

# Panel Discussion: Bridge Performance, from Damage to Function (DM to DV)

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# Objectives

- Current directions in PBEE 5 min
- PEER terms: DM and DV 5 min
- Caltrans viewpoint (Tom Harrington)
  - Decision-makers & their DVs
  - Gaps for evaluating bridge performance 15 min
- Practitioner viewpoint (Roy Imbsen)
  - Practitioner skillset
  - New values PEER can bring to practice 15 min
- Discussion 1 hr+



# Current Directions in PBEE

	LRFD (1980s- )	PBEE-1 (1997- )
Structural performance	$\phi R \geq \phi S$	$F \leq F_{max}$ $D \leq D_{max}$
Nonstructural performance		$F \leq F_{max}$ $D \leq D_{max}$
System performance		indirectly
Probabilistic	✓	
Avoids judgment	✓	
Refs.	Ellingwood et al., 1980	FEMA, 1997 SEAOC, 1995



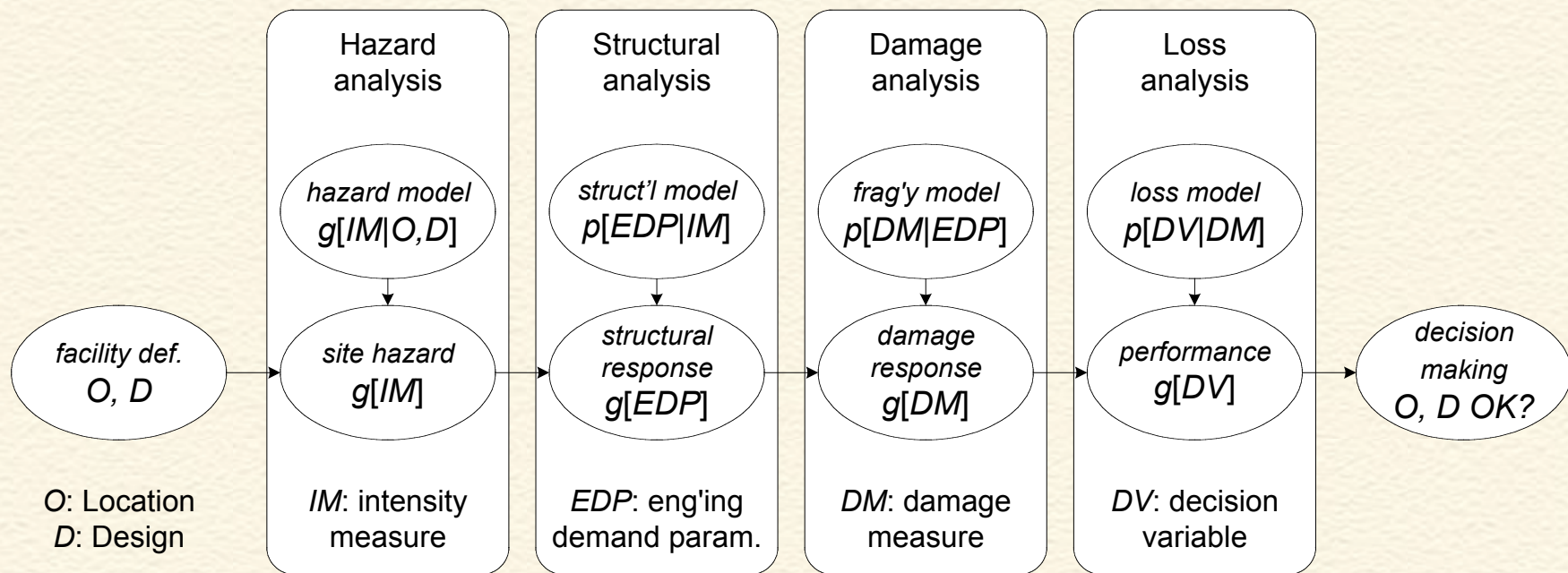
# Current Directions in PBEE

	<b>PBEE-1 (1997- )</b>	<b>PBEE-2 (2004? -)</b>
Structural performance	$F \leq F_{\max}$ $D \leq D_{\max}$	$p[\text{damage}] = f(F, D)$
Nonstructural performance	$F \leq F_{\max}$ $D \leq D_{\max}$	$p[\text{damage}] = f(F, D)$
System performance	indirectly	$p[\text{loss}] = f(\text{damage})$
Probabilistic		✓
Avoids judgment		✓
Refs.	SEAOC, 1995 FEMA, 1997	<a href="http://www.peertestbeds.net">www.peertestbeds.net</a> , Porter, 2003



# PEER (& Assembly-Based Vulnerability) Methodology

PEER PBEE ANALYSIS METHODOLOGY →



# What are DMs and DVs

- Example DVs
  - Bridge state: open; limited use; closed; collapsed
  - Repair or replacement time
  - Repair or replacements cost
- Example DMs
  - Structural component state: undamaged; spalling; bar yield; bar buckling; ...
  - Abutment state: roadway discontinuity at abutment...
  - Nonstructural component state: expansion joint damage...



# Discussion Questions

1. **Current DVs.** Who are the decision-makers? Their current decision variables used regarding bridge performance objectives? Includes pre-planning (design, maintenance) and post-event (response, repair) scenarios.
2. **Major gaps.** Major gaps and shortcomings in current knowledge? Gaps universally acknowledged, or are there distinctly different approaches and views?
3. **Current research.** Who has performed research to relate DV to DM, and how does that research relate to PEER's framework? Current efforts in Caltrans, FHWA, ... that relate to the DV-DM relationships?
4. **Years 7-10.** What DM-DV relationships should be explored? What empirical or theoretical datasets need to be found, compiled, or created?
5. **Research timeline.** What should our research timeline look like?
6. **Skillset.** On what engineering practitioner skills can we reliably depend, and in what skills will PEER most likely challenge practitioners?
7. **New value.** What new value can PEER's methodology bring to practice?
8. ...

