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JOURNAL OF THE
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YESTERDAY AND TOMORROW

Presidential Address by Ernest L. Spencer

(Presented at the Annual Meeting of the
Boston Society of Civil Engineers, March 24, 1971)

The 1969-1970 academic year witnessed a decline in engineering enrollment according to the Engineering Manpower Commission of the Engineers Joint Council. The nation's engineering schools lost 9,500 full-time students. This is in spite of a 5% annual growth rate in the total number of first degrees awarded to male students in the United States.

The decline was most noticeable in full-time master's degree candidates, an 18% decrease from the previous year. Due to changes in draft deferments, engineering master's degree enrollments have dropped from 34,000 in 1967 to 20,000 in 1969. Doctoral degree candidates dropped approximately 10%. An increase in foreign graduate students, although substantial, accounted for only about 2% of the loss. Evening and part-time enrollments, however, did increase, especially in technology-type programs. This seems to indicate that students have a strong desire to work at their profession while studying for a degree, both at the undergraduate and graduate level.

Undergraduate enrollments have decreased, primarily in the first and second years. Evidence at hand indicates that 1971 will see a sharp decline in the number of freshman engineering students. The upperclass students undoubtedly feel that they have made their commitment and are going forward to complete their engineering education.

Many authorities feel that an engineering education is about the best preparation for life that is available to young people today. It forms a solid foundation upon which to build a career in law, architecture, public health, urban planning; to be brief, in our technological society, an engineering education is in itself the basis of a liberal education. the foundation of an engineering education is the training in logical thinking; the collection of the essential raw data, sifting and analyzing these data, and then formulating a possible solution. What better training does one want in order to plan his life and effectively execute his plan? It seems no exaggeration to say that an engineering education will be to the 70's what a liberal arts education was to the 50's. Engineering needs those who can see in the profession a means to a wider end, not merely an end in itself. For example, it is worth noting that today most graduate management business classes are made up of a large percentage of engineers. Engineering graduates have been known to enter the ministry and they have also become medical doctors.

The projected long-range needs for engineers and Civils in particular through the 1970's are expected to be substantially higher than can be met by the number of graduates being produced at the present enrollment levels. The present day major fluctuations in employment conditions for engineers must not be interpreted as an indication that engineering is fading away and is not to remain an attractive career choice. What are some of the reasons for this great change in the number of engineering students and what might be considered as means to reverse this downward trend in enrollment?

A recent report supported by funds from the Ford Foundation and submitted to HEW made several suggestions that might be worth considering. The report indicated that faculty members should be drawn not only from those who have spent their life in academic pursuit but also from persons with wide experience in society. This statement is also supported by the ASCE in its Guidelines for ECPD Inspectors. Today's students should be exposed to the practical aspects of engineering as well as the theoretical. All that now needs to be done is next to impossible, i.e., to convince the administrators of an engineering curriculum, deans in particular, of the wisdom of a faculty that consists of a few practical people and is not 100% research oriented. One large engineering school reports that the administrators refused to interview a candidate for a position on the Civil Engineering staff solely on the position that the man did not possess a Ph.D. degree. The candidate had an enviable record of 20 years of experience with considerable time as a project manager. It is rather ironic that today's engineering faculties are trying to teach young people how to make decisions in the engineering world that they, the faculty, have never been called upon to make for themselves.

Another point made in the report was that, at nearly all schools, students are expected to learn from reading assignments, attending classes, listening to lectures, conducting routine laboratory exercises, writing skeleton reports, and taking examinations. The report suggests that perhaps there were other ways to subject young minds to the learning process that would benefit students who are not attracted by the present method. A curriculum with a generous sprinkling of projects, work units to be completed at the student's own pace, seminars with student presentations and seminars with presentations by practicing engineers might be well received by today's embryo engineers. It would appear that the cooperative work plan of education might well be one of those ways – especially in engineering. Perhaps the part-time students referred to previously have already accepted this plan of education, i.e., a plan that combines classroom learning with practical applications, as one of those "other ways".

The report raised the question as to why only persons in the late teens and early twenties, for the most part, attended college. Could it be that this is one of the causes of the so-called "generation gap"? Colleges should be encouraged to

recruit older students to attend class with the youngsters. A work-study program would probably be necessary to enable the older student to finance his education. Since many of the part-time and evening students are usually older than most of the day students, it could conceivably be of great benefit if more of the day students had some of their classes scheduled with these evening students. The older student might discover "what's with" the younger set and bring about a "peace with dignity" between the older "degenerate" generation and the younger "progressive" generation.

Engineering since its beginnings has always been thought of as a creative profession. The early works of engineers or master builders as they were called, such as the ancient temples, bridges, aqueducts, medieval churches and early skyscrapers, represent a continuing sequence of creative acquisitions. These early civil engineering achievements were followed by the more recent attainments in mechanical, electrical, chemical, aeronautical, nuclear and space achievements of great brilliance. To me, these accomplishments are only indicative of the bright future that lies ahead. Unfortunately, very recent past history indicates that many activities of engineers are not thought of as being areas of great brilliance by all, especially by some students. These students, at least the more radical ones, somehow see engineering, and to some extent the physical sciences, as being heavily corrupted with the so-called false values of the "Establishment". These students feel that engineers have been enslaved by the military, the polluters, and the exploiters.

Perhaps this image as seen by the young is a correct one to those who do not know much about engineering and whose minds can understand little about conditions outside their own narrow area of involvement. In the first place, due to the professional ethics that frown upon self-laudatory statements, unlike politicians, few engineers are known to the public to have taken an active role in public life and in defending the public good. Although a change is now taking place, in the past the professional societies have not generally made public their opinions on controversial issues of a technological nature and of social importance. This has left many young people a little cold. They want to be part of an active and progressive group that is concerned with the world in which they would like to live.

A more logical explanation of the student's anti-science and anti-technology feeling might be the fact that most of these students are less than 25 years old. They have had a short life span and direct experience with a limited number of things. This would suggest that many, expecially non-engineering students, do not have an understanding of how incredibly complex and interdependent modern civilization is. They cannot comprehend the major catastrophy millions of human beings would face if our food production, transportation systems or power failed for a few days. The way in which things have been done, and are

being done, has not changed much in their lifetime. They have had TV, the automobile, radio, airplanes, etc. They have had all of these things and they have had no other basis with which to make comparison; and they are not happy. It may be excusable if the youth questions the society that we live in and the goals that we appear to have set for ourselves, but the older generation is somewhat frightened because our memories extend back to what things were like without the products of today's technology. Older people see a need and the young see a need. I believe that it is the same need. This need is to change things and bring technology under control so that it becomes a real servant of human beings. We know that this has to be a gradual process, one that is now going on and one in which every move does not bring about disruption and complications to the next move. The youth, in their inexperience, think that it can be done very rapidly and very radically – after all, very complicated problems are almost instantly solved at the end of the TV programs in order to leave some time for the commercial.

Another possibility for explaining young people's attitude toward engineering is a little frightening. One hears little of any dissent or criticism of the engineering discipline in the totalitarian countries. In fact, engineers are held in great esteem in these countries, and it is a great honor for any young person to be chosen to study engineering. Our country, and the other free nations of the world, depend to a considerable extent upon engineering achievements to maintain strength, leadership and freedom in the world. What an easy matter it would be for an unfriendly foreign power to saturate this country with silver tongued agitators that could easily sway young minds to believe that our industrial complex is in reality nothing more than a scheme to enrich a few while systematically poisoning and enslaving the remaining members of our society. The young and inexperienced minds might well believe the distorted views of these imports and begin the destruction of our democracy by sabotaging the one thing that has made this country the great nation that it is: namely, the U.S. educational system. We all know the trouble that has been prevalent on our college campuses and is now plaguing the high schools. All wars are not necessarily fought with guns, planes and tanks on the battlefields. Psychological warfare seems to be replacing old-time warfare. The A-bomb has assured the nations of the world that everyone will be losers in the next armed conflict between major powers.

A look at history will tell us that Galileo had trouble with the problem of anti-technology. R. A. Millikan was worrying in the 1920's about the anti-science movement at that time and suggested a holiday on new science so that society could catch up to the developments of science. It would appear then that the engineer has been under periodic attack in past, so why should today be different?

A long and costly depression and World War II with its one-sided industrial productivity was followed by a great boom-time in which the people demanded the products that they had long gone without. Unfortunately in our haste to get back to modern living with its multitude of improved products, we overlooked many of the byproducts of this industrial explosion – water pollution, noise pollution, air pollution, ecological exploitations, and the fact that we could build cars faster than we could build roads. We also inadvertently produced the greatest love affair the world has ever known – man's love for his automobile. The production of cars within the economic reach of large numbers of people justified mass production. The enthusiastic response of the public gave rise to new industrial enterprises and transformed the landscape and our living habits to a remarkable degree. However, it is fairly clear that someone needs reminding that the industrial explosion was provided by the demands made by the general public.

Ernest Weber, President of ECPD in 1969-1970, noted that technological leadership was taken, only a short while ago, as the measure for the ranking of nations. But times have changed, he noted, and now technology is the "scapegoat of society for all the ills that we cannot cope with." It seems only natural that people resent and even hate those to whom they have become indebted. Mr. Weber warns, "It is an axiom that the mere existence of man pollutes the environment. The combination of venture capital and the almost insatiable desires of society exploit technology; the decisions are essentially society's own responsibility." The automobile is a classic example of this.

Many would have us believe that our industries and our cars are using up the earth's oxygen so that eventually we will suffocate. NSF has recently compared samples of air from 78 sites around the world with samples taken 61 years ago. Their findings indicate that we have the same amount of oxygen today as we had 61 years ago – 20.95%. New York's Department of Air Resources reports that there has been a steady decrease in air pollutants since 1965. New York City air is much cleaner today than it was 100 years ago in the soft coal burning era that produced smog one could cut with a knife. This improvement is the result of engineering design of power plants and more stringent specifications for fuel. This was reported in a recent talk by the editor of Look magazine before a meeting of business managers. Undoubtedly, he was referring to the oxides of sulfur only as it is rather difficult to believe that the pollutants due to automobile emission in New York City have decreased in the last 5 years.

Prior to the industrialization of America, our lakes and streams were crystal clear. However, these clear rivers and lakes were the source of the worst cholera, yellow fever and typhoid fever epidemics the world has ever known. Today, our waterways are not as pretty as they used to be but they are not as deadly. The water we drink is the safest in the world – thanks to engineering. We are making

progress in improving the appearance of our streams but it will take time. After all, it took time to disfigure the streams. The recent sewage plant operation strike in England caused the dumping of raw sewage into the well-known streams in England, and now that the short strike is over the best estimate is that it will take 7 years to return the streams to their previous normal condition. This illustration indicates the havoc that can be wrought in a short time; and as our streams and lakes have been used for dumping areas for years, it will take considerable time to clean them up.

Our young friends and our old friends must be made aware of the great strides that industry and municipalities are making in the effort to clean up our lakes and streams. The task would be made much easier if the young (and many of the older people) would conserve some of the energy they consume in demonstrations and put it to work in more fruitful ways, such as increased studying to better prepare themselves to go out into the real world of professional work, and an increased willingness to work a little harder to hasten this clean-up process. It is work that is going to solve our problems, not endless jawboning and demonstrations.

Industry is admitting its history, but as I have pointed out before, the community also shares in the responsibility for today's environmental problems. It is we as consumers, who have demanded higher standards of living and have been willing to finance this living standard, but now we find that the price is more than money, due to the open cycle system we have encouraged our industry to develop. Up until a few years ago, the public had been apathetic despite warnings from a few people that we were headed for trouble.

Today, however, people are concerned and often angry about the pollution problems. These aroused people are attempting to do something about it. They should be encouraged as we need a basic reassertion of concern and pride among the people in this country in areas of pollution control, as well as in other areas such as corruption in government (a form of pollution), apathy on the part of workers, and a growing disregard for law and order.

Many ask the question, "What is clean air?" To a resident in a remote area, a find day in a metropolitan area might be viewed as horrifying. His judgment would be based upon appearance. A physician would, on the other hand, judge the air based upon any potential health hazards. The ordinary citizen might well view the problem from the standpoint of costs. All this points up to the fact that many of our environmental problems involve many criteria and contingencies and are always relative matters. Our educational curriculums should be programmed to include all matters concerned with the means of solving problems, not just a hard, cold, ruthless mathematical type of solution that may or may not arouse the interest of the students.

Engineering educators have been criticized for being narrow professionals. Credit for being a good professional seems to be lacking. Engineering has been defined as "the application of science for the good of mankind" – please note "the *application* of science for the good of mankind". One might also want to consider this expression: "Scientists learn what is – engineers create what never was." Thus engineers might be considered as professional users of knowledge, who take the scientists' principles and apply them to some purpose in imaginative and innovative ways. Today the engineering practiced and taught by many college engineering departments is quite far afield from its applications. The research in engineering schools has been more involved in science than in engineering. This trend was fostered by government research money that was distributed to fundamental research or to applied work of a military nature just after World War II and more specifically after Sputnik I. In order for a faculty member to obtain a promotion and tenure it was necessary to get a suitable share of the government funds for his department. To convince the government of his capabilities, the faculty member began to develop his interest in science and to stress science to his classroom contacts and in his research efforts. New faculty members were added to staffs if they had a strong scientific background. Engineering experience was not a requirement. This situation is still somewhat the same, although a change is gradually taking place; but this change is not taking place fast enough.

The Engineering curriculum naturally enough reflected the attitude and skill of the faculty with its emphasis on engineering science and mathematics. A curriculum such as this may be desirable and appropriate to sophisticated technology, but it has led to the neglect of application and design. It produced a program that was dull and lacking in contact with potential applications of subject matter. The course challenged the mathematically gifted student but failed to match the expectations of many who chose engineering instead of science because they expected to do something useful. This state of affairs soon produced disenchantment, loss of motivation, and a feeling of helplessness in the face of the future engineering situations that the students felt they would face. To compound matters, it was felt by many engineering educators that it was absolutely necessary that engineering students carry from 1/5 to 1/4 of their total classes in areas of the humanities. Unfortunately, there was little connection between the humanities courses and engineering courses taken by engineering students. In the student's mind the engineering curriculum seemed isolated since the two disciplines did not appear relevant to each other and there was not any order to the humanities. The further removed from engineering a humanities course was, the better the course it was; at least that was the way it seemed to many.

Student lack of interest, along with outside pressures, has recently caused many engineering schools to reevaluate their programs, both educational and research. Drastic changes are taking place; the core of specifically required courses has been reduced, more engineering electives made available in the upperclass years, and courses with humanistic and social content added. There has been a renewed emphasis in research on applied work and work of a social value. In Civil Engineering, this has been primarily in Environmental Engineering and in Transportation Engineering. The students apparently are feeling the wind of these changes as the Civil Engineering enrollment at Northeastern University is continuing the upward swing that started 10 years ago. Other schools are reporting a recent renewed interest in Civil Engineering. I might add that although we did make changes in our curriculum during the science fad, we managed to hold on to a "basic engineering with application" type of curriculum. In our recently revised curriculum, care has been taken not to load the curriculum with the learning of skills which will be outdated or taken over by machines or computers.

Today's engineering curriculums are designed to be concerned with human values and the solution of society's ills. It is vital to the success of this new curriculum that the teachers relate engineering to society in the classroom, and communicate an enthusiasm for engineering as a practical and useful profession. This may mean that many instructors will have to revise their attitude toward encouraging students to learn. A strong individualistic appeal must be made to the young people to point out that an engineering education is one of the best means to equip them to be able to help their fellow man. Students will come back to engineering when it can be shown that the engineering profession is indeed contributing to society's welfare.

Having credited the engineer for his triumphs, we might well ask to what extent is the engineer at fault when technology fails? The fault may be less than the critics claim, but more than the engineer realizes. Engineers, in concentrating on producing miracles, assumed the public had some realization that such miracles are not always beneficial to everyone. More often than not, a price has to be paid. Engineers can be accused of not making this part clear; and the public, in their zeal to take advantage of the miracle, usually forgets it.

One must not forget that approximately 10% of the working population are engineers and scientists. The remaining 90% probably have absolutely no knowledge, and many have no willingness to know, what the art and science of engineering really is. Without science and engineering, their life would be a miserable one, as we know from our study of living conditions in the past; and they would clamor for every bit of comfort, even though there is a price attached to it.

Historically, the men and women who have shaped this country, directed it,

governed it, and handled its political, social, and financial affairs, have been trained, for the most part, as lawyers and businessmen. These leaders have rarely been trained as engineers or scientists. They probably know less about engineering than the engineer knew of liberal arts, humanities, and social sciences.

Today, one can see far enough into our uneasy future to know that we must include engineers and scientists in our leadership in order to assure a proper solution to most of the problems of today and tomorrow. As a species, man will probably survive. This survival problem might be stated in quite another way: Any young man or woman who decides to become an engineer can know that his career will lead not just to satisfying work, but to a role in changing the world by transforming technological knowledge into human renewal and by assuring survival. The solution to our social and environmental problems will come only through more science and technology, and *not through restrictive action.* The best hope for wiser use of technological power rests in the hands of young men and women now thinking about how they will use their years of achievement.

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REPORT OF PANEL DISCUSSION ON VERTICAL SAND DRAINS

1.0 INTRODUCTION

1.1 Background

This paper reports on the proceedings of a panel discussion on Vertical Sand Drains. The panel discussion was presented by the Geotechnical Section of the Boston Society of Civil Engineers on 13 May 1970 at Harvard University, Cambridge, Mass. The purpose of the panel discussion was to review and discuss recent developments and experiences of the panel members in the area of vertical sand drains.

The distinguished panel members were:

Dr. Leo Casagrande
Division of Engineering & Applied Physics
Harvard University
Cambridge, Mass.

Mr. Stanley Johnson, Special Assistant, Soils Division
Waterways Experiment Station
U.S. Army Corps of Engineers
Vicksburg, Mississippi

Dr. Charles C. Ladd
Associate Professor of Civil Engineering
Massachusetts Institute of Technology
Cambridge, Mass.

Mr. Martin S. Kapp
The Port of New York Authority
New York, New York

The moderator of the discussion was Dr. Harl P. Aldrich, Jr., Haley & Aldrich, Inc., Cambridge, Mass.

1.2 General Description of Vertical Sand Drains

Vertical sand drains are used in compressible soils where it is found necessary to increase the rate of consolidation under applied loads. They consist of vertical columns of pervious material (sand) extending into the compressible soil at regular intervals over the loaded area. These columns of sand are intended to provide a shorter drainage path within the compressible soil, thereby decreasing the time required for dissipation of excess pore-pressures resulting from applied loads. There are many methods of installing these sand columns, including driving, augering and jetting.

1.3 Scope of Discussion

Each of the panel members presented a brief review of his experiences as well as his philosophy concerning the use of vertical sand drains. A general discussion followed which was open to questions and comments from the floor.

Within the general area of vertical sand drains the following specific topics were discussed in detail:

1. The need for vertical sand drains at a given site.
2. The determination of soil properties and soil profiles at the sand drain site.
3. Procedures for design of sand drains.
4. Methods of installation and their effects.
5. Test sections.
6. Use of sand drains to increase strength.
7. Use of sand drains in organic soils.

The main points made by panel members concerning each of these topics are presented below.

2.0 TOPICS OF DISCUSSION

2.1 Usefulness of Sand Drains

All of the panel members generally agreed that sand drains can be an effective means of accelerating the rate of consolidation of compressible soils. However, their need in a specific situation should be carefully evaluated by means of field test sections and a thorough foundation investigation involving continuous sampling procedures.

Dr. Ladd clearly showed from the results of field data, that properly installed sand drains were very effective in a soft sensitive clay in Portsmouth, N.H. Mr. Johnson stated that sand drains are effective in soft soils and that they should be considered an economic alternative to other methods of foundation treatment. Dr. Leo Casagrande, however, felt that sand drains should only be used if their need can be clearly established from field test sections. Mr. Kapp mentioned numerous cases where sand drains were apparently used effectively but he emphasized that perhaps results equally as good could have been achieved without drains. He believes that only field test sections can tell us whether drains are required for a given situation.

2.2 Soil Profiles

All the members strongly emphasized that a thorough foundation investigation is the first step in evaluating the need for drains. Mr. Johnson and Dr.

Casagrande stressed that continuous samples should be obtained and examined for potential internal drainage layers. Likewise undisturbed samples should be obtained for determination of soil properties.

2.3 Determination of Soil Properties

The panel members generally agreed that laboratory tests on undisturbed samples provide good estimates of the vertical coefficient of consolidation.

Dr. Casagrande stressed the importance of field permeability tests in arriving at the relationship of c_h to c_v as well as the actual value of c_h. Dr. Ladd indicated that c_h can be estimated from laboratory permeability tests on vertical and horizontal samples.

Mr. Johnson indicated that the results obtained from the use of vertical sand drains in the field will be at least as good as results predicted on the basis of laboratory tests wherein c_h is assumed equal to c_v computed from the log time method, provided that the coefficient of consolidation is selected at or near the maximum effective stress to be imposed by the surcharge loading. He also stated that c_v values for design frequently correspond to initial in situ or average stresses but this results in too high design values. He stated that this conclusion results from experience and is compatible with recent theoretical analyses that consider the variation of the coefficient of consolidation during loading, as the effective stress increases.

In determining c_v from lab data, Dr. Ladd prefers to average the value obtained from the log time and the square root time methods.

2.4 Installation Method

The panel members disagreed over the benefits of non-displacement type drains. The only general conclusion reached by all panel members in this regard was that field test sections appear to be the only way of resolving this question.

Mr. Johnson emphasized that there is no evidence to date that any installation method affects the average shear strength of the compressible soils. Displacement drains do disturb a small zone of soil near the drains, but this zone re-consolidates rapidly since it is so close to the drain. He pointed out that a zone of reduced permeability must exist around even a perfectly installed sand drain because of rapid consolidation around the drain and the consequent reduction in permeability and void ratio. While the displacement method must cause some undesirable effects on rate of consolidation, the economic effects can be evaluated only by field test sections such as described by Dr. Ladd.

Dr. Casagrande indicated that displacement type drains remold the soil near the drain and reduce its permeability such that it destroys the drainage

capability of the drains. He also stated that this disturbance could adversely effect the strength of the soil.

Dr. Ladd discussed the results of two field test sections in Portland, Maine. Incomplete results from one test section involving a sensitive clay showed that displacement type drains were less effective in accelerating the rate of settlement than non-displacement type drains; however, field data from the other test section involving a less sensitive, slightly organic clay did not establish clearly the superiority of augered or jetted drains over driven drains, and the resulting rates of settlement obtained by each method were practically identical (final settlements were not available).

2.5 Test Sections

There was general agreement among the panel members on the need for test sections in designing sand drain installations. The results of test sections can be used to determine the usefulness of sand drains, and the effects of various spacings, sizes and methods of installation. It was pointed out by several panel members that test sections should always have a control area where no sand drains are placed in order to properly evaluate the effects of sand drains. Mr. Johnson noted that test sections should be incorporated into the final embankments. Mr. Kapp stated that the best test section is the final embankment; and monitoring post-construction behavior would provide valuable information on the effectiveness of sand drains. Dr. Casagrande also cautioned on the premature interpretation of results of test sections or final embankments.

Concerning instrumentation of test sections, Mr. Johnson felt that it should be kept as simple as possible, using "Casagrande" or "Bureau of Reclamation" piezometers. He also felt that, where large settlements were anticipated, there was a strong possibility of malfunction and funds for replacement piezometers should be budgeted.

Dr. Ladd stated that piezometers should be placed at a number of different elevations within the compressible layer and should be used in conjunction with settlement measuring devices.

2.6 Use of Sand Drains to Increase Strength

There was no consensus among the panel members on the use of sand drains to increase shear strength. Both Mr. Kapp and Mr. Johnson felt that this was a valid use for sand drains; however, Mr. Johnson cautioned on the anticipation of strength increases during loading. He felt that stage construction was the proper method of taking advantage of shear strength increases. Neither Dr. Casagrande nor Dr. Ladd commented directly on this aspect except to mention that there

could be a loss of shear strength resulting from an installation method causing displacement (i.e. driven drains), especially in sensitive soils. (See Section 2.4)

2.7 Use of Sand Drains in Highly Organic Soils

There was general agreement on the inapplicability of sand drains in highly organic soils, especially fresh water peats. The reasons were twofold: first, such soil deposits generally compress so rapidly that sand drains are not required and; secondly, sand drains *per se* do nothing for the problem of secondary compression (or creep) which in these soils is of the same order of magnitude as the compression due to dissipation of excess pore pressure.

Mr. Johnson pointed out that highly organic surface soils are frequently underlain by soft clays, in which sand drains may be required even though of little or no benefit in the overlying organic material. He also stated that postconstruction settlements in organic or other soils can be reduced by surcharge loading.

The question also arose as to the need for removal of surface organic soils when a sand drain installation was planned for underlying compressible soils. There was no general agreement on this question. Mr. Johnson felt that surface organic soils generally should be left in place for economic reasons. He also felt that such soils could be stabilized by proper design.

Mr. Kapp felt that economic considerations might dictate whether these soils should be removed or stabilized. He felt that organic deposits 3 to 4 feet thick should be removed while in deposits 10 to 15 feet thick efforts to stabilize the soil were worthwhile. He also noted that the Port of New York Authority generally does not remove surface organic soils.

Dr. Casagrande felt that the class of highway should be the determining factor in the removal of surface organic soils. He felt that organic soils could not be adequately stabilized because of secondary compression; therefore, for major highways, these soils should be removed and for secondary roads these soils could be left in place with the prospect of continual maintenance. He also noted that high fills on organic soils were apt to cause displacement.

3.0 SUMMARY AND CONCLUSIONS

The results of the panel discussion on vertical sand drains can be aptly summarized by noting the major areas of agreement and disagreement among the panel members.

3.1 Points of General Agreement

The points on which most of the panel members were in general agreement can be summarized as follows:

A. Field test sections are extremely useful in evaluating the need for sand drains as well as the effectiveness of the different types of installation methods.

B. A thorough foundation investigation is the first step in evaluating the need for sand drains. This investigation should include the determination of a detailed soil profile and soil properties.

C. Sand drains are only useful in eliminating primary consolidation. They do nothing to eliminate secondary compression per se. They can be used in conjunction with surcharging, however, to reduce secondary compression.

D. Sand drains are not applicable to highly organic soils since such deposits compress rapidly without drains, and the magnitude of secondary compression in these soils is quite large.

E. Sand drain installations require careful stability analyses, thorough field inspection, and extensive field instrumentation.

3.2 Points of Disagreement

No general agreement was reached among the panel members on the following topics:

A. *Usefulness of sand drains* – Although sand drains are an effective method of treating poor foundation materials, some panel members believed they are often used in cases where they are not needed (i.e., varved clays) or in cases where they do more harm than good (i.e., driven drains in sensitive soils).

B. *Installation method* – The panel members did not agree on the effect that the installation of displacement type drains has on the strength and compressibility of poor subsoils. However, all agreed that field test sections are highly desirable for resolving this question.

C. *The use of sand drains to increase the shear strength of soils* – There was no consensus among the entire panel on this point.

D. *Excavation of highly organic soils – especially fresh water peats* – Some panel members felt that this material should be left in place and others believed it should be excavated. No one felt, however, that sand drains were needed in this material.

4.0 REFERENCES

The following references are useful in pointing out the development and usefulness of sand drain theory (Ref. 1 & 6) and in presenting design procedures

(Ref. 4 & 5). Ref. 3 presents an excellent "State of the Art" discussion on vertical sand drains. Ref. 2 presents some interesting case histories relating to the use of sand drains.

4.1 References

1. Barron, R.A. (1948) "Consolidation of Fine Grained Soils by Drain Wells" Transactions, ASCE, Vol. 113, 1948, pp 718-754.
2. Casagrande, L. and Poulos S. (1969) "On the Effectiveness of Sand Drains", Canadian Geotechnical Journal, Vol. 6. No. 3 pp 287-326.
3. Johnson, S.J. (1970) "Foundation Precompression with Vertical Sand Drains" ASCE, JSMFD, Volume 96, SM1, pp 145-175.
4. Moran, Proctor, Mueser, & Rutledge (1958) "Study of Deep Soil Stabilization by Vertical Sand Drains, Report to Bureau of Yards and Docks," Department of the Navy.
5. Navdocks DM-7 (1962), "Design Manual, Soil Mechanics, Foundations and Earth Structures" Department of the Navy, Bureau of Yards and Docks.
6. Richart, F.E., Jr. (1957), "Review of the Theories for Sand Drains" Transactions, American Society of Civil Engineers, Volume 124, pp 709-739.

5.0 ACKNOWLEDGEMENTS

This paper was prepared by:

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The panel members reviewed the draft and made some additions and corrections. The Geotechnical Section is grateful to the writers and panel members.

Signed:
Executive Committee, BSCE Geotechnical Section

Charles C. Ladd, Chairman	Vincent J. Murphy, Jr.
Philip A. Wild, Vice-Chairman	Steve J. Poulos
Edmund G. Johnson, Clerk	Stiles F. Stevens

DESIGN AND CONSTRUCTION OF A NEW ENGLAND FISH HATCHERY

By

RICHARD H. ESTES* Member

(Paper presented at the Meeting of the Hydraulic Section, Boston Society of Civil Engineers, November 17, 1970)

In 1969, a new fish hatchery was constructed for the Massachusetts Division of Fisheries and Game in the Town of Belchertown, Massachusetts, which is off Route Nine, about twenty miles northeast of Springfield. It is located about a mile downstream from the Quabbin Reservoir on the banks of the Swift River. (See Figure 1.)

In the middle 1950's, the Director of the Massachusetts Division of Fisheries and Game, Charles L. McLaughlin, conceived the idea of a new hatchery in the Quabbin area and recognized the need for new State facilities. Due to his untimely and accidental death, he was not able to see the project completed; however, the facility has been named for him and was dedicated in 1969 in his honor, as the "Charles L. McLaughlin Trout Hatchery".

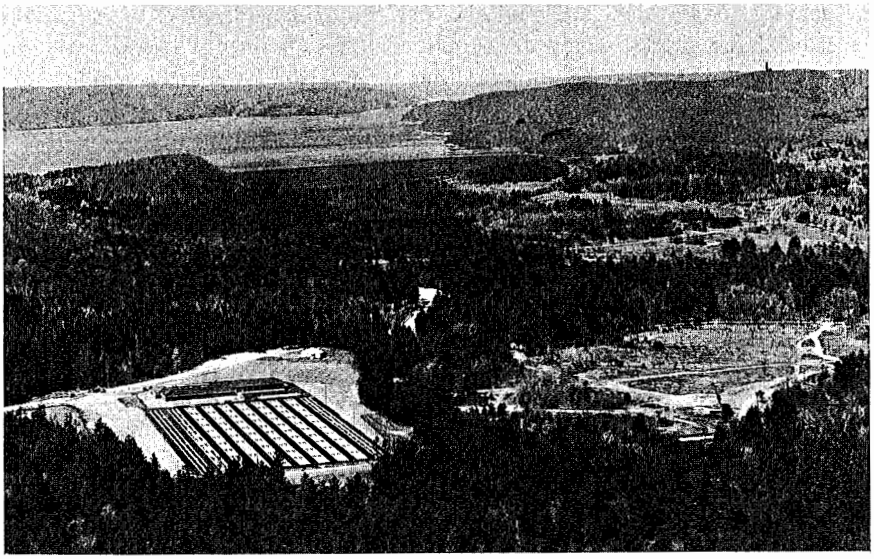

Figure 1 An aerial photograph showing Quabbin Reservoir in the background and the completed Fish Hatchery in the center of the picture, with three gravel packed wells adjacent to the building complex.

Mr. McLaughlin realized that the Division of Fisheries and Game was in serious trouble with its existing six hatcheries. These six hatchery facilities were each about fifty years old and many were becoming obsolete and unable to keep up with the State requirements for producing fish to be used for the State's stocking program of ponds and streams. For many years, it was necessary for the Division of Fisheries and Game to purchase stocking fish from commercial hatcheries in order to meet the necessary demands. Thus, a new hatchery was almost a necessity, if Massachusetts was to continue to meet the requirements of its sportsmen.

The amount of water and quality of water required at a fish hatchery are the very backbone of good fish production, since the rate of growth and production of fish is directly related to the quantity and quality of the water used. Based on prior experience by other state hatcheries and the results of federal hatcheries in New England, it was concluded that if a good quality water was available, between 10 and 15 mgd (million gallons per day) of supply would be needed to meet the requirements of the State.

Feasibility Study

In 1964, a feasibility report was prepared by Camp, Dresser & McKee on the availability of a water supply at the site of the new facility. Investigations revealed that a good groundwater supply could be obtained with a safe yield of about 1800 gpm (gallons per minute) using three separate wells. By sampling and testing the flow of water in the Swift River, it was concluded that the quality and quantity of water there were also suitable for fish hatchery use.

A scheme to run a pipeline from the Quabbin Reservoir to the site of the fish hatchery was also investigated. The scheme would have produced plenty of water; however, the cost of the pipeline plus the cost of buying M.D.C. (Metropolitan District Commission) water was found to be prohibitive. It was determined that, even if the M.D.C. would allow the sale of water from the Quabbin Reservoir, the cost would result in the most expensive fish in the country.

The State specified that the new installation should be large enough to produce about ½ of the total trout fish stock required for the entire State. This represents 200,000 to 250,000 lbs. of trout, or roughly 500,000 to 750,000 of 7-in. to 10-in. stocking fish. The water supply requirements for such a hatchery would be comparable to the demands of a municipality with a population of between 50,000 and 100,000 persons.

From data obtained at a U.S.G.S. (United States Geological Survey) gaging station on the Swift River, it was determined that flows in the Swift River were

normally sufficient to meet the operating requirements for the hatchery. By Massachusetts State Statute (Acts of 1927) a minimum flow of 20 mgd must be released from the Quabbin Reservoir to the Swift River. The only drawback to use of the water from the Swift River for the hatchery is that the State Statute has no specific requirement on the time over which the 20 mgd must be released. The M.D.C., therefore, is free to release the 20 mg over any time period within 24 hours they desire. However, since the M.D.C. operates a power plant at the dam, the 20 mg has normally been discharged within an 8-hour workday and the hatchery design had to take this into consideration, since the hatchery has to operate on a 24-hour basis. Using these data and the low flow data on the river, it was concluded that flow ranges from 1500 gpm to 6000 gpm could easily be obtained from the Swift River without causing any undue hardship on the river or operation of the hatchery.

The quality of water necessary for a fish hatchery is equally as important as the quantity of water available. Temperature and dissolved oxygen concentration are the two most critical items to be considered. Ideal temperatures for maximum fish (trout) propagation are 50° to 55°F. Water temperatures below 40°F reduce the growth rate of trout to practically zero and water temperatures above 70°F can be fatal to trout. Thus, many a mountain stream that has good, cold, clear water is not really a good breeding ground for trout. State personnel have told us that trout 5 to 6-years old in these cold streams may be only 2 or 3 in. long, whereas under proper temperatures, a hatchery can produce a 6 to 9-in. long trout in less than one year.

Dissolved oxygen concentrations greater than 5 mg/l (milligram per liter) are needed to promote good growth. D. O. much less than this can be fatal to trout. Saturation is desirable but seldom obtainable. The expense required to obtain D. O. saturation is not economical as long as the quality of the water is sufficient to promote adequate growth in the fish stock.

A slightly basic water also promotes fish growth. Any pollution is detrimental to trout production. Heavy metals such as zinc, copper and lead can only be tolerated in minute quantities, after which they become fatal to trout. During the hatching process, these metals have to be limited to practically zero. Thus, all piping, pumping equipment, etc. had to be so specified that practically no heavy metals could be dissolved into the water.

It is therefore necessary that the water quality requirements be adhered to very closely if the hatchery is to function properly. From the testing and sampling programs that were carried out in the study phase, it was concluded that, through proper mixing of well water and river water, the necessary quantity and quality of water could be obtained to supply a new hatchery at Quabbin.

The Facilities

In 1965, Camp, Dresser & McKee was retained by the Massachusetts Division of Fisheries and Game to complete final construction plans for the hatchery. These plans were completed in 1967. Bids were received in June 1967 and again in August of 1967, after sufficient funds were appropriated to construct the project. All the funds for this project (about $2,000,000) came from the sale of hunting, fishing and trapping licenses. The Division of Fisheries and Game is one State Department that is self-sufficient financially and does not rely on outside State funds for its operation.

The physical plant at the fish hatchery consists of the following: an administration building, a hatchery building, a food process building, two permanent residences, a river pumping station, three groundwater well pumping stations, ten sets of raceways or rearing ponds, and a display pool.

Many of the requirements for space and the necessary equipment needs were developed in cooperation with the Division of Fisheries and Game.

The administration building (40 ft x 60 ft) contains an office, conference room, biological laboratory, lunchroom, public and private toilet facilities, living quarters that sleep four, and the main control panel for the entire operation. All pumps and major equipment can be operated from this control panel. Flow recorders, pump controls, temperature recorders, alarms and the instrumentation for all units are centralized at the main control panel.

The hatchery building (42 ft x 140 ft) houses eleven double hatching tanks where the young fish are hatched from eggs in fiberglas troughs and then allowed to grow to a 1 to 2-in. size in the concrete tanks (22 nursery tanks, 28 ft long x 30-in wide by 36-in deep) before being placed in the larger outside raceways for full growth.

Water temperatures for the entire hatching process are controlled through a heat exchanger that has the ability to raise the temperature of the well water from 45°F to 55°F for a flow of up to 200 gpm. Mechanical aeration in the piping system also adds oxygen to the water at this critical point.

Hatching of the trout eggs takes between 20 and 50 days duration, everything being dependent upon temperature and specie. Chemical treatment for control or prevention of disease is often added during this phase of the operation.

The food process building and garage (38 ft x 150 ft) houses the following: a walk-in refrigerator for storage of pelleted foot (35°F), a walk-in freezer for storage of frozen meat food (0°F), food processing rooms, a storage room, a boiler room, maintenance shop, and a six-stall garage. Also contained in this area is the domestic water booster pumping facilities that produce enough pressurized water for all domestic usage within the hatchery complex and the two residences.

Fifteen and twenty years ago, the hatchery trout diets consisted mainly of waste products from the meat packing industry, choice morsels like liver, spleens, horse meat, canned carp and similar delicacies. Today, there is greater economy and nutritional value from the dry fish foods that have been developed. The dry pelleted foods, that are mostly vegetable, lend themselves to modern feed methods using automatic equipment that spray feed from trucks directly into the raceway pools.

Two permanent residences were also constructed as a part of the installation since full-time around-the-clock supervision is needed. The superintendent and assistant superintendent live in the two structures. Each house is situated on high ground above the hatchery in order that visual observation can be maintained. Floodlights for the entire complex are controlled from either house and the alarm system for the hatchery is wired to each in order to notify the operator of a power failure, low water or other malfunction of the equipment.

At present, the facilities require about ten people for operation and maintenance work at the site. Figure 2 is an overall view of the hatchery complex.

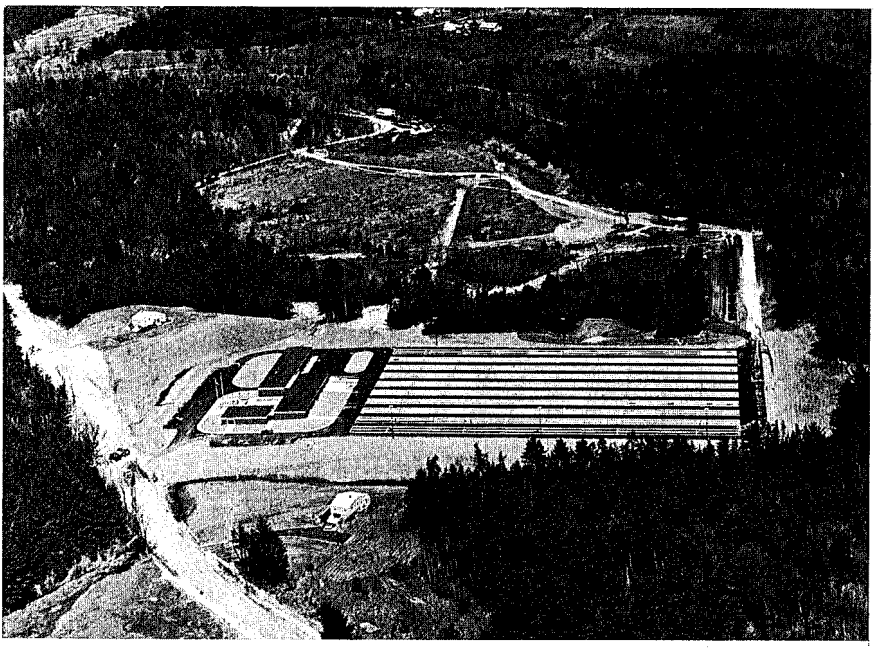

FIGURE 2 An aerial photograph showing the completed hatchery complex, two residences, and the raceway area.

Three gravel packed wells with a capacity of 180 gpm, supply all the domestic water requirements, the hatchery water, and the necessary water during hot and cold weather to buffer the river water supply. During periods when water being pumped from the river is either too warm or too cold, the well water is mixed with the river water to improve the temperature conditions. A lesser flow of water at near optimum temperature will promote more fish growth than a large quantity of water where the temperature varies considerably from the optimum. The operation and control of the hatchery, therefore, can vary extensively, and the operators are thus required to change rates of flows and temperature almost daily.

The pipe lines from each of the three wells connect at a common point from which a separate 12-in. pipe line connects to the hatchery building. The pressure regulating valve in the hatchery building maintains a constant pressure system for hatching water whereas the booster pumping system maintains pressure for the domestic water supply. All excess well water that is not used in the domestic system and the hatching water system is diverted to the mixing chamber, where river water and the spent water from the hatching process are mixed in the concrete mixing chamber through a baffle system, prior to supplying the raceway area. The well water diversion is also arranged so that the entire excess supply that comes from the hatchery building can be fed into a portion of the raceway area. It may be beneficial at times to feed only well water to certain trout species, or during periods when diseases may require special treatment of the fish.

The river pumping station is located on the bank of the Swift River some 2,000 feet from the hatchery complex. Three vertical turbine constant-speed pumps with capacities of 1500 gpm, 2000 gpm, and 2500 gpm, pump water directly from the river to the raceway area. The scheduling and controlling of the pumping rate is determined by the flow and temperature in the river, and is controlled accordingly.

All the river water is pumped to the mixing chamber ahead of the raceway, yet downstream from the well supplies. A 20-in. force main extends from the river pumping station to the mixing chamber. Controls at the mixing chamber can be altered so that diversion of flow can be varied to supply one or ten of the raceways or any combination thereof. It is arranged so that no river water can get into the domestic water system. The river pumping station also houses the electrical switchgear and controls. A 150 kw diesel generator with automatic starting is also contained in this structure. The generator will supply enough power to run about 50 percent of all pumping facilities plus the required domestic demand for the hatchery complex and the two houses.

The raceways or rearing tanks are the mainstay of the entire facility. They

contain ten double tanks, 16 ft. wide, with a varying depth of water of 4 to 5 ft. that can be altered as necessary. Each raceway is 50 feet long, and there are ten units in each section; therefore each extends for a total length of 500 feet. If these tanks were all connected, continuously, they would constitute a 16-ft. wide tank, 5,000 feet long, comprising 200 individual areas. A 16-ft. roadway separates each raceway so that feeding and loading of fish can be done mechanically. The entire raceway area encompasses about 8 acres. Each 50-ft. tank is separated by screens and stop logs in order that control, sizing and feeding of each batch of fish is maintained. A 1.5-ft. drop in elevation between each raceway helps to promote aeration through a natural waterfall.

Each set of raceways has a separate supply line that runs off of the main distribution line from the mixing chamber. By regulating the necessary valves, the flow of water to each raceway can be varied to meet the requirements. Depending on the size and age of the fish being reared, the supply system has enough flexibility so that the operators can vary the demand as needed.

In order to supplement the oxygen concentration, mechanical aerators that are electrically operated can be placed at every other 50-ft. tank, for the entire raceway area.

Drainage facilities are provided for every other 50-ft. raceway tank. These drains are normally used only to clean or to drain the raceways, the normal flow of water running the entire 500-ft. length before being wasted. The dissolved oxygen concentration, of course, decreases along the raceway as the water flows from tank to tank; however, the operators arrange the number and poundage of the fish so that as you proceed from the upper end to the lower end, less of a load is placed on the flowing-through supply.

At the midpoint of the raceway area, 250 ft. from each end, an auxiliary supply line can introduce fresh water from the mixing chamber. Thus, there is enough built-in flexibility so that during critical periods of high temperatures, low temperatures, low flows, or during other problem situations, the operators can vary the water supply in order to maintain optimum conditions.

A lighting system and a public address system in the raceway area reduce the risk of thievery and poaching by unsportsmanlike sportsmen.

The effluent water or wastewater from the raceway area is returned to the Swift River through a series of underground pipes and an open channel that has three series of stop log dams that help to create a free waterfall and thus, to some degree, aerate the effluent from the hatchery. All of the effluent can be recirculated through the River Pumping Station, if necessary, by means of placing stop logs at a diversion structure located adjacent to the Swift River outfall. This was done once last year when the dissolved oxygen concentration and the temperature of the river water were less favorable than the recirculated effluent.

See Figure 3 for a schematic diagram of the water distribution system for the entire hatchery operation.

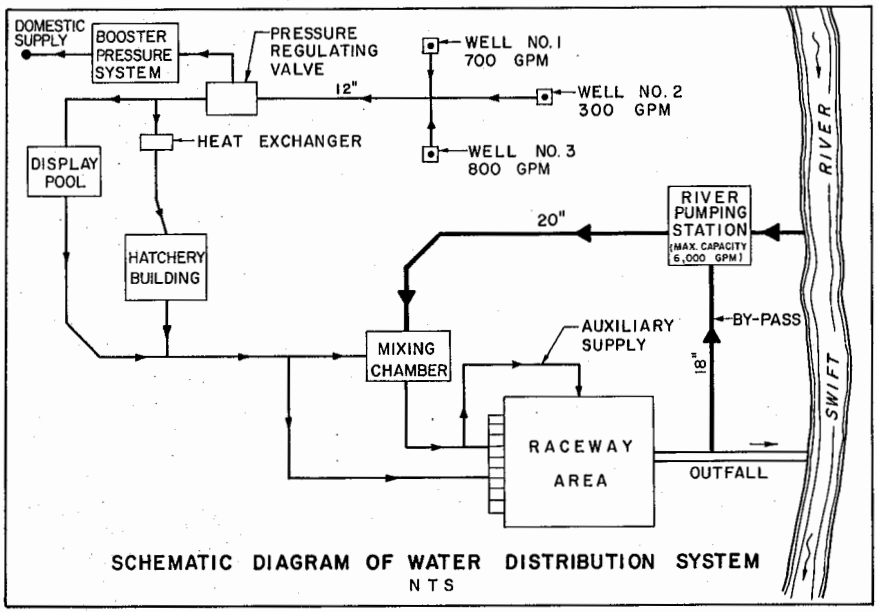

FIGURE 3 A schematic diagram of the water distribution system.

Operation

Information obtained from hatchery personnel reveals that for the first full year of operation, the hatchery produced 200,000 pounds of fish or about 450,000 fish of an 8-in. to 12-in. size, which was about 43% of the total for the State. The total for the State was 470,000 pounds or about 1,000,000 trout in the 8-in. to 12-in. size. The rate of growth at the Quabbin Hatchery has been ¾ of an inch per month; in other terms, a 9-in. trout can be produced in one calendar year. This growth rate exceeds the other State hatcheries by about 1/3.

The operating budget at the hatchery for the last year was about $100,000 which means that the average cost was $0.50 per pound of fish produced. The trout produced at the other State hatcheries were costing an average of about $1.00 per pound.

One problem encountered at the hatchery is the number of visitors that frequent the area. The hatchery is open to the public seven days per week, and

during the first full year's operation, about 60,000 people toured the area. During the summer months, a full-time guide is hired to escort visitors over the site. Since Quabbin Reservoir is only about a mile up the river, many people are probably visiting both areas at the same time.

The design and construction of the Charles L. McLaughlin Trout Hatchery has been a very interesting and challenging engineering project. The new facility will provide adequate stocking trout for the Massachusetts sportsmen for many years to come.

PROCEEDINGS OF THE SOCIETY

Minutes of Meetings

Boston Society of Civil Engineers

February 17, 1971:– The regular monthly meeting of the Boston Society of Civil Engineers was held jointly with the Hydraulics Section, as the annual John R. Freeman Memorial Lecture, at the Charter Room, New England Life Building, 225 Clarendon Street, Boston, Mass. The meeting followed a pot roast of beef dinner, preceded by a cocktail hour at which 45 members and guests were present.

At 7:45 P.M., President Ernest L. Spencer called the meeting to order.

President Spencer stated that the Minutes of the December 16, 1970 meeting would be published in a forthcoming issue of the Journal and that the reading of those Minutes would be waived unless there was objection. There was no objection.

President Spencer then asked the members to rise while he announced the loss to the Society, by death, of the following members:

Richard Malkasian, elected a member Feb. 15, 1954 who died Sept. 24, 1969.
Arthur R. Hahn, elected a member March 14, 1955, who died Nov. 16, 1970.
Thomas G. Giblin, elected a member Sept. 23, 1936, who died Dec. 7, 1970.
George W. Lewis, elected a member June 21, 1911, who died Dec. 1970.
Henry W. Durham, elected a member June 21, 1911, who died in 1970.

President Spencer called upon the Secretary for announcements. The Secretary announced that applications for membership in the Society had been received from the following:

Wendel N. Hovey, Cambridge, Mass.
Charles M. Levine, Sharon, Mass.
Alan E. Willis, Lynn, Mass.
Alexander H. Langer, Jamaica Plain, Mass.

The Secretary continued to hold the floor and moved "that the Board of Government be authorized to transfer an amount not to exceed $5,000 from the Principal of the Permanent Fund to the Current Fund for Current Expenditures."

President Spencer stated that this was the final action on this matter; that the preceding action had been taken at the December 16, 1970 meeting of the Society.

President Spencer then asked Professor Leslie J. Hooper to make an announcement. Professor Hooper announced that the Annual Report of the John R. Freeman Fund Committee had been prepared. He informed those present that Arthur T. Ippen, speaker for this evening, would be the Freeman Lecturer for this year, and he further announced that the John R. Freeman Fund was going to contribute $7,000 to the Current Fund to defray the unusual costs of publishing the Soil Mechanics Boring Data in the Journal of the Boston Society of Civil Engineers.

President Spencer thanked Professor Hooper on behalf of the Board of Government of the Society, for the unusual and generous action of the John R. Freeman Fund Committee. President Spencer then turned the meeting over to Mr. Stephen E. Dore, Jr., Chairman of the Hydraulics Section, to conduct any business of that Section. The members of the Hydraulics Section elected a new slate of officers for the 1971-1972 year.

Professor Hooper then introduced the guest speaker of the evening, Dr. Arthur T. Ippen, Ford Professor, Engineering and Director of Hydrodynamics Laboratory at M.I.T. Dr. Ippen gave a very interesting and informative talk on the subject "A New Look at Sedimentation in Turbulent Streams". It is to be expected that this talk will be published in a forthcoming issue of the Journal. Following Dr. Ippen's scholarly dissertation on this subject, there was a brief question and answer period.

Forty five members and guests attended

the meeting which adjourned at 9:00 P.M.

Respectfully submitted,

Paul A. Dunkerley
Secretary

March 24, 1971:– The business session of the 123rd Annual Meeting of the Boston Society of Civil Engineers was held in Morse Auditorium, Museum of Science, Science Park, Boston, Mass. President Ernest L. Spencer called the meeting to order promptly at 4:00 P.M., a quorum being present.

President Spencer stated that the minutes of the December 1970, and the January and February 1971 meetings will be published in a forthcoming issue of the Journal. The minutes of the March, April, June, July, September, October and November 1970 meetings would be declared approved as published.

The annual reports of the Board of Government, Treasurer, Secretary and the Auditors were presented.

Reports from the following committees were also presented: Publications Committee, Hospitality Committee, Library Committee, John R. Freeman Fund Committee, Ralph W. Horne Fund Committee, Subsoils of Boston Committee, Membership Committee. Advertising Committee, Committee on Professional Conduct, Public Relations Committee, BSCE-ASCE Relations Committee. It was moved and VOTED "that the reports of various committees will be accepted". President Spencer announced that all of the foregoing reports will be published in the April 1971 issue of the Journal.

The annual reports of the executive committees of the sections were presented, and the President declared that these reports would be published in a forthcoming issue of the Journal.

The Chairman of the Joint Legislative Affairs Committee arrived, and he was asked to present his report. Following this presentation, it was moved and VOTED "that the report of the Joint Legislative Affairs Committee be accepted".

The Secretary read the report of the Tellers of the Election, Mr. Samuel E. Rice and Mr. Peter K. Taylor. President Spencer declared that the following officers had been elected for the ensuing year.

President	Ernest A. Herzog
Vice-President	Max D. Sorota
Secretary	Paul A. Dunkerley
Treasurer	Robert T. Colburn
Directors	Charles A. Parthus
	Lawrence C. Neale

Elected to the Nominating Committee were: Stephen E. Dore, Jr., David A. Duncan and Howard Simpson.

President Spencer then made a few announcements concerning the dinner meeting and the cocktail hour.

Following a 5-minute recess, President Spencer delivered his retiring address entitled, "Yesterday and Tomorrow".

The meeting adjourned at 5:30 P.M. to reconvene following the social hour and the dinner.

President Spencer called the adjourned meeting to order again at 8:20 P.M. Following the general remarks and the introduction of the guests at the head table, President Spencer turned the affairs of the meeting to the awarding of prizes. The Secretary announced the endowment conditions for the prized to be awarded, and then called each of the recipients to step forward to receive his prize as follows:

Award	*Recipient*	*Paper*
Clemens Herschel Award	Harl P. Aldrich, Jr.	"Back Bay Boston, Part 1"
	Klas Cederwall	"Dispersion Phenomena in Coastal Environment"
William P. Morse Scholarship	Michael D. Giggey	
Desmond FitzGerald Scholarship	Joseph Schindler	

President Spencer then introduced the guest speaker of the evening. Dr. Harold L. Edgerton, Institute Professor Emeritus, M.I.T. Dr. Edgerton gave a very interesting illustrated lecture on the subject "Photog-

raphy of the Deep with the Russians". Dr. Edgerton had also set up a stroboscopic light experiment which he invited all present to examine. Following his talk Dr. Edgerton invited the audience to join with him in singing a Russian song.

President Spencer made a few remarks and then turned the gavel over to the newly-elected president, Ernest A. Herzog. President Herzog then presented retiring President Spencer with a certificate of appreciation for services rendered. Following this presentation, President Herzog gaveled the meeting closed.

One-hundred ninety-four (194) members and guests attended the dinner and the meeting following the dinner. The meeting adjourned at 9:30 P.M.

Respectfully submitted,

Paul A. Dunkerley
Secretary

COMPUTER SECTION

April 7, 1971:– Robert D. Logcher, acting chairman, called the meeting to order at 7:30 at Purcell's Restaurant. Twenty people were present for this joint meeting of the BSCE Computer Section and the ASME Computer Division. A brief report on the status of negotiations between the Board of Government of the BSCE and the ASCE on a union of societies was made. The meeting chairman, Charles Shaker, was then introduced.

Mr. Shaker introduced the speaker, Robert A. Freiburghouse, Manager of Language Systems Development for Honeywell's Cambridge Information Systems Laboratory and his topic, PL/1.

Mr. Freiburghouse began by describing the history and objectives of PL/1, aimed to serve both scientific (FORTRAN) and business (COBOL) users and systems programmers, hopefully a universal procedural language. By extensive use of default options, it was aimed at both the novice and advanced programmer. The first compiler emerged in 1966; a version which produces efficient code came in about 1969. PL/1, although aimed at machine independence, is about as machine independent as any other compiler language.

Mr. Freiburghouse described the various characteristics of the language; program structure, data types and structures, storage classes, and default rules. The last, although aimed at easy use, does lead to ambiguity due to unknown defaults. The discussion included relative program efficiency, from the points of view of both the programming time and code efficiency.

After numerous questions, the meeting adjourned at 8:50 P.M.

Respectfully submitted,

Robert D. Logcher
Clerk

ANNUAL REPORTS

REPORT OF THE BOARD OF GOVERNMENT FOR THE YEAR 1970 – 1971

To the Boston Society of Civil Engineers:

Pursuant to the requirements of the By-Laws, the Board of Government presents its report for the year ending March 24, 1971.

The following is a statement of the status of membership in the Society:

Honorary	12
Members	1088
Associates	3
Juniors	51
Students	1
Total	1155
Applications pending on March 24, 1971	12
Student Chapters	2

Summary of Additions

New Members	41
New Juniors	6

Reinstatements

Members	6

Summary of Loss of Members

Deaths	22
Resignations	16
Dropped for non-payment of dues	37
Dropped for failure to transfer	1

Life Memberships

Life Members	121
Members becoming eligible today for Life Membership	8

Honorary Membership is as follows:

John B. Babcock, 3rd, elected January 2, 1969
Charles O. Baird, Jr., elected January 2, 1969
Harry P. Burden, elected February 1, 1965
Thomas R. Camp, elected February 3, 1964
Arthur Casagrande, elected February 1, 1965
Frank M. Gunby, elected February 15, 1950
Ralph W. Horne, elected February 1, 1965
Karl R. Kennison, elected February 7, 1951
Frank A. Marston, elected February 15, 1960
Howard M. Turner, elected February 18, 1952

John A. Volpe, elected January 20, 1968
Frederic N. Weaver, elected February 1, 1965

The following members have been lost through death:

William J. Balough, Sept. 1969
Homer Briggs, March 18, 1970
Charles S. Bryer, 1970
Edward D. Chase, Jan. 9, 1970
Kenneth T. Corey, Jan. 2, 1971
Edwin A. Dow, Feb. 16, 1971
Henry W. Durham, 1970
Thomas G. Giblin, Dec. 7, 1970
Walter J. Grady, 1971
Joseph D. Guertin, Apr. 19, 1970
Arthur R. Hahn, Nov. 16, 1970
Horace P. Hamlin, Feb. 23, 1970
James E. Hanlon, June 30, 1970
George W. Lewis, Dec, 1970
Richard Malkasian, Sept. 24, 1969
Howard A. Mayo, Apr. 4, 1970
Edwin J. O'Connor, 1970
Dana N. Peaslee, July 11, 1970
Edward G. Powers, Aug. 1970
Reginald L. Reed, Sept. 20, 1970
Samuel I. Widershein, May 27, 1970
Edward F. Wilcox, Jan. 17, 1970

MEETINGS OF THE SOCIETY

March 25, 1970 — Address of Retiring President, Robert H. Culver, "The Time for Re-evaluation".

April 29, 1970 — Joint Meeting with BSCE Construction Section. Richard Q. Praeger of Praeger, Kavannaugh & Waterbury, Eng. Architects, New York, "Modern Stadium Design and Construction with Emphasis on the William Shea Stadium".

June 3, 1970 — Joint Outing with BSCE Sanitary Section. Treatment Facilities for City of Brockton. Mr. Joseph Heney, Camp, Dresser & McKee, "Nature of the Water Supply Treatment Facilities and Distribution of System". George M. Reece, Fay, Spofford & Thorndike, Inc., "Nature of Waste Disposal Problem and Nature of Materials to be Processed".

July 13, 1970 — Joint Meeting with BSCE Transportation Section and Mass. Section ASCE with National Meeting of the ASCE. William J. Ronan, Chairman, Metropolitan Transportation Authority, New York, New York, "Mass Transportation in the Seventies".

September 16, 1970 — Joint Meeting with BSCE Geotechnical Section and BSCE Structural Section. Rev. Daniel Linehan, Director, Weston Observatory, "Nature and Sources of Earthquakes". Russell J. Holt, President of Weston Geophysical Research, "Nature of Earthquakes". Robert V. Whitman,

Prof. of Civil Engineering, M.I.T., "Relationship between Earthquakes and Structures Involved in the Earthquake".

October 14, 1970 — Joint Meeting (Student Night) with BSCE Computer Section and Mass. Section of ASCE. Dr. Alan Altshuler, Prof. of Political Science at M.I.T., and Chairman of the Governor's Task Force on Transportation, "A Balanced Transportation for Metropolitan Boston".

December 16, 1970 — Joint Meeting with American Society of Military Engrs., and Mass. Section of ASCE. Edward J. King, Executive Director, Mass. Port Authority, "Growth and Development of the Mass. Port Authority".

February 17, 1971 — Joint Meeting with BSCE Hydraulics Section (John R. Freeman Memorial Lecture). Dr. Arthur T. Ippen, Ford Professor of Engineering and Director of the Hydrodynamics Laboratory at M.I.T. "A New Look at Sedimentation in Turbulent Streams".

ATTENDANCE AT MEETINGS

Date	*Place*	*Meeting*	*Dinner*
March 25, 1970	Science Museum Science Park Boston, Mass.	162	162
April 29, 1970	Red Coach Grill Boston, Mass.	65	62
June 3, 1970	Treatment Facilities City of Brockton	30	30
July 13, 1970	Statler Hilton Hotel Boston, Mass.	210	210
September 16, 1970	Townhouse Beacon St. Boston, Mass.	107	80
October 14, 1970	University of Massachusetts Amherst, Mass.	107	103
November 16, 1970	Red Coach Grill Boston, Mass.	190	170
December 16, 1970	Navy Building Summer Street Boston, Mass.	90	90
February 17, 1971	New England Life Bldg. Clarenden Street Boston, Mass.	45	45

The meetings of the Sections, offering opportunity for more detailed discussions, continue to demonstrate their value to the Section members and to the Society. A wide variety of subjects were presented. The annual reports of the various Sections will be presented at the annual meeting of the Society and will be published in the Journal.

*FUNDS OF THE SOCIETY**

Permanent Fund. The Permanent Fund of the Society has a Book Value of $79,210.91. The Board of Government authorized the use of as much as necessary of the Current Income of this fund in payment of current expenses. By vote of the Society (as prescribed by the By-Laws) at the December 18, 1970 and February 17, 1971 meetings, the Board of Government was authorized to transfer an amount not to exceed $5,000 from the Principal of the Permanent Fund for current expenditures. The amount necessary to transfer from the Principal of the Permanent Fund for current expenditures was none.

John R. Freeman Fund. In 1925 the late John R. Freeman, a Past President and Honorary Member of the Society, made a gift to the Society of securities which was established as the 'John R. Freeman Fund'. The income from this fund is to be particularly devoted to the encouragement of young engineers. Mr. Freeman suggested several uses, such as, the payment of expenses for experiments and compilations to be reported before the Society; for underwriting meritorious books or publications pertaining to the hydraulic science or art; or a portion to be devoted to a yearly prize for the most useful paper relating to hydraulics contributed to the Society; or establishing a traveling scholarship every third year open to members of the Society for visiting engineering works, a report of which would be presented to the Society. This year a John R. Freeman Memorial Lecture was given by Dr. Arthur T. Ippen. The expenditures from this Fund during the year were $499.58 for the Freeman Lecture and $7,000 which the Committee transferred to the Current Fund for publication of "Boring Data of Greater Boston".

Edmund K. Turner Fund. In 1916 the Society received a bequest of $1,000 from Edmund K. Turner, a former member of the Society. The income of which is to be used for Library purposes. The Board voted that no expenditures be made this year from this Fund.

Alexis H. French Fund. The Alexis H. French Fund, a bequest of $1,000 was received in 1931 from the late Alexis H. French, a Past President of the Society. The income of this fund is 'to be devoted to the Library of the Society'. The Board voted that no expenditures be made this year from this Fund.

Tinkham Memorial Fund. The Samuel E. Tinkham Fund, established in 1921 at Massachusetts Institute of Technology by the Society, "to assist some worthy student of high standing to continue his studies in Civil Engineering", had a value of $3,507.24 on June 30, 1970. Jay Pollock a student in Civil Engineering class of 1972 was awarded this Scholarship of $250 for the year 1970-1971.

Clemens Herschel Fund. This Fund was established in 1931 by a bequest of $1,000 from the late Clemens Herschel, a Past President and Honorary Member of the Society. The income from this fund is "to be used for presentation of prizes for papers which have been particularly useful and commendable and worthy of grateful acknowledgement". The expenditures from this fund during the year was $33.80.

Desmond FitzGerald Fund. The Desmond FitzGerald Fund established in 1910 by a bequest of $2,000 from the late Desmond FitzGerald, a Past President and Honorary Member of the Society, provided that the income from this fund shall "be used for charitable and educational purposes". The Board voted on April 13, 1964 to use the income of this Fund to establish a Boston Society of Civil Engineer's Scholarship in Memory of

*Details regarding the value and income of these funds are given in the Treasurer's Report.

Desmond FitzGerald and that it be given to a student in Civil Engineering at Northeastern University. It was voted on February 24, 1971 to accept the recommendation of the Committee at Northeastern University, namely, that the Scholarship of $150 be given to Joseph Schindler, presentation to be made at the Annual Meeting of the Society on March 24, 1971.

Edward W. Howe Fund. This Fund, a bequest of $1,000, was receved in 1933 from the late Edward W. Howe, a Past President of the Society. No restrictions were placed on the use of this bequest, but the recommendation of the Board of Government was "that the Fund be kept intact, and that the income be used for the benefit of the Society or its members".

William P. Morse Fund. This Fund, a bequest of $2,000, was received in 1959 from the late William P. Morse, a former member of the Society. No restrictions were placed on the use of this bequest, but the recommendation of the Board of Government was "that the Fund be kept intact and that the income be used for the benefit of the Society of its members". Upon recommendation of the Committee appointed by the President, the Board voted on April 5, 1953, to appropriate from the income of this Fund a Scholarship to be known as "the Boston Society of Civil Engineer's Scholarship in Memory of William P. Morse", and that it be given to a Civil Engineering student at Tufts University. It was voted on January 27, 1971 to adopt the recommendation of the Committee at Tufts University, namely, that the $150 Scholarship be given to Michael D. Giggey, presentation to be made at the Annual Meeting of the Society on March 24, 1971.

Frank B. Walker Fund. This Fund, a bequest of $1,000, was received in 1961 from Mary H. Walker, wife of Frank B. Walker, a Past President of the Society. No restrictions were placed on the use of this bequest, but the recommendation of the Board of Government was "that this Fund be kept intact and that the income be used for the benefit of the Society or its members". The expenditure from this fund during the past year was $1,000 towards the publishing of Boring Data in the Journal.

Ralph W. Horn Fund. This Fund, a bequest of $3,000, was received June 29, 1964, from the Directors of Fay, Spofford & Thorndike, Inc., the income from which shall be devoted to a prize or certificate to be awarded annually to a member designated by the Board of Government as having been outstanding in unpaid public service in municipal, state or federal elective or appointive posts; or in philanthropic activity in the public interest. Members of B.S.C.E. only are eligible for the Award. No award was made this year.

Thomas R. Camp Fund. This Fund, a bequest of $10,000, was received January 15, 1971, from the Directors of Camp, Dresser & McKee, Inc., to establish the 'Thomas R. Camp Fund', the income to be used to support an annual Thomas R. Camp lecture or lectures on outstanding recent developments or proposed or completed research in the sanitary engineering field. The income from the fund, over and above that needed to support the annual lecture should be added to the fund, but could be used otherwise at the discretion of the Board of Government of the Boston Society of Civil Engineers.

PRIZES

Award	*Recipient*	*Paper*
Clemens Herschel Award	Harl P. Aldrich, Jr.	"Back Bay Boston, Part 1

Award	*Recipient*	*Paper*
Clemens Herschel Award	Klas Cederwall	"Dispersion Phenomena in Coastal Environments"
Desmond FitzGerald Scholarship	Joseph Schindler	Northeastern University
William P. Morse Scholarship	Michael D. Giggey	Tufts University

LIBRARY

The Report of the Library Committee contains a complete account of the Library Committee's activities during the past year.

COMMITTEES

The usual special committees dealing with the activities and conduct of the Society were appointed. The membership of these committees is published in the Journal and the reports of the committees will be presented at the Annual Meeting March 24, 1971.

Your Board in conclusion wishes to express its appreciation of the excellent work done by the officers of the Sections and by the committees of the Society.

Ernest L. Spencer
President

REPORT OF THE SECRETARY

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers:

The following is a statement of cash received by the Secretary and of the expenditures approved by the President in accordance with the budget adopted by the Board of Government.

FOR THE YEAR ENDING FEBRUARY 28, 1971

	Expenditures	*Receipts*
OFFICE		
Secretary's Salary & Expense	$ 1,400.00	$
Treasurer's Honorarium	900.00	
Stationary, Printing & Postage	1,612.87	
Incidentals & Petty Cash	123.39	
Insurance & Treasurer's Bond	423.00	
Quarters, Rent, Telephone & Light	6,611.76	
Office Secretary	7,025.00	
Soil Mechanics	6.97	780.75
Social Security	498.69	
MEETINGS		
Rent of Halls	25.00	
Hospital Committee	4,381.79	4,339.00
Annual Meeting – March 1970	1,231.78	1,067.00
SECTIONS		
Sanitary Section	43.00	
Structural Section	106.60	
Transportation Section	47.03	
Hydraulics Section	17.45	
Construction Section	36.25	
Geotechnical Section	125.34	
Computer Section	45.53	
Contingency Fund	9.55	
JOURNAL		
Editor's Salary & Expense	900.00	
Printing & Postage	11,434.89	
Advertisements	—	2,581.30
Sale of Journals	—	2,389.20
Reprints	652.84	570.00
Copyright	18.00	
Newsletter	544.36	
LIBRARY		
Periodicals	113.00	
Binding	29.69	

MISCELLANEOUS	*Expenditures*	*Receipts*
Binding Journals for Members	10.00	10.00
Badges	—	5.15
Bank Charges	14.26	
Miscellaneous	466.66	251.11
Engineering Societies Dues	1,165.00	
Public Relations Committee	90.00	
Sales Tax	.90	.90
Dues from B.S.C.E. Members		19,311.00
Trans. Income Perm. Fund		2,468.10
Trans. John R. Freeman Fund		7,000.00
Trans. Lecture Fund		4,000.00
	$40,110.60	$44,773.51
Increase in Balance of Current Fund	1,662.91	
Payable estimated bill Oct. '70 Journal	3,000.00	
	$44,773.51	$44,773.51

Entrance Fees to Permanent Fund $450.00

41 New Members; 6 New Junior Members, 6 Reinstatements

The above receipts have been paid to the Treasurer whose receipt the Secretary holds. The Secretary holds cash amounting to $30 to be used as a fixed fund for cash on hand. $46.75 withholding tax is payable to the State of Massachusetts in April 1971.

Respectfully submitted,

Paul A. Dunkerley
Secretary

REPORT OF THE TREASURER

MARCH 24, 1971
for
Fiscal Year March 1, 1970 through February 28, 1971

FINANCIAL STANDING

The financial standing of the Society is summarized in the following four tables which accompany this report. The tables represent conditions as they existed at the close of business on February 28, 1971.

TABLE I	Condensed Statement of Condition – Assets and Liabilities
TABLE II	Condensed Statement of Income and Expenditures–Distribution of Funds
TABLE III	Portfolio of Investments
TABLE IV	Income and Yield from Investments

SOCIETY INVESTMENTS

The Boston Safe Deposit and Trust Company continues to provide us with investment management and custodian services for the portfolio of securities owned by the Society. The Custodian Bank has furnished us a certified audit of the Income and Principal Accounts relating to our investments.

Twice this year the Investments Division of the Boston Safe Deposit and Trust Company has reviewed our portfolio of securities and in both instances stated that our present holdings would do well under anticipated future economic conditions and therefore recommended no changes. The Bank also recommended certain additional investments at the time of the receipt of $10,000 for the establishment of the Thomas R. Camp Fund. The Investment Committee of the Society considered and approved all of these recommendations and so informed the Board of Government. In each case the Board voted to approve the recommendations of the Bank and where required, voted to authorize the recommended changes and directed the Custodian Bank to proceed with the transactions.

The general policy which dictates the handling of the portfolio continues to be the maintenance of reasonable income consistent with a reasonable growth rate as a hedge against inflation.

The following changes, part of which were recommended in the previous fiscal year, were made in the portfolio during this fiscal year.

Sold	
177 Shs. So. Cal. Edison	$ 5,382.96
200 Rights Std. Oil, N.J.	35.50
250 Rights Amer. Tel. & Tel.	96.45
	$ 5,514.91
Bought	
170 Shs. Boise Cascade	$ 9,829.69
2 Shs. I.B.M.	573.50
100 Shs. McGraw Edison	3,790.19
50 Shs. N.E. Elec System	1,288.95
	$15,482.33

Received as Stock Dividend
1 Sh. Boise Cascade + $19.30 in lieu of stock dividend

The percentage of common stocks in the portfolio based on current market value is now 77% compared to 77.4% a year ago. The yield from all securities in the portfolio based on current market value is approximately 4.3%. The market value of the portfolio as listed a year ago has increased by approximately $22,000 which is 11%.

AUDIT

The Auditing Committee has reviewed the Treasurer's account book, the bills paid by the Treasurer, the receipts from the Secretary, the savings bank passbook, the checkbook, and the certified audit of the income and principal accounts of the Society investments. The information contained in this report has been verified.

INVESTMENT FUNDS – INCOME ACCOUNT
(Bos. Safe Dep. & Tr. Co. Custodian)

Balance March 1, 1970	1,162.52
Dividends Received	6,709.34

Interest Received	2,736.30	
Sub Total		10,608.16
Custodian Bank Charges	1,403.26	
Transfer to B.S.C.E. Savings Acct.	3,500.00	
Transfer to B.S.C.E. Checking Acct.	5,000.00	
Sub Total		9,903.26
Balance in account February 28, 1971		704.90

INVESTMENT FUNDS – PRINCIPAL ACCOUNT
(Bos. Safe Dep. & Tr. Co. Custodian)

Balance March 1, 1970	152.15	
Stock Sold	5,382.96	
Rights Sold	131.95	
Received in lieu of Stock Dividend	19.30	
Received for Thomas R. Camp Fund	10,000.00	
Sub Total		15,686.36
Stock Bought	15,482.33	
Sub Total		15,482.33
Balance in account February 28, 1971		204.03

SAVINGS ACCOUNT
(First Fed. Sav. & Loan Assoc. of Boston)

This savings account is used as a temporary investment for money available for investment, and for excess balance in the checkbook, thus providing additional income to the funds, until there is a need to transfer it to the checkbook to meet expenditures. It is a temporary investment for the major part of the cash balance.

Balance March 1, 1970	2,935.18	
Transfer from Income Account	3,500.00	
Transfer from Checking Account	9,000.00	
Interest Received	428.18	
Sub Total		15,863.36
Transfer to Checking Account	14,000.00	
Sub Total		14,000.00
Balance February 28, 1971		1,863.36

CURRENT FUND ACCOUNT

This fund is set up for payment of operating expenses of the Society and for receiving income for that purpose. To provide money for operation in March before regular income is received, the fund is provided with a balance sufficient for this purpose. The customary amount for this balance has been $1,500. The Board of Government voted to increase this to $3,000 next year.

Total Expenditures	40,110.60
Total Income and Receipts	31,305.41
Excess of Income over Expenditures	(8,805.19)

Balance in Fund March 1, 1970	1,337.09
Transfer from Permanent Fund Income	2,468.10
Transfer from Lecture Fund	4,000.00
Transfer from Freeman Fund	7,000.00
Subtotal Available to cover deficiencies	14,805.19
Balance in Fund March 1, 1971	3,000.00
Reserve in Fund for Bill Payable	3,000.00

By vote of the Board of Government $2,468.10 was transferred from the Income of the Permanent Fund and $4,000.00 was transferred from the Lectures Fund to the Current Fund.

By vote of the Freeman Fund Committee and by acceptance by the Board of Government, $7,000.00 was transferred from the Freeman Fund to the Current Fund, to be used toward the expense of publishing Boring Data for the City of Boston. The journals for July and October 1969 and July 1970 published these data, the cost of which has been paid from the Current Fund. This $7,000.00 will cover most of this expense.

It should be noted that in addition to the $3,000 balance in the current fund, the transfers to this fund also include an additional $3,000 to cover later payment of bill payable for the October 1970 Journal, which is rightfully payable out of 1970-71 funds.

The membership and other interested persons are referred to the report of the Secretary published elsewhere in the Journal for a detailed breakdown of the income and expenditures of the Current Fund.

PERMANENT FUND

The Permanent Fund receives income from its prorated portion of interest and dividends from investments and pays its portion of service charges of the Custodian Bank.

Receipts from entrance fees are credited to the principal of this fund. These amounted to $450.00 this year.

Income from Interest and Dividends	4,721.00
Prorated portion of Custodian Services Charges	671.42
Net Income	4,049.58

As explained above $2,468.10 of this net income was transferred from the Permanent Fund to the Current Fund. No transfer was made from the Permanent Fund principal this year.

JOHN R. FREEMAN FUND

Payments from this fund were made this year for expenses of the annual Freeman Lecture. The lecturer, Prof. Arthur T. Ippen, received an honorarium of $300.00.

As stated above $7,000.00 was transferred from this fund to he Current Fund to be used toward expense of publishing Boring Data.

Expenses of Freeman Lecture	199.58
Lecturer's Honorarium	300.00
Transfer to Current Fund	7,000.00
Prorated portion of Custodian Service Charge	461.06
Total Expenditures	7,960.64
Prorated portion of income from Investment	3,242.85
Excess of Income over Expenditures	(4,717.79)

LECTURES FUND

As stated above $4,000.00 was transferred from this fund to the Current Fund to be used for operating expenses.

Transfer to Current Fund	4,000.00
Prorated portion of Custodian Service Charge	60.68
Total Expenditures	4,060.68
Prorated portion of income from Investment	424.99
Excess of Income over Expenditures	(3,635.69)

BORING DATA FUND

The Committee on Subsoils of Boston has been actively engaged in revising and adding to the Boring Data Book. Mr. Clarence Seagrave has continued his work of sorting and collating the information into a publishable form, and has been assisted by Mr. E. M. Battle and Mr. N. P. Kenis.

Solicitations for funds for this purpose were made this year resulting in donations amounting to $2,525.00.

Balance in Fund March 1, 1970	721.63
Donations from Solicitations	2,525.00
Received from Sale of Books	36.00
Total Receipts	3,282.63
Paid for sorting and collating	1,868.90
Paid for prints	77.62
Total Expense	1,946.52
Balance in Fund February 28, 1971	1,336.11

THOMAS R. CAMP FUND

The Thomas R. Camp Fund was established in January 1971 as a result of a gift to the Society of $10,000 from the firm of Camp Dresser & McKee, made for this purpose. The income from the fund is to be used to support an annual Thomas R. Camp lecture on outstanding recent developments, or proposed or completed research in the sanitary engineering field.

M.I.T. TINKHAM SCHOLARSHIP FUND

By letter of January 2, 1971 Mr. Jack H. Frailey, Director of Student Aid at Mass. Institute of Technology, reported the status of this fund as of June 30, 1970.

Balance in Principal Account June 30, 1970	3,507.24
Balance in Income Account June 30, 1970	283.48

The scholarship award for the year 1970-71 was made to Jay Pollack, Class of 1972 in the amount of $250.

KARL R. KENNISON FUND

On March 3, 1971 Mr. Beaton of the Massachusetts Company reported to the Treasurer of the Society the status of the irrevocable trusts established on behalf of the Society by Mr. Karl R. Kennison. As of February 28, 1971 the two trusts involving shares in the Massachusetts Fund were as follows:

	No. Shares	*Market Value*
Trust #4315	356.650	4,005.18
Trust #4444	473.942	5,322.37
Total	830.592	9,327.55

A year ago there were 823.909 shares which had a market value of $8,749.70.

OTHER FUNDS

The membership and other interested persons are referred to the Report of the Board of Government published elsewhere in this issue of the Journal for information concerning the remaining funds, the reason for existence, and the disbursements made from each.

ACKNOWLEDGEMENTS

I wish to thank Prof. Paul A. Dunkerley, Secretary of the Society, for his valued assistance and Mrs. Virginia Boudia, office secretary, for her time and effort in handling the voluminous routing of keeping the accounting records.

Respectfully submitted,

Robert T. Colburn
Treasurer

TABLE I

CONDENSED STATEMENT OF CONDITION

ASSETS AND LIABILITIES

February 28, 1971

ASSETS	BOOK VALUE		MARKET VALUE	
	2–28–71	2–28–70	2–28–71	2–28–70
First Nat. Bank Bos. (Check Acct.)	2,875.04	1,662.31	2,875	1,662
Boston Safe Dep. & Trust Co. (Custodian Acct.)				
Bonds	55,628.84	55,628.84	44,540	40,151
Common Stocks	112,608.60	99,210.51	184,471	157,222
Balance in Acct.	908.93	1,314.67	909	1,315
First Fed. Sav. & Loan Assn. (Savings)	1,863.36	2,935.18	1,863	2,935
Cash held by Secretary	30.00	30.00	30	30
TOTAL ASSETS	$173,914.77	$160,781.51	$234,688	$203,315
LIABILITIES AND FUNDS				
Permanent Fund	79,210.91	75,533.76	109,950	95,684
John R. Freeman Fund	48,437.74	52,023.92	67,345	65,933
Edmund K. Turner Fund	2,648.72	2,463.60	3,670	3,136
Desmond FitzGerald Fund	5,133.04	4,988.17	7,110	6,292
Alexis H. French Fund	2,622.83	2,439.68	3,630	3,096
Clemens Herschel Fund	1,788.46	1,681.16	2,480	2,111
Edward W. Howe Fund	2,950.59	2,743.41	4,090	3,498
William P. Morse Fund	4,931.27	4,729.89	6,840	5,990
Frank B. Walker Fund	1,332.28	1,239.07	1,850	1,568
Ralph W. Horne Fund	4,082.18	3,949.98	5,650	5,005
Lectures Fund	3,363.89	6,853.40	4,660	8,703
Thomas R. Camp Fund	10,000.00	—	10,000	—
Subtotal Investment Funds	$166,501.91	$158,646.04	$227,275	$201,016
Boring Data Fund	1,336.11	721.63	1,336	722
Current Fund	3,000.00	1,337.09	3,000	1,500
Secretary's Change Fund	30.00	30.00	30	30
*Taxes withheld	46.75	46.75	47	47
Reserve for Bill Payable	3,000.00	—	3,000	—
TOTAL LIABILITIES	$173,914.77	$160,781.51	$234,688	$203,315

*Withhold Massachusetts State Income Taxes due and payable in April 1971

TABLE II

CONDENSED STATEMENT OF INCOME AND EXPENDITURES – DISTRIBUTION OF FUNDS

Fiscal Year March 1, 1970 through February 28, 1971

FUND	Book Value 3-1-70	Income Interest and Dividends	Gain from sale of Securities	Receipts and Transfers to Funds	Expenditures and Transfers from Funds	Book Value 2-28-71
Permanent	$ 75,533.76	$4,721.00	$1,645.67	$ 450.00	$ 671.42)	$ 79,210.91
Transfer to Current	—	—	—		2,468.10)	
John R. Freeman	52,023.92	3,242.85	1,131.61		960.64)	48,437.74
Transfer to Current	—	—	—		7,000.00)	
Edmund K. Turner	2,463.60	153.45	53.48		21.81	2,648.72
Desmond FitzGerald	4,988.17	299.19	106.27		260.59	5,133.04
Alexis H. French	2,439.68	151.55	53.14		21.54	2,622.83
Clemens Herschel	1,681.16	104.19	36.91		33.80	1,788.46
Edward W. Howe	2,743.41	171.47	60.04		24.33	2,950.59
William P. Morse	4,729.89	288.54	103.50		190.66	4,931.27
Frank B. Walker	1,239.07	77.29	26.91		10.99	1,332.28
Ralph W. Horne	3,949.98	239.30	86.26		193.36	4,082.18
Lectures	6,853.40	424.99	146.18		60.68)	3,363.89
Transfer to Current	—		—		4,000.00)	
Thomas R. Camp	—		—	10,000.00		10,000.00
SUB TOTAL Invest. Funds	$158,646.04	$9,873.82	$3,449.97	$10,450.00	$15,917.92	$166,501.91
Boring Data Fund	721.63	—	—	2,561.00	1,946.52	1,336.11
Current Fund	1,337.09	—	—	31,305.41)	40,110.60	3,000.00
Transfer from Permanent				2,468.10)		
Transfer from Freeman				7,000.00)		
Transfer from Lectures				4,000.00)		
Reserve for Bill Payable						3,000.00
Secretaries Change Fund	30.00	—	—			30.00
Taxes Withheld	46.75	—	—			46.75
TOTALS	$160,781.51	$9,873.82	$3,449.97	$57,784.51	$57,975.04	$173,914.77

TABLE III

PORTFOLIO OF INVESTMENTS

	BOOK VALUE		MARKET VALUE	
BONDS 20%	2-28-71	3-1-70	2-28-71	3-1-70
6,000 Assoc. Invest. Co. 5-1/8-79, Deb.	$ 6,000	$ 6,000	$ 4,800	$ 4,320
10,000 Flintkote Co. 4-5/8-81, Deb.	10,450	10,450	7,875	7,300
1,000 Florida Po. Corp. 3-1/8-84, 1st Mtg.	1,018	1,018	664	604
5,000 Florida Po. Corp. 3-7/8-86, 1st Mtg.	5,038	5,038	3,525	3,219
5,000 Georgia Po. Co. 3-3/8-77, 1st Mtg.	5,162	5,162	4,144	3,669
5,000 Marine Mid. Corp. 4½-89 Deb.	5,000	5,000	3,450	3,275
10,000 Montreal Quebec Imp. 6%-87 Deb.	10,075	10,075	8,025	6,900
10,000 Orange & Rockland 6½-97 1st Mtg.	9,950	9,950	9,200	8,262
3,000 Ontario 3¼-72 Deb.	2,936	2,936	2,858	2,602
TOTAL BONDS	$ 55,629	$ 55,629	$ 44,541	$ 40,151
STOCKS 77%				
250 Amer. Tel. & Tel. Co.	$ 4,410	$ 4,506	$ 12,250	$ 12,812
400 Clark Equipment Co.	12,287	12,287	16,200	13,600
170 General Motors Corp.	9,131	9,131	13,621	11,794
214 Hartford Insurance Co.	—	1,534	—	10,700
171 Boise Cascade	9,810	—	7,353	—
250 Illinois Power Co.	11,591	11,591	9,781	8,500
37 Inter. Business Machines	6,974	6,400	12,450	11,909
214 Inter. Tel. & Tel. – Preferred	1,534	—	14,739	—
400 McGraw Edison Co.	14,211	10,421	14,550	8,813
200 Kraftco	1,155	1,155	8,225	7,800
358 New England Elec. System	7,505	6,216	8,503	6,699
500 Newmont Mining Corp.	12,548	12,548	14,062	16,000
177 So. Calif. Edison Co.	—	1,933	—	5,332
200 Std. Oil, N.J.	1,977	2,013	15,025	10,868
472 Texaco	1,516	1,516	16,992	13,157
200 Warner Lambert Pharm. Co.	9,937	9,937	14,800	14,400
4 W. R. Crace & Co.	156	156	134	93
260 Wilson & Co. Inc.	7,866	7,866	5,785	4,745
TOTAL COMMON STOCKS	$112,609	$ 99,210	$184,470	$157,222
SAVINGS BANK 1.5%				
First Federal Sav. & Loan Assn.	$ 1,863	$ 2,935	$ 1,863	$ 2,935
CASH ACCOUNTS 1.5%				
1st Nat. Bank Boston (Check Acct.)	2,875	1,662	2,875	1,662
Bos. Safe Dep. & Tr. Co (Custodian Acct.)	909	1,315	909	1,315
Secretary's Change Fund	30	30	30	30
TOTAL SAVINGS & CASH	$ 5,677	$ 5,942	$ 5,677	$ 5,942
GRAND TOTAL	$173,915	$160,781	$234,688	$203,315

TABLE IV

INCOME AND YIELD FROM INVESTMENTS

Fiscal Year March 1, 1970 to February 28, 1971

BONDS	Income	Yield on Current Market Value
6,000 Assoc. Invest. Co. 5-1/8-79, Deb.	$ 307.50	6.4%
10,000 Flintkote Co. 4-5/8-81, Deb.	462.50	5.9
1,000 Florida Power Corp. 3-1/8-84, 1st Mtg.	31.25	4.7
5,000 Florida Power Corp. 3-3/8-77, 1st Mtg.	193.80	5.5
5,000 Georgia Power Corp. 3-3/8-77, 1st Mtg.	168.75	4.1
5,000 Marine Midland Corp. 4½-89, Deb.	225.00	6.5
10,000 Montreal Quebec Imp. 6%-87, Deb.	600.00	7.3
10,000 Orange & Rockland 6½%-97, 1st Mtg.	650.00	7.1
3,000 Ontario 3¼-72, Deb.	97.50	3.4
TOTAL BONDS	$2,736.30	6.1%
COMMON STOCKS		
250 Amer. Tel. & Tel.	$ 650.00	5.3%
400 Clark Equipment Co.	560.00	3.5
170 General Motors Corp.	578.00	4.2
214 Hartford Fire Ins. Co.	149.80	—
171 Boise Cascade	17.58	1.0
250 Illinois Power Co.	525.00	5.3
37 Inter. Business Mach. Corp.	170.40	1.2
214 Inter. Tel. & Tel. Corp. – Preferred	219.36	3.3
400 McGraw Edison Co.	420.00	3.9
200 Kraftco	340.00	4.9
358 New England Elec. Co.	462.00	5.9
500 Newmont Mining Corp.	520.00	3.7
200 Standard Oil, N.J.	750.00	5.0
472 Texaco	755.20	4.5
200 Warner Lambert Pharm. Co.	235.00	1.6
4 W. R. Grace & Co.	6.00	4.5
260 Wilson & Co. Inc.	351.00	6.0
TOTAL COMMON STOCKS	$6,709.34	3.7%
SAVINGS ACCOUNT		
First Fed. Savings & Loan Assn.	428.18	5.25%
TOTAL INCOME FROM INVESTMENTS	$9,873.82	4.3%

REPORT OF THE AUDITING COMMITTEE

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers

We have reviewed the records and accounts of the Secretary and Treasurer of the Boston Society of Civil Engineers, and we have compared the bank statement of securities held by the Boston Safe Deposit and Trust Company with the enumeration submitted by the Treasurer.

We have found them to be in order and to account accurately for the Society's Funds.

Respectfully submitted,

Max D. Sorota
Peter S. Eagleson

REPORT OF THE JOURNAL EDITOR

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers:

During the last fiscal year, Volume 57 was published, consisting of issues for January, April, July and October 1970. It contained five technical papers and the Boring Data for the Roxbury area of Boston, plus Society reports, in 340 pages of text.

As mentioned in last year's report, the publication of the boring data increases the Journal expense since it involves extra composition costs. The Society should benefit, however, when the boring data are eventually published in a single hard-cover volume, since the composed copy is being retained for future use.

The continuing purpose of the Journal is to provide the Society members and our subscribers with a publication of high standards as a medium for top quality technical papers, high grade professional advertising, and Society reports. With increased and still rising publication costs, a determined effort is being made to reduce the cost of the Journal to the Society, and still maintain our standard of service to the Society membership and the engineering profession.

Respectfully submitted,

H. H. Holly, Editor

REPORT OF PUBLICATION COMMITTEE

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers:

During the period March 1970 and February 1971 the Publication Committee reviewed nine papers.

Of these nine, one was rejected, two were published, two have been accepted for publication, and four were conditionally accepted and returned to the authors for modification.

Respectfully submitted,

James P. Archibald, Chairman
Publication Committee

REPORT OF THE ADVERTISING COMMITTEE

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers:

The Advertising Committee met three times during the year and worked continuously in an attempt to bolster advertising revenue from the Journal. In spite of the general economic decline prevalent in the nation, advertising in the Journal has been maintained at a fairly constant level during the year.

In order to substantially increase advertising revenue, the Committee suggests that serious consideration be given to:

1. Engaging a professional advertising agency to mount a vigorous soliciting campaign.
2. Revision of advertising rates.

Respectfully submitted,

Frank W. Stockwell
Robert J. Van Epps
John S. Cusack
Joseph W. Lavin
H. Hobart Holly
Walter M. Newman, Chairman

REPORT OF THE LIBRARY COMMITTEE

Boston, Mass., March 24, 1971

To the Boston Society of Civil Engineers:

The activity and the use of the Library for the current year, has not increased over the previous year. Most of the activity is associated with literature in the historical section of the library. A few students have made use of the library throughout the year in search for material to aid them in their theses.

During the year, approximately 30 books and proceedings were loaned out to individuals. These were individuals associated with engineering firms in the greater Boston area.

The Library Committee recommends no expenditures for new books.

No books have been donated to the library during this current year.

The Committee at its meeting on February 12, 1971 did not recommend any new action to be presented in its report to the Society. It did feel strongly that the recommendations in the March 25, 1970 report of the Library Committee be carried out. The Committee would strongly suggest the recommendations which involves culling out material no longer of sufficient value to the membership both in the main library room and in the storage room; also, the recommendation dealing with part-time employment. It is particularly important that the books on the library shelves be arranged in an orderly fashion. Material which is kept in the storage room should be re-arranged, and the material which is not to be retained should be discarded. This could be handled by part-time help under the supervision of Mrs. Boudia.

The Committee felt that with the present lease expiring at the end of 1972, and with the possibility of seeking new quarters, the Society should begin to dispose of material of questionable value to the membership.

Respectfully submitted,

George W. Hankinson
For the Library Committee.

REPORT OF HOSPITALITY COMMITTEE

Boston, Mass., March 3, 1971

To the Boston Society of Civil Engineers:

The Hospitality Committee submits the following report for the year 1970-1971:

A total of nine meetings of the Society were held during the past year. This was three meetings less than the previous year.

Included in this total were the 122nd Annual Meeting, eight joint meetings with the American Society of Civil Engineers, one of which was a Student's Night Meeting, another meeting was held at the ASCE National Convention, and seven regular meetings of the Society.

Catered dinners were served prior to all meetings.

The average attendance of members and guests for all nine meetings, using the larger attendance figure, was 112 as compared to last year's average of 84.

ATTENDANCE AT MEETINGS

Date	*Place*	*Meeting*	*Dinner*
March 25, 1970	Science Museum Science Park Boston, Mass.	162	162
April 29, 1970	Red Coach Grill Boston, Mass.	65	62
June 3, 1970	Treatment Facilities City of Brockton	30	30
July 13, 1970	Statler Hilton Hotel Boston, Mass.	210	210
September 16, 1970	Townhouse Beacon Street Boston, Mass.	107	80
October 14, 1970	University of Mass. Amherst, Mass.	107	103
November 16, 1970	Red Coach Grill Boston, Mass.	190	170
December 16, 1970	Navy Building 495 Summer St. Boston, Mass.	90	90
February 17, 1971	New England Life Bldg. 225 Clarendon St. Boston, Mass.	45	45

Respectfully submitted,

Philip A. Bianchi
Chairman

REPORT OF MEMBERSHIP COMMITTEE

March 24, 1971

To the Boston Society of Civil Engineers:

During the past year, the members of the Committee canvassed several of the larger engineering firms and governmental agencies for new members. Although the effect of intensive membership recruiting drives in recent years was evident, many new possible candidates were contacted. We suggest that the Society continue to place a strong emphasis on new member recruiting.

The increase in membership during the current year is as follows:

New Members	41
Membership Applications Pending	12
New Juniors	6
Reinstated	6

Total Membership as of March 1, 1971 – 1,115

Respectfully submitted,

Warren H. Ringer
Chairman

REPORT OF THE PUBLIC RELATIONS COMMITTEE

March 24, 1971

To the Boston Society of Civil Engineers:

The members of this Committee were in contact during the past year by phone, correspondence and personal contact. In reporting to the Society on its activities, we emphasize three main public relation projects that were considered.

1. A new brochure, updating one that we understand was developed about 20 years ago, is not deemed worthwhile. The added interest in BSCE activities and membership may better be encouraged in other ways.
2. Three standard forms were developed for use by Section Chairmen to better publicize meetings. The forms consist of:
   a. An abstract of the paper to be delivered. This information can be used to better inform BSCE members of the contents of the paper to be delivered.
   b. An information for news release form which can be used for insertion in local newspapers.
   c. A speaker information form which can be used for introductions and for later filing with the abstract to form a permanent, more detailed record of Section speakers and papers.
3. The Committee suggests to the Board of Government that a "Speaker Bureau" consisting of a volunteer from each Section be set up. The Bureau would supply to college and university classes, ready access to speakers on engineering specialties, the advantages of engineering societies and BSCE in particular, and would serve as a means to communicate with and assist engineering students in choosing their career specialty.

Respectfully submitted,

Charles A. Parthum
Chairman

REPORT OF COMMITTEE ON SUBSOILS OF BOSTON

March 24, 1971

To the Boston Society of Civil Engineers:

The Committee on Subsoils of Boston met on April 8, September 16, 1970 and January 28, 1971.

During the past year boring data for the sub-area Roxbury was published in the July 1970 issue of the Journal of the Boston Society of Civil Engineers. Boring information on South Boston was turned over to the Publication Committee last October and it shall be published in the near future. Collection and compilation of boring data for Cambridge was begun last November but the work was interrupted due to insufficient funds.

To improve the sagging finances of the Committee, a second fund raising campaign was started last July. The President of the Boston Society of Civil Engineers sent a letter to all former contributors, also to additional addresses requesting new donations. The letter was followed up by personal contacts by the members of the Committee. All these efforts produced meager results, the total cash on hand as of January 28, 1971 was $1,236.11. It is estimated that about an additional sum of $2,500.00 is required to bring the Cambridge sub-area to completion. This sum does not include the cost of publication which will be, hopefully, underwritten by the Boston Society of Civil Engineers.

The Committee is presently considering different avenues which would make it possible to finish the Cambridge area. It is however questionable that the contemplated additional areas will ever be published in light of the lack of interest and financial support by the engineering profession.

Respectfully submitted,

Horst Borbereky, Chairman
Subsoils of Boston Committee

REPORT OF COMMITTEE ON PROFESSIONAL CONDUCT

March 16, 1971

To the Boston Society of Civil Engineers:

During the past year the Society has received no complaints of ethical practice violations on the part of any of the members. The Committee has held one meeting.

William L. Hyland, Chairman
George G. Bogren
Francis S. Harvey
George M. Reece

REPORT OF THE JOINT LEGISLATIVE COMMITTEE

Boston, Mass., March 25, 1970

To the Boston Society of Civil Engineers:

The Committee has looked at legislation submitted to the General Court for the present session. Of the many proposed pieces of legislation that relate to the interests of the

Society, the Committee feels that the following should be of general interest to the members.

Senate Bills

1072 – Legislation to provide a limitation of three years for the bringing of actions of contract or tort for malpractice, error or mistake against architects, professional engineers and land surveyors.

1074 – Legislation to provide for the definition of the terms "responsible charge" and "supervision of construction".

1075 – Legislation to provide for stamping of certain engineering plans.

House Bills

474 – That the membership of certain boards and commissions shall consist of at least two non-professionals or lay persons.

There are presently eight bills which would allow citizens to bring legal actions to enforce statutes and regulations protecting the environment. These bills are presently in committee and a compromise bill is anticipated. Where the compromise bill is reported it will probably be by the Committee on Natural Resources. One of the provisions would allow that any ten citizens of the Commonwealth may bring a suit in equity against any person, violating environmental protection laws or regulations.

This Committee feels that the impact of this legislation may be such that members of the Society should be aware of the proposed legislation and should make their views known to the Committee on Natural Resources.

During the 1970 legislative session the most significant legislation to our Society was the enactment of Chapter 707 of the General Laws. This law requires that to become a registered professional engineer or land surveyor a written examination is mandatory. Candidates will have to take an eight-hour examination in the basic sciences and an eight-hour examination in engineering principles and practices. These examinations will be offered twice each year.

Respectfully submitted,

Cornelius J. O'Leary, Chairman
Ralph Soule
Joseph Knox
James Dallas
Charles Parthum

REPORT OF BSCE-ASCE RELATIONSHIP COMMITTEE

March 24, 1971

To the Boston Society of Civil Engineers:

Acting jointly with a like committee of the Massachusetts Section of the American Society of Civil Engineers, the work of this Committee culminated with the preparation of a proposal for a final resolution of BSCE-ASCE Relationship.

This proposal was requested by the Board of Government of the BSCE and has been submitted to the governing bodies of both organizations for study and action.

The proposal presents a plan for consolidating the Massachusetts Section of the ASCE and the BSCE into one civil Engineering organization to be named the Boston Society Section of ASCE. The proposal presents details for consolidation, discusses the impact of

consolidation on members in the two societies and gives recommendations for implementation if warranted.

Respectfully submitted,

James P. Archibald, Chairman
BSCE-ASCE Relationship Committee

REPORT OF THE JOHN R. FREEMAN FUND COMMITTEE

March 24, 1971

To the Boston Society of Civil Engineers:

Professor Arthur T. Ippen, Institute Professor of the Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics presented the sixth John R. Freeman Memorial Lecture. His topic was "Another Look at Sediment Transport in Turbulent Streams".

As a worthy project for the year the Freeman Fund Committee agreed unanimously to provide $7,000.00 toward the expense of publishing the Boring Data of Greater Boston.

Leslie J. Hooper
Chairman

REPORT OF THE RALPH W. HORNE FUND COMMITTEE

Boston, Mass., February 17, 1971

To the Boston Society of Civil Engineers:

This is the Fifth Annual Report of the Ralph W. Horne Fund Committee.

At the 1970 Annual Meeting, the Society, acting upon the recommendation of the Committee, named Wilfred McGregor Hall as the recipient of the Ralph W. Horne Award and presented him a scroll in recognition of the unpaid public service which he has rendered throughout his professional career.

Prior recipients of the award were Edward Wright in 1969, Dr. Carl Stephen Ell in 1968, Llewellyn T. Schofield in 1967, Miles N. Clair in 1966 and Charles O. Baird, Jr. in 1965.

William L. Hyland, Chairman
George G. Bogren
Miles N. Clair

ANNUAL REPORT OF THE EXECUTIVE COMMITTEE SANITARY SECTION

March 16, 1971

The Sanitary Section met four times during the preceding year. A brief account of each meeting follows:

1– *March 4, 1970 – Annual Meeting*
(Meeting held at Society Rooms)

The following officers and members of the Executive Committee were elected:

Leland F. Carter	Chairman
Cornelius O'Leary	Vice-Chairman
Prof. Jack Cochrane	Clerk
Paul Guertin	
William Parker	
George K. Tozer	

After election of officers, there was a panel session on the subject of "Air Pollution Control Implementation Plans and Their Economic Impact". Panelists introduced by Chairman David Duncan were:

Mr. David Standley
Executive Director
City of Boston
Air Pollution Control Commission

Mr. John W. Lebourveau
Environmental Engineer
New England Electric System

Mr. James L. Dallas
Director, Bureau of Air Use Management
Massachusetts Department of Public Health

2– *June 3, 1970 – Annual Outing and Joint Meeting with Parent Society*
(Meeting held at Brockton, Massachusetts)

Members and guests attended the dinner meeting at the Congress Inn in early evening.

The meeting was opened by Secretary Paul A. Dunkerley of the Boston Society of Civil Engineers and parent society business was conducted.

The meeting was turned over to the Sanitary Section Chairman, Leland F. Carter.

Between 2:00 p.m. and 5:00 p.m., previous to the dinner meeting, the members and guests visited the Brockton Water Filtration Plant at Silver Lake and the Brockton Sewage Treatment Plant, off Meadow Lane.

After dinner, Mr. Joseph Heney of Camp, Dresser & McKee spoke briefly on the Water Filtration Plant and Mr. George Reece of Fay, Spofford & Thorndike, Inc., spoke briefly on the Sewage Treatment Plant.

3– *October 7, 1970*
(Meeting held at Society Rooms)

At this meeting an interesting lecture on "New England Offshore Currents and Potential Pollution Problems" was presented by Dr. Robert Batchelder, Professor of Geography, Boston University.

4– *December 2, 1970*
(Meeting held at Society Rooms)

At this meeting Mr. Arthur A. Baker, Instructor/Coordinator for the New England Wastewater Institute, described in detail the function and operation of the school for training sewage treatment plant operators.

The Executive Committee met prior to the March 4, October 7 and December 2 meetings. Programs for the year were planned and plans for future meetings were discussed.

Action on more suitable quarters and remedial action on the present quarters was discussed, and the results of these discussions were transmitted to the parent organization.

Better attendance at meetings was also discussed, but no definite course of action was decided upon in this area.

Respectfully submitted,

Jack Cochrane
Clerk

REPORT OF THE EXECUTIVE COMMITTEE OF THE STRUCTURAL SECTION

Boston, Mass., March 11, 1971

The Structural Section held five meetings during the past year, as follows:

April 8, 1970 — Mr. Richard P. Thuma, Building Commissioner of the City of Boston, spoke on "Impact of the New Boston Building Code on Structural Engineers". Attendance was 38. This dinner meeting was held in the Harvard Room of Purcell's Restaurant.

October 14, 1970 — This was a joint meeting of the Structural and the Geotechnical Sections. Mr. Mark Fintel, Director of Engineering, Design and Standards, Portland Cement Association, spoke on "Earthquake Codes and Design Implications". Attendance was 83. This and the following dinner meeting was held in the Engineers Club at the Prudential Building.

December 9, 1970 — Mr. Sepp Firnkas, Consulting Engineer in Boston, spoke of "Headaches with Prestressed Precast Concrete". Attendance was 56.

January 13, 1971 — This was the "Young Engineers" evening initiated by Mr. Abraham Woolf, Member of the Executive Committee. The first speaker, Mr. Alvin R. Griffith, Structural Engineer, Charles T. Main, Inc., spoke on "A.D. Edmonston Pumping Plant Discharge Line Manifolds – Structural Design Studies". The second speaker was Mr. Jack I. Mann, Principal Engineer, Jackson and Moreland, who spoke on "Structural Design of 38 Story Steel Framed Building with Emphasis on Computer Application on Analysis and Design". The third speaker, Mr. Peter K. Taylor, Soils Engineer, Stone and Webster Engineering Corp., spoke on "Problems in Constructing a Pile Foundation". Attendance was 37. This and the following meeting was held in the Town House Restaurant on Beacon Street.

March 10, 1971 — Mr. T. W. Spilman, Manager of Engineering Fabricated Steel Construction Division, Bethlehem Steel Corp., spoke on "Problems in Bolted Connections in Structural Steel". This was the annual meeting of the Structural Section. Attendance was 58. The following were nominated and elected to the Executive Committee of the Structural Section for the year 1971-1972:

Sepp Firnkas, Chairman
Jurgis Gimbutas, Vice-Chairman
Rubin Zallen, Clerk
Harold McKitrick
Othar Zaldastani
William Hagen

The total attendance at the five meetings was 272, averaging 54 per meeting. The last three meetings, starting in December, were joint meetings with the Structural Section of the American Society of Civil Engineers, Massachusetts Section.

Respectfully submitted,

Jurgis Gimbutas
Clerk

REPORT OF THE EXECUTIVE COMMITTEE OF THE TRANSPORTATION SECTION – YEAR 1970-1971

March 22, 1971

The Executive Committee for the year 1970-1971 consisted of the following:

A. Paul LaRosa	Chairman
A. Russell Barnes	Vice-Chairman
Robert T. Tierney	Clerk
Charles D. Shaker	
Maurice Freedman	
Richard K. Guzowski	

The Transportation Section held four meetings during the past year, as follows:

May 20, 1970

Joint Meeting with Institute of Traffic Engineers

A panel of speakers, consisting of Daniel S. Horgan, Chief Engineer, Massachusetts Department of Public Works; Sumner Hoffman, Engineer, Massachusetts Department of Public Works; and Philip Robinson of the Bureau of Public Roads, Department of Transportation, discussed "Traffic Operations Program for the Improvement of Capacity and Safety".

Attendance – approximately 66

This meeting was held at Purcell's Restaurant, School Street, Boston.

July 13, 1970

Joint-Sponsored Dinner with A.S.C.E.

This meeting took place during the 1970 A.S.C.E. National Transportation Engineers' Convention. Mr. William J. Ronan, Chairman of the Metropolitan Transit Authority of New York, presented an interesting talk on "Mass Transit in the Seventies".

Attentance – over 350 engineers and wives

The meeting was held at the Statler-Hilton Hotel, Boston.

In November of 1970, a new program of joint meetings of the B.S.C.E. and A.S.C.E. Transportation Sections was initiated and appears to be stimulating increased attendance and interest at the meetings.

November 18, 1970

Joint Meeting B.S.C.E. and A.S.C.E. Transportation Sections

Dr. Alan A. Altshuler, Director of the Governor's Boston Transportation Planning Review, presented his talk entitled, "Balanced Transportation for Metropolitan Boston".

Attendance – capacity audience of 140 engineers

This meeting was held at the Red Coach Grill, Stanhope Street, Boston.

February 24, 1971

Annual Meeting

Mr. Robert T. Kenney, Director of the Boston Redevelopment Authority, addressed the group on "The New Boston".

The following were nominated and elected to the Executive Committee of the Transportation Section for the year 1971-1972:

A. Russell Barnes	Chairman
Robert T. Tierney	Vice-Chairman
Richard K. Guzowski	Clerk
A. Paul LaRosa	
R. Lawrence Whipple	

Attendance – 65

This meeting was held at the Red Coach Grill, Stanhope Street, Boston.

I wish to thank the members of the Executive Committee who contributed so much of their time and energies in providing assistance in the activities of the Transportation Section and making the 1970-1971 year an active and successful season.

Respectfully submitted,

A. Paul LaRosa
Chairman

EXECUTIVE COMMITTEE REPORT OF THE HYDRAULICS SECTION

March 8, 1971

The following meetings were held during the past year:

May 6, 1970

Mr. Saul Cooper, Chief Reservoir Control Center, New England Division, Corps of Engineers, spoke at a joint meeting of the Hydraulics and Computer sections. The subject of the presentation, held at the Corps' offices, was the Automated Hydrologic Reporting Network recently placed in operation by the Corps. A demonstration of the interrogating and reporting procedure was given together with the plotting of the data received.

Attendance: 50

November 17, 1970

Mr. Richard Estes of Camp, Dresser & McKee spoke on the construction, operation and function of the Commonwealth of Massachusetts Fish Hatchery installed just downstream of Quabbin Reservoir.

Attendance: 16

February 17, 1971

The Annual Meeting was held jointly with the Main Society of the Boston Society of Civil Engineers at the Charter Room of the New England Life Building, 225 Clarendon Street, Boston, Massachusetts. Dr. Arthur Ippen, Ford Professor of Engineering and Director of the Hydrodynamics Laboratory at M.I.T. gave the sixth John R. Freeman Memorial Lecture. He presented a review of achievements in theoretical and experimental research on the transport of sediments in turbulent flow, with emphasis on applications to engineering practice.

The following slate of officers of the Hydraulics Section for the year 1971-1972 was elected unanimously by voice vote:

Chairman	Albert G. Ferron
Vice-Chairman	Jerome Degen
Clerk	Frank E. Perkins
Executive Committee	Robert E. Restall
	Saul Cooper
	Stephen E. Dore, Jr. (Past Chairman)

Attendance: 45

The cooperative effort between the Hydraulics Sections of the Boston Society of Civil Engineers and American Society of Civil Engineers has been initiated. To afford a high degree of coordination with a view toward increasing interest and attendance at meetings, Jerome Degen of the Boston Society was appointed Chairman of the American Society, Hydraulics Section. One executive committee was held on November 17, 1970, with mutually satisfactory results.

Respectfully submitted,

Jerome Degen
Clerk

ANNUAL REPORT (1970-71) OF THE EXECUTIVE COMMITTEE OF THE GEOTECHNICAL SECTION

The officers and members of the Executive Committee who have served during the past year are as follows:

Charles C. Ladd	Chairman
Philip A. Wild	Vice-Chairman
Edmund G. Johnson	Clerk
Vincent J. Murphy	Member
Steve J. Poulos	Member
Stiles F. Stevens	Member
Ronald E. Bucknam	Chairman, Continuing Education Committee

During the past year, four highly successful regular Section meetings were scheduled, and in addition, two well-attended, informal Geotechnical Section Forum meetings were sponsored, as follows:

GEOTECHNICAL SECTION MEETINGS

Date:	*May 13, 1970* 3:30 to 9:30 P.M.
Place:	Harkness Commons, Harvard University
Attendance:	130 ± Afternoon and evening sessions, buffet dinner
Subject:	Panel Discussion on Vertical Sand Drains
Moderator:	Dr. Harl P. Aldrich, Jr. Haley & Aldrich, Inc.
Panel Members:	Dr. Leo Casagrande Div. of Engineering & Applied Physics Harvard University, Cambridge, Mass.
	Mr. Stanley Johnson Waterways Experiment Station Vicksburg, Mississippi
	Mr. Martin S. Kapp The Port of New York Authority New York, New York
	Dr. Charles C. Ladd Prof. of Civil Engineering M.I.T., Cambridge, Massachusetts

The primary purpose of the panel discussion was to present and review recent developments and experiences among the panel members on the subject of stabilization by means of vertical sand drains. Each of the members has had considerable experience in this field and brought to the group a most distinguished presentation. After formal presentations by each panelist there was group discussion among the panel, followed by general discussion from the floor.

Note: The following Section members served as Reporters: J. Rixner, P. Taylor and D. Riordan. They have prepared notes summarizing the major points of discussion in these sessions, which have been forwarded to the Society for publication in the BSCE Journal.

Joint Dinner Meeting with: BSCE & Structural Section, BSCE

Date: *September 16, 1970*
Place: The Townhouse, Boston
Attendance: 81
Subject: "Implications of Revised Earthquake Zone Classification for Boston"

Speakers:

Rev. D. Linehan (S.J.)
Director, Weston Observatory
"Earthquake History of Boston"

Mr. R. J. Holt
President, Weston Geophysical Research, Inc.
"Comparative Seisicity"

Dr. R. V. Whitman
Prof. of Civil Engineering, M.I.T.
"Ground Motions and Amplification"

The meeting was opened by Prof. Spencer, President of the Society, for a brief business meeting. Prof. Ladd, Section Chairman, then introduced the guest speakers.

Each speaker presented a most interesting illustrated talk and was followed by a general discussion period.

Joint Dinner Meeting with Computer Section, BSCE

Date: *November 10, 1970*
Place: Patten's Restaurant, Boston
Attendance: 37
Subject: "Computer Applications in Soil Mechanics"

Speakers:

Dr. C. C. Ladd
Prof. of Civil Engineering, M.I.T.
"Engineering Applications"

Dr. J. T. Christian
Assoc. Prof. of Civil Engineering, M.I.T.
"Recent Advances"

Mr. G. L. Woodland, Jr.
Computer Section, Stone & Webster Corp., Boston
"Computer Services"

This meeting was of interest to members of both Sections as it pointed out the common areas where both fields can serve each other.

Annual Meeting of the Geotechnical Section

Date: *February 10, 1971*
Place: Dinner: Harkness Commons, Harvard University
Meeting: Room 110, Pierce Hall, Harvard
Attendance: 100 ±

Business Meeting:

Chairman Ladd called on Mr. Donald Goldberg to present the slate of candidates proposed by the Nominating Committee (Messrs. D. Goldberg, C. Ladd and H. P. Aldrich, Jr.) which were as follows:

Philip A. Wild	Chairman
Edmund G. Johnson	Vice-Chairman
Steve J. Poulos	Clerk
Vincent J. Murphy	Member
Stiles F. Stevens	Member
Anwar Wissa	Member

There being no further nominations from the floor, the members voted to elect the slate as read.

General Subjects of Program:

1. Inherent Pay Item Conflicts in Typical Pile Specifications
2. Applications of the Wave Equation
3. Interpretation of Pile Load Tests

Speakers:

Panel Moderator:	Ronald C. Hirschfeld
Panelists:	Charles L. Guild, Guild-Moulton Construction Corp.
	James F. Haley, Haley & Aldrich, Inc.
	Clifford Simmons, Raymond International Inc.
	William F. Swiger, Stone & Webster Engr.. Corp.

The format was quite informal, and was a continuation of the general subject of pile foundations. Each panelist made a brief presentation, followed by discussions among the panelists and questions from the floor.

Subsequently, several brief presentations on related subjects were given, some of which were illustrated and accompanied by handouts, including the following:

John Dunnicliff	Method of surveying internal alignment of pipe piles
Tom Davisson	Discussion of stresses induced in steel piles during driving
Peter Taylor	Short-term load test experiences
Gabriel Fuentes	(Pile Contractor, Puerto Rico). Short movie on pile load test and installation procedures in Puerto Rico
Abraham Woolf	Reminiscences of experiences with pile tests on several types, 30 years ago
Gary Brierley	Recent load tests in which tell-tale measurements at pile tip important

There were, in addition, several worthwhile and pertinent comments from other members in the group. The meeting was adjourned at 9:30.

Geotechnical Section Forum Meetings

Sponsored by Continuing Education Committee
Ronald E. Bucknam, Chairman

First Meeting:

Date:	*November 17, 1970*	
Place:	Harkness Commons, Harvard University Panel Discussion, followed by buffet dinner	
Attendance:	144	
Subject:	"Pile Load Tests and Use of Preaugering:	
Organizer:	Steve J. Poulos	
Moderator:	Eric P. A. O'Neil	
Panelists:	W. P. Carter	J. F. Haley
	C. L. Guild	H. A. Mohr
	C. E. Simmons	S. F. Stevens
	F. Maxwell	D. D'Appolonia

Second Meeting:

Date:	*January 19, 1971*	
Place:	Harkness Commons, Buffet Dinner Room 110, Pierce Hall, Program	
Attendance:	80	
Subject:	"Performance During Loading of Areas Underlain by Peat or Rubbish Fill"	
Organizer:	William Zoino A. Allen Gass	
Speakers:	Harl P. Aldrich, Jr.	Carmine DeVito
	Birger Schmidt	Edson F. White
	Donald Goldberg	Norbert Schomaker
	William Zoino	

Both of these meetings were well attended and received with much enthusiasm, indicating that these subjects and meeting format are well received by the membership.

Respectfully submitted,

Edmund G. Johnson
Clerk

ANNUAL REPORT OF THE EXECUTIVE COMMITTEE OF THE COMPUTER SECTION – 1970-71

During the second year of operation the computer section conducted or participated jointly with other sections in six meetings.

April 1, 1970

(Meeting at Pattens Restaurant, Attendance 76)

The Computer Section met to hear a panel discussion on "Computer Graphics in Civil Engineering". The first speaker, Mr. Paul DeNapoli, Chief Engineer, Hayden, Harding and Buchanan, Boston, described his experiences with the use of computers and computer graphics using time-sharing and remote terminal hardware. The second speaker, Mr. Joseph Fornataro, California Computer Products, Inc., reviewed the evolution of hardware and software aspects of automatic digital plotters.

May 6, 1970

(Meeting at Corps of Engineers Reservoir Control Center, Waltham, Mass., Attendance 50 approximately)

The Computer and Hydraulic Sections met jointly to hear Mr. Saul Cooper, Chief of the Reservoir Control Center describe and demonstrate, "A System for Automated Flood Control and Hurricane Protection". Mr. Cooper described the system which transmits hydrologic data to a central computer to direct the operation of 35 flood control dams in New England.

October 14, 1970

(Student Night – Meeting at University of Mass., Amherst, Attendance 150)

The Computer Section jointly sponsored student night with the Main Society and the Mass. Section of ASCE. The speaker was Mr. David Carsen of Omnidata, Inc., New York City. His talk was entitled: "Civil Engineering in the Seventies – The Effects of Mergers, Conglomerates, Unions and Computers". Mr. Carsen's presentation was followed by a lively discussion regarding the civil engineer's economic and professional status in society.

October 28, 1970

(Meeting at Playboy Club, Attendance 50)

The Computer Section met to hear Professor Joseph Sussman of M.I.T., who spoke on the subject, "Computerized Specification Editing", using illustrated examples from the "SPECS" Program. The discussion period indicated considerable potential use of the system.

November 10, 1970

(Meeting at Pattens Restaurant, Attendance 37)

The Computer and Geotechnical Sections met to hear a panel discussion concerning "Computer Applications in Soil Mechanics".

Dr. Charles C. Ladd, Professor of Civil Engineering, M.I.T., presented some engineering applications of computers.

Dr. John T. Christian, Associate Professor of Civil Engineering, M.I.T., discussed recent computer advances including graphical output.

Mr. Gerald L. Woodland, Jr., Assistant Manager, Systems Analysis and Programming Division, Stone & Webster Engineering Corporation, discussed "Computer Services and Engineering Objectives of Computer Usage".

January 20, 1971

(Annual Meeting at Playboy Club, Attendance 67)

During the business meeting the following persons were nominated to serve on the executive committee:

Chairman	–	Alan Rimer
Vice-Chairman	–	David Hellstrom
Clerk	–	Robert Logcher
Member	–	John Christian
Member	–	Charles Shaker
Member	–	Gerald Woodland

There were no other nominations, and it was voted that the clerk cast a single ballot for the slate.

Mr. Woodland then read the annual report of the section. Following this, there being no other business, Dr. G. Neil Harper, President of CLM Systems, Inc., was introduced as guest speaker. His subject was "Civil Systems Engineering in the 70's". He described several computer programs which his firm had developed and used, including those for vehicle licensing, airport noise studies, hydraulic systems, building size and shape optimization, elevator optimization, real estate analysis and risk analysis. A question period followed.

With this meeting the Computer Section completes its second year of service to the Society. Our section mailing list now identifies approximately 125 civil engineers in the Greater Boston area who are involved in computer applications. Computer Section meetings have indicated considerable interest in computer-related subjects and have generated considerable discussion.

Joint meetings with other technical sections have been attended principally by those engineers practicing in particular technical areas. I would encourage future meetings along both lines to satisfy both interests.

It is now accepted practice to use computers in engineering work by practically all engineering organizations. There is a definite need for a Computer Section in the Society and this has been demonstrated by increased attendance and participation in the affairs of the section. The future holds a challenge as computer-related techniques are refined and adopted. The Computer Section's role of service to the Society and to the profession will be to bring to the membership the knowledge and experience required for successful use of the computer by the Society's membership.

In conclusion I would like to express my personal appreciation to the Executive Committee for their cooperation and assistance during the past year and to the membership for your support. It has been a professionally rewarding experience.

Respectfully submitted,

Gerald L. Woodland, Jr.
Chairman 1970-71

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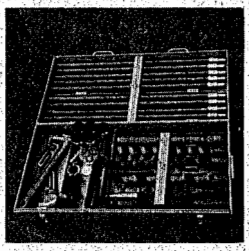

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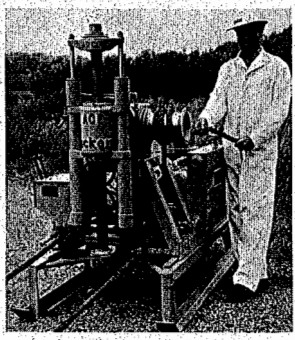

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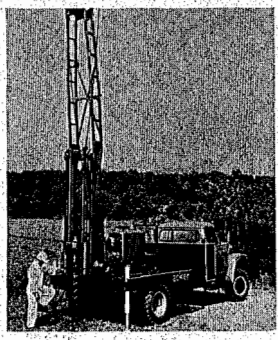

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