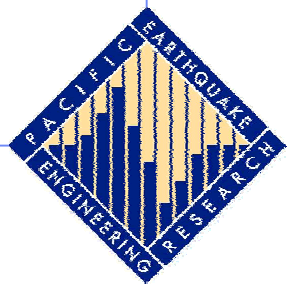
PEER Education Program

Scott A. Ashford

PEER Assistant Director for Education



2006 PEER Annual Meeting

PEER Education Objectives

- Stimulate interest in young students
  - Focus is on Undergraduates
- Provide challenging opportunities in education and research to university students
- Encourage participation of traditionally underrepresented groups
- Raise public awareness and knowledge

PEER Education Programs

- Undergraduate Students
  - PEER Summer Interns
  - REU Interns
  - Earthquake Engineering Scholars Course
  - Shake Table Competition
- These programs reach about 100 undergraduate students each year.

PEER Education Programs

- Graduate Students
  - Student Leadership Council
    - PEER Student Association
  - Tri-Center Field Study
- K-12
  - K-12 Events
  - Research Experience for Teachers

PEER and REU Summer Interns

- 22 Internships for summer 2006
- $5,000 stipend for 10 weeks
  - Travel, housing supplement available
- Selections start in February....
  - Stanford already requested 4 interns
- Moving toward Intern Clusters
  - Interns can work together
  - Better experience
- Internships likely to be carried by NEES

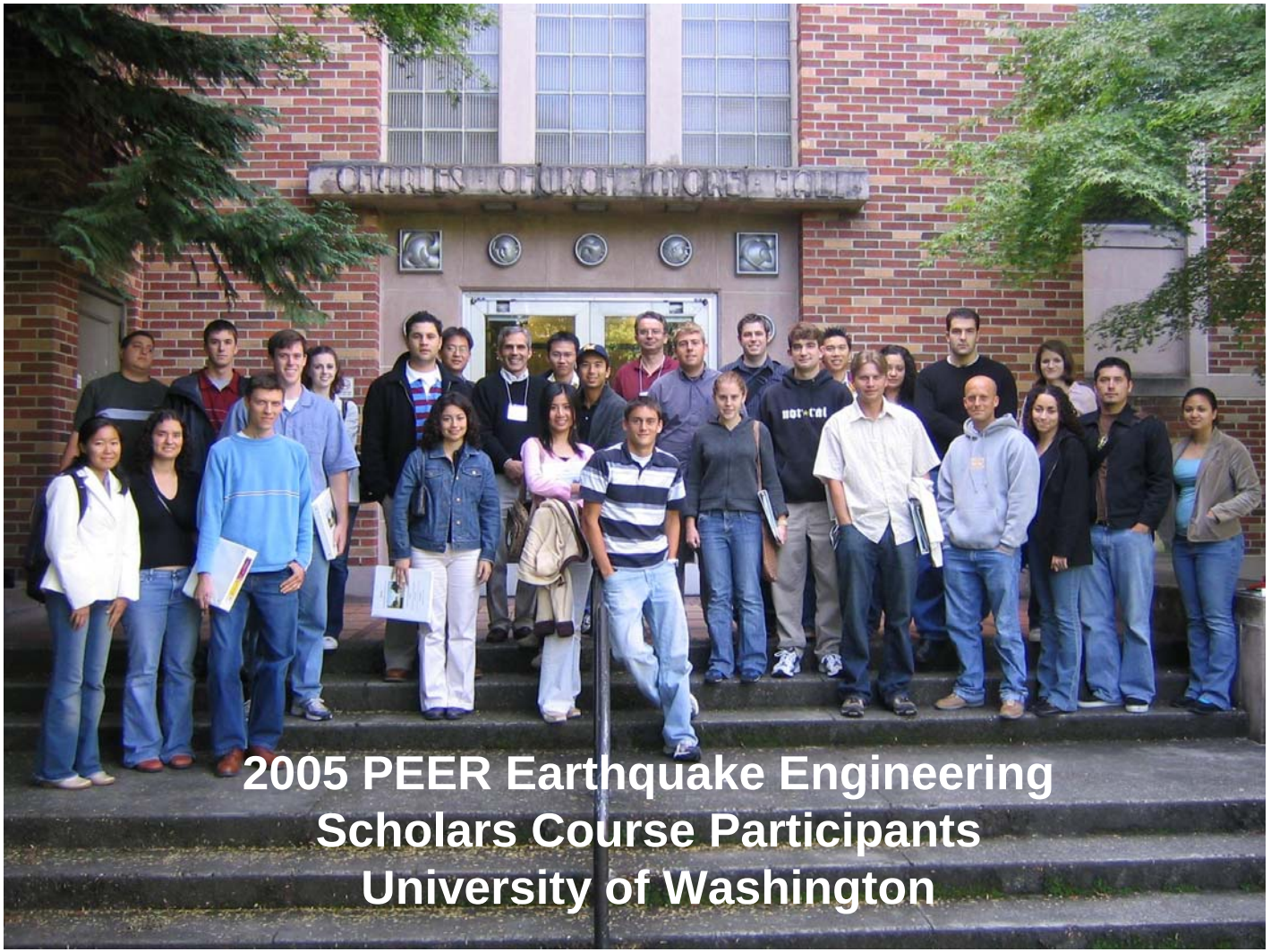
PEER and REU Summer Interns

2004 Tri-Center REU Symposium
at Cooper River Bridge site
Charleston, South Carolina

2004 PEER Summer Interns at the
2005 EERI Annual Meeting in
Ixtapa, Mexico

- Year 5=24 Applicants
- Year 6=52 (13 from beyond PEER)
- Year 7=56 (24 from beyond PEER)
- Year 8=69 (35 from beyond PEER)

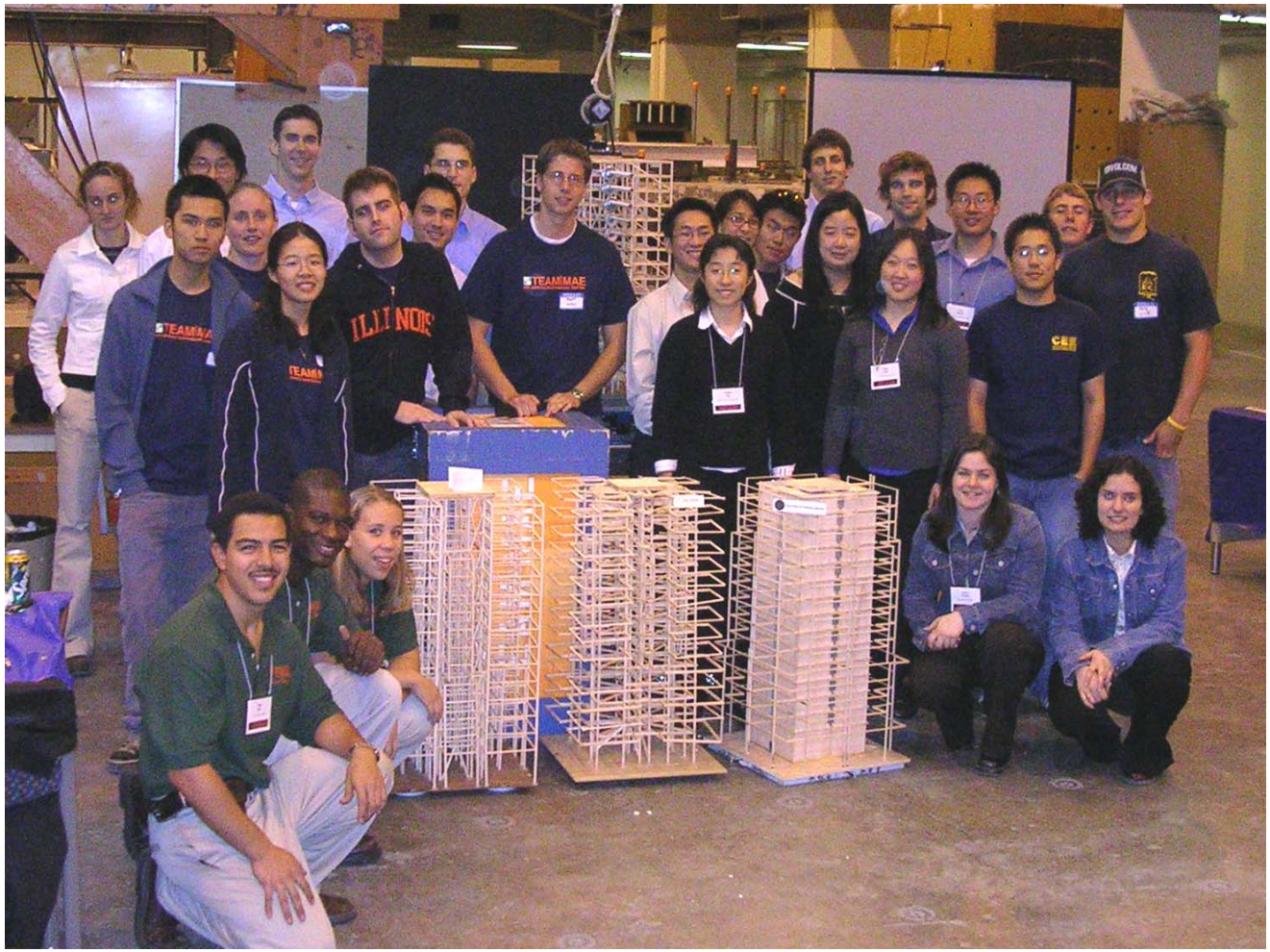
Earthquake Engineering Scholars Course



Earthquake Engineering Scholars Course

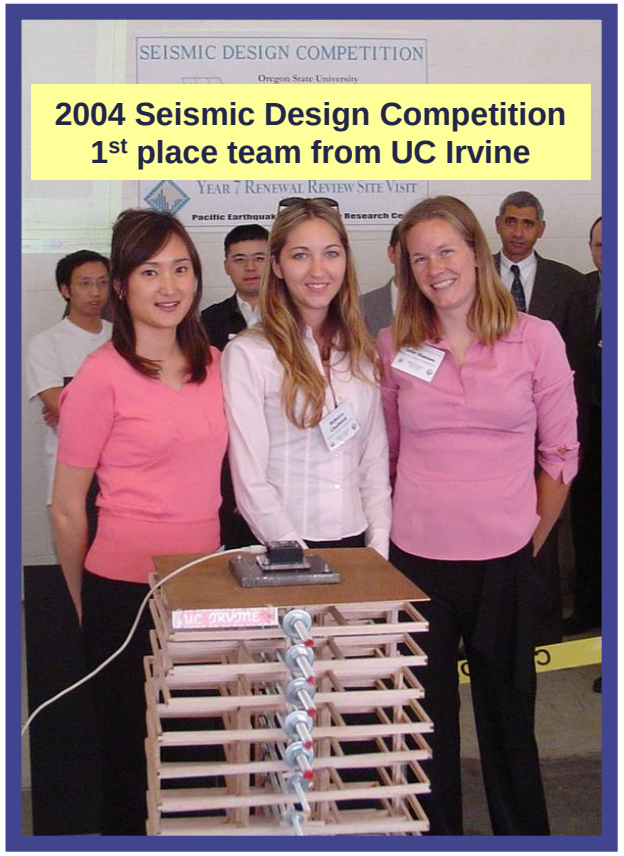
- Multi-campus program for 30 students
- 4 weekend retreats at PEER core campuses
- At least one BIP presentation
- Participation of faculty from other campuses
  - Short courses
  - Lab demonstrations
  - Tours
  - Meet graduate students
  - Fun

2005 PEER Seismic Competition



Seismic Design Competition

- 3rd Annual in 2006
- Three criteria
  - Paper
  - Presentation
  - Performance
- 2006 Tri-Center Competition
  - 8NCEE, April 19-21
  - Jointly with EERI
  - 50 students participating
- This is an SLC volunteer effort!



2004 Seismic Design Competition
1st place team from UC Irvine

Student Leadership Council

- Represents Students within PEER
  - President is Judy Mitrani-Reiser, Caltech
  - PEER Student Association
- Need at least one Representative from each Campus (or more)
  - 21 current members
  - All PEER Universities represented
- Coordinates PEER Student Activities
  - At PEER meetings and on campus
  - Seismic Design Competition

Tri-Center Field Study: Miki Shake Table

Tri-Center Earthquake Field Study

- Graduate students from each EERC join together to study EE beyond US
  - PEER will send 3 graduate students
- PEER organized trip to Japan in 2004
- 2005 went to Greece, led by MAE
- 2006 Study goes to New Zealand, with MCEER
- 2007 Study will be led by PEER
  - Japan again or tsunami recovery study

K-12 Event: Minds in Motion

PEER

K-12 Outreach

- Minds in Motion K-12 Event
  - Held 2005 at California State University, Chico
  - Purpose: To expose K-12 students to career opportunities in Science and Engineering
  - 3958 students from 63 Northern California K-12 schools attended the event
  - SLC member Curt Haselton represented PEER, teaching students about earthquakes and structural engineering
- San Carlos Middle School
  - Shake Table Competition hosted by Stanford
- RET: Research Experience for Teachers

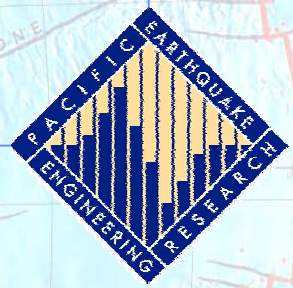
Future Direction for PEER Education

- Overall Goal
  - Find homes for our most successful programs
- Summer Internships: $125k for 22 students
  - NSF funding for REU Site
  - NEES REU Program
- Undergraduate Shake Table Competition
  - EERI co-hosting 2006 competition
- Earthquake Engineering Scholars Course
  - $80k for 30 students over 4 weekends
  - Talking with NEES Education Committee

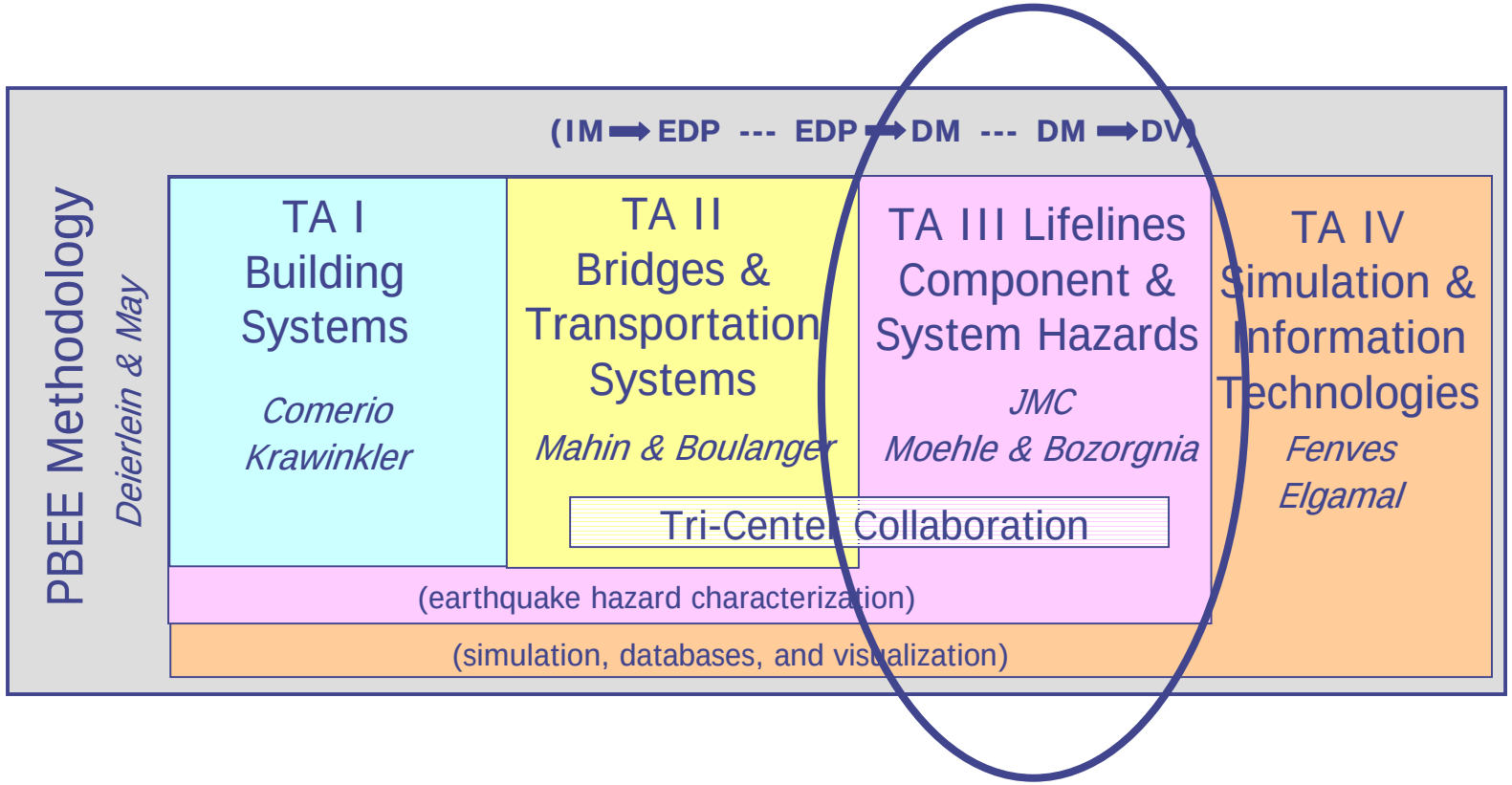
PEER Lifelines Program: Accomplishments and Future Plan

Yousef Bozorgnia

January 21, 2006



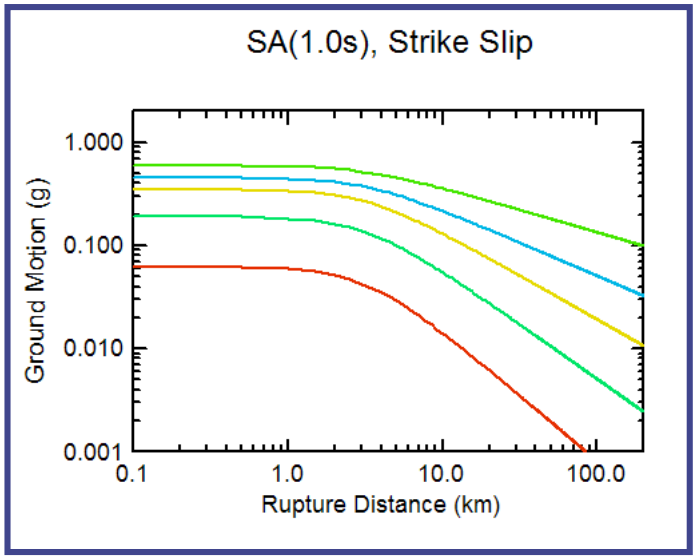
PEER Thrust Areas

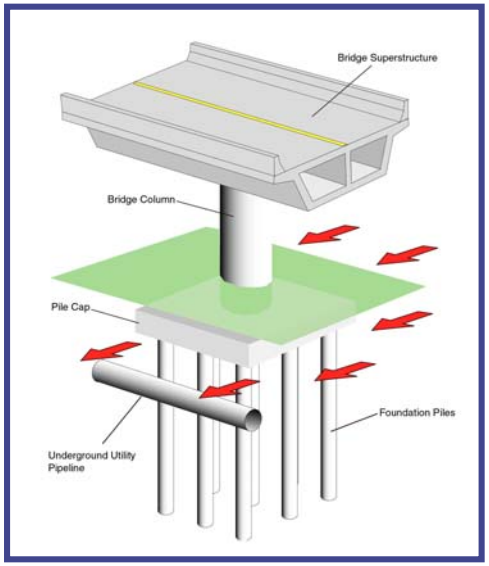


PEER Lifelines Program ... Main Accomplishment

- Effective collaboration among:
  - Engineers (multi-disciplines)
  - Scientists (multi-disciplines)
  - Funding agencies
  - Researchers
  - Practitioners
  - End users

PEER Lifelines: > 100 Projects Have Been Initiated

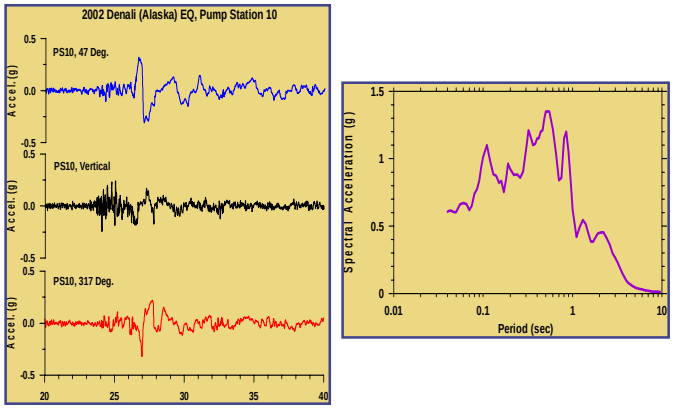


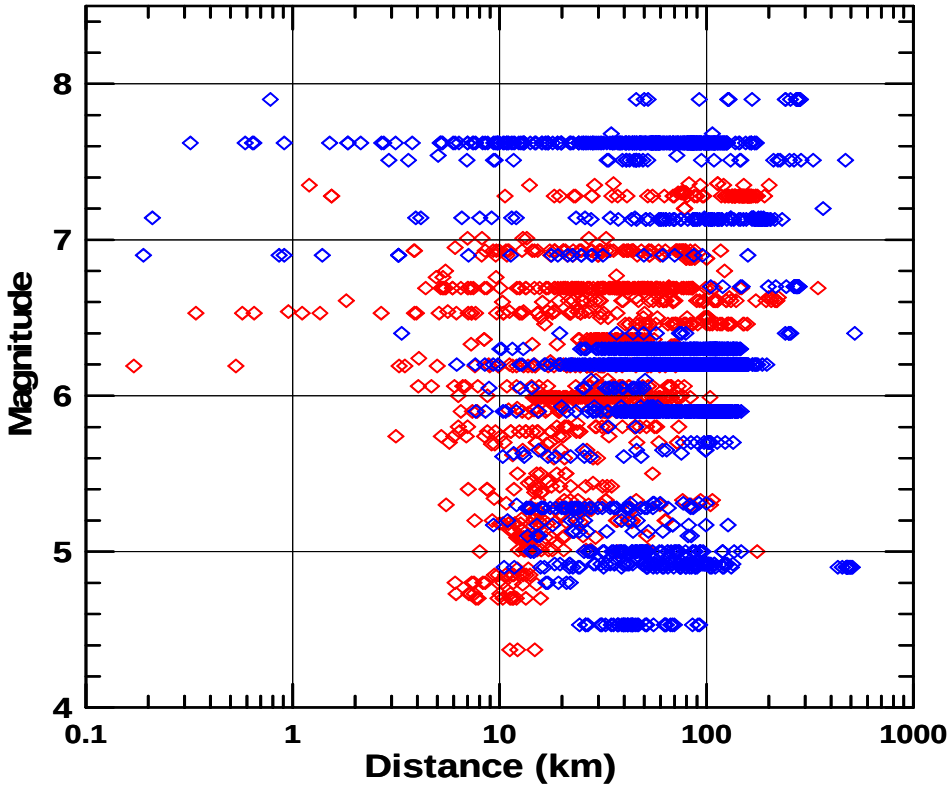


Example Project: Seismic Hazard Characterization

Next Generation Attenuation Models (NGA)

- NGA Database:
- 175 worldwide earthquakes
  - > 10,500 corrected records

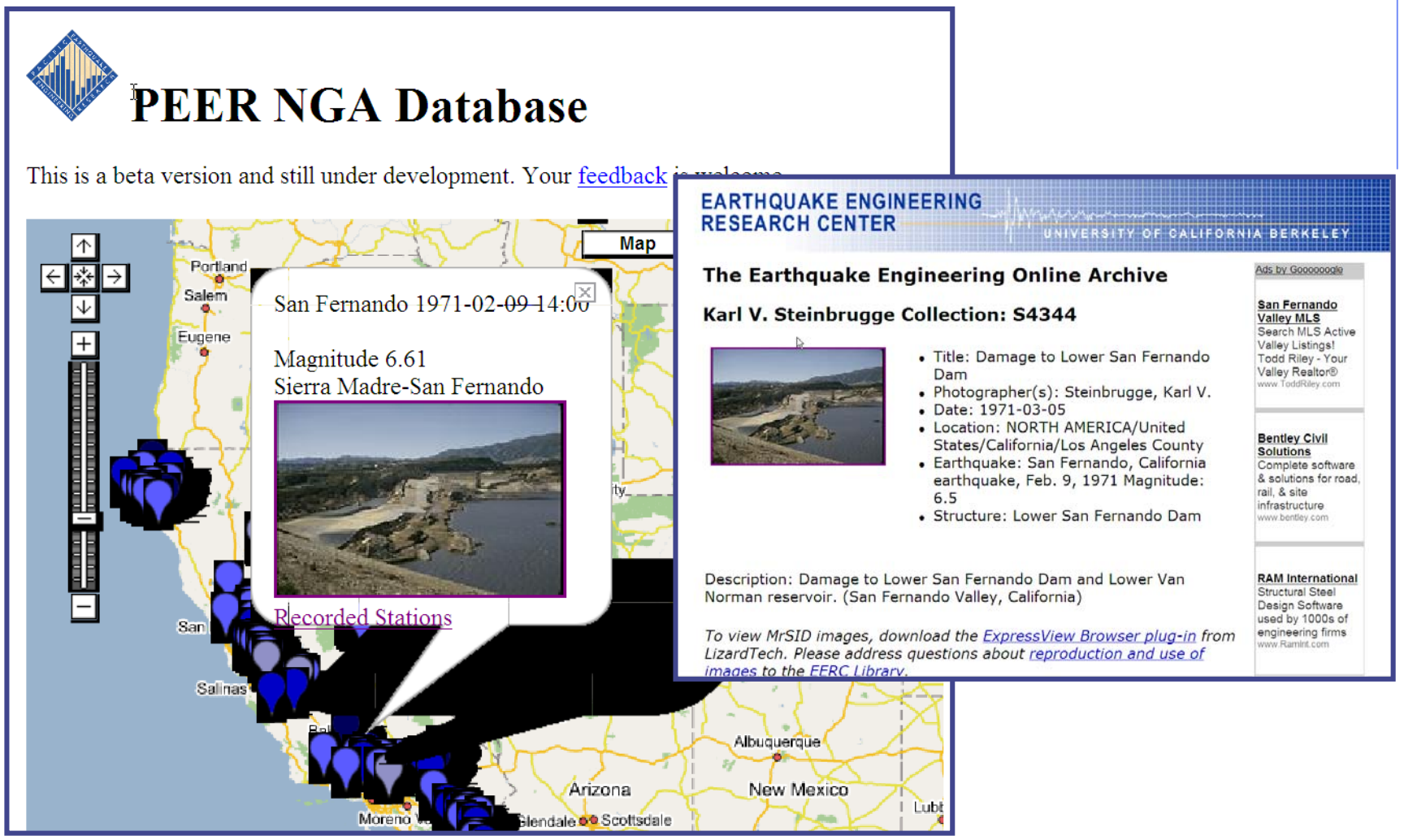




Previous Data **New Data**

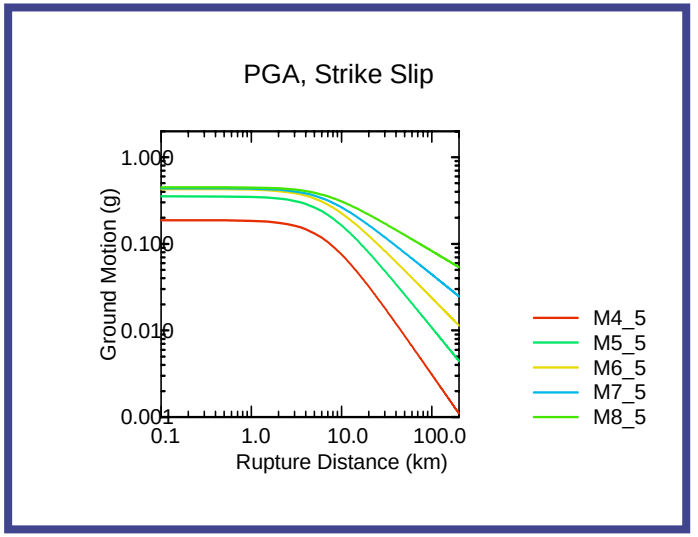
PEER

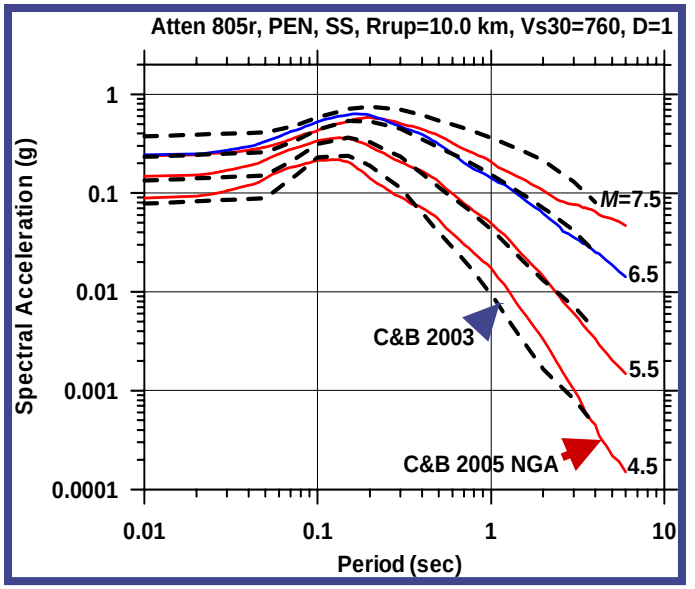
NGA Database is Being Linked to Collection of Thousands of Damage Photos at Berkeley EERC



NGA Attenuation Models

- Period: 0 to 10 sec
- Magnitude range:
  - 5.0 - 8.5 (SS)
  - 5.0 - 8.0 (RV)
- Distance range:
  - 0 – 200 km
- Fault Mechanism:
  - Strike-Slip
  - Reverse
  - Normal





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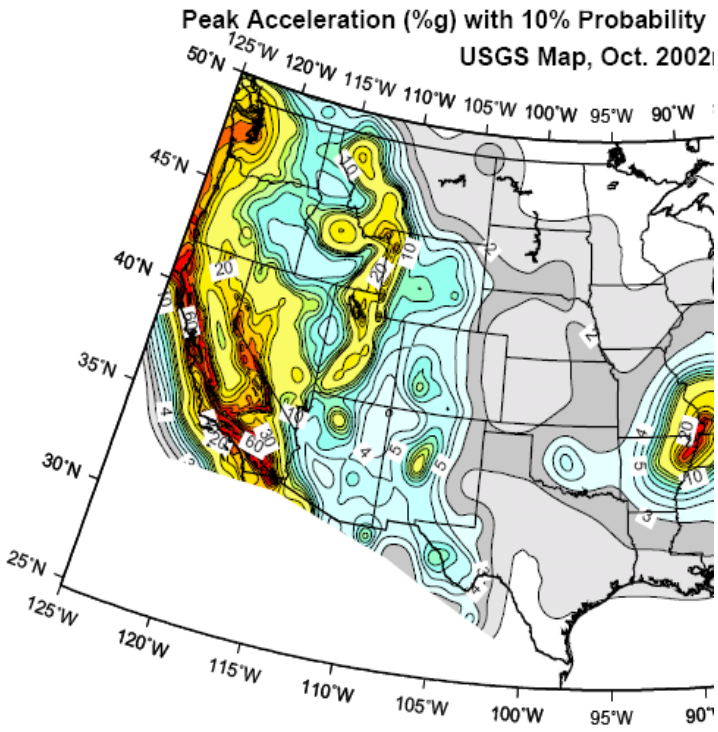
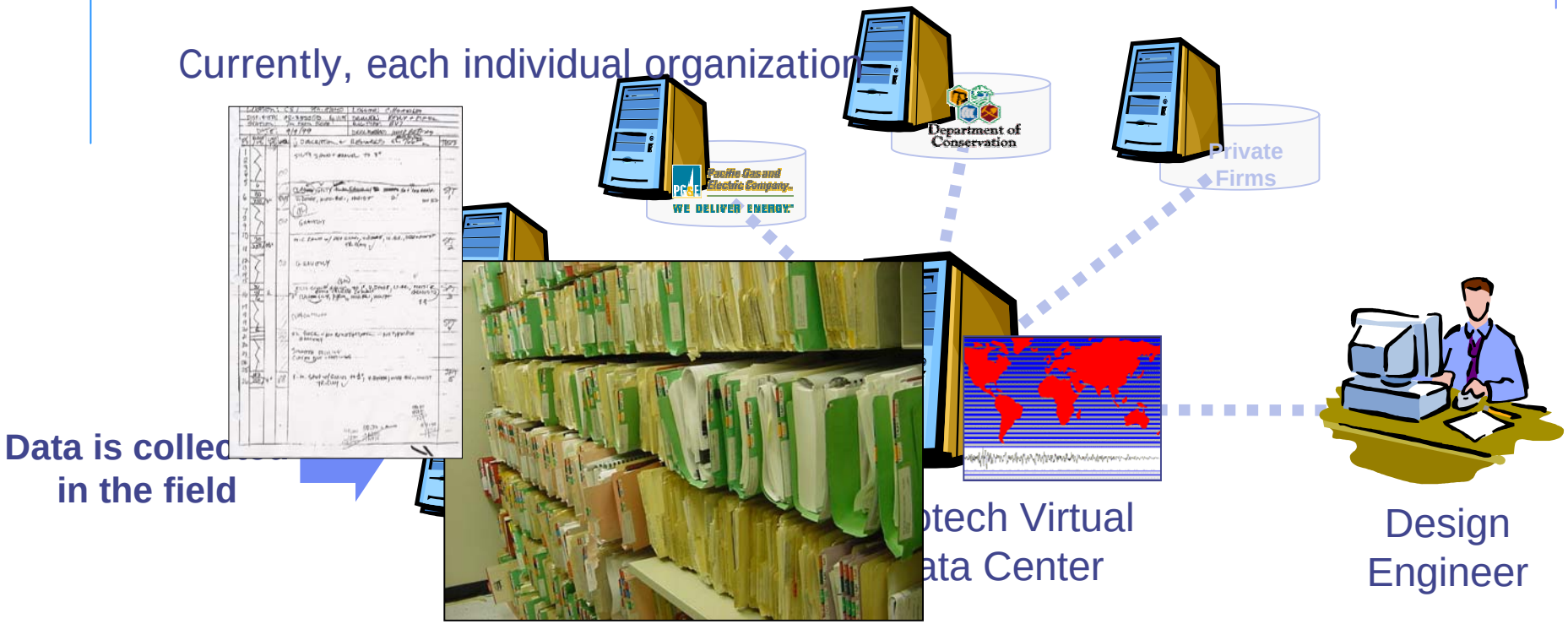
Impact of NGA on Hazard and Seismic Design



- USGS is reviewing the NGA models for adopting for the US National Hazard Maps
- The national maps are basis of seismic design in various codes

Example Project: Geotechnical Virtual Data Center

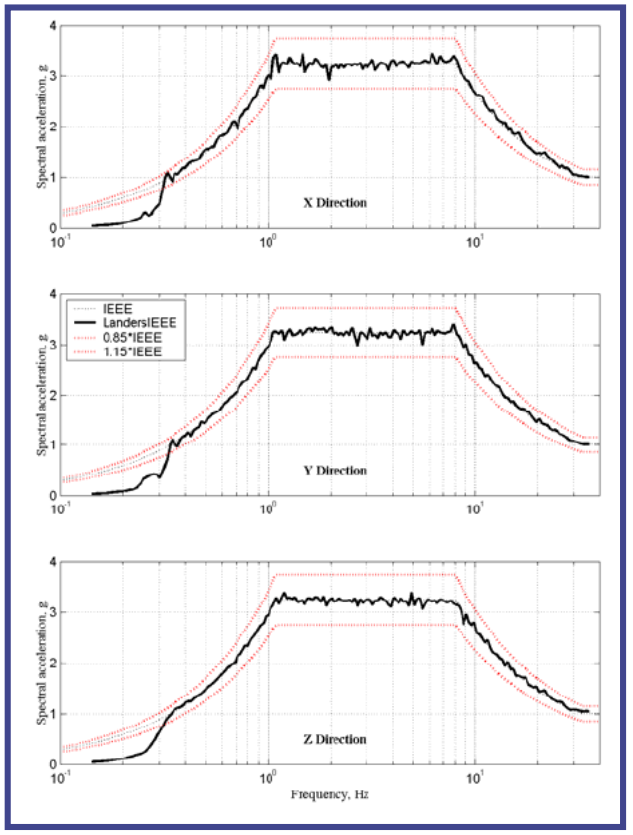
- Goal: Collect and efficiently organize geotechnical data, and make it accessible to the public



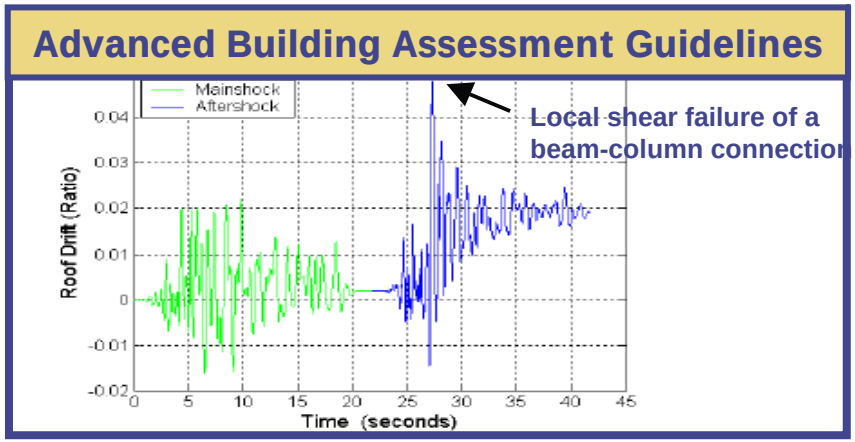
Seismic Performance of Electrical Equipment
Example: Response of 500 and 230 kV switches

Example Project: Input Motion for Shake Table Testing of Electrical Equipment

- Developed a standard set of input motions for shake table tests of electrical equipment
- The input motions are being considered for inclusion in IEEE-693 standard for testing



There are MANY More Successful Projects …



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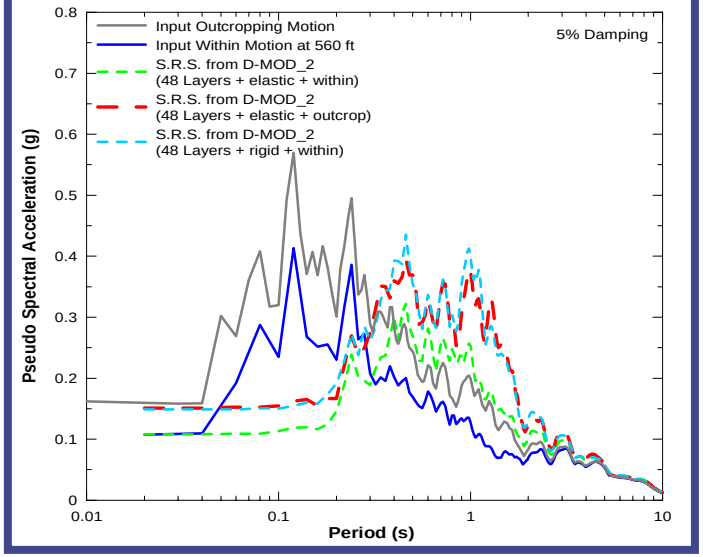
There are MANY More Successful Projects ...

Engineering Assessment of Liquefaction-Induced Lateral Spreading

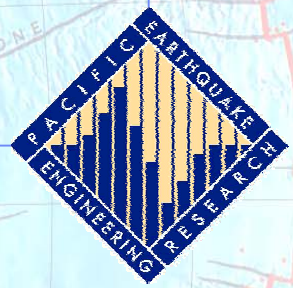
Benchmarking of Analysis Procedures for Nonlinear Soil Response



There are MANY More Successful Projects ...

Future of PEER Lifelines Program ...

PEER LL Program Will Be Going and Going ...
and Going ... Beyond Year 10



PEER Lifelines Program Will Continue ... Beyond Year 10 ...

- PEER LL Program is mainly supported by the State of CA and private funding

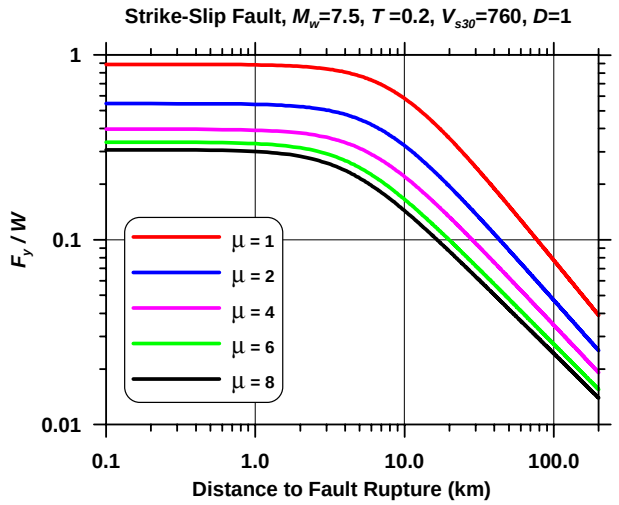
- We recently signed a five-year contract with Caltrans for:
  - Research on seismic performance of lifelines

PEER Lifelines Funding ...

- A new contract was just signed with BART
  - Seismic response of partially embedded structures

- Other proposals are being reviewed by other State agencies

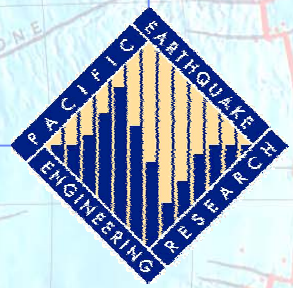
Future Projects Will Include ...



- Ground motions:
  - Attenuation models
  - Selection of ground motions for nonlinear analysis
  - Hazard
  - Engineering characterization
- Ground deformations, soil response, Fault-crossing
- Performance of bridges and transportation systems
- Seismic reliability of electric components and networks

In summary:

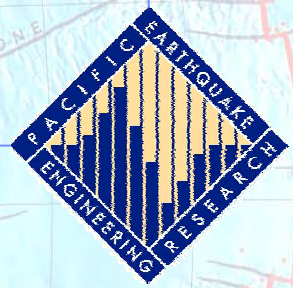
PEER Lifelines Program Will Be Going and Going ...



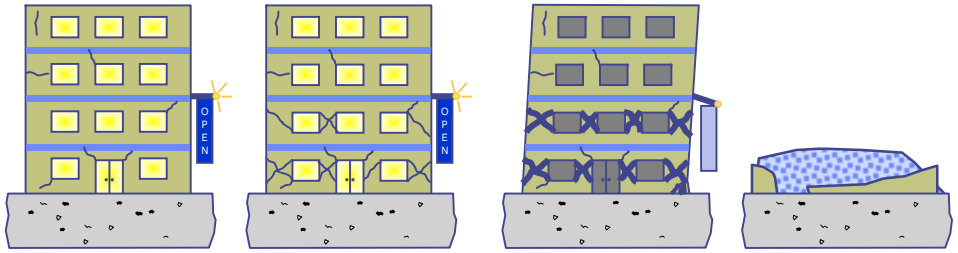
PEER Core Program

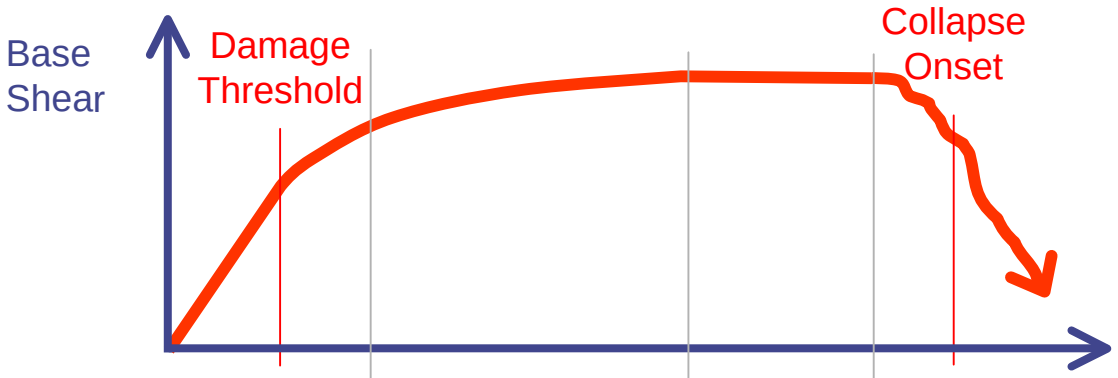
Greg Deierlein

January 20, 2006



PEER Vision and Legacy





PBEE today

PEER & ATC 58 vision

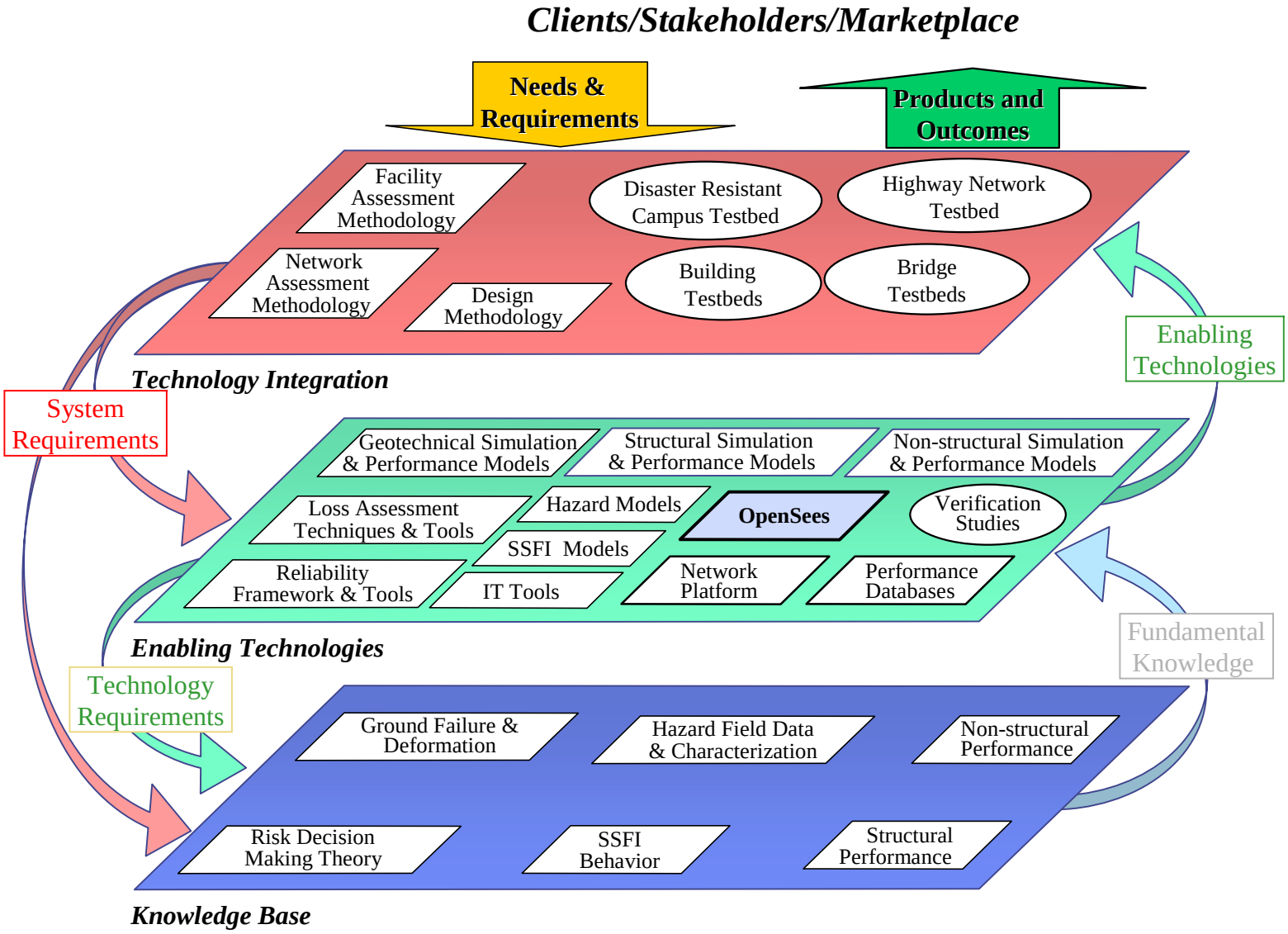
FEMA 356 Performance Levels

0 — 25% — 50% — 100% — $, % replacement

0.0 — 0.0001 — 0.001 — 0.01 — 0.25 — Casualty rate

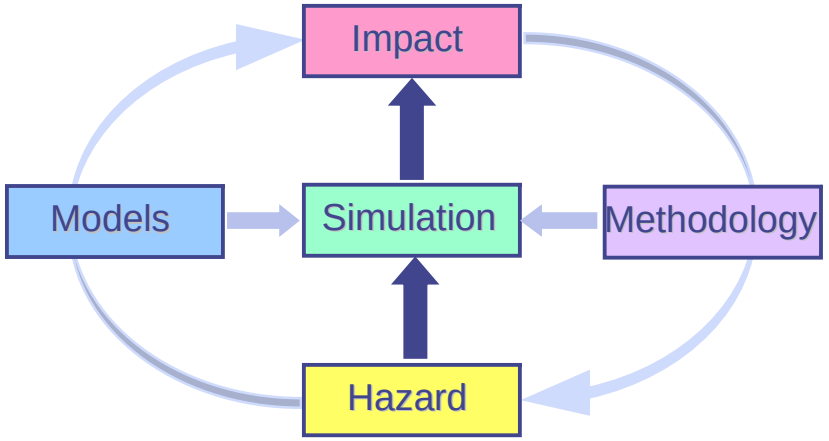
0 — 1 — 7 — 30 — 180 — Downtime, days

Systems-Level Research



PEER's Products & Research Plan

- PBEE Methodology
- Technologies & Data
- Illustrative Examples
- Guidelines



t r a n s i t i o n s

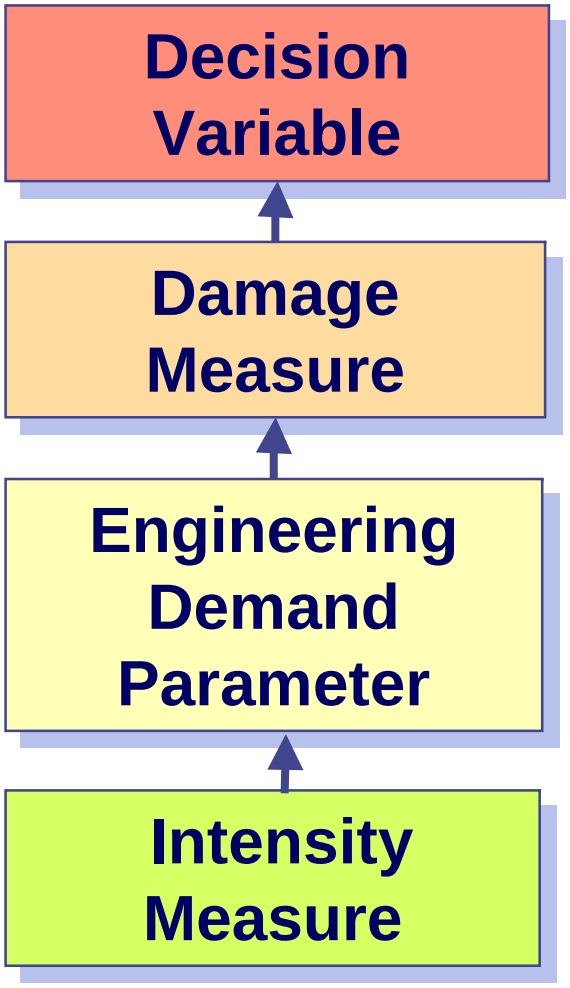
Year 1 **Year 5** **Year 10**

Methodology: *Development ---- Application/Packaging*

Data/Model: *Creation ---- Implementation/Validation*

Demonstrations: *Evaluate/Synthesize ---- Impact of PBEE*

Performance Assessment Components



DV: $ loss, functionality, downtime, casualties

DM: physical condition & consequences/ramifications

EDP: Drift Ratio (peak, residual), Floor Acceleration, Local Indices (Θ_p, strain, ...)

IM: *Sa(T_1),* multiple *Sa's,* epsilon, *$Sd_{inelastic}$,* duration

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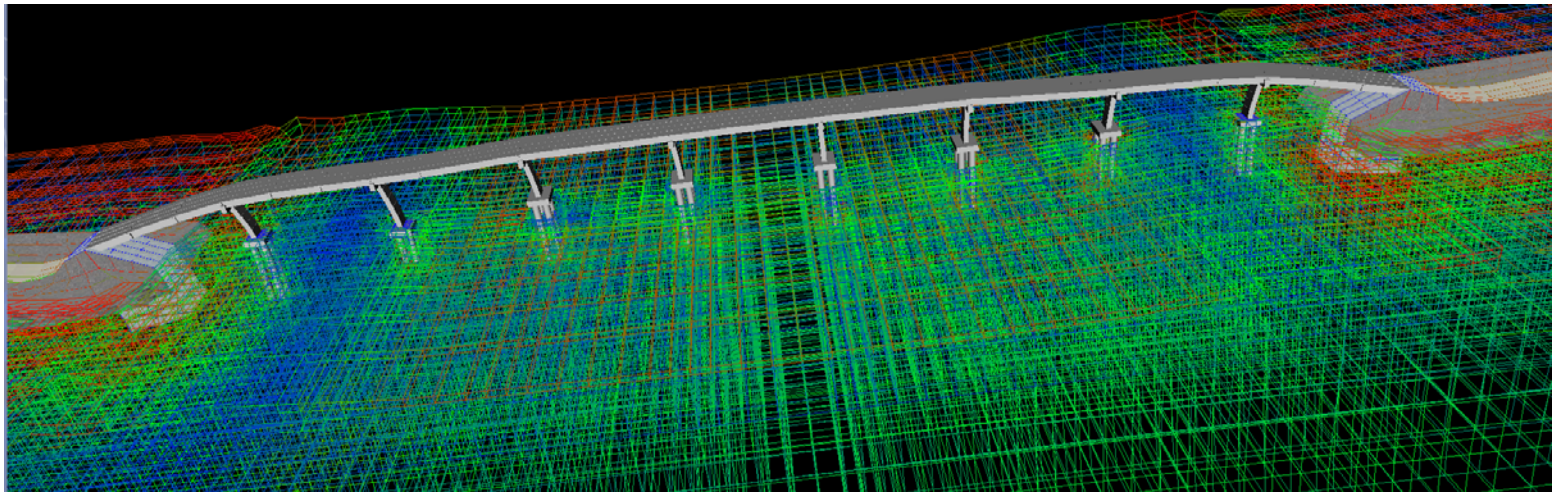
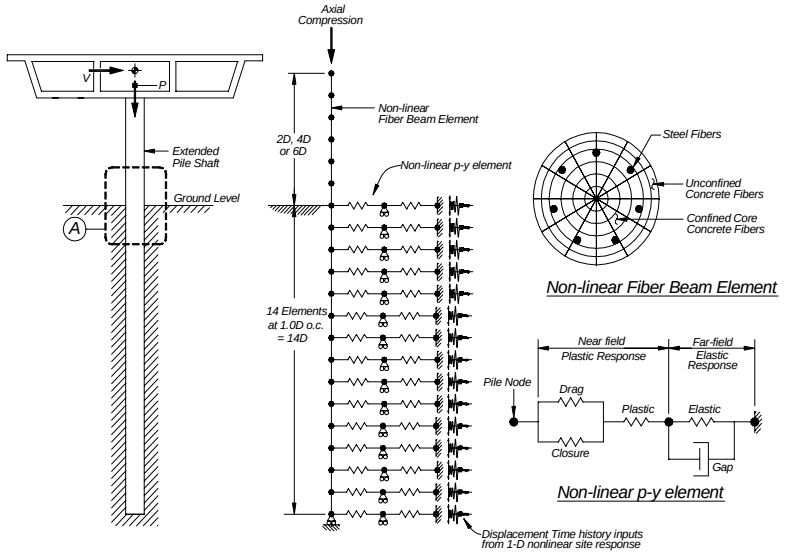
Comprehensive System Simulation



REF: Yang, Conte, Elgamal (UCSD)



REF: Boulanger (UCDavis)

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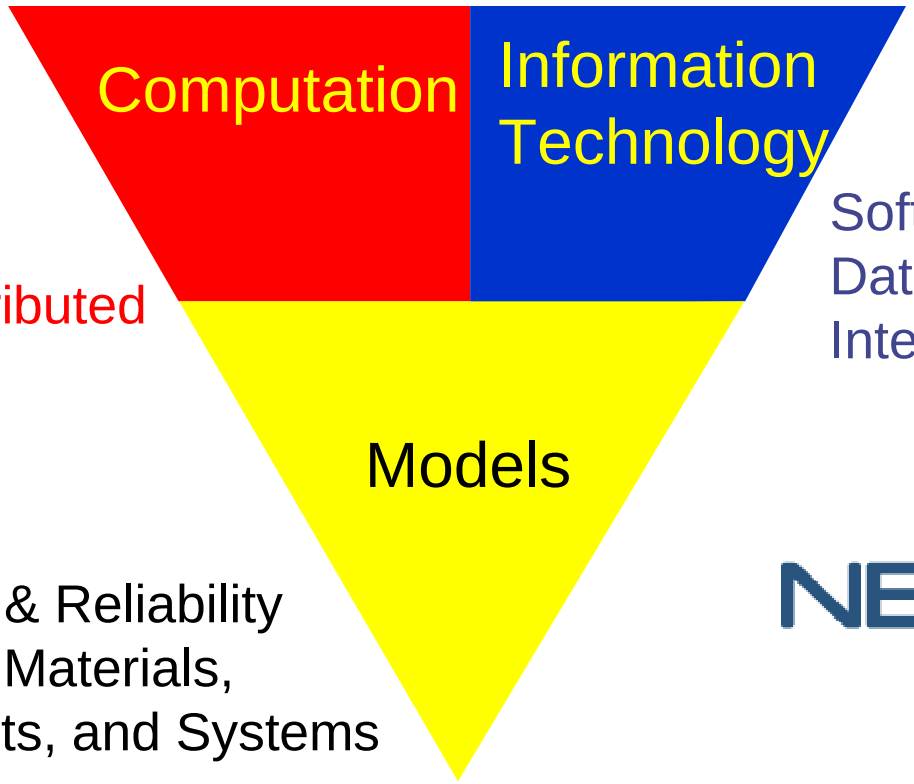
Integrated Simulation/Assessment Platform



Algorithms,
Solvers,
Parallel/distributed computing

Software framework,
Databases, Visualization,
Internet/grid computation

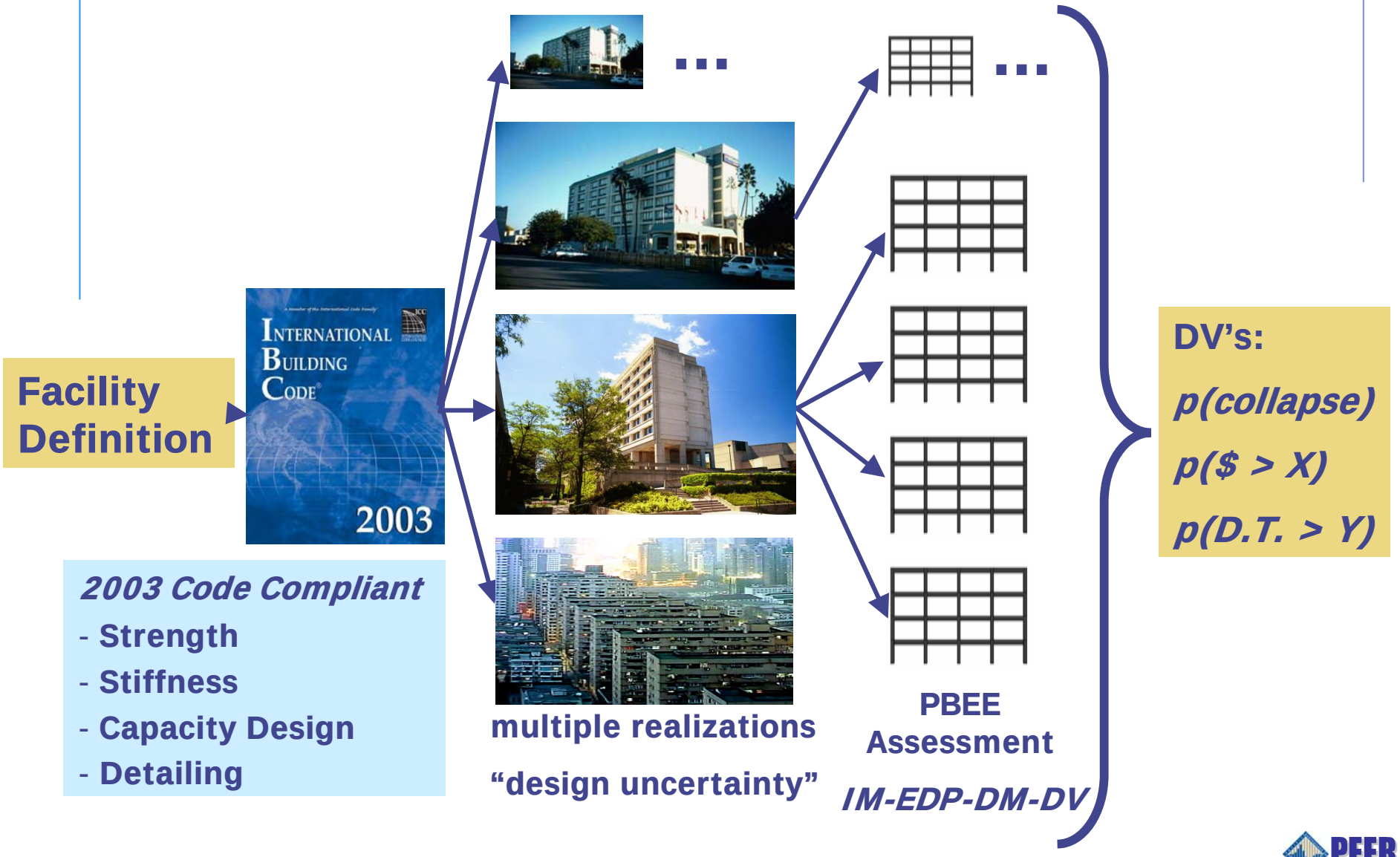
Simulation & Reliability
Models for Materials,
Components, and Systems

NEESgrid

OpenSees **http://opensees.berkeley.edu**

PEER

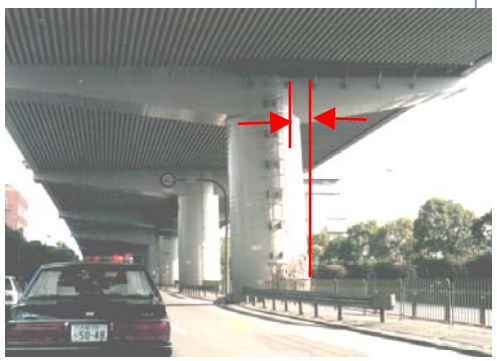
Building Benchmarking Studies



Bridge Benchmarking & Innovation Studies

- Post-earthquake residual displacements are a primary contributor to bridge closure.
- Liquefaction hazards continue to cause widespread damage or drive huge foundation costs.
- Interesting fundamental & practical issues.

About 100 columns with more than 1.75% drift were demolished after 1995 Kobe Earthquake although they did not collapse



Bridges often constructed on sites susceptible to liquefaction/lateral spreading. This has major impact on design and performance assessment.

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Making an IMPACT

- Packaging of PBEE Methodology
  - Specificity & Simplification !
  - DV's that inform decision makers
- Packaging of Information and Tools
  - OpenSees and related computational tools
  - Databases (Columns, Ground Motion, other)
  - Models – Fragility and simulation models
- Demonstrate value/benefits of PBEE
  - Building benchmarking
  - Bridge systems (liquefiable soil, self-centering)
- Dissemination & Outreach Initiatives
  - Research community (NEES researchers)
  - Professional engineers
  - Other design professionals & decision makers
- Implementation Initiatives
  - Buildings - ATC 58, ATC 63, FEMA 356 (ASCE 41), ACI, NEHRP ...
  - Bridges – Caltrans, FHWA, ACI ...

PEER

Day 2 (Saturday)

10:00 – 12:00 Thrust Area Topical Sessions

- TA I – Loss Group
- TA I – Foundations
- TA I – Structural Analysis/Assessment
- TA II – Bridges w/liquefaction
- TA II – Benchmark & self-centering bridges
- TA II – Transportation Systems

12:00 – 1:00 LUNCH

- IAB/SAC – SWOT Analysis
- Education Committee

1:00 – 3:00 Thrust Area I, II, IV Sessions

- TA I – Buildings
- TA II – Bridges/Transportation
- TA IV – Simulation and IT

3:00 – 4:30 RC meeting with IAB, SAC, & JMC