



EARTHQUAKE PREPAREDNESS FOR LABORATORIES

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Because earthquakes occur with little or no warning, planning and preparation for a potential earthquake must be performed in advance. The following information is provided to help Department Chairs, Principal Investigators, Lab Supervisors, and Lab Personnel perform a self-assessment for their areas of responsibility. Use this information to identify situations that may pose a problem in case of an earthquake.

Certain geologic characteristics and the state's geographical location increases Indiana's vulnerability to earthquakes. Since 1811-1812, several moderate to strong earthquakes have occurred within the central United States, many of which occurred in the Wabash River Valley.

The bedrock in this region permits seismic waves to travel greater distances without rapid decrease in wave amplitude (energy), a property referred to as "low attenuation." Low attenuation may lead to a wider area of damage because the wave amplitude remains high over greater distances as it propagates away from the epicenter.

Surface soils also contribute to earthquake hazards. Soils composed of loose sand and gravel in floodplains actually increase the amplitude of the passing seismic waves causing more intense ground motion. Also, thick soils that are saturated with ground water may liquefy during strong earthquakes causing buildings to move, tilt, or subside.

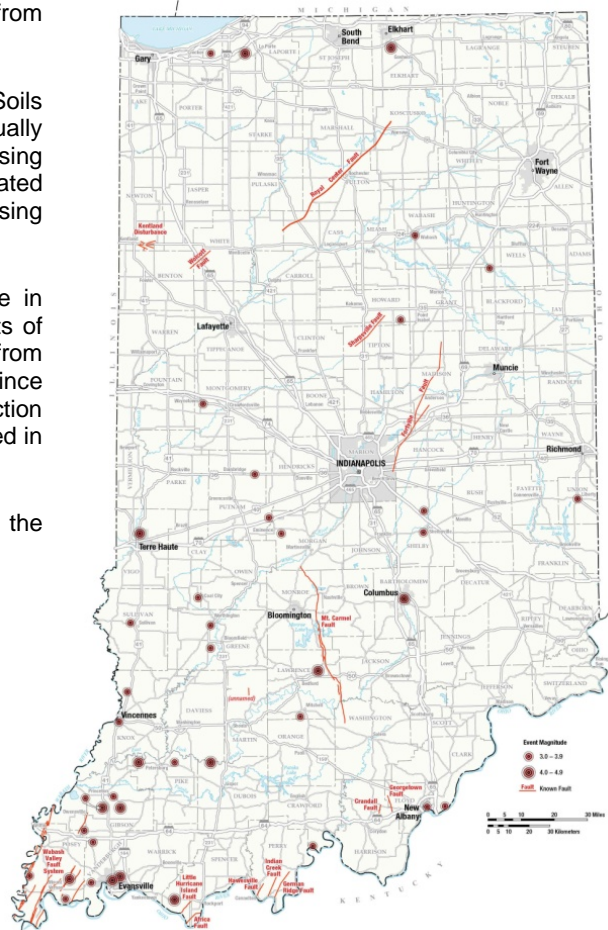
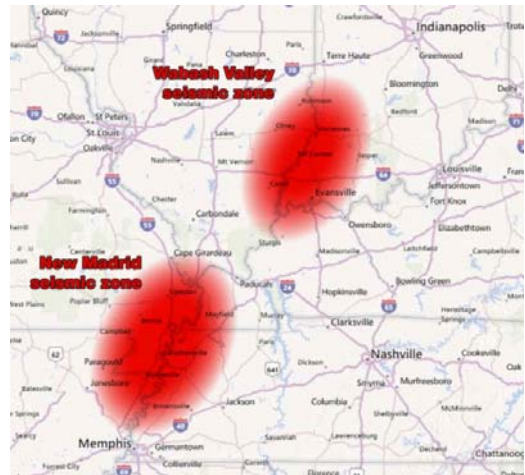
Although Indiana has not experienced a severe earthquake in recent times, residents are susceptible to the negative effects of these natural occurrences. Only 43 earthquakes, ranging from magnitude 3.0 to 4.9 (M3.0-M4.9), have occurred in Indiana since 1817. However, geologists have located paleoliquefaction evidence suggesting multiple strong earthquakes have occurred in the last 12,000 years.

For more information related to earthquakes in Indiana, visit the Indiana Geological Survey Web site at <http://igs.indiana.edu>.

Indiana University Campuses and Counties

IU Bloomington
IUPU Columbus
IU East in Richmond
IU Kokomo
IU Northwest in Gary
IPFW in Fort Wayne
IUPUI in Indianapolis
IU South Bend
IU Southeast in New Albany

Monroe County
Bartholomew County
Wayne County
Howard County
Lake County
Allen County
Marion County
St. Joseph
Floyd County



Campus Administration

Campus administrators should ensure that the following plans are in place and up-to-date.

- The campus Emergency Action Plan
- The campus Business Continuity Plan

General Preparation

To prepare your lab and protect your research assets please consider the following procedures:

- Develop an Emergency Action Plan (EAP) for your workplace including a predetermined location where you and your co-workers will meet after the earthquake. This should be a safe area outside that is clear of overhead dangers.
- Establish a long distance contact for your family. Call them and let them know that in the event of an earthquake, you and your family members will call them to let them know how you are doing and to collect information on others who have called.
- Have an alternative meeting place arranged with your family members in case you can't reach them or stay in your home.
- Develop the habit of thinking, every so often, of what you would do in an earthquake. This will prepare you to react if and when it does happen. It will also help you get your preparations started.

Laboratory Preparation

Earthquakes occur with little or no warning. Thorough preparation and diligence is the key to minimizing the impact.

- Ensure that all contact information on your laboratory sign is correct and up to date. Add temporary contact information if you are away or on vacation.
- Ensure you have the current Emergency Procedure Handbook posted in the laboratory.
- Ensure that safety equipment (i.e., fire extinguishers, safety showers, eye washes) are accessible and in proper operating condition and that everyone in the lab knows how to operate them.
- Ensure that spill containment supplies are available.
- Maintain an emergency evacuation kit with first aid, flashlight, radios, fresh batteries, food, water, and clothing in an easy to carry bag.
- Always keep exits and aisle ways maintained free and clear of obstructions.
- Secure furniture and equipment that might move or tip over in an earthquake including heavy equipment and furniture that might block exit routes. Look for top-heavy free standing furniture, heavy or breakable objects, electronic equipment and appliances, hanging items, mirrors and heavy pictures, unsecured cabinet doors, drawers, and utilities (gas, water, electrical).



Photographs provided by Safe-T-Proof

- Identify equipment and/or processes that could be damaged or pose a fire or health hazard if power was suddenly lost.
- Establish contingencies to provide backup or emergency power to maintain critical system.
- Locate safe and danger spots in your area. Decide if you would go under a desk or table, in a safe corner, or out of the lab against a corridor wall. Consider flying glass hazards from windows, lights and pictures or falling objects such as books and equipment when selecting safe spots.
- Know where the emergency assembly point is for your building, department, or work unit.
- Know where your alternate assembly point in case your first emergency assembly point happens to be downwind of a chemical or gas release or is otherwise unusable.
- Ensure that all gas cylinders are secured. Two cylinder straps or chains fastened to the lab wall are recommended in seismic areas for each cylinder.
- Ensure that pressure regulators are removed and cylinder caps in place on cylinders that are not in use.
- Ensure that chemicals are stored properly.
- Ensure that chemicals are recapped and returned to their storage cabinets immediately after use.

- Ensure that chemical storage cabinets are closed and latched.
- Ensure that chemical storage cabinets are secured to prevent tipping or movement.
- Ensure that chemical storage shelves are equipped with lips or restraints to keep chemicals and glassware in place.



- Always store chemicals in secondary containment trays or tubs.
- Always store incompatible chemicals separately.
- Remove waste chemicals from the lab regularly.
- Plug refrigerators, freezers, and other equipment into emergency power whenever possible. Red outlets are typically connected to emergency generator power. Avoid opening freezers and refrigerators during power outages to maximize cooling ability.
- Secure and protect valuable research samples, radioactive isotopes, biohazardous agents, recombinant materials, synthesized chemicals, radioisotopes, and regulated materials (i.e. controlled substances, explosives, etc.) to prevent breakage, release, or theft.
- Ensure that critical samples and cell lines are placed in multiple locations and under different storage conditions to maximized probability of survival (i.e. frozen samples in ultra-low freezers and liquid nitrogen vessels). Note: Do not store liquid nitrogen vessels in walk-in refrigerators.
- Keep cryogenic Dewars and reservoirs full for any critical sample storage.
- BSL-3 laboratory Directors must have Standard Operating Procedures in place to follow in case of a loss of electricity or ventilation.
- Be prepared for the housing, care and security of laboratory animals.
- Always close fume hoods when not in use to contain spills and provide ventilation (even when closed).
- Always back-up computer files, make more than one copy and store in several different locations.
- Protect any laboratory documents such as lab notes, computer discs and research documentation.
- Ensure you have your identification (ID) with you.

During an Earthquake

- DROP under a desk or sturdy table. Stay away from windows, bookcases, file cabinets, and other objects that could fall.
- COVER until the shaking stops.
- HOLD onto the desk or table. If it moves, move with it.
- Do not leave the building until the tremors have stopped.

Additional tips for other locations:

- If you are in a HIGH-RISE BUILDING and not near a desk or table, move against an interior wall, and protect your head with your arms. Face away from windows. Do not use elevators. Do not be surprised if alarm or sprinkler systems come on.
- If you are OUTDOORS, move to a clear area, away from trees, signs, buildings, or downed electrical wires and poles.
- If you are on a SIDEWALK near a tall building, get into a building's doorway to protect yourself from falling bricks, glass, and other debris.
- If you are DRIVING, slowly pull over to the side of the road and stop.
- If you're in a CROWDED STORE or PUBLIC PLACE, do not rush for exits. Move away from display shelves with objects that could fall on you.
- If you're in a WHEELCHAIR, stay in it. Move to cover, if possible, lock your wheels, and protect your head with your arms.
- If you're in the KITCHEN, move away from the refrigerator, stove and overhead cupboards.



- If you're in a THEATER or STADIUM, stay in your seat or get under it if possible, and protect your head with your arms. Do not try to leave until the shaking is over.

After an Earthquake

Depending on the time and circumstances of the earthquake, you may be asked to stay out of the building for a few minutes to a few days--or indefinitely.

Follow your evacuation checklist. Have it posted near the exit of your lab. This is a check list of essential steps to take before leaving the building. These include, but are not limited to:

- Turn off gas burners.
- Check quickly for fires, fire hazards, or spilled chemicals.
- Check for injured or physically limited people who might have trouble evacuating the building.
- Bring emergency supplies (first aid kit, flashlights, etc.) to the emergency assembly point.
- Close the lab door as you leave.
- Evacuate slowly and carefully. Look before exiting to make sure there is no overhead danger from falling objects, electrical or gas utilities.
- Report to your predetermined location.
- Report or send a runner to report missing persons, injuries, or hazards to emergency management personnel.
- At your meeting spot, assist others, and check on loved ones. Let someone know if you leave.



California Memorial Stadium straddles the active Hayward Fault in Berkeley, California.

Summary

Each of these suggestions could be critical for the health and safety of laboratory occupants. While this article is directed toward earthquakes, please remember that building fires, power outages, and other natural or man-made disasters could have impacts on your laboratory space and staff that some of these preparations may help alleviate. We encourage you to discuss these plans among yourselves and take whatever action is necessary to see that all issues are addressed. It is a good idea to practice your disaster plans periodically to assure:

- That the plans meet the requirements of current laboratory operations,
- That all staff are familiar with both the overall plan and their specific role, and
- That the plan is successful in accounting for staff and in reporting staff and laboratory conditions to key personnel.