Task Committee Report on

Advanced Credentialing for Civil Engineers

Committee on Professional Practice (CPP)

American Society of Civil Engineers

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Introduction:
Advanced credentialing is a post-licensure certification that provides recognition of advanced expertise in an engineering specialty, superior experience, strong ethics, and a commitment to life-long learning and continued professional development.

In 1963, the American Society of Civil Engineers (ASCE) Board of Direction (ASCE Bylaws, Article 1) adopted a definition of a profession as "the pursuit of a learned art in a spirit of public service." As further amplification, the Board of Direction stated that "a profession is a calling in which special knowledge and skills are used in distinctly intellectual plane in the service of mankind, and in which the successful expression of creative ability and application, of professional knowledge are the primary rewards." Implied in the Board of Directions statements is the application of the highest standards of excellence in the pursuit of education prior to entering the profession, in the performance of services, and in the ethical conduct of its members. Also implied is the conscious recognition of the profession's obligation to society to advance its standards and to prescribe the conduct of its members. In keeping with this obligation to advance standards and to prescribe the conduct of its members, ASCE has empowered a number of activities and committees to ensure its obligation to society is met. This includes the formation of a Committee on Professional Practice and in recent years the need for continuing certification of a member's abilities to apply engineering principles to addressing complex societal needs in a sustainable way. Advanced credentialing is aimed directly at ongoing certification of a member's capabilities.

The Committee on Professional Practice (CPP) of ASCE is charged with providing vision, leadership, and direction to ASCE and its members regarding professional and ethical issues affecting practicing engineers. One aspect of this charge is the professional development of the civil engineer, including education, mentoring, ethics, licensing and advanced credentialing. CPP currently has constituent committees working diligently on all these subjects. In 2008, CPP created a task committee to provide a summary of the status of advanced credentialing and a description of how and why a civil engineer may want to seek advanced credentialing. This Report is the product of the Task Committee's efforts and a current picture of advanced credentialing opportunities.

The charge to the Task Committee on Advanced Credentialing for Civil Engineers is in line with CPP's goal of encouraging, guiding and promoting the professional development of civil engineers including skill development to improve the practice of civil engineering, licensure of all eligible Society members, and appropriate professional and business behavior. Advanced credentialing like CPP is aimed at enhancing the image of civil engineers through providing leadership on issues of importance to the profession and recognizing and rewarding excellence. Lastly, advanced credentialing is another avenue by which ASCE can encourage compliance with the ASCE's Code of Ethics, always keeping in mind that civil engineering is a learned profession that has a direct impact on the safety, health and welfare of the public. Accordingly, the services provided require high standards of honesty, integrity and fairness to assure public health, safety and welfare. (Reference: Professional Ethics and Conflict of Interest, ASCE Resolution 502)

Background:
ASCE President Thomas L. Jackson in his inaugural address stated
"Education and maintenance of competency of civil engineers has become a major concern of the civil engineering profession leadership. Raising the bar of the profession through a redefined body of knowledge required to practice civil engineering at the professional level, and continued professional competency to assure the user of our services, and the public, that civil engineers will maintain their technical, ethical and professional skills throughout their career are all part of this discussion." President Jackson's comments regarding continued professional competency and assuring the users of our services that we as civil engineers are maintaining our technical, ethical and professional skills are on point in the discussion of how and why civil engineers should pursue advanced credentialing.

For more than a decade, ASCE has been talking and listening to many stakeholders to determine how to implement ASCE Policy 465. The complete text of ASCE Policy Statement 465 is presented in Appendix A. As a result, ASCE has progressively proposed programs to "raise the bar" for professional practice and to raise the educational requirements for entry into the future practice of civil engineering at the professional level. For example, the ASCE Committee on Academic Prerequisites for Professional Practice (CAP^3) was established to investigate how to enhance the educational requirements for the future practice of civil engineering at the professional level. The first Body of Knowledge (BOK) Committee was charged with defining the knowledge, skills, and attitudes needed to enter the practice of engineering at the professional level. Outcomes are the heart of the BOK and of the entire ASCE master plan for civil engineering excellence. The National Council of Examiners for Engineers & Surveyors (NCEES), the National Society of Professional Engineers (NSPE) and the National Academy of Engineers (NAE) have joined ASCE in the pursuit of increasing the educational requirements needed to practice civil engineering. The 2nd Edition of the Body of Knowledge (BOK2) was completed, published and formally released in February 2008.

In August 2009, the ASCE Task Committee to Achieve the Vision 2025 for Civil Engineering in 2025 completed their assignment and issued their committee report; "Achieving the Vision for Civil Engineering in 2025, A Roadmap for the Profession." Their report concluded "The task committee saw that the vision embodied a number of outcomes for the future, that is, new states of affairs within ASCE and the civil engineering environment that should be in place by the year 2025." Vision 2025 Outcome 1 foresees civil engineers being considered by society to create a sustainable world and enhance the global quality of life or in other words to become master builders. To fulfill the role of master builder civil engineering is recognized as a "learned profession" characterized by competency and continued pursuit of knowledge and experience. Two factors identified for maintaining the role of master builder are to: 1) develop and promulgate comprehensive programs of advanced credentialing; and, 2) promote credential mobility for civil engineering practice worldwide.

During the spring 2008 meeting of CPP and its constituent committees, a round table discussion was held to discuss: What types of civil engineering activities should have

specialty credentialing and what is the value and to whom? Ms. Sandra Knight facilitated the discussions. The following are some of the comments from the discussion:

- All specialty certification or advanced credentialing is post professional engineer (PE) licensure.
- ASCE Institutes that desire to pursue advanced credentialing in a form other than post PE licensure should work through Civil Engineering Certification, Inc. (CEC) to provide specialty credentialing.
- The Technical Activities Committee (TAC) should cover Civil Engineering disciplines that are not part of an Institute.
- The general practitioner may not fall into one of these categories.
- Paraprofessionals are not licensed; therefore, advanced credential does not apply.
- Any civil engineering discipline that is considered a specialty within Civil Engineering should have the opportunity to pursue advanced credentialing.
- Advanced credentialing could be provided by any group of engineers practicing a like discipline that can adequately justify a credentialing program.

On May 8, 2008 the ASCE Board of Direction approved Policy Statement # 524, titled **"**LICENSURE AND ADVANCED CREDENTIALING WITHIN THE CIVIL ENGINEERING PROFESSION." The Policy reads: "The American Society of Civil Engineers (ASCE) supports licensure as a Professional Engineer (PE) that recognizes the traditional breadth of the civil engineering practice. ASCE also supports post-PE credentialing that attests to a Professional Engineer's expertise in a civil engineering specialty area. Obtaining a PE license or post-PE credential shall require the engineer to demonstrate attainment of an appropriate body of knowledge." A copy of the entire Policy Statement text is provided in Appendix B.

Why should civil engineers seek advanced credentialing?

The benefits of advanced credentialing include:

- Establishing a higher level of distinction and recognition above the PE license.
- Validation of knowledge, expertise, and experience for the mastery of an engineering specialty.
- Having a positive influence on salaries and job opportunities for civil engineers who have been recognized by advanced credentialing.
- Demonstrating a higher level of achievement and a commitment to life-long learning.
- Advancing or increasing the public perception of Civil Engineers, (see Vision 2025 reference).
- Providing another measure of professional or technical competence when competing to provide consulting engineering services.
- Providing another avenue for continuing education in the credentialed area, including a continuing study of ethics.
- Enhancing public perception that the quality and professionalism of the practicing civil engineer are focused on creating a sustainable world, enhancing the quality of life, and providing for the safety of the public.

How can civil engineers achieve advanced credentialing?

There are currently two avenues civil engineers can pursue for advanced credentialing. One avenue is to obtain advanced credentialing through the auspices of Civil Engineering Certification, Inc. or the American Academy of Environmental Engineers. The other is avenue is to seek advanced credentialing through specialty licensure. The National Academy of Forensic Engineers and Transportation Professional Certification Board Inc. also have certifications for engineers in their respective areas of expertise and practice that do not limit their certifications to engineers with degrees in civil engineering.

Civil Engineering Certification**:**

Civil Engineering Certification (CEC) is a separately incorporated and wholly owned subsidiary of ASCE that was established in 2004 to administer specialty certification programs for civil engineering specialties. The American Academy of Water Resources (AAWRE), the American Academy of Geo-Professionals (AGP), and the American Academy of Coastal, Ocean, Port and Navigation Engineers (ACOPNE) all operate under CEC. The Council of Engineering & Scientific Specialty Boards (CEBS) has accredited CEC. The CESB was formed by national engineering technical and professional societies, the state examining boards who license professional engineers, and the accreditation board which governs the university engineering curricula.

The Diplomate, Water Resources Engineer (D.WRE) credential was the first ASCE sponsored, voluntary, post-licensure, specialty certification for civil engineers. The CEC Board of Directors approved the creation of the American Academy of Water Resources Engineers (AAWRE) in October 2004. Members of ASCE's Environmental and Water Resources Institute (EWRI) led the development of AAWRE. The Academy was created to offer a voluntary, post-license credential that provided professional engineers and practitioners an opportunity to gain further recognition in the field of water resources engineering, to promote life long learning, and the ethical practice of water resources engineering. AAWRE's goal is dedicated to improving the practice of, elevating the standards of, and advancing the profession of water resources engineering. The Diplomate, Water Resources Engineer credential is awarded to those water resources engineers who demonstrate fulfillment of a specific water resources engineering body of knowledge (WBOK). This specialized WBOK is based on the work being done by the ASCE CAP^3. The WBOK extends the desired outcomes of the BOK to reflect higher, post-licensure levels of competency in water resources. The D.WRE credential requires licensure as a professional engineer; a bachelor's degree in engineering or related science plus 30 credits of post-graduate studies, a master's degree, or a doctorate; 10 or more years of professional work experience; passing an oral exam or assessment, and a commitment to professional ethics. Continuing education is required for renewal on an annual basis, after the initial year of certification. Since the start of the AAWRE specialty certification program, over 500 water resources engineers have qualified for the Diplomate, Water Resources Engineer (D.WRE) credential.

ASCE's Geo-Institute Board of Governors recommended that a task committee be

created to pursue the creation and implementation of the Academy of Geo-Professionals (AGP) on November 20, 2007. The task committee completed their work and in October 2008, AGP became the second academy operating under CEC. The objective of AGP is to improve the practice of, elevate the standards of, and advance the Geo-Profession by: identifying and certifying individuals with specialized knowledge in the Geo-profession for the benefit of the public; recognizing the ethical practice of the Geo-Profession; supporting and promoting positions on Geo-Professional issues important to the public health, safety, and welfare; and encouraging life-long learning and continued professional development. The AGP Program is similar to the AAWRE certification program in that a candidate must possess a baccalaureate degree in engineering from a college engineering program accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET); have successfully completed approximately 30 additional semester credits, or equivalent, of acceptable graduate-level, or upper-level undergraduate courses which are directly related to the Geo-Profession specialty field to which he or she is applying for certification; possess a valid license to practice professional engineering recognized by a State, District, or Territory of the United States; possess a minimum of eight years of progressively increasing responsible charge after receipt of a professional engineer license; and, agree in writing to adhere to CEC's Code of Ethics. Applicants are required to orally defend his/her application. Applicants who have met the designated program requirements undergo a formal credential review by designated AGP professionals prior to being granted certification as a Diplomate, Geotechnical Engineer (D.GE). AGP has granted certification to over 100 Diplomates and 6 Honorary Diplomates.

The ACOPNE-Profession comprises the individuals and professional organizations that are engaged in the sustainable development and protection of coastal, ocean, port, and navigation environments for the benefit of society in the United States and foreign countries. On October 1, 2009, ACOPNE became the third academy formed under the auspices of CEC. ACOPNE has in part been created to complement the Coasts, Oceans, Ports, and Rivers Institute (COPRI) and provides recognition to those individuals who have excelled in one or more of the sub-disciplines embraced by COPRI. In this regard, ACOPNE has defined the following subspecialty fields of expertise consistent with the sub-disciplines contained in COPRI: 1) Coastal Engineering**,** which involves the practice of civil engineering, as well as the sciences of oceanography and coastal geology concerned with the interactions between water and land, including shorelines, bays, lakes, estuaries, inlets, river mouths, and harbors, and the structures within these environments; 2) Ocean engineering, which involves the practice of civil engineering and the science of oceanography concerned with the design, analysis, operation, and planning of systems that operate in the oceanic environment; 3) Port engineering, which involves the practice of civil engineering, environmental engineering, and the science of oceanography concerned with the planning, design, construction, maintenance, operation, pollution control, and technical functioning of ports and harbors; and 4) Navigation engineering, which involves the life cycle planning, design, construction, operation and life maintenance of safe, secure, reliable, efficient and environmentally sustainable navigable waterways (channels, structures and support systems) used to move people and goods by waterborne vessels. The requirements for certification by ACOPNE are essentially the same as those of AGP. Each academy has adopted a Body of Knowledge (BOK) that is

unique to their disciplines but compatible with the ASCE BOK all of which require mastery of outcomes via education as well as by experience.

At a CEC meeting in May 2009, and at a workshop in September 2009, CEC discussed the need and opportunities for certifying civil engineers in sustainable design. The discussion included members of the Sustainable Design Task committee (SDTC) created by the ASCE Board of Direction (BOD) to develop a strategy for addressing the topic of sustainability as it relates to ASCE and ASCE activities and programs. The CEC discussion with the SDTC members concluded with an agreement to fully cooperate on planned programs and activities, up to and including certification of engineers in the development of sustainable designs. Plans for a "sustainability summit" are being jointly developed by CEC and SDTC. The summit will include an open discussion on the need for and the opportunities for the development of a program to certify engineers in sustainability as one possible recommendation from the ASCE Sustainable Design Task Committee to the ASCE Board of Direction. If deemed desirable, a sustainability certification program could be added to the purview of CEC to provide civil engineers with another opportunity to demonstrate their unique engineering expertise. There was also a discussion about the possibility or desirability of certification of sustainable projects, in addition to the certification of design engineers. Project certification would be similar in nature to the LEED certification developed by the U.S. Building Council for building design, construction, operations and maintenance that satisfy certain energy conservation criteria.

American Academy of Environmental Engineers (AAEE):
The American Academy of Environmental Engineers® was founded in 1955 for the principal purpose of serving the public by improving the practice, elevating the standards, and advancing public recognition of environmental engineering through a program of specialty certification of qualified engineers. AAEE is dedicated to excellence in the practice of environmental engineering to ensure the public health, safety, and welfare to enable humankind to co-exist in harmony with nature. AAEE is a group of highly qualified professional engineers who have imposed self-testing and review for entry qualification. Each Board Certified Environmental Engineer (BCEE) or Board Certified Environmental Engineering Member (BCEEM), have not only met the standard prerequisites for specialty certification, but also has passed written and oral examinations and reviews by an admission panel of the Academy. The Council of Engineering and Scientific Specialty Boards (CEBS) has certified AAEE's programs.

The AAEE is an active participant in the accreditation of environmental engineering curricula. Through this process, AAEE ensures that educational standards are responsive to the needs of the professional and that tomorrow's engineers will meet the needs of the profession.

AAEE further organizes multi-disciplinary teams of BCEEs and BCEEMs to participate in concept study groups. These groups seek solutions to major environmental problems. Once developed, AAEE provides these solutions to key policy makers in industry and government.

Specialty Licensing for Structural Engineers:
The structural engineering community has opted for specialty licensing as their preferred method of providing advanced credentialing. This requires individual state legislatures to add structural engineering to the engineering disciplines licensed by the state. Structural engineers have for many years been lobbying state legislatures for specialty licensing. To date only 12 states have passed laws to establish a professional engineer license for structural engineering. In their fourth summit held at ASCE headquarters in July 2008, structural engineers from around the USA met to consider the current state of affairs for specialty licensure for structural engineering. The summit focused on why specialty licensure is needed, the role of state legislatures and the associated licensing boards, and the types of laws that have been enacted to date. In answering the question of why, ASCE member Susan A. Jorgensen of Denver explained that specialty licensure is needed to protect the public from engineers who are not qualified to do structural engineering and who do not do structural engineering on a daily basis. The two principal types of state licensure laws that are currently being enforced are practice acts and title acts. A structural engineering practice act may include all structures, or defines specific types of structures, normally referred to as "significant structures", that a licensed structural engineer can legally design, along with the corresponding responsibilities and liabilities. With a practice act, a P.E. cannot perform any structural design for these significant structures, and conversely a licensed structural engineer cannot perform electrical, mechanical, civil, or other engineering work. A title act allows civil engineers to be licensed as structural engineers and to employ a particular title, "SE," and thus to append these initials to their name. With a title act, there is no distinction on the type of structure a PE or a SE can design. Title acts are considered stepping-stones to a practice act. The summit concluded by encouraging engineers in states that do not have specialty licensure for structural engineers to work together to present a unified front and to solicit as much support for legislation in their state as is practical.

The Board of Governors of the Structural Engineering Institute is currently reviewing a draft of their first official SEI Policy Statement, which addresses licensure for structural engineers. It is expected that this Policy Statement, in support of Structural Engineering licensure, will be formally released in 2010.

The National Academy of Forensic Engineers:
The National Academy of Forensic Engineers (NAFE ®) is a professional organization formed in 1982 to advance the art and skill of engineers who serve as engineering consultants to members of the legal profession and as expert witnesses in courts of law, arbitration proceedings and administrative adjudication proceedings. Forensic Engineering is the application of the art and science of engineering in matters that are in, or may possibly relate to, the jurisprudence system, inclusive of alternative dispute resolution. NAFE identifies and brings together professional engineers having qualifications and expertise as practicing forensic engineers to further their continuing education and promote high standards of professional ethics and excellence of practice. To be granted admission to NAFE, a candidate must have appropriate engineering education and experience in practice, including actual experience in forensic engineering.

NAFE is formally affiliated with the National Society of Professional Engineers (NSPE) and has adopted the NSPE Code of Ethics. The NAFE is a founding member of the Council of Engineering and Scientific Specialty Boards (CESB).

To qualify for membership, a candidate must be a member of the NSPE and must be a registered Professional Engineer (P.E.). The candidate must have appropriate engineering education and experience in practice, including actual experience in forensic engineering. In addition, the candidate must provide acceptable detailed references from attorneys; senior claims managers or NAFE members who are personally familiar with his or her forensic practice and experience.

Transportation Professional Certification Board Inc.:
Recognizing the certification and professional development needs of the transportation profession, the Transportation Professional Certification Board Inc. (TPCB), an autonomous certification body affiliated with the Institute of Transportation Engineers (ITE), now offers the following certification programs: Professional Traffic Operations Engineer® (PTOE), Professional Transportation Planner® (PTP) and Traffic Signal Operations Specialist® (TSOS). The certifications do not substitute for appropriate professional licenses when they are required for specific responsibilities or jurisdictions. Certification as a Professional Traffic Operations Engineer® (PTOE) is a demonstration of requisite knowledge, skill and ability in the specialized application of traffic operations engineering. The certification process, which has been adopted for professional traffic operations engineers, requires that the holder be a licensed professional engineer if he or she practices in the United States, Canada or any other country that provides governmental licensing of engineers. There are 2,306 Certified Professionals as of January 5, 2010

Why should engineers with advanced credentialing be hired as employees or engaged to perform engineering services?
Employers seeking to hire or promote Civil Engineers for advanced positions within their company should look to engineers who have been granted specialty certification because the professional competence of these engineers has been reviewed, evaluated, and verified by an independent group of their peers or by a state board of engineering registration. This provides employers with a level of confidence in the employee's capabilities and expertise that is not otherwise available. In addition, it provides evidence that the existing or prospective employee is dedicated to the ethical practice of engineering, and to taking ownership and pride in continued professional development and education. Civil Engineers who have made the commitment to seek advanced credentialing and to advance their professional capabilities have a proven track record of being responsible and capable engineers. These are qualities that are compatible with the needs and desires of a potential employer. The BOK that engineers with advanced credentialing have mastered attests not only to their engineering expertise but also to their ability to multi-task, to be effective team members, to be able to manage diverse tasks and to be effective written and oral communicators. Simply put, Civil Engineers with advanced credentialing have a step up on their competitors and can be relied upon to be competent and capable engineers.

Likewise, entities needing to contract for engineering services should also look to contracting first with engineering companies with a team member or members who have advanced credentialing. Team members with advanced credentialing have demonstrated mastery of a BOK set forth by their peers. This along with the commitment to continuing education and the ethical practice of engineering should give comfort to potential clients that the engineers they are contracting with are professionally capable, good communicators and project managers.

Lastly, engineers who have been recognized by advanced credentialing are capable, forward-thinking engineers who have a demonstrated capability to protect the health, safety and welfare of the public that they serve through the education, research, regulation, design, construction and operation of viable sustainable infrastructure.

This is not to say that engineers who have not pursued advanced credentialing are not qualified. It does mean that engineers who have been granted advanced credentialing have submitted their qualifications to practice in a discipline of civil engineering to an independent body of their peers or in the case of structural engineering have been granted a second professional engineer license. In states where a structural engineer license has been established only those structural engineers who have been granted a structural engineering license are authorized to design certain categories of structures.

Summary:

In conclusion, civil engineers have opportunities to gain an independent certification of their professional expertise in one or more disciplines of Civil Engineering. They might seek such certification in order to enhance their standing within the engineering community, to be recognized for having attained a BOK that testifies to their engineering capabilities, and to enhance their opportunities as a prospective employee or as a potential engineering consultant.

The American Society of Civil Engineers (ASCE) has also recognized that advanced credentialing is important to ASCE members and needs to be part of ASCE's on going activities related to advancing the stature of civil engineers. ASCE created CEC to provide the civil engineering community with a means to achieve advanced credentialing. The American Academy of Environmental Engineers®, founded in 1955, provides advanced credentialing for the environmental engineering community. Structural engineers are working through state registration boards in order to put in place specialty licensure for structural engineers. The National Academy of Forensic Engineers (NAFE) and the Transportation Professional Certification Board Inc. (TPCB) have programs to certify engineers in their respective disciplines.

Advanced credentialing for civil engineers is becoming more and more a part of the civil engineering profession, part of the focus of ASCE and will continue to be a path through which professional engineers can enhance their stature and establish their professional expertise.

References and related material:

1) Achieving the Vision for Civil Engineering in 2025, A Roadmap for the Profession.

2) ASCE Civil Engineering Body of Knowledge for the 21st Century, 2nd Edition 2008

3) ASCE News August 2008, Volume 33, Number 8, see article titled "Summit Addresses Specialty Licensing for Structural Engineers" pages 1 and 2.

4) ASCE Policy Statement 524: Licensure and Advanced Credentialing within the Civil Engineering Profession.

5) ASCE Resolution 502, Professional Ethics and Conflict of Interest.

6) ASCE Vision for Civil Engineering in 2025.

Appendix A

ACADEMIC PREREQUISITES FOR LICENSURE AND PROFESSIONAL PRACTICE

ASCE Policy Statement 465

Approved by the Committee on Academic Prerequisites for Professional Practice on February 15, 2007
Approved by the Policy Review Committee on March 9, 2007
Adopted by the Board of Direction on April 24, 2007

Policy

The American Society of Civil Engineers (ASCE) supports the attainment of a Body of Knowledge (BOK) for entry into the practice of civil engineering at the professional level. This would be accomplished through the adoption of appropriate engineering education and experience requirements as a prerequisite for licensure.

ASCE encourages institutions of higher education, governmental units, employers, civil engineers, and other appropriate organizations to endorse, support, promote, and implement the attainment of the Body of Knowledge for individual civil engineers. The Body of Knowledge includes (1) the fundamentals of math, science, and engineering science, (2) technical breadth, (3) breadth in the humanities and social sciences, (4) professional practice breadth, and (5) technical depth or specialization. Fulfillment of the Body of Knowledge requires additional education beyond the bachelor's degree for the practice of civil engineering at the professional level. The implementation of this effort should occur through establishing appropriate curricula in the formal education process, appropriate experience guidelines for the workplace, and related education and experience standards **by the 55 engineering licensure jurisdictions**.

Admission to the practice of civil engineering at the professional level means professional engineering licensure requiring attainment of a Body of Knowledge through appropriate engineering education, experience and examinations. Fulfillment of this Body of Knowledge will typically include a combination of:

- a baccalaureate degree in civil engineering,
- A master's degree, or approximately 30 coordinated graduate or upper level undergraduate technical and/or professional practice credits or the equivalent agency/organization/professional society courses providing equal academic quality and rigor, and appropriate experience based upon broad technical and professional practice guidelines which provide sufficient flexibility for a wide range of roles in engineering practice.

Issue

The practice of civil engineering at the professional level means practice as a licensed professional engineer.

The Body of Knowledge prescribes the necessary depth and breadth of knowledge, skills, and attitudes required of an individual entering the practice of civil engineering at the professional level in the 21st Century. This Body of Knowledge exceeds today's typical civil engineering baccalaureate degree, even when coupled with the practical experience gained prior to licensure.

The civil engineering profession is undergoing significant, rapid, and revolutionary changes that have increased the Body of Knowledge required of the profession. These changes include the following:

- Globalization has transcended the historically recognized worldwide geographic boundaries primarily as a result of enhanced communication systems.
- Information technology continues to make more information available; however, the analysis and application of this information is becoming more challenging.
- Complex systems are requiring integration of our knowledge and skills outside of traditional sub-discipline focus.
- The diversity of society is challenging our traditional views and increasing our need for improved interpersonal and communications skills.
- Any clients are searching for leadership in new management approaches that equitably manage risk as well as improve cost, quality and safety performance.
- New technologies in engineering and construction are emerging at an accelerating rate
- Enhanced public awareness of technical issues is creating more informed inquiry by the public of the technical, environmental, societal, political, legal, aesthetic, and financial implications of engineering projects.
- Civil infrastructure support within the United States is rapidly changing from a focus on development and operation, to the innovative renewal, maintenance, and improvement of existing systems, and the visionary development of new systems.

These changes have created a need for civil engineers to have simultaneously greater breadth of capability and specialized technical competence than that required of previous generations. For example, many civil engineers must increasingly assume a different primary role from that of designer to that of program, project or team leader. The knowledge required to support this new need is found in the combination of an appropriate baccalaureate education, additional education, and experience.

Rationale

Requiring education beyond the baccalaureate degree for the practice of civil engineering at the professional level is consistent with other learned professions. The Body of Knowledge gained in the formal civil engineering education process is not significantly less than the comparable knowledge and skills required in other professions. It is unreasonable to believe in such complex and rapidly changing times that we can impart the specialized Body of Knowledge required of professional engineers in just four years of formal schooling while other learned professions necessitate seven or eight years. Four years of formal schooling were considered the standard for medical, law and engineering professionals 100 years ago. While the education requirements for physicians and attorneys have been increased with the growing demands of their respective professions, the requirements for the practice of engineering have remained virtually unchanged. Today, many other professions beyond medicine and law require education beyond the baccalaureate degree including pharmacy, architecture, occupational therapy and accounting. Most likely, the retention of a four-year undergraduate engineering education has contributed to the lowered esteem of engineering in the eyes of society, and prospective students and the commensurate decline in the perceived value brought forth by engineers relative to other professions.

Current baccalaureate programs, while constantly undergoing reform, still retain a nominal four-year education process. This length of time limits the ability of these programs to provide a formal education consistent with the increasing demands of the practice of civil engineering at the professional level. There are diametrically opposed forces trying to squeeze more content into the baccalaureate curriculum while at the same time reducing the credit hours necessary for the baccalaureate degree. The result is a baccalaureate civil engineering degree satisfactory for an entry-level position, but becoming inadequate for the professional practice of civil engineering. The four-year internship period (engineer-intern) after receipt of the baccalaureate degree cannot make up for the formal educational material i.e. the expanded Body of Knowledge that would be gained from additional education.

The implementation of this concept will not happen overnight. While ASCE cannot mandate that it be done in a specified time period or manner, ASCE will be an active partner with other groups and organizations to accomplish this policy. The ultimate full implementation may not occur for 5 to 15 or more years. Appropriate grandfathering for existing registered and degreed engineers will be part of the implementation process. This concept is a legacy for future generations of civil engineers. However, perhaps the most important aspect of the implementation of this policy is already in place. Within the U.S. system of higher education, high quality, innovative and diverse master's degree programs currently exist in colleges and universities to support this concept. A growing number of government agencies, public and private organizations, and professional societies now offer high quality on-site and distance learning educational opportunities that can support attainment of the Body of Knowledge

outside of college campuses and as adjuncts to employee development. The active support of this policy by all of the stakeholders such as the educational institutions, the registration boards, and the various employers of civil engineers will be required for the implementation of this concept.

Appendix B

ASCE Policy Statement 524

LICENSURE AND ADVANCED CREDENTIALING WITHIN THE CIVIL ENGINEERING PROFESSION

Approved by the Committee on Professional Practice on February 13, 2008
Approved by the Engineering Practice Policy Committee on March 6, 2008
Approved by the Policy Review Committee on March 7, 2008
Adopted by the Board of Direction on May, 8, 2008

Policy

The American Society of Civil Engineers (ASCE) supports licensure as a Professional Engineer (PE) that recognizes the traditional breadth of the civil engineering practice. ASCE also supports post-PE credentialing that attests to a Professional Engineer's expertise in a civil engineering specialty area. Obtaining a PE license or post-PE credential shall require the engineer to demonstrate attainment of an appropriate body of knowledge.

Issue

While the practice of civil engineering may require the performance of tasks within specialty areas, the successful completion of civil engineering projects requires comprehensive knowledge, experience, and judgment in a variety of related elements within the profession. Furthermore, the National Council of Examiners for Engineering and Surveying (NCEES) Model Law states that "licensees must demonstrate by education, experience, and examination that they are competent in their field." Therefore, licensure in accordance with the Model Law conveys to the public the Professional Engineer's qualifications. Additionally, following licensure as a Professional Engineer there is a desire to recognize those with engineering expertise in specialized areas of civil engineering. Post-PE credentialing helps achieve this goal. Credentialing is a generic term defining the granting of a credential; for example diplomas, licenses, and/or certifications.

Rationale

The NCEES Model Law is intended to provide greater uniformity of qualifications for licensure, simplify interstate licensing procedures and enhance

mobility, and establish levels of qualifications for professional licensure that ensure the public's safety, health, and welfare.

The traditional concept of civil engineering is the integrated practice of engineering embracing a number of related specialty areas. The process of attaining a Professional Engineer license is the first step towards recognition of competency in these related civil engineering specialty areas. Furthermore, those engineers who exhibit additional or advanced expertise and credentials within a specific practice area of civil engineering should be identified through post-PE credentialing programs.

ASCE Policy Statement 524
First Approved in 2008