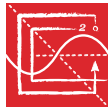




1920-2015



NCEES
*advancing licensure for
engineers and surveyors*

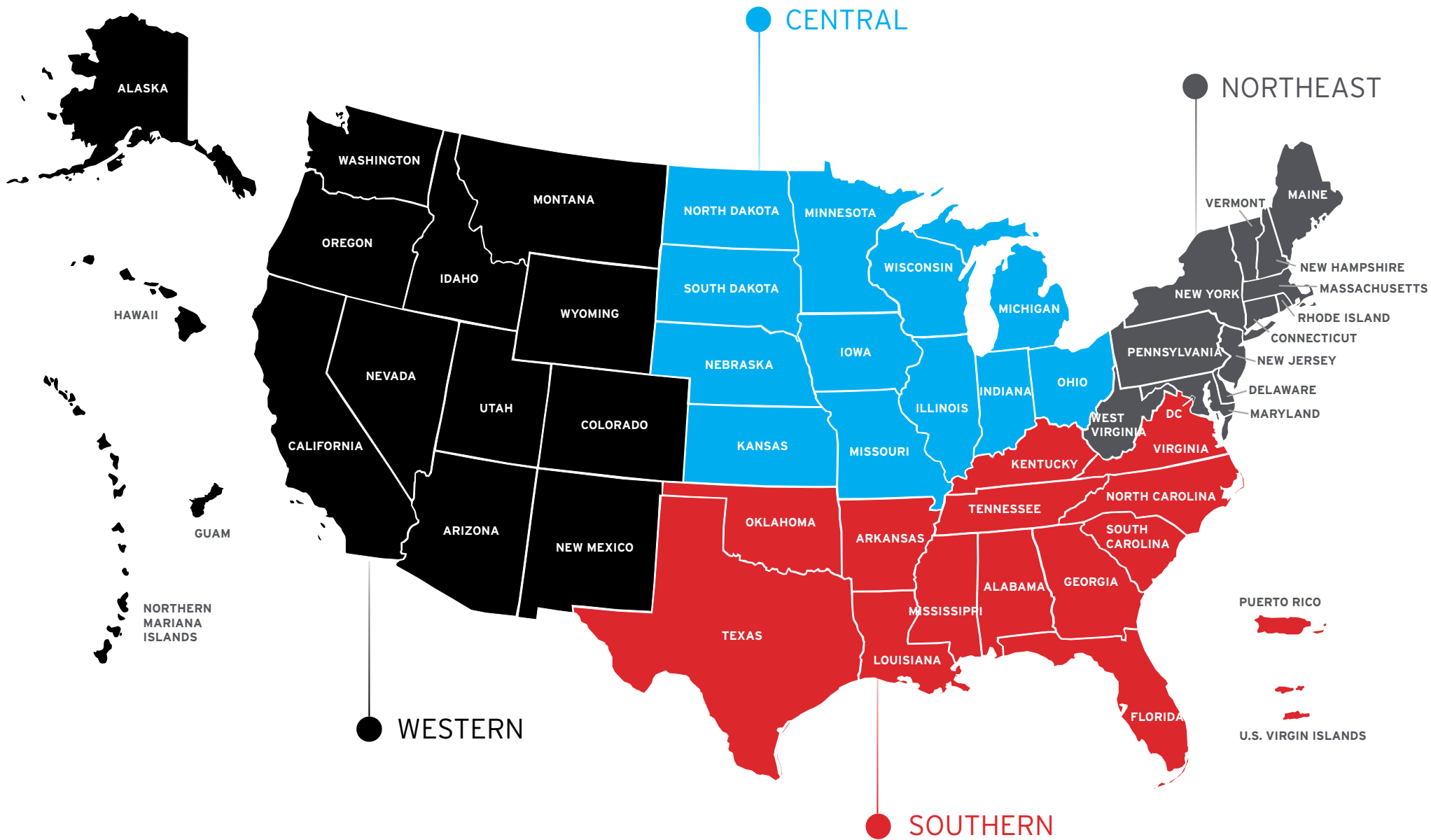
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Except for the last chapter (2005–2015), this history is based on the *History of the National Council of Examiners for Engineering and Surveying, 1920–2004*, which is available on ncees.org in the publications section of About NCEES.

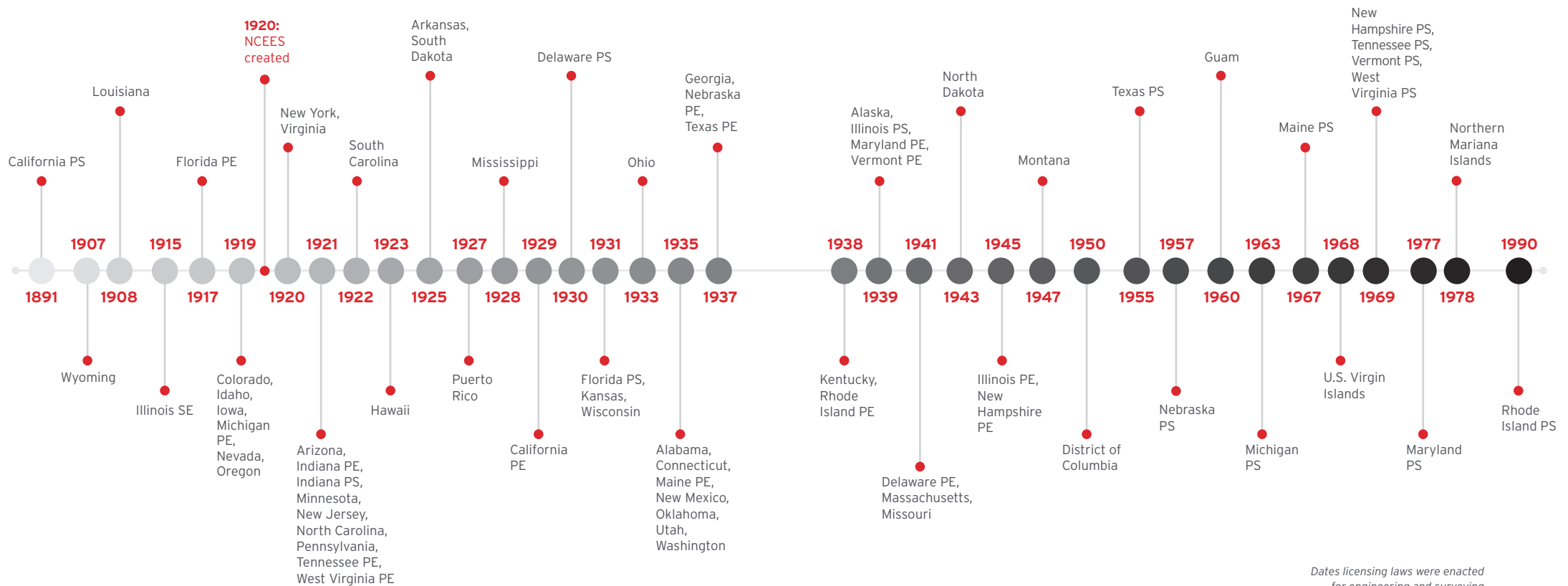


NCEES ZONES

Introduction

In the United States, engineers and surveyors are licensed at the state and territory level. U.S. licensure began in 1891 when California passed legislation to regulate surveyors. Engineering followed in 1907 when Wyoming began requiring licensure for both engineers and surveyors. As more states enacted similar legislation over the next decade, U.S. licensing boards began to see a need for a national council to help improve uniformity of laws and to promote mobility of licensure throughout the country. The organization now known as the National Council of Examiners for Engineering and Surveying (NCEES) was created in 1920 for these reasons.

Since its founding, NCEES has focused on finding ways to advance licensure and facilitate mobility among the licensing jurisdictions. It provides the *Model Law* and *Model Rules* for its member boards to use when enacting legislation, develops uniform exams for the 70 boards to use as part of their licensing process, adopts position statements and policies, and provides the Records program and Credential Evaluations services. This history highlights some of the key developments in licensure over the past century, as well as how NCEES has grown as an organization while increasing its services to boards, licensees, and educators.



Dates licensing laws were enacted for engineering and surveying

In 1903, Clarence Johnston accepted the position of state engineer for Wyoming. He found the office in poor condition, the main problem being that untrained individuals were working as engineers and surveyors. A law mandated that everyone who wished to use state water to irrigate land had to file an application for a permit. It also required filing a map that outlined streams, canals, reservoirs, and the lands to be irrigated. Johnston wrote that he “discovered that lawyers, notaries, and others were making the maps and signing them as engineers or surveyors.” This led to confusing, inaccurate records. To remedy this, he prepared a bill that the Legislature passed in 1907. “After it took effect,” Johnston commented, “a most astonishing change took place within a few months in the character of maps and plans filed with the applications for permits.”

Other states soon passed similar laws. For surveyors, this was usually done to prevent boundary disputes. For engineers, licensure tended to focus on the safety of the built environment. As each state developed its own licensure laws, members of the licensing boards began to recognize the need for a central body to coordinate their efforts. As the matter stood before 1920, engineers had to go through the licensure or registration process in every state where they wanted to practice because boards did not recognize each other’s licenses. Standards for licensure also varied greatly from state to state. Licensing boards felt that a national body was needed to work toward professional standards and reciprocal recognition.

THE FOUNDATION LAID

1920-1925



In 1920, the Iowa State Board of Engineering Examiners issued the following call to the 10 existing engineering boards:

It having developed, in the application of the laws for the registration of Professional Engineers, Land Surveyors and Architects, that there should be an organized and systemized method of procedure to be followed in interstate registration, that there should be a uniform basis of examination and registration, that a convention for the purpose of arriving at a working plan and an understanding of the scope, plan, and procedure of the several Boards was desirable and practical. Further, that it appeared to be desirable to effect a form of permanent organization to arrive at the best understanding and to facilitate the business of state and interstate registration.

Seven engineering boards sent representatives to the meeting in Chicago on November 8, 1920. They drafted the organization’s first *Constitution*, which legally constituted the Council of State Boards of Engineering Examiners (CSBEE) as a “permanent organization ... to carry out as far as may be practical, a uniformity of practice in examination and registration of engineers.” For membership, each of the state boards and any other states that had or would have such boards could send one member to the annual meeting. The *Constitution* also expressed the purpose of the Council as follows:

Examine the state laws providing for registration of engineers and the custom and rule of procedure of the different boards in the examination of applicants with suggestions and recommendations for uniformity of practice so far as the same can legally be done by the different State Boards, and to provide for reciprocal relations between the State Boards for granting registration licenses to applicants from other states on equal terms of examination.

During the early 1920s, CSBEE worked to develop a system for granting engineers reciprocal registration. It adopted the Articles of Agreement of Reciprocal Registration of Engineers, through which boards could grant reciprocal registration by means of certification from one state to another. This certification took the form of a reciprocal card “bearing the date, serial number, and signatures of the officers and the seal of the Board of the state issuing the same.” Secretary Keith Legaré of Columbia, South Carolina, reported at the 1925 meeting that 5,000 reciprocity application blanks had been printed and distributed to the boards.

By the 1926 annual meeting, the tone had changed from deliberation to focused debate. Eighteen states were now members, and all had ratified the articles outlining the requirements for reciprocal registration. The Council was an established organization ready to take on major problems of the engineering profession. Secretary Legaré further set the tone at the meeting by stating, “The Council is now evidently recognized as an authority on engineering registration, and the Secretary’s office is rapidly becoming a clearinghouse for information on the subject.” In 1931, it recognized this growth by adding “national” to its name, becoming the National Council of State Boards of Engineering Examiners (NCSBEE).

The Council had discussed the framing of a model law as early as the 1924 convention. Such a document would function as a model for states to follow in formulating their own laws. The goal was to bring some uniformity to the chaos of boards having vastly different requirements for licensure. Many fundamental questions about the nature of a model registration law were the cause of extensive debate in the years leading up to its adoption. Delegates were initially undecided on whether the registration certificate should show a specialized branch of engineering. This was important because it would also affect the nature of the exams. They eventually adopted a statement affirming “the essential unity of the Engineering Profession.”

NCSBEE made enough progress on addressing these questions to adopt the *Model Law for the Registration of Professional Engineers and Land Surveyors* in 1932. The same year, it created the National Bureau of Engineering Registration. The bureau’s purpose was more extensive than that of the reciprocal registration cards; its services included certification of experience and educational records of engineers seeking registration.

THE STRUCTURE ERECTED

1926-1945



In 1933, a Council committee focused on the nature of the exams by establishing the areas applicants would have to pass to become registered by state boards. Its recommendation for a rigorous three-day exam that included written and oral portions was approved the next year.

The Council also continued to focus on reciprocity and the practical details of facilitating it. For instance, delegates discovered a weakness in Article 7 of the Reciprocal Agreement. If an engineer with adequate qualifications applied for reciprocal registration from “his own state board,” he should be granted it. The weakness centered on the interpretation of the quoted phrase and what it meant. Did this mean the state of the person’s legal residence or his business address? After debating this, they decided the phrase should be interpreted as the person’s state of legal residence.

In 1926, the Council took the first steps toward certifying engineering schools. After reviewing numerous school catalogs, its Committee on Classification of Colleges compiled a list of acceptable schools. The Council accepted the list as a tentative one because it omitted some schools that did not fulfill catalog descriptions or did not offer courses in all engineering branches. Though tentative, the list marked the beginning of the Council’s role in reviewing and evaluating engineering program curricula. The next year, the committee refined the list and created the following definition of an engineering school:

An engineering school of recognized standing shall be one which requires the equivalent of a high school or preparatory school diploma as an entrance requirement and demands the equivalent of a four year’s course in engineering for graduation.

A few years later, in 1932, NCSBEE became an inaugural member of the Engineers’ Council for Professional Development (ECPD). The organization was run by a committee of representatives from the major engineering societies, the Society for the Promotion of Engineering Education, and NCSBEE. In 1936, ECPD began evaluating engineering degree programs.

When NCSBEE celebrated its silver anniversary in 1945, it had grown to include 48 state boards representing 75,000 registered engineers. It was now organized by zones: Central, Northeast, Southern, and Western. The Council was coming of age and fulfilling its constitutional mandate to promote the public welfare by improving professional standards.

When the Council convened for its 1946 meeting, it included 50 boards representing all states and U.S. territories that had laws governing the practice of engineering. Over the next 13 years, NCSBEE continued to define itself and grow.

The *Model Law* was revised in 1946 to reflect a number of court decisions, legal opinions, and the expansion of scientific knowledge and technology. One of the largest changes was to add the engineer-in-training (EIT) category to the licensure process. The revision also dealt with the legal definitions of “professional engineer” and “practice of engineering.”

Since 1931, the Council had attempted many times to create uniformity in the type, quality, and quantity of exam questions. By the mid-1940s, most boards were giving a two-day exam, and many had eliminated the oral portion of their exam. But a uniform exam did not yet exist. A 1951 canvass of member boards revealed that many boards had reverted to administering theoretical questions on the second day of the exam rather than testing on the application of knowledge and extent of experience. The Council’s Subcommittee on Written Examinations reported that a syllabus of examinations was essential for equivalent exams to be established among boards. In 1953, it proposed such a syllabus; delegates accepted it at the annual meeting. Its purpose was to ensure proper distribution of questions covering the entire subject matter during a two-day exam period: fundamentals on the first day and professional applications on the second.

In 1955, the Northeast Zone pioneered the way for uniform exams when 277 engineering seniors were examined in eight states in the zone at one time using the same exam. The EIT Committee described it as the “first step taken by any Zone to employ uniform questions on the same date for their state board examinations.”

Enforcement of registration laws was another focus during these years. At the annual meeting in 1954, the Committee on Uniform Laws and Procedures included the Synopsis of State Engineering Laws and Policies and Procedures of State Boards in its report. The synopsis was intended to provide boards with recognized standards for enforcing registration.

In the mid-1950s, NCSBEE took an important step concerning qualifying experience. In the past, its committees had tried to list experiences that could be considered to qualify an applicant. The Committee on Qualifying Experience recommended changing this by adopting a definition of qualifying experiences instead of listing all specific acceptable experience.

At the 1957 annual meeting, delegates decided another major issue that they had debated for years—the corporate practice of engineering—by adopting the following position:

The Council is in favor of permitting the practice of engineering through the medium of a firm, association, partnership, company, corporation, or other form of organization, provided those officers and other persons responsible for such engineering practice are legally qualified as registered and licensed Professional Engineers.

Organizationally during these years, the Council revised its *Constitution and Bylaws* to more clearly state its objectives and committee activities. Zones began holding regular annual and interim meetings, and state board secretaries began meeting annually. The position of NCSBEE executive secretary was made a full-time one, with Keith Legaré filling the role that he had been doing for years on a part-time basis.

By 1959, the Council or its Registration Bureau was mentioned in three-fourths of the state registration acts and two Acts of Congress. It was generally recognized as the national agency of all engineering registration boards and as a bureau of information regarding registration.

THE POST-WAR YEARS

1946-1959

The Council continued to evolve over the next two decades. Executive Secretary Legaré retired in 1959, and James Sams accepted the position of executive secretary. When Sams—dean of engineering at Clemson University—took office the next year, Council headquarters moved from Columbia to Clemson, South Carolina. NCSBEE also shortened its name to the National Council of Engineering Examiners (NCEE) in 1969.

The *Model Law* was again revised in 1960. Among other changes, the new model document raised the qualifications for licensure, eliminated the eminence and grandfather clauses, and spelled out requirements for EIT registration. The most controversial provision was Corporate and Partnership Obligations under the exemption, or right-to-practice, clause. This section required all persons who acted on behalf of a corporation in an engineering capacity to be licensed as a professional engineer. Because of strong opposition within and outside the Council, the provision was revisited over the next five years. In 1965, Council delegates concluded that there were basically two types of engineering practice: consulting and industrial.

In 1974, NCEE developed and adopted *Rules of Professional Conduct for Professional Engineers*. This document provided model rules on limiting practice to the engineer's area of competence, the proper use of seals, conflict of interest, and other ethical issues for the profession. A few years later, staff was charged with reviewing past proceedings of annual meetings, board of directors minutes, and committee reports in order to collect all actions that could be classified as policy. These were compiled into a policy manual that was adopted at the 1980 annual meeting.

THE COUNCIL FULFILLS ITS POTENTIAL

1960-1983



In 1979, NCEE replaced the National Bureau of Engineering Registration with the Records program. After several years of operation, the Records program was deemed to be beneficial for both member boards and licensees. The Council's Long Range Planning Committee envisioned it to be "the central depository of official documentary and personal biodata of all types of engineers."

The Engineers' Council for Professional Development—of which the Council was an inaugural member when it was created in 1934—also underwent a large change in 1979 when it was renamed the Accreditation Board for Engineering and Technology (ABET). NCEE continued to serve as a member society.

During these years, the Council finally realized its goal of a national uniform exam. Licensing boards had long agreed that one of the best ways to facilitate reciprocity would be to standardize the exams. The movement for a national exam reached a milestone when a common Fundamentals of Engineering exam (also referred to as the EIT exam) was offered in 1965. The widespread use of the FE exam was an immediate aid to boards for reciprocity. However, lack of uniformity in grading was an issue. Of the 30 boards using the FE exam the first year, only 20 scored the exams through the Council's central grading service. To address this, NCEE moved to a standardized, machine-graded FE exam in the early 1970s.

For the professional engineering exam, the Northeast Zone again led the way by administering the first zone uniform professional exam in 1961. Then in 1966, the Council offered the first national Principles and Practice of Engineering (PE) exam. Development of uniform surveying exams soon followed. The first common Fundamentals of Land Surveying (FLS) exam was offered in April 1973, and the Principles and Practice of Land Surveying (PLS) exam was introduced the next year.

As NCEE continued to increase its services, the number of staff grew and more space was needed. In 1980, construction started on a new headquarters building in Clemson, and it was dedicated in December 1981. The Council was fulfilling its potential with the establishment of uniform exams, growth of services such as the Records program, and development of new services to aid member boards. It was ready to look toward how it would build on these accomplishments in the next century.

In the years leading up to its 75th anniversary, the Council increasingly focused its attention on professional ethics, examinations, and the internationalization of engineering.

In 1984, an ad hoc committee on professionalism and ethics reviewed the *Model Rules of Professional Conduct*. The committee worked to provide engineering schools with information to use in creating courses in professionalism and ethics, prepare information that could be used by board members in examinations, compare state rules with the *Model Rules of Professional Conduct*, and study past engineering failures for possible patterns in disregarding rules of professional practice. The Council adopted proposed revisions to the *Model Rules of Professional Conduct* in 1985. The revisions addressed two areas of concern: the seal and whistleblowing.

The Council felt that an engineer's first obligation was to the public welfare, so licensees were to approve and seal only "those design documents and surveys that conform to accepted standards and safeguard the life, health, property, and welfare of the public." In addition, licensees having knowledge of possible violations were obligated to provide the member board with information and assistance. These new rules forbade licensees from affixing their seals to documents dealing with subject matter outside their area of competency and to documents not prepared under their direct control and personal supervision.

Another major issue during this time was the continuing evolution of the licensure exams. Beginning in 1983, all PE exams were considered to be psychometrically sound, which meant they could withstand challenges by courts and regulatory agencies as to whether or not they validly measured what they claimed to measure. Moving into 1984, the Council

LOOKING TOWARD THE 21ST CENTURY

1984-1995



went from a norm-referenced method to a criterion-referenced method to determine the minimum passing score for the PE exam. In addition, it explored automated scoring as a way to shorten the three-month scoring turnaround time, while still maintaining the accuracy of student performance assessment.

In 1984, the Council began using machine-scorable biodata sheets to collect information about the exams and the examinees; doing this allowed for an item analysis that could document the validity of the exam. In 1992, a task force began discussing new procedures for the FE exam. Its recommended changes included adding engineering discipline questions (Chemical, Civil, Mechanical, Electrical, Industrial). In 1994, the Council voted to change the FE exam format as recommended.

NCEE also addressed the internationalization of engineering, primarily with regard to the growing number of foreign applications that boards were receiving and how they could get uniform evaluations. The two main areas of concern were education equivalency and experience equivalency. In 1990, the Council established its Procedures for Evaluation of Foreign Schools and Degrees, which included creating a clearinghouse of information on foreign schools and engineering degrees and creating a database for use by the boards. By 1993, the Committee on International Relations had decided that ABET was the appropriate organization to evaluate foreign degrees but later changed this decision. The next year, the Committee on Foreign Engineering Education Evaluation Program identified the American Association of Collegiate Registrars and Admissions Officers as the organization to help evaluate foreign engineering education. The Council would continue to grapple with this issue in the coming years.

In addition to ethics, exams, and international matters, the Council focused more attention on surveying. The most visible way it did this was by changing its name to the National Council of Examiners for Engineering and Surveying (NCEES) in 1989. This was to recognize that its members were involved in the regulation of both the engineering and surveying professions. By 1990, NCEES membership included all 70 engineering and surveying boards from all 50 U.S. states, the District of Columbia, Guam, Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

The Council celebrated its milestone 75th anniversary in 1995 and began looking toward the 21st century. It remained committed to devoting its energy, talent, and integrity to shape the professions of engineering and surveying "for the benefit of humanity."

During the next decade, NCEES reexamined several core areas, including the format of its exams, the licensure process, and the services it offered its member boards.

In 1996, the Council voted to change the PE exams—with the exception of the Structural exam—to objectively scored multiple-choice exams in order to improve testing reliability and consistency of measurement. The move was also to stabilize pass rates and give NCEES more control over the degree of difficulty of exams from administration to administration.

A year later, delegates approved moving the FLS exam from an experience-based exam to a knowledge-based one. The new surveying exam, first administered in October 1999, reflected the changes that had occurred in the surveying profession during the previous 30 years. It was also consistent with the definition of Model Law Surveyor approved at the 1995 annual meeting. Under the new definition, a Model Law Surveyor must be a graduate of an EAC/ABET-accredited engineering curriculum, an ASAC/ABET-accredited curriculum, or the equivalent. In 2004, the name was changed to the Fundamentals of Surveying (FS) exam to recognize that the profession encompassed more than land.

Computer-based testing (CBT) was also being discussed in the late 1990s. In 1999, a CBT Task Force made a motion for the the Council to affirm the vision that CBT should be the eventual format for the exams. The next step was to conduct a feasibility study. Extensive research was conducted to gather data on the thoughts, attitudes, and perceptions about CBT held by NCEES stakeholders, members of engineering academia and organizations, engineers, and engineering students and interns. After reviewing the results, the Council concluded that it was not yet ready to implement CBT but was committed to doing so in the future.

BROADENING SCOPE OF THE COUNCIL

1996-2004



Because of the significant breadth of this study, many other issues surfaced, particularly with regard to the value of licensure. A major finding was that engineering students and educators generally lacked an understanding of licensure, its importance, and the qualifications required to become licensed. The Licensure Promotion Task Force was created to address this, and a variety of NCEES licensure promotion efforts were subsequently launched. These included the creation of a website geared toward engineering students and interns, the debut of the Speaker's Kit to aid in talking about licensure, the recruitment of licensed professionals to speak at campuses, the promotion of the FE exam as an outcomes assessment tool, and a campus poster campaign advancing the value of licensure.

With regard to reviewing the licensure process itself, the Engineering Licensure Qualifications Task Force was created in 2000 to consider the engineering licensure model and develop recommendations for possible changes or enhancements. This group, which included representatives from NCEES and 11 engineering societies, issued a report of its findings in March 2003; one of these findings was that additional education would be necessary in the future to prepare students for engineering practice at the professional level. In August 2003, the Licensure Qualifications Oversight Group, made up of only NCEES members, was charged with studying the report and assessing the recommendations from an NCEES viewpoint. At the 2004 annual meeting, it presented several successful motions—including initiating a process to determine specific recommendations regarding additional engineering education for licensure.

In 2000, the Council broadened its scope in another way by creating an exam administration service. At the request of the Arizona board, NCEES administered the exams in Arizona in April 2000; this service included locating the sites, hiring proctors, collecting registration information and candidate fees, and administering the exams. After the success of this pilot study, NCEES began offering exam administration services to all boards. By October 2003, 18 boards were using this service.

By 2004, NCEES had grown from 24 to 57 staff members over a five-year period and needed more space. Council headquarters was expanded to add ample conference space for exam development volunteers, as well as space for the growth of the staff. The dedication of the new building addition was held in March 2004.

In 2005–2015, NCEES carried out many initiatives that furthered its mission of advancing licensure in order to safeguard the health, safety, and welfare of the public. It implemented a major change to its exam program, focused on facilitating mobility of licensure domestically and internationally, explored education requirements for licensure, and increased its efforts to promote the value of licensure.

NCEES had considered moving its exams to computer-based testing (CBT) for many years. In 2007, a task force was created to revisit the possibility of CBT and to update the previous 1999–2000 study. After several years of intense research, the task force made a motion at the 2010 annual meeting to convert the FE and FS exams from pencil-and-paper exams to computerized exams; the motion passed. Two years later, the Council also approved transitioning the PE and PS exams as soon as feasible. On January 2, 2014, the FE and FS exams were first administered via CBT. The move to CBT allowed for more uniform testing conditions, stronger security for exam content, and greater scheduling flexibility.

Facilitating mobility of licensure remained a core purpose of the Council, and it worked with boards to make it easier for licensees to practice across state lines and international borders. One essential NCEES service to help with this—the Records program—had existed in one form or another since the 1920s. Establishing an NCEES Record reduces the time needed to become licensed in multiple jurisdictions, especially when the licensee meets the high standards of the Model Law Engineer, Model Law Surveyor, or Model Law Structural Engineer designations. The program saw huge growth during this decade as it continued to streamline its processes by moving to online applications in 2008. In 2005, there were 13,661 active Record holders; by 2015, there were more than 37,000.

ADVANCING LICENSURE

2005-2015



The Council's international presence grew as well. In 2007, NCEES first administered the FE and PE exams in Japan in conjunction with the Japan PE/FE Examiners Council. Other countries followed. By 2014, the Council had signed agreements with seven foreign entities to administer its exams in those countries. Because the number of these requests continued to rise, NCEES established and published criteria for the assessment of the administration of its exams at non-U.S. sites. The document serves as a valuable guide for the Council in deciding whether or not to administer its exams in other countries.

NCEES member boards were also seeing an increase in the number of foreign-educated candidates for licensure. They indicated a need for uniform, transparent, and reliable evaluations of foreign applicants to use when evaluating whether an applicant was qualified for licensure. In 2005, NCEES created a Credentials Evaluations service to provide this.

Over the decade, the Council built on the work of the Engineering Licensure Qualifications Task Force by evaluating the need for additional education for engineering licensure. At the 2006 annual meeting, delegates voted to modify the *Model Law* requirements for licensure to require a master's degree or its equivalent before initial engineering licensure. In 2014, delegates voted to remove the language, which was set to take effect in 2020, from the model documents. The next year, it instead placed the language in a position statement to allow work on the concept to continue without a set implementation date.

NCEES increased its outreach efforts to promote the value of licensure to educators, engineering and surveying students, unlicensed professionals, and the general public. These efforts included expanded Speaker's Kits, which helped get accurate, consistent information about the importance of licensure to engineers, surveyors, and the general public. NCEES also sponsored or supported many national outreach efforts, including DiscoverE Engineers Week, the Best Land Surveying Practices special award for the Future City Competition, and New Faces of Engineering—College Edition. In 2009, it created the NCEES Engineering Award to recognize college engineering programs that demonstrated initiative in uniting academic learning with professional practice.

As NCEES moves into 2016, many of the same issues will remain at the helm of the organization. The Council, from its beginning, has kept the protection of the public's health, safety, and welfare as its core cause.

