

In Industry, The Title "Engineer"

Should Be Issued Only

To Licensed Engineers

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ABSTRACT: *Operating on the belief that older engineers become technically obsolete and faced with a declining supply of its preferred young engineers from college, industry turns to alternative ways to fill the engineer ranks. Less than qualified engineers are issued the title Engineer and go forth to practice. With nearly every product or equipment affecting the public's safety in some way, this practice tends to deny the safety protection the law says the public is entitled to. This paper examines the practice of awarding the title Engineer in industry and exempting 1,000,000 from regulation and projects future consequences of this action and corrective measures which need to be taken. The problem of Technical Societies certifying individuals without legal regulations also is discussed currently.*

INTRODUCTION

Industry today in practice is exercising what the author proposes to be regulated by law when it issues the title Engineer to persons other than the fully qualified having an ECPD approved education, experience and good character. Let me cite a portion of a National Society of Professional Engineers, July 1972 note on Registration:

Legal registration of members of the engineering profession is an exercise of the police powers inherent in every state for protection of the public safety. Such registration gives assurance that only those persons who meet fixed educational and experience requirements may practice engineering. Practically every design, every operation and every process undertaken by the engineer has public implications. Engineering therefore, comes under the police powers of the state. Regulation is achieved in two ways; either by protecting the use of the title or by regulating the actual practice of the profession. Both methods have been declared constitutional by the courts.

THE MODEL OF THE FUTURE — NCEE'S MODEL LAW

The Model Law, as adopted and amended by the National Council of State Boards of Engineering Examiners (NCEE), is proposed by the author to be the criteria for defining the Practice of Engineering, Engineer-in-Training, Professional Engineer, Right to Practice and Exemptions. Further, it is proposed that appropriate Federal and State registration and/or licensing laws be enacted or amended to reflect the intent of the Model Law and that industrial organizations, companies, firms, and/or corporations employing, engaging and/or utilizing engineers be required to comply with the Model Law are given as follows:

Practice of Engineering: "The term, 'Practice of Engineering' within the intent of this Act, shall mean any service or creative work, the adequate performance of which requires engineering education, training, and experience in the application of special knowledge of the mathematical, physical, and engineering sciences to such services or creative work as consultation, investigation, evaluation, planning, and design of engineering works and systems, planning the use of land and water, teaching of advanced engineering subjects, engineering surveys, and the inspection of construction for the purpose of assuring compliance with drawings and specifications; any of which embraces such services or work, either public or private, in connec-

tion with any utilities, structures, buildings, machines, equipment processes, work systems, projects, and industrial or consumer products or equipment of mechanical, electrical, hydraulic, pneumatic or thermal nature, insofar as they involve safeguarding life, health or property, and including such other professional services as may be necessary to the planning, progress and completion of any engineering services."

Engineer: "The term, 'Engineer' within the intent of this Act shall mean a person who, by reason of his special knowledge and use of the mathematical, physical and engineering science and the principles and methods of engineering analysis and design, acquired by engineering education and engineering experience, is qualified to practice engineering."

Engineer-In-Training: "The term 'Engineer-In-Training,' as used in this Act, shall mean a person who complies with the requirements for education, experience and character, and has passed an examination in the fundamental engineering subjects, as provided in this Act."

Professional Engineer: "The term, 'Professional Engineer,' as used in this Act shall mean a person who has been duly registered and licensed, as a Professional Engineer by the Board."

Right to Practice: "The practice or offer to practice for others as defined in Section 2, Practice of Engineering, by individuals registered under this Act through a corporation as officers, employees, or agents is permitted, subject to the provisions of this Act; provided that one or more of the corporate offices of said corporation is designated as being responsible for the Engineering activities and decisions is a Professional Engineer, under this Act, or under the Engineering registration law of another state, territory or possession of the United States, or the District of Columbia; provided that all personnel of said corporation who act in its behalf as Professional Engineers are registered under this Act, or are persons lawfully practicing under Section 23; and further provided that said corporation has been issued a certificate of authorization by the Board, as hereinafter provided. The requirements of this Act shall not prevent a corporation and its employees from performing Engineering services for said corporation, or subsidiary, or affiliated corporations. All final drawings, specifications, plans, reports or other Engineering papers or documents involving the practice of Engineering as defined in this Act when issued, or filed for public record, shall be dated, and bear the signature and seal of the Professional Engineer who prepared or approved them.

A corporation desiring a certificate of authorization shall file with the Board an application, using a form provided by the Board, listing the names and addresses of all officers and board members of the corporation, and also of an individual or individuals duly registered to practice engineering in this State who shall be in responsible charge of the practice of engineering in the State through said corporation, and other information required by the Board. The same form, giving the same information, must accompany the annual renewal fee. In the event there shall be a change in any of these persons during the year, such change shall be designated on the same

form and filed with the Board within thirty days after the effective date of said change. If all of the requirements of this Section are met, the Board shall issue a certificate of authorization to such corporation, and said corporation shall be authorized to contract for and to collect fees for furnishing Engineering services.

No such corporation shall be relieved of responsibility for the conduct or acts of its agents, employees, or officers by reason of its compliance with the provisions of this Section, nor shall any individual practicing Engineering as defined in Section 2 be relieved of responsibility for professional services performed by reason of his employment or relationship with such corporation."

Exemption Clause: "This Act shall not be construed to prevent: (a) Other Professions. The practice of any other legally recognized profession. (b) Temporary Permits.

The practice or offer to practice engineering by a person not a resident of or having no established place of business in this State, provided such person is legally qualified by registration to practice engineering, as defined in Section 2(d) herein, in his own state or country. Such person shall make application to the Board in writing and after payment of a fee of \$. . . may be granted a written permit for a definite period of time not to exceed one year to do a specific job, provided, however, no right to practice engineering shall accrue to such applicant with respect to any other words not set forth in said permit.

(c) Employees and Subordinates. The work of any employee or a subordinate of a person holding a certificate of registration under this Act, or an employee of a person practicing lawfully under Subsection (b) of this Section; provided such work does not include final engineering designs or decisions and is done under the direct supervision of and verified by a person holding a certificate of registration under this Act or a person practicing lawfully under Subsection (b) of this section."

The Older Engineer Obsolescence Syndrome: Professors Dalton and Thompson in 1971 published findings from management behavioral sciences research study which quantified the mechanisms associated with management's widespread belief that "older engineers tended to become obsolete," and on that basis so they act. Their summarized findings stated that:

Not only does the performance of engineers peak in their middle to late thirties, but also there is a definite trend toward earlier obsolescence and the years of high performance are starting and ending sooner. This is a major finding of the study. What is more, say the researchers, this movement toward younger and younger obsolescence is occurring when the larger numbers of technically trained people are entering their forties and fifties than ever before.

Companies themselves, they argue, are in large part responsible for the problem with rigid performance appraisal systems, inequitable job assignments, and insensitivity to the needs of older engineers. These are some of the practices that must be changed. The researchers offer suggestions for making such changes and discuss some creative new approaches such as classes by cable television in the company's classroom, sabbatical leaves for employees, and portable pension plans.

Armed with the belief that older engineers in increasing numbers over forty become obsolete and thus less productive per dollar invested in salary, the engineer manager attempts to solve his believed problem by attempting to replace the older engineer with the younger engineer. Let's examine what's happening at the lower end of the engineer age spectrum as a consequence.

Attempted Utilization of Younger Engineers: Dalton and Thompson found that management had been attempting to give greater responsibility and more technically challenging work to ever younger and younger engineers in their thirties, at the same time that greater numbers of engineers were moving into the forty and fifty age groups. At the present time, however, this isn't working out too well because there are fewer and fewer engineering graduates being produced by the nation's colleges, and it won't get better for some time. Let's look at some figures.

Enrollment in engineering education dropped sharply in the fall of 1972 according to statistics released by the Engineering Manpower Commission of Engineer's Joint Council. The freshman class of Engineers fell 11% from a year previous making this the smallest entering class in the last 20 years. The survey covers 283 U.S. colleges and universities offering Bachelor's or higher degrees in engineering. Projections for the future on earned Bachelor's Degrees show continued sharp declines through the present decade, till 1980, according to:

YEAR FRESHMEN ENGINEERING ENROLLMENTS

1967	77,551	
1968	77,484 - 67	Decrease from
1969	74,113 - 3,438	1967 Level
1970	71,661 - 5,890	
1971	58,566 - 18,985	
1972	52,100 - 25,451	

Therefore, while management turns away from improved utilization and retraining of the large number of available older engineers, it tries unsuccessfully to fill the ranks from a supply of young engineers which decreased significantly between 1967 to 1972 levels. Where then can management secure the engineers needed during the decade of the 70's to solve the technological problems facing this nation?

Discussion of Intent: The time has come to bring the entire activities associated with the defined Practice of Engineering, and those who engage in and practice it, under the police powers of the Federal and State Governments, in so far as who actually is legally permitted to practice and their ethical conduct. The concept of continuing exemptions from the law is obsolete, misinterpreted and is a serious detriment to the fundamental purpose stated for engineering registration and licensing as stated by Section 1, General Provisions of the Model Law, which says:

In order to safeguard life, health, and property, and to promote the public welfare, the practice of engineering in this State is hereby declared to be subject to regulation in the public interest. It shall be unlawful for any person to practice engineering in this State, as defined in the provisions of this Act, or to use in connection with his name or otherwise assume, or advertise any title or description tending to convey the impression that he is an engineer, unless such person has been duly registered or exempted under the provisions of this Act. The right to engage in the practice of engineering shall be deemed a personal right, based on the qualifications of the individual as evidenced by his certificate of registration, which shall not be transferable.

Further, the practice of granting exemptions from the law can no longer be continued which treats certain engineering activities on the basis of whether it is a Federal project or domain, interstate commerce, intra-state commerce, industrial, consumer, or foreign. Let's look at all segments wherever the practice of Engineering is engaged in. In this way, all engineering will be covered no matter the specific end usage or means of financing and will close the loopholes which today, according to NCEE estimates, excludes 90% of the some 1,280,000 United States engineers from being required to be registered and regulated. With the shift in legal ruling emphasis from "Let the Buyer Beware" to today's "Let the Seller Beware" the time has come to implement the mandate of the court decisions by fully protecting the general public by requiring licensure of the 1,000,000 unregulated engineering designers of today.

ALTERNATIVE CONSEQUENCES OF CONTINUING TODAY'S PRACTICES

Utilization of Less Than Qualified Engineers: The Engineering Manpower Commission, in its report on engineering degree projections points out by chart.

. . . that if the demand for engineering graduates exceed the projected supply for the next several years as expected, employers may attempt to fill the gap by 'upgrading' people without a formal engineering education, or by hiring foreign nations, whose entry to the U.S. is currently restricted. If these alternatives fail to produce sufficient manpower, industry may be tempted to 'export' engineering jobs by shifting work to foreign locations or to 'import' technology by procuring engineering services from foreign firms.

It has been said that today some personnel recruiters' policy is, "If we can't find enough qualified engineering graduates, we will look to those we categorize as being qualifiable: That is those with Math or Science degrees, give them some training and make an Engineer out of him." To show factual evidence of this practice, a report prepared by Thomas L. Allen of the Massachusetts Institute of Technology, titled "Aerospace Cutbacks: Impact on the Companies and Engineering Employment in Southern California," his survey "showed that the aerospace industry was least likely to employ the engineers it had created out of draftsmen and technicians to meet supply shortages in the early 1960's."

More recently, in an article appearing in ELECTRONICS, March 15, 1973, Mr. Irvin Feerst, last year's unsuccessful IEEE Presidential candidate is quoted to have said, "It's common knowledge that companies use non-engineers to do design work." He proposes to make the practice illegal, similar to the way medical doctors and lawyers have restricted to.

To obtain a profile of those presently engaged in doing engineering work in the U.S., data from the Engineer's Joint Council is used. Out of some 1,280,000 people employed as engineers, 475,000 are non-graduates and 805,000 are engineering graduates; or in other words, one-third of the engineering work force are non-engineering graduates, while two-thirds are. This data is based upon both census and college statistics.

About 25 years ago, the so-called half-life of an Engineer's knowledge that was useful any longer, was said to be about 12 years. Today, that half-life is said to be only 5 years. Therefore, if a properly educated Engineer has had his half-life reduced over half in 25 years, what is the corresponding relationship for the less than fully qualified engineer and what will be the resulting consequence of the engineering design work turned out by these "so-called"engineers? Will all this be in the best interest of the general public? The author says, "No, it won't, nor can this be allowed to happen. The regulation of who practices engineering or is given the title Engineer must be broadened, and enforced based upon the proposed model of the future throughout all segments of commerce; this includes Federal, Interstate and Intrastate."

Attempted Regulation Circumvention: It recently came to the author's attention that some societies of technical, professional or management may have instituted already or are considering instituting the practice of testing and then certifying individuals who they examine to being qualified to render a professional specialty service. A case in point is the CDP issued by the DPMA, The Data Processing Management Association. The CDP initials are being placed after the individuals name, like the PE initials are placed for legally registered professional engineers. CDP in this case refers to the Certificate in Data Processing. Registered Professional Engineers should challenge anyone who, while designated only as a CDP, does in fact offer and/or render Professional Engineering services in the area of Teleprocessing and/or Telecommunication design engineering as defined in the Model Law, and then take appropriate complaint filing actions to the Board of Examiners for full enforcement of the law.

CONCLUSION

The public must be afforded the necessary safeguards against less than qualified practitioners of Engineering. To do this requires that the title of engineer in industry use be protected by law first, then everything else should be done to keep all engineers, young and older ones, at their peak qualifications through continued education and state re-examination. The proposed Model of the Future should guide the way.