

Second Order Effects and Structural Licensure

By Timothy M. Gilbert, P.E., S.E. SECB

The NCSEA Structural Licensure Committee, like many of us, occasionally “takes stock” to reflect and make resolutions for the future. Over the past few years, the Committee has advocated for structural licensure in various ways: articles, newsletters, member surveys, presentations, and communication with other organizations. Though structural licensure has yet to be established in many jurisdictions, NCSEA continues to believe its implementation would offer better protection to the public and ultimately save lives. These reflections led to the conclusion that the second order effects of the Committee’s actions are worth the investment of our time and, in the coming years, continual support of the mission:

The Licensing Committee works with the Member Organizations to influence states to adopt consistent licensing laws and rules in the interest of public safety, especially relating to licensure of structural engineers.

Second-order effects are a typical consideration in structural analysis. It recognizes that, as structures deflect under loads, deformations can cause the initial loads to induce further stresses into the structure. These induced stresses are the second order forces and moments arising from the structure’s initial response to first order loads. In a stable structure, the second order effects are self-limiting – the second order deflections are small enough that they do not continue to amplify. Unstable structures exhibit a different behavior; second order deflections are large enough to induce even larger forces, leading to greater and greater deflections and ultimately to collapse.

Second order effects are not merely a structural concern. These effects arise in a wide variety of endeavors. In a simple example, a decision to save money for vacation has first order effects leading to less disposable income. Having less disposable income, a person or family might choose to go for walks in the evening rather than out to dinner, leading to the second order effect of losing weight. Similarly, legislation can also have second-order effects that stretch beyond the law’s strict wording. It is commonly noted by legislators and economists

that tax changes can influence behavior, not merely affect revenue. If structural licensure provisions are passed in a jurisdiction, the effects will extend beyond limiting who may perform structural engineering – and this is why the NCSEA Structural Licensure Committee supports its implementation.

Saving lives is the most significant second order effect of structural licensure. By establishing a standard specifically developed for structural engineering, the practice, as related to significant structures, would be limited to individuals who have demonstrated the requisite qualifications.

Increasing complexity of both current designs and building codes combine to compound their effects, yielding circumstances where the testing protocols to obtain an engineering license do not align with structural engineering practice as applied to complex design. Partly in recognition of this discrepancy, NCEES created the 16-hour Structural Exam. In the instances where a structural design has the potential for significant impact on the public, the Committee favors a requirement that the engineer has demonstrated sufficient proficiency in structural engineering. Structural licensure would provide a means for engineers to demonstrate proficiency in the subject to the public.

One might ask what evidence supports this assertion. In a recent incident, one worker was killed and 20 were injured when a Jacksonville, Florida parking garage collapsed while it was under construction. Investigations revealed that the design was inadequate. Some columns did not have sufficient strength to support the dead weight of the structure alone, without any live or environmental loads. OSHA has a thorough discussion of the investigation available for review (<http://goo.gl/IvNUoI>). The Florida Board of Professional Engineers determined that the structural engineer of record bears a significant responsibility for the accident (<http://goo.gl/iIv07j>). Had structural licensure been established there, it is much less likely that this tragedy would have taken place.

Saving lives is a second order effect with positive results. Some opponents of

structural licensure are concerned with other potential second order effects. The potential for increased fees, a possible limited availability of service providers, and a reduction in the number seeking to practice are sometimes cited as reasons for opposing structural licensure.

These conceptual second order effects center around the idea that structural licensure is an obstruction to business practices. This contention parallels debate held decades ago about the establishment of licensure for engineers. Research has shown that the passage of licensure for engineers did not result in these adverse effects (<http://goo.gl/rNzgL9>). The NCSEA Structural Licensure Committee contends that, like engineering licensure, structural licensure would not have these adverse effects. Those who practice capably and responsibly are likely to have few concerns with attaining structural licensure and would contribute to a competitive marketplace.

To further allay concerns, the Committee advocates for a robust “grandfathering” provision that would allow currently qualified structural engineers to continue practicing while providing a path forward for younger engineers based on the NCEES 16 hour Structural Exam. The rationale for such a transition mechanism has been well reviewed in past editions of STRUCTURE magazine.

As with structural analysis, a careful consideration of second order effects is prudent in many endeavors. In the case of structural licensure, we believe that the lives saved by second order effects are why it deserves the profession’s support as well. ■



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