

# Hurricane and Tropical Storm Toolkit

Action planning to mitigate risk before, during and after the storm

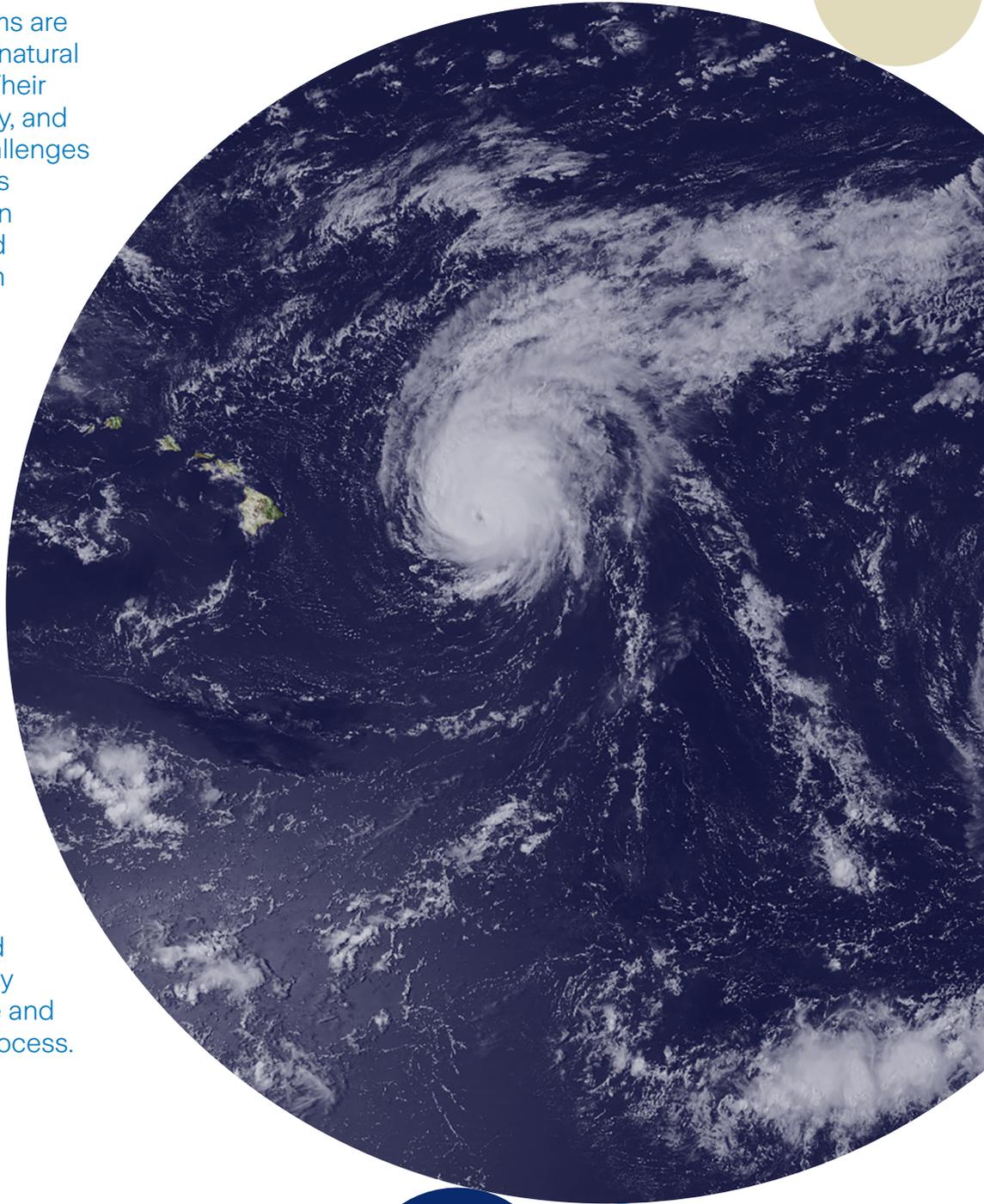


# Table of Contents

Section	Page
1 Introduction	3
2 Taking action to mitigate risk in advance of a storm	4
3 Developing a comprehensive hurricane preparedness plan	7
4 Activating your hurricane emergency response plan	10
5 Hurricane disaster recovery planning: 10 tips for business owners	12
6 Conclusion	15

# Introduction

Hurricanes and tropical storms are among the most destructive natural hazards known to mankind. Their increasing frequency, severity, and duration pose significant challenges to individuals and businesses alike. The financial impact can be devastating, as evidenced by the combined \$278 billion in property losses from [hurricanes Harvey, Irma, and Maria](#) in 2017. For business and property owners in hurricane-prone regions, the importance of preparedness cannot be overstated. This comprehensive packet aims to provide detailed guidelines on how to protect yourself, your employees, your property, and your business from the risks associated with hurricanes and tropical storms. By implementing a robust Emergency Response Plan (ERP) that covers mitigation, preparedness, response, and recovery, you can significantly reduce the potential damage and ensure a quicker recovery process.





## Hurricane mitigation means preparing for the inevitable

Hurricanes and tropical storms are among the most destructive natural hazards known to mankind.

In fact, most of the [top 10 costliest natural disasters](#) in the United States were hurricanes. Three of the costliest natural disasters occurred in 2017: hurricanes Harvey, Irma, and Maria, which cost a combined \$278 billion in property losses.

For business and property owners living in a region prone to destructive hurricanes, there is no time like the present to start thinking about how to protect yourself, your employees, your property, and your business from the risk of hurricanes and tropical storms.

### Wind, Water, and More

Hurricanes bring extreme weather conditions, including:

- High winds
- Heavy, wind-driven rain
- Windborne debris
- Storm surge and coastal flooding
- Wave action and beach erosion
- Waterborne debris
- TORNADOS

It is possible to design a building to survive the extreme conditions associated with a hurricane, except for tornados. Hurricane damage typically becomes a catastrophe when water can penetrate the building envelope or undermine the building foundation. That's why controlling water is key.

Failed roofs, glazing, or cladding can quickly allow wind-driven rain into a building. Once inside, gravity spreads the water down through the building.

Water and waterborne debris from flood, storm surge, and stormwater runoff can enter and damage a building. Uncontrolled wave action can scour away soil under and around building foundations. Buildings can become inaccessible or unstable and may even collapse.

### Make a Plan

Businesses in a hurricane-prone region should develop and implement a hurricane emergency response plan, which should be a living document. The response plan should be reviewed and updated each year before hurricane season begins. The plan should address actions needed at the beginning of hurricane season, when a tropical storm or hurricane watch is issued, during the storm, and immediately after the passing of the storm. The plan should have senior-level management support.

### **Before Hurricane and Storm Season Begins:**

- Review and update the plan.
- Verify equipment and supplies are on-site, available, and in good condition.
- Verify a roofing company contract is in place for emergency repairs.
- Verify that other critical vendor contracts are up to date.
- Schedule an inspection of building roofs, rooftop equipment, walls, windows, and doors.
- Verify emergency generator testing, fueling, and maintenance are current.
- Inspect and test any dewatering pumps.
- Verify shutters and installation hardware are ready and staff is trained for installation.
- Establish procedures with local authorities for accessing or reentering the site after a hurricane or storm.
- Verify all employees are properly credentialed.
- Establish backup communication procedures for notifying staff and other business operations.
- Establish a plan to allow employees to return home early in the preparedness phase to secure their residence and family.

### **During Hurricane and Storm Season:**

- Check the National Hurricane Center website regularly.
- Monitor local and regional weather forecasts.
- Be prepared for any potential mandatory evacuations that could impact the implementation of the site's emergency preparations.

## Wind

Since Hurricane Andrew in 1992, Miami-Dade County in Florida has been a leader in developing and implementing test standards for building products. Some recommendations include:

- Consider a penthouse to house rooftop equipment, rather than having rooftop equipment exposed to direct wind loads.
- Secure small rooftop equipment with corrosion-resistant fasteners.
- Secure exhaust fan cowlings with wire rope to the curb or roof deck.
- Avoid rooftop ductwork.
- Follow FEMA guidelines for securing lightning rods.
- Arrange satellite dishes to be removed to a secure location before a storm.
- Protect cooling towers with equipment screens designed for wind loads.
- Secure steel decks with screws rather than welds.

## Storm Surge

The results of a severe storm surge associated with a tropical storm or hurricane can be catastrophic. One of the most important things business owners can do is ensure that enclosed building spaces and key outdoor structures are located above the anticipated storm tide that may accompany a tropical storm or hurricane.

## Surface Water Runoff

Surface water runoff becomes a concern when the surrounding topography allows rainwater to flow toward high-value or critical equipment areas. Heavy rains may overtax drain systems, or a power failure may impair dewatering pumps that support the drain systems.

## Flood

Business owners should also consider locating building points of access and other important structures above the 100-year flood elevation. Important structures may include transformers, emergency generators, above-ground fuel tanks, and other critical equipment.

## Waterborne Debris

Vehicles, trash dumpsters, fuel storage tanks, sheds, fallen trees, and other objects can be readily carried by moving water. Building walls that are within reach of water from storm surge, storm water runoff, or flood should be designed to resist the loads associated with the impact of such debris.

## Wave Action

Wave action is a powerful force that can readily scour away sand and soil during severe storms. Buildings supported on piles may not fail if undermined; however, building access may be impaired, and underground and under-floor utilities may be damaged.

## Roof Drainage

Water damage from inadequate drainage can occur if heavy rains exceed available drain capacity or if drains become obstructed.

## Keeping the Lights On

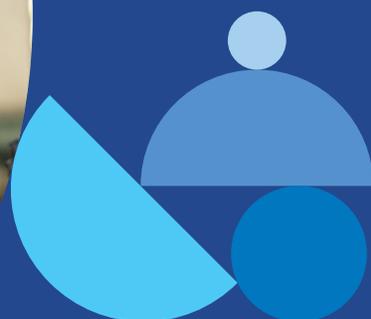
When a hurricane strikes, the loss of normal electric power can be expected. Extended power outages are not uncommon, so a reliable source of emergency power will be required to maintain essential electric loads and support any needed clean-up or restoration efforts.

## Establish a Plan Now

If you have property in a hurricane-prone area, it's not a question of if a destructive storm will affect your business, it's a question of when. Now is the time to establish a plan to deal with the inevitable. Your insurance provider can help. Here are five key steps to mitigating the damage that can be caused by a hurricane:

1. Make sure the full team is in the loop: insured, broker, and insurance provider.
2. Ask your insurance provider to conduct a hurricane risk assessment.
3. Compare your property to the risk guidelines provided by your insurer.
4. Map out a plan designed to achieve or validate each risk characteristic.
5. Take corrective action to improve features that do not meet the guidelines provided by your insurer.

These actions should be part of a fully developed hurricane Emergency Response Plan (ERP).



## Timing is everything in a hurricane preparedness plan for business

Another hurricane season is underway, but with the historic increase in frequency, severity, and duration of these storms, even saying “another hurricane season” can sound like a dangerous understatement. The hard truth is that the challenges associated with hurricanes and other severe windstorms are growing.

But they are not insurmountable.

While the volatility of windstorms means no plan can guarantee the prevention of major damage and losses, a properly conceived Emergency Response Plan (ERP) can help lessen impacts and help businesses bounce back more quickly. A thorough ERP involves four phases: mitigation, preparedness, response, and recovery.

This article focuses on the preparedness phase, which can be broadly broken down into two time frames: 48 hours before the storm hits and 36 hours before the storm hits. While different types of storms may demand some variances in detail, the hurricane preparedness guidelines for businesses here can also be applied to typhoons, gales, and severe tropical storms below the hurricane threshold.

### 48 Hours Before the Storm

Windstorm warning accuracy can vary from region to region, so variable elements need to be considered within your ERP to ensure you have the needed response time, emergency personnel, and resources. Recommended actions to take 48 hours before the storm makes landfall can be broken down into five areas:

#### **Flood and Storm Surge Protective Measures**

If the business property is at risk from flooding and storm surge exposures, it's vital to do everything you can to reduce water ingress as quickly (though, of course, properly) as possible. These measures should include:

- Checking for potential problems with the building's roofing, including improper overlaps or loose or damaged roofing system elements.
- If time allows, making any needed repairs to coverings and flashing.
- Ensuring any loose items or debris are removed from the roof.
- Securing equipment doors and coverings.
- Ensuring roof drains and other outside storm drains and catch basins are also clear of leaves, debris, and other obstructions.
- Filling tanks and vessels with enough material to secure them against buoyancy forces and help keep them from floating away.
- Removing any accumulated rainwater from storage tank spill containment areas (bunds).

## Emergency Equipment and Supplies

Even with every foreseeable protective measure taken, a major storm can cause significant water ingress and other impacts that demand emergency-level response. In planning for that response, your hurricane safety plan should include:

- Verifying dewatering pumps are in service and working.
- Filling fuel tanks for emergency generators, diesel fire pumps, water heaters, and other vital services.
- Confirming non-perishable goods, food, potable water, etc., are in good condition.

## Wind Protective Measures

Even if the building structure itself has been engineered to withstand a major windstorm, the damage wind alone can do during a storm should not be underestimated. This is especially true on construction sites or other locations where freestanding equipment and objects may be common. 48 hours ahead of the storm, be sure to:

- Remove debris from outdoor areas on the site and around it that can become dangerous “missiles” in high winds.
- Remove or secure loose outdoor equipment.
- Ensure yard equipment is not directly placed on the ground and adequate clearance (approximately 1 foot) under the equipment is provided.
- For new construction projects, in addition to removing/securing loose equipment:
  - Secure and protect material storage.
  - Temporarily brace new construction.
  - Secure roofing and items on the roof.

## Equipment Shutdown

If it's clear the storm may impact your property, any potentially hazardous equipment (pipelines for natural gas and oxygen, which take several days to shut down, are prime examples) needs to be shut down until it's safe to resume operations. Two essential steps in doing this are:

- Verifying you have the necessary supplies to safely shut down equipment.
- Ensuring the pertinent operators are aware of safe shutdown procedures.

## Business Continuity Plan Actions

Your business continuity plan should align with all four stages of your overall ERP. Within that plan, these actions specific to the 48-hour pre-storm period should be prioritized:

- Notify suppliers of any impending shutdown, as well as alternative production facilities.
- Inform risk managers and all others within the organization involved with the business continuity plan of actions being taken.
- Maintain contact with suppliers of pipeline-delivered materials.
- Ship out as much stock as possible. Verify all stock is elevated at least 1 foot above finished floor level or store it in a protected area.
- Back up your computer data to a location that will be protected from the windstorm.

## 36 Hours Before the Storm

With the storm now closer to landfall, immediate actions may need to be taken, falling under the three areas below:

### Additional Flood and Storm Surge Protective Measures

Where the flood and storm surge protective actions taken 48 hours before the storm are focused on keeping loose equipment and debris from becoming a hazard, these measures are more focused on protecting equipment and property from water and wind damage.

- Raise critical equipment above the expected inundation level, if known, or at least 1 foot above floor level.
- Move critical equipment from basements and other below-ground areas to secure upper levels of the building.
- Install any manual protection systems (e.g., shutters, plywood covers, and flood gates) you have available.
- Set up flood barriers (if necessary) at all ground-floor doors and entrances, especially of operations-critical structures. Seal all openings in the building envelope at ground level.
- Seal buildings under construction to avoid entry of wind-driven rain.

## Operations Shutdown

Depending on the type of business, some operations may need to continue as long as possible before the threat of the storm is imminent, but the 36-hour pre-storm period is a prudent guideline for ensuring the following steps are taken in time:

- Stop incoming shipments of raw materials that will be exposed to damage.
- Initiate an orderly shutdown of production equipment and systems that rely upon utility power.
- For manufacturing facilities, shut down processes that could be exposed to damage.
- Turn off non-essential electrical systems and fuel and gas services.
- Evacuate non-critical personnel if roads are safe for travel.

## Securing Potentially Windborne Materials

With the storm now closer, additional wind-protection tasks need to follow those already completed 48 hours before the storm. These include:

- Removing and securing small equipment (e.g., cable tray covers, roof-mounted ventilation hoods, etc.).
- Removing or securing scaffolding.
- Securing outdoor storage or equipment that cannot be moved.
- Anchoring portable buildings or trailers to the ground.
- Covering critical stock and equipment with well-secured waterproof tarpaulins.

Preparing the needed hurricane procedures for businesses 48 and 36 hours before a major windstorm can be the difference between having a resilient business and one overly vulnerable to storm-related risk exposures.

As mentioned earlier, these actions should be part of a fully developed hurricane Emergency Response Plan (ERP).

# Activate your hurricane emergency response plan

The threat is clear. The National Weather Service, National Hurricane Center, and local forecasters are reporting that a named storm is headed for landfall in your area — and your business is in its path. You have a robust Emergency Response Plan developed in anticipation of just such an event. With approximately 12 hours before landfall, it is time to fully implement your plan and prepare for what is about to happen, so your people, property, and business will weather the challenge and emerge resilient on the other side.

## Within 12 Hours of Landfall

### Implement Your Emergency Response Team (ERT)

Give the word to your ERT members to evacuate to pre-defined secure areas on your premises — such as your emergency command center — for the duration of the event. Continuously monitor radio, television, internet reports, and any available local warning services to stay current on the developing crisis.

### Inspect Your Infrastructure and Building

Inspect your building and property for weak points and for any objects or equipment that might become wind-driven projectiles. Realize that you are likely to lose local infrastructure — electrical power, municipal water, and other services — for several days following the storm.

Note that paved or hardscape areas may be undermined by storm surges. Verify the status of protection systems, such as water supplies, sprinkler systems, fire alarms, and security systems.

## Immediately After the Storm

### Secure Site in Preparation for Employees' Return

Immediately after the storm, survey your site for any hazards, such as electrical wires, broken glass, sharp metal, leaking fuel tanks, or other hazards. When returning to inspect your site, bring identification, necessary supplies, and take pictures to document conditions. Communicate with local authorities to verify that roads are clear and there are no threats of landslides, local surface runoff, or other hazardous conditions.

Do not turn on electrical systems until you have verified that all water leakage has been discovered and corrected. Have qualified personnel thoroughly check all utility systems, including roof-mounted equipment, photovoltaic systems, and hazardous processes.



## **Execute Emergency Repairs**

Initiate emergency repairs immediately, promptly notifying contractors with whom you have relationships so that you will not have to wait in line. Establish repair priorities, emphasizing your building envelope, utilities, and fire protection systems.

Focus on any impairments of protection systems, and post fire watches in areas where protection systems may be impaired. Also, post security personnel in areas where building and site access is not suitably controlled.

Begin salvage operations as soon as possible to prevent further damage to the building and contents. Be careful to avoid accumulations of combustible materials inside the building. Avoid storage of materials and equipment in areas where protection is impaired or which have been contaminated by sewage, fuel leakage, and other contaminants.

Clear roof drains, balcony drains, and ground-level catch basins and drains in anticipation of future rain events. However, do not access the roof until it has been certified safe. Initiate a detailed inspection of the entire building envelope by qualified personnel.

## **Administration and Claims Reporting**

Maintain communications with your corporate management and your insurance broker. Contact your insurance carrier to report your claim and to report any fire protection impairments that may require expedited repairs.

All these actions should be part of a fully developed hurricane Emergency Response Plan (ERP), from preparation through recovery.

# Hurricane disaster recovery planning: 10 tips for business owners

Getting your business back on its feet after a hurricane strikes can be a time-consuming and sometimes frustrating experience. If there's an upside, it's this: Although you cannot control a hurricane, you can control your recovery activities after the storm passes.

Remember that the first step to recovery after a storm is filing a claim with your insurance provider and discussing the claim with an adjuster. Zurich customers can find information about filing a claim online at [www.zurichna.com/claims](http://www.zurichna.com/claims).

Of course, what you did before hurricane season can determine the success of your recovery efforts. Implementing and practicing a hurricane response plan tailored to your business will pave the way for a more effective recovery.

Following are 10 steps from Zurich's Resilience Solutions' Risk Engineering team to help you restore your business operations. But first, some cautionary notes: In your eagerness to return to normal, don't cut corners, which can lead to subsequent, more serious losses. Following proper protocols helps assure the safety of your rebuilding team and your employees, and also will support a business that's more resilient than it was before the storm.

## 1. Maintain Communications

A hurricane will likely result in some level of business interruption. Timely, responsive communication is key. Establish and maintain internal and external communications with appropriate parties, including:

- **Onsite personnel:** Keep in touch with employees who have remained onsite for guidance on their welfare and any supplies or resources they need.
- **Corporate management:** As the recovery process continues, provide periodic updates on conditions and progress.
- **Your insurance distributor and carrier:** You likely called your insurance representatives to begin the claims process. But in addition to providing updates, don't hesitate to ask for guidance as the recovery process continues. They have the experience and resources you may need during this stressful time.
- **Displaced personnel:** Deliver updates via channels such as your company website, text messages, social media, and/or phone messages.
- **Your customers and vendors:** Update your website's homepage or blog to communicate with them. Social media and text messaging can help you keep your business connected. You may also want to record daily updates on your general phone line.
- **Local and federal governmental agencies:** Contact for support and information regarding regional protocols, updates, and resources.



## 2. Put Safety First

A variety of risks can exist in a hurricane-compromised property. Assuring the safety and security of workers has to be your first priority. Some ways to protect yourself and your helpers during the days (and possibly weeks) of the recovery process include:

- Always have properly trained personnel on hand to help assess and navigate the risks.
- Everyone must wear appropriate personal protective equipment, including steel-toed safety boots, hard hats, safety glasses, and heavy work gloves.
- Bring additional supplies such as water and disinfecting solutions.
- Be aware of the risk of heat stress. Ample drinking water should be visible as a reminder to hydrate. Workers wearing heavy gear should be limited to 20 minutes per hour in extreme temperatures.
- Monitor physical stress on employees. More effort than is typically required may be exerted during flood cleanup and other labor-intensive disaster recovery tasks. Overdoing it can result in avoidable injuries.
- Depending on the extent of damage and type of business, a disaster can expose employees to toxic environments and disease. Providing protective masks may help reduce these risks, but properly trained health and safety specialists should survey the damage as soon as possible.

## 3. Familiarize Yourself with Hazards Unique to Hurricanes

Flooding and wind damage from hurricanes can create a variety of structural, chemical, and electrical hazards. These include:

- Live electrical wires
- Broken glass and sharp metal
- Leaking fuel gases or flammable liquids
- Damaged building features or contents that may shift or collapse; flooding and wind can loosen shingles and downspouts
- Paved or hardscape areas undermined by wave action and subject to collapse
- Flammable atmosphere in vapor space of flammable storage tanks
- Animals and pests that may have relocated during the disaster, seeking shelter

**A note about animals:** Frightened animals, whether they're family pets or rats and snakes, may be more likely to bite or scratch people who encounter them. They are often injured in storms, which can make them more dangerous. Do not attempt to handle animals yourself, and seek immediate treatment if bitten or injured by an animal.

## 4. Document Damage

Bring a fully charged smartphone and a backup camera to document conditions with photography and video. Consider a portable energy pack for your phone, too. Document damage to physical structures as well as inventory, supplies, furniture, contents, equipment, and business losses from interruption. Track expenses as well.

## 5. Assess Your Property

You should have conducted a rudimentary inspection immediately after the storm. When feasible, perform a more thorough examination of your protection facilities and/or systems for problems that may have gone unnoticed on the first go-round. Building integrity may be reduced, fire protection systems may be impaired, and damaged utilities and processes may present hazards.

Start by verifying the status of protection systems. These include water supplies, fire pumps, automatic sprinklers, fire alarms, and security systems. Expedite repairs and post security personnel if protection systems are compromised.

If you haven't already, clear roof drains, balcony drains, and ground-level catch basins and drains, especially if more rain is forecast. If additional floods are predicted in the near term, set up sandbags or other recommended barriers at first-floor doors and entrances.

## 6. Plan and Initiate Repairs

After you've filed a claim with your insurance provider and discussed the claim with an adjuster, you may be able to consider what repairs are needed. Zurich customers can find information about filing a claim online at [www.zurichna.com/claims](http://www.zurichna.com/claims).

Depending on the extent of damage, consider bringing in additional staff from other business locations outside the impact zone to assist with your recovery operations. These staff members can include a facilities planner, safety officer, and accountant. The extra hands will greatly assist in managing the restoration of operations.

Also, promptly notify the contractors who, it is hoped, you have already secured in advance of hurricane season. Keep in mind:

- Establish repair priorities, including the building envelope, utilities, and fire protection systems.
- Always prioritize the protection of your recovery staff and maintain communication with them during cleanup and recovery work.
- Begin the restoration process, starting with essential equipment and systems, but only after they have been cleared for use by qualified personnel.

The duration of your property's shutdown will necessitate different approaches. For more information on restarting operations after a hurricane shuts your business, download these documents from Zurich Risk Engineering: "Management Practices: Locations Unoccupied Long-Term and Restart Procedures" and "Management Practices: Locations Unoccupied Temporarily."

## 7. Begin Salvage Operations as Soon as Possible

You may have begun this work immediately after the storm. Depending on the size of your facility, it's important to get this done as quickly as possible. Steps to take:

- Separate damaged goods.
- Save all damaged goods.
- Avoid accumulations of combustible materials inside the building.
- Avoid storage in areas with impaired fire protection.
- Be cautious when removing debris. Wreckage and rubble can hide structural damage and other changes. Workers removing debris must also use proper lifting techniques to avoid potential injuries.

## 8. Check Your Data Recovery Systems

Since there is advance warning when a hurricane approaches, it is likely that you backed up, transferred, and/or transported important business data to an alternate recovery site or secured facility. Your most critical data includes your business license, major contracts and legal documents, tax returns and financial statements, and other important business and customer documents. Following a disaster, make sure these vital records are still securely accessible from the devices you'll be using.

## 9. Clean and Disinfect as Soon as You Can

Whatever the strength of a tropical storm or hurricane, lingering rain and damp conditions can lead to flooding and water damage. The rapid growth of mold and bacteria after floodwaters seep into a property can create serious setbacks to storm recovery, both from property and health standpoints. Controlling and mitigating mold damage is not a difficult process, but it's a crucial step that needs to be done as soon as possible.

### Additional resources

[Guide: Securing rooftop equipment to resist wind loads](#)

[Guide: Wind resistance of low-slope roof edge systems](#)

[Windstorm response plan](#)

Once the water recedes and you've documented damage, begin cleaning your business (with your team or by hiring a qualified professional). If you still have standing water, rent a sump pump to remove it. Electric fans, portable dehumidifiers, and water vacuums can help dry out smaller areas, but only when it's safe to begin using them (i.e., your electric systems are safely functioning and there is no standing water).

Clean, then disinfect all surfaces with hot water and bleach. Dry thoroughly. Decide whether furniture and other water-contaminated materials (floorboards, paneling, etc.) can be salvaged and dried or if they need to be discarded.

## 10. Conduct a Review

When your business is operating again, take the time to review your hurricane response and recovery processes. What worked, and what didn't? Did the vendors you contracted with come through? Were mistakes made from lack of planning? Were there critical tasks you overlooked? Talk to your employees and reassess how effective your plan was. And don't forget to acknowledge the things you did right and thank everyone who helped in the crisis. You'll be better prepared for the next challenge.

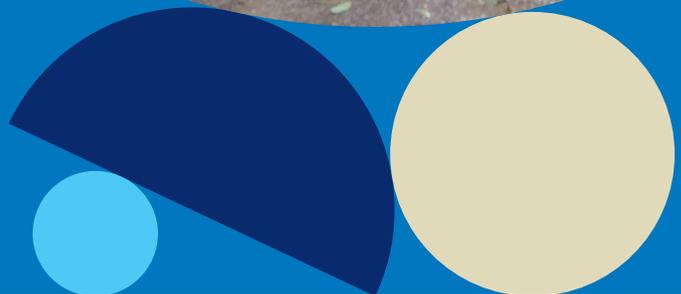
These recovery actions should be part of a fully developed hurricane Emergency Response Plan (ERP). The articles below detail the other three major components of a windstorm ERP: mitigation, preparedness, and immediate response. Taken together, they can provide your business with a path to reduced risks and faster recovery.

### References

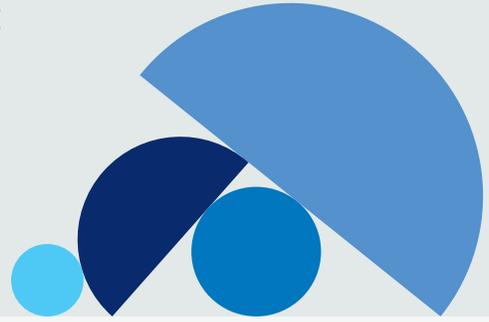
- <sup>1</sup> ["Rebuilding Your Business After a Natural Disaster."](#) Business News Daily. 12 May 2020.

# Conclusion

Hurricanes and tropical storms present formidable challenges, but with thorough planning and preparation, their impacts can be mitigated. A well-crafted and diligently executed Emergency Response Plan (ERP) is essential for safeguarding your business and ensuring the safety of your employees. This comprehensive packet provides guidance on actions you can take to prepare for, respond to, and recover from these natural disasters. From initial preparations and securing your property to post-storm recovery and restoration, each phase is crucial for building resilience. By following these guidelines and continually updating your ERP, your business can emerge stronger and more resilient, ready to face future challenges with confidence. Remember, while you cannot control the storm, you can control your response and recovery, paving the way for a safer and more secure future.



Visit the Zurich Natural Hazards Resource Hub at <https://www.zurichna.com/knowledge/natural-hazards-resource-hub> for more insights to help your business prepare for, respond to, and recover from natural hazards, including Hurricanes, Floods and Convective Storms.



[Previous page](#)

[Front cover](#)

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