Continuing Professional Development for Engineering, Engineering Technology, and Industry Personnel

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Abstract

West Virginia was one of the first states to require continuing professional development to maintain professional engineering licensure; as a result, the engineering and education communities in West Virginia were at the front of the curve in developing a sustained continuing education program to serve engineers in the state. Furthermore, we have developed partnerships and coordinated efforts of colleges, universities, professional organizations, and other participants in offering affordable continuing education programs through Annual Spring and Fall Technical Conferences, EXPO (statewide Architectural, Engineering & Construction programs), and various specialty programs, seminars, and workshops.

Fairmont State College has played a central role in developing a consortium of faculty, trainers, and subject matter experts to respond to industry requests instantly through a regional training network. Career development programs in project management, scheduling, CPM, total quality management, statistical process control, AutoCAD, SurvCADD, safety engineering, materials engineering, surveying, electronics, materials testing, business management, computer applications, customer service, problem solving, decision making, process reengineering, quality systems, occupational safety and safe work practices, OSHA compliance, supervisory skills, team development, and many others have been developed. These programs draw participation from all types of technical personnel to include engineers, engineering technologists, technicians, and industry line workers.

Introduction

Who requires career development? Does graduation with a baccalaureate degree ensure lifetime employment and provide the necessary skills to succeed in the workplace or should continuing professional competence be required? Or maybe, on-the-job experience itself provides for a lifetime of learning and development? The National Society of Professional Engineers (NSPE) completed a two-year study of approximately 1000 employers in industry and government in the early 1990's; this study identified employers' interests when evaluating a potential employee and sparked considerable discussion. Generally, graduates were assumed to possess technical skills; however, soft skills such as teamwork, leadership, communication and interpersonal skills, analytical ability, personal initiative, and self-confidence were identified as areas for evaluation in the hiring process. In general, these skills and attributes are desired in addition to basic competency in mathematics, sciences, and engineering analysis and design. In an excellent discussion titled "Broader View Needed for Quality Improvement" in 1995, Delon

Hampton addresses this issue. He wrote *"…the educational requirements of students striving to become licensed to practice these professions [physicians and architects] have increased with time, while those of the engineering profession have become less stringent….Simultaneously, though the demands for an increase in the nontechnical portion of the Accreditation Board for Engineering and Technology (ABET) engineering curricula have grown and the complexity of technical engineering knowledge has exploded…."*

Many have suggested that a fifth year of education is required to adequately prepare graduates for the workforce. Reality suggests that existing four year programs generally require more than four years to complete; in fact, some estimates are that the typical engineering undergraduate student requires about 4.75 years to obtain the degree. The NSPE study suggested that almost half of all organizations surveyed indicated that they provided additional training (beyond on-the-job experience) for new engineering hires. As a profession, engineers have, to date, resisted the concept of a fifth year of education to obtain their first professional degree and I do not expect that five-year first professional degree programs will become the norm in the immediate future. On the other hand, most engineers will acknowledge that continuing education is necessary to keep engineers current and provide adequate growth opportunities. What they may not agree on is the notion that continuing education should be mandated. Hampton identified continuing education as one of three areas needing serious and immediate attention to achieve a total commitment to quality in the civil engineering profession; when he wrote this article only three states had continuing education requirements.

Let's examine Fundamental Canon #7 from the Code of Ethics of Engineers. It states:

> 7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

Hence, state boards of registration, the Accreditation Board for Engineering and Technology (ABET), The National Council of Examiners for Engineering and Surveying (NCEES), and the American Society of Civil Engineers (ASCE), to name a few, have gotten involved in the issue of continuing professional competence. States which have passed continuing education legislation requiring engineers to obtain professional development hours for license renewal include Alabama, Iowa, Minnesota, New Mexico, North Carolina and West Virginia. The NCEES has issued a set of continuing professional competency guidelines. According to NCEES, the *"guidelines are set forth for the purpose of providing consistency in those jurisdictions that adopt mandatory requirements or for those jurisdictions that wish to encourage voluntary usage."* NCEES describes as their rationale for a continuing professional competency requirement *"to demonstrate a continuing level of competency of professional engineers and/or land surveyors."* Under these guidelines, *"Every licensee shall meet the continuing professional competency requirements of these regulations for professional development as a condition for licensure renewal."* These guidelines include as a requirement that *"Every licensee is required to obtain 15 (30 if biennial) PDH units during the renewal period year."* PDH's are professional development hours defined as *"a contact hour (nominal) of instruction or presentation."*

According to the NCEES guidelines *"PDH units may be earned as follows:*

1. Successful completion of college courses.
2. Successful completion of continuing education courses.
3. Successful completion of correspondence, televised, videotaped, and other short courses/ tutorials.
4. Presenting or attending qualifying seminars, in-house courses, workshops, or professional or technical presentations made at meetings, conventions, or conferences.
5. Teaching or instructing in (1) through (4) above.
6. Authoring published papers, articles, or books.
7. Active participation in professional or technical societies.
8. Patents.

In 1992, the ASCE Board of Direction requested a study be performed on mandatory continuing education as a requirement of membership renewal in the society's professional development program. Mandatory continuing education as a condition for membership renewal failed at ASCE. However, James W. Poirot, ASCE Past-President, wrote while serving as President *"This proposal will meet resistance by many, as did the evolution of licensing professional engineers at the turn of the century. We cannot be proud of the ASCE actions at that time, when the Society resisted licensing of engineers for some 30 years.*" Poirot further elaborated *"…Let's hope ASCE doesn't take 30 years to recognize that the public, project owners and our nonengineering team members expect engineers to provide evidence that we are continuously studying the state of engineering practice and are current and competent in our field of practice."* Poirot pointed out that Wyoming was the first state to adopt legislation requiring licensing of engineers in 1907 and that ASCE did not exhibit strong support for licensing until after 1930. It should also be pointed out that it took almost 20 years for all 50 states and 5 jurisdictions (District of Columbia, Puerto Rico, Virgin Islands, Guam, and Northern Mariana Islands) to adopt the use of the uniform national examinations developed by NCEES for the Fundamentals of Engineering (FE) and Principles and Practices of Engineering (PE) exams.

The Accreditation Board for Engineering and Technology (ABET) Engineering Criteria 2000 states, as part of *Criterion 3: Program Outcomes and Assessment*, that

> *Engineering programs must demonstrate that their graduates have*
> *…(i) a recognition of the need for, and an ability to engage in life-long learning.*

Continuing education , professional development, continuing professional competence, or lifelong learning - whatever term you choose - is and will continue to be an integral part of the engineering profession.

Mandatory Continuing Professional Competence: West Virginia Experience

The West Virginia State Board of Registration for Professional Engineers implemented continuing professional competency requirements as a condition for registration renewal, effective July 1994. The requirements were phased in over three years with the Board requiring fifteen professional development hour units for the fiscal year 1996 and thereafter.

In general, the engineering community in West Virginia was not aggressively engaged in the business of delivering continuing education to its constituents prior to 1993. When it became evident that West Virginia was going to enact a continuing professional competency requirement, some began asking how, where, and when can I obtain continuing education or professional development units? Or, for that matter, what constitutes a continuing education unit or professional development hour? The Board of Registration undertook an aggressive education program on the requirements.

As late as June 1996 (three years into the program), the Board issued a "What's up with continuing education?" Article in the West Virginia Compass & Rule Newsletter, published by the Board for the purpose of educating the engineering community on the three-year young requirements. Part of the article read as follows:

These fifteen hours must be completed and recorded on the renewal notice. The Board will not process any active renewal unless fifteen hours are completed and recorded properly on the renewal form. A maximum of eight PDH units may be carried forward to the next year.

The Board does not have a pre-approval process of courses to be counted towards the PDH requirement. The Board has accepted activities as long as the engineer feels the course(s) has improved his/her engineering career and can validate the merit of and attendance of the course.

Conventions as well as seminars and workshops given to improve the qualifications of an engineer can be counted. Each hour of attendance can be counted as one PHD. For courses evaluated in continuing education units one CEU equals 10 PDH units. One college or semester unit is 45 PDH units.

Teaching also may be counted towards the requirement. The course or seminar should relate to subjects which enhance the engineer's career. Two PDH's are awarded for every hour of instruction.

Those engineers, who have published papers or articles on engineering subjects, may count 10 PDH units for each paper or article published towards their requirement.

Renewals of registration must be processed within ninety days of June 30th or the registration is considered lapsed as prescribed by the West Virginia Law. A registrant may bring an inactive license to active status by obtaining all delinquent PDHs and filling out an application for Board approval. The number of PDH units required shall not be more than two times the minimum annual requirement.

Each registrant is charged with his/her own record keeping. These records must be maintained for a period of three years for auditing verification purposes. The documentation should not be forwarded to the Board unless requested.

Continuing professional development is an advantage for every professional engineer thereby improving the engineer's knowledge and skills to provide the professional service at a high standard.

Clearly, the Board of Registration was engaged in a long-term effort to educate its constituents concerning the continuing professional competence requirements.

Subsequent to the implementation of the continuing professional competence requirement by the Board, many telephone calls and faxes were made and sent trying to find an adequate supply of reasonably priced seminars and workshops within the state to meet the requirements of the roughly 5,500 registered professional engineers in the state. The math wasn't very tough - a total of 80,000+ PDH's would be logged once the requirements were fully implemented. While the engineering community in the state had some activities established, they needed to be better managed and promoted, and still others needed to be developed.

While ASCE WV Section had been involved in technical conferences and seminars for many years, no formal committee was charged with these activities. ASCE had anticipated the continuing professional competency requirements and lain the groundwork to be in a position to meet the growing need for seminars and workshops. Thus ASCE created a continuing education committee to determine what types of programs the state's engineering community was interested in and to develop and deliver those programs. The committee solicited input from key players to include the section membership, other professional societies, and the engineering schools in the state.

A common theme of affordability kept surfacing in discussions concerning the types and number of programs required to meet the needs of the engineering community. Many professional seminars and workshops charge several hundred dollars for a short course. Regionally and nationally advertised short courses of from 2 to 4 days, can require registration fees ranging up from less than $300 to over $1500 or more with many at the mid to upper end of the range. Often, these programs are held in larger, more urban or metropolitan areas which require overnight travel and lodging, airfare and meal expenses. A company can easily spend several thousand dollars on one or more of these programs. Many of the smaller consulting firms in the state indicated that they could not afford such large expenses that surely would be generated in order to meet all their staff's PDH requirements. The professional societies and the engineering schools in the state took the lead to strengthen existing partnerships and develop new ones to address these needs.

The ASCE Continuing Education Committee developed programs to meet the needs of the civil engineers in the state by committing funds for the development of a continuing education library which is available to the WV Section membership. The library consists of video- and audio-tapes, books, and manuals, and is expanded each year. The WV Branches can borrow the materials for local meetings, and individual ASCE members in the state can "check out" these materials for self-study at home for a nominal fee to cover shipping, etc. In addition, the committee partnered ASCE with a number of other groups to serve a wider engineering

audience. A significant number of notable partnerships flourished and will be described individually, with specific courses listed in Appendix A.

ASCE WV Section, ASCE Charleston Branch, ASCE Northern WV Branch, West Virginia University (WVU), WVU ASCE Student Chapter, West Virginia University Institute of Technology (WVUIT) , WVUIT Student Chapter

ASCE WV Section partnered with the two engineering schools in the state and their ASCE Student Chapters to develop mutually beneficial arrangements for providing significant continuing education opportunities to the ASCE membership. Two full day technical conferences are held each year, one each in the fall and spring. The Fall Technical Conference is a long-standing tradition at West Virginia University Institute of Technology, having been held since 1965, while the Spring Technical Conference at West Virginia University is relatively young, starting in 1993.

Many universities host technical workshops, seminars and conferences; what is unique about the West Virginia technical conferences is the fact that the event is hosted by the respective university, sponsored by the local ASCE branch, and organized by each university's ASCE Student Chapter. The Student Chapter at WVU organizes the event in consultation with the Northern West Virginia Branch while the WVUIT Student Chapter does likewise with the Charleston Branch. The Department of Civil & Environmental Engineering at WVU, the Department of Civil Engineering at WVUIT, and the ASCE WV Section assist with promotion and advertising.

Benefits of the technical conference go well beyond the continuing education provided. Civil Engineering students receive on-the-job training in organizing a major technical program thus gaining and demonstrating the management skills which employers indicate are essential. Practicing engineers and students in the state know each other through this interaction which often leads to employment opportunities for the students after graduation. Practicing engineers receive high quality continuing education at a cost of approximately $20 to $25 per PDH.

WVSPE (Clarksburg, Fairmont & Morgantown Chapters), ASCE Northern Branch, and AACE

The ASCE Northern Branch, the three north-central West Virginia Society of Professional Engineers chapters (Clarksburg, Fairmont and Morgantown), and the American Association of Cost Engineers - Morgantown Chapter have developed joint meetings for the purpose of providing continuing education. The meetings are normally evening meetings with one or more speakers. These meetings are planned and hosted on a rotating basis among the participating organizations. Again, high quality continuing education is provided at a cost of approximately $20 to $25 per PDH.

WV EXPO Engineering Seminars Subcommittee:
ASCE WV Section and WVSPE

EXPO is an annual trade show in West Virginia for the construction, engineering and architectural industries. While many specialty groups and trade associations provide professional development opportunities at EXPO, the ASCE WV Section and WVSPE have collaborated to schedule and host a number of continuing education activities at this annual event. Again, high quality continuing education is provided at a cost of approximately $20 to $25 per PDH.

West Virginia Training Network

Recognizing the crucial need for a trained workforce at all levels, West Virginia has invested in the development of a trained workforce through the Governor's Guaranteed Workforce Program. The West Virginia Training Network was developed to provide a single point of access for training services in each region of the state as part of the Governor's Guaranteed Workforce Program. The Region 9 Training Network serves North Central West Virginia which includes the counties of Barbour, Doddridge, Harrison, Marion, Monongalia, Preston, Randolph, Taylor and Tucker counties. The organization's mission statement declares that the network consists of community trainers committed to providing quality, broad-based workforce training and development to the counties of North Central West Virginia.

The network can provide "off-the-shelf" training in a variety of areas, perform organizational assessment services when requested, and/or develop customized training programs to meet specific objectives and needs. Participants in the training network include the Appalachian Hardwood Center (WVU), Fairmont State College, Marion County Technical Center, Monongalia Technical Center, Preston High School, Safety and Health Extension (WVU), West Virginia Wood Technology Center, the West Virginia Workplace Education Program and various private sector training organizations.

Jobs in West Virginia have shifted significantly in the past two decades. Mining and manufacturing employment has decreased significantly in the state while at the same time shifting to more high tech types of operations. Trade and Services have increased substantially during the same period. All this change has created a substantial need for training, retraining, and professional development. Training has been requested and provided to personnel ranging from the boardroom to the shop floor and to a broad variety of clients in the public, private, service, industry, consulting, manufacturing, and construction sectors.

Fairmont State College faculty provide training in many areas to include project management, scheduling, CPM, total quality management, statistical process control, AutoCAD, SurvCADD, safety engineering, materials engineering, surveying, electronics, materials testing, business management, computer applications, customer service, problem solving, decision making, process reengineering, quality systems, occupational safety and safe work practices, OSHA compliance, supervisory skills, team development, and many others. These programs draw participation from engineers, engineering technologists, technicians, and industry line

workers, among others. Training can occur on-campus, at the organization's facility or at an off-campus site if desired. FSC faculty who provide these training programs are generally compensated at some negotiated rate of pay ranging from $50 to $100 per hour, dependent upon qualifications, expertise, etc. In addition, an institutional overhead rate is charged to include faculty benefits, matching retirement funds, etc.

Summary

Recognizing the merits of continuing professional competence requirements, The West Virginia State Board of Registration for Professional Engineers requires 15 PDH's per year as a condition for professional licensure renewal. As a result of this requirement which was phased in beginning in 1994, the engineering community in West Virginia recognized the need to provide high quality continuing education at reasonable prices.

Clearly, career advancement depends on continuing professional development; in West Virginia, engineers, technologists, technicians, and industry personnel can obtain high quality continuing education at reasonable prices, generally on the order of approximately $20 to $25 per PDH, sometimes less. This did not happen by chance. A large number of people and organizations contributed and continue to contribute to these activities to include: the professional engineering societies, West Virginia's engineering schools, the Governor's office, West Virginia Training Network participants, and many other unnamed participants.

Continuing professional development has been a good choice for West Virginia. Two new ASCE branches have been organized during this implementation of continuing education, participation in professional societies has increased as evidenced by membership awards at the national level, and engineering as a profession is gaining stature in the state.

Appendix A: List of typical recent or upcoming continuing education activities in WV

West Virginia University Institute of Technology
(Spring '98 Seminar Schedule)
Ethics & Professionalism for the Practicing Engineer
Environmental Permitting
An Introduction to Total Quality Management
Environmental Law & Regulation
Engineering Management
Intellectual Property
Slope Stability Analysis
Hazardous Waste Remediation
Total Quality Management
Seismic Design Requirements for Structures
Effective Time Management for Engineers

EXPO '98 (West Virginia Equipment/Technology/Design Exposition)
Scheduled Engineering Seminars - March 1998
Smart Roads
Brownfield Legislation
Water Quality Standards
Leadership
Accountability
Corporate Culture Shock
Dealing with Change
ISTEA Funding
Project Collaboration on the Internet
GIS Available Information

Spring Technical Conference (West Virginia University)
WVU Waste Management Education & Research Consortium
Fiberwrap™ System Development and Applications
Superpave Mix Design for Asphalt Concrete
Use of Composite Rebar
Principles of Geosynthetics as Reinforcement in Soil Structures
An Engineering Design Approach for FRP Structural Beams
ASTM A913/A913M Grades 50 and 65 - The Perfect Steel for Seismic Design

Fall Technical Conference (West Virginia University Institute of Technology)
Federal Construction Contract Administration
Construction Law: Rights, Duties, and Liabilities of the Design Professionals
Managing the Design-Build Process
Construction of the Öresund Fixed Link Between Sweden and Denmark
The Architects Role in Construction Projects
Automation and Robotics in Construction
Use of Constructed Wetlands for Industrial Wastewater
Marmet Lock Replacement - Innovative Design and Construction Studies
GIS Applications for Engineering
Construction of a Typical California Pre-stressed, Post-tensioned, Box Girder Bridge

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