



# “Resilience by Design” The Los Angeles Earthquake Retrofit Law

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# “Resilience by Design” and the Los Angeles Earthquake Retrofit Law

## Your speaker today:

Wayne H. Kalayjian, CE, SE, CFE

Senior Manager, Capital Projects Consulting

Deloitte Advisory

[wkalayjian@deloitte.com](mailto:wkalayjian@deloitte.com)

310.218.6530

BS Civil Engineering / Environmental Science – Tufts University

MS Structural and Earthquake Engineering – Stanford University

MS Business Management – Massachusetts Institute of Technology

# “Resilience by Design” and the Los Angeles Earthquake Retrofit Law

## Topics for today’s discussion:

- Background – Why this matters
- The Los Angeles Earthquake Retrofit Law
  - What buildings are affected by the new law?
  - What does the new law require?
  - What are its potential cost impacts?
- Technical concepts and issues
- Takeaways from today’s presentation

# “Resilience by Design” and the Los Angeles Earthquake Retrofit Law

## Background – Why this matters

- California: the world’s 8th largest economy (surpassing Italy, India, Russia):
  - **2014 GDP = \$2.3 Trillion**
- Los Angeles: the world’s 16th largest economy (surpassing Turkey, Saudi Arabia, Argentina, Netherlands)
  - **2014 GDP = \$870 Million**
- Estimated effects of a Richter Magnitude 7.8 Earthquake in Los Angeles are approximately:
  - 1,800 fatalities
  - Estimated economic losses:
    - \$ 48 billion in property damage due to building shaking
    - \$ 65 billion in property damage due to fire
    - \$ 96 billion in business interruption costs
    - \$ 4 billion in losses due to traffic delays

**\$ 213 billion**

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## The New Law

- What’s it Intent?
  - Seismic Vulnerability
  - Protect human life
  - Improve capacity to respond to earthquake events
  - Quick recovery from earthquake events
  - Protect the economy
- Timeline of events:
  - **January 2014:** LA Times article publishes results of UC Berkeley study of unsafe concrete buildings in Los Angeles
  - **December 2014:** LA Mayor Garcetti issues “Resilience by Design” report
  - **October 2015:** Garcetti signs Earthquake Retrofit Law

# “Resilience by Design” and the Los Angeles Earthquake Retrofit Law

## The Los Angeles Earthquake Retrofit Law:

### *What buildings and systems are affected by the new law?*

1. Pre-1980 “soft-first-story” buildings
2. Pre-1980 “non-ductile reinforced concrete” buildings
3. Telecommunications infrastructure
  - Cellular Towers
  - Internet Maintenance
  - Data Centers
  - Earthquake Early Warning system
4. Water system infrastructure
  - Firefighting Water Supply
  - Aqueducts, dams, reservoirs, local systems
  - Water transit systems: Seismic Resilient Pipe Network

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## The Los Angeles Earthquake Retrofit Law:

### *What does the new law require?*

#### **Mandatory seismic retrofitting** for:

#### 1. Pre-1980 soft-story buildings (7-year horizon)

- LA Department of Building and Safety (LADBS) has identified **13,500 soft-story buildings**
- **2016-2017:** Building owners have ONE year to determine retrofit status
- **2017-2018:** Owners have ONE additional year to acquire necessary retrofit permits
- **2018-2022:** Owners have an additional FIVE years to perform building retrofits

#### 2. Pre-1980 non-ductile reinforced concrete buildings (25-year horizon)

- LADBS has identified **1,500 non-ductile reinforced concrete buildings**
- **2016-2019:** Building owners have THREE years to begin the assessment process
- **2019-2029:** Owners have TEN additional years to determine retrofit status
- **2029-2041:** Owners have an additional TWELVE years to perform building retrofits

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## The Los Angeles Earthquake Retrofit Law:

### *What are the potential cost impacts?*

- If each building requires \$100,000 (assessment, design, permits, construction), then buildings alone would cost:

$$15,000 \times \$100,000 = \$1,500,000,000$$

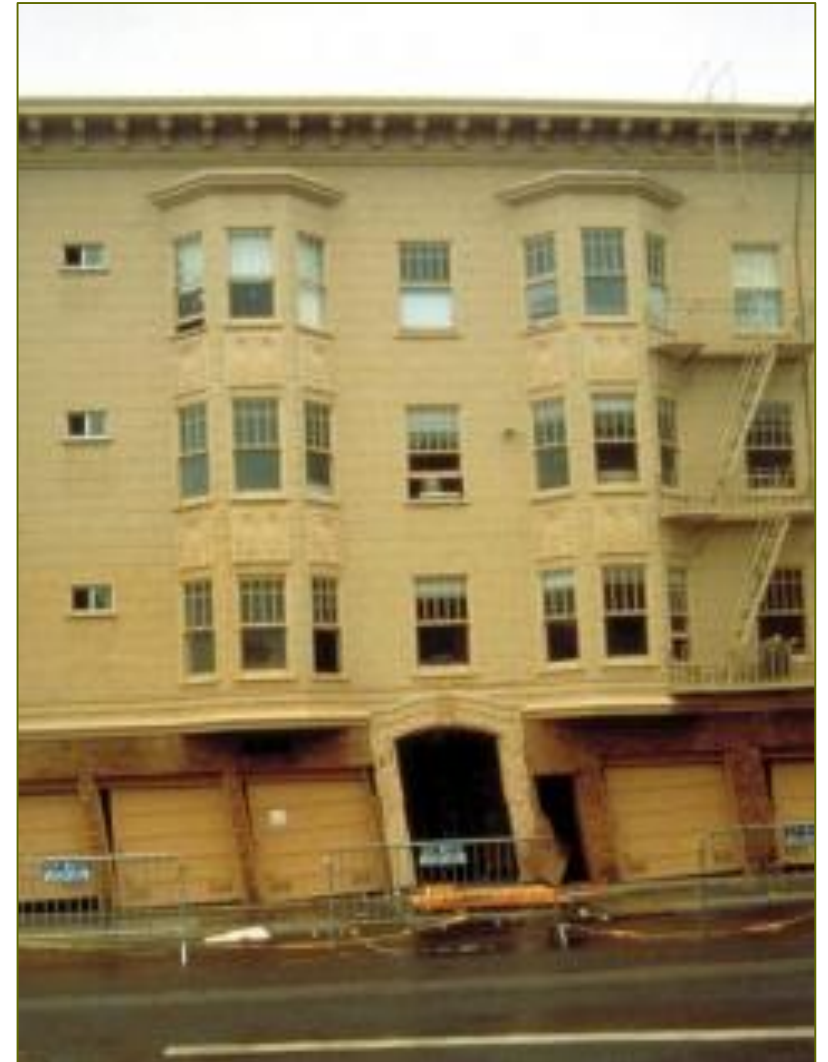
- How might the Program be Financed?
  - Directly from building owners
  - Tenants
  - Rate Payers (water, sewer, power, telecommunications)
  - Statewide Seismic Resilience Bond Measure



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## Technical Concepts and Issues:

- **Soft-Story Buildings:**
  - Large openings on bottom floor(s)
  - Abrupt changes in building rigidity
  - Leads to localized floor collapse and pancaked collapse from floors above
  - Often found in apartment buildings, mixed-use commercial blocks
  - Dates to 1950s and 1960s
  - Soft-stories are relatively easy to identify
  - Phenomenon is understood and remedies are straightforward, relatively inexpensive, and non-disruptive



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## Technical Concepts and Issues:

- **Non-Ductile Reinforced Concrete Buildings:**
  - Brittle nature leads does not absorb seismic shaking
  - Lack of elasticity leads to catastrophic structural collapse
  - Found in apartment buildings, office buildings, schools, hospitals, warehouses
  - Dates to 1950s and 1960s
  - Non-ductile R/C buildings are not easily detectable
  - Phenomenon is complex and non-straight-forward
  - Repairs are tailor-fit, expensive, time-consuming, disruptive



<http://resilience.abag.ca.gov/commercial-building-types/>

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## Technical Concepts and Issues:

- **Telecommunications Infrastructure:**

- Cellular Towers
- Solar-powered Internet Maintenance
- Data Centers

- **Water System Infrastructure**

- Firefighting Water Supply
- Aqueducts, dams, reservoirs, local systems
- Water transit systems: Seismic Resilient Pipe Network

# “Resilience by Design” and the Los Angeles Earthquake Retrofit Law

## Takeaways from Today’s Presentation:

- **Strengthening Our Buildings**

- Buildings require inspection and appraisal, whether they require retrofit repairs or not
- Estimated that 1.2 million buildings exist in Los Angeles

- **What’s next?**

1. Need for increased inspection and appraisal services
2. Engineers and cost estimators are needed to perform many inspections
3. Engineers and estimators view ‘valuation’ in a different way than appraisers
4. Resilience program will be document-intensive and require robust management of repair progress, budgets, costs, and completion



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# Questions?

Wayne H. Kalayjian, CE, SE, CFE  
Senior Manager, Capital Projects Consulting  
Deloitte Advisory  
[wkalayjian@deloitte.com](mailto:wkalayjian@deloitte.com)  
310.218.6530