Licensure EXCHANGE

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Incidents at exam sites raise concerns

Administering national licensing examinations is a serious undertaking, and NCEES Member Boards in general perform at or above the level of competency. Member Board Administrators plan six or more months in advance for candidate registration, secure handling of examinations, and smooth and secure administration procedures. NCEES Member Boards protect the public not only by issuing engineering and surveying licenses, but also by ensuring that the licensing examinations are administered in a uniform manner across the nation, that questions are kept secure, and that all examinees have optimum conditions under which to take the examinations.

The 2002 Examination Security Task Force has encouraged NCEES to provide information and feedback to Member Boards regarding exam administrations. The task force anticipates that the added communication will support and encourage effective exam administration strategies.

In order to protect the public, it is imperative that exam administrators ensure the following:

- Examinations are secure and accounted for at all times
- All examinees are tested under the same conditions
- All examinees are given the same instructions
- Boards abide by NCEES deadlines
- Boards notify NCEES when appropriate

The following administration incidents compromised at least one of the above imperatives.

- The NCEES policy approved at the 2002 Annual Meeting requires boards to return all exam booklets and answer sheets within 10 days following the exam administration. Eleven boards failed to return their exam materials within the 10-day deadline. Many thanks to the 59 boards that complied with the deadline. Members approved this policy to ensure that exam materials are shipped to NCEES as soon as possible to limit the possibility of examination compromise.
- In accordance with NCEES policy, all requests to administer exams on a different test date must be submitted to NCEES within 60 days prior to the test date. Eighty-six requests were received after the 60-day deadline. Some were received right up until the exam day.
- NCEES received a phone call from an examinee who was upset because candidates at his test site were allowed to use calculators with QWERTY keypads. Calculators with letters arranged in the traditional "QWERTY" or typewriter format are not permitted in the examination room.
- Through monitoring a chat room, NCEES learned that examinees at one exam site were instructed not to work an exam question because of a purported printing error in the exam book. This decision made by proctors at the exam site had a direct impact on the scoring process of all the examinations in that discipline. Any decision regarding whether candidates should work or not work questions must be made by NCEES. To ensure the integrity and fairness of the NCEES scoring process, it is imperative that boards inform NCEES of any deviations from Council procedures that occur at the exam site.
- When returning exam materials, many states failed to include a packing list detailing the contents of each box. As a result, NCEES had to make numerous calls to the boards to verify information. Including a packing list will speed the processing of returned exam materials and the turnaround for exam scores.

In addition, NCEES requests that boards return Examinee Comment Forms to Council headquarters as soon as possible after the exam administration. Some of the comments have potential impact on the scoring of a particular question. It is not necessary to collect and send them at one time.

Through open communication and collaboration between NCEES and its Member Boards, the Council's examinations will continue to be high-quality licensure assessment tools, effective in protecting the public.

Call NCEES Director of Exam Services Susan Whitfield (864-654-6824, ext. 452) if you have any questions regarding exam administration.

From the
PRESIDENT

Engineering education—dare we go there?

Robert C. Krebs, P.E., L.S.
NCEES President

The Council has long endorsed the three-legged stool of licensure: education, experience, and examinations. One could argue that the education leg is the foundation of our licensure system and should be strong and sturdy like oak. If this qualification is so fundamental, why does the Council seem to have so little control or influence over the desired outcomes of engineering education?

Since the Council's inception in 1920, the qualifications to become a professional engineer have been debated, agreed to, revised, debated again…and the cycle continues today. Around 1932, a Council Committee on Accredited Engineering Schools formulated a Suggested Schedule for Rating Engineering Schools. This schedule included entrance requirements, graduation requirements (credit hours), curriculum, degrees, and faculty. One of the more interesting of the 14 requirements stated that, "No college will be accredited until it has been inspected and reported on by the National Council of State Boards of Engineering Examiners (NCSBEE)." NCSBEE is, of course, now called NCEES.

That same year the Founder Societies—the American Institute of Mining, Mineral, and Petroleum Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Institute of Electrical and Electronic Engineers, and the American Institute of Chemical Engineers—promulgated a parallel effort known as the Engineers Council for Professional Development (ECPD), now known as the Accreditation Board for Engineering and Technology (ABET). The Council was invited to participate, and eventually the ECPD was established as the accrediting agency for schools of engineering. The minimum qualifications for an engineer were codified that same year and included a four-year approved course in engineering, a specific record of four or more years of engineering work, and successful passing of written and oral examinations covering technical, economic, and cultural subjects.

So what has happened to engineering education over the last 68 years? Is it sufficient? Is it keeping up with the changes in technology and the added demands of professional practice? Is it still encompassing the required body of knowledge? And is it of a quality that allows the public to rely on the proficiency and competency of the students that graduate?

Engineering education is decidedly more than teaching technical competence, and the evidence seems to be mounting that there needs to be still "more." Now that there is a population of engineers close to retirement, the "good old days" of 150 or more credit hours (with few electives) are now no more than a basis for bragging rights. These old standards do die, and legislative edicts, concern for student overload, increased costs of higher education, and a plethora of other reasons have now reduced an engineering degree to somewhere between 120 and 130 credit hours. With this reduction, something has to give, and often the faculty and student choices are wedged between accreditation criteria (albeit less prescriptive) and the desired outcomes. Is this reduction in the required credit hours significantly affecting the level of student competency with respect to the licensure track?

(continued on page 3)

Engineering education... *(continued from page 2)*

Is there a need for more "non-engineering" activities or additional "non-engineering" education at the university level? Some senior managers claim that management activities, public speaking, and association involvement during students' years at university would enhance and improve their leadership skills during their careers. I recently heard that engineers are hired for the technical skills, fired for their people skills, and promoted for their leadership skills.

Many engineering programs have formulated some successful methods to integrate coursework with upper-level design and eventually with industry and private practice constituents. I certainly do not have the expertise to assess such innovations, nor do I have training to judge curriculum content. The education community has acknowledged that a paradigm shift has been made away from ticking off a set of (some say) prescriptive plug-and-chug engineering courses to examining a set of engineering program objectives and desired learning outcomes. Constant feedback and continuous quality improvement are of cardinal importance under this new paradigm.

Accreditation has, since the formation of the ECPD, assured quality in higher education. Now that there is an institutional change in how education is administered and how learning outcomes are measured, does the Council still have that quality assurance and are the end products of this system meeting our minimum competence standard? I do not have the answer, and we as a Council may never have a clear directive. However, if the Council is to do its due diligence with regard to our pledge and duty to protect the public health, safety, and welfare, we must not take anything, especially education, for granted. We must formulate a clear Council policy with respect to education and define our objectives based on that policy. If deemed necessary, we must create an action plan to assure our Member Boards that candidates for licensure do indeed have the quality education needed as a foundation for professional practice.

Change cannot be completed in a vacuum, and change will come to fruition only with a committed and sustained effort, and an effort that includes relevant stakeholders. I believe that assuring quality education is much more than counting credit hours or adding a graduate degree or measuring outcomes or even passing exams. It is an attitude, and it is a passion not to accept anything less than the rigor required, and then taking the responsibility to make it happen. The indications are that our institutions are committed to quality education, but we must be involved as a partner in the process. For our Member Boards, there must be assurance that accredited education and the outcome of that education is positively linked to licensure qualifications. Moreover, the Council should renew its commitment to its ever so important first leg of licensure—education—and protect it as we have pledged to protect the public.

In February at the Board Presidents Assembly in Anchorage, Alaska, we will address some of these very difficult issues. With regard to education, the decisions on where we are going, where we want to go, and how we are going to get there will be yours, as leaders in the Council, to make. Please prepare yourselves for this critical discussion and interact with your own board members, so that you can bring along their concerns, ideas, and feelings on education. See you in Alaska.

Robert C. Krebs, P.E., L.S.
NCEES President

Now that there is an institutional change in how education is administered and how learning outcomes are measured, does the Council still have quality assurance and are the end products of this system meeting our minimum competence standard?

Send letters to *Licensure Exchange* Editor. NCEES, P.O. Box 1686, Clemson, SC 29633 or e-mail to lwilliam@ncees.org.

Please include your name and state of residence on the letter. Letters may be edited for clarity, brevity, and readability.

Headquarters
UPDATE

Besty Browne
NCEES Executive Director

New face for NCEES Web site

I have several new things to report this month—and perhaps most notable is our fresh-faced Web site. On November 20, we took a technological step forward with the debut of an updated design. The homepage features new colors and a new "look," intuitive navigation, and access to all information within one or two clicks. Links to the licensure process, exam specifications, study materials, and the Records Program are among the first items that visitors see. We also offer online exam registration and detailed questions and answers about exam preparation, what to expect on exam day, and volunteering to participate in exam development. Be sure to check out CouncilNet, a secure portion of the Web site reserved for members of NCEES Member Boards. (If you need a password, e-mail tbradley@ncees.org.)

We're pleased with the results of the October exam administration. A few things occurred that with your help will not happen in the future (see front page article), but in general the administration went smoothly. Our scoring department has been scanning answer sheets at break-neck speed, working closely with Exam Development and the Chauncey Group to finalize scores. Land surveying results were mailed to Member Boards four weeks after the administration. Results of the Principles and Practice of Engineering (PE) examinations began going out on December 5—a record of five weeks and four days post administration. Scores for the Fundamentals of Engineering (FE) examination were distributed beginning on December 6. Because of the low volume of candidates taking the PE Manufacturing exam, Exam Development had to schedule a cut-score study to take place in early January. Once the study is complete and its data is analyzed by Chauncey, all PE results will be available to Member Boards. PE scores minus the Manufacturing results have been made available to boards that wished to receive them.

The October administration marked the end of our move to all-objectively scored (minus Structural II) examinations, which began before 1995. It has been a long process with countless volunteer hours, and it has finally paid off. For the April 2003 administration, the Chemical PE exam will be given with new specifications. In addition, the transportation and structural design standards—used in the Civil and Structural PE exams—have been updated for April. The spring will also be the first administration of the Architectural Engineering PE examination.

The Council's building renovation and expansion project began in late November. Though inclement weather has hampered progress, it is exciting to see each step as it is completed. Parking has been the first area affected by construction. For exam development meetings, volunteers are shuttled to Council headquarters from their hotels. We look forward to welcoming NCEES committee members and volunteers to an updated facility in 12–15 months.

We embraced a new member of Council staff in November. Jennifer King, a certified meeting planner, came to us from a nonprofit association in Rockford, Illinois. She has settled nicely into the hum of NCEES activities. Listen for her cheery voice on the phone, and look for her in person at the 2003 Annual Meeting in Baltimore.

And lastly, I'd like to remind you about the Board Presidents Assembly in Anchorage, Alaska, this February. All board chairs and administrators are invited. We will focus on two significant issues: exam security and education. You will have the opportunity to learn about and provide input on current and potential exam security problems and also discuss the role of education in the licensure process. Oh, and in our spare time, we will all go moose tipping—native Alaskans report that nothing matches it for entertainment. I plan to lead the pack and shoot-with-my-camera the first moose we see. I'll leave the tipping to President Bob.

If I don't see you in Anchorage, then I'll look for you at the spring zone meetings.

Betsy Browne
NCEES Executive Director

Upcoming EVENTS

DATE	EVENT	LOCATION
December 24–25	Christmas Holidays—Office closed	
January 1	New Year's Holiday—Office closed	
February 13–15	Board Presidents Assembly	Anchorage, AK
February 27–March 1	Board of Directors Meeting	Naples, FL
March 20–23	Southern Zone Meeting	Charleston, SC
April 3–5	Central and Northeast Zone Meeting	Orlando, FL
April 11	PE and PLS Exam Administration	
April 12	FE and FLS Exam Administration	
May 15–17	Western Zone Meeting	Red Lodge, MT

Treasurer reports year-end surplus

Martin Pedersen, L.S.
NCEES Treasurer

We held costs below budget, so we were able to substantially attain our targeted surplus. As a result, we increased our total reserves by almost $125,000 to $5,850,110.

I am pleased to report, with a total budget of $8,735,000, the Council has ended the 2001–2002 fiscal year with a surplus of $123,384 compared to an anticipated a surplus of $130,221—almost exactly what we had planned. Most revenue centers were significantly over budgeted volume with the exception of Member Board Services. The discontinuance of the Foreign Engineering Education Evaluation Program (FEEEP) and the disappointing performance of the financial markets were the leading causes of our revenue shortfall of $338,496. The diversification of our investment portfolio prevented further shortfalls: the value of the Council's investments in mutual funds fell approximately 5%, compared with the approximately 21% drop of the Standard and Poor's 500. We held costs below budget, so we were able to substantially attain our targeted surplus. As a result, we increased our total reserves by almost $125,000 to $5,850,110.

One of the Council's largest growth areas is Engineering and Land Surveying Examination Services (ELSES), which provides examination registration and/or administration services to NCEES Member Boards. In October 2001, ELSES supplied administration services to two boards, and by October 2002 ELSES had grown to support 10 boards. For the April 2003 exam administration, two additional states are contracting with ELSES for examination services.

Independent auditors Pope, Smith, Brown, and King have completed our annual audit, and they have issued an unqualified opinion supporting our financial statements. They also issued a comparative report to management covering the last two fiscal years. In their conclusion they noted that Council's management has demonstrated its commitment to establishing and maintaining a control environment that sets forth a plan and objectives toward financial reporting, meeting budget, operating goals, business risks, and safeguarding assets against unauthorized use or disposition. Council management and staff are to be commended for the excellence they have shown in responding to suggestions for improvement and incorporating new accounting procedures.

As we move forward in this current fiscal year, we will complete most of the building renovation and expansion at Council headquarters. To finance this project we have issued tax-exempt bonds through the South Carolina Jobs and Economic Development Authority. This method enables nonprofit organizations to obtain the lowest interest costs available, and the current market has allowed us to take advantage of the lowest rates in 40 years. The first phase of the construction has begun. Repayment of the bonds will be over a 16-year period at $200,000 per year for the first 14 years and $300,000 per year for the last 2 years. Expansion of headquarters has been badly needed and will provide volunteers and staff with elbow room as the Council continues to grow.

With the positive results of this audit, we look forward to another year of fulfilling the mission of the Council.

Martin Pedersen, L.S.
NCEES Treasurer

Mileage rate drops to 36¢ per mile

In the past, NCEES has reimbursed volunteers and members who qualify for travel funds at the standard mileage rate of 36.5¢ per mile. This will change starting January 2003. The Internal Revenue Service has announced that in 2003 the business travel mileage allowance for owned or leased motor vehicles will be 36¢ per mile.

Join the Council's Law Enforcement Listserv

Are the majority of your states' disciplinary actions matters of practice issues or ethical violations? In most cases, allegations of incompetent practice, negligence, and so forth, lead to allegations of ethical violations as well. State licensing boards must pursue violations in their own jurisdictions and communicate and work together to discourage future violations. One excellent mode of board communication is the Council's Law Enforcement Listserv.

Codes of ethics cover several areas:

- Holding paramount the safeguarding of life, health, and property, and promoting the public welfare
- Performing services only in areas of competence
- Issuing professional statements only in an objective/truthful manner
- Acting in professional matters for each employer/client as a faithful agent, avoiding conflicts of interest
- Avoiding improper solicitation of professional employment

These five areas, although stated generally, are very specific in nature and deserve constant attention by all professionals. Take, for instance, the ethical issue of conflict of interest. Is it possible that an engineer or engineering firm can remain objective in determining whether there is a conflict of interest in a particular business matter, when a project's revenue, profit, or expediency has a personal effect? Clearly, the cost of business cannot outweigh the legally obligated ethical commitment of every professional engineer.

And, of course, a discussion of ethics must include the issue of an engineer's obligation to practice only in his/her area of competence, as well as sealing documents prepared only under his/her supervisory control and review. The engineer who is routinely charged with such allegations and resolves the matter by entering into a Consent Order and paying fines is unethical by any standard. Does long-standing practice and licensure in numerous jurisdictions absolve a "professional" engineer from his/her legal and moral obligation to abide by the code under which his/her license was granted?

Licensing boards need to work together to eliminate unethical practices. Proactive enforcement of statutes, and networking with other boards to share information on disciplinary actions is the first step. NCEES's CouncilNet Enforcement Exchange is an excellent networking vehicle. I urge all boards to participate in this forum and increase its value to all.

To join the listserv, visit the NCEES Web site at www.ncees.org, click on CouncilNet in the upper right-hand corner, and enter your name and password. Scroll to the bottom of the page and click on Law Enforcement Listserv. Once registered, you will be privy to questions and answers posted by enforcement officials and board administrators across the country. If you do not have a password to CouncilNet, e-mail tbradley@ncees.org.

Peggy Abshagen
NCEES Law Enforcement Committee Member
Executive Director
Delaware Association of Professional Engineers

PURPOSE

The purpose of this Council shall be to provide an organization through which state boards may act and counsel together to better discharge their responsibilities in regulating the practice of engineering and land surveying as it relates to the welfare of the public in safeguarding life, health, and property. The Council also provides such services as may be required by the boards in their mandate to protect the public.

Constitution Article 2, Section 2.01

Committee
FOCUS

New MBA Survey to collect valuable information

David Curtis, P.E.
Executive Director
of Idaho Board

Zone Representatives of the Member Board Administrators Networking Group (MBANG) have spearheaded an effort to update the Member Board Survey. This survey reports each Member Board's position on issues such as board organization and policies relating to engineer interns, professional engineers, surveyor interns, and professional surveyors. It is used as a reference by MBAs, first-time and comity licensure applicants, and NCEES staff. The survey was last completed in 2000. MBANG intends to have the new survey ready for distribution to Member Boards in January 2003.

As it has for the past two years, the Council has funded the attendance of each MBA to the Board Presidents Assembly in February. This year's assembly will be held in Anchorage. Some of MBANG's major goals for this meeting are to affirm governance issues and to better define its purpose and the activities to pursue in the future. To assist in those goals, Anne Browning, a longtime consultant for NCEES, has been retained to facilitate the meeting. MBANG will also receive reports from MBAs who serve on NCEES committees and task forces regarding issues that relate to and affect the job responsibilities of board administrators.

When MBANG was formed approximately two years ago, the Council gave it wide latitude as to organization, activities, and purpose. The MBAs who participated in the formative process of MBANG wanted to keep its organization as informal as possible. They voted to elect a representative from each of the four zones, with those four representatives electing a spokesperson. The term of service of the Zone Representatives coincides with his/her Zone Vice President's term of office. Representatives for the 2002–2003 year are David Curtis of Idaho, Western Zone; Candie Robinson of North Dakota, Central Zone; Peggy Abshagen of Delaware, Northeast Zone; and Regina Dinger of Alabama, Southern Zone. Curtis was elected MBANG spokesman.

We are looking forward to a productive meeting at the Board Presidents Assembly. MBAs should come prepared to facilitate the growth of MBANG and its plans for the future.

David Curtis, P.E.
MBANG Spokesman
Executive Director, Idaho Board of Professional Engineers and Professional Land Surveyors

Awards Committee seeks nominations

Do you know someone who has provided extraordinary service to your board, the Council, and the community? Do you know someone who has advanced licensure or ethics in the engineering or land surveying profession?

At the 2002 Annual Meeting, the Council voted to expand the pool of people who can nominate someone for an NCEES award. You may make a nomination if you are a Member Board Administrator, a staff member of a board, a member of a Member Board, an emeritus member of NCEES, or any other individual whom the Awards Committee believes to be an individual directly related to NCEES.

Chair Warren Fisk, P.E., L.S., and the Committee on Awards are accepting nominations for the Distinguished Service Award, the Distinguished Service Award with Special Commendation, and the Meritorious Service Award. These awards will be presented at the 2003 Annual Meeting in Baltimore, Maryland.

Nominations materials have been sent to each Member Board Administrator and Board President and are also available on CouncilNet and by contacting Lisa Townsend at ltownsend@ncees.org. Nominations are due no later than January 31, 2003.

Engineers bring real-world experience to exam

Bob Becnel and Dave Kerns live more than three hundred miles apart, but they meet four times a year to give back to their common profession: electrical engineering. Becnel, a member of technical staff with Lucent Technologies in Town and Country, Missouri, and Kerns, formerly a distinguished member of technical staff with Lucent in Lisle, Illinois, serve on the NCEES electrical exam development committee.

Both Becnel and Kerns volunteer about 80 hours annually to help develop the Electrical and Computer Principles and Practice of Engineering (PE) exam. Exam development volunteers are divided into subcommittees to develop questions for various sections of the exam. Becnel and Kerns serve on the computer engineering subcommittee. Because exams are assembled, reviewed, and pretested in advance, there is a constant need for new questions.

Each committee member is a licensed professional engineer who has expertise that supports an area of the examination specifications. The selected individuals attend a seminar sponsored by NCEES to receive coaching on how to write effective exam questions. Afterward, writers work together to develop new questions and perform rigorous quality checks. NCEES sponsors travel and meals for the participants, who meet for marathon weekend sessions to draft and finalize questions.

"After they're written, test questions need to be approved by the committee members and the chair," explained Kerns, who received his P.E. in 1994. "Once we've verified that a test question works, that is, the test-key is valid, then the test distractors, or wrong answers, are created. We then pretest an alpha version of the exam with other licensed volunteers. Comments from the pre-test are reviewed by the committee and used to improve exam quality. Before an exam is published, it receives the review of at least five different subject-matter experts."

The Electrical and Computer PE exam measures minimum competency in both breadth and depth of engineering knowledge. The "breadth" portion tests understanding of standard electrical engineering concepts. The "depth" portion measures specialized knowledge in one of three categories chosen by the examinee: (1) computers, (2) power, and (3) electronics, controls, and communications.

Some of the volunteers on the exam committee are from academia, so the real-world perspective Becnel and Kerns bring to the table is extremely valuable to the process. "We add a different dimension and approach things with more of a 'rule-of-thumb' perspective instead of from a theoretical angle," said Becnel, who earned his P.E. designation in 1997. "The practical examples we provide are a big part of what the organization is looking for on the exam."

Computer engineering and networking—Becnel and Kerns' area of expertise—is a relatively new subject on the Electrical and Computer PE exam, though it has been offered at the university level for a number of years. "There aren't many licensed professional engineers in computer networking," said Becnel. "Since the expertise was thin in this area, it was hard for NCEES to find people who could come up with relevant test material."

Kerns enjoys participating in the exam committee because it is a chance to network with other engineers and keep his skills sharp. "These are very smart people," he said. "It's a humbling experience. I get as much as I give." Becnel has been active in several NCEES projects, including serving on a passing-score panel and participating on an exam-writing committee. Moreover, Becnel is currently a regional vice chairman for the National Society of Professional Engineers (NSPE). Becnel was asked to assist the NCEES organization after proposing a computer engineering exam in Missouri through a white paper developed for his local NSPE chapter.

"It is a great honor to be considered among the tens of thousands of P.E.s in the United States," Becnel said. "I am happy to have the opportunity to help other engineers earn licensure."

Article developed by Lucent Technologies, Inc., in conjunction with NCEES.

Because exams are assembled, reviewed, and pretested in advance, there is a constant need for new questions.

If you would like to participate on an NCEES exam development committee, visit the NCEES Web site at www.ncees.org and click on "Volunteer Now."

Students give standing ovation for inspirational message

Through its sponsorship of the 2002 annual leadership conference of the National Association of Engineering Student Councils (NAESC), NCEES representatives were given the opportunity to interact with a significant number of student leaders about the importance of licensure—and gained an open door to speak to hundreds more.

During the conference, NCEES Director of Professional Services Mike Shannon, P.E., gave three PowerPoint presentations titled "Engineering Licensure: A Path to Opportunity." Each presentation was offered at the same time as several other topics, which made it especially gratifying that the talks were so well attended. The significance of NCEES having a presence at the conference was not solely in reaching out to 320 student leaders attending from 43 academic institutions. "Through this conference, there is the potential for the licensure message to reach hundreds of students who did not attend the conference," explains Shannon. How so?

Engineering Student Councils (ESC) exist on university campuses all over the United States. Each ESC is composed of student representatives from the variety of engineering disciplines offered at the academic institution. The representatives come from student chapters of technical associations—for example, the American Society of Civil Engineers, the Institute of Electrical and Electronics Engineers, and the Society of Manufacturing Engineers. In other words, the attendees at an NAESC conference are not only active in their technical society, they participate in campus-wide activities with other engineering student leaders. They are a unique, talented, and highly motivated group. They are decision makers who have the influence to invite NCEES to speak at either their ESC or technical society chapter. As a result of its presence at the conference, NCEES has been approached to provide speakers at university chapters and currently is looking for local NCEES members who are willing to talk about licensure at those student meetings.

...the key to advancing licensure is to appeal to young people.
–Bill Sutherland, P.E.

In addition to making presentations, Shannon and NCEES Manager of Communications Nina Norris

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Speaker's kit available to facilitate presentations

NCEES will debut its speaker's kit at the 2003 Board Presidents Assembly. The kit is designed to provide volunteer speakers all they need in order to promote the value of licensure to college students, explain the licensure process, and encourage students to take the Fundamentals of Engineering examination while enrolled at university. Elements of the kit include a PowerPoint presentation, a "Path to Licensure" brochure, a video featuring professional engineers working in their current fields, and a guide to help volunteer speakers prepare for the presentation. A student-focused Web site will be launched in conjunction with the speaker's kit.

For more information or to volunteer to speak in your community, contact Mike Shannon, Director of Professional Services at mshannon@ncees.org or Nina Norris, Manager of Communications at nnorris@ncees.org.

Excerpt from NAESC keynote speech

The licensure stool has legs that identify events: exams, degrees—finite periods of qualifying experience. The "True Professional" stool has legs that represent not so much events as guiding principles, or truths, to hold throughout your professional life. The first leg is your license. Get it and keep it. Give the world confidence in your competence. The second leg is ethical practice. Do it and keep doing it. It is just as important to do the right thing as to do things right. The third leg is involvement in your profession. Sign up for membership in your professional association and get involved on a committee. After you get a few years work experience under your belt, apply for a position on your state licensing board, and get involved in the National Council. If you think as many do that the laws of your state that impact engineering need change, get involved. *To read the entire speech, click here.*

Students... *(continued from page 10)*

gave out information and complimentary t-shirts at the NAESC Career Fair, encouraging students to come to the licensure talks. It was a slightly different atmosphere from other professional and technical conferences they have attended. Shannon comments, "This conference was developed completely by NAESC student leaders. They invited the sponsors, reserved the rooms, planned the activities, wrote and distributed conference brochures—they prepared everything, while also finishing papers and studying for exams." Norris could well appreciate the work involved in planning a conference for over 300 people—the NCEES Annual Meeting in La Jolla had 306 registrants and 157 guests. Though Norris and Shannon passed up the 2:00 a.m. boat race and Twister Tournament, they participated in most other events and took every opportunity to encourage the student engineers to pursue licensure.

The conference ended with a strong encouragement to pursue professionalism. As one of the primary sponsors, NCEES was able to select the keynote speaker at the farewell banquet. Bill Sutherland, P.E., chair of the Minnesota Board, volunteered to give the speech. He believes that the key to advancing licensure is to appeal to young people. Sutherland admits to giving a lot of thought to what he would say. Though a friendly person who naturally puts others at ease, he was well aware of the "generation gap" between him and his listeners. He says, "The challenge was to frame the speech in a way that would appeal to that age group. I haven't been that age for a lot of years now. I wanted to put something together that wouldn't talk to my peers as much as to people somewhere around age 20." Sutherland prepared the material to dovetail with the NCEES presentations. He says, "I attended a couple of the presentations given to the students. A lot of information was provided as well as a good justification for licensure. I wanted to put something together to complement that—not repeat what was said, but to put some context around it." Sutherland continues, "The focus [during the presentations] was on taking the FE and getting licensure because it would do these things for you. I wanted to expand on [that message] and give a broader perspective of where licensure fits in the scheme of things."

Sutherland spoke about life concerns, including the three legs of professionalism. By all accounts, it was an inspirational message, and it brought the 300-person crowd to its feet for an "embarrassingly long standing ovation," says Sutherland. "When you first stand at the lectern, you don't know how a speech will be received, how it will work out. In this case it seemed to connect to them, and that's wonderful," he says. Sutherland reports that several people spoke to him afterwards about how much the speech meant to them, and he has received a couple of requests for copies.

The NAESC conference was an exceptional opportunity to reach many student leaders from a variety of academic institutions about the importance of licensure. NCEES took full advantage, and shared how and why to become licensed with engineering students who were open to the message. As a result of its participation in the conference, NCEES has received requests to speak at local student organizations to advance engineering licensure and professionalism.

The engineering profession needs you. If you would like to speak to engineering student groups in your local area about the importance of licensure, contact NCEES Director of Professional Services Mike Shannon at mshannon@ncees.org or 800-250-3196, ext. 463.

Please send your board news, including notice of board member changes, to the editor of *Licensure Exchange*. NCEES, P.O. Box 1686, Clemson, SC 29633 or e-mail to lwilliam@ncees.org.

Member Board NEWS

ALABAMA
- Preston L. Jackson is the new board chair.

FLORIDA LS
- The board's new telephone number is 850-487-1395, and its new fax number is 850-488-8040.

INDIANA
- The PE board's Web address is www.in.gov/pla/bandc/engineers. The LS board's Web address is www.in.gov/pla/bandc/surveyors.

IOWA
- Lyle Tekippe is a new appointee to the board. Nicholas Konrady resigned from the board.

MICHIGAN PE
- Gwendolyn Hale is a new appointee to the board. The term of Alicia Diaz has expired.

NEBRASKA PE
- Roger M. Helgoth is a new appointee to the board. The term of Robert J. Rohde has expired. Dale Sall, a member of the board since 1981, has been selected to be a Chapter Honor Member of the Chi Epsilon chapter at the University of Nebraska-Lincoln.

NEVADA
- J. Clark Gribben is the new board chair.

NEW HAMPSHIRE LS
- Louise Lavertu's title has changed from board administrator to executive director.

NEW HAMPSHIRE PE
- Lee F. Carroll is a new appointee to the board. The term of Tyler Carlisle has expired. Louise Lavertu's title has changed from board administrator to executive director.

NEW MEXICO
- Mary E. Wells, Charles G. Cala, Jr., and Robert A. Smith are new appointees to the board. The terms of Paul Martin, Ronald Tyree, and Gordon Walhood, Jr., have expired.

OHIO
- On September 27, 2002, Governor Taft re-appointed Chandra R. Shah to a third five-year term ending September 24, 2007. This is the first time since 1952 that a member has been appointed to a third term.

OREGON
- Stuart Albright is the new board president.

PUERTO RICO
- The board's current telephone number is (787) 722-0058. The telephone number for Executive Director Carmen Carreras is (787) 722-4816.

TENNESSEE LS
- Dave B. Gilbert is a new appointee to the board. Sam Cannon resigned from the board and passed away shortly afterward.

TEXAS PE
- C. Roland Haden, William Lawrence, Shannon K. McClendon, and Gerry Pate are new appointees to the board. The terms of Dave Dorchester, Danny Perkins, and Edmundo Gonzalez have expired. Brenda Bradley Smith is the new board chair.

VIRGINIA
- Carole Ridings Renmark is a new appointee to the board. The term of M. Lou Barnett has expired.

WEST VIRGINIA PE
- Ms. Lesley L. Rosier is the Executive Director. The board's address is 910 Kanawha Valley Building, 300 Capitol Street, Charleston, WV 25301. The board's Web site is www.wvpebd.org. B. S. Saluja is a new appointee to the board. Gene R. Weekley has resigned.

WISCONSIN
- Dale C. Zabel is a new appointee to the board.

Texas Attorney General supports practice act

On July 9, 2002, the Texas Attorney General issued an opinion supporting the Texas Engineering Practice Act and the interpretation that an unlicensed individual—though exempt from licensure under the Act and employed and classified internally by a corporation as an "engineer"—cannot use the title of "engineer" or its derivates on business cards, cover letters, or other forms of correspondence made available to the public.

National Engineers Week promotes profession

Check out the 2003 National Engineers Week Web site, www.eweek.org. It contains a variety of information pertinent to engineers, educators of all age groups, and persons interested in how things work. The sponsors of the upcoming Engineers Week, February 16–22, have created a new program to encourage young engineers in the profession: Fresh Faces of Engineering. In addition, there are a variety of ongoing programs to encourage youth to consider engineering as a career, such as Zoom into Engineering, which targets grades 1–6, Introduce a Girl to Engineering Day, Future City Competition, involving middle schoolers, and DiscoverE, which reaches out to grades K–12. Also visit www.engineeringsights.org, a Web site developed by the National Society of Professional Engineers for National Engineers Week 2001. Called A Sightseers Guide to Engineering, this Web site provides an online introduction to the engineering innovations all around us.

NCEES has been a sponsoring society of National Engineers Week for four years.

NCEES Past President Orland Mayer, P.E.

Orland Mayer, P.E., passed away on November 14, 2002, at home surrounded by his family. He served as NCEES President from 1973–1974.

Mayer was devoted to his family, his community, and his profession. He served as member and chair of the Idaho State Board of Engineering Examiners, president of the Idaho Society of Professional Engineers, vice president of the NCEES Western Zone, and president of NCEES. He was a member and chair of the Small Business Advisory Board, member of the American Council of Industrial Development, and member and first vice president of Pacific Northwest Industrial Development Council. Mayer retired from his position as director of industrial relations at Idaho Power in 1969. He graduated from the University of Idaho at Moscow in 1929, receiving a degree in electrical engineering, and later received the Outstanding Graduate award from the engineering college.

Mayer was preceded in death by his wife, daughter, and son. He is survived by his brother, grandchildren, and many great-grandchildren.

In My
OPINION

ABET's EC 2000 and engineering practice–

Forrest M. Holly Jr., Ph.D., P.E.

What has changed in the ABET accreditation criteria? The simple answer is that the focus has changed from validation of* input to *the engineering educational process to validation of* output from *the process.

At our NCEES Annual Meeting in La Jolla, it was clear from various presentations and remarks that the engineering accreditation climate has changed significantly. From the perspective of licensure in support of the protection of the public health, safety, and welfare, there is a perception that accreditation change may not be for the better, since it may represent a divergence of accreditation criteria from the needs of engineering practice. I believe that there are other elements of the "new" criteria put forth by the Accreditation Board for Engineering and Technology (ABET) that represent, by contrast, a *convergence* of accreditation criteria to the needs of engineering practice. While it may be too soon to assess the overall effect of these diverging and converging elements, Member Boards need to keep a close watch on the relative roles of examination and education in the licensure process.

First, let me make it clear from which soapbox I am preaching. Before and after completing graduate studies in hydraulics, I worked in industry for seven years. I plan to return to consulting for the last chapter of my career. I am presently in my twentieth year as an engineering educator. In 1996, as chair of civil and environmental engineering at the University of Iowa, I survived accreditation review under the old ABET criteria. Now, as associate dean of engineering, I am coordinating my college's accreditation preparation efforts under ABET's new Engineering Criteria 2000, which is quite different. By the time you read this, our ABET site visit will have come and gone, and I may be in exile at an undisclosed overseas location.

What has changed in the ABET accreditation criteria? The simple answer is that the focus has changed from validation of *input to* the engineering educational process to validation of *output from* the process. The pre-EC-2000 criteria were somewhat proscriptive, for example, requiring a half year of humanities and social sciences, one year of mathematics and basic sciences (with key subject areas specified), and one-and-a-half years of engineering topics, specifically to include mechanics, thermodynamics, electrical and electronic circuits, materials science, transport phenomena, computer science, and other subjects specific to the discipline, often including specification of a half year of engineering design. Accreditation largely consisted of careful review of curriculum, administration and student records, and faculty. Engineering educators complained that the curricular aspects of accreditation review were little more than bean counting, uncoupled from any consideration as to whether students were actually learning anything, and stifling the opportunity for programs to develop their own unique identity tailored to their particular geographic, socio-economic, and engineering environment. Engineering practitioners, through their professional-society representation on ABET's Engineering Accreditation Commission (EAC), complained that the accreditation criteria did not necessarily produce graduates who were well prepared to enter the profession and, in particular, were not effective in addressing professional issues such as ethics, communication, teamwork, and societal awareness.

In response to these perceived shortcomings, EAC/ABET began in the early 1990s to formulate the new EC 2000 criteria that are now mandatory for accreditation of engineering programs. EAC/ABET comprises about 55 members representing 21 engineering societies/associations, including NCEES. About 60% of the society/association members are from academe, the remaining 40% being from industry, government, and private practice. (Given that only about 10–20% of the EAC/ABET membership represents the disciplines in which licensure is considered important, it is not surprising that EAC/ABET as a whole gives short shrift to licensure in the accreditation criteria.)

The new EC-2000 criteria developed by the commission, optional from 1995 through 2001 and now mandatory, can be viewed at http://www.abet.org/images/Criteria/2002-03EACCriteria.pdf. Criterion 4, Professional Component, reflects a less proscriptive approach to engineering curricula, and it is this relaxation of some curricular requirements that may represent a divergence from the expectations of the licensure process. For example, EC 2000 now requires only a general education component that "…complements the technical content of the curriculum and is consistent with the program and institution objectives," requires a

—divergence or convergence?

year of a combination of college-level mathematics and basic sciences "appropriate to the discipline," and retains one-and-a-half years of engineering topics. The new criteria are silent on the specific subjects to be included in math/science or engineering topics. The new criteria are also silent on the amount of time to be devoted to engineering design (however see further on). One could argue that the old criteria were not particularly proscriptive, but the new ones are clearly somewhat less so. Accreditation review under EC 2000 still involves a detailed verification and validation of curriculum, administration, and faculty, but adds a new critical review of outcomes assessment and involvement of constituencies.

The relaxation of proscriptive curriculum requirements follows naturally from EC 2000's recognition of the need for engineering programs to develop their own identity. For example, in principle a civil engineering program (Program A) could pursue an objective of educating environmental engineers who will pursue the doctoral degree and enter positions in academe, to populate the next generation of leadership in environmental engineering education. The curriculum developed to support this objective would likely not include surveying or AutoCAD®; would probably give short shrift to statics, dynamics, circuits, and structures; and would likely be rather heavy in chemistry and biological sciences. By contrast, at a sister institution, the civil engineering program (Program B) might decide to pursue an objective of educating engineers to populate the next generation of county engineers in its state or region and design its curriculum accordingly. This curriculum would likely include AutoCAD® and surveying; pay careful attention to statics, dynamics, structures, hydraulics, and hydrology; pay minimum attention to chemistry and biological sciences; and possibly require that its students attempt or pass the Fundamentals of Engineering (FE) examination.

Assuming both of the above programs earned ABET accreditation under EC 2000 (see caveats further on), could or should a Member Board view graduates from both Programs A and B as equally qualified, from an educational point of view, to earn licensure with its implications for protecting the health, safety, and welfare of the public? There are additional constraints in EC 2000 that make the potential divergence above less stark than it might appear.

First, Criterion 2 of EC 2000 requires that an engineering program formulate its educational objectives with direct and close involvement of its constituents, to include not only students and faculty, but also external entities such as employers. Program A would have had to convince ABET that its ambitious, nontraditional educational objective represents the real desires of a significant constituency (for example, representatives of environmental engineering graduate programs throughout the region or the country and the students themselves). Similarly, Program B would have to convince ABET that its more traditional educational objective was developed in close consultation with its constituencies (likely including county engineers and possibly members of the state licensing board).

Second, Criterion 4 of EC 2000 requires that *all* engineering programs prepare students for "…engineering practice through the curriculum culminating in a major design experience ….incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political." So even Program A, despite its non-practice educational objective, would have to demonstrate compliance with this design requirement to earn ABET accreditation.

Third, Criterion 3 of EC 2000 requires that programs demonstrate, through outcomes assessment, that their graduates have attained a minimal set of engineering skills (expressed as 11 specific outcomes) that include "(c) an ability to design a system, component, or process to meet desired needs; (e) an ability to identify, formulate, and solve engineering problems; (f) an understanding of professional and ethical responsibility; (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice."

In allowing engineering programs to develop their own identity, and in focusing on outcomes rather than curricular input, EC 2000 is indeed less

(continued on page 16)

Given that only about 10–20% of the EAC/ABET membership represents the disciplines in which licensure is considered important, it is not surprising that EAC/ABET as a whole gives short shrift to licensure in the accreditation criteria.

Accreditation review under EC 2000 still involves a detailed verification and validation of curriculum, administration, and faculty, but adds a new critical review of outcomes assessment and involvement of constituencies.

EXCHANGE

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ABET's EC 2000.... *(continued from page 15)*

proscriptive than the old accreditation criteria. But my experience and that of many of my colleagues at peer institutions has been that EC 2000 has made us much *more* attentive to the advice and observations of industrial advisory boards (indeed, many of us did not even have external advisory boards prior to EC 2000); much *more* careful to ensure that our design experiences include the critical elements of Criterion 4; much *more* conscious of the requirement to include in our curriculum professional issues such as communication, ethics, and awareness of the need for lifelong learning; and much *more* aggressive about doing genuine outcomes assessment and turning the results back into continuous improvement of our curricula. I believe that this culture change represents a new *convergence* to the needs of practice that more than compensates for the potential divergence of a less proscriptive curriculum template.

Does my view that EC 2000 represents a net convergence of accreditation to the needs of practice make me sound too much like a Pollyanna? Perhaps. At the very least, my view assumes that all parties involved—educators, ABET, practitioners—live up to their responsibilities in the accreditation process. For educators, this means taking both the spirit and the letter of EC 2000 seriously and implementing genuine constituency consultation and outcomes assessment for continuous improvement. For ABET, it means the same: holding educators to these standards and working with them to ensure that the standards are met. For practitioners, it means participating in the process by becoming program advisory board members, ABET program evaluators, and EAC members if the opportunity arises. For Council members, it means proactively seeking to participate in accreditation visits as observers, possibly as a first step toward becoming an evaluator. "Them" is in reality "Us."

This leads me to a final thought in regard to technical competency and licensure. In the pre-EC-2000 world, Member Boards could consider their requirements for an ABET-accredited engineering degree and successful completion of the FE exam as mutually reinforcing guarantors of a minimum level of technical competency. (In designing its new curriculum, my institution has taken as a given that graduates should be able to pass the FE exam.) As illustrated above in the example of Program A, there is now the potential that at some institutions accreditation will mean a bit less than it used to insofar as technical competency in physics-based engineering topics is concerned. Therefore, in my view, the FE exam—perhaps even a stronger exam—has become even more important as the initial screening, or filter, for minimal technical competency in physics-based engineering as the first step on the road to licensure.

Do I believe that EC 2000 will cause an overall divergence of engineering education from the needs of licensure? *Not necessarily.* Do I think that EC 2000 is provoking an overall improvement in the quality of engineering education? *Most definitely.* Do I continue to see the value of a careful FE exam for assessing technical competency as the first step towards licensure? *Without a doubt.*

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