Rapid Visual Screening of Buildings for Potential Seismic Hazards

FEMA 154 Second Edition
Quake ’06 Workshop

- Presentation by
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  - Structural Engineer
  - Torrance, CA
Rapid Visual Screening of Buildings for Seismic Hazards

SECOND EDITION
Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook

SECOND EDITION
Rapid Visual Screening of Buildings for Potential Seismic Hazards: Supporting Documentation

EARTHQUAKE HAZARDS REDUCTION SERIES 41
Project Participants

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Project Director: Charles Scawthorn
Project Advisory Panel:
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- James Cagley
- Terry Hughes
- Joan MacQuarrie
- Lawrence Reaveley
- Ted Winstead
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- Chris Poland
- Doug Smits
- Ted Winstead

Rapid Visual Screening of Buildings for Seismic Hazards
FEMA 154 Table of Contents

1. Introduction
2. Planning and Managing Rapid Visual Screening (RVS)
3. Completing the Data Collection Form
4. Using the RVS Procedure Results
5. Example Application of Rapid Visual Screening
6. Appendices
Example of a Program

- City developing a hazard mitigation
  - What is our building stock?
  - What is the risk faced by residents?
  - What is the risk to business?
  - How does this change our disaster response program?
- What happens to the city if we do nothing?
Seismic Safety Issues

- Some older buildings pose a potential risk in major earthquakes
- Potential for the loss of housing and commercial buildings
- Tax City’s ability to provide assistance for a large number of people
Project Overview

- Safety Element Update - General Plan
- Survey of all commercial and multi-family buildings in the city
- Methods used include a visual observations, a FEMA 154 screening approach plus review of city records.
- Prepare database for retrieval and use by Building and Planning Departments for future land use and permit activities.
Considerations

- **Building Codes** – In 1976 there were significant earthquake code changes.
- **Date of implementation of the updated code** is not clear - assumed to be 1980.
Rapid Visual Screening of Buildings for Seismic Hazards
Context of City

- Populating the Database
Multi-family vs. Commercial Buildings

- Multi-family Residential - 2191 (70%)
- Commercial - 885 (30%)
Rapid Visual Screening of Buildings for Seismic Hazards
Building Data
Commercial Structures

- Number of buildings - 885
- Age - 83% pre-1981
- Valuation of Commercial Buildings
  - Total Valuation - $4 Billion,
  - Pre-81 - $2.2 Billion
- Occupants at Risk – 80,000
  (1/2 code assumed)
Rapid Visual Screening of Buildings for Seismic Hazards
Residential

- Number of buildings - 1565
- Age - 95% pre 1981
- Valuation - $500 Million
- Number of dwelling units - 9964
Multi-family Buildings

Post 1981 - 5% (85 Buildings)

Pre 1981 - 95% (1480)

Rapid Visual Screening of Buildings for Seismic Hazards
Policy Issues

- Develop Safety Element Policies
  - Most Safety Elements are sweeping generalities
  - Goal is to have direct policies that can be implemented
Unreinforced Masonry Buildings

- Program – Retrofit (completed)
- Number of Buildings – 90
- Issues –
  - Impact on city business districts
  - Loss of rent-controlled housing
  - Might encourage demo
  - Scale of buildings might become larger/denser
  - Loss of character of the city
Rapid Visual Screening of Buildings for Seismic Hazards
Unreinforced Masonry Buildings

- **Solutions**
  - Incentives
  - Phased notices - Limit simultaneous construction per block – 2 buildings
  - Work with owners on housing issues
Unreinforced Masonry Buildings

- Incentives
  - No parking or park fees
  - Permit mezzanine addition with no additional parking
Wood Frame Structures

- Policy Recommendation – Retrofit
- Issues
  - Cripple Studs
  - Lack of Anchor Bolts
Wood Frame Structures
Cripple Studs

- Number of Buildings – 1,080
- Number of Dwelling Units - 6,450
- Occupants – 13,000
Wood Frame Structures Lacking Anchor Bolts

- Number of Buildings - 930;
- Number of dwelling units – 3,800;
- Number of occupants – 8,000
Wood Frame Structures

- **Solutions**
  - Mandatory program
    - 10 year duration
  - Trigger rehab on sale or conversion
  - Trigger rehab on major alterations

- **Incentives**
Multi-family Soft-story

Policy Issue - Strengthen buildings containing parking areas with little seismic resistance

- Number of Buildings – 454
- Number dwelling units – 2,315
- Number of occupants – 4,600
Rapid Visual Screening of Buildings for Seismic Hazards
Rapid Visual Screening of Buildings for Seismic Hazards
Multi-family Soft-story

- Loss of housing stock
- Loss of rent-controlled housing
- Might encourage demo
- Scale of buildings might become larger/denser
- Loss of character of the community
Multi-family
Soft-story

- Solutions
  - Mandatory strengthening program
  - Trigger using remodeling permits
  - Trigger at sale or conversion

- Incentives
  - Phased notices for rent controlled units
Multi-family Soft-story

- **Solutions**
  - Limit simultaneous construction per block – 2 buildings
  - Work with owners on housing

- **Incentives**
Non-ductile Concrete Frame and Soft-story Buildings

- Issue - Risk posed by some older (pre-1981) concrete structures
- Definition - Three stories or greater
- Number of buildings – 123
Rapid Visual Screening of Buildings for Seismic Hazards
Non-ductile Concrete Frames and Soft-story Buildings

- 48 residential buildings
  - 1,097 dwelling units
  - 2,200 occupants
- 75 commercial
  - As many as 95,000 occupants
Rapid Visual Screening of Buildings for Seismic Hazards
Non-ductile Concrete Frame and Soft-story Buildings

- **Issues**
  - Loss of housing stock – possibly rent-controlled
  - Loss of office and professional space, possibly not recoverable
  - Image of city

- **Solutions**
  - Mandatory program
  - Phased program at voluntary remodeling
Tilt-Up Concrete Wall Buildings

- Policies - Retrofit
- Number of buildings – 2
- Program – mandatory retrofits
- Incentives – none
Low Rise Open Front Concrete and Masonry Buildings

- Issue - Potential Damage Due to Drift
- Estimated Number of Buildings – 96
- Number of Occupants - 16000
- Program
  - Major Remodel Trigger
Buildings in Liquefaction Zone

- Number of Buildings - 995
  - 302 commercial
  - 693 residential with 4680 dwelling units
- Program - None
Next Steps

- Identify possible programs for the seismic hazard mitigation
  - No Program
  - Program based on selected triggers
  - Mandatory program over a decade
- Develop loss cost model to better identify consequences of no program
- Review incentive options
Outline of Presentation

- Description of Procedure
- Behavior of Buildings
- Building Types and Typical Damage
- Basic Scores and Score Modifiers
- Occupancy and Falling Hazards
- Implementation of Procedure
- Example Applications
Procedure Overview

1. Pre-Field Trip
   1.1 Define project, train personnel
   1.2 Determine seismic hazard region, choose form
   1.3 Determine seismic code dates
   1.4 Determine soil type data

2. Rapid Visual Screening Field Trip
   2.1 Identify building type, calculate basic score
   2.2 Identify modifiers, calculate final score
   2.3 Sketch, photo, and complete form

3. Post-Field Trip
   3.1 Database entries and summary
Purpose and Limitations of Procedure

- **Purpose**
  - Screen for potential seismic hazards
  - Identify buildings that may be hazardous

- **Limitations**
  - Some hazardous buildings might not be identified
  - Some adequate buildings might be identified as hazardous
  - Accurate results dependent on experience of screener and thoroughness of pre-field activities
Earthquakes in the United States
Seismic Hazard Map

Note:
(1) Based on NEHRP B-C soil type.
(2) The seismicity at any site is calculated based on the highest seismicity at any point in a county. More accurate information on any site can be obtained from the USGS site. (http://geohazards.cr.usgs.gov/eq/)
Map Areas Based on County Boundaries

- High
- Moderate
- Low

Note:
1. Based on NEHRP B-C soil type.
2. The seismicity at any site is calculated based on the highest seismicity at any point in a county. More accurate information on any site can be obtained from the USGS site. (http://geohazards.cr.usgs.gov/eq/)
Alternate Seismicity Determination

The input zip-code is 62960.

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<tr>
<th>Location</th>
<th>Value</th>
</tr>
</thead>
<tbody>
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<td>Location</td>
<td>37.1548 Lat. -88.7225 Long.</td>
</tr>
<tr>
<td>Distance to nearest grid point</td>
<td>5.3960 kms</td>
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<td>Nearest grid point</td>
<td>37.2 Lat. -88.7 Long.</td>
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Probabilistic ground motion values, in %g, at the nearest grid point are:

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<th>Period (sec)</th>
<th>PGA</th>
<th>5%PE in 50 yr</th>
<th>2%PE in 50 yr</th>
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Rapid Visual Screening of Buildings for Seismic Hazards
# Seismicity Region Definition

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<th>Region of Seismicity</th>
<th>Spectral Acceleration (short period or 0.2 sec)</th>
<th>Spectral Acceleration (long period or 1.0 sec)</th>
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<td>$&lt; 0.067 \text{ g}$</td>
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<tr>
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<td>$\leq 0.067 \text{ g}$</td>
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<td></td>
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<td>$&lt; 0.2 \text{ g}$</td>
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<tr>
<td>High</td>
<td>$\leq 0.50 \text{ g}$</td>
<td>$\leq 0.20 \text{ g}$</td>
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</table>
Rapid Visual Screening of Buildings for Seismic Hazards

<table>
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<tr>
<th>Address:</th>
<th>Zip</th>
<th>Other Identifiers</th>
<th>No. Stories</th>
<th>Year Built</th>
<th>Seismic</th>
<th>Date</th>
<th>Total Floor Area (sq. ft.)</th>
<th>Building Name</th>
<th>New</th>
</tr>
</thead>
</table>

**Seismicity**

**Building Type**

**Basic Score**

**Score**

**Modifiers**

**Final Score**

**Evaluation**

---

![Data Collection Form Diagram](image)
Building Types

- **Building Materials**
  - Wood
  - Steel
  - Concrete
  - Masonry

- **Lateral Force Resisting System**
  - Shear Wall
  - Moment Frame
  - Braced Frame
Score Modifiers

- Height
  - Mid rise (4-7 stories)
  - High rise (>7 stories)
- Vertical irregularity
- Plan irregularity
- Pre-code
- Post benchmark
- Soil type
## Structural Scores and Modifiers

### BASIC SCORE, MODIFIERS, AND FINAL SCORE, S

<table>
<thead>
<tr>
<th>BUILDING TYPE</th>
<th>W1</th>
<th>W2</th>
<th>S1 (MRF)</th>
<th>S2 (BR)</th>
<th>S3 (LM)</th>
<th>S4 (RC SW)</th>
<th>S5 (URM INF)</th>
<th>C1 (MRF)</th>
<th>C2 (SW)</th>
<th>C3 (URM INF)</th>
<th>PC1 (TU)</th>
<th>PC2 (FD)</th>
<th>RM1 (RD)</th>
<th>RM2 (RD)</th>
<th>URM</th>
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<td>4.6</td>
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<tr>
<td>Mid Rise (4 to 7 stories)</td>
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<td>-0.2</td>
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<td></td>
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<tr>
<td>High Rise (&gt;7 stories)</td>
<td>N/A</td>
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<td>+1.0</td>
<td>+1.0</td>
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<tr>
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<tr>
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### FINAL SCORE, S

- **W1**: 7.4
- **W2**: 6.0
- **S1 (MRF)**: 4.6
- **S2 (BR)**: 4.8
- **S3 (LM)**: 4.6
- **S4 (RC SW)**: 4.8
- **S5 (URM INF)**: 5.0
- **C1 (MRF)**: 4.4
- **C2 (SW)**: 4.8
- **C3 (URM INF)**: 4.6
- **PC1 (TU)**: 4.8
- **PC2 (FD)**: 4.6
- **RM1 (RD)**: 4.6
- **RM2 (RD)**: 4.6
- **URM**: 4.6

---

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Rapid Visual Screening of Buildings for Seismic Hazards
## Final Score Calculation

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<th>Component</th>
<th>Score</th>
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### Table: BASIC Score, Modifiers, and Final Score, S

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**Final Score, S**: 2.8
Earthquake Forces

- Displacement
- Ground Motion
- Static Lateral Forces
- Equivalent Earthquake

Rapid Visual Screening of Buildings for Seismic Hazards
Structural Systems
Moment Frames

DIAPHRAGM

MOMENT RESISTING FRAMES
Structural Systems
Shear Walls

DIAPHRAGM

SHEAR WALLS

Rapid Visual Screening of Buildings for Seismic Hazards
Structural Systems
Braced Frames

DIAPHRAGM

BRACED FRAMES
Ductile Behavior

Force $< \text{Yield strength}$
- Deformed shape when a force is applied
- No permanent deformation

Force $> \text{Yield strength}$
- Deformed shape when force exceeds yield strength
- Permanent deformation
Brittle Behavior

Force
Elastic vs. Nonlinear Response

- **Yield point**
- **Elastic range**
- **Ductile nonlinear (plastic) behavior**
- **Brittle failure**
- **Permanent deformation**

The diagram illustrates the comparison between elastic and nonlinear responses in buildings, showing key points such as the yield point, elastic range, and permanent deformation.
Seismic Hazards and Performance Levels

- **Seismic Hazards**
  - Probabilistic (Return period or probability of exceedence)
  - Deterministic

- **Seismic Performance Levels**
  - Collapse Prevention
  - Life Safety
  - Immediate Occupancy
  - Operational
Data Collection Form Building Types

- **Wood**
  - Light wood frame (W1)
  - Large wood frame (W2)

- **Steel**
  - Steel moment frame (S1)
  - Steel braced frame (S2)
  - Light metal building (S3)
  - Steel frame with concrete shear walls (S4)
  - Steel frame with URM infill (S5)
Data Collection Form Building Types

- **Concrete**
  - Concrete moment frame (C1)
  - Concrete shear wall (C2)
  - Concrete frame with URM infill (C3)
  - Tilt-up concrete (PC1)
  - Precast concrete frame (PC2)

- **Masonry**
  - Reinforced masonry with flexible diaphragm (RM1)
  - Reinforced masonry with rigid diaphragm (RM2)
  - Unreinforced masonry (URM)
Wood Light Frame (W1)
W1 Example
W1 Performance

Porch Roof Separation

Cripple Wall Failure
Large Wood Frame (W2)

- 5000 square feet or more
- Few interior walls
- Beams or trusses over columns
- Plywood or wood diaphragms
- Shear walls or diagonal rod bracing
W2 Example
Steel Moment Frame (S1)

- Column
- Slab
- Welded or Bolted Shear Connection
- Girder or Beam
- Welded Moment Connection
S1 Example
S1 Performance

Crack weld at bottom flange of the girder to column flange moment connection
Steel Braced Frame (S2)

- Single Diagonal
- Chevron
- Beam Specially Strengthened at Eccentric Joints
- Double Diagonal
- Eccentric Braced Frame
S2 Example

Rapid Visual Screening of Buildings for Seismic Hazards
S2 Performance

Tube Steel Brace Fractured Due to Buckling
Light Metal Building (S3)

Corrugated Metal Skin:
Lightweight Purlins Typ.

Diaphragm Tie-Rod Bracing

Longitudinal Tie-Rod Bracing
S3 Example

Transverse Frames

Rod Braces
S3 Performance

Plastically Stretched Rod

Fractured Rod
Steel Frame with Concrete Shear Walls (S4)

Concrete Shear Walls

Girders, Beams

Columns
S4 Performance

Cracked Concrete Wall at Interior Elevator Core
S5 Example
S5 Performance

Rapid Visual Screening of Buildings for Seismic Hazards
Concrete Moment Frame (C1)

- Infill Wall
- Curtain wall
C1 Example
C1 Performance

Shear Cracks in Columns
Concrete Shear Wall (C2)
C2 Example
C2 Performance

Shear and Bending Cracks in Shear Walls Repaired by Epoxy Injection
Concrete Frame with URM Infill (C3)

Concrete Frame

Brick Infill
C3 Example

Rapid Visual Screening of Buildings for Seismic Hazards
C3 Performance

X-Cracks in Infill Panels
Tilt-up Concrete (PC1)
PC1 Example
PC1 Performance
Precast Concrete Frame (PC2)
PC2 Example
PC2 Performance

Precast Connections Failed

Undamaged Shear Wall
Reinforced Masonry with Flexible Diaphragm (RM1)
RM1 Example
Reinforced Brick Masonry

- Wire Ties
- Reinforcing Bars
- Grout
Reinforced Brick Example
RM1 Performance
RM2 Example
RM2 Performance

Diagonal Crack in Shear Wall
Unreinforced Masonry (URM)
URM Bearing Walls

Header Course
URM Example
URM Performance

Out-of-Plane Wall Failure
Unreinforced Concrete Block
Determining Building Type

- Pre-screening data
- Exterior survey
- Interior survey
  - Unfinished basement
  - Parking garage
  - Mechanical equipment rooms
  - Suspended ceilings
Multiple or Unknown Building Types

- **Procedure**
  - Eliminate building types
  - Use interior inspection and drawing review, if possible
  - Evaluate all probable building types
  - Record lowest score
Rapid Visual Screening of Buildings for Seismic Hazards

**Seismicity**

**Building Type**

**Identifier**

**Abbreviation**

**Basic Score**

<table>
<thead>
<tr>
<th>W2</th>
<th>S1</th>
<th>S2</th>
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</thead>
<tbody>
<tr>
<td>(MRF)</td>
<td>(BR)</td>
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</tr>
<tr>
<td>3.8</td>
<td>2.8</td>
<td>3.0</td>
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<tr>
<td>Building Type</td>
<td>W1</td>
<td>S1</td>
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<tr>
<td>---------------</td>
<td>----</td>
<td>----</td>
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<tr>
<td>Low Seismicity</td>
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<tr>
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</tr>
<tr>
<td>High Seismicity</td>
<td>4.4</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Score Modifiers

- Mid Rise (4-7 Stories)
- High Rise (>7 Stories)
- Vertical Irregularity
- Plan Irregularity
- Pre-Code
- Post Benchmark
- Soil Type C
- Soil Type D
- Soil Type E
Mid Rise Example
High Rise Example
Vertical Irregularity

- Setbacks
- Hillside
- Soft Story
- Short Column
Setback Example

Rapid Visual Screening of Buildings for Seismic Hazards
Hillside Example
Soft Story Example
Short Columns Example
Plan Irregularity

L-Shaped

T-Shaped

U-Shaped

Large Opening

Weak Link Between Larger Building Plan Areas
Plan Irregularity Example
Pre-Code

- Constructed prior to initial adoption and enforcement of seismic codes
- Applies to Moderate and High seismic zones
- Default year is 1941 (Exception: 1973 for PC1)
# Post Benchmark Years

<table>
<thead>
<tr>
<th>Building Type</th>
<th>BOCA</th>
<th>SBCC</th>
<th>UBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>1992</td>
<td>1993</td>
<td>1976</td>
</tr>
<tr>
<td>S1</td>
<td>BD</td>
<td>BD</td>
<td>1994</td>
</tr>
<tr>
<td>S2</td>
<td>1992</td>
<td>1993</td>
<td>1988</td>
</tr>
<tr>
<td>S3 / S5</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>S4</td>
<td>1992</td>
<td>1993</td>
<td>1976</td>
</tr>
</tbody>
</table>

Note: BD - Contact Local Building Department
## Post Benchmark (Cont.)

<table>
<thead>
<tr>
<th>Building Type</th>
<th>BOCA</th>
<th>SBCC</th>
<th>UBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 / C2</td>
<td>1992</td>
<td>1993</td>
<td>1976</td>
</tr>
<tr>
<td>C3</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>PC1 / RM1</td>
<td>None</td>
<td>None</td>
<td>1997</td>
</tr>
<tr>
<td>PC2</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>RM2</td>
<td>1992</td>
<td>1993</td>
<td>1976</td>
</tr>
<tr>
<td>URM</td>
<td>None</td>
<td>None</td>
<td>1991</td>
</tr>
</tbody>
</table>
Soil Type

- Type A - hard rock
- Type B - rock
- Type C - Soft rock and very dense soil
- Type D - Stiff soil
- Type E - Soft soil
- Type F - Poor soil
Occupancy

- Assembly
- Commercial
- Emergency Services
- Government
- Historic
- Industrial
- Office
- Residential
- School

Number of Occupants
- 0 - 10
- 11 - 100
- 101 - 1000
- >1000
Nonstructural Falling Hazards

- Unreinforced Chimneys
- Parapets
- Cladding or veneer
- Other
  - Appendages
  - Equipment
Performance of Chimneys
Performance of Parapets
Performance of Cladding
Appendages
Other Falling Hazards

- **Architectural**
  - Interior ornamentation
  - Heavy partitions

- **Building services**
  - Mechanical equipment
  - Electrical equipment

- **Contents**
  - Racks and shelving
Rapid Visual Screening of Buildings for Seismic Hazards

**Implementation**

1. Pre-plan field survey and identify the area to be screened
2. Acquire and review pre-field data
3. Develop budget and cost estimate
4. Choose and train screeners
5. Select and review Data Collection Form
6. Review existing construction drawings
7. Screen the building, sketch the plan and elevation
8. If you have access to the interior, verify building type and irregularities
9. Photograph the building
10. Check the field data in the record keeping system

*FEMA*
Pre-Screening Tasks

- Determine seismicity region
- Determine key seismic code adoption dates
- Determine cut-off score
- Acquire pre-field building data
- Determine soil information
Pre-Field Data Collection Sources

- Assessor’s files
- Building department files
- Sanborn maps
- Municipal databases
- Previous studies
Field Survey Tools

- Binoculars for high-rise buildings
- Camera, preferably instant or digital
- Clipboard for holding Data Collection Forms
- Copy of the FEMA 154 Handbook
- The Quick Reference Guide
- Pen or pencil
- Straight edge (optional for drawing sketches)
- Tape or stapler, for affixing instant photos
Data Collection Form

- Building Identification
- Sketch
- Photograph
- Falling Hazards
- Soil Type
- Occupancy
- Building Type
- Modifiers
- Final Score
- Comments
- Evaluation Required

Rapid Visual Screening of Buildings for Seismic Hazards
Use of RVS Results

- Designing seismic hazard mitigation programs
- Ranking seismic rehabilitation needs
- Developing building inventories
  - Earthquake damage and loss impact assessments
  - Planning post-earthquake building safety evaluations
- Developing seismic vulnerability information
  - Insurance rating
  - Building ownership transfers
  - Triggering seismic rehabilitation requirements during building remodel permitting
HAZUS Data Collection Tool

Rapid Visual Screening of Buildings for Seismic Hazards
Example 1 (Cont.)

Building Type: Concrete Shear Wall C2
Example 1 (Cont.)

Modifiers:
Mid Rise
Vertical
Irregularity
Plan
Irregularity
Soil Type D
Example 1 Scoring

- Building Type: C2
- Basic Score: 2.8
- Mid Rise: 0.4
- Vertical Irreg: -1.0
- Plan Irreg: -0.5
- Soil Type D: -0.5
- Final Score: 1.2

![Chart showing Basic Score, Modifiers, and Final Score](chart.png)
**Example 1 - Completed Form**

### Rapid Visual Screening of Buildings for Potential Seismic Hazards

#### FEMA/54 Data Collection Form

**Address:**
- Oakland, CA
- Zip: [__] [__] [__] [__]
- Other/Identify: [__] [__] [__] [__]

**Use:**
- Office

**Occupancy:**
- Commercial
- Institutional
- Other: [ ]

**Building Name:**
- [ ]

**PILING HAZARDS**

<table>
<thead>
<tr>
<th>COLUMN TYPE</th>
<th>W</th>
<th>W</th>
<th>W</th>
<th>B</th>
<th>W</th>
<th>W</th>
<th>W</th>
<th>W</th>
<th>W</th>
<th>W</th>
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</thead>
<tbody>
<tr>
<td>Basic Score</td>
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<td>1.8</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Weak Frame (by floors)</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>High-Rise (by floors)</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
</tr>
<tr>
<td>Vertical Irregularity</td>
<td>-0.5</td>
<td>-0.5</td>
<td>-0.5</td>
<td>-0.5</td>
<td>-0.5</td>
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<td>-0.5</td>
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<td>0.5</td>
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<td>0.5</td>
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</tr>
<tr>
<td>Pre-Code</td>
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<td>0.2</td>
<td>0.2</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
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<tr>
<td>Point Break</td>
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<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
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<td>Building Type</td>
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<td>C</td>
<td>C</td>
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<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**FINAL SCORE:**
- 1.2

**COMMENTS:**
- [ ]

**Detailed Evaluation Required:**
- [ ]
Example 2
Example 2 - Interior
Example 2 - Exterior

Building Type: Steel Moment Frame S1
## Example 2 - Scoring

<table>
<thead>
<tr>
<th></th>
<th>Low Seismicity</th>
<th>Moderate Seismicity</th>
<th>High Seismicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Score</td>
<td>4.6</td>
<td>3.6</td>
<td>2.8</td>
</tr>
<tr>
<td>Mid rise</td>
<td>0.2</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Plan Irregularity</td>
<td>-0.8</td>
<td>-0.5</td>
<td>-0.5</td>
</tr>
<tr>
<td>Post Benchmark</td>
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<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Soil Type E</td>
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<td>-1.6</td>
<td>-1.2</td>
</tr>
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<td><strong>3.3</strong></td>
<td><strong>2.7</strong></td>
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</table>
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