Editorial | *A Structural Engineer's Got to Know His (or Her) Limitations*

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As stated so eloquently by my professor and class advisor, J.O. Liebig, "*The problem with most engineers is they don't know what they don't know*." Although this expression was repeated numerous times during my undergraduate years, its true meaning did not sink in until well after my initiation into the field of structural engineering. Today that phrase transcends many of the issues that plague the structural engineering community.

What are the ramifications associated with one not knowing what one does not know? Unless one aspires to live by the adage "*ignorance is bliss*", the results can be catastrophic, particularly in the realm of structural engineering where our primary obligation is to hold paramount the safety, health, and welfare of the public. We like to think of engineers as being ethical and repulsed by ignorance; however, engineers are, in fact, human. As cited by Jon Schmidt in *The Case for Discipline-Specific Licensure* (STRUCTURE®, July 2011), there is a documented psychological phenomenon known as the Dunning-Kruger effect: the natural human tendency to overestimate one's own capabilities. Combine this with a structural engineer's inability to recognize what he/she doesn't know and you have a recipe for disaster.

Where does "*not knowing*" manifest itself in structural engineering? It can arise almost anywhere. What might be viewed as a minor oversight by an engineer could be considered negligence by a plaintiff's attorney. What might be deemed an innocuous computer input error could have dire consequences. What seems like a simple statics problem to the mechanical engineer could have loading conditions that are unforeseen by someone who specializes in the design of HVAC systems. What are some specific examples?

- Satisfying strength requirements but not considering serviceability
- Failing to develop a proper load path
- Inability to follow and implement code requirements properly
- Neglecting to check for snow drifting/sliding and unbalanced snow loads
- Neglecting wind concentrations on overhanging eaves and parapets
- Failing to consider stress reversals associated with wind uplift conditions
- Creating hinges in a gable end wall of a building
- Failing to account for secondary loading conditions (e.g. out-of-plane wind load applied to bottom flange of spandrel beam from curtainwall)
- Failing to follow the detailing provisions associated with the selected seismic force-resisting system
- Inability to verify the results of a computer model
- Failing to recognize incompatibility issues with dissimilar materials
- Failing to understand the default boundary conditions assumed by the finite element software (e.g., the actual unbraced length of a truss bottom chord under an uplift condition can be considerably larger than the default unbraced length assumed by the finite element software)
- Using an antiquated code or standard (component and cladding wind loads could be calculated much more expediently in BOCA/1984!)

How do we rectify this problem? First, we must embrace the 16-hour NCEES structural engineering examination and continue to steadfastly pursue the implementation of a discipline-specific licensing structure that recognizes the unique aspects of structural engineering. By promoting and adopting this rigorous and comprehensive examination, we help to ensure that new licensees have an in-depth knowledge of the structural codes and standards which we rely upon to provide safe and economical structures for the public. Through the adoption of structural engineering licensure laws, we ensure that only those who have been properly trained and licensed in the field of structural engineering render structural engineering services – an essential step toward our ethical obligation to protect the safety, health and welfare of the public.

Second, we must promote a mandatory, *meaningful* continuing education program for all practicing structural engineers. Although passing the 16-hour structural examination is a significant accomplishment, codes and standards are revised every three-to-six years and they are becoming increasingly more complex. The structural engineering profession is constantly evolving. A structural engineer must stay abreast of such changes in order to maintain a high level of competence and to continue to protect the safety, health and welfare of the public. While many states require mandatory continuing education for license renewals, some of what qualifies as "continuing education" is of questionable value. An excellent model for meaningful continuing education for structural engineers is that established by the Structural Engineering Certification Board (SECB), which provides limitations on different categories of continuing education and mandates that all continuing education be specific to structural engineering.

By adopting separate structural engineering licensure and mandatory, meaningful continuing education requirements, we elevate the profession. By enabling structural engineers to better recognize what they don't know, we also enable them to practice at a higher level of competence. To paraphrase from the immortal Dirty Harry, "*a structural engineer's got to know his (or her) limitations*."▪