

The New Structural Exam

NCEES Raises the Bar

By Peter Vaccaro, P.E.

The National Council of Examiners for Engineering and Surveying (NCEES) is introducing a new 16-hour Structural PE examination. The current Structural I (SE I) and Structural II (SE II) exams will be replaced by the new exam starting in April 2011. Therefore, the current exams will be offered for the last time in October 2010.

Currently, NCEES offers three different structural engineering exams: the 4-hour structural module of the Civil PE exam, the 8-hour SE I exam, and the 8-hour SE II exam. In addition, California and Washington administer an 8-hour, state-specific Structural III (SE III) exam. Oregon also uses the same exam developed by Washington. Out of the different NCEES exams, there are at least eight different combinations that various NCEES licensing jurisdictions use to qualify structural engineers for licensure.

1. The civil/structural exam is used for P.E. licensure
2. The civil/structural exam is used for P.E. licensure with a structural engineering specialty/area of expertise.
3. The SE I exam is used alone for P.E. licensure.
4. The SE I exam is used alone for P.E. licensure with a structural engineering specialty/area of expertise.
5. The combination of the SE I exam and the SE II exam is used for S.E. licensure.
6. The civil/structural exam is used for P.E. licensure, and the combination of the SE I exam and the SE II exam is used for S.E. licensure.
7. The civil/structural exam is used for P.E. licensure, and the combination of the SE II exam and the California SE III exam is used for S.E. Licensure.
8. The civil/structural exam is used for P.E. licensure, and the combination of the SE II exam and the Washington SE III exam is used for S.E. licensure.

Furthermore, NCEES adopted the Model Law Structural Engineer (MLSE) designation in 2004 as a guideline to a national standard for minimum competence for structural engineering licensure. To qualify for the MLSE, a candidate must meet specific education and experience requirements and pass 16 hours of structural engineering exams. The exams can be a combination of SE I and SE II, a combination of SE II and an 8-hour state-specific exam, or a 16-hour state-specific exam taken prior to 2004. As a result, there have been questions and confusion about requirements to become a licensed structural engineer from state to state.

In 2006, the Structural Exam Task Force (SETF) was appointed by former NCEES President Louis Raimondi, P.E., L.S., to address these issues. Its members were asked to evaluate the SE I and SE II examinations, analyze Member Board use of the exams and candidate performance, and consider the additional needs of those jurisdictions with issues of high-seismic activity. The task force was composed of engineers from various states that have P.E. and S.E. licenses and from jurisdictions that have only generic P.E. licenses. Also, the task force was composed of members from jurisdictions that had a diversity of structural loading conditions. As a result of their evaluations, the SETF recommended the following:

1. Sixteen is the appropriate number of exam hours for structural engineering licensure.
2. The format and specifications for the exam should be modernized and brought into step with current building codes.

3. The revised exam should be designed in such a manner that its content and format will be acceptable to all jurisdictions that now offer structural engineering licensure based on 16 hours of structural engineering exams.
4. A new Professional Activities and Knowledge Study (PAKS) should be undertaken in 2007-2008, two years earlier than previously scheduled.
5. NCEES should maintain a structural module of the Civil PE exam and discontinue the use of the 8-hour SE I exam for P.E. licensure. The structural portion of the Civil PE exam should be reviewed by the Examinations for Professional Engineers (EPE) Committee, which should make recommendations to modify its item writing procedures and content in a manner such that a minimum level of competence for a civil engineer with a structural engineering background is maintained at an appropriate level.

In August 2007, the SETF's recommendations were officially adopted at the NCEES Annual Meeting in Philadelphia, Pennsylvania.

To determine the new exam's content, NCEES formed a PAKS committee as the SETF had recommended. The committee was composed of structural engineers from all states that require 16 hours of exams for structural engineering licensure, as well as from many other states that do not. The committee developed a survey that was sent to licensed structural engineers to determine the knowledge areas most relevant to current professional practice with regard to public health, safety, and welfare. This committee subsequently reviewed the results of the survey and developed the exam specification that was approved by the NCEES Committee on Examinations for Professional Engineers (EPE). In addition, most of the committee members are involved in the preparation, assembly and review, and scoring of the new exam.

The new exam will be offered in two components on successive days. The 8-hour Vertical Forces (Gravity/Other) and Incidental Lateral component will be offered on Friday and the 8-hour Lateral Forces (Wind/Earthquake) component will be offered on Saturday. The morning sessions will consist of multiple-choice questions covering a comprehensive range of structural engineering topics. The afternoon sessions will have an essay format and focus more closely on a single area of practice in structural engineering. Examinees will have to choose either buildings or bridges and work the same topic area both days.

The 4-hour module on Friday morning will be 40 multiple-choice questions covering the following subjects:

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|-------------------------------------|-----|
| 1. Analysis of Structures | 30% |
| 2. Design and Details of Structures | 65% |
| 3. Construction Administration | 5% |

The 4-hour module on Friday afternoon will be more in-depth, covering the following subjects:

Buildings:

Steel structure (1-hour question)

Concrete structure (1-hour question)

Wood structure (1-hour question)

Masonry structure (1-hour question)

At least one problem will include a multistory building and at least one problem will include a foundation.

Bridges:

Steel superstructure (2-hour question)

Concrete superstructure (1-hour question)

Other elements of bridges (e.g. culverts, abutments, retaining walls) (1-hour question)

The 4-hour module on Saturday morning will be 40 multiple-choice questions covering the following subjects:

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| 1. Analysis of Structures | 37% |
| 2. Design and Details of Structures | 60% |
| 3. Construction Administration | 3% |

The 4-hour module on Saturday afternoon will be more in-depth, covering the following subjects:

Buildings:

Steel structure (1-hour question)

Concrete structure (1-hour question)

Wood/Masonry structure (1-hour question)

At least two problems include seismic content, at Seismic Design Category D and above.

At least one problem includes wind content, with a Basis Wind Speed of at least 110 mph.

Problems may include a multistory building.

Problems may include a foundation.

Bridges:

Columns (1-hour question)

Footings (1-hour question)

General Analysis (e.g., existing structures, secondary structures, nonbuilding structures, and/or computer verification) (1-hour question)

General analysis (e.g., seismic and/or wind) (2-hour question)

Score results from the morning sessions are combined with the afternoon sessions for a final score on the component. Since the exams are broken into two different 8-hour components, the exams may be taken and passed in different exam administrations. However, to pass the complete exam, the examinee must pass both components.

At the 2009 NCEES Annual Meeting, a motion was passed to change the NCEES Model Law and Model Rules to include a 5-year window for passing both components. Once the candidate passes one component, whether Vertical Forces or Lateral Forces, the candidate will have 5 years to pass the second component. If the candidate does not pass both the components within the 5-year window, the candidate will have to retake the first component again. Currently, it is up to the state licensing boards to amend their rules in order for these changes to take effect.

The implementation of the new 16-hour exam will affect currently licensed engineers, as well as individuals taking the test for the first time, since several licensing boards have indicated that they are adopting the new exam. Several of these licensing boards will now require passage of the 16-hour exam to become licensed as a structural engineer. On the other hand, some other licensing boards will require passage of only the 8-hour Civil exam with the structural module, in order to be licensed as a P.E. and practice structural engineering in those states.

Furthermore, the licensing board in Washington, which currently writes and administers its own state-specific SE III exam, has indicated that it plans to discontinue its use in favor of the new 16-hour exam. Other states, such as California, are also considering this option. This will be beneficial to examinees that do not live in these states, because they will now be able to have the new exam proctored in their own state, if the state offers it, without travel time and expenses. If the states choose not to proctor the new 16-hour exam, the candidate may elect to take the exam in another state and apply for reciprocity. Washington will offer its state SE III exam for the last time in October 2011. After that date, if an examinee has not passed the Washington SE III exam, the only way to become licensed as a structural engineer in Washington and Oregon will be to take the new 16-hour exam, even if the person has previously passed the SE II exam. Therefore, engineers who practice structural engineering will want to plan ahead and check with the local licensing boards in the states where they practice.

The new 16-hour NCEES Structural exam is raising the bar for the structural engineering profession and has the potential to improve consistency in requirements among the various jurisdictions that have

implemented separate licensure. This development appropriately reflects the unique and important responsibility that structural engineers have, for protecting the safety, health, and welfare of the public, no matter where their projects are located.