



# Affordable, effective ways to protect your business from earthquake damage

Unlike most other natural disaster events, earthquakes have no season and they can cause devastation any time of the year without warning. Earthquakes also can occur in areas not previously considered to be in seismically active areas, as seen with the rare quake in Mineral Springs, Virginia, in August 2011. Recognizing this risk, it makes sense for businesses in many areas of the country to invest in affordable, effective earthquake protections throughout the year.

## WHAT HAPPENS WHEN THE EARTH MOVES?

As the foundation of the building moves to follow the ground motion caused by an earthquake, the building structure tries to follow along. The result is large inertial forces generated by the movement of the mass of the building's walls, floors, roof and contents. The lateral forces caused by the side-to-side motion are usually the most damaging. To survive an earthquake, a building's structure must absorb the energy associated with these forces and provide a stable path to transfer the forces back to the ground.

A building is more likely to perform better in an earthquake when its structural system is properly designed to resist lateral loads and detailed to absorb the energy. A major part of this design is the establishment of a continuous load path, which can absorb the energy. This load path is achieved when the roof and floor systems are properly connected to the walls and/or structural frame, and the walls and/or structural frame are properly designed and anchored to a strong foundation.

## STRUCTURAL VERSUS NON-STRUCTURAL PROTECTIONS

Building design and construction can vary greatly. Time of construction and codes used, building shape, materials, structural frames and their inter-connections all relate to the structural integrity of a building. There are multiple ways to construct a building using different types of systems that will have varying structural resistance to seismic ground movements. To determine your building's risk for structural damage from an earthquake, consult a structural engineer.

Although major changes to your building's structure may be quite costly and time-intensive, there are other more affordable retrofits available. These types of non-structural retrofits are intended to reduce interior damage, as well as damage to water, gas and power systems. The improvements can be quite effective in maintaining the functionality of the building during earthquakes that produce ground motion

below the design level. A detailed list of possible non-structural retrofits can be found at [www.disastersafety.org/](http://www.disastersafety.org/) earthquake.

If you decide to retrofit your structural system, the best time to do this is when you are making a significant change, such as remodeling or re-siding the exterior. Be sure to enlist the help of a knowledgeable structural engineer to both assess the vulnerability of your structural system and to design the retrofits. If you rent your business space, you may not have the authority to make structural changes to your building. Speak with your building manager or landlord about what actions might be taken to strengthen your building so that it can better resist a potential earthquake.

According to the California Seismic Safety Commission, the foundation and superstructure only account for approximately 20 percent to 25 percent of the original construction cost of a building, while the other 75 percent to 80 percent is made up of mechanical, electrical and architectural elements within the building. It is, therefore, extremely important to protect interior elements and systems, both for life safety reasons and to reduce financial losses due to property damage. Start with these simple measures outlined below:

- Fasten bookcases and cabinets to nearby walls when possible, or stabilize central bookcases by attaching them back-to-back to each other. Further reduce spillage by affixing self-locking latches to cabinet drawers or doors.
- Secure electronic equipment to the floor or table surface with braces, hook and loop closures, or heavy glue to prevent overturning.
- Secure picture frames, bulletin boards, and other wall mounted equipment to the wall using closed screw-eyes to prevent falling.
- Brace storage shelves to withstand side-to-side movement and make sure they are well anchored to the floor. Place

heavier objects on the bottom, as well as secure them to nearby walls if possible.

- Use a protective film on all glass windows, doors and walls to prevent shattering, which can cause serious injury.
- Replace rigid plumbing supply lines and couplings with flexible braided lines and flexible couples to reduce the chance of rupture.
- When possible, ensure the hangers supporting your mechanical and plumbing systems are less than 12 inches long to reduce the sway during a tremor.
- Brace mechanical equipment such as boilers, furnaces, air conditioning equipment, and water heaters to the wall and/or floor to prevent overturning or shifting.

## PROTECTING YOUR DATA AND DATA CENTERS

Information and information technology are the lifeblood of most businesses. Whether a business is small, medium or large, the importance of protecting data is vital. However, both data and data equipment are at risk if you do not take steps to protect them from an earthquake.

Bracing the expensive equipment in your data center is critical but can be tricky to accomplish. Because of the sensitive nature of the equipment, rigid bracing techniques could result in damage from excessive shaking during an earthquake. There are several unique solutions on the market, some of which isolate the most sensitive components and others that utilize specialty storage racks, which gently move in the direction opposite to the ground motion to provide a stable surface for the equipment.

Along with protecting information technology, including protection measures for your data is an important part of your business continuity plan. Following an earthquake, businesses may not have access to their buildings to get to their computers. Your data is not actually lost, but without access to vital records and critical information, it is unlikely your business will be able to quickly control and manage the event successfully.

Managing these records and having a backup plan will be critical to your success. There are many options for how to back up and store your company's vital data and records; make sure you investigate what best suits your company. When it comes to protecting data, follow these three steps regardless of the solution you choose:

- Minimize the risk of losing data at your primary location (i.e., limit who has access to your data, or consider the security of the environment in the area where your computers are located);
- Backup the data frequently and ensure your data is available offsite in case it is lost from the primary location, and
- If data is corrupted or lost, have the ability and know how to recover the data.

## RACK STORAGE

Ideally, buildings with warehouse space that include open frame/pallet racks should also include seismic-rated rack storage. Seismic-rated rack storage is specifically designed to resist and counteract the ground motions created by an earthquake. A seismic study can be performed by a qualified licensed structural engineer to evaluate proper design, including appropriate uprights, beams, connections, height, average pallet loads, rack layout, etc., for new and existing rack storage systems in a particular seismic zone.

### ADDITIONAL GUIDANCE FOR RACK STORAGE:

1. Check local building codes and municipality requirements for rack design.
2. Larger and thicker foot plates should be used to provide greater floor anchorage.
3. Wall ties can be used to secure racks located along walls.
4. Wire decking can be installed to prevent items from falling through.
5. Wire mesh or barriers can be used on the face and rear of the racks to prevent items from falling from the front or back side of the racks.
6. Store heavier items on the bottom to reduce the potential for overturning of the racks.
7. Segregate and store liquids on the bottom with a wire mesh or barrier on the face and rear of the rack to prevent from falling out of the rack. Combustible/flammable liquids in storage racks may also have additional fire protection requirements not discussed here.
8. Segregate and store Level 2 and 3 aerosols on the bottom with a wire mesh or barrier on the face and rear of the rack to prevent from falling out of the rack. Level 2 and 3 aerosols in storage racks may also have additional fire protection requirements not discussed here.
9. Racks that include in-rack sprinklers should also include proper bracing of sprinkler piping.
10. See also : "[Seismic Considerations for Steel Storage Racks located in areas accessible to the public](#)" FEMA Publication 460, prepared by the Building Seismic Safety Council for FEMA.

Business owners should also consider an uninterruptible power supply (UPS), as power outages are common after an earthquake. A UPS provides battery backup that aids in saving data by keeping computer systems running without interruption when the power fails.

If you operate a business in an earthquake zone, IBHS recommends meeting with Information Technology specialists and engineers to determine a solution that best fits your company's needs.

## FIRE PROTECTION SYSTEMS

Fire following earthquakes can result in loss of life and economic damage that is more severe than the damage from the earth movement itself. Possible causes of fire following earthquake include broken gas and power lines, spilling or pooling of flammable liquids, damaged equipment or appliances becoming electrically charged, and chemical hazards.

Making sure your fire sprinkler system is operational following an earthquake poses special challenges due to the possibility of a rupture or malfunction. Newer buildings are likely to be built to modern codes that will include proper designs to allow for the sprinkler system to move along with the building. Older buildings, however, may lack sufficient bracing to properly protect the sprinkler system during earthquakes. Adequate sway bracing of your sprinkler system will help ensure that the system remains operational to contain or extinguish a fire, as well as prevent extensive water damage even if there is no fire following an earthquake. A fire protection engineer can assist you in providing adequate sway bracing for system risers, cross mains, branch lines, etc. in accordance with the National Fire Protection Agency's [NFPA 13, Standard for the Installation of Sprinkler Systems.](#) Non-water based type automatic fire suppression systems, such as clean agent fire suppression, CO2, restaurant/cafeteria fire suppression, foam, etc., should also be evaluated for proper securement and post-earthquake functionality.

## GAS LINES

A broken gas or propane line creates the potential for a fire or explosion. Gas lines should be properly braced and equipped with proper safety devices. Because most gas or propane lines are rigid, they can be torn from their connection points during an earthquake. One way to prevent broken gas or propane lines is to have flexible connection pipes installed between gas or propane appliances/equipment and their supply lines. Gas lines should have an automatic seismic safety shutoff valve at all structure entry points, which will cut the flow of gas when they sense a problem.

## SUSPENDED CEILING AND LIGHT FIXTURES

Contact a professional contractor to properly brace all suspended ceilings and light fixtures if you live in an earthquake-prone area. This is especially important in older buildings that may not have the proper reinforcement to prevent suspended ceilings from collapsing during an earthquake. For relatively new buildings, check to see the suspended ceilings and light fixtures have been properly braced. Most new construction will have been built following modern building codes, which require that ceiling and light fixtures be able to move along with the building when shaking occurs.

For suspended light fixtures, 12 gauge wires or chain straps can be used to keep fluorescent lights and their ballasts from falling during a quake. Each corner should be supported for maximum support, while at least diagonally opposite corners should be supported. Additionally, if fluorescent light bulbs are not shatter resistant, install plastic tubes over the bulbs in case of severe shaking.

## PREPARE FOR A QUICK RECOVERY

An earthquake can not only cause an interruption to business operations, but also can ultimately mean the end for many small businesses that can't recover from such a catastrophic disruption. Completing these projects can go a long way to reducing your earthquake risk and limit the amount of damage that occurs. By limiting the damage, your business can efficiently recover and be up and running under normal conditions.

While reducing the amount of damage to protect your business is critical, it is also important to build a plan. IBHS offers guidance for building a business continuity plan with the [IBHS Open for Business® toolkit](#). By both preparing your business for the damage that can occur during an earthquake and establishing a plan for smooth recovery, the company is in the best possible situation to successfully move forward after a disaster.

Working with other businesses in your area, possibly through local chambers of commerce, is another way to ensure the community stays strong. Consider registering your business or professional organization to participate in the annual Great Shakeout earthquake drill at [www.shakeout.org](http://www.shakeout.org). Learn more about preparing for an earthquake and other disasters by viewing the [joint IBHS and FEMA Multi-Hazard Business Continuity Tools Webinar](#).

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