

# LETTERS

## *Thoughts on Gulf Coast Protection and Education and Licensure*

I am writing in response to two items published in the November issue—the letter from Frank A. Bell, Jr., P.E., M.ASCE, (“Get Moving on Gulf Coast Protection”) and the feature “The 21st-Century Engineer: A Proposal for Engineering Education Reform,” by Patricia D. Galloway, Ph.D., P.E., F.ASCE.

With respect to Bell’s letter, while all of his points may well be correct, I feel that I must add another. Sometimes the best solution that one can provide as an engineer is to not offer a shield from an oncoming threat but to get out of the way. I am not one of those who question whether or not people should be able to rebuild in the damaged regions of New Orleans, although that would [certainly] be one solution to [hurricane] protection. Instead, I am suggesting that perhaps protection by levees should not be taken for granted. It may be best to regulate construction within areas protected by levees as if they were in a floodplain. In this case, though cars and roads might be washed out, the buildings and all of the valuables (including the people) would be spared the wrath of the rushing waters. In the case of cash-strapped New Orleans, this may also be the least expensive solution.

If this type of regulatory strategy were adopted, the main benefits to the property owner of having a levee would be a reduced risk of flood damage to cars and landscaping as well as reduced flood insurance rates. It would also be a way of responding to the nationwide problem that was exhibited in New Orleans: improperly managed flood protection systems. In addition to those that failed in New Orleans, I have seen articles concerning problems with levees in California and I have personally seen a levee system in North Carolina that was not built properly to contain the 100-year flood that the Federal Emergency Management Agency maps said it should hold back. Instead it relied on an unprepared municipal government to block a railroad underpass with many vertical feet of sandbags. Maintenance is the key to any engineered solution, and it is clear that our government is failing at this task, perhaps in part because it is often the poorest and

least-educated residents who live behind these systems.

With respect to Galloway’s article, I largely agree with the premise, but I do have some comments, including some that relate to licensure and practice. First, I would like to say that a bachelor of science can be plenty to start a career in engineering, but it may not ensure that one can work with the client and other nontechnical people or can manage a schedule, money, or people. Therefore, I would still recommend that this degree satisfy the requirement for taking the fundamentals exam to become either an engineering intern or an engineer in training. In this way, one could still do technical work, but more experience would be required to become a professional engineer than would be the case for someone holding a master of science in engineering.

The point next in importance with respect to increasing the required education levels for licensure is that teaching will be even more important in keeping prospective students engaged and thereby filling the profession’s demand for engineers. Currently, my experience is that many programs tend to filter students out in the first two years of undergraduate education instead of teaching them to the level required for completing the program successfully. Extending the program to include graduate-level education may help lower the stress during individual semesters, but I wonder how many more [students] would be filtered out with the increased burden of two or more additional years. The level of teaching will be key in addressing this question.

One benefit that I see to an extended engineering education program is the ability to have a better grounding in the science behind the engineering as well as an ability to specialize in areas that are often not adequately addressed in undergraduate education. A good example would be the combination of a bachelor of science in environmental science and a master of science in environmental engineering. In my experience, engineering programs are not always open to the expansion of one’s education outside of a particular program. As an example, I was limited with respect to what combination of majors I could have as well as to how many nonengineering classes I could

take in undergraduate study. I hope that, if the program is lengthened to require graduate education, engineering departments will become more open to the possibility of extending one’s horizons. Just as medical school does not require premedical education from entrants but simply a minimum level of related education, so should “engineering school” require only a minimum level of related education for its entrants.

Licensure would need to reflect the new education program as well as one’s ability to specialize. Currently, the tests given roughly correspond to respectively the first two years and the last two years of one’s undergraduate education. The exams for an extended educational requirement should, at a minimum, be reflective of the undergraduate (or pre-engineering) and graduate (engineering) education programs. Many would argue that the second exam should be more pertinent to practice. In either case, it should not be necessary, for example, for someone practicing in water and wastewater treatment to know anything about air beyond how chemicals transfer between mediums. Similarly, a water resources exam should emphasize such topics as culverts, hydrology, pipe networks, and reservoir routing while deemphasizing such topics as water and wastewater treatment. The current exam misses the mark when it comes to the topics it covers for such specialists and it may be time to return to a test wherein one can pick which problems to answer.

There is currently no formal apprenticeship (or internship) process of the type one might find in such places as Britain. There is no formal review of one’s professional experience at the end of each year by a professional engineer who is designated as mentor. There is no assessment of progress. As such, there is no immediate responsibility for one’s employer to provide either a mentor or an assessment, especially if it is thought that, upon achieving professional engineer status, the employee is likely to leave. One would think that the requirement for a professional engineer to seal the work of an engineering intern or an engineer in training would lead to his or her position as mentor, but this is not necessarily so. In fact, I spent much of my “training” with professional engineers who did

not completely understand what I was working on. Without this and also without the licensure requirement for continuing education, there was little to no impetus for my progress and training.

Additionally, the licensure process needs to account for globalization. Currently, it is possible for an American holding a degree from a program accredited by ABET, Inc., to begin the apprenticeship process either here or abroad, and I believe that comparable degrees from abroad can accomplish the same here. However, even if one is licensed here, it is not easy to become licensed abroad. In contrast, if one were to become licensed in Britain, it would be relatively easy to become licensed in the rest of Europe as well as in, I believe, Australia, New Zealand, and Canada. The American licensure system needs to be more in line with international standards. If it were so, it would be more valuable to those who have worked—or would like to work—abroad.

I end with a note on engineering practice. I believe it necessary that engineers be required, perhaps for continued licensure, to monitor the performance of their designs for some period of time after the structures have been built. Not all problems will become apparent upon construction, and some designs are, to some degree, experimental. As such, the only way that engineers are to learn is by examining past designs for mistakes. This monitoring would likely result in better design, better value for the customer, and better compensation for the engineer.

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### **License Should Be Required to Teach Engineering Courses**

The provocative article on engineering education reform by Patricia D. Galloway, Ph.D., P.E., F.ASCE, that appeared in the November issue (“The 21st Century Engineer: A Proposal

for Engineering Education Reform”) sets forth desirable measures for elevating the competence of engineers in the 21st century. One essential criterion for achieving this necessary educational improvement is mentioned only briefly and merits further consideration.

Along with determining the spectrum of knowledge that is to be learned, we must define the qualifications of those who will impart this knowledge. The article’s treatment of this important issue is limited to a single sentence: “ASCE also recommends that those who teach engineers should predominantly be licensed.” As a generalized goal, this statement points in the right direction, but the language needs to be a bit more specific if a nexus that is both necessary and sufficient is to be established.

First, the word “engineers” needs to be replaced by “engineering courses.” Many of the subjects in an engineering curriculum (both at present and as recommended for future inclusion) are outside the field of engineering; some of these are basic science and some are nontechnical in nature. Such courses are certainly important, but they are best taught by persons whose expertise is in the particular subject matter.

Second, the word “predominantly” needs to be removed. Having limited the courses that need to be taught by engineers to those of an engineering nature, there is no justification for allowing exceptions. If the practitioner of a particular discipline is required to be licensed, how can we condone the teaching of that discipline by an unlicensed person? What this then suggests is that the teaching of engineering courses must be deemed to fall within the statutory practice of engineering; efforts should be undertaken to revise the relevant licensing laws so as to include this requirement.

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