A Proposal for a Structural Engineer Licensure Law in Tennessee

By the Licensing Committee of the Tennessee Structural Engineers Association

Licensing Committee Members	Company
David Cartwright, PE (Chair)	Cartwright Engineering, Nashville
Eugene Adams, PE (Secretary)	MS Technology, Oak Ridge
Jason Perry, PE	Stanley D. Lindsey & Assoc., Nashville
Stephen Shearer, PE	LMK Building Designs, Memphis
Robert Paullus, PE	Paullus Structural Consultants, Memphis
Kathy Kontrim, PE	Pickering Inc, Memphis
Jeremy Scallion, PE	Scallion Structural, Jackson
Sean Smith, PE, SE	SSOE, Nashville

Introduction

The Licensing Committee of the Tennessee Structural Engineers Association (TNSEA), in order to further safeguard the life, health, and welfare of the citizens of Tennessee, proposes the adoption of a structural engineer licensure law in the State of Tennessee. Doing so will increase safety in the structural design of significant buildings and structures, whose failure could result in serious injury or loss-of-life to occupants, and have serious economic and societal impacts. The proposed provisions contained herein describe the minimum recommended qualifications to practice structural engineering in Tennessee, and define the significant buildings and structures that require the additional expertise of a licensed structural engineer. The proposed provisions allow for a smooth transition for current practitioners and will result in minimal administrative changes for the Tennessee Board of Architectural and Engineering Examiners (the Board).

Current Engineering Licensure Law in Tennessee

Licensure of Professional Engineers (PE) in Tennessee is governed by Tennessee Code Annotated §62-2-101 to §62-2-602. In order to obtain a PE license, applicants must meet several criteria, with the most important relating to education, experience and examination.

- *Education:* Applicants must typically be a graduate of a four-year, Board-approved program leading to a Bachelor of Science degree in engineering.
- *Experience:* Applicants must have a minimum of four years engineering experience under the supervision of a licensed PE after graduation.
- *Examination:* Applicants must pass an 8-hour written examination on the Principles and Practices of Engineering as administered by the National Council of Examiners for Engineering and Surveying. There are separate examinations for each branch of engineering, and most applicants take an examination in the engineering discipline in which they obtained their degree.

Current Tennessee law licenses all engineers under an umbrella Professional Engineer designation, regardless of their specific area of practice. The PE designation is based on the premise that the core

engineering education is mostly the same for all engineering disciplines, and that much of an engineer's knowledge is obtained through experience after graduation. A central tenet of Tennessee's PE law is that an engineer could receive experience in a branch of engineering other than that for which their degree and the majority of their work experience were obtained, and be competent to practice in that branch of engineering. The majority of engineers receive a degree, obtain experience, and successfully pass a licensing examination in a single engineering discipline, and continue to practice only in that discipline for their entire career. However, some engineers do cross over into other engineering disciplines at some point during their career, and often become quite knowledgeable in that additional field. In these instances, it is the purview of the individual engineer to determine if they have received sufficient training and experience in an alternate branch of engineering to be considered competent to act in responsible charge of work performed in that discipline. A PE is not subjected to additional examination in the additional branch of engineering, and is not required to demonstrate to the Board adequate experience specific to that branch, unless specifically requested by the Board during the course of a disciplinary hearing.

Why is a Structural Engineering License Necessary?

The provision of Tennessee's PE law that allows licensed engineers to practice in any discipline in which they feel competent is adequate in most cases. However, there are instances where this may not be prudent. T.C.A §62-2-101 states that the purpose of Tennessee's Professional Engineer licensure law is "…to safeguard life, health and property, and to promote public welfare, by requiring that only properly qualified persons shall practice…engineering…" Failures in electrical or mechanical systems usually result in poor functionality, discomfort of building occupants, and general inconvenience. Failure of a structural system almost always has much more severe consequences. One only has to look at devastating photographs of damage to buildings and houses in the aftermath of recent natural disasters around the world to realize that no other engineering discipline has a more direct impact on public safety than structural engineering.

Structural design of modern structures is becoming increasingly more complex. Owners want their buildings to be bigger and taller, while at the same time being more economical. The Burj Khalifa tower in Dubai, currently the world's tallest building, stands an incredible 2,717 feet tall – over one-half of a mile! In addition to designing for natural hazards, such as earthquakes and hurricane-force winds, many structures are designed to resist man-made effects such as explosions and impacts from aircraft. While design requirements are becoming more demanding, the building codes that engineers must use to design structures are also becoming more complex. The design standard used by structural engineers for determining loads applied to buildings, entitled ASCE 7 "Minimum Design Loads for Buildings and Other Structures", contains 650 pages in its most recent edition published in 2010. That same document from 1988 only contained 94 pages. The trend of more demanding structural design requirements and increasingly complex building codes requires a higher level of competence and experience from structural engineers than ever before.

At the same time that design is becoming more demanding, the engineering curriculum in many universities has become less so. Bachelor of Science degree requirements have decreased over the past few decades from 150 semester hours to as little as 124 hours. Structural Engineering is a subcategory of the much broader curriculum of Civil Engineering. In order to obtain a well-rounded Civil Engineering education, students can receive their B.S. degree and only have completed 1 or 2 courses in structural design – hardly adequate for today's structures. Advances in computing technology have

made possible the analysis and design of today's complex buildings and structures, and it is very tempting to just "let the computer do it for you." However, as buildings become more complex and computer analysis programs become more sophisticated in their capabilities, it is more important than ever that the engineer using these programs has a thorough grasp of structural behavior and is able to recognize the reasonableness of the input and output of the program. The adage "Garbage in, garbage out" certainly applies here. Engineers need a strong educational and work experience background to ensure the adequacy of their designs.

The need for licensure of structural engineers has been recognized by the major structural engineering professional societies. The Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE) states in their Policy Statement 101:

> "The public will be better served if those engineers practicing structural engineering have attained a minimum set of qualifications directly related to structural engineering."

The Council of American Structural Engineers (CASE), a Coalition of the American Council of Engineering Companies (ACEC), issued a Position Statement on August 21, 2009 in favor of separate licensure for structural engineers. Additionally, CASE, the National Council of Structural Engineers Associations (NCSEA), and SEI, together in a joint report on the National Summit on Separate Licensing of Structural Engineers that took place on November 3, 2000, stated:

> "The field of structural engineering is changing rapidly. Buildings and other structures are becoming larger and more complex and are being constructed with new materials and methods. Along with these advances in the state-of-the-practice, owners and the public alike have increased expectations about performance. Some structures are now expected to remain serviceable even after experiencing a traumatic force such as a seismic tremor or winds. As a result, it is more important than ever for all engineers with responsibility for structural projects to have appropriate credentials, stay current in the field, and demonstrate sound judgment that comes only with experience."

More states are beginning to recognize the need for additional credentials for licensure as a structural engineer. Currently, seven states have a form of licensing law that requires a Licensed Structural Engineer to design all, or certain types, of structures in their state. Nine states have a form of licensing law that recognizes structural engineering as a unique engineering discipline. Additionally, nine other states are at some stage in the process of seeking licensure laws for structural engineers. There is an obvious trend across the country to adopt licensing laws specifically for structural engineers, and Tennessee should be at the forefront of that movement.

Proposed Provisions of a Structural Engineering Licensure Law in Tennessee

Since May 2012, the Licensing Committee of TNSEA has met on a regular basis to develop recommendations for the provisions that would make up a Structural Engineering (SE) Licensure Law in Tennessee. In September 2013, the Committee's recommendations were sent to the general membership of TNSEA for a 30-day review and comment period. The following is a summary of the proposed provisions.

Additional Credential: The SE license will be obtained as an additional credential after one has obtained a PE license.

Education: There will be no additional education requirements beyond that which is currently necessary in order to obtain a PE license.

Experience: The amount of experience required in order to be eligible to sit for the PE licensing examination will remain the same, at four years. However, in order to be eligible to sit for the SE licensing examination, an applicant must have a minimum of four years of experience that is structural in nature. This experience must be obtained under the supervision of an SE or a PE that is competent in the design of structures. There will be no requirement on when the four years of structural experience occurs with relation to obtaining the initial PE license. For example, an applicant accepts a position with a structural engineering firm immediately after graduation, works for four years, and then obtains a PE license. This person is immediately eligible to sit for the SE examination, since they have obtained a PE and have four years of structural experience. On the other hand, suppose an applicant has worked for four years post-graduation in an engineering discipline that involves no structural design, and then obtains their PE. This applicant will have to obtain four years of structural experience after receiving their PE in order to be eligible to sit for the SE examination. It is also possible that an applicant may obtain some amount, less than four years, of structural experience prior to receiving their PE. They will need to obtain an additional amount of structural experience so that they have a total of four years since graduation in order to be eligible to sit for the SE examination.

Examination: Current Tennessee law requires successful completion of an 8-hour, discipline specific examination on the Principles and Practices of Engineering. This is commonly referred to as the PE exam. Structural engineering is one of several fields of study in a civil engineering curriculum, along with construction, transportation, geotechnical, water resources, and environmental. Thus, structural engineers typically obtain their PE by sitting for some form of civil engineering examination. In past years, there was only a single, general civil engineering examination that covered all fields of study within civil engineering. However, more recent examinations in civil engineering have become more specialized, and there are separate 8-hour examinations for each of the sub-disciplines of civil engineering. The National Council of Examiners for Engineering and Surveying (NCEES) examination in Civil : Structural is now the typical PE examination for an individual wishing to practice structural engineering. However, an examination in any engineering discipline can be used for obtaining a PE license, which then permits the practice of structural engineering by any licensee that feels they are competent in that area.

Even though NCEES does offer a Civil : Structural examination, this Committee, along with many national organizations, does not feel that the content of this examination sufficiently demonstrates a level of competence in structural engineering that one would need for design of the more critical or complex structures that may be encountered in practice. Therefore, the Committee recommends the

NCEES 16-hour structural examination be used as the basis for obtaining an SE license. This exam consists of an 8-hour Vertical Forces component and an 8-hour Lateral Forces component. Each component consists of breadth and depth modules. This 16-hour exam may not be used to obtain both a PE and an SE license. Thus, an individual must successfully pass an 8-hour examination in order to obtain a PE license, and then complete this 16-hour exam in order to obtain their SE license.

Transition Period: The Committee recommends a transition (or "grandfathering") period of two years after the effective date of the new legislation. This will provide current Tennessee PE's that practice structural engineering ample opportunity to apply for the additional SE license. The only requirement for current practitioners to obtain their SE is that the applicant complete an affidavit stating that they are competent in, and actively practice, structural engineering. This affidavit will also list five references that the Board may contact at their discretion if there are any questions as to the competence of the applicant. No additional testing will be required for those individuals taking advantage of this clause.

Practice Restrictions: In recognition of the fact that some structures and buildings more directly affect the welfare and safety of the public than others, the Committee recommends that an SE license only be required in order to perform the structural design of "significant" structures. This will still allow a PE that is competent in structural engineering to perform the design of most structures and buildings that are constructed in Tennessee. There are three categories of structures and buildings that are to be considered significant:

- *Buildings and structures that represent a substantial hazard to human life* - This category consists of high occupancy structures such as schools and public assembly facilities, and jails and detention facilities.
- *Essential facilities* - This category consists of hospitals, fire, rescue, and police stations, emergency shelters, emergency communications centers, facilities containing hazardous materials, and commercial air traffic control facilities.
- *Large facilities* – This category consists of high-rise structures greater than five stories or 60 feet, and facilities larger than 90,000 square feet. In addition, local building officials have the authority to require an SE for any other structures that they deem significant.

Closing Thoughts

Protecting the welfare and safety of the general public is the primary purpose of the Professional Engineer Licensure Law in Tennessee. No other engineering discipline has a more direct impact in this regard than structural engineering. Unfortunately, the demands of modern construction and the rapidly advancing nature of the "state-of-the-art" in structural engineering require a level of competence from structural engineers that is not provided in the current engineering licensure law. Introduction of a Structural Engineer license in the State of Tennessee will ensure an appropriate level of expertise from those performing the design of our most critical buildings and structures.

About TNSEA

The Tennessee Structural Engineers Association (TNSEA) is a member organization of the National Council of Structural Engineers Associations (NCSEA). NCSEA was formed to constantly improve the level of the standard of practice of the structural engineering profession throughout the United States. NCSEA provides an identifiable resource for those wishing to communicate with the profession. Acting as the autonomous national voice for practicing structural engineers, NCSEA serves to protect the public's right to safe, sustainable and cost effective buildings, bridges and other structures. The mission of TNSEA is to advance the art and science of Structural Engineering, providing a statewide organization for structural engineers to discourse, to educate, and to represent, for the benefit of the profession and the public. To learn more about our organization, visit the TNSEA website at www.tn-sea.com or the NCSEA website at www.ncsea.com.