



## **Raising the Bar for Engineering: Why ABET is Necessary but not Sufficient**

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### **Background: Professional Licensure and ASCE’s “Raise the Bar” Initiative**

In the United States, responsibility for evaluating the credentials of licensure candidates lies with individual state-level licensure boards. In engineering, these boards evaluate candidates in terms of education, experience, and examination. More specifically, today’s most common pathway for engineering licensure specifies an accredited baccalaureate degree in engineering, four years or more of acceptable and progressive engineering experience, and successful completion of the Fundamentals of Engineering (FE) and the Principles and Practices of Engineering (PE) examinations. While alternative pathways are available in *some* jurisdictions, *all* state licensure boards recognize this common path. The legitimacy of this pathway is further enhanced by its inclusion in the Model Law and Model Rules promulgated by the National Council of Examiners for Engineering and Surveying (NCEES)—a national nonprofit federation that includes the engineering and surveying licensure boards from all 50 states, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands.<sup>1</sup> NCEES’s Model Law and Model Rules facilitate professional mobility, promote uniformity of licensure processes across the U.S., and advance the qualifications for licensure to protect the public interest.

State licensure boards are composed primarily of practicing licensed professional engineers, who typically have two to five decades of practical experience. However, most board members do not have the expertise to evaluate the details of an individual candidate’s educational credentials, as reflected in an academic transcript. Moreover, even if this expertise were available, most boards simply would not have the time to perform such evaluations.

Historically, the U.S. licensure system has addressed this limitation through accreditation. The licensure community supported the establishment of the Engineers’ Council for Professional Development (ECPD) in 1932 to develop a system “whereby the progress of the young engineer toward professional standing can be recognized by the public, by the profession, and by the man himself, through the development of technical and other qualifications which will enable him to meet minimum professional standards.”<sup>2</sup> ECPD was subsequently renamed the Accreditation Board for Engineering and Technology (ABET); and while the organization’s role has expanded significantly over time, licensure boards have continued implicitly to rely on ABET to establish and enforce appropriate educational standards for engineering licensure. Thus, if a candidate for licensure has a baccalaureate engineering degree from a program accredited by the Engineering Accreditation Commission (EAC) of ABET, any state board will accept that degree as fulfillment of the educational requirement for engineering licensure, without any further scrutiny. This *presumption of quality* has relieved boards of the need to conduct detailed transcript analyses for most licensure candidates.

In recent years, this well-established system for validating the educational preparation for licensure has been called into question. Since 1995, the American Society of Civil Engineers (ASCE) has been engaged in a major strategic initiative to enhance the educational prerequisites

for entry into the practice of civil engineering at the professional level.<sup>3</sup> From a macro perspective, this “Raise the Bar” initiative has been promulgated by:

- formally articulating and publishing the Civil Engineering Body of Knowledge (BOK);<sup>4</sup>
- determining through curricular analysis that the educational component of the BOK cannot be fully attained within the current four-year baccalaureate degree;<sup>5</sup>
- determining that the educational component of the BOK *can* be fully attained through a baccalaureate degree augmented by a master’s degree (or equivalent);
- advocating for a change to the NCEES Model Law and Rules, to require a master’s degree or equivalent for engineering licensure; and
- advocating for changes to state licensure laws, to require a master’s degree or equivalent for engineering licensure.

This last endeavor—attempting to influence state licensure laws—is fraught with challenges, because it represents a significant change to a deep-rooted system that has been in place for over eight decades. Given the profession’s long-standing reliance on ABET as the guarantor of academic qualification for licensure, many members of the licensure community have responded to ASCE’s “Raise the Bar” initiative with the question: “*Why can’t ABET take care of this problem?*” This question implies that enhanced educational standards could be implemented more easily or more effectively *through the accreditation system* than *through the licensure system*. It also assumes, implicitly, that the problem can be addressed with no changes to current licensure laws.

## Purpose

The principal purpose of this paper is to answer the question: “*Why can’t ABET take care of this problem?*” In addressing this question, the authors refute the claim that *the problem*—inadequacy of a four-year baccalaureate degree as academic preparation for professional engineering practice—can be addressed by changes to accreditation policies and criteria *alone*. In a broader sense, we demonstrate that ABET accreditation *does* have a critical supporting role in raising the educational bar for engineering; however, this contribution is *necessary but not sufficient* to achieve the desired end.

## Why ABET is Necessary

In promulgating its Raise the Bar initiative, ASCE’s overarching goal is to ensure that aspiring professional engineers attain the civil engineering BOK as a prerequisite for licensure. ABET’s two fundamental functions contribute substantially to the achievement of this goal:

- Based on input from its constituencies, the EAC of ABET establishes standards for engineering degree programs at both the baccalaureate and master’s levels. These standards are organized into three different sets of criteria—General Criteria for Baccalaureate Level Programs, which are applicable to all engineering disciplines; General Criteria for Master’s Level Programs, which are also applicable to all engineering disciplines; and Program Criteria, which are discipline-specific. An ABET Member Society representing a particular curricular area can be designated as a Lead Society, with responsibility for developing and maintaining Program Criteria for that curricular area.<sup>6</sup>

- Through its four commissions,\* ABET conducts rigorous accreditation evaluations to ensure that accredited programs are in compliance with the published criteria.<sup>7</sup>

Therefore, the accreditation system can be a powerful tool for promulgating enhanced educational standards for licensure—but only if (1) the EAC criteria are consistent with the engineering BOK and (2) ABET policies are adequate to ensure compliance with these standards.

Indeed, over the past decade, ASCE has been successful in three major efforts to advance the “Raise the Bar” initiative through changes to ABET accreditation criteria and policies:

- During the period from 2004 to 2006 ASCE developed new Civil Engineering Program Criteria to enhance consistency with the published *Civil Engineering Body of Knowledge (1<sup>st</sup> Edition)*. These criteria were approved by the ABET Board of Directors in 2007 and implemented for accreditation visits starting in the fall of 2008.
- Also in 2007, ASCE fostered the approval of new General Criteria for Master’s Level Programs, which facilitated the use of an accredited master’s degree as one possible means of validating attainment of the BOK.
- In 2008, ASCE fostered the removal of a long-standing ABET policy that prohibited institutions from offering accredited engineering programs at *both* the baccalaureate and master’s levels. This policy change was important for the “Raise the Bar” initiative, because it allowed for more flexible attainment of the civil engineering BOK along two different paths—one with an EAC-accredited baccalaureate degree (supplemented with master’s-level coursework) and one with an EAC-accredited master’s degree.<sup>8,9,10</sup>

In addition, approval of another update to the Civil Engineering Program Criteria (to enhance consistency with the 2<sup>nd</sup> Edition of the *Civil Engineering Body of Knowledge*) is currently underway. As of this writing, these criteria have been approved by the ABET Board on “first reading.” If they gain final approval on schedule in 2015, these program criteria would go into effect for the 2016-2017 accreditation cycle.

Other efforts at influencing ABET policy have not been as successful. The three most important of these are:

- ***An ASCE initiative to close a loophole in ABET’s policy on program naming.*** This policy allows institutions to assign the names of accredited programs without the approval of ABET or of any Lead Society. As a result of this policy loophole, a program can avoid compliance with existing Program Criteria simply by using a non-standard program name. ASCE’s effort to close this loophole was defeated by a vote of the ABET Board of Directors in March 2012.
- ***An ASCE proposal to clarify ABET’s definition of “one year of study.”*** The current EAC criteria define one year of study as “the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.” The practical implication of this definition is that it provides *no definitive lower limit* on a program’s math, science,

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\* The operating elements of ABET are its four commissions—the Engineering Accreditation Commission (EAC), Engineering Technology Accreditation Commission (ETAC), Computing Accreditation Commission (CAC), and Applied Science Accreditation Commission (ASAC).

and engineering content. ASCE's written request (in April 2010) to define one year of study definitively as 32 semester hours was never acted upon by ABET. ASCE's subsequent written request (submitted in June 2014) to define one year of study as 30 semester hours has not yet been acted upon by ABET.

- ***A NCEES proposal to establish 128 semester hours as the minimum requirement for an engineering program of study.*** This request, submitted by NCEES in June 2011, was denied by ABET on the grounds that imposing a 128-hour “floor” would cause several high-quality programs to fall out of compliance with the EAC Criteria.

These policy initiatives are discussed in detail in Reference 11. All of these initiatives represent ways that the ABET accreditation system *could* contribute further to enhanced educational standards for licensure; thus, ASCE will continue to pursue more favorable resolutions to these issues in the future.

For the purpose of this paper, however, the reasons why these initiatives were thwarted is as important as the issues themselves.

## **ABET and Licensure**

In the authors' view, many of ASCE's efforts to promote ABET policy changes conducive to enhanced educational standards for licensure have failed—at least in part—because ABET's charter and governance structure are not predisposed to support licensure.

ABET is a federation of 30 Member Societies, all of which have at least one seat on its 54-member Board of Directors.<sup>12</sup> These societies represent highly diverse professional communities—not only in ABET's core areas of engineering, engineering technology, and computer science, but also in such diverse fields as industrial hygiene, safety, and health physics. The majority of these societies have little interest in engineering licensure and have opposed policy initiatives offered in support of engineering licensure. Nine of 30 ABET Member Societies have publicly opposed raising academic standards for licensure.<sup>13</sup>

NCEES and the National Society of Professional Engineers (NSPE) are also ABET Member Societies; but, together with ASCE, these licensure-focused organizations constitute less than 10% of seats on the Board of Directors and thus have little capacity to influence Board decisions on issues that do not have broad appeal.

This unfavorable situation is currently becoming even more unfavorable. On November 1, 2014, the ABET Board of Directors approved a substantial change to the ABET governance structure.<sup>14</sup> This new structure, which significantly reduces the size of the ABET Board of Directors, will provide no formal representation from the licensure community in the revised Board organization. ASCE opposed this restructuring initiative, in part, because of this lack of representation—but was unable to gain the Board's support for this position. This new governance structure is expected to be implemented in October 2015, following ratification by two thirds of the ABET Member Societies.

The notion that ABET criteria and policies should be the sole mechanism for implementing ASCE's "Raise the Bar" initiative presumes that ABET would be receptive to changing its criteria in response to higher standards for licensure. There is no evidence to support this presumption. Apart from the inclusion of NCEES and NSPE as Member Societies, ABET's only formal support of licensure—as stated in the organization's "Policy on Licensure and Licensure-Related Certification"—is to "encourages graduates...to strive for professional recognition by enhancing their individual credentials through licensure and certification programs.."15 ABET's "Licensure, Registration, and Certification" web page identifies ABET's role as "contributing significantly to the education of students who later seek official recognition of their qualifications to serve the public."16 The ABET vision and mission statements do not mention licensure or imply any support for licensure.17 The word "licensure" does not appear in the ABET Constitution or in the current ABET Strategic Plan.18 The authors can find no statement in any official ABET document indicating that its criteria or policies can or should be influenced by licensure standards.

### **Why ABET is Not Sufficient**

In attempting to answer the question, "Why can't ABET take care of this problem?" it is useful to identify all possible mechanisms by which ABET *might* solve the problem—and then assess the feasibility of each one. There are four possibilities.

#### ***(1) ABET could proclaim that a master's degree is required for the professional practice of engineering.***

This solution is infeasible. According to the ABET Constitution, the organization's purposes are:

- To assure quality through the accreditation of existing programs;
- To assure quality by stimulating innovation, fostering continuous improvement, and facilitating strategic planning; and
- To engage in other appropriate projects and programs.

Mandating the required level of educational attainment for professional practice is entirely outside of ABET's charter and purpose. Furthermore, ABET has no legal authority to make such a proclamation and no capacity to enforce it. Even if ABET did have such authority, it is likely that a majority of its Board of Directors would oppose the initiative—as they have with the policy issues described above.

#### ***(2) ABET could modify EAC Criterion 3, specifying additional student outcomes at a significantly higher level of detail, to ensure that the BOK is attained.***

This solution is infeasible. ASCE's curriculum analyses have demonstrated conclusively that the civil engineering BOK *cannot* be accommodated within the traditional four-year baccalaureate degree program. Specifying all of the BOK outcomes under Criterion 3 would have the effect of mandating that four-year engineering degree programs accommodate five years of academic content.

Increasing the scope and specificity of Criterion 3 would also be unacceptable to many ABET constituencies—most notably the academic institutions. In recent years, ABET’s Academic Advisory Council (AAC) has tended to oppose ABET criteria and policies that its members deem to be burdensome to academic institutions. These efforts have already yielded a significant reduction in requirements for assessing the achievement of program objectives under Criterion 2. The AAC is currently advocating a significant reduction in the number and specificity of the Criterion 3 student outcomes as well.<sup>19</sup>

***(3) ABET could modify the Civil Engineering Program Criteria, specifying all of the student outcomes necessary to ensure that the civil engineering BOK is attained.***

This solution is infeasible. As with (2) above, this solution would require specifying five years of academic content in a four-year degree program. Moreover, specifying the equivalent of a fifth year of study through Program Criteria would be even less feasible than achieving this end through General Criteria, for two reasons. First, it would require a very high level of prescriptiveness in the Program Criteria—and, for this reason, would be strongly opposed by both the Engineering Accreditation Commission and the ABET Board. Second, it would effectively violate the Engineering Accreditation Commission’s policy that Program Criteria are applicable only at the baccalaureate level.

***(4) ABET could specify 150 hours as the minimum number of credit hours required for all baccalaureate-level engineering degrees.***

This solution is feasible, in that the engineering BOK *could* be accommodated in a 150-hour program. However, it is extremely unlikely that ABET would even be willing to consider this option, for the following reasons:

- Prior efforts to establish five-year baccalaureate-level engineering programs—led by Cornell University in 1946—have failed.<sup>20</sup>
- As noted above, nine ABET Member Societies have publicly stated that additional formal education is not required for the professional practice of engineering in their disciplines.<sup>13</sup> Thus any increase in minimum credit-hour requirements would impose an unneeded or unwanted requirement on these disciplines.
- Academic institutions and ABET Member Societies would strongly oppose a 150-hour degree requirement, on the grounds that it would drive students away from engineering. (These same groups currently use this argument against ASCE’s “Raise the Bar” initiative and would likely view a 150-credit baccalaureate degree as even more burdensome than ASCE’s proposed requirement for a master’s degree or equivalent.)
- As noted above, the current ABET-EAC criteria establish no lower limit on credit hours required for an engineering degree—and ABET has steadfastly resisted any effort to establish one. The NCEES initiative to establish a minimum at 128 credit hours was disapproved on the grounds that highly reputable programs would be disadvantaged.

Given this track record, the likelihood of ABET supporting a 150-hour graduation requirement is exceedingly low.

## Conclusion

*“Why can’t ABET take care of this problem?”*

In one sense, this question seems entirely logical. Historically, the licensure community has relied on ABET as the gold standard for evaluating the academic credentials of licensure candidates. Indeed, ABET’s predecessor, ECPD, was founded for this purpose. But times have changed since 1932; ABET’s relationship with the licensure community has changed since 1932; and, most importantly, the expansion of the BOK beyond the capacity of the traditional four-year baccalaureate degree program has created a fundamental disconnect between the needs of the profession and a licensure system that only requires a baccalaureate degree for professional registration.

ABET accreditation and licensure are *both* essential for raising the bar. But licensure is the key, because only licensure laws can mandate a specific type and level of degree. ABET *cannot* mandate a type and level of degree; ABET *cannot* force a five-year curriculum into a four-year program; and ABET *will not* mandate a five-year baccalaureate engineering degree.

As such, licensure, not accreditation, must be the principal focus for implementing enforceable standards that enhance the educational preparation of future engineering professionals.

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