



# US Resiliency Council

## Improving the Built Environment and Promoting Community Resilience



The USRC improves societal resilience with the establishment and implementation of a building rating system, education about the vulnerability of our built environment, certification of engineers, and delivery of credible evaluations of building performance in natural and man-made disasters. The USRC is modeled after the US Green Buildings Council (USGBC®), which through its LEED® rating system, has successfully engrained environmental sustainability into the public consciousness. The USRC rating system delivers information on the expected safety, damage and recovery of the buildings we use and occupy.

### Who Uses the Rating System?

Building owners, brokers, buyers, lenders, insurers and tenants all benefit from the USRC rating system. The USRC rating system is based on national building standards and audited to prevent the manipulation of results.

Properties that receive high USRC ratings will benefit from an increase in perceived value, potentially increasing leasing rates and transaction efficiency—the same kind of benefits associated with LEED® accredited properties. Market awareness results in price differentiation. In Tokyo, office buildings with seismic performance on par with a USRC five-star rating receive 40% higher lease rates compared to otherwise equivalent buildings that would have a USRC three-star rating.

**Lenders and Insurers** use USRC ratings to inform real estate transactions associated with lending decisions and defining insurance products.

**Tenants** value the USRC rating as it relates to both safety and recovery time following a major event.

**Governments and Institutions** use USRC ratings to identify safe buildings and make long-term strategic plans for reducing reconstruction costs and recovery time following a major disaster. As a comparison, over 40 jurisdictions in California require “Green” or LEED® certification of new public and private developments to improve long term sustainability.

### What Does a USRC Rating Deliver?

The USRC system provides rating users with greater confidence in a building performance evaluation by delivering:

- **Consistency** – Only certified engineers are able to submit applications for a USRC rating.
- **Credibility** – Rating submissions undergo a technical audit by certified reviewers.
- **Value** – Users receive actionable information about building safety, repair cost, and time to regain function.

# USRC Building Ratings: Dimensions and Definitions

**SAFETY:** The potential for people in the building to get out after a disaster and avoid bodily injuries or loss of life. A safety rating is required in all building evaluations.

★ ★ ★ ★ ★ **Injuries and blocking of exit paths unlikely:** Expected performance results in conditions unlikely to cause injuries or to keep people from exiting the building.

★ ★ ★ ★ ★ **Serious injuries unlikely:** Expected performance results in conditions that are unlikely to cause serious injuries.

★ ★ ★ ★ ★ **Loss of life unlikely:** Expected performance results in conditions that are unlikely to cause loss of life.

★ ★ ★ ★ ★ **Loss of life possible in isolated locations:** Expected performance results in conditions associated with partial collapse or falling objects, which have a potential to cause loss of life at some locations within or around the building.

★ ★ ★ ★ ★ **Loss of life likely in the building:** Expected performance results in conditions associated with building collapse, which has a high potential to cause death within or around the building.

**REPAIR COST:** Damage as a percentage of the building's overall replacement cost including structural, architectural, mechanical, electrical and plumbing systems. It does not include damage caused by breaks/leaks in water and gas pipes or contents damage.

★ ★ ★ ★ ★ **Minimal damage:** Repair Cost likely less than 5% of building replacement cost.

★ ★ ★ ★ ★ **Moderate damage:** Repair Cost likely less than 10% of building replacement cost.

★ ★ ★ ★ ★ **Significant damage:** Repair Cost likely less than 20% of building replacement cost.

★ ★ ★ ★ ★ **Substantial damage:** Repair Cost likely less than 40% of building replacement cost.

★ ★ ★ ★ ★ **Severe damage:** Repair Cost likely greater than 40% of building replacement cost.

**TIME TO REGAIN BASIC FUNCTION:** An estimate of the MINIMUM timeframe to carry out sufficient repairs and to remove major safety hazards and obstacles to regain occupancy and use of the building, but not necessarily restore it to its full intended functions.

★ ★ ★ ★ ★ **Immediately to days:** The expected performance will likely result in people being able to quickly re-enter and resume use of the building from immediately to a few days, excluding external factors.

★ ★ ★ ★ ★ **Within days to weeks:** The expected performance may result in delay of minimum operational use for days to weeks, excluding external factors.

★ ★ ★ ★ ★ **Within weeks to months:** The expected performance may result in delay of minimum operational use for weeks to months, excluding external factors.

★ ★ ★ ★ ★ **Within months to a year:** Expected performance may result in delay of minimum operational use for months to a year.

★ ★ ★ ★ ★ **More than one year:** Expected performance may result in delay of minimum operational use for at least one year or more.



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## What is a USRC Rating?

The USRC building rating system identifies expected consequences of an earthquake or other hazards affecting buildings. You can use a USRC Rating to understand the expected performance of the building in which you live, work or invest. The USRC Building Rating System assigns one to five stars for three performance measures—Safety, Damage, and Recovery.



[www.USRC.org](http://www.USRC.org)

Safety	★★★★☆
Damage	★★★★☆
Recovery	★★★★☆



EARTHQUAKE - 2015

### What Hazards Can a Building be Rated For?

The USRC’s long term goal is to provide building ratings for a broad range of natural and manmade hazards. The USRC is launching with a national earthquake building rating, and will grow to include other hazards such as wind, flood, storm and fire.

### What is Included in the USRC Earthquake Rating?

The earthquake rating considers the performance of a building’s structure, its mechanical, electrical and plumbing systems, and architectural components such as cladding, windows, partitions, and ceilings. The performance of these elements affects occupant safety, the cost and time to carry out necessary repairs, and when you can begin using the building following an earthquake.

Ratings are based on ground shaking intensity expected to occur during the lifetime of the building and is consistent with the benchmarks in the International Building Code.

The **SAFETY** rating describes the potential for people in the building to get out of the building unharmed after benchmark shaking intensity.

The **DAMAGE** rating (expressed as Repair Cost) describes the estimated cost to repair the building after earthquake benchmark shaking as a percentage of the building’s replacement cost.

The **RECOVERY** rating (expressed as Time to Regain Basic Function) is an estimate of the minimum time required to effect repairs and to remove safety hazards and obstacles to an extent necessary for using the building. Additional time might be needed to restore the building to provide the functions and operations at levels prior to the earthquake.

### Types of USRC Ratings

#### USRC Transaction Rating

A USRC Transaction Rating is used for transactional due diligence that accommodates both the schedule and cost demands of the leasing, sales, finance and insurance representatives of the real estate industry.

A USRC registered Transaction Rating must be performed by a USRC Certified Professional Rater, is limited to three stars in each dimension, and is confidential. Random audits of USRC Transaction Ratings are performed to maintain credibility.

#### USRC Verified Rating

A USRC Verified Rating is used by building owners for promotional, marketing and publicity purposes (e.g. at the entrance of the building). All USRC registered Verified Ratings must be performed by a USRC Certified Professional Rater, and are technically reviewed to maintain credibility.

### More Information:

Information on the USRC, the rating system, and the procedures can be found at [www.usrc.org](http://www.usrc.org). The USRC welcomes your inquiries.

## USRC ratings do not address the following:

- Damage caused by water and gas pipe breakage
- Damage to the building contents
- Demand surge following the earthquake
- Repair of historic features or hazardous materials; removal
- Code required upgrades
- Business interruption
- The time needed to fully restore all building functions; and repair all damage
- The time needed to restore utilities and transportation systems

## Getting the most out of a USRC rating

The USRC star ratings reflect performance estimates made by USRC certified engineers who have reviewed the building's engineering design. Many factors beyond the control of an engineer affect the earthquake performance of a building. You should understand what these are and take steps to protect your interests accordingly. These factors may include:

- Ground shaking intensity often varies from the intensities expected for the region;
- Construction might deviate from the plans, or changes could have been made after the rating was made
- Building occupants might introduce hazardous materials or create additional hazards.

Knowing these USRC rating definitions and limitations allows building owners and tenants to prepare for earthquakes, improve occupant safety, reduce repair costs and shorten the time to regain partial and full building use. The USRC strongly recommends that building tenants carefully consider the basis for the rating, excluded items and associated uncertainty, and then take measures to remove hazards from the work place and prepare plans for business resumption.

## Can I Improve My Rating?

### Existing Buildings

Most cities do not require that an existing building be brought into full compliance with the current building code when an owner voluntarily seeks to improve a building's structural capacity. Even after certain safety issues are corrected, the performance expectations can vary widely and remain unknown. The full benefits and value of mitigation efforts may not be understood. The USRC's rating system allows owners to show that the anticipated building performance aligns with an objective standard. Likely performance is understood, and higher levels of seismic performance, as demonstrated by a USRC rating, will be broadly recognized and add to the building's value.

## Who Uses the Rating System?

Building owners, brokers, buyers, lenders, insurers, architects and tenants all can benefit from the USRC rating system. The USRC rating system is based on national building standards and audited to prevent the manipulation of results.

**Owners use USRC ratings because** properties having high USRC ratings benefit from increased perceived value, potentially increasing leasing rates and transaction efficiency. For example, in the Tokyo market, office buildings rated on par with a USRC five star rating receive 40 percent higher lease rates than equivalent buildings with a rating similar to a USRC three star rating. The benefits of a USRC rating can be similar to the benefits associated with LEED® accredited properties which demonstrate that buyer's, leasee's and renters are prepared to pay a premium for highly rated buildings.

**Lenders and Insurers** use USRC ratings to make informed real estate transactions associated with lending decisions and defining insurance products.

**Architects** use the USRC rating as an integral part of resilient design strategies for their clients.

**Tenants** value the USRC rating as it relates to both safety and recovery time following a major event.

**Governments and Institutions** use USRC ratings to identify safe buildings and make long-term strategic plans for reducing reconstruction costs and recovery time following earthquakes. Currently over 40 jurisdictions in California require "Green" or LEED® certification of new public and private developments to improve long-term sustainability. The next step in this progression is to include certification of a building's resilience to natural hazards. The city of Los Angeles has committed to being the first city to adopt and implement a voluntary rating system, utilizing the system designed by the USRC.

## New Buildings

Building codes are minimum standards intended to have a low likelihood of collapse in the maximum considered earthquake but there will be substantial damage in many structures rendering them unfit for occupancy or use. For a new building, a seismic design that results in a four or five star USRC rating may add only 1 to 10 percent to construction costs, or about as much as a typical contingency budget. The USRC rating system allows an owner to specify the desired level of performance rather than accept by default the performance of a building designed to the minimum level prescribed by the building code. A USRC rating empowers developers and building users to make informed decisions about what aspects of performance matter most to them and to explore the cost-effectiveness of seeking higher levels of performance.



# TEN MISCONCEPTIONS ABOUT BUILDINGS AND EARTHQUAKES

Are any of these myths putting your people, your business or your investments at undue risk?

## 1 Cities would not allow unsafe buildings to be occupied or sold. **UNTRUE!**

Building codes evolve dramatically over time, as technologies improve and engineers learn from each new disaster. This knowledge reveals previously hidden hazards in existing buildings. Most communities do not require these dangerous buildings be demolished or even retrofitted.

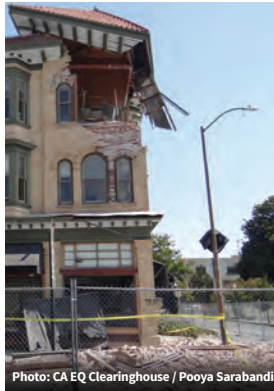


Photo: CA EQ Clearinghouse / Pooya Sarabandi

## 2 Newer buildings are essentially earthquake proof. **UNTRUE!**

Building codes are minimum standards set to prevent deadly collapse, not to eliminate damage or make sure buildings stay usable. When two major earthquakes hit Christchurch, New Zealand in 2011, most modern structures performed as expected to the code—only two buildings collapsed. However, 70% of the buildings in the downtown area were eventually demolished due to extensive damage.

## 3 The most dangerous buildings rent for less or are located only in poorer neighborhoods. **UNTRUE!**

In many US cities, the most desirable areas were built decades ago. Older structures there can command premium rents owing to location and historic charm. As long as these older buildings in prime locations remain desirable, owners have little incentive to investigate their risk or invest in voluntary seismic improvements.

## 4 Damage to the building's structure is the most costly type of damage in earthquakes. **UNTRUE!**



Photo: Russell Berkowitz

Dramatic structural failures gets press coverage but past earthquakes show that the most expensive repair costs are typically non-structural elements like partitions, ceilings, fire sprinkler systems, mechanical and electrical components, and replacement of high-value contents. Lost revenue and other business interruption costs can even exceed the value of the building itself.

## 5 A typical retrofit brings an existing building up to current code. **UNTRUE!**

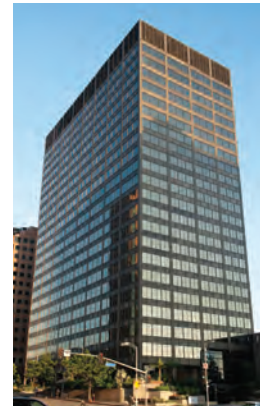
In a voluntary or mandated retrofit, most cities do not require an existing building be brought into full compliance with the current building code. For retrofits, the performance goals of various owners vary widely and remain essentially hidden, leading to uncertainties about the actual value of mitigation efforts.

## 6 “Value Engineering” does not diminish a building’s level of seismic performance. **UNTRUE!**

With the aid of computer modeling, value engineering can optimize building design by removing redundancies from the structural system and thereby reducing costs, usually with the goal of meeting the minimum standards of the building code. Developers are often unaware of the tradeoff—value engineering reduces upfront costs while ensuring safety, but it can also result in a building that will need to be demolished and replaced following a major earthquake.

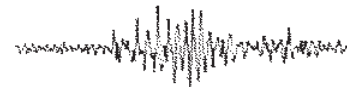
## 7 Designing for better seismic performance will significantly increase construction costs. **UNTRUE!**

For a new building, a seismic design that results in a four or five star USRC rating may add 1% to 10% to total up front construction costs, or about as much as a typical contingency budget. FEMA P58 and other computerized seismic models are now available to test design solutions in the early stages of a building’s creation when it is cost effective to explore various approaches to earthquake resilience. Once a structure is built, retrofitting to a higher level of seismic performance can become far more expensive.



## 8 Seismic structural engineering is a precise science. **UNTRUE!**

Seismic engineering relies on equations that can be calculated to the nth decimal place. But those equations are based upon current best estimates for an imprecise phenomenon - earthquakes. The Great East Japan-Tohoku Earthquake was ten times stronger than scientists predicted, meaning buildings were designed using the wrong inputs to these equations. Many faults are still undiscovered. Further, our ability to predict building response to earthquakes is imprecise but improving. Given the degree of uncertainty in current knowledge, relying on code minimums is more risky than people think.



## 9 Distance from the epicenter is the most important factor in how much a building will be damaged. **UNTRUE!**

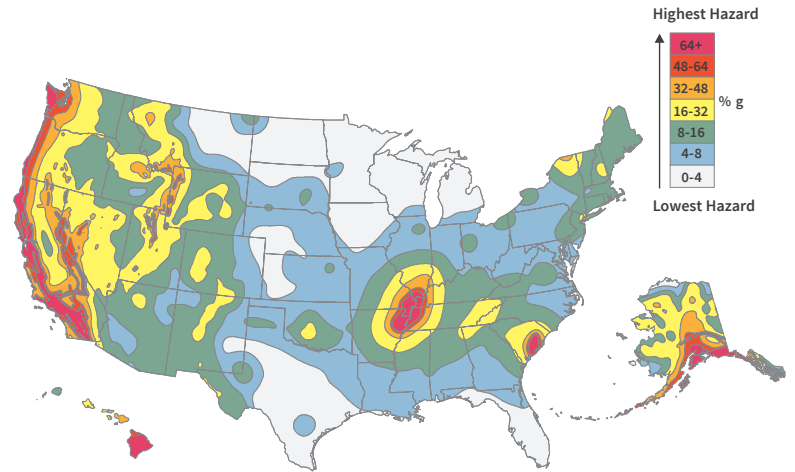
Although distance from the epicenter is important, soil and rock types at a specific location affect the degree of hazard. For example during the 1989 Loma Prieta earthquake the muddy ground in San Francisco’s Fisherman’s Wharf area shook like Jello while half a mile away the bedrock in Chinatown experienced ground shaking one fifth as strong.



## 10 Earthquakes are only a West Coast problem. **UNTRUE!**

Over 50% of the US population lives in an area where earthquakes are a threat. It's true that earthquakes are more frequent on the West Coast, Alaska and Hawaii, but in our nation's history, significantly damaging quakes occurred in Massachusetts, Missouri, Kansas, South Carolina, Indiana, Texas, New Hampshire, Montana, Illinois, Idaho, Pennsylvania, Florida, Illinois, Virginia, and Oklahoma.

The Midwest and East Coast do not have California's level of codes and standards so the damage from a 6.0 quake can be more severe. For instance, the 2011 5.8 Magnitude event in Virginia caused roughly \$300 million in damage. Repairing the Washington Monument cost \$15 million alone.



Source: USGS



## About the USRC

The US Resiliency Council is a 501(c)3 non-profit organization that helps communities understand the vulnerability of our built environment. It does this through education, certification of engineers, and evaluation of building performance in disasters.

The USRC's initial focus is on increasing seismic awareness on the West Coast but the rating system can be adopted anywhere. The USRC hopes to eventually develop similar rating systems for severe storm events such as hurricane, tornado, and flood.

<b>SAFETY</b>	★ ★ ★ ★ ★
<b>DAMAGE</b>	★ ★ ★ ★ ★
<b>RECOVERY</b>	★ ★ ★ ★ ★

Through its building rating system for earthquakes, the USRC aims to raise public consciousness and demand for disaster resilience. USRC ratings deliver consistent, credible information on expected safety, damage, and recovery for the buildings we use and occupy every day. We also work with public and private sector partners to support broader resilience efforts. For more information, please visit:

[www.usrc.org](http://www.usrc.org)



## TEN MISCONCEPTIONS ABOUT BUILDINGS AND EARTHQUAKES

Are any of these myths putting your people, your business or your investments at undue risk?



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## USRC Transaction Rating and Due Diligence

### The USRC Transaction Rating - an Enhanced PML

- Used for financial due diligence
- An upgrade on the existing but fractured PML system
- Performed by certified professionals
- Subject to random technical audit
- Transparent – use of national standards
- Credible – designed to prevent manipulation

The USRC Transaction Rating gives your team a reliable transactional due diligence report for making well-informed property investment decisions and managing risk exposure, accommodating both the schedule and cost demands of the leasing, sales, finance, and insurance representatives of the real estate industry. Random technical reviews of your Transaction Rating are performed to maintain credibility. Your Transaction Rating is limited to three stars in each dimension and registration with the USRC is confidential. It also provides a means to deliver consistent information regardless of the engineer performing the evaluation.

To produce the Transaction Rating the USRC certified engineer will do all the analysis required for a PML and then some. As such, the USRC rating can easily be an added requirement to a typical PML due diligence checklist. A USRC Transaction Rating provides more information, including a building’s level of seismic safety as well as estimating the likely time to regain basic function.

**Greg Michaud - Chair of the Commercial Real Estate Finance Council & Head of Real Estate Finance, Voya Investment Management**

*“Seismic due diligence is very important to the commercial lending and real estate industries. Many in the commercial real estate industry consider the current state of PML reporting to be fractured : lacking consistency, credibility, and professional licensing verification. Just as the accountants created the PCAOB (Public Company Audit Oversight Board) to provide credibility to their members audit reports, I am encouraged that the structural engineering profession is finding ways, such as the USRC, to provide consistency, audit procedures and a revocable certification to those who prepare this critical piece of transactional due diligence.”*

The USRC provides two types of seismic ratings:

- 1. A USRC Transaction Rating** is used for transactional due diligence that accommodates both the schedule and cost demands of the leasing, sales, finance and insurance markets for commercial real estate.
- 2. A USRC Verified Rating** is used for promotional, marketing and publicity purposes. A USRC Verified Rating includes a technical review of each building evaluation prior to its issuance.

Comparison of PML and USRC Transaction and Verified Ratings				
FEATURES		Current Industry Practice - PML	US RESILIENCY COUNCIL	
			TRANSACTION RATING (ENHANCED PML)	VERIFIED RATING
RATING	RATING DESIGNATION	0-100%	One to Three Stars Each Star has a specific threshold (e.g. three star <20%)	One to Five Stars Each Star has a specific threshold (e.g. five star <5%)
BUILDING PERFORMANCE DIMENSIONS	Safety	Sometimes Excluded	✓	✓
	Damage	✓	✓	✓
	Recovery	Almost always Excluded	✓	✓
SPECIAL FEATURES	Identifies Location of Damage	No	Available with FEMA P58 Methodology	Available with FEMA P58 Methodology
	Usable for Advertising & PR	No Controls	Not Allowed	✓
QUALITY CONTROL AND TRANSPARENCY	Evaluator Qualifications	Voluntary Compliance	State Licensed Engineer + Min 5 years experience + USRC Training & Certification	State Licensed Engineer + Min 5 years experience + USRC Training & Certification
	Latest ASTM Compliance	Voluntary Compliance	✓	✓
	Certification of Engineer’s Qualifications	None	✓	✓
	Engineer’s Stamp Required	Voluntary Compliance	✓	✓
	Third Party Technical Review	None	1 in 7 at random - after the fact	All - prior to issuance

**The USRC Transaction Rating – a Logical Replacement or Addition to a PML Evaluation:** A USRC Transaction Rating requires the USRC certified engineer to do all of the work needed to produce a traditional PML report, plus additional engineering analysis. Use of the FEMA P58 methodology provides more information as well as consistency, transparency, and credibility. Each of the star rating categories of a USRC rating corresponds to a specific replacement cost threshold level (e.g. Damage: 1 star > 40%; 2 stars < 40%; 3 Stars < 20%). Less than 10% and <5% replacement cost threshold checks are available only for 4 and 5 stars with the USRC Verified rating).

**The USRC Verified Rating – the Highest Level of Credibility:** The enhanced level of credibility of a USRC Verified Rating can make a property stand out and may make the rating more portable; i.e. accepted by competing buyers or lenders for the proposed transaction, thus, speeding up the closing process and providing a higher certainty of closing.

**Qualified Professionals:** A USRC Earthquake Rating is developed by a USRC Certified Rating Professional (CRP) who:

1. Must be approved by the USRC Certification Committee,
2. Must be a state registered engineer,
3. Must have a minimum of 5 years of significant structural experience in building design and evaluation,
4. Must carry current E&O insurance, and
5. Must submit USRC Earthquake Ratings for audit (Transaction Rating) or verification (Verified Rating).



<b>Safety</b>	★★★★★
<b>Damage</b>	★★★★★
<b>Recovery</b>	★★★★★



The CRP is trained in the use of USRC rating procedures and tools. USRC Certification must be renewed every year and subject to periodic mandatory training on new industry standards and USRC procedures.

**Subject to Audit:** The USRC provides the oversight that is currently lacking in the field of seismic due diligence. Just as CPAs established the PCOB to certify auditors for public companies and securities and randomly audit the PCOB member's audits, the USRC has created a similar technical review system. The USRC uses Certified Rating Reviewers (CRR) to randomly audit USRC Transaction Ratings. USRC CRR's are state licensed engineers currently practicing structural engineering with at least ten years of experience in the design and evaluation of buildings subject to earthquakes and other natural hazards.

**Methodologies are Transparent and Credible:** USRC technical methodologies used to develop a USRC rating are state of the art, industry standard, and openly available with little left to the judgment of the CRP. These are not "black box" systems, so all components of the evaluation are transparent. The USRC rating system is designed to prevent gaming to achieve a desired result, i.e. two CRP's should come to a similar result if they use the same methodology to rate the same building.

**Portable:** Because a USRC Transaction Rating is transparent and credible, it is more likely to be portable than current PML reports. Lenders, investors, buyers, and tenants are more likely to rely on a USRC Transaction or Verified Rating and not require the building to be evaluated by several parties for seismic due diligence purposes.

**Easy for the Public to Understand:** The USRC Rating has all the information needed for a PML and in addition it communicates levels of performance to non-technical audiences within the thresholds common to a PML report.

**Detailed Back-Up Information:** The report that supports the USRC Transaction Rating provides more detail and technical documentation than is currently provided in a typical due diligence or ASTM PML seismic evaluation. The rating developed with the FEMA P58 methodology considers the performance of a building's structure, its mechanical, electrical and plumbing systems, and architectural components such as cladding, windows, partitions, and ceilings. The performance of these elements affects occupant safety, the cost and time to carry out necessary repairs, and when you can begin using the building following an earthquake.

**Lucile Jones USGS Seismologist and Past Science Advisor to Los Angeles City Mayor Eric Garcetti**

*Across the Nation, people are making significant financial decisions about buildings often without adequate information about the vulnerability of those buildings to earthquakes. The USRC Rating System is credible, consistent and transparent and would make a better foundation for those critical decisions.*

**For more information, visit us at: [www.usrc.org](http://www.usrc.org)**