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Earthquake Preparedness and Response Guide

POWER THROUGH PARTNERSHIP

Contents

Introduction

Earthquakes are a serious threat in the United States. Although certain states (e.g., California) and regions are at higher risk than others, the Insurance Information Institute reports earthquakes have occurred in 39 states. The organization also notes that one of the largest earthquakes in U.S. history had its epicenter in Missouri, demonstrating that even areas not traditionally associated with seismic activity may be at risk.

These natural disasters are measured by their magnitude and intensity. To determine their magnitude, a seismometer measures the shaking of the ground directly underneath it. The shaking is expressed in whole numbers and decimal fractions (e.g., 3.5, 5.4, 6.7). Because the utilized scale has a logarithmic basis, every whole number increase represents a tenfold increase in measured amplitude.

The Richter scale is the most familiar earthquake measurement scale; however, it is not commonly used anymore, except for locally recorded small earthquakes. Instead, the moment magnitude scale is considered a more accurate measure of the size of an earthquake. Although the magnitude scale's figures are roughly the same as the Richter scale's measurements for small to large earthquakes, it is more capable of accurately measuring very large earthquakes. The following chart from Michigan Tech provides more information on earthquakes' potential magnitudes:

Magnitude	Effects	Estimated Frequency Per Year (Worldwide)
2.5 or less	Generally, not felt but detected by seismographs	Millions
2.5 to 5.4	Usually felt, minor damage	500,000
5.5 to 6.0	Slight damage to buildings and structures	350
6.1 to 6.9	May cause a lot of damage in highly populated areas	100
7.0 to 7.9	Major earthquake with serious damage	10-15
8.0 or greater	Great earthquake that can completely destroy communities near the earthquake's epicenter (the location on Earth's surface directly above where the earthquake starts)	Once every year or two

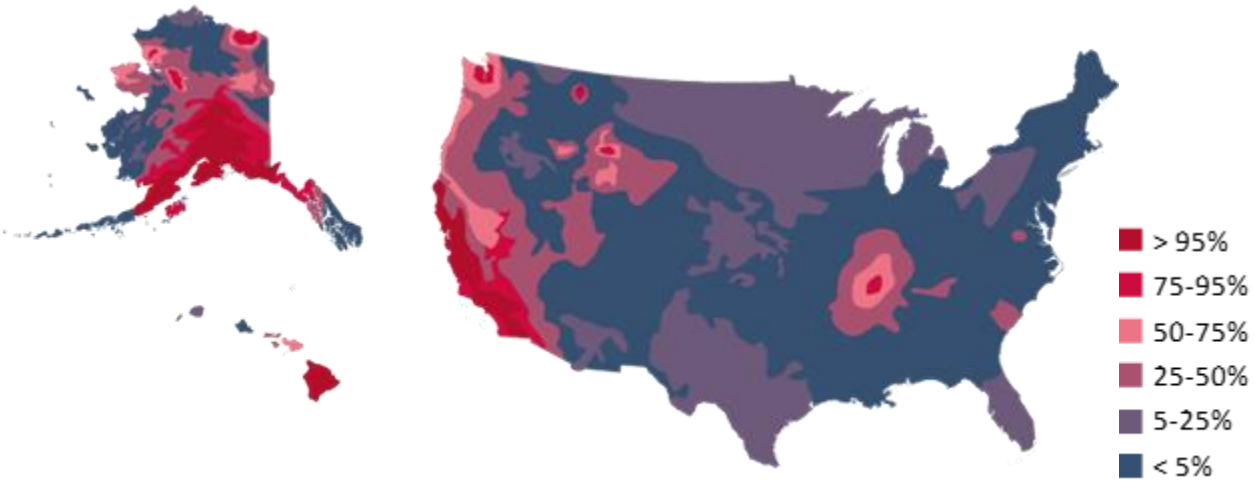
Source: https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/magnitude/

In addition to serious injuries and fatalities, earthquakes can cause substantial damage to commercial property, creating lengthy business interruptions or leading to permanent closure. Every year, there are thousands of earthquakes capable of damaging property. A joint report from the U.S. Geological Survey (USGS) and the Federal Emergency Management Agency estimated that earthquakes cost the country approximately 14.7 billion per year in building damage and associated losses. The report also stated that the total economic exposure of buildings at risk of earthquake damage in the United States is $107.8 trillion. It is important that businesses take action to improve their properties' safety and durability and have plans and procedures in place to react to and recover from these natural disasters.

This guide provides an overview of earthquake preparedness and response planning essentials, detailing steps to take before, during and after an earthquake to keep personnel safe and minimize damage to commercial property. It also explains how businesses can resume operations swiftly following an earthquake. The appendix provides a checklist to assist businesses in earthquake preparedness planning.

Assessing Earthquake Risks

To be adequately prepared for earthquakes, businesses must assess the risks. Although different regions have varying exposures, a recent USGS-led team of scientists and engineers reported that nearly 75% of the United States could experience damaging earthquake activity. The same team also noted that 37 states have experienced an earthquake exceeding magnitude 5 in the last 200 years while developing the latest National Seismic Hazard Model (2023) that displays the likelihood of damaging earthquake activity over the next 100 years (below).



Chance of slight (or greater) damaging earthquake shaking in 100 years

Source: https://www.usgs.gov/media/images/national-seismic-hazard-model-2023-chance-damaging-earthquake-shaking

While this model is intended to help inform building and structural designs, earthquakes remain unpredictable, and only a few areas of the country (i.e., the Pacific Northwest) have access to an early warning system known as the USGS ShakeAlert Earthquake Early Warning System. This technology detects earthquakes when they begin and provides a warning to people so they can act before the damaging quaking reaches their location.

In addition to being aware of the likelihood of an earthquake occurring at a business's location (checking with local government agencies can provide additional clarifications), it is essential to understand the ways earthquakes can impact businesses:

- **Damage to buildings and contents** can occur due to the violent shaking from the initial earthquake or aftershocks. This can create costly property losses and lead to substantial disruptions of services.
- **Disruption to utilities,** including gas, electricity, and telephone services, can immediately impact operations, but it can also lead to lengthy business interruptions, possibly resulting in lost profits.
- **Dangerous conditions for occupants** are likely to be present during and after an earthquake. Such conditions may entail falling objects, broken glass, complete or partial building collapses, the generation of toxic dust and the creation of leaks that release toxins. These conditions can lead to serious injuries or fatalities of building occupants, including employees and clients.

- **Secondary perils** are the aftereffects of a primary peril. In the case of earthquakes, secondary perils may include fires, landslides, floods, and tsunamis, all of which can cause significant property damage or bodily injuries.

Steps to Take Before an Earthquake

To properly prepare for an earthquake, a business must implement measures to protect people and property and prepare for the risk of fires following the seismic event. Businesses should also ensure earthquakes are part of their business continuity plans to resume critical operations and that they carry adequate insurance to cover losses created by earthquakes. By taking these actions, businesses can help safeguard their employees and clients, reduce the risk of property damage to their buildings and contents, and mitigate potential business interruptions and financial impacts.

Protect People

Businesses must take steps to protect people. Since earthquakes occur quickly with little to no advanced warning, planning and preparation can reduce the chances of injuries and loss of life. In addition to ensuring buildings are positioned to withstand earthquakes and that their contents do not present falling risks to occupants, the following actions can be taken to protect employees and others:

- **Develop a disaster recovery plan (DRP) that addresses the risks identified.** Having a DRP before an earthquake can help ensure individuals' safety. Businesses often incorporate disaster recovery strategies in their overall business continuity strategies, which define roles and responsibilities, establish an emergency response team, and create proper communication protocols and a chain of command. While planning, it is important to consider that emergency services may not be immediately available in the aftermath of an earthquake.
- **Organize supplies.** Earthquakes can disrupt utilities and supply chains for extended periods of time. Individuals may be stranded at a business location for various reasons, such as damaged or congested transportation infrastructure. An emergency supply kit can help address individuals' immediate needs following an earthquake. Make sure water is available for drinking and sanitization and nonperishable food is on hand. Supplies should include battery-powered radios, flashlights, first-aid kits, dust masks, and cellphone battery backups. It may be beneficial to include a whistle to signal for assistance, as well as sanitation items such as moist toilettes, feminine supplies, hand sanitizer, and garbage bags. Having fire extinguishers and blankets available is also crucial.
- **Provide safety training and conduct earthquake drills.** Employees must be educated on how to recognize the signs an earthquake is occurring and how to respond to them. It is also important to

conduct drills on the “drop, cover and hold on” method as well as provide instruction on first aid and fire safety techniques (e.g., how to use a fire extinguisher).

- **Consider aftershocks and secondary perils.** While the initial earthquake can cause significant damage and injuries, be aware of the risks of aftershocks and secondary perils. Aftershocks are smaller earthquakes that occur after the main shock. They can take place in the first hours, days, weeks, or months after the initial earthquake. Also be aware that some earthquakes are foreshocks, and a larger earthquake might occur later. Secondary perils including fires, power outages, gas leaks, toxin releases, landslides, tsunamis, and unstable soil also need to be considered.

Protect Property

Ensuring property is positioned to withstand earthquakes can help reduce potential damage and costly losses. Having the facility inspected by a structural engineer can also help identify vulnerabilities. To mitigate these risks, businesses should take the following proactive steps:

- **Retrofitting buildings** with structural reinforcement is crucial to protect structures from earthquake damage. This can be done with techniques such as adding seismic bracing to suspended ceilings; installing shear walls; strengthening frames, columns and building foundations; and following an engineer’s seismic retrofitting plans to fortify unreinforced masonry walls. Installing flexible pipe fittings on water and gas lines can also improve durability. Protective films can be placed on glass windows and doors to help prevent shattering. Safety glass can also be utilized. If recommended by the gas company, businesses should install an automatic gas shut-off valve that is triggered by strong vibrations.
- **Securing contents** by fastening bookcases, shelves, furniture, equipment, large appliances and machines to the floor or wall with proper seismic anchoring systems may prevent damage. Wire mesh or other barriers can be placed in front of other objects to prevent them from falling, and bracing equipment suspended from the ceiling appropriately is crucial. Heavier items should be kept on bottom shelves, and combustible or flammable liquids should be separated and stored on low racks in accordance with National Fire Protection Association Guidelines.
- **Protecting digital assets** is as important as securing physical property. Businesses should ensure all important data has been frequently and securely backed up offsite or in a cloud. Using uninterruptible power supplies can also safeguard data during power outages, and securing technology with specialty hardware protection devices (e.g., those that isolate the most sensitive components or safety storage racks designed to counteract the shaking from earthquakes) can also be beneficial. Furthermore, having a data recovery plan in place is crucial if data is lost or corrupted.
- **Following building codes** enables businesses to mitigate damage from natural disasters proactively. Building codes regulate the design, construction, maintenance and alteration of buildings and other structures. They are adopted and enforced by state, local, tribal and territorial jurisdictions. The latest codes are written with the latest geoscience information available; therefore, businesses can help ensure their property is best positioned to withstand earthquakes by following the most recent building codes.

Prepare for Fires After Earthquakes

Fires are a frequent risk to businesses following earthquakes. In fact, OSHA describes them as the most common earthquake-related hazards. Fires may ignite because of seismic events due to downed power lines, electrical shorts, chemical leaks and cracked gas lines. Flammable debris strewn around by earthquakes may allow fires to spread more quickly. Moreover, the conditions in an earthquake's aftermath can make firefighting more difficult. For example, water supplies may be unavailable, disrupted utilities may affect automatic fire protection systems, and roads may be damaged or blocked, delaying responders who may also be difficult to reach due to overtaxed phone networks or high demand.

Considering these obstacles, businesses must take the following measures to address the risks of fires to people and property:

- Construct buildings with fire suppression systems.
- Ensure multiple types of fire suppression equipment (e.g., fire extinguishers) and systems (e.g., sprinkler systems and heat-activated fire doors) are available and in working order.
- Keep flammable materials secure.
- Inspect power sources and electrical equipment before turning them back on.
- Provide training on fire extinguisher use, evacuation routes, signs that a fire is occurring, as well as turning off power and gas supplies and avoiding elevators.

Businesses should also review their insurance policies to ensure coverage is in place for losses caused by fires following an earthquake.

Include Earthquakes as Part of a Business Continuity Plan

A business continuity plan outlines how businesses can restore critical operations during an unplanned service disruption. However, studies have shown that more than half of all organizations worldwide do not have a business continuity plan in place. These businesses are at an increased risk of financial loss, reduced productivity, reputational damage, and business failure.

When creating a business continuity plan, it is crucial to identify the most severe threats by focusing on the most likely disruptions and their potential impact. A business continuity plan should include:

- **Plan development**—By developing a plan framework, organizing recovery teams and developing relocation plans, businesses can ensure the correct steps are in place to help reduce or eliminate risks that can cause property damage, business interruptions and injuries.
- **Outline procedures for business continuity**—Preparing for business continuity helps minimize delays and reduce downtime. It is advisable to review and coordinate business continuity plans with suppliers and partners and to plan for supply chain disruptions. Having alternative suppliers available can also help ensure operations continue following an earthquake.
- **Business impact analysis**—Businesses should identify events that could compromise operations, assess the severity of the threats, and detail steps to eliminate or minimize their impact.
- **Recovery strategies**—After a disaster, a business must assess which critical functions are needed for the restoration of operations. Businesses can develop recovery strategies by identifying and documenting resource requirements, conducting gap analyses, and exploring recovery strategy options.
- **Testing and exercises**—To successfully execute a business continuity plan in the face of disaster, it is crucial to develop testing, exercise and maintenance requirements for the plan. In addition, training should be conducted, and an orientation process should be developed for new employees.

Secure Proper Insurance

Businesses should review their insurance policies with a licensed professional to ensure earthquake damage and resulting business interruptions are covered. Generally, regular commercial property insurance policies do not cover damage caused by earthquakes. However, commercial property owners have the option to purchase earthquake insurance to financially protect against damage specifically caused by earthquakes, as well as additional perils that may arise from earthquakes, such as fires, explosions, and sprinkler leakage. Policy details to consider include:

- **Property coverage** to ensure the building(s) and its contents (including inventory) are sufficiently covered.
- **Lost income coverage** to provide a financial cushion if a business interruption occurs.
- **Extra expense coverage** to help pay for additional expenses that may be incurred while operating from a temporary location.
- **Building code coverage** to help cover expenses that arise to repair a building up to code.

Steps to Take During and Immediately Following an Earthquake

Once an earthquake begins, there are several actions businesses must take to help ensure the protection of their employees. Employers should direct employees to:

1. **Drop** onto their hands and knees.
2. **Cover** their head and neck with their arms.
3. **Hold** on until the shaking stops.

Individuals on the premises should be advised to crawl underneath a sturdy table or desk for shelter if one is nearby. If that option is not available, they should crawl next to an interior wall away from windows (if it is possible to do so without going through an area with debris) and remain on their knees, hunched over to protect their vital organs.

If there is an individual who uses a wheelchair or a walker with a seat, they should:

1. **Lock** their wheels.
2. **Bend forward**.
3. **Cover their head** with their arms and their neck with both hands.

Employees should be trained to avoid elevators during an earthquake, as power outages can cause them to get stuck. The shaking can even create structural damage to the elevator shaft and the elevator's safety features, making its use hazardous. Furthermore, following an earthquake, emergency personnel may need to use elevators to help, and employee use may make elevators congested or unavailable.

Employees should be trained to stay outside in an open area away from falling debris (e.g., buildings, trees, power lines, utility poles) if they are outside when an earthquake strikes. Employees should also be instructed to bang on a pipe or wall or use a whistle to signal for help if they become trapped.

Once the shaking ceases, businesses should:

1. **Account for the whereabouts** of all employees.
2. **Administer first aid** if necessary.
3. **Ensure masks are available** and are being utilized to protect from polluted air.
4. **Establish communication channels** with emergency responders and reach out to them as needed.
5. **Monitor and know how to respond to** aftershocks and secondary perils (e.g., fires, power outages, gas leaks, tsunamis) that can cause additional injuries and damage.

Furthermore, employees should be ready to evacuate all business locations, including factories and warehouses, if authorities deem it necessary and it is safe to do so. A clear chain of command with the designation of the individual in the workplace authorized to order an evacuation should be in place, as should specific evacuation procedures that list routes and exits. Businesses must also consider how to assist those

with disabilities or language barriers, if any workers need to shut down critical operations or perform other duties before evacuation, and if any special equipment or personal protective equipment (e.g., escape respirators) is needed. There should also be a designated area in the facility, away from exterior walls and windows, where personnel should gather after an earthquake if evacuation is not necessary.

Steps to Take After an Earthquake

Earthquakes can still pose a threat after the initial shaking has stopped and cleanup efforts have begun, as the risk of secondary perils and aftershocks are still present. Additionally, businesses must consider how to navigate the insurance claims process to mitigate potential financial losses. Without a strategic recovery plan in place, they may struggle to resume normal operations.

Along with executing DRPs and business continuity plans, businesses should follow these steps to help rebuild their businesses after an earthquake:

- **Return when safe and assess the damage.** Once emergency personnel and government agencies have given the "all clear" and licensed professionals (e.g., engineers or architects) have certified the building is safe for personnel to enter the building, businesses can begin assessing the damage. Assessors should ensure they take the proper safety precautions by wearing protective clothing (e.g., boots, gloves, hard hats, eye protection and masks). The assessment report should extensively detail the property damage discovered and track losses to inventory, equipment, and supplies.
- **Take pictures and videos.** Before cleanup efforts begin, it is best practice to document the damage with pictures and videos, as they are often needed for insurance claims.
- **Check for other potential hazards.** The site and building should be inspected for harmful debris, broken glass, sharp metal, weakened utility poles, live electrical wires, fuel, gases, or flammable liquids. Safety and fire hazards must be removed. Furthermore, qualified professionals should check water, gas and electrical lines, fire protection systems, and electric appliances and equipment. The appropriate authorities may need to be notified depending on what is discovered.
- **Initiate cleanup, repairs, and salvage.** When the assessment is complete, contractors can be hired for cleanup and repair. Businesses should establish priority repairs and look to salvage property when it is safe to do so. They should also consult with local experts to begin the restoration process.
- **Contact an insurance company and an agent/broker.** Businesses must consult an insurance representative for information regarding filing claims and restoring their property. Submitting comprehensive documentation, pictures, and videos to the insurer is also helpful in claims processing.
- **Return to work when safe, having contingencies ready and offering support.** Employees should only return to work when it is safe to do so. Businesses may also need to consider contingency plans regarding moving to temporary locations, utilizing alternative suppliers, and adjusting their operating hours. Businesses should offer support to returning employees through flexible work arrangements and counseling resources.
- **Maintain communications.** Throughout the recovery process, businesses should maintain internal and external communications with corporate management, insurance professionals, displaced personnel, customers, vendors, and local and federal government agencies.

After immediate needs have been addressed, businesses can review their actions and update their disaster plans accordingly. Receiving input and feedback from multiple parties can help strengthen these

policies and procedures. It is also crucial to regularly update these documents and to conduct drills and training, so employees know how to respond if another earthquake strikes.

Conclusion

There are several measures businesses can take to appropriately prepare for and respond to earthquakes. Since no two organizations are exactly alike, each business must assess its own risks thoroughly to guide the actions it should take to protect people and property and ensure business activities can resume as soon as possible following a disaster.

Earthquake preparedness is ongoing, so employers should continually update and improve DRPs and ensure they have appropriate insurance coverage in place. Contact us today for more information and risk management guidance.

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APPENDIX

POWER THROUGH PARTNERSHIP

CHECKLIST

Earthquake Preparedness for Businesses

Date: _____ **Assessment conducted by:** _____

Earthquakes occur suddenly and without warning. They can cause serious injury, death, business interruptions, and damage to buildings and their contents. They can also disrupt utility services and trigger landslides, avalanches, flash floods, fires, and huge ocean waves called tsunamis. Aftershocks can occur for weeks following an earthquake.

Businesses should have a plan for earthquakes. Consider the following preparedness guidelines.

Preparation Procedures	Not Completed	Completed	Comments
Check with local government agencies for the earthquake risk for your area.	☐	☐	
Ensure compliance with all applicable building codes.	☐	☐	
Have the facility inspected by a structural engineer to assess its vulnerability to earthquakes.	☐	☐	
Based on feedback from the engineering inspection, prioritize and develop building strengthening measures.	☐	☐	
Inspect the facility for items that could fall, spill, break or move during an earthquake.	☐	☐	
Place large and heavy objects on lower shelves or the floor and hang heavy items away from where people may be located.	☐	☐	
Properly secure shelves, cabinets, tall furniture, desktop equipment and fixtures.	☐	☐	
Secure fixed equipment and heavy machinery to the floor.	☐	☐	
Add bracing to suspended ceilings if necessary.	☐	☐	
Install safety glass where appropriate.	☐	☐	
Secure large utility and process piping.	☐	☐	
Save copies of facility design drawings that can be used to assess the facility's safety after an earthquake.	☐	☐	
Review the processes for handling and storing hazardous materials and ensure incompatible chemicals are stored separately.	☐	☐	
Establish procedures to determine whether evacuation is necessary after an earthquake.	☐	☐	
Designate an area in the facility, away from exterior walls and windows, where personnel should gather after an earthquake if evacuation is not necessary.	☐	☐	

Provide training to personnel on how to drop, cover and hold on while avoiding windows, skylights and items that could fall if they are indoors during an earthquake.	☐	☐	
Provide training to personnel on avoiding elevators and using the stairways if evacuation is necessary.	☐	☐	
Provide training to personnel on how to move into the open and away from buildings, streetlights, and utility wires if they are outdoors during an earthquake.	☐	☐	
Provide training to personnel on how to react to an earthquake if they use a wheelchair or walker with a seat or if they have a disability that could impact their response.	☐	☐	
Establish emergency plans for addressing secondary perils that threaten all locations (e.g., fires and power outages) and those that may be location-dependent (e.g., flooding, tsunamis, landslides, mudslides, and avalanches).	☐	☐	
Place fire extinguishers in strategic locations, train employees on how to use them and inspect the fire extinguishers on a regular basis.	☐	☐	
Review insurance policies to ensure earthquakes and their associated losses are covered.	☐	☐	
Develop policies on when it is safe to enter the building, initiate cleanup, and repair, and return to work.	☐	☐	
Develop a business continuity plan.	☐	☐	

For more risk management guidance, contact your AssuredPartners representative.

Additional Resources

- Federal Emergency Management Agency https://www.fema.gov/emergency-managers/risk-management/earthquake
- The National Earthquake Hazards Reduction Program https://www.nehrp.gov/
- U.S. Geological Survey https://www.usgs.gov/
- Ready.gov https://www.ready.gov/earthquakes
- Occupational Safety and Health Administration https://www.osha.gov/earthquakes/resources
- Central United States Earthquake Consortium https://cusec.org/
- U.S. Centers for Disease Control and Prevention https://www.cdc.gov/earthquakes/about/
- U. S. Environmental Protection Agency https://www.epa.gov/natural-disasters/earthquakes
- American Red Cross https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/earthquake.html

Emergency Contacts:

Insurance Agent/Broker	
Building Owner	
HVAC Contractor	
Electrician	
Plumber	
Other	