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TWO HUNDRED YEARS — AND MORE — OF ENGINEERING IN THE UNITED STATES

Presidential Address of Charles A. Parthum

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Introduction

There is a tendency in this bicentennial year to review the past two hundred years and to speculate on the future. I think this is appropriate. In the next few minutes, let's look at what has gone on before — and what the future may present to the engineering profession. Let's look at these issues from Society's viewpoint, from the viewpoint of the entire engineering profession, and most important, from the viewpoint of young engineers (college graduates) and of the public in this the start of our third century.

I hope this discussion will raise some questions and present some thoughts that can be considered individually, in companies, and particularly by younger engineers making decisions on which will hang their future careers and those of the profession.

History

Last fall at a ceremony in Lawrence, Massachusetts, the American Society of Civil Engineers presented a plaque to the Lawrence Experiment Station, naming it a National Historic Civil Engineering Landmark. Within the last two weeks, ASCE named the Granite Railway in Quincy as a National Historic Civil Engineering Landmark, and next July a presentation will be made honoring the Hoosac Tunnel in North Adams, Massachusetts. We in New England are fully aware that we are surrounded by history and that this recognition is deserved.

At the spring conference of the New England Council, American Society of Civil Engineers, held in Durham, New Hampshire on March 13th, former ASCE Vice President Ivan Viest presented a very interesting illustrated lecture on the history of ten different civil engineering accomplishments that have received the Landmark Award. In his remarks to the over 100 students at the conference, Mr. Viest reminded them that all physical development in the United States over the last two hundred years was accomplished with the help of engineers. The roads, the buildings, the railroads, water and sewer systems, dams, locks, airports, etc. all involved civil engineers. We civil engineers have a rich heritage. Things were done when they were needed and had to be done, and our country grew, developed and prospered. There

was no red tape! Even the country's first President, George Washington, was a civil engineer!

If we wish to go further back in history, back to the Roman empire and perhaps beyond, we find that the success of any nation depended upon its ability to build and improve — all involving the work of the engineer.

One hundred twenty eight years ago, civil engineers in the Boston area founded the Boston Society of Civil Engineers. As we know, four years later the American Society of Civil Engineers was founded in New York by some of the same individuals. Since that time, the Boston Society of Civil Engineers has existed, has grown, has remained strong, has held to tradition and has served as a meeting place for engineers to discuss projects, get ideas, transmit knowledge and as a place where engineers could get together and "shoot the bull." The fact that the society has been in business 128 years proves that it has served both engineers and the public well.

I am a believer in tradition; tradition is one of the things that hold an organization together. It has been a tradition with the Boston Society of Civil Engineers to have the retiring president present an address every year at the annual meeting. I welcome this opportunity, and I hope that the Boston Society continues this tradition. Who knows; in some year, something of value may be stated that may have an effect on the future.

Two years ago, after much prodding and the "never say die" dedication of certain members of the Boston Society and the Massachusetts Section, ASCE, the Boston Society and of the Massachusetts Section of ASCE merged. This was long overdue and tonight we start our third year, just as our country starts its third century. What do we have to look forward to?

The Future

After the second world war, the United States turned its attention to improving itself. Massive highway systems were built — with engineers. Transportation modes were improved; more, bigger, faster cars, diesel locomotives and jet planes were introduced, all with engineers' help. We flew to the moon, and nuclear power grew up, all with the help of engineers. By the mid 1960's nothing seemed impossible. The country's horizons were practically unlimited and engineers continued to guide the technological aspects of this expansion.

Then something happened. It did not happen overnight, although looking back, it may seem that way. Concerned citizens began to ask, where are we going, what are we doing, how much is it costing, and what is happening to our resources?

We began to look at our environment. This became popular. Politicians saw the good in this attitude and rode the environmentalist wave because, as we know, everyone needs a cause. As a result, laws were passed aimed at the entire cleaning up of our water and air from the pollution of two hundred years of progress — with a ten year goal!

But something else also happened, or rather, failed to happen. No one asked the engineers if this 100 per cent clean-up was technologically or practically possible. Perhaps we did not try very hard to educate the public that this was not a feasible goal, but anyway we were not successful.

Thus a "monster" was born. Those old political standbys called "blue sky" and "motherhood" had a competitor. That competitor was to get elected on a platform of "clean rivers and clean air". Laws were passed, money was appropriated; the country ordered a "clean-up" and the problem from the politician's and public's point of view appeared to be solved.

As we all know, the pollution problem has not been solved; instead attempts to solve it have met with frustration. The public was sold a bill of goods that was impossible to achieve. The politicians did not consider the consequences of their actions on others. The effects now echo into every walk of life, and no one has dared admit the mistake. In fact, the pollution problem has gotten worse. We now are caught up in the Government's patented philosophy; if a law isn't working, issue more regulations. The wheels of progress have thus been slowed by Government regulation, stopped in many instances by misguided environmental impact statements, and pushed backward by ever changing red tape, with the public now saying, "Wait until next year; maybe a new federally aided program will give us more money."

In the March 1976 Public Works Magazine, an editorial entitled "Design by Decree," included these pertinent statements:

> "The municipal consulting engineer in the United States has traditionally enjoyed freedom in exercising his judgment in designing water supply and sewerage facilities. By having freedom of choice in reaching decisions and using it ethically, he has attained a peak of professionalism rivaled only by the practitioners of medicine. With the advent of regulation of design practice by state and interstate authorities when serving municipalities, there was some restriction of their freedom. But the power of those regulatory bodies, headed by engineers, was also tempered with judgment in most instances.
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> Within the last few years, the picture has changed and the respected engineer-municipal client relationship has been challenged to the point where the professionalism of the consultant is in jeopardy. Where does the fault lie? Could it be over regulation caused by the funding power of the federal government? With the billions of dollars at stake in meeting the deadlines of the water pollution control act, the corporate interests behind equipment vendors and contractors could be waxing to the point of unprecedented greed. It is conceivable that standards of designs and strings on the funding can be made so tight that interpretation is possible only at the federal level — and possibly by a single prejudicial group in power. Dare one suggest that the prospective narrowness of such interpretation could be influenced by vendor-cor-

porate interest? Situations have been coming to light to indicate that this could be happening. Should it continue to be tolerated, honest competition between equipment manufacturers could be destroyed. There is already feeling among some manufacturers that the municipal market is not for them. Thus we have two American pedestals being threatened: The first is the spirit of competitive manufacturing in the pollution control field — the second which could be most fatal, the professional stature of the consulting engineer. What will the result be — design by decree?"

The above asks some very basic questions. It also asks, where does the fault lie? Who is to blame? Certainly not the politician, after all his heart was in the right place. Certainly not the public, they believed the politician. Certainly not the construction contractor, because he would like to build these projects if he were only given some to build.

The blame has been heaped on the engineer because things are not moving. Undeserved? Yes and No. It's undeserved because we knew all along it would not work. But perhaps part of it is deserved because we didn't look out for ourselves and the country. We were not vocal enough.

I have been working with the American Consulting Engineers Council, the American Society of Civil Engineers, the Water Pollution Control Federation, and the National Society of Professional Engineers and all of these societies are up against a stone wall. The federal government has become anti-engineer. Undeservedly, but true, the engineer is being attacked on all sides. With the major efforts now being through anti-trust actions, procurement regulations and professional liability — and all of these snowballing — a slow-down exists that is putting engineers out of work. With engineers out of work, designing and planning slow down. This will have a real effect on the entire country.

What is the cause of all this? Why it's fundamental. It's as old as time itself. It's a question of saving face. The government, in its endeavor to make a better world, passed laws, expanded and hired new people, mostly right out of college with no experience, put them in positions of great responsibility and then allowed them to run hog wild. Where was the older professionals' guidance, both in government and out? Now, although promises were made that could not be kept and things are getting more mixed up, government officials will continue to blame others as a face saving gesture. Are we to take the blame? Should we as professionals take the blame? Let's look at the picture. There are more engineers, more registered professional engineers, working for the government now that ever before. They must act on their best judgment and common sense — instead of expending their energies in frustrated fault finding. They must "tell it like it is." They must not explain that their hands are tied by stupid regulations, but instead act like professional engineers and fight to correct the situation. They must not feel that they must cover their trails because of legal and audit clouds that govern-

ment hangs over their heads continuously. Question: If engineers in responsible positions, both in government and out, cannot control misguided actions, do not speak out, but instead let other interests sway their better judgment — should they be called engineers? Should they be allowed to continue to be registered? Are they hypocritical in belonging to professional societies?

I have been personally requested by professional engineers in positions of responsibility to alter my best engineering judgment in order to expedite some project because it appears to be the politically expedient thing to do. Something is dead wrong. Either these professional engineers are afraid or they don't know what professionalism is.

I wonder if academia has a responsibility that it is not aware of, not able to teach, or not willing to face. Most graduates do not have (nor should they be expected to have if no one taught them) much feeling for the professional side of engineering when they graduate. All of this then leads to what in my opinion are necessary, essential future responsibilities of the Boston Society of Civil Engineers Section.

Future Essentials

At Student Night on February 26, 1976, in Lowell, the subject of the presentation was "Unionism and Civil Engineers". The discussion was led by a man experienced on both sides of the fence. He emphasized that unions are not for professional engineers, simply because unions attempt to upgrade all of their members at the same time and at the same level while professional engineers improve them selves individually without having to pull everyone else along with them. During the question and answer period, it became clear that there was misunderstanding and confusion in the minds of civil engineering students. It was implied by some students that if professional societies cannot go to management and get salary increases and physical improvements, such as a new desk for the individual engineer, what good are these professional societies?

In other words, the students were equating professional societies with unions and expecting each to do about the same thing. You, I, we, all have to give them an answer and soon. These students are going to be the future profession and if government continues to expand, more and more of them will become our bosses in the future whether we like it or not. They have got to gain an understanding of what a professional engineer does, what his problems are, what his philosophy is, and the value of professional engineering societies.

Who educates the engineer once he leaves college? In the January 1976 issue of "Corrosion" magazine, an editorial appeared which carries some important thoughts along these lines: Post graduate engineering education in the United States is a haphazard affair, including on the job training, technical societies, university short courses, and the products of over eager publish-

ing houses. One is impressed frequently with the fact that most failures that occur in the engineering world were not caused by lack of new information, but by the failure to use existing available knowledge.

Coming upon us like the plague is the specter of malpractice suits. Medical doctors, unfortunately, have been the chief targets, but every professional group will ultimately be affected. We will be held increasingly more responsible for our actions as professionals. The move to multiple-party liability in the law is a result of the demand by society for competent (maybe perfect) professional performance.

Who, then, provides a cohesive basis for technological information transfer and accreditation? Is it in fact the professional engineering societies? I think so. These societies can exert an important influence on the course of the economy and the quality of the nation's engineers.

The argument for increased support of societies by their members can be made along several lines. For example, any member of an engineering society has at his easy call services of many professional acquaintenances. On any given day, he can call friends in industry or university organizations and obtain help in solving pressing problems. This alone is worth more than the nominal support which some members now provide.

The engineering societies offer opportunities for individual advancement. Today accreditation of technologists is at a trivial level. Despite the great interest in professional engineering, the title of professional engineer does not carry the impact it should. It should have a status equivalent to that gained by passing the bar exam or the medical examinations. But it does not. Why not accredit different groups — technicians, practicing engineers and applied scientists? Should we have a separate accreditation for registered engineers not affiliated with professional societies and for registered *professional* engineers?

The engineering societies provide many functions which benefit individuals as well as their respective companies. They expose their members to a broad intellectual base. Engineering societies provide a peer review which frequently is not possible within a particular company. Often a person is an individual specialist with a small company or even a large one and others in the company are not able to provide a critical review of his ideas. On the other hand, within a engineering society meeting, a paper may be constructively criticized and the author thus enlightened. The society also serves as a management training organization through member participation in society activities. Often the judgments of management operations provided by peers in an engineering society are as severe and critical as they are within companies. Societies also serve as employment brokers. Companies interested in employing new people have ready access through contacts made in societies. Conversely those who find it necessary to obtain other employment have ready access to many possibilities through acquaintances made in engineering societies.

The Boston Society should continually look at and assess ways in which its value to engineers can be improved. Let's also find out how the needs of companies can be met more effectively and also how companies could support more extensively the activities of engineering societies. We should make a greater effort to identify and offer the benefits of professional engineering societies to students and recent college graduates.

Engineering societies are as important to the practicing engineer as the universities are to the undergraduate. We should treat the Boston Society of Civil Engineers Section accordingly and look more energetically and carefully at our effectiveness.

It may not be too long before a requirement for renewal of a license to practice engineering will be the showing of evidence of continuing education and upgrading of knowledge in one's chosen field. The question of how to achieve continuing education credibility for future renewals of registration certificates must be addressed by professional engineering societies. No other civil engineering society is in a better position to do this than BSCES/ASCE, technically as well as professionally. If BSCES/ASCE and other societies on a country wide basis do not assume these responsibilities, more and more graduates will be "trained" (and bossed) by politicians, lawyers and, more recently, accountants, all to the detriment of this country in its third century.

Since the future belongs to those who prepare for it, we must become dead serious as a profession or we shall surely become dead as a profession.