

To help you respond when lightning strikes, consider these tips from Zurich Resilience Solutions:

Develop and implement a formal, written emergency response plan that includes crisis communication procedures and covers all possible scenarios for the specific facility. Ensure the plan is reviewed regularly and any time significant onsite modifications are made. Plans should include defined duties and functions of various employees.

- Provide training for staff on evacuation, intervention and first aid protocols, depending on the specific needs and means available.
- Conduct regular emergency and evacuation drills. Evaluate the results and implement changes/corrective actions as needed.
- Establish a list of contacts for external responders (ambulance, fire brigade, police, hospitals, etc.) and ensure all employees receive a copy.
- Establish a system to notify any affected employee or family member in the event an employee is involved in catastrophic event.
- Conduct a business impact analysis to assess business resiliency.
- Review shutdown and evacuation processes, including data backup and shipping records offsite.
- Create a business continuity plan.
- Limit yard storage and remove flammable items, vehicles and, especially, propane tanks from the property or move them at least 100 feet away from the building.



Conclusion

As the frequency and severity of convective storms continue to escalate, businesses must adopt a proactive approach to risk management and resilience. Understanding the various forms of convective storms and their potential impacts is crucial for developing effective strategies to protect people, property, and operations. By implementing the practical measures and recommendations outlined in this document, businesses can mitigate the risks associated with severe weather events and enhance their ability to recover swiftly from any damage incurred.

In addition to internal preparations, collaboration with experts and leveraging external resources can provide valuable support in building a robust defense against these natural catastrophes. Zurich Resilience Solutions (ZRS) offers a wealth of knowledge, tools, and services to help businesses navigate the challenges posed by convective storms and other climate-related events. By working together and staying informed, businesses can strengthen their resilience and ensure continuity in the face of an increasingly unpredictable climate.

Visit the Convective Storm Resource Hub for additional articles offering insights on how to help mitigate, respond to and recover from tornados, lightning and convective storms.

References

1. Aon. (2024). *Climate and Catastrophe Insights Report*. Retrieved from https://assets.aon.com/-/media/files/aon/reports/2024/climate-and-catastrophe-insights-report.pdf
2. National Oceanic and Atmospheric Administration. (n.d.). Storm Prediction Center: Monthly and Annual Summaries. Retrieved from https://www.spc.noaa.gov/climo/summary/
3. Claims Journal. (2024, February 22). *CoreLogic: 2-inch-Plus Hail Fell on 10M U.S. Homes in 2023*. Retrieved from https://www.claimsjournal.com/news/national/2024/02/22/322017.htm
4. The Weather Channel. (2021, June 24). *Texas Record Hailstone in Hondo Confirmed*. Retrieved from https://weather.com/storms/severe/news/2021-06-24-texas-record-hailstone-hondo-confirmed
5. Swiss Re. (2024). *Severe thunderstorms drive insured losses to USD 60 billion in first half of 2024, Swiss Re Institute estimates*. Retrieved from https://www.swissre.com/press-release/Severe-thunderstorms-drive-insured-losses-to-USD-60-billion-in-first-half-of-2024-Swiss-Re-Institute-estimates/fdefcc81-c403-4ce8-ab2c-37ca6d98cf4a
6. NOAA National Centers for Environmental Information, Monthly Tornadoes Report for Annual 2025, published online January 2026, retrieved on February 19, 2026 from https://www.ncei.noaa.gov/access/monitoring/monthly-report/tornadoes/202513. **DOI:** https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ncdc:C00769
7. National Weather Service. (n.d.). Lightning safety. Retrieved from https://www.weather.gov/safety/lightning
8. Triple-I: Lightning Caused $1.04B in US Homeowners Claim Payouts in 2024; Frequency Drops 21.5% Year-Over-Year | III
9. National Severe Storms Laboratory. (n.d.). Tornadoes. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/
10. Centers for Disease Control and Prevention. (n.d.). Lightning: Data and research. Retrieved from https://www.cdc.gov/lightning/data-research/index.html
11. Centers for Disease Control and Prevention. (n.d.). *About lightning*. Retrieved from https://www.cdc.gov/lightning/about/index.html
12. Lightning Protection Institute. (2019). *Build and Protect: A White Paper on Lightning Protection Systems*. Retrieved from https://lightning.org/wp-content/uploads/2019/11/Build-Protect-White-Paper-2019-1.pdf
13. Insurance Journal. (2023, January 31). *Rising Costs of Secondary Perils Force Reinsurers to Require Higher Attachment Points*. Retrieved from https://www.insurancejournal.com/news/international/2023/01/31/705330.htm
14. Insurance Insider. (n.d.). *New normal: Secondary perils are reshaping dialogue on CAT losses*. Retrieved from https://www.insuranceinsider.com/article/2cscwbmvxhlfejrim7aps/catastrophes-section/new-normal-secondary-perils-are-reshaping-dialogue-on-cat-losses?zephr_sso_ott=E5Fqj0
15. Insurance Journal. (2024, January 25). After $70 Billion Hit, Insurers Wake Up to Growing Risks of Severe Convective Storms. Retrieved from https://www.insurancejournal.com/news/international/2024/01/25/757121.htm

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