

## **ASCE’S RAISE THE BAR INITIATIVE: MASTER PLAN FOR IMPLEMENTATION**

**ASCE Task Committee on Academic Prerequisites for Professional Practice  
(TCAP<sup>3</sup>)**

**BOK-Curricula Committee of TCAP<sup>3</sup>  
Accreditation Committee of TCAP<sup>3</sup>  
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### **Abstract**

In October 2001, ASCE approved Policy Statement 465 entitled “Academic Prerequisites for Licensure and Professional Practice.” The underlying purpose of ASCE Policy Statement 465 is to prepare the civil engineering professional of the future. The Task Committee on Academic Prerequisites for Professional Practice (TCAP<sup>3</sup>) has been working to implement the policy for the past two years. The purpose of this paper is to describe the master plan for the implementation of Policy Statement 465.

### **Introduction**

In October 2001, the American Society of Civil Engineers (ASCE) Board of Direction unanimously approved Policy Statement 465, entitled “Academic Prerequisites for Licensure and Professional Practice.” This policy supports “the concept of the Master’s degree or Equivalent as a prerequisite for licensure and the practice of civil engineering at a professional level.” Undergirding this policy is the belief that the Body of Knowledge (BOK) necessary to enter the practice of civil engineering at the professional level in the future will be beyond the scope of a traditional 4-year bachelor’s degree and required practical experience. While ASCE recognizes that implementation of Policy Statement 465 will not occur overnight, this policy has the potential to transform the practice of civil engineering, and positively influence the safety, quality, efficiency, and sustainability of the built environment in the 21<sup>st</sup> Century. The purpose of this paper is to describe the master plan for implementing ASCE Policy Statement 465.

### **Background: Motivation For Change**

The policy is forward-looking and addresses the following six issues.

1. *Education for a Complex Future*—Today’s world is fundamentally challenging the way civil engineering is practiced. Complexity stems from every aspect of the project, from pre-project planning with varied stakeholders to building with minimum environmental and community disturbance. The ASCE report “Engineering the Future of Civil Engineering” ([www.asce.org/raisethebar](http://www.asce.org/raisethebar)) has highlighted the significant and rapid changes confronting the profession, while recent events have demonstrated our vulnerability to human-made hazards and disasters. The risks and challenges to public health, safety, and welfare will continue to escalate in complexity, and the civil engineering profession must respond proactively.

2. *A New Skill Set and Mindset for a New Century*—Civil engineering must restructure its 150-year-old educational model to meet the challenges of the 21<sup>st</sup> Century. Civil engineering must provide future practitioners with the fundamental knowledge, skills, and attitudes to account for and manage complexity. The current 4-year bachelor's degree is becoming inadequate academic preparation for the future. Additional education will provide the next generation with the knowledge, skills, and attitudes necessary to ensure the high standards of the profession and protect public health, safety, and welfare.

3. *A Long Way to Go*—The National Research Council (NRC) recently published a report citing three “serious concerns” with engineering graduates. Many have “little knowledge of the design process,” “inadequate knowledge of the role of technology in their professions,” and “little knowledge of business, economics, and management.” These issues cut to the core of civil engineering. Graduates who do not understand “The Big Picture” will be challenged to provide safe, practical design in a complex future.

4. *Fewer Credits*—Civil engineers are expected to simultaneously possess greater breadth of capability and greater specialized technical competence than was required of previous generations—a nearly impossible challenge with fewer college credits. Students take at least 20 fewer credits than did their counterparts in the 1920s. While they take comparable proportions of math, science, and general education, today's students take, on average, 18 fewer credits of engineering topics. That is a whole semester less of technical and professional courses at a time when, by almost universal estimation, the complexity of the modern engineering project escalates. How can tomorrow's civil engineers design safe, cost-effective projects, accounting for greater complexity and uncertainty, with less formal education?

5. *Growing Complexity*—The nation's (and world's) infrastructure has grown increasingly mature, dense, technically complex and interconnected, especially in urban areas. To maintain what we have as we plan and build for the future, civil engineers will have to apply creative technologies and solutions. Fortunately, compared with a few decades ago, there are numerous new tools and techniques to address project challenges. Yet the ever-expanding body of scientific knowledge and resulting engineering technology is not without consequences. The vast increase in technologies, materials, and processes available to the civil engineer has become daunting. And while cost-effective technologies provide more accurate and reliable information, someone must still interpret the data in its ever-expanding detail and yet still understand sufficiently the consequences of its adoption and application.

6. *Greater Accountability*—Change is needed in this era when the public is playing a more active role on private and public projects alike through a more open planning process, environmental regulations, and community standards. To be sure, this involvement from end-users and stakeholders provides valuable input, but it adds an element of complexity to the way projects are conceived, designed, and built. The difficulties of managing complexity can contribute to misapplication and unsafe practice. As the complexity in our society and on our projects mounts, the risk to public health, safety and welfare increases.

To effectively manage the complexity of the future, to make informed, ethical, and safe decisions in the face of rising uncertainty, ambiguity, and increased stakeholder involvement, civil

engineers require additional fundamental knowledge. More education for civil engineers means a safer, better future for the greater public who rely on the value, judgment, and services the profession provides.

### Communicating For Success

Over the last 8 years, ASCE has evolved in defining, describing, and communicating its intent to raise the education bar (see Figure 1). The original Policy Statement 465 approved in October 1998 stated that “ASCE supports the concept of the Master’s degree as the First Professional Degree for the practice of civil engineering at a professional level.” This led to considerable confusion regarding the meaning of a “First Professional Degree” and “practice at a professional level.” This confusion led to the formation of the Task Committee on the First Professional Degree (TCFPD). This committee worked for almost three years to define the intent of the policy and eventually defined the “Master’s degree or equivalent” (MOE) as a prerequisite for licensure and practice at the professional level. Entry into “the practice of civil engineering at a professional level” was defined as licensure. The “equivalent” of a Master’s degree was established as approximately 30 credits of advanced/graduate technical and/or professional practice coursework.

These efforts to communicate Policy Statement 465 focused disproportionately on the “means” or education tools to fulfill policy intent. The policy was commonly referred to as the “MOE Policy,” overemphasizing the requirement of an individual to obtain a master’s degree or an equivalent level of graduate education. Too little emphasis was given to the desired “end state” of Policy Statement 465, which is the realization of a requisite body of knowledge by the civil engineer of the future.

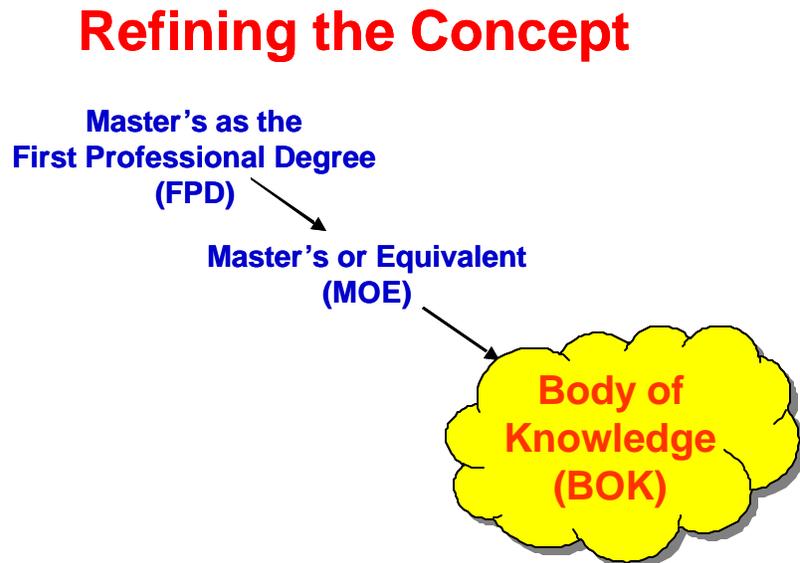


Figure 1. Communication for Success: Evolution of Terms Associated with Policy Statement 465

The focus is now on the Body of Knowledge (BOK). The BOK is defined as the knowledge, skills, and attitudes necessary to become a licensed professional engineer. The BOK is fulfilled via the Bachelor's plus Master's or equivalent education – and appropriate practical experience. This resulted in yet another expression, “B + M/30 & E,” the acronym for “Bachelor's Plus Master's or 30 Credits & Experience.”

### **Bachelor's Plus Master's Or 30 Credits: “B + M/30 & E”**

TCAP<sup>3</sup> is using “B + M/30 & E” to express the total post-secondary formal education fulfilling body of knowledge requirements for entry into the practice of civil engineering at the professional level. The “B” in “B + M/30 & E” generally refers to an engineering baccalaureate degree accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). The second part—“Plus Master's or 30 Credits”—can best be explained by exploring two alternative approaches to fulfilling additional educational requirements as prescribed by ASCE Policy Statement 465:

1. The “M” in “B + M/30 & E” refers to a formal post-baccalaureate educational program that leads to a master's degree and to the completion of the requisite body of knowledge.
2. The “30” in “B + M/30 & E” refers to a post-baccalaureate educational program that does not lead to a formal master's degree but leads to the completion of the requisite body of knowledge. For an individual with a BSCE from an ABET-accredited program, this might consist of approximately 30 semester credits of acceptable graduate level (or upper level undergraduate) courses in technical and/or professional practice topic areas. These credits are expected to be beyond those required for the baccalaureate degree.

The third part—the “E” in “B + M/30 & E”—refers to post-baccalaureate practical engineering experience. To sum up, TCAP<sup>3</sup> envisions two alternative paths to fulfilling the requisite body of knowledge. One is the “B + M & E” path that includes a formal master's degree; the other is the “B + 30 & E” path that does not include a formal degree (see Figure 2).

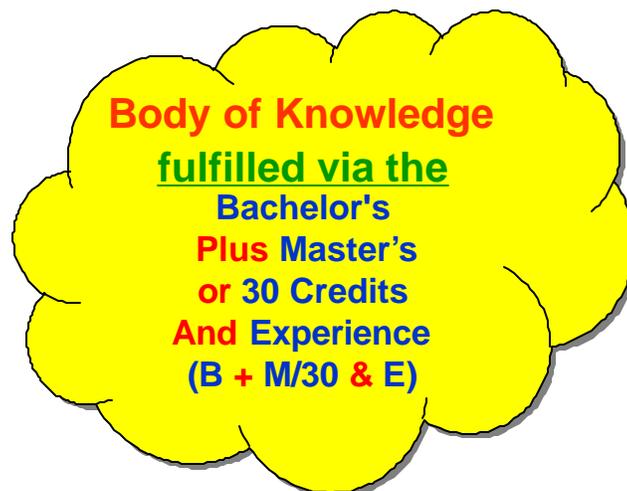


Figure 2. Tools to Fulfill the BOK

It should be noted that both the “M” and the approximately “30” credits could be accomplished by traditional university courses or by approved distance learning delivery systems. In addition, at some point in the future, all or part of the “30” might be delivered through high-quality, standards-based educational programs offered by firms, government agencies, and for-profit educational organizations. ASCE recognizes that the role of distance learning will become more prevalent and important in the future for both degree and non-degree granting programs.

Defining the requisite body of knowledge to prepare the civil engineer of the future is a critical initial step in accomplishing the goals of ASCE Policy Statement 465. TCAP<sup>3</sup> has drafted a BOK with the help of its corresponding members. As this body of knowledge is further articulated, TCAP<sup>3</sup> envisions working to help revise existing undergraduate and graduate programs, as well as helping facilitate the creation of new Masters in Engineering programs.

### **Misconceptions Regarding Policy**

Based upon feedback generated from over 15 published articles and 100 presentations, numerous misconceptions have emerged regarding Policy Statement 465. These misconceptions are based upon the experience, knowledge, and perspective of the commenter and the inability of ASCE to clearly and consistently communicate the key aspects of the Policy to every stakeholder. The key misconceptions and *their refutations* are as follows:

- ❖ We (the civil engineering profession as represented by ASCE) are “tacking on” more education to support academic job security. *Policy Statement 465 is for the future of the profession and is knowledge-centric.*
- ❖ We will require “more of the same” education beyond Bachelor’s even though the current Bachelor’s program needs to be improved. *By defining the body of knowledge for practice, the committee is clearly focused on the entire post-secondary education trajectory of future civil engineering professionals.*
- ❖ We are recommending that all individuals pursuing engineering licensing obtain a research-oriented/thesis-based Master of Science (MS) Degree. *The focus on defining the body of knowledge and not on degree titles, as well as the flexibility in fulfilling the body of knowledge through the “B + M/30 & E” requirement moves ASCE away from requiring a traditional MS degree.*
- ❖ We are stressing degrees independent of required knowledge. *Again, the primary task of the committees has been to examine what the fundamental body of knowledge of the profession is, or better yet, should be.*
- ❖ We are requiring/advocating that the additional “M/30” education must occur directly after completing the Bachelor’s degree. *There is no set sequence to the formal post-baccalaureate education required in the “B + M/30 & E” model, and any requirements will incorporate maximum flexibility, including distance-learning delivery of courses.*
- ❖ We believe that practical on-the-job experience and life-long learning are not important. *The committees firmly believe in the importance of experience and life-long learning to develop the body of knowledge over a career. As such, the committees advocate mandatory experience as part of licensure.*

- ❖ We will implement the policy instantly. *As will be discussed below, the committees and ASCE recognize that this initiative will take 20 or more years.*
- ❖ We have the power and authority to mandate change within universities, accreditation bodies, and licensing boards. *The committees can only make recommendations to ASCE and organizations such as ABET and the National Council of Engineering Examiners and Surveyors (NCEES), but neither the committees nor ASCE can mandate anything.*
- ❖ We should wait to let someone else define the educational requirements for the Civil Engineering (CE) profession. *If we don't act soon, someone else will—and that someone is not guaranteed to have the civil engineer's interest in mind.*

These misconceptions have helped clarify the committee's thinking and communication with the civil engineering community. This feedback is enabling the committee to refine and sharpen the master plan for implementation.

### **Structure and Philosophy of Committees**

In October 2001, the ASCE Board charged the Task Committee on Academic Prerequisites for Professional Practice (TCAP<sup>3</sup>) with developing, organizing, and executing a detailed plan for the full realization of Policy Statement 465. TCAP<sup>3</sup> and its three constituent committees consist of 20 members representing a broad cross-section of the society including practitioners, educators, younger members, students, and ASCE senior staff. To accomplish our mission, the committee established three separate, constituent committees pursuing three parallel, long-term, and complex initiatives. These three constituent committees include the Body of Knowledge-Curricula Committee, the Accreditation Committee, and the Licensing Committee, and involve the participation of additional people beyond the membership of TCAP<sup>3</sup>. A complete listing of all participating committee members is provided at the end of the paper.

The primary charge of the Body of Knowledge-Curricula Committee is to define the body of knowledge (BOK) needed to enter the practice of civil engineering at the professional level in the 21st century. The Accreditation Committee is working within the current engineering accreditation system to support the implementation of ASCE Policy Statement 465. The Licensure Committee is working to encourage the incorporation of additional engineering education requirements in the Model Law and Model Rules and Regulations adopted by the National Council of Engineering Examiners and Surveyors (NCEES). More detailed information concerning the charge of each of these three constituent committees is included in a subsequent section of this paper.

The operating philosophy of TCAP<sup>3</sup> is to:

1. Be proactive.
2. Be thoroughly prepared.
3. Be creative and thorough in documenting its ideas in writing.
4. Be inclusive.

5. Communicate, communicate, and communicate with a broad set of stakeholders.
6. Leverage technology.

Being proactive means not waiting for progress and contacts to happen on their own. Sitting back and hoping that someone else will do the work necessary to move this effort forward is not an effective or realistic strategy. It is not magic—it is hard work! To be thoroughly prepared, the committee does its homework. All dimensions of the issue must be considered and investigated. This includes, for example, doing research on what other professions are doing and contacting knowledgeable individuals who can provide relevant information.

There is no better way to sharpen your thinking than to express your ideas in writing. The committee has found that putting our ideas in writing helps engage others in the discussion, improves the quality and clarity of our ideas, and brings everyone to a common understanding of issues and directions. Being inclusive means not marginalizing others in the dialogue and debate (to include both those for and against the idea). Embracing and including others who think differently and have different views on the topic is healthy and productive for all involved, if the dialog process is properly managed.

Most concerns/misunderstandings start with a lack of effective communication. Communication is complex and requires an understanding of the content of the message, the background of the audience, and how the message is delivered. Equally important is what the listener hears (this includes what the listener chooses to hear and NOT hear). Word choice plays a large role in shaping and positioning the message in a way the audience can understand it.

The committee makes extensive use of e-mail, an online community interface (e.g., e-room), and the website ([www.asce.org/raisethebar](http://www.asce.org/raisethebar)) for the communication and the warehousing of all internal and external correspondence, presentations, and papers. E-mail has enabled the involvement of over 300 corresponding members.

The overall philosophy has also lead to the following principles:

- ❖ The Communication Process – Clear, concise, consistent, and compelling. *This has been a humbling experience for the members of TCAP<sup>3</sup>. We have struggled constantly to hone our vision of Policy Statement 465 and communicate that to various stakeholders.*
- ❖ The Change Process – Awareness, Understanding, Commitment, and Action. *We are working to be facilitators of change, but change takes time. We currently understand that we are in the middle of a historic reorganization.*
- ❖ The Marketing Process – Earn Trust, Learn Needs, Close Deal. *We have experimented with getting “buy in” from stakeholders, and we have learned how difficult this can be when proposing to thoroughly shake things up.*
- ❖ The Planning Process – “A plan is not so important; it is the planning process that is critically important.” Dwight D. Eisenhower. *We have worked very hard to be proactive and expeditious in this undertaking, which has required constant commitment and hard work from the members of TCAP<sup>3</sup>.*

- ❖ The Conflict Resolution Process – Acknowledge Conflict, Identify the Issue(s), Analyze, Craft a Compromise, Implement, Repeat. *When confronted with criticism to Policy Statement 465 or for a particular facet of our approach to communicating the implementation plan for its realization, we have worked hard to avoid alienating parties. The committee responds to all letters and e-mail he receives about this issue—positive or negative.*
- ❖ The Covey Circle of Influence and Circle of Concern – Trust must be established, then needs must be understood, then a logical follow-up occurs. *We have worked to make partners and allies with a broad array of stakeholders, and one of the ways we have achieved this is to be straightforward and honest with all stakeholders. We want to improve the civil engineering profession and professional education. That is it.*

### **Caveat to Change: Options to Facilitate Raising the Education Bar**

It is important to recognize the numerous means available to facilitate the magnitude of change we are enumerating, in order to explain where we are focusing our efforts and why. TCAP<sup>3</sup> would like to recognize several overarching options for increasing the educational requirements of a profession.

1. *Encourage schools to offer 5-year BS + MS programs and seek ABET accreditation for these programs.* The University of Louisville offers a 5-year program with an ABET accredited Master of Engineering (M. Eng.). Since dual accreditation is not currently feasible under ABET guidelines, Louisville's bachelor program is not accredited by ABET. Nevertheless, this model has served well for over a quarter century, and it could serve as a model for helping transform civil engineering degrees. In addition, such a model has worked for pharmacists, which as a profession only accredited 5-year programs until they recently moved to a 6-year doctoral professional program.
2. *Make additional education a requirement for licensure.* TCAP<sup>3</sup> is currently working with NCEES to incorporate the B + M/30 & E model into the model law for licensure. In addition, as will be described more below, TCAP<sup>3</sup> is working with individual state licensing boards to help make licensing a prerequisite for professional practice.
3. *Make additional education a requirement for specialty certification.* Specialty certification is usually controlled by a profession, though it may be regulated by a state licensing board. ASCE could work to link additional education to specialty certification, which would conceivably require changes to licensing laws as well.
4. *Make additional education a requirement to be a M.ASCE (Full Member of ASCE).* This tactic to raise the education bar was used successfully by accountants. The accountancy profession increased the education requirement for professional practice from the bachelor's degree to 150 college credits with at least 24 at the graduate level, a model similar to the B + M/30 & E.

5. *Make Continual Professional Competency (CPC) a requirement for professional practice.* Almost half of all states now require some form of mandatory CPC or continuing education to maintain licensure. However, a review of state requirements shows that current time commitments are minimal, at between 8 and 45 hours of contact time every two years. While these laws represent an important development in the profession's acknowledgement of the need for life-long learning, it remains to be seen how effective these programs could be at delivering the BOK of the future.

TCAP<sup>3</sup> has chosen to focus its efforts on options 1 and 2 in the above list, as will be made increasingly obvious in the next section of the paper. By defining the BOK, we hope to encourage universities to design programs that deliver the necessary skills, knowledge, and attitudes to professionals of the future—a process that will require formal education beyond the BSCE degree. Tied into this effort could be modifications to accreditation criteria. As will be discussed more below, we have also chosen to actively pursue a modification to the NCEES model law for licensure as a way to help facilitate the adoption of the B + M/30 & E for civil engineering. Nonetheless, we have and continue to consider all 5 options as means to help move Policy Statement 465 forward.

## **Master Plan**

In order to facilitate implementation and communication with a broad set of stakeholders, a master plan was developed (see Figure 3). The master plan is expressed in terms of eight principal products. The plan identifies the constituent committee primarily responsible for delivering each of the principal products and the ideal sequence for delivery. The circles represent the start and completion of TCAP<sup>3</sup>'s charge. The rectangles, ovals, and triangles represent products of the BOK-Curricula, Accreditation, and Licensure committees, respectively.

One sequence of delivering principal products, enclosed by a dashed line at the top of Figure 2, starts with the "Body of Knowledge (BOK)" and leads to accredited Master's degree programs. The BOK leads to the development and/or identification of "Example Curricula" that fulfill the BOK. It is anticipated that new "B + M" programs will be developed. Currently, Colorado State University (CSU) is designing a new "B + M" program "on paper" in close coordination with the BOK-Curricula Committee of TCAP<sup>3</sup>. We are pleased to report that Iowa State University, Case Western Reserve University, and California State University-Los Angeles are also engaged in similar processes.

The "BOK" also leads to reevaluating the "Accreditation Criteria." This reevaluation may lead to changing the accreditation process to allow dual-level accreditation of both EAC undergraduate and graduate civil engineering programs. Changing the "Accreditation Criteria" will lead to a reevaluation of the current list of "Accredited Programs." It is anticipated that licensing boards will need a listing of accredited "B + M" programs as a practical means of certifying the fulfillment of "BOK" by an applicant for licensing. With enabling accreditation criteria, it is expected that graduate programs will seek accreditation.

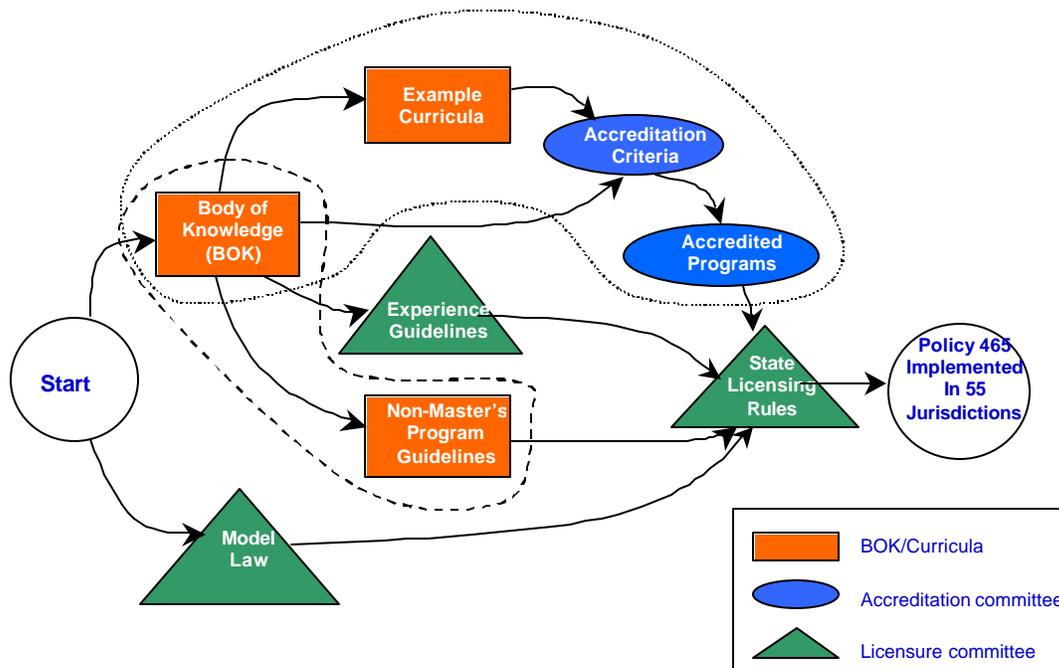


Figure 3. Master Plan For Implementing Policy Statement 465

A challenging task, depicted in the middle of Figure 3, is the establishment of “Non-Master’s Program Guidelines.” In essence, this is defining the “B + 30” methods of fulfilling the requisite Body of Knowledge. Completing this principal product will require the creation of guidelines for the approximately 30 credits of advanced undergraduate/graduate technical and/or professional practice courses. The verification of the fulfillment of the BOK by the “B + 30” route will be more challenging. Several organizations could serve as the lead: ABET, NCEES, universities, other accrediting bodies, or professional societies/organizations such as ASCE.

The “Model Law,” “Experience Guidelines,” and “State Licensing Rules” shown as triangles, are related to licensure. The “Model Law” is currently being discussed and debated within NCEES. It is expected that the model law will include the requirement for additional education beyond the baccalaureate degree in the future. The “Experience Guidelines” will provide advisory guidelines concerning appropriate progressive on-the-job experience. Increasing the educational requirements will be operationalized by modifying the “State Licensing Rules”—the ultimate goal of TCAP<sup>3</sup>’s efforts.

### Master Plan Milestones

A milestone chart is shown in Figure 4. Licensing was first implemented in 1907 by the state of Wyoming and took over 40 years to implement throughout the United States. Based upon this, the committee considers its schedule of implementation to be reasonable. If we fast-forward to 2010, the committee will have accomplished the following:

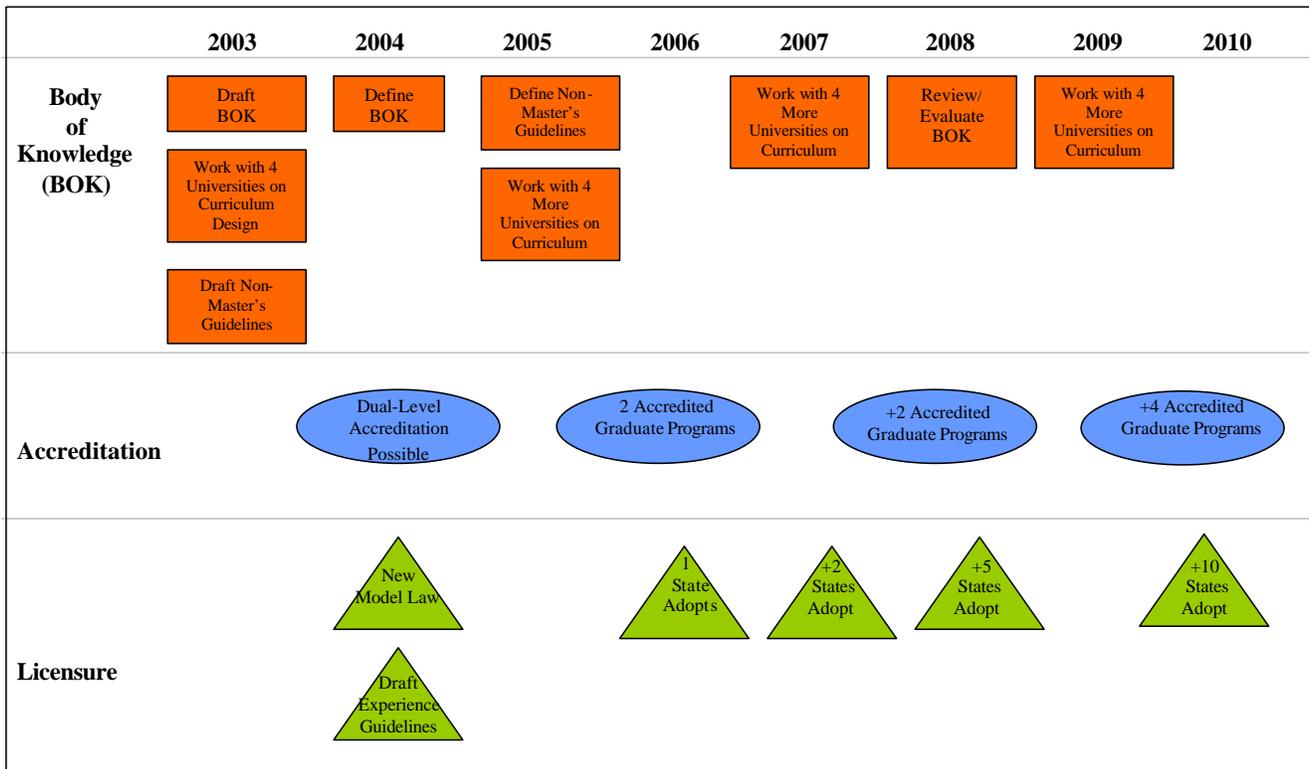


Figure 4. Milestone Events for Implementing Policy Statement 465

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1. Defined the Body of Knowledge (BOK) to practice CE at the professional level.
2. Defined Non-Master's Guidelines for fulfilling the BOK.
3. Defined Experience Guidelines for appropriate progressive industry experience.
4. Enabled Dual-level ABET accreditation.
5. Engaged 16 schools in designing a practice-oriented Master's degree.
6. Created eight accredited practice-oriented Master's programs.
7. Influenced the NCEES Model Law to include additional education beyond the BS.
8. Enabled eighteen jurisdictions to adopt additional education for implementation on or before 2020.

By 2020, the committee will have:

- ❖ Refined the BOK, Non-Master's Guidelines, and Experience Guidelines.
- ❖ Engaged ten additional schools in designing a practice-oriented Master's degree.
- ❖ Accredited an additional 10 Master's programs.
- ❖ Enabled an additional thirty jurisdictions to adopt additional education for implementation on or before 2025.

### **BOK-Curricula Committee**

The BOK-Curricula Committee has been charged to:

- Define the body of knowledge (BOK) needed to enter the practice of civil engineering at the professional level (licensure) in the 21<sup>st</sup> century.
- Address the role of experience in the licensure preparation process.
- Design and/or identify B + M programs and experience that will implement the BOK in the early part of the 21<sup>st</sup> century.
- Describe the role of faculty and practitioners communicating the BOK by means of B + M programs.
- Seek input from and support for the preceding from forward-looking academics and practitioners.

The committee's views on the BOK are arranged by three themes; (1) *what* should be taught and learned, (2) *who* should teach it to civil engineering students, and (3) *how* should it be taught and learned. Stated differently, the three elements of the BOK, as recommended by the committee and described in this report, are:

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- Content defined in terms of knowledge, skills, and attitudes;
- Faculty educational preparation and engineering experience; and
- Curricular, co-curricular and extra curricular approaches, methodologies, and techniques.

The committee has developed a work plan, consisting of key tasks and some target completion dates. The work plan is continuously updated and extended as the committee's work proceeds. The committee has also formed a group of corresponding members, comprised mostly of civil engineers from the public and private sectors and academia interested in the BOK aspects of ASCE Policy Statement 465. They have made themselves available to review draft materials, respond to questions, and otherwise provide ideas and information for consideration by the committee. The corresponding members approach has enabled the committee to greatly expand the breadth and depth of stakeholder input. Another element of the committee's approach has been the participation in key conferences and workshops, and writing articles and papers for targeted publications. These activities have provided another means of moving stakeholders from awareness to understanding and soliciting input and broadening support.

The committee has developed guidelines within which the draft BOK can be discussed and defined. These guidelines are analogous to the objectives and constraints imposed on a typical engineering design project. That is, the guidelines describe what the committee is trying to accomplish and what issues and limiting factors must be recognized in achieving that objective. The guidelines integrate ideas, information and issues drawn from several sources, including BOK approaches used by other professions and entities.

Defining, much less explaining, the BOK has challenged the committee. A top-down approach was ultimately used, in that outcomes were initially defined. By outcomes, the committee means the knowledge, skills, and attitudes necessary to become a civil engineer practicing at the professional level. The committee adapted ABET's 11 outcomes to include additional technical depth and breadth outcomes. The committee has completed a draft BOK and it can be found at [www.asce.org/raisethebar](http://www.asce.org/raisethebar). Feedback on the draft is being actively solicited.

### **Accreditation Committee**

From the start, the Accreditation Committee has been envisioned as dependent upon the findings and progress of the other two committees. Therefore, the committee has only recently begun to formally carry out their charge. Some specific actions to be accomplished in the near-term include:

- Identifying feasible means and methods for accreditation of Master's degree programs that include the essential topics from the BOK.
- Persuading ABET to permit dual-level accreditation of civil engineering programs and assure that the civil engineering criteria encompass the essential topics from the BOK.
- Authoring a paper advocating dual level accreditation (Smerdon and Anderson 2003).

- Development and/or evaluation of quality assurance methods (accreditation) of non-traditional, post-baccalaureate programs of study that do not culminate in a master's degree.

## **Licensure Committee**

The ultimate implementation step regarding Policy Statement 465 is to change state licensing requirements to make additional formal education in the form of B + M/30 & E a prerequisite for licensure in the future. It is generally accepted that licensure is more important to civil engineering than to the other engineering disciplines because of direct contact with the public. Many engineers in other engineering disciplines generally interact with the public through large corporations and are not required to be licensed due to industrial exemptions in place in many states. By encouraging the requirement of additional formal education beyond the baccalaureate degree as a prerequisite for licensure, and therefore professional practice, ASCE is advocating a general raising of the bar for the practice of civil engineering. For those who choose not to become licensed, there will continue to be rewarding careers within the civil engineering community, just as there are currently. The policy is viewed as a positive requirement for all civil engineers independent of licensing.

There are fifty-five (55) independent licensure boards or jurisdictions in the United States, and licensure requirements vary from jurisdiction to jurisdiction. There is no national law that requires all jurisdictions to have the same licensing requirements, though the National Council of Examiners for Engineering and Surveying (NCEES) has developed and promulgated a Model Law Engineer category that serves as a guideline for the state-level bodies that regulate licensing. NCEES is presently considering modification of their Model Law for licensure. It is the hope of the committee that some form of the B + M/30 requirement will become incorporated in the forthcoming model law. This would be a major achievement and could potentially accelerate the implementation of the policy. As such, this initiative has been the focus of committee effort.

The committee is currently developing an implementation work plan to help integrate additional education into licensure rules and guidelines. The plan will take into account the barriers and critical issues identified by the committee, which include, among other issues, the variation in licensure requirements, the problem of interstate mobility and recognition/reciprocity issues, and the fact that currently most states and jurisdictions do not even require an ABET-accredited engineering degree for licensure (12/55 require ABET degree and 22/55 have continuing education requirements). The following items should be considered as a starting point for the work plan, which is evolving rapidly:

- Continue refining a position paper for presentation to NCEES defining licensure issues to address.
- Obtain a workable BOK and definition of B + M/30, in collaboration with BOK-Curricula committee.
- Develop a regulatory definition that can be suggested to the licensing jurisdictions for their consideration.

- Have the Licensure Committee members interact with other members of licensing boards.

The committee has also made presentations to other organizations, and plans to continue this means of soliciting feedback on progress and generating support for the policy.

## The Path Forward

Policy Statement 465 is directed toward the *future* of the profession. As already stated, implementation of this concept will not happen overnight. It is anticipated that, at the earliest, the additional education requirements would apply to the graduating class of 2020. ASCE cannot mandate who, how, and when it will be implemented. ASCE will be an active partner with ASCE members, other engineering disciplines, employers, NSPE, NCEES, state-licensing boards, ABET, deans, department heads and chairs, faculty, students, and the public, to implement the policy.

Laying the groundwork for a new future for civil engineering has taken tremendous work on the part of TCAP<sup>3</sup>, constituent committees, and the forward-looking committees that have come before it, but the possibility of making that future brighter is fuel for progress.

## References

Smerdon, E. T., and Anderson, R. O. (2003). "Dual Level Accreditation of Engineering Programs," ABET Newsletter.

Body of Knowledge for the 21<sup>st</sup> Century: Preparing the Civil Engineer of the Future, (2003). Draft available on [www.asce.org/raisethebar](http://www.asce.org/raisethebar)

## Committee Members

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