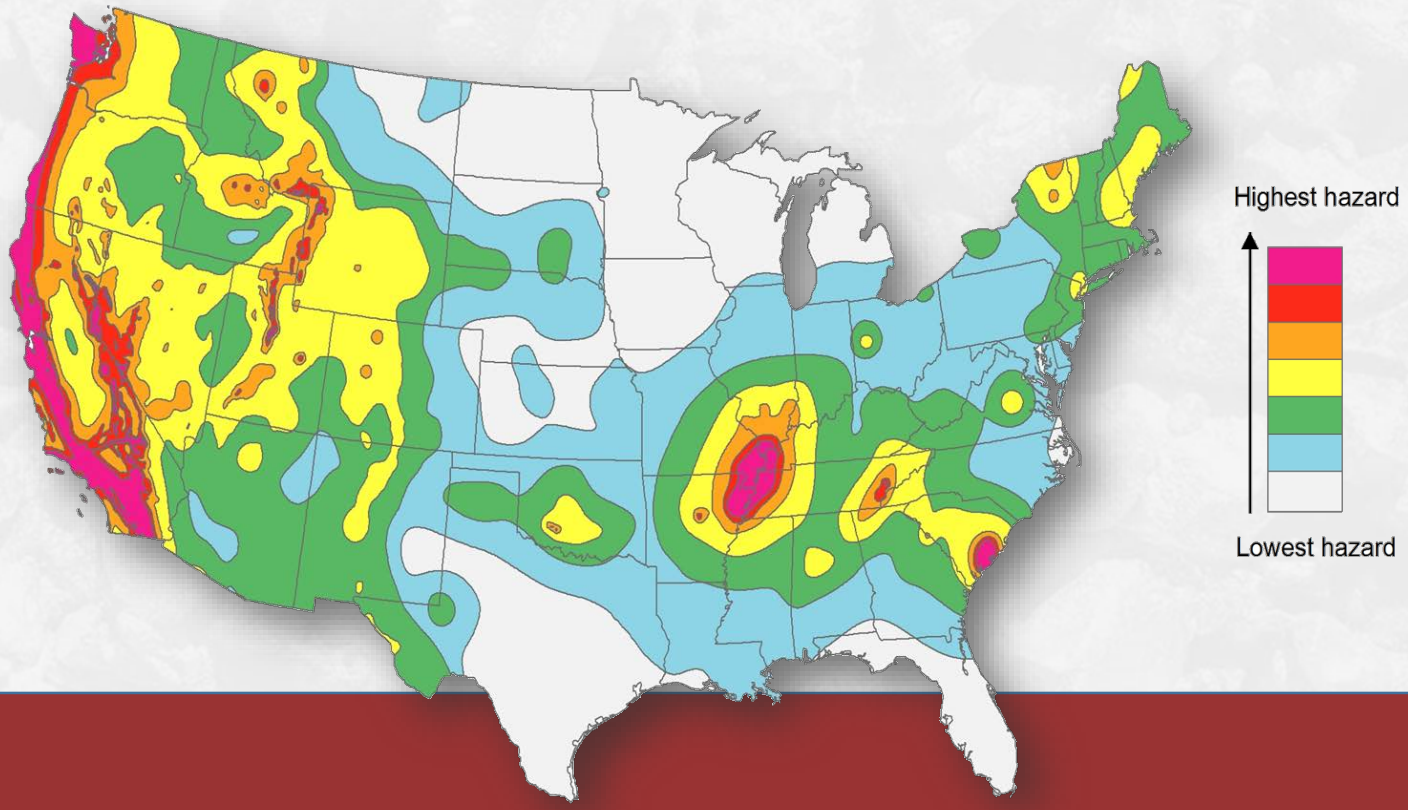
Earthquake Risk Reduction for Healthcare Facilities

January 20, 2020 | Missouri Earthquake Summit | Poplar Bluff, Missouri

CUSEC: A partnership approach

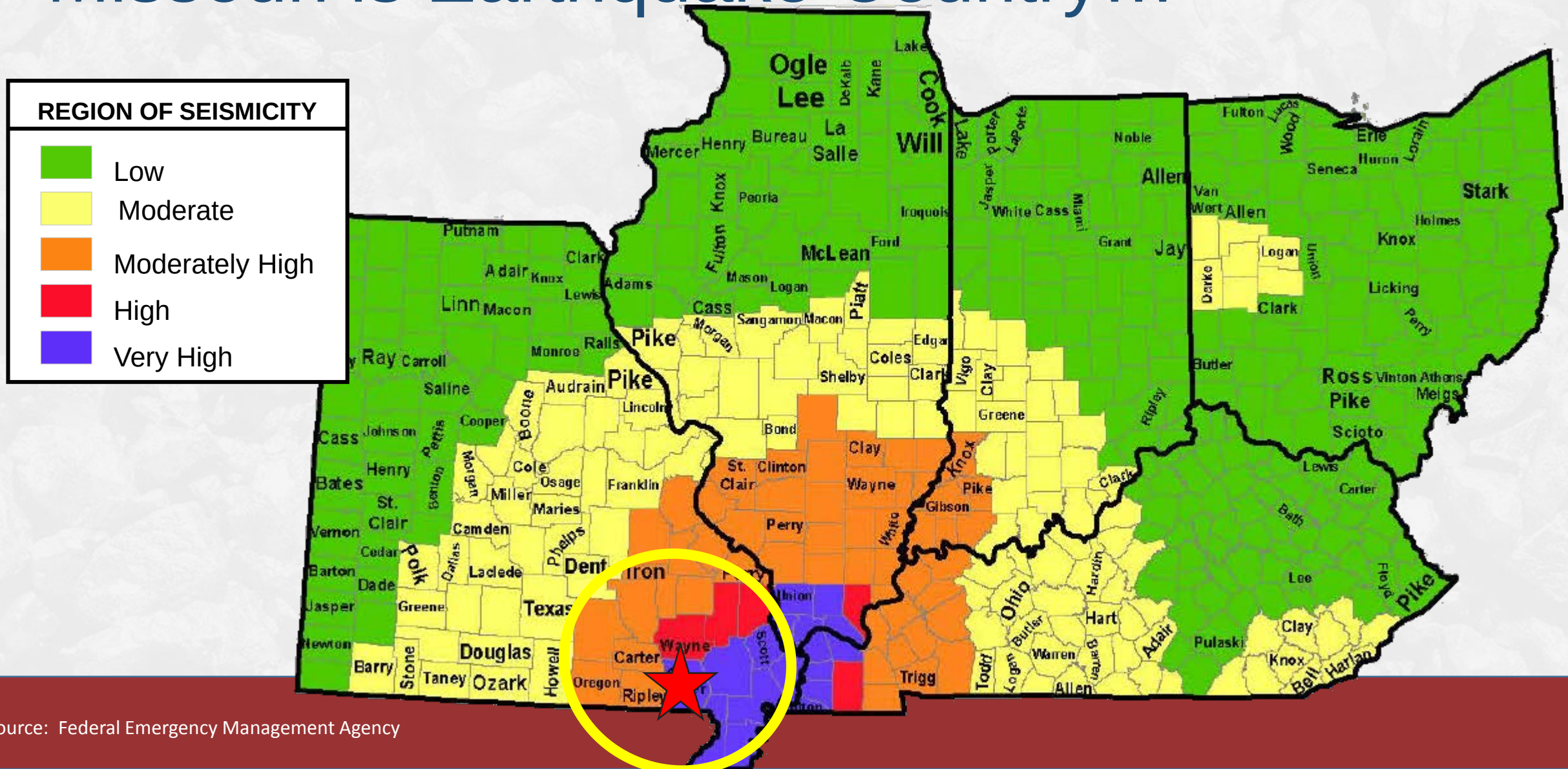
Mission: *"….the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the central United States."*



Overview

- Potential Impacts
- Structural & Nonstructural Concerns
- Mitigation

Missouri is Earthquake Country…



Map Source: Federal Emergency Management Agency

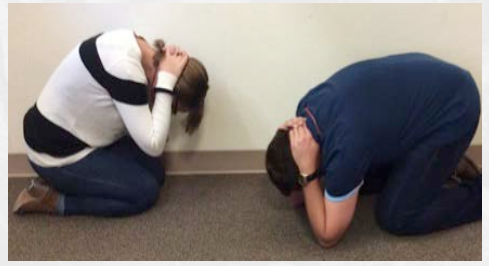
Know How to Protect Yourself...

Christchurch, New Zealand September, 2010 Magnitude 7.0

Know How to Protect Yourself

In *most* situations and building types:

Drop on to your hands and knees, where you are.

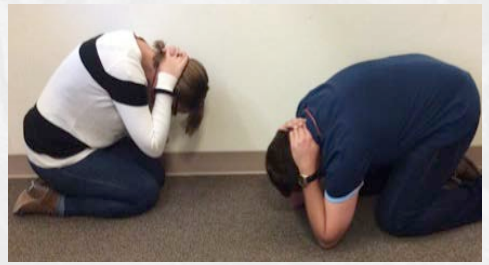


Know How to Protect Yourself

In *most* situations and building types:

Cover your head and neck with one arm and hand.

- *If a sturdy table or desk is nearby*, crawl underneath it for shelter
- *If no table/desk,* crawl against a wall or next to low furniture for sideways protection



Know How to Protect Yourself

In *most* situations and building types:

Hold On to your shelter until shaking stops

- Be ready to move with your shelter
- *If not under a shelter*, hold on to your head/neck with both arms and hands

What are the risks to Healthcare?

Life Safety

- Deaths or casualties

Property Loss

- Dollar loss or cash

Functional Loss

- Downtime or closure

Image Sources: Abilene Reporter-News, Daily Republic, Federal Emergency Management Agency

Post-Earthquake Safety Concerns

- Aftershocks are common
- Fire following
- DO NOT ENTER or RE-ENTER obviously unsafe areas

- Natural gas leaks
- Falling hazards (above/around you)
- Shock/electrocution hazards
- Water/sewage leaks

Unique Disaster Medical Challenges

- Traumatic Injuries
- Compartment Syndromes
- Dust Impaction/Inhalation
- Crush Syndrome
- Hypothermia
- Exacerbation of Chronic Illness

DOUGLAS C. PIZAC/AP

Lessons Learned: Christchurch, New Zealand

- 2/22/2011
- M6.3
- 185 Fatalities
- > 2,000 Injuries

- $30-50 Billion Economic impact

Image Source: https://en.wikipedia.org/wiki/2011_Christchurch_earthquake

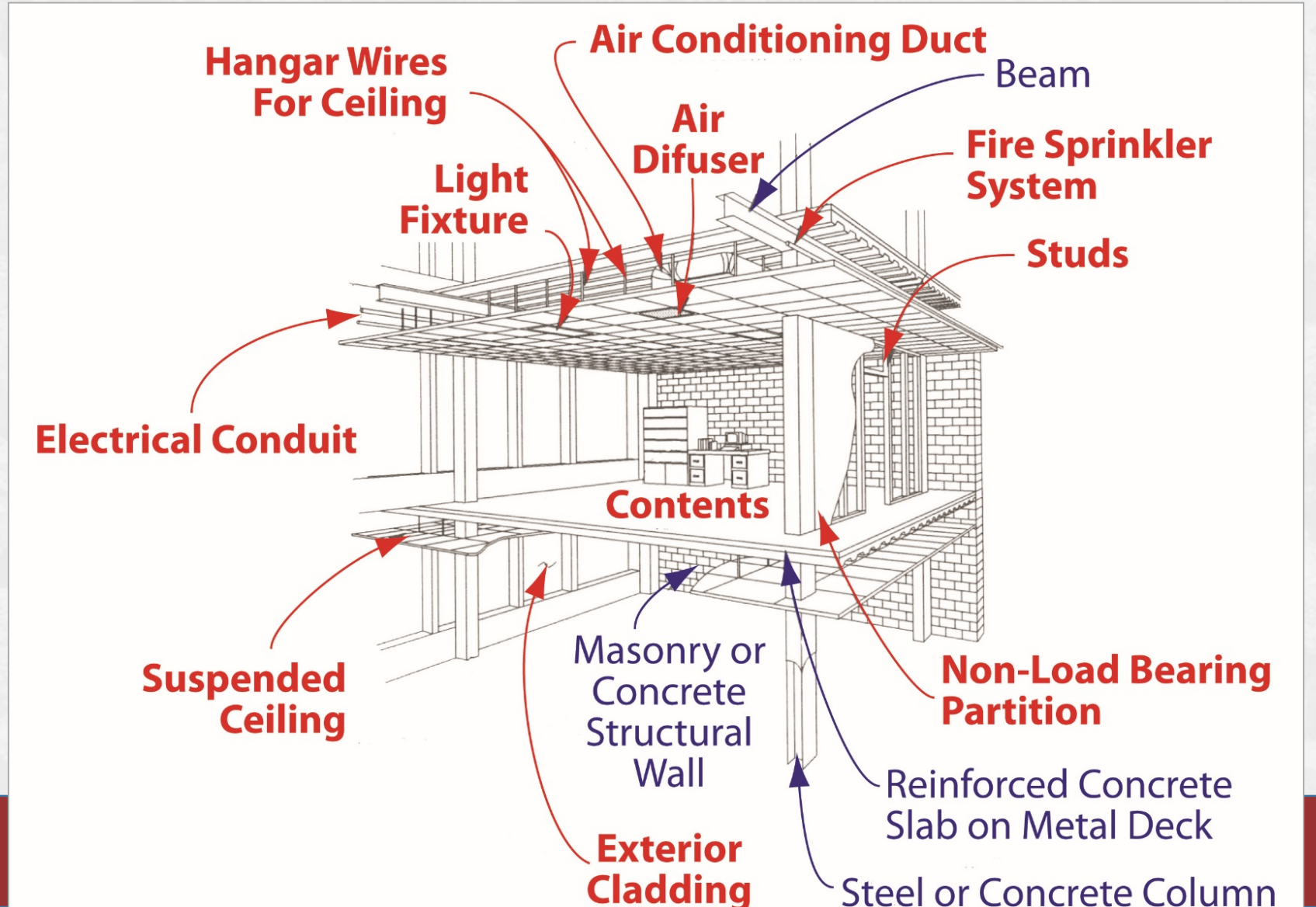

St Asaph St
SMITH
BIKE HQ
metro


AFTER HOURS
RADIOLOGY
• GENERAL X-RAY
• MAMMOGRAPHY
• ULTRASOUND
MEDLAB
4 HOU
SUR
PEGASUS

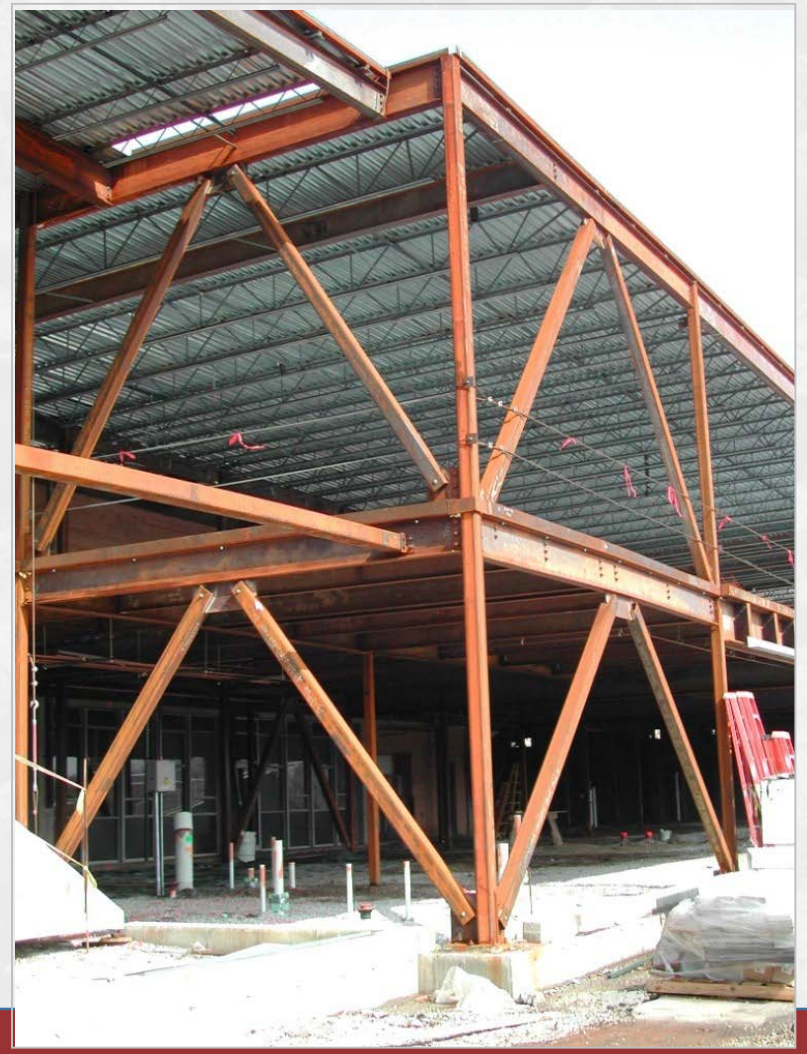
Is your Facility Vulnerable?

- Hazard Exposure
  - Proximity to hazard
  - Site geology
  - Secondary hazards
- Facility Performance
  - Structural components
  - Nonstructural components
  - Critical components
- All-Hazard Preparedness
- External Factors

Structural vs. Non-Structural

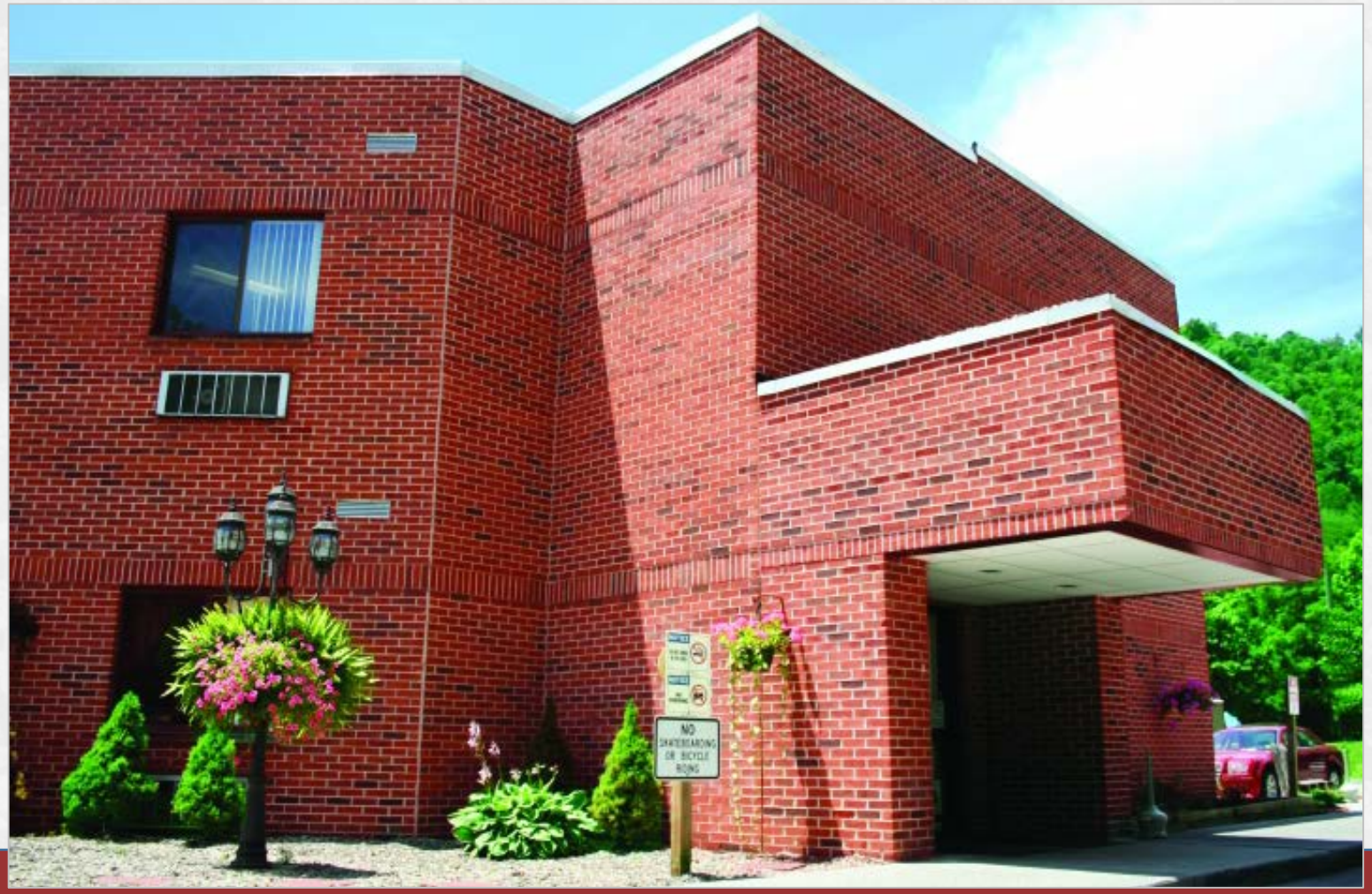


Facility Vulnerabilities: Structural

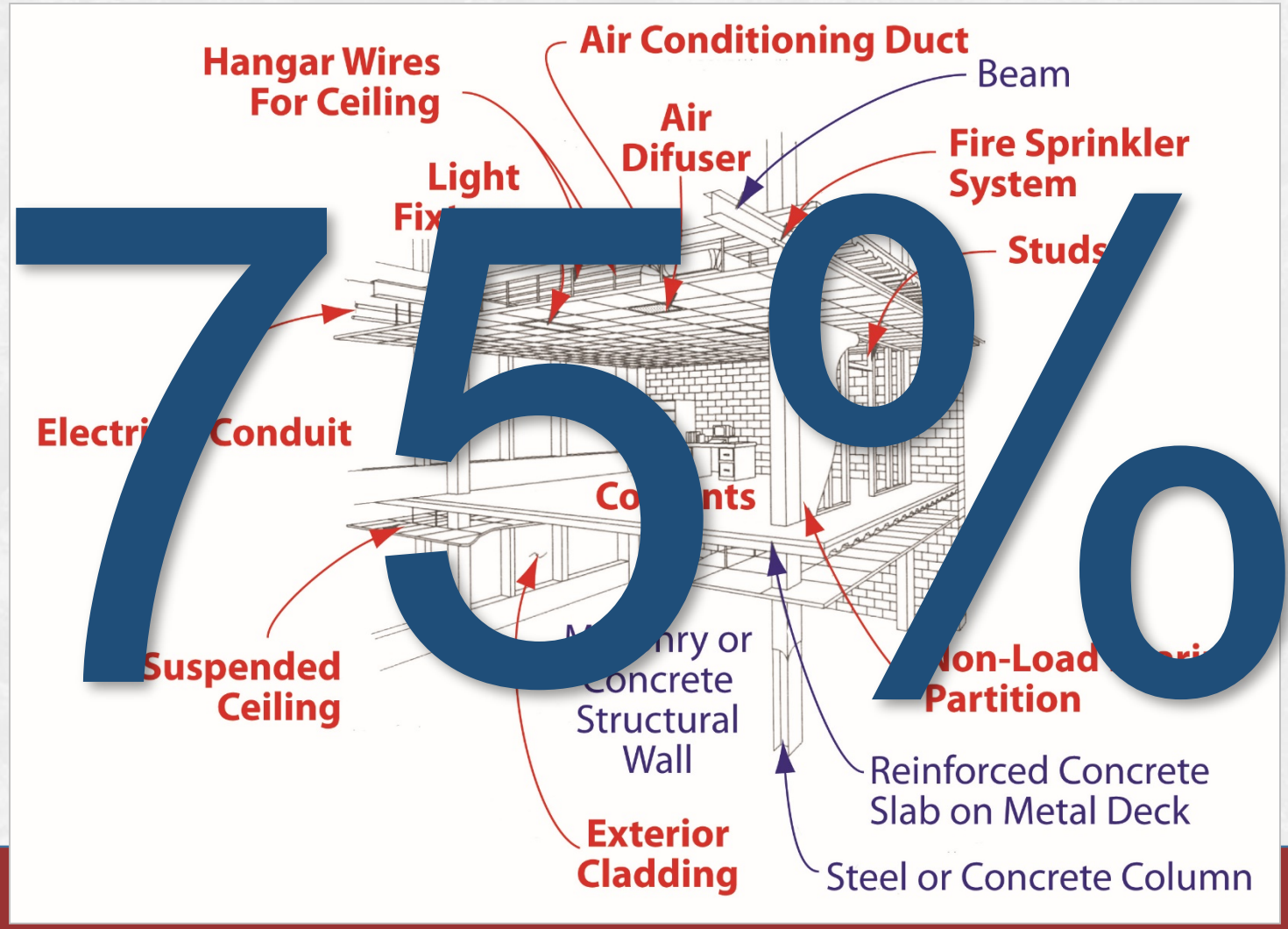


Is This Facility Obviously Vulnerable?

- Built 1985 (pre-code)
- Steel Frame/Reinf. Masonry(?)
- Architectural details
- Site Geology?



Non-Structural Elements



Significance of Non-Structural Damage

- Non-Structural damage impacts:
  - Life Safety
  - Functional Loss
  - Property Loss

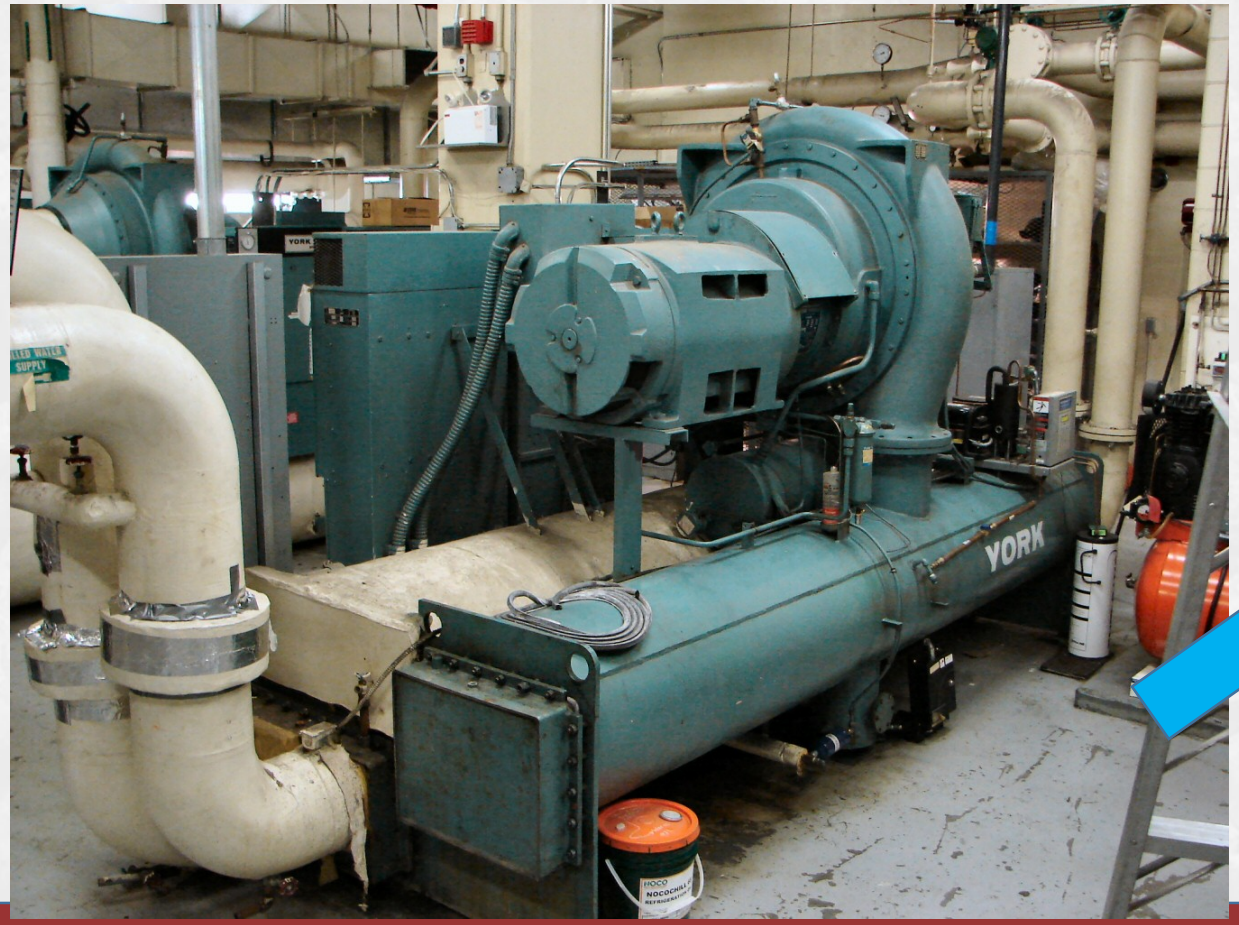
Nonstructural Hazards


PHILIPS

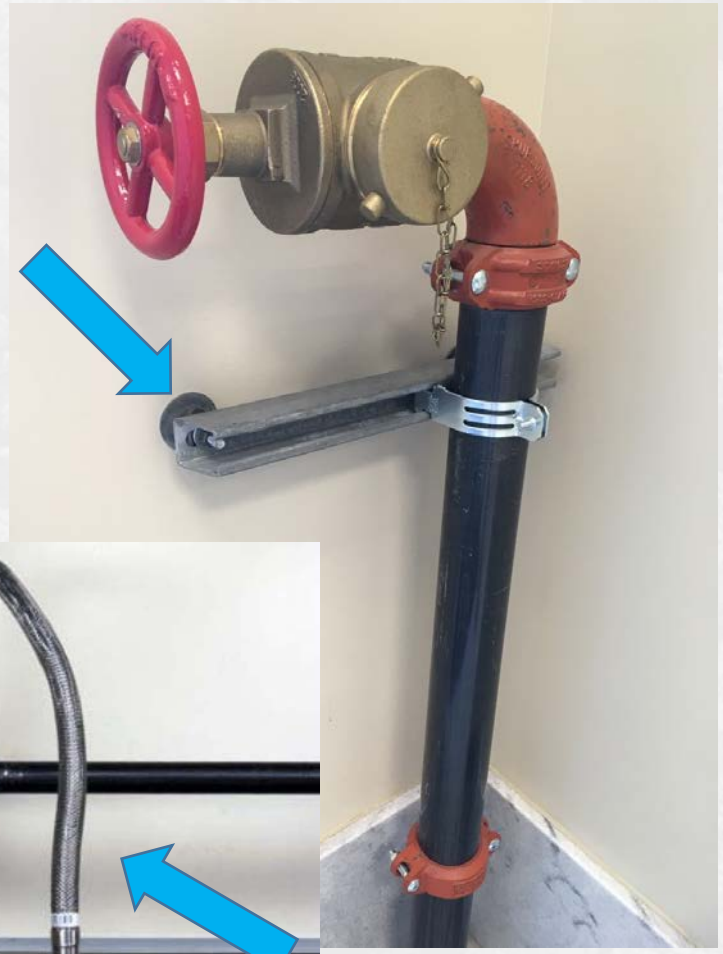

CLOCK
MAQUET

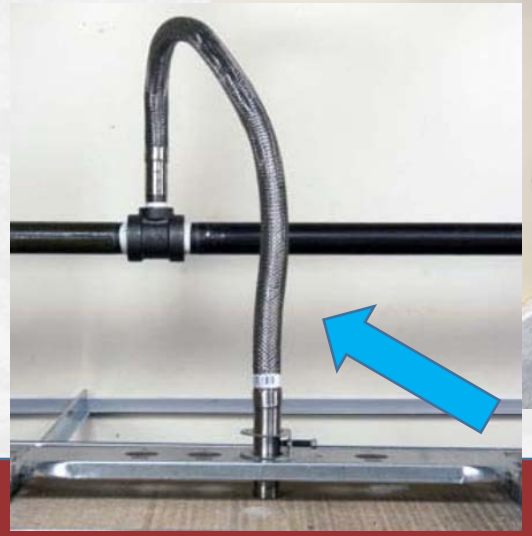
Critical Components: Generator

Critical Components: Heating & Cooling



Critical Components: Other





External Factors

When to call an Engineer…

- Seismic risk assessment
- Critical components
- Some nonstructural items
- After an earthquake…

Non-Structural Mitigation Options

- Retrofit
- Replace
- Relocate
- Replicate (redundancy N+1/ provide a back-up)

- Plan for the consequences of failure

Earthquake Mitigation Challenges

- Disruption to operations/Loss of Space

- Temporary relocation of patients and patient care services
- Specialized areas
  - MRI, X-ray, etc.
  - Pharmacies
  - Bio Hazards
  - Records

- Deep foundations

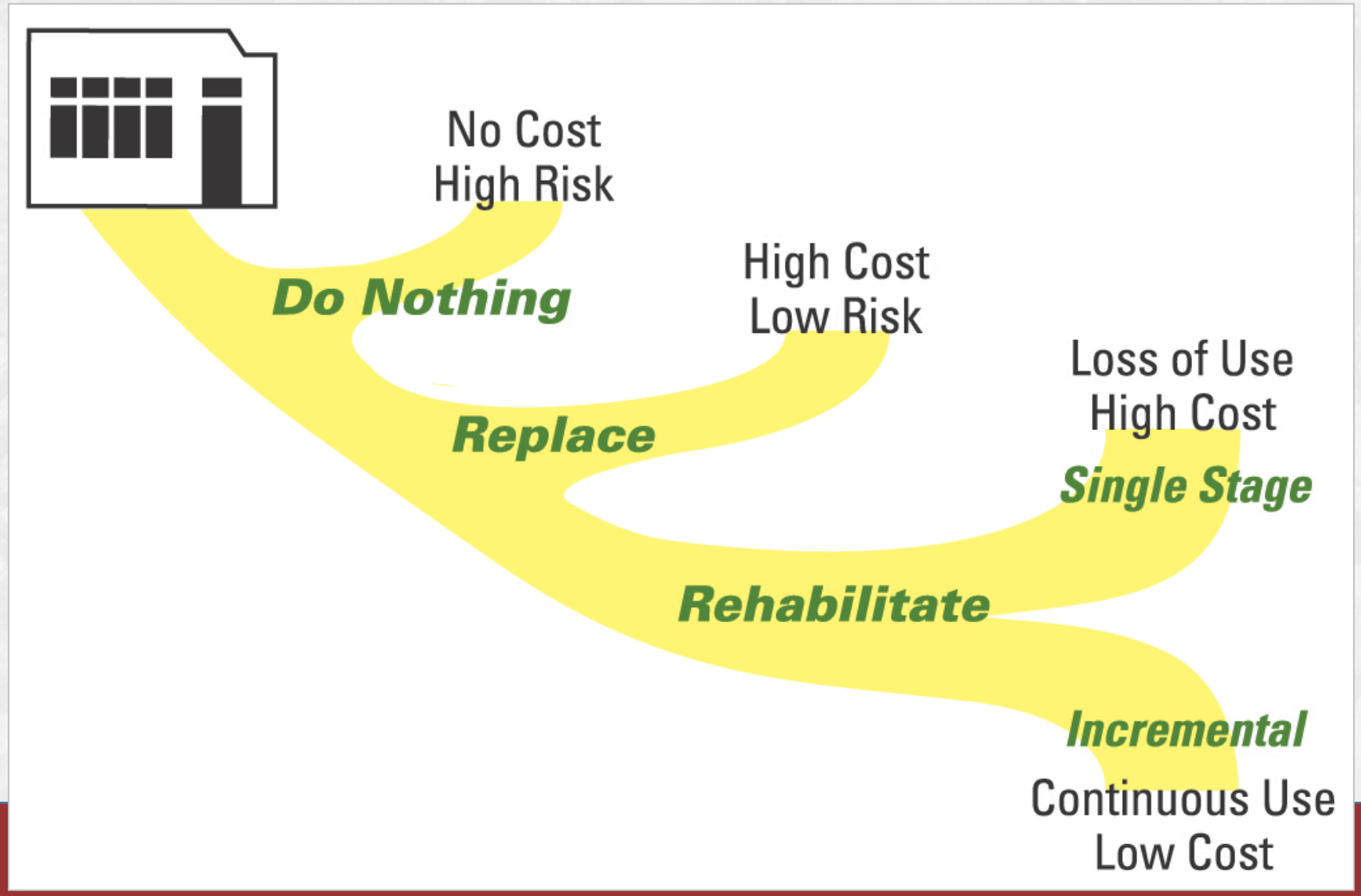
What level do we need to prepare to?

7-10% Probability (~500 year event)

What level do we need to prepare to?

25-40% Probability (~100 year event)

Incremental Risk Reduction



Mitigation Food for Thought

- *Do it right the first time from today forward*
- *Long-term strategy:*
  - New Construction
  - Planned facility outages
  - Renovations & remodels
  - New equipment installations
  - Aging equipment replacement
  - During equipment maintenance activities
- *Earthquake mitigation does not happen overnight*

Mitigation & Training Resources

FEMA P-767 Workshop

Earthquake Mitigation for Hospitals

- April 22, 2020
- Cape Girardeau, MO
- FREE!

MHA
MISSOURI HOSPITAL ASSOCIATION

https://www.surveymonkey.com/r/EarthquakeMitigation_04-22-2020

Contact Info

Brian Blake

Associate Director

Central U.S. Earthquake Consortium

bblake@cusec.org