The Failure of the Five E's

The Pressing Need for Structural Licensing

By Barry Arnold, P.E., S.E., SECB

Engineering is an honorable and admired profession – or so we like to say and believe. But is it true? Are we as honorable and admired as our predecessors? What type of profession are we going to hand over to the next generation of structural engineers? Are we holding a hard line on policies and procedures that will ensure public safety, or are we focused on making things easier for ourselves?

Twenty years ago, I remember a dear professor holding up three fingers and stating that the three E's are the bedrock of the engineering profession: "Education, Experience and Examination combine to safeguard the public and act as a bastion of the profession." I revered that professor, admired the passion with which he spoke, and took his words to heart. He went on further to exclaim that the three E's are like the three legs of a stool, and combine to provide the profession with stability and the public with safety. In my mind, I questioned the analogy; as one who had used a three-legged stool, I knew that they are not especially stable or safe.

It was not long after I began practicing that I witnessed the addition of two more E's to the list: Ethics and Enforcement. I was told that together these five E's provide a strong foundation and impenetrable fortress that will protect the public, and ensure the quality and longevity of the engineering profession.

As the title of this article suggests, I have come to question that assertion. It appears that, through the years and by degrees, the engineering profession has been weakened by a crumbling foundation. The safeguards and checkpoints that were instituted to protect the public have given way to tedious bureaucracy filled with endless loopholes allowing questionable individuals and practices to become commonplace.

The consequences of a lack of attention to our purpose and responsibilities, along with not taking a firm and clear stance against the internal and external struggles that we face daily, have the potential to wreak havoc with our professionalism in general, and our duty to the public in particular. It is my contention that loopholes exist in all five aspects of the present system.

Education

Most engineers believe that the education provided by their alma mater was adequate. The problem is that there is no requirement that a person who wants to practice structural engineering must take a specific set of core and elective classes.

In addition, some institutions tinker with the classes, thus further limiting the student's options and educational opportunities. When I was in college, they removed three structures classes from the curriculum to force students to take classes on composites and agricultural engineering, just to increase sagging enrollment. Those classes were interesting, but for a structural engineer, classes in wood, masonry and post-tensioned concrete would have been more valuable.

With these loopholes, a person could graduate with a bare minimum of structures-related courses and still qualify as having met the "education" requirement for licensure.

Experience

Because of the above-mentioned loophole, the requirement for experience becomes even more important. In most states, a graduate with a bachelor's degree is required to complete four years of qualifying experience before becoming licensed as a professional engineer. The term "qualifying experience" can be a bit nebulous.

What happens when a person who wants to practice structural engineering works for four years in a mechanical engineer's office? Can such a person claim to have qualifying experience? Unfortunately, there is nothing to prevent that from happening. Sadly, it happens more often than it should.

With this loophole it is easy to meet the letter of the law, but not the intent.

Examination

A milestone is reached when individuals are ready to take the Principles and Practice of Engineering (PE) exam. Having completed the education and experience requirements, they sit for the exam. Out of the myriad problems offered, they solve only a few that are structural. When I took the PE exam, I answered questions relating to surveying, open channel flow, and highway design. Prevailing logic suggests that I should be qualified to practice in those areas, but am I? Absolutely not!

Passing the PE exam is an indication of how hard I studied for the test and how well I remembered some of the broad spectrum of information that I learned in college – and nothing more. It is not an indicator of the depth of my education or the relevance of my experience, and it is inadequate to assess my knowledge and capabilities as a practicing structural engineer.

With this loophole, it is impossible to assess the ability of an engineer to design a structural system correctly.

Ethics

Ethics is being taught and emphasized less frequently in college and in practice today. Senior engineers will tell you that they had a semester of ethics in college. Unfortunately, many younger engineers will tell you that they received, at most, an hour or two of education or instruction in ethics, if any at all.

Why is ethics being overlooked and ignored today? A number of engineers have opined that it is because the Code of Ethics is not enforceable. The Code of Ethics, while containing grand ideals and philosophies, is not law; or as Captain Barbossa from *Pirates of the Caribbean* would say, "The Code is more what you'd call guidelines than actual rules." Read

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any state's disciplinary action list, and you will see that, generally, the source of almost every problem is a violation of one or more of the canons of the Code of Ethics.

This loophole has the potential to do more damage to the profession and jeopardize the public than the previous three. Without having educated our consciences by studying, understanding and applying our Code of Ethics, we lack firm (although intangible) boundaries within which to work and provide engineering services.

Enforcement

Enforcement is the public's last chance to catch and correct inappropriate actions, and redirect those engineers that slipped through the other loopholes. Unfortunately, enforcement – despite the best efforts of those involved – is difficult and often inadequate. A fitting analogy would be to compare enforcement to a police officer sitting by the side of the freeway. Many cars speed by, but only one is caught, pulled over and cited. Sure, everyone else slows down temporarily; but then they wipe their brows, delighted that they were not the one caught, and after a short time begin speeding again.

This loophole is difficult to fix because it is underfunded and the responsible agencies are overworked.

Conclusions

It is unpleasant to think that we may be losing sight of our duty to the public and our profession, but the situation must be addressed – preferably sooner, rather than later. In light of the potential consequences of inaction on the part of the engineering community, it is essential that existing loopholes be removed and additional measures be taken and enforced.

The loopholes that I have cited herein are the tip of what could be an enormous iceberg. Talking with engineers from around the country, I know that this issue crosses all boundaries and borders – it exists everywhere. Take a minute and look carefully around you. The problem may exist in the next town, at a competitor's office down the street, or within your own firm.

Before you enter another building, ask yourself this very important question: What are the credentials of the engineer who designed this structure? Do you know? Most people do not – and that puts them at risk. The public assumes that all engineers with a seal are equal in education, experience, and other qualifications. We know better. Sure, the building is standing up now; but in an 'event', how will it perform? Was your neighborhood fire station designed by a moonlighting mechanical engineer? Is the strip mall where your family shops a "first attempt" at structural design by a recently retired aerospace engineer? Was the local church that your family attends designed to meet code requirements by someone who knew what they were doing, or by someone who guessed and bluffed their way through a set of plans and calculations? Was the structural design of your children's or grandchildren's school prepared by an electrical engineer trying to pick up a few extra dollars?

Maybe those questions do not matter to you, but when the 'event' happens, there will be many families asking building owners, architects and the engineering community why the credentials of the engineer designing the structure were not checked. Suddenly tight budgets, low fees, and all the reasons that the engineering profession has given for not taking action to fix the problem will seem insignificant.

Unfortunately, acknowledging the elephant in the room offends, angers, and irritates some people, including those in the engineering profession. Regardless, we do not have the luxury of ignoring the situation any longer. We cannot turn our eyes away from the obvious and continue on an unaltered course in blissful ignorance, leaving the public at risk.

That is the reason why I fully support separate licensure for structural engineers and practice restrictions in all jurisdictions. Separate licensure by means of a specific and rigorous examination is a clear indication that structural engineering is not your hobby, but your profession, and that you have a higher level of competence to practice it.

The detractors of separate licensure and practice restrictions say, "Show us the bodies!" That is the single most embarrassing and pathetic statement that an engineer can make. Our job and purpose is to protect the public by removing as much risk from them as possible so that we never have to "count the bodies".

Structural licensing and structural practice restrictions are not part of a turf war – they are a necessary addition to the five E's if we are to do what the first cannon of our Code of Ethics requires: holding paramount the health, safety and welfare of the public.▪

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