

Systems And Product Safety/Liability- Government, Business And Professional Responsibility

Walter L. Elden, P. E., IEEE, NSPE/FES
System Safety Society
Professional Activities Committee

ABSTRACT: *With the era of "Let The Buyer Beware" now replaced by "Let The Seller Beware" the responsibility for placing safe systems and products into the hands of the consuming public, free from design deficiency and/or manufacturing defect, rests upon the shoulders of Businessmen and Professional Engineers alike, with the Government providing the catalytic agent necessary to guide the process. If those responsible fail to exercise their responsibilities and duties, and unsafe systems and products result, they can face liability loss. This overview paper presents Models of The Future to strive towards, serving to enhance system and product safety.*

INTRODUCTION

This is the first of seven papers [1-6] presented by the author at this session, solely devoted to professional topics. It is fitting therefore, in keeping with the conference theme, to set down this one engineer's thoughts, Attempting to Invent The Model Of The Future. The seven papers, attempt to address a specific segment of constructing the whole Professional model, but of course they only can deal with portions of the bigger model needed. It is with this need in mind that the author urges other Engineers to commit themselves to building a better IEEE future, by contributing their individual models in succeeding conferences to guide the Professional Activities of IEEE in its newest segment of endeavors.

SYSTEMS AND PRODUCT SAFETY

Up until very recently, the laws and court rulings were such as to say "Let The Buyer Beware" in matters affecting unsafe products. The laws essentially provided protective measures in behalf of corporations. Recently, however, new laws have been enacted and court rulings have reversed the direction previously taken, as a result of great pressure brought by the consumer [7]. Today, the laws and court rulings are saying "Let the Seller Beware!"

Two very good examples of how the law has been changed are demonstrated in the enactment of the Occupational Safety and Health Act of 1970 (OSHA) and the Consumer Product Safety Act of 1972 (CPSA). While OSHA addresses the safety and worker's healthy environment in the factory, the CPSA's purpose is to insure safe products which the consumer comes in contact with around his home, essentially. A one week short course, attended by the author at UCLA in August of 1973, pointed out by Engineer-Lawyer instructor George Peters that the businessman and the designer are both liable for the systems and the products which they place in the stream of commerce, that are unreasonably hazardous, in the eyes of a jury of lay people [7]. As a result, new policies, procedures, standards, qualifications and attitudes are needed to be put into practice, to insure responsible designs and defect free goods are maximized.

Since today's technology has become so complex, it is hardly likely that products will stand completely alone for long and not be affected by another product, equipment, or the environment which it is a part of. On the other hand, the product may itself affect others, including the environment. For these reasons, the Model of The Future must take a much broader perspective; it must take a Systems Safety approach.

From the words of the Honorable John H. Reed [8], chairman of the National Transportation Safety Board, speaking before the 55th Annual Convention of the American Gas Association in San Francisco on October 16, 1973, he stated in part, "This study basically discusses the utilization of system safety by the pipeline industry. What we attempted to say is that future accidents can be prevented before they occur if you look for them in a systematic way. The big question is how do you accomplish this.

The answer is by first identifying all hazards that exist. This includes looking at your physical system, how you *operate* it, the *people* who operate it, and the *environment* in which all this takes place, with special emphasis on the inter-relationships among these three areas. By utilizing the techniques of system safety, as proven effective in the aviation and aerospace industries, we believe that all hazards existing in a pipeline system can be identified.

A pipeline operator should never be in a position to say "I didn't know that could happen" after an accident has taken place. By use of these techniques you can visualize the inter-relationships of all the components of a pipeline system, and bring accident possibilities into focus automatically in order to solve your problems before they occur."

THE PRACTICE OF ENGINEERING REGULATED BY LAW

According to the Model Law, adopted by the National Council of Engineering Examiners [9], "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 is very clear to the author that this implies that if engineering is not regulated, then a danger exists which could bring harm to the general public. Therefore, it is for the purpose of protecting the public's safety that engineering and those who practice engineering must be regulated. Each state's licensing board will be quick to point out that they exist to promote the public's welfare and not that of the engineers. The next two sections provides quotations from NSPE Publications regarding registration.

REGISTRATION FOR ENGINEERS IN INDUSTRY [10]

"Registration for engineers in industry has taken on new meaning and importance with increased attention by the public and all levels of government in safety of products and processes and the demands for greater protection of the environment. In addition, industry faces problems of liability for the design and manufacture of its products. For these reasons both industrial employers and individual engineers in industry have found it desirable to identify engineering employees as having met the minimum qualifications to perform engineering services in accordance with the state registration laws."

"Registration or licensure is a legal acknowledgement by a competent body that the person to whom a certificate is issued possess a specified degree of competence and has demonstrated his qualifications. Registered engineers thus have the legal status to practice their profession. In exchange for the registered engineer's obligations to the public and to his profession, he is granted certain rights

through legal rulings by virtue of his being registered. For instance, it has generally been held by the courts that a person cannot collect on a contract for the rendition of engineering services unless he is a registered engineer. Contracts for engineering services entered into by an engineer who is not registered are considered by the courts to be invalid, and thus unenforceable. It has also been held that a person is unqualified to testify in judicial proceedings as an expert witness on engineering matters unless he is a registered professional engineer."

The profession of engineering [11, 12]: "The work of no other profession more truly concerns the safety of life, health and property than does engineering. Protection of the public in its practice provides legislative justification and established constitutionality of registration legislation. Protection of the profession, its standards and its standing, is an associated benefit. But the two benefits are inseparable."

"A profession is judged by the qualifications of all who use its name, by the failures of the incompetents and by the conduct of the unworthy, unless a clear dividing line is established in the public recognition between the lawful practitioners of the profession and those who are not admitted to practice. A profession should be empowered to disown those who hold themselves out as belonging to it without proper qualifications or character, and to bar the unfit and the unprincipled who seek to practice in its name."

"Registration places the force and sanction of the law behind the desire of the profession to maintain a clearly recognizable line of demarcation between the engineer and the non-engineer. It places the agencies of the law behind the efforts and aspirations of the profession to maintain high standards of qualification and ethical practice."

"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."

"If engineers want professional status comparable to that of the medical and legal professions, they should become licensed. It is only by the use of a licensing provision that engineers can be truly given the stature of professionals. It is foolish for a man to spend a college career training to be an engineer, work as an engineer, and then have no standing before the law as a professional because he is not licensed."

The practice of engineering — Model Law [9]: The Model Law of NCEE states that "the practice of engineering is subject to regulation in the public interest" and "it shall be unlawful for any person to practice, or offer to practice, engineering . . . unless such person has been duly registered or exempted." Therefore, let us examine closer how the Model Law defines the practice of engineering so we may better assess the future implications upon individual engineers becoming licensed.

(4) *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 connection with any utilities, structure, buildings, machines, equipment, processes, work systems, projects, and industrial or consumer products or equipment of a 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.*

A person shall be construed to practice or offer to practice engineering within the meaning and intent of this Act, who practices any branch of the profession of engineering; or who, by verbal claim, sign, advertisement, letterhead, card, or in any other way represents himself to be a Professional Engineer or that he does perform any engineering service or work or any other service designated by the practitioner which is recognized as engineering."

It certainly appears clear to the author then that the Model Law applies to all engineers engaged in practice in industry, including industrial and consumer products. Therefore, why are there some 800,000 engineers in the U.S. who are not registered?

Government responsibilities: It is the author's thesis that existing registration laws are not being fully enforced, particularly regarding the so-called exemption provision. For example, here in the State of Florida, it is the practice of the State Board of Professional Engineers and Land Surveyors SBPELS in administering Florida Statutes 471 to take the position that "industry" is exempt from complying with the law but that "turnkey contractors" are not [13]. From a systems safety point of view it is hard for the author to understand how so many products and equipments made by "industry" are ignored in this approach to protecting the public.

If the SBPELS won't regulate industry, the author asks why then does it not enforce the other provision under exemption, which "exempts regular full time employees of a corporation not engaged in the practice of professional engineering as such, *who are the subordinates of a person in responsible charge, such person being registered professional engineer . . .*" While the corporation may be exempt through SBPELS interpretation there isn't an exemption for every engineer also, and at least one responsible person must be registered in that corporation. It is the author's viewpoint that the SBPELS *must* assume its role of responsibility to see that this provision of the law is enforced in every industry.

Let's state this another way. While it is generally expressed that engineers in industry are exempt from registration, the language of Florida's Law attaches the condition that the exempt engineer must be under at least one licensed P.E. who is the one in *responsible charge*. It is this misconception that needs clearing up.

The following discussion is contained in the 1972 NCEE Proceeding Yearbook [14], regarding what state registration boards owe to members of the profession:

It has been said that state registration boards do not owe protection to the members of the engineering profession per se; that their sole responsibility is to the public in the protection of the public health, safety and welfare.

Upon the surface of this widely used statement is found the first consideration of public trust in office holders. However, the statement has another deep and serious meaning. A part of that same public trust lies in the insurance that high professional standards are maintained; that only those truly qualified to practice are licensed. It therefore behoves the boards of registration to take those actions and make those decisions which assure the public of a qualified engineering profession, able to respond to the needs of progress.

In this sense, boards of registration bear some responsibility for the protection of the profession. A part of their duty is to maintain standards for license which, within the state statutes, are progressive.

In another area where Government needs to make changes, regards the Federal Government in the Defense Military and Aerospace work. While local state laws exempt Government officers and engineers, the author proposes to motivate the Federal Government and Congress to require its contractor's to engage licensed registered engineers in places of responsible charge of doing engineering work. It has been the author's past 16 years experience that because the Federal Government hasn't required this, that a vast majority of all industry engineers never have been motivated to become a P.E. and so they haven't. Today, with so much career re-training, these ex-government contractor engineers are designing industrial and consumer systems and products, directly affecting public safety, and are not being regulated under State law as a result of these past errors [2].

The author further urges that the OSHA and CPSA laws either be amended or have administrative rulings issued requiring designers and quality engineers who are in responsible charge of products, to be licensed, and regulated. With these steps, the day approaches closer when a national licensing law will be necessary.

Business Responsibility: There exists in the mind of the author that conflicting goals between supporting a corporation's profit objectives and the public safety responsibility, which the law places upon the engineer in industry, creates a conflict of interest for the engineer as an employee. He then goes about in a continual dilemma caught between economic pressure and legal penalties, as a companion paper discusses [3].

One solution would be for industry to engage engineers on a contract basis for periods of at least two years duration. Another, would be to have the engineering department organization formed into a separate corporation, with it then being certified to practice Professional Engineering by its state board. In this arrangement, a corporate officer, a vice president or the chief engineer would have to be a licensed P.E.; and not only he but the engineering corporation would be better regulated in its practice of engineering as a result. At any rate, a degree of protection for the overall members of the engineering staff would be afforded with either the contract or corporation concept which doesn't exist today.

Lastly, employers should subscribe to the "Guidelines To Professional Employment For Engineers and Scientists" adopted in February of 1972, and endorsed by 20 societies as of August 1973, representing a combined membership exceeding 750,000 [15].

Professional responsibility: The world's largest engineering organization, the IEEE, must accept a large responsibility for the low esteem, recognition, respect and rewards which the Electrical Engineers, the greatest discipline number of the 1,280,000 practicing engineers, in the U.S. have today. The author places this primarily upon the single minded mission which IEEE's 90 some year's evolution has concentrated upon, this the "purpose of scientific and educational, directed toward the advancement of the theory and practice of electrical engineering, etc." In pursuing this single minded purpose some 300,000 or more electrical engineers have been made to believe that technical excellence alone was enough.

This is where IEEE leaderships of the past were wrong. Technical excellence is only one half of the right hand side of the equation which should equal being a total engineer. The missing parameter was finally put into the equation in November of 1972 when, by a 86% affirmative vote, the IEEE membership authorized adding to IEEE's purpose "professional, directed towards the advancement of the standing of the members of the profession it serves, etc." Therefore, using the correct equation: *Total Engineer Equals Professional plus Technical Excellence.*

The IEEE Policy Statement #23 titled, "Registration of Engineers," is weak and gives lip service to the licensing of engineers. The author urges the IEEE Board of Directors to, (1) strengthen this, and (2) adopt a positive requirement that IEEE membership includes becoming a licensed P.E. as a condition. Further, IEEE, as a not-for-profit corporation in the State of New York, should (1) be required by New York law to be certified under local registration laws, (2) to have a responsible engineer in charge be licensed as well as a corporate officer be a P.E. In particular, the engineer in charge of preparing and issuing Standards for sale to the public should be a licensed P.E. to protect the public. Further, at least one officer of each IEEE Section in the U.S. should be a P.E. too, and secure certification for the Section under state law.

To the author's knowledge, IEEE does not require its membership to subscribe to any Code of Ethics. This is a fundamental requirement for any professional society. Therefore, the author urges the IEEE Board of Directors to (1) endorse the Code of Ethics of the National Society of Professional Engineers [16], (2) to require its membership to agree to practice in accordance with it, (3) to establish National, Regional and Sectional ethical practices and review committees to enforce the code, and (4) to provide the support necessary to legally assist any engineer who is subjected to economic pressure, penalty or even loss of employment as a result of ethically practicing his legal profession in accordance with the code. In case of dispute between engineer and employer, the engineer should be judged on ethical charges by his professional peers, and not his employer.

CONCLUSION

Lastly, it remains up to the hundreds of thousands of individual engineers across the U.S., to finally take a look at his or her profession, what it really means to you, and what you would like for it to mean to you, and in the eyes of the public, whose safety the profession is responsible for, say in five or ten years. More particularly, this message goes out to the future engineering profession leaders, the under 40 year age group to commit yourselves to work for change, yes change IEEE, the profession, and your own individual place of practice. First, make up your mind to do something, and then do it. The author has tried to do a little bit in presenting these seven professionalism papers. Now, what will you do?

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