Rethinking Engineering Licensure

By Kip Gatto, P.E., S.E.

It was a pleasure to read the 2013 report by the SEI Board of Governors Task Committee, *A Vision for the Future of Structural Engineering and Structural Engineers: A Case for Change*. This document provides great suggestions for significant changes in the profession if structural engineers are to remain a respected and vibrant part of the global community. Advancements in technology and ongoing globalization require reappraising the structural engineer's role in the design, development, and preservation of the built environment. Although technical abilities remain important, other skills –leadership, innovation, diversity, and economics – now need to be considered of near-equal importance. Excessive risk aversion and over-reliance on prescriptive design criteria are hindering progress. Most of us who practice structural engineering are constantly reminded by our well-meaning colleagues about "liability" and are directed to an alphabet soup of codes and standards that constrain our innovations. The values espoused in the SEI document seek to restrain this tendency and pose refreshing goals for the future of our profession.

The SEI committee recommends substantive changes in the way we educate new engineers, conduct business, and define our profession, all of which are clearly consistent with their stated goals. They also endorse the promotion of "structural engineering licensure …. needed to promote public safety in the built environment." It is not as clear how this recommendation is consistent with their objectives. It feels to some like an attempt to restrain trade and legislate our way around the reality that automated design and specialty engineering are causing part of our profession to become obsolete. Although there have been some dramatic cases of design errors causing tragic loss of life and property, such as the Hyatt Regency in Kansas City and the I-35W Bridge in Minneapolis, many remain skeptical that licensure laws would have prevented these tragedies or will substantially contribute to safer structures in the future.

Attributes such as innovation, leadership, and diversity are not well-captured in the licensing process, implying that these "softer" skills are not as important to our profession. We are competing for candidates with other exciting disciplines that embrace these skills for designing cars, biomedical machines, spaceships, supercomputers, solar panels, and other fascinating and useful technologies for the global community. These thriving disciplines do not typically rely on licensure for furthering their profession or providing safe work products. To some extent, structural licensure actually has the potential to lead to complacency, implicitly relieving some licensed individuals from their duty to be innovative leaders and stay up-to-date. Proposed solutions to this generally acknowledged issue typically include even greater reliance on bureaucratic processes, which seem just as attractive to us as codifying every aspect of engineering design.

Structural licensure has been adopted in many states and is likely to be adopted in even more. The train has already left the station, so to speak. Assuming that this train will not be stopped, a logical analysis suggests that instead of resisting it, those with concerns may be better served by trying to redirect it. SEI identifies one indicator that its vision for the future is being realized as when "Earning a structural engineering license is viewed as a major achievement and aspirants would willingly rise to the challenge to earn the distinction." It might be time to rethink what the *challenge* is so that the process of earning a license can be made more consistent with SEI's stated objectives and can thus attract more dynamic and diverse candidates.

Most engineers familiar with the licensing exam are aware that its primary goal is to evaluate a candidate's ability to apply building and bridge codes properly to structural engineering design. If you do not have a good understanding of the codes, you are not going to pass the exam. Although this may seem like a sensible goal, it is actually inconsistent with the vision of SEI, which indicates that a heavy reliance on codes is not necessarily desirable for the future of the profession. Could we not instead encourage up-and-coming engineers to focus their efforts on mastery of the fundamentals – such as Newtonian mechanics, material behavior, and structural response – rather than current code provisions? The code will be at least somewhat different three years from now, and substantially different 30 years from now, but proper application of engineering principles will result in safe structures in perpetuity.

Consider (what should be) the simple design of a cast-in-place concrete anchor. Instead of requiring candidates to demonstrate that they can quickly navigate all 48 pages of ACI 318 Appendix D, would it not be better to have them instead demonstrate ability to calculate anchor strength from first principles such as failure cone geometry and concrete tensile strength? Have them recommend a factor of safety for the anchor design and justify it based on the expected reliability of the anchor. Or consider the calculation of seismic forces on a structure. Instead of requiring candidates to determine code values for various parameters and apply prescribed force distribution equations, they could be provided with an arbitrary response spectrum and be required to estimate the spectral acceleration based on the calculated period of the structure. They could then be asked to estimate an appropriate force reduction based on overstrength, ductility, etc. (not tables), and distribute calculated forces based on seismic principles.

Consideration should also be given to exam questions that test for "softer" skills. Candidates could be presented with a scenario that includes economic and cultural sensitivities, and then asked how they would handle the situation. A rethinking of licensure priorities along these lines could help the process appeal to a broader group, require genuine demonstration of competence, and attract dynamic candidates with a desire to *rise to the challenge*.▪

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