Closing Plenary
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3B Improving New Building Performance - Codes vs. Cost/Benefit Data vs. Resilience Ratings

John Sherstobitoff & Carlos Molina Hutt
Improving the Seismic Performance of New Bldgs: How do we make it happen?

- **Workshop Purpose:**
  To discuss the different mechanisms we can collectively pursue to achieve enhanced seismic performance in new buildings.

- **Themes addressed:**
  - Building Codes
  - Resilience Ratings
  - Cost-Benefit Data

- **Participants:**
  - Count: 80+
  - Primarily Engineers (58%) & Academics (17%)
Improving the Seismic Performance of New Bldgs: How do we make it happen?

**BUILDING CODES:**
- **Pros:** Uniformity
- **Cons:** Binary (no incentive to do better)
- **Actionable Strategies:** Codes should be more transparent about performance

**RESILIENCE RATINGS:**
- **Pros:** Transparency
- **Cons:** Social Equity (What about existing buildings?)
- **Actionable Strategies:** Validation + Incentives

**COST-BENEFIT ANALYSIS:**
- **Pros:** In theory, great decision tool
- **Cons:** Complex/Many Assumptions/Costly
- **Actionable Strategies:** Standardized approach for EQ mitigation + Case studies

**Key Finding:**
68% of participants listed building codes as their preferred approach to achieve enhanced performance.
6B Performance Based Design and Resiliency of Utilities & Bridges

- Sepideh Ashtari & Lalinda Weerasekara
Performance Based Design and Resiliency of Bridges and Utilities

- Two main objectives of the workshop:
  - Implementation of PBD in seismic design guidelines (US vs Canadian)
  - Approaches to increase the seismic resiliency of utilities and bridges

- The main outcomes of the workshop and technical sessions:
  - The importance of various elements on the outcome of PBD was highlighted through the experience of developing NCHRP 12-106 guidelines, such as the effect of damping assumption and the input response spectrum.
  - The practical background for developing CSA S6-14 PBD approach was reviewed by providing examples of previous retrofit projects across BC. Some of the proposed changes in CSA S6-19 PBD approach were presented.
  - Passive force-displacement relationship for skewed bridge abutments were discussed followed by practical design recommendations validated by full-scale tests.
  - Examples of improving resiliency through using innovative materials for bridges were presented and practical opportunities in this area were highlighted.
  - Post-earthquake restoration of San-Francisco lifelines was presented as an example to highlight the actions required to meet resiliency targets.
  - The main impediment for implementing PBD in design guidelines were discussed. Many factors were considered including contractual impediments (design-build vs design-bid-build), interpretation of the qualitative performances, defining performance for stakeholders, inconsistency in calibration of the FBD vs PBD approaches, and higher cost of PBD vs FBD for competitive bidding.
8B New Technologies and Instrumentation

- Salman Soleimani-Dashtaki & Teron Moore
New Technologies & Instrumentation

- Instrumenting & Monitoring → Tall Buildings & Bridges
  - Opportunities:
    - Post Earthquake Assessment → automatic/semi-automatic tagging
    - Emergency Response Management → prioritization, res. Allocation
    - BIM updating using drift/fragility approach → quick citywide assessment
  - Challenges:
    - Funding → public education approach + bylaw enforcement
    - System Reliability → Tagging (Red, Yellow, Green) responsibility
    - Data Privacy → Block-chain approach, reveille under the “state of emrg.”
New Technologies & Instrumentation

- Early Warning Systems & Mass Notification
  - Opportunities:
    - Values are clear → automated system response (e.g., airport, sky train)
    - SENDAI platform → understanding hazard/risk, post-earthquake products
    - Effective tsunami responses → evacuation, rerouting, & closures
  - Challenges:
    - Funding → market-based appr., value proposition, company champions
    - Reliability/accuracy → operational goals, expectations, iterative improvements
    - Roles/gaps → network integration, dissemination, consistency (e.g., education)
5B Post-Earthquake Response and Recovery

- Steven Bibby & Dave Brunsdon
Post-Earthquake Response and Recovery: Damage Assessment and Habitability

Workshop purpose:

- Improving the knowledge, understanding and implementation of Post-Earthquake Response and Recovery Actions

Scope of session – discussion of the following initiatives:

- Understanding the range and suitability of qualifications of evaluators, and the associated licensing issues
- Utilising building performance prediction software in the post-earthquake context
- Pre-event designation of indicator buildings to more quickly establish the types of buildings most affected
- Supporting critical facilities (e.g., hospitals) to have specific relationships with engineers for immediate response
- Exploring criteria for habitability beyond structural damage (a key component of the road map being prepared by ATC under the 2018 USA Disaster Reform Recovery Act)
Post-Earthquake Response and Recovery: Damage Assessment and Habitability

Key Points

- ‘It’s complicated!’
- But we need to pursue qualification of evaluators, use of performance prediction software, pre-event designation of indicator buildings, engineers and critical facilities, and habitability criteria

Actionable Strategies

- Qualifications and licensing – actively engage with other professionals for the assessment of elements that fall outside the purview of design professionals
- Supporting critical facilities – prepare and share an exemplar of a priority agreement with engineers to encourage uptake
- Criteria for habitability – support the development of the road map being prepared by ATC under the 2018 USA Disaster Reform Recovery Act
7B Improving Performance of Existing Buildings

- Micah Hilt & Jessica Shoubridge
A strategic balance of techniques to advance action, adjust the market, reduce risk and foster recovery

Education and Information
- People **know the risk** – They need to be able to see themselves in it and understand what they should and can do to reduce it
- People do NOT understand building seismic performance - Rating, CBA are important tools for communicating performance and the benefits of improvement. They must be carefully designed and implemented though
- Mandating **evaluation** works, with disclosure

Tools
- **Incentives**, both things we give and things we no longer offer for free, move action
- **Insurance** has a role – CEA offers an insurance benefit and grants for retrofit
- Consider the **whole building**, its use and occupants, when considering retrofits -- opportunity
2B Connecting the Dots: Seismic Resilience through Inter-Disciplinary Synergy

- Nicky Hastings & Murray Journeay
Connecting the Dots: Seismic Resilience through Inter-Disciplinary Synergy

Workshop Purpose

Expand on the discussion of disaster recovery - explore the components of a system that provide health care, which one ought to be improved either through mitigation of business continuity planning.
Response Top Priorities

- Prioritize lifelines functioning, invest in reliable onsite back-up generators
- Plan to address thousands of injuries which could overwhelm the system
- Injury prevention plan and promote prevention steps after “drop, cover and hold”
Sustained Response

Priorities

- Utilities: Electricity/Gas/Petroleum/Water/waste water/IT
- Supplies: Medical Equipment and supplies, Hospital Supplies overall
- Work Force
- Operation: Hospital operation

Other considerations

- Roads and Bridges
- Supply chain of goods and services for off site contracts (i.e. Laundry, food)
- On-site contingency plans and supplies (water, electricity, food, etc)
- Injury data with details of number, type of injury and the time are critical to have
- Health staff get redistributed into other facilities from a damaged facility
- Code Orange plan exist within BC
Recovery Top Priorities

Priorities
- Restoration of core day-to-day health care services
- Supplies availability
- Workforce availability

Key Considerations
- Utility functioning
- Regional picture and context. Possibly move patients around
- Transportation. For example, on North Shore, complete reliance on key bridges and highway with little intermodal substitution
- Longer term picture, what is happening to population. Change jobs, schools, etc. Population might decline, then how does that impact normal day to day demands?
Report Back from EERI Sessions

LAURIE JOHNSON, EERI PRESIDENT
Plenary Sessions

- **Distinguished Lecture, Ross Boulanger:**
  *Liquefaction Lessons, Challenges, and Opportunities*
  - More collaborative, multi-institutional research work that integrates lab testing, field exploration, and analytical modeling is needed to take our understanding of liquefaction to the next level.

- **Joyner Lecture, Rob Graves:**
  *Simulating Realistic Earthquake Ground Motions*
  - New methods for simulating realistic ground motions that merge stochastic approaches for high frequencies and deterministic approaches for low frequencies will become possible as uncertainties are resolved and computational capacity increases.
EERI Learning From Earthquakes
Meeting & Sessions

- **Lessons Learned from M7.0 Anchorage, Alaska Earthquake**
  - This earthquake was an important opportunity to understand how the engineering and scientific response to earthquakes in the US has evolved.
  - Every earthquake is different, unique characteristics of earthquakes should inform comparisons of impacts between 2017 and 1964 earthquakes.

- **Lessons and Impacts from recent international earthquakes: Dominican Republic, Japan, and Indonesia**
  - The role of technology in reconnaissance is quickly expanding, so EERI should embrace the use of new technologies to increase what we can learn.
  - EERI should continue to ensure that reconnaissance knowledge from many disparate teams can be shared broadly.
EERI Learning From Earthquakes
Meeting & Sessions

- **Measuring the Resilience of Businesses After Earthquakes**
  - Correlating physical damage with business operational impacts is important and continued refinement of survey methodologies and procedures is needed to ensure this knowledge can be uncovered.

- **LFE Resilience Reconnaissance Framework in the Context of the Pubela-Morelos Mexico Earthquake**
  - There is increasing desire for “resilience” measurement, however quantifying specific resilience measures is challenging. EERI should learn from the EERI Housner Fellows and explore how this can be addressed in reconnaissance.
  - EERI members continue to have strong passion and new ideas for the future development of LFE, so EERI should leverage this energy.
Public Policy & Advocacy Meeting and Session

- EERI and its members can play an important role in informing legislation so that it reflects the best technical knowledge.
- Engagement in multiple ways is needed including developing and introducing policy language, targeting outreach to elected officials, contributing to committees like the EERI PPA Committee or ACEHR, and coordinating with other colleagues to communicate a unified message.
- Engagement at many community levels is needed including local, regional, state, and federal.
- After the reauthorization of NEHRP, it’s become increasingly important to define and develop a framework for achieving functional recovery after earthquakes.
- EERI’s Public Policy & Advocacy Committee is seeking your participation!
Discussion

What is one important next step you can take to advance the outcomes you just heard about?
Closing Remarks

- Laurie Johnson
- Jessica Shoubridge (upcoming event)
- John Sherstobitoff
Friday, March 8, 2018
SDC Awards Ceremony
Parq Grand Ballroom E & F
12:30 PM - 2:00 PM
All conference attendees welcome, but a paid ticket is required. Tickets can be purchased at the registration desk for an additional fee.
The US Resiliency Council (USRC) and partners seek to convene public and private sector leaders in resilient building policy for a summit to engage in collaborative efforts to define, establish and promote resilience initiatives related to existing buildings. Specific topics will include:

- Identifying existing market momentum and policy drivers synergistic with seismic and climate resilience
- Describing unique and overlapping technical considerations for seismic and climate resilience
- Exploring intersecting government policy that addresses both chronic stresses and acute shocks, including consideration of related building code objectives
- Documenting and sharing best practice policies that have been successfully adopted to improve resilience including codes and standards, government investment, market stimulus, real estate engagement, and insurance
Share your experience on social media using #EERI2019

THANK YOU!