



Mandatory Educational Requirements for Engineering Licensure

General Position Paper January 1, 2016

Introduction

Founded in 1880 as the American Society of Mechanical Engineers, ASME is a not-for-profit professional organization recognized globally for its leadership in providing the engineering community with technical content and a forum for information exchange. With more than 140,000 members worldwide, ASME serves this wide-ranging technical community through high-quality programs in continuing education, the development and maintenance of codes and standards, research, conferences and publications, government relations, and various forms of outreach.

ASME endorses lifelong learning and encourages mechanical engineers to pursue graduate degrees in engineering. As the quality of engineering education improves around the world, in order to remain globally competitive, engineers who wish to advance in their careers will need to continue their education either through formal study leading to a degree, or through the various types of continuing education that are offered.

Background

In 2006, the National Council of Examiners for Engineers and Surveyors (NCEES) adopted a change to the Model Law for professional engineers to require that, for an individual to be licensed by a state as a Professional Engineer (PE) in 2015 and beyond, he or she must hold at least a Master's degree in an engineering discipline or its equivalent (MOE). In 2008, NCEES extended the implementation timeline to 2020. In 2014, the provision was taken out of the Model Law, but in 2015, it was put back into NCEES's official documents as a Position Statement with the 2020 date removed. NCEES claims that it was motivated to add additional education by the decline in university and college requirements for a bachelor's degree in engineering from an average of 144 semester credits 30 years ago to an average of 128 credits today.

The First Professional Degree (FPD) in engineering has long been considered to be the degree needed for the practice of engineering. The FPD informs the public and licensing bodies about the minimum requirements that qualify an aspiring professional for practice. Since the 1920s, the FPD in engineering in most regions of the world has been a baccalaureate degree, requiring the equivalent of full time study of approximately four years.

Current engineering baccalaureate degrees typically require courses in mathematics; exact sciences and life sciences; fundamentals and practice of engineering; laboratory and design

experience; metrology and experimentation; ethics and professionalism; and selected topics from other disciplines, including the liberal arts and business. Some programs also include industry-based experience in the form of cooperative education or internships.

ASME Position Statement on Master's or Equivalent (MOE)

ASME opposes a mandatory, across-the-board requirement of MOE, beyond the FPD currently decreed by tradition and practice.

ASME believes that the typical scope of an ABET accredited bachelor's degree can be and has been demonstrated to accommodate technical breadth and flexibility and the intellectual skills necessary for engineering graduates to qualify for employment in an engineering position. In addition, it is the appropriate qualification to attain licensure as a Professional Engineer. The steps in achieving that status are: (1) passing the Fundamentals of Engineering (FE) Examination, (2) successfully completing a four-year internship under a licensed engineer and (3) passing the final Principles and Practice (PE) Examination. Before being licensed as a Professional Engineer, these steps assure that the knowledge, skill and ethical standards expected from a Professional Engineer are attained. Continuing education is essential to the attainment and maintenance of licensure, as well as a life-long necessity for engineers of all disciplines beyond the studies that qualified them for the FPD. Continuing education helps PEs stay up-to-date with developments beyond their classroom and professional experience.

ASME believes that increasing educational requirements for licensure should not be used as a tool to offset the decrease in graduation requirements for the FPD. Over the past decades, legislatures and state higher education authorities have reduced the course load required for a baccalaureate degree in engineering to an average of 128 semester credits. From 2004 to 2014, however, data available to ASME shows that the average decrease was a mere 1.4 semester hours, and that this downward trend has plateaued. ASME believes that the current number of total hours is sufficient. Yet, even with this gradual change over time, there has been no drop in the national test scores in either the FE or PE examinations required for engineering licensure. In order to produce such results, the approach to educating an engineer has had to become more focused and efficient.

Improved technology has also contributed significantly, i.e. computers have replaced slide rules, and CAD software has replaced drawing by hand on drafting tables. The outcomes-based assessment of modern engineering programs has resulted in better, more focused coursework and computational capabilities are significantly superior to those available decades ago. Most of the decrease in credits is a result of the removal of physical education, ROTC, and basic math and science courses that are now taught in high schools. Thus, the need for increased hours is not required.

The reason for engineering licensure is to protect the safety, health and welfare of the public (as stated in the National Society of Professional Engineers Code of Ethics and in the codes of most of the other engineering societies). Legislation in these matters should be used for the purpose of public safety only. Increasing the prestige or status of the profession by raising the bar to access does not contribute to the profession nor does it serve the public. The value and effectiveness of

the work that engineers do should be the sole measure of the profession. Professionalism and continuous education across the decades of an engineering career, together with strict adherence to the canons of ethics, are the real foundations of public safety.

We currently have a workable, effective and adaptable system of examinations and supervision in practice that results in highly competent professional engineers. We also have a system of state oversight that can take action against an individual engineer or part of the system that can be demonstrated to have fallen short of professional expectations. If more front-end coursework is the remedy, it should be employed because public safety is at risk due to poorly educated engineers. This is not the case now, nor are we seeing early indicators that it will be the case in the foreseeable future.

The people of the United States and the legislative and executive branches of the U.S. government are concerned with enhancing the nation's capabilities in science, technology, engineering, and math (STEM). To compete in the modern technological society and global economy, it is imperative that we expand our technologically capable workforce.

However, the percentage of students studying engineering compared to overall students enrolled in four-year colleges is shrinking. In 1981, 6.7 percent of degrees awarded in the U.S. were in engineering. In 1986, the figure rose to a high of 7.8 percent. Today it has dropped to 4.7 percent.¹ These statistics show we could be losing potential innovators to other majors each year.

The engineering degree is one of the most challenging programs of study that one may undertake at the university and requiring a Master's or Equivalent will make becoming an engineer appear even more difficult, which could further detract some of the highly capable students needed to ensure U.S. technological growth. Increasing the professional licensing requirements also has the potential to reduce the supply of licensed engineers who are able to practice and therefore reduce the U.S.'s technological competitiveness.

Because technological change is continuous over the typical 40 years of a professional engineering career, the additional courses taken at the beginning of a career have a rapidly decreasing usefulness compared to the continuing education required in most states to maintain licensure. In addition, many graduates are required to take highly specialized short courses, unavailable in universities, relating to their new job duties.

In addition, most graduate schools require a 3.0 grade point average for admission. If we say that a master's degree is a requirement for professional practice, we are telling many of our students that they are not qualified for a license.

ASME also opposes the implementation of MOE for only selected engineering disciplines. The line between disciplines can at times be difficult to establish. Individual professionals must exercise the appropriate professional judgment, autonomy and discretion to perform services only in the areas of their competence.

¹ Digest of Education Statistics, National Center for Education Statistics, U.S. Department of Education, accessed September 25, 2015.

Finally, there is also no evidence to suggest that earning a Master's or adding thirty credit hours, which represents a full academic year of upper-level undergraduate coursework or graduate-level coursework, will have a positive impact on the public's health and safety. The fundamental issues affecting the public are already adequately covered under the current education, testing and experience requirements of licensure. We believe that it is misguided to add a year of coursework on the front-end of a professional career as a remedy to a public safety problem that has not been demonstrated. It will discourage students from seeking a career in engineering by significantly adding to the time and cost of their education.

Conclusion

In conclusion, ASME opposes a mandatory, across the board requirement of MOE, beyond the FPD currently decreed by tradition and practice, for the following reasons:

- ASME believes that the typical scope of an ABET accredited bachelor's degree can and has been demonstrated to accommodate technical breadth and flexibility and the intellectual skills necessary for engineering graduates to (1) pass the Fundamentals of Engineering Examination, (2) successfully complete a four-year internship under a licensed engineer and (3) go on to pass the final Principles and Practice Examination before being licensed as a Professional Engineer.
- Continuing education is an essential life-long need for engineers, and significant learning is necessary for engineers of all disciplines beyond the studies that qualified them for the FPD. These principles are already incorporated within the present system as most states require professional development credits to maintain licensure.
- There is no clear benefit to requiring MOE, but there is considerable cost that will affect both firms and individuals (tuition, time off, fees, books, commuting, etc.).
- Due to the federated nature of licensing jurisdictions, some states may adopt MOE and others will not, causing disparities and hindering licensee mobility. Equivalency of other non-university-based courses also will be a major concern.
- ASME will continue to review the body of knowledge required for entry-level engineers not from the standpoint of professional registration, which has been addressed above, but from the standpoint of the global competitiveness of graduating mechanical engineers.
- We are prepared to oppose the acceptance of MOE jurisdiction-by-jurisdiction if it comes before individual legislatures and/or licensing boards.

ASME believes legislating this new barrier to entry into the profession is not in the public's interest and comes at the expense of engineering students, their parents, and anyone who employs engineering services.