



U.S. Resiliency Council

Welded Steel Moment Frame Buildings

Is your building a potentially vulnerable welded steel moment frame?

Welded Steel Moment Frame (WSMF) buildings were a popular way to build from the 1960's to the mid 1990's. Some of the most valuable Class A space in our large cities are older WSMF buildings. But many smaller buildings may be as well.

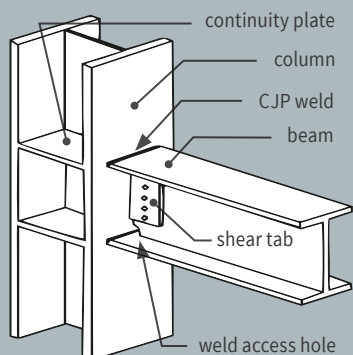
- Only an appropriate engineering analysis can tell for sure if a building is vulnerable.
- Some cities have developed inventories of WSMF's and other vulnerable buildings.
- Others have ordinances requiring retrofit of these vulnerable structures.
- Insurers and lenders are more cautious about lending on or insuring older WSMF buildings.



Examples of WSMF buildings (shown left to right): Embarcadero Center (SF), the US Bank Tower (LA), and the Columbia Center (Seattle).

"Out of San Francisco's 156 tallest buildings, roughly 100 were built before the era of modern seismic codes for their building type. That doesn't mean all of them are at risk of collapse. Further study would be needed to determine if they are vulnerable and need a retrofit."
- Applied Technology Council in the Los Angeles Times

What is the issue with older welded steel moment frame buildings?



Older welded steel moment frames have brittle joints at the beams and columns.



Earthquake shaking can cause these joints to fracture and tear, damaging the steel members.



Retrofitting WSMF's involves removing fireproofing, finishes and cladding to strengthen the joints.

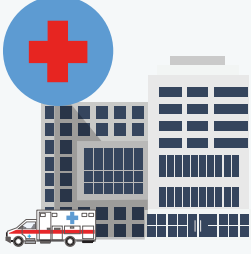
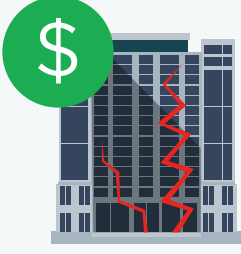



Newly constructed WSMF's are designed to protect the beam-column joints.

Older WSMF buildings are more likely to be red-tagged than those complying with newer codes.

USRC Building Rating System

The USRC Earthquake Rating System assesses the expected performance of buildings across the dimensions of Safety, Damage and Recovery, and can estimate the likelihood of receiving a red tag.

			
	SAFETY	DAMAGE	RECOVERY
★ ★ ★ ★ ★	Blocking exit paths unlikely	Minimal damage (<5%)	Immediate to days
★ ★ ★ ★ ★	Serious injuries unlikely	Moderate damage (<10%)	Within days to weeks
★ ★ ★ ★ ★	Loss of life unlikely	Significant damage (<20%)	Within weeks to months
★ ★ ★ ★ ★	Isolated loss of life	Substantial damage (<40%)	Within months to a year
★ ★ ★ ★ ★	Loss of life likely	Severe damage (40%+)	More than a year

Frequently Asked Questions

Could my steel building have cracked welds from prior earthquakes, say, Loma Prieta or Northridge?

Yes, but they may be hidden behind sprayed-on fire proofing, ceilings or wall finishes.

If I own, work or live in a welded steel moment frame building does it mean it will collapse?

Probably not, but only an appropriate engineering analysis can tell for sure if a building is vulnerable. Buildings are not earthquake proof. The code allows for up to 10% to collapse under a maximum credible earthquake, and many more may be unusable.

If my building doesn't collapse after a major earthquake, is it still safe and usable?

Maybe not. Even if your building is not at a high risk of collapse, heavily damaged WSMF buildings can be very expensive and time consuming to repair. A red tag could delay reoccupancy more than a year as improvements and fireproofing are removed, joints are repaired, and finishes are restored.

What are my next steps?

If you are considering leasing or purchasing a building:

- Have your broker determine whether it is a welded steel moment frame.
- Once you've narrowed down your list, hire an engineer or negotiate with the owner and work with the USRC to obtain an Earthquake Rating to better understand the buildings' expected performance.

If you own a building:

- Have your engineer determine whether it is a WSMF, and if so, work with the USRC to obtain an Earthquake Rating to determine your risk.
- Consult with your engineer about retrofitting your building if the risk is excessive.
- Plan for post-earthquake damage inspection of your building through a business occupancy resumption program.

If you are a tenant broker:

- Make the building's structural system a part of the information you provide to your clients
- Negotiate with owners of WSMF buildings to have them rated by the USRC to determine if they are vulnerable.

For more information, contact us at info@urrc.org

The U.S. Resiliency Council is a non-profit organization whose mission is to educate, advocate and promote better tools for assessing, designing and communicating the performance of buildings during earthquakes and other natural hazards; and to develop and implement rating systems that are both credible and meaningful. We are a 501(c)3 nonprofit organization.