# 16-HOUR STRUCTURAL EXAM – AN UPDATE

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# Background

- Previously there were at least five paths to SE licensing
- Mobility was difficult
- Exam length varied
- Exam content varied
- 2007 NCEES Task Force
- 2008 PAKS Study
- 2009 Exam Specification



# States that have SE License based on 16 hour exam:

- Arizona
- California
- Guam
- Hawaii
- Idaho
- Illinois
- Louisiana
- Nebraska
- Nevada
- Northern Mariana Islands
- Oregon
- Utah
- Washington

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### New Exam Format

- Two 8-hour components
- Breadth and Depth
- **Integrated** design, analysis and detailing questions
- No single component of the exam is a sufficient stand-alone exam for any purpose
- See NCEES website for exact specifications
- In addition to the specification, there is a exam design matrix



# SE Exam Format (continued)

- Vertical Forces (Gravity/Other) and Incidental Lateral Component
  - Analysis and Design for Gravity Forces and incidental lateral forces from soil, ice, etc.
  - 4 hours multiple choice problems
  - 4 hours essay problems (buildings <u>or</u> bridges)
    - Four 1-hour building problems
    - One 2-hour and Two 1-hour bridge problems



# SE Exam Format (continued)

- Lateral Forces (Wind/Earthquake)
  Component
  - Analysis and Design for Lateral Forces High wind and high seismic
  - 4 hours multiple choice problems
  - 4 hours essay problems (buildings <u>or</u> bridges)
    - Four 1-hour building problems
      - 2 problems in SDC D and 1 wind problem with wind speed at 110 mph or higher
    - One 2-hour and Two 1-hour bridge problems



# The Cut Score Process and Audit:

- There were four cut score teams, let by two pscyometricans
- Process included both building and bridge engineers
- First day set the MC cuts using two teams, one for the vertical module and one for the lateral module
- Second day added more individuals and broke into 4 teams for buildings and bridges on both the vertical and lateral modules
- Very positive audit with only a few points to address



### Codes and Standards:

- List of Codes and Standards on the NCEES website
- 2009 IBC and standards on the April 2012 exam.
- Will likely move to the 2012 IBC and referenced standards on the April 2015 exam.
  - 2012 IBC was just published
  - It takes 12 to 24 months for jurisdictions to adopt a new code
  - Examinees need to use the code for a year or more prior to being tested on it.
  - EDM requires that we have two exams ready and material for a third exam at any time, so the 1210, 1304 and 1310 exams are ready and we have material for the 1404 exam



# Scoring

#### The Exam

Before the Scoring Session

The Scoring Process



### The Exam

#### **Scoring Requirements**

- The Multiple Choice modules are machinescored.
- The PM modules are essay problems and must be hand-graded by grading teams.
- Each team has a coordinator and an assistant who oversee the grading session for the problem



### The Exam Scoring Criteria Development

- Developed by the exam committee as the problems are developed
- A list of items the examinee should present in the solution
- Criteria challenge Candidate solutions may show a response different from what is expected



# Scoring

#### The Exam

#### **••** Before the Scoring Session

The Scoring Process



# Before the Scoring Session Identifying Scoring Coordinators

- Most familiar with problems, but not the item writer
- Coordinators work with staff
- Empowered to modify criteria as needed and develop alternate solutions



### Before the Scoring Session

#### **Identify Sample Papers**

- Select papers for training
- Select 5 papers for certification



# Scoring

#### The Exam

#### Before the Scoring Session

#### -- > The Scoring Process



# The Scoring Process Training the Scorers

- Scorers should be skilled at assigning scores to specific problems
- Scorers are trained

#### **Certifying Scorers**

- 5 papers are given to scorers as a test
- Pass or Fail Equal to coordinator for 3, within 1 point for the other 2
- Scorers have two chances to be certified



### The Scoring Process Scoring

- Care is taken to ensure the scorers do not know the names or jurisdictions of the examinees
- Each paper is scored by two scorers
- If the scores agree or are off by no more than 1, the score is assigned the rounded average (round up for 0.5)
- If off by more than 1, the coordinator or Assistant adjudicates
- Goal is that any scorer can be replaced by any other and the same score should result
- Database provides feedback



### Results:

- April 2011 (Anchor Exam) 27%
- October 2011 32%
- April 2012 39%
- Reasons:
  - This exam tests high wind and high seismicity, which are complex subjects
  - New Exam candidates are figuring out how to pass it
  - Expensive exam candidates are learning they have to prepare
  - Variation in problem length still getting it dialed in



# Quality Control:

- We have always had a robust QC program for the Multiple Choice problems
- We will be improving it
- The Constructed Response problems are group reviewed
- Effective with the October 2012 Exam we initiated a senior level review of the Constructed Response.
  - Each 4-hour module is worked by an experienced individual
- Need to standardize pretests and scoring criteria











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