POST-EARTHQUAKE BUILDING DAMAGE ASSESSMENT PROGRAMS

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The basic intent of a Post-Earthquake Building Damage Assessment is to identify, in general terms, whether or not a building or parts of a building are safe to occupy either full time or for limited time periods.

Three categories are defined in relation to safety of occupancy:

**INSPECTED:** No apparent hazard found, although repairs may be required. Original seismic resistance is not significantly decreased. Appears safe for lawful occupancy. NO RESTRICTION ON USE OR OCCUPANCY.
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Three categories are defined in relation to safety of occupancy:

**RESTRICTED USE:** a hazardous condition exists (or is believed to exist) that requires restrictions on the occupancy or use of the structure. ENTRY AND USE ARE RESTRICTED AS INDICATED ON THE PLACARD, controlled by building owner/manager.
The basic intent of a Post-Earthquake Building Damage Assessment is to identify, in general terms, whether or not a building or parts of a building are safe to occupy either full time or for limited time periods.

Three categories are defined in relation to safety of occupancy:

**UNSAFE:** Extreme structural or other hazards present. There may be imminent risk of further damage or collapse from creep or aftershocks.

**UNSAFE FOR OCCUPANCY OR ENTRY,** except as authorized by the jurisdiction.
Post-earthquake building damage assessments undertaken at one or more of four levels of detail:

- Windshield survey (minutes – overview, no postings)
- Rapid Damage Assessment (30 – 60 minutes)
- Detailed Damage Assessment (several hours)
- Engineering Assessment (days to weeks)
Major Structural Damage
(Anchorage, Alaska - 1964)
Major Structural Damage
(Whittier Narrows, California, 1987)
Major Structural Damage
(Nepal, 2015)
Major Structural Damage (Haiti, 2010)
Major Structural Damage (Northridge, 1994)
Major Structural Damage
(San Francisco, 1989)
Minor Structural Damage

(Photo courtesy of the Applied Technology Council)
Minor Structural Damage

(Photo courtesy of the Applied Technology Council)
Minor Structural Damage

(Photo courtesy of the Applied Technology Council)
Minor Structural Damage

(Photo courtesy of the Applied Technology Council)
Non-Structural Damage

(Photo courtesy of the Applied Technology Council)
Non-Structural Damage

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BC Earthquake Immediate Response Plan (July 2015)

Two earthquake planning scenarios chosen:
• Vancouver, M7.3, 10 km under the city on an assumed fault;
• Victoria, M7.0, 10 km under the city on a known fault (Leech River Fault)

Loss estimation results (using the HAZUS model):
• Metro Vancouver – 18% of buildings most likely to receive extensive damage, including 12% most likely to receive complete damage
• Capital Regional District - 18% of buildings most likely to receive extensive damage, including 11% most likely to receive complete damage
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Northridge Earthquake (1994):

- Approximately 104,000 buildings posted
  - 3% posted **UNSAFE**
  - 11% posted **RESTRICTED USE**
  - 86% posted **INSPECTED**

- Does not account for many buildings not assessed because complete damage was evident or there was no obvious damage
Value in determining whether or not it is safe to continue to occupy the building, or parts of it? particularly if occupancy of the building is needed in the short term for response and/or recovery needs of the owner/occupant.

Let’s assume that the owner/occupant has determined that assessment of the safety of occupancy of a building(s) should be completed as soon as possible for business continuity needs.
We are trained building damage Rapid Evaluators.

And I have never done this before!

At least we attended the training seminar!

And the earthquake just happened!!!

But what now? We have no forms, no tools, no direction.
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Issues to be addressed before an earthquake occurs:
(to increase the likelihood of building damage assessments being successful from an organization’s post-earthquake emergency response and recovery perspective)

• Governance
• Standards
• Documentation
• Evaluator Assignments
• Tools and Equipment
• Training and Exercises
• Undertaking and Reporting on Evaluations
• Recovery
• Program Reviews and Audits

(Plan Do Check Act)
GOVERNANCE

- Policy
- Objectives
- Program Structure
- Program Definition
- Implementation

Identification of roles and responsibilities within the organization.
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STANDARDS

- Development
- Best Practices
- Compliance
- Continuous Improvement
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DOCUMENTATION

- Governance, standards, program details
- Integration with emergency management
- Building Emergency Response Plan requirements
- Assessment manuals (critical infrastructure, large/complex buildings)
- Building prioritization for assessments
- Forms and placards
- Distribution of forms and placards
- Third party (e.g. Local Authority) agreements
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EQUIPMENT

- Storage locations
- Forms and placards
- Damage assessors kits
OVERVIEW OF POST-EARTHQUAKE BUILDING DAMAGE ASSESSMENT PROGRAMS

• Damage assessors kits
EVALUATOR ASSIGNMENTS

• Assign Rapid Evaluators
• Assign Detailed Evaluators and Engage Detailed Evaluator consultants
• Listing of trained evaluators
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TRAINING AND EXERCISES

• Classroom training – Rapid and Detailed
• On site training – Rapid and Detailed
• Activation drills
• Evaluation exercises
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EVALUATIONS

• Rapid evaluations
• Engage additional evaluators as necessary
• Initial postings
• Monitor compliance
• Detailed evaluations
• Re-postings
• Engineering evaluations
• Reports
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RECOVERY

- Correct minor problems
- Implement projects for major corrective action
- Confirm successes
- Re-occupy buildings
REPORTING AND PROGRAM AUDITS

- Periodic program audits
- Regular reporting of program activities to senior management
POST-EARTHQUAKE BUILDING DAMAGE ASSESSMENT PROGRAMS

SUMMARY
POST-EARTHQUAKE BUILDING DAMAGE ASSESSMENT PROGRAMS

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Based on general distribution of building stock with respect to:
• Age
• Structural type
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SUMMARY

From an organizational perspective, you can look at the organizational impact of building damage results in several ways:

a) i) Damage to the organization’s building stock is likely to be sufficiently extensive to result in UNSAFE postings to practically all buildings, and they would not be occupiable after an earthquake, or

ii) There is no business continuity urgency to occupy the organization’s buildings after an earthquake, so regardless of the condition of the buildings, they would be evacuated until resources are found to assess it.

LITTLE VALUE IN HAVING A BUILDING DAMAGE ASSESSMENT PROGRAM IN PLACE BEFORE THE EVENT

OR
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BUILDING DAMAGE ASSESSMENT PROGRAMS

SUMMARY

From an organizational perspective, you can look at the organizational impact of building damage results in several ways:

b) There is a business continuity justification for continuing to occupy buildings if the conditions of the buildings are such that they are safe to occupy.

THERE IS VALUE IN HAVING AN EFFECTIVE BUILDING DAMAGE ASSESSMENT PROGRAM IN PLACE TO ENSURE CONTINUED OCCUPANCY IF IT IS SAFE TO DO SO.
Integrated Provincial Damage Assessment and Inspection (IPDAI) initiative:

- Initiated in 2009
- Representation from a wide range of provincial, federal, local authority and private sector organizations
- Draft Roadmap to Develop Building Damage Assessment and Inspection Procedures for Local Governments issued in January 2012
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Existing programs:

- BC Housing - [http://www.bchousing.org/aboutus/RDA](http://www.bchousing.org/aboutus/RDA)