

very promptly showed that normal loading of this wharf would stress the piles at least 100% and any combination of added wind loads or wave action would very seriously overstress the piles. In this particular instance, the soils consultant had to convince the owners that his conclusions based on expert investigation were more reliable than the owner's own previous experience with timber wharf construction on the west coast but under somewhat different conditions.

The growth of soils engineering during the past 20 years has led to an appreciation of the value of this work. However, it is still necessary to increase this appreciation in some quarters and that is the responsibility of the soils engineer. The structural engineer expects from the soils consultant definite engineering advice presented with sufficient confidence that it will be approved by the owners.

For material for this discussion, I am very much indebted to personal contacts with the soils consultants in the Montreal district. The engineering staff of the Aluminum Company of Canada, Limited, has very kindly commented on specific details. Our soils consultant on the west coast has provided invaluable information through discussion on what may be expected from the soils consultants.

DISCUSSION

BY RALPH B. PECK*

Probably every consultant acquires a professional personality that reflects his own background and the fortunes of his professional life. No two consultants would have identical views about the relations among consultants, clients and contractors. Yet the publication and discussion of opinions and experiences concerning this subject may serve a most useful purpose, and we are fortunate that Dr. Terzaghi has ventured to open for debate a field with many controversial aspects.

The writer has by necessity given considerable attention to the special opportunities and problems of the professor-consultant. Soil mechanics experienced much of its early growth in academic surroundings and it is not surprising that many teachers and research workers developed consulting practices. Nevertheless, there are all shades of opinion regarding whether or how the professor-consultant

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should operate. On the one hand, we find some universities—even state-supported ones—formally serving as the vehicle for the consulting practices of their staffs. On the other hand, a senior partner of a well established firm specializing in soil mechanics recently suggested** that professors should abandon independent consulting activities forthwith, although such firms might upon occasion engage professors to study selected problems.

The writer takes a middle ground. He believes there are valid, even compelling reasons why professors should maintain a consulting practice. First, the experience cannot but improve the breadth and vigor of instruction. Secondly, certain phases of the work afford an opportunity for students to participate directly in the solution of current engineering problems. Thirdly, the work provides an impetus for research and develops judgment regarding the significance of problems worthy of research. Finally, the experiences provide the professor with raw material for digests of case histories, professional papers, and even textbooks. The bare fact that the majority of modern texts have been written by teacher-consultants rather than by members of consulting firms is strong justification for participation in consulting activity on the part of the professor.

Nevertheless, the writer feels that there should be sharp limitations on the nature and extent of consulting services by academic people. The professor should not allow himself to be in competition with practicing engineers. Particularly if he is an employee of a tax-supported institution, he should meticulously avoid the use of public funds or the uncompensated use of public facilities for private gain. Over a period of some 15 years the writer has gradually recognized a few criteria that he considers useful for judging whether a consulting assignment is appropriate. Of foremost importance, the assignment should involve his personal services on a personal basis. It should not involve participation in an organization or company having an existence separate from the University. Secondly, the assignment should involve the special skills of the consultant preferably in a novel way, that is, the work should not be routine or of a character within the ordinary scope of activities of the practicing engineer. For the most part, in fact, his work should be done for practicing engineers or engineering firms. Finally, the fee, which should be on a per diem basis, should be not less than that which would be charged

**Too Much In-Fighting, Consulting Engineer, Dec. 1956, p. 6.

by an independent consultant; it should, in fact, be somewhat greater to encourage the employment of the independent consultant if a competent one is available.

From time to time, assignments may have to be accepted which do not suit all these criteria. One cannot always tell in advance whether a project will be routine. For some problems the type of soil testing must be decided on a day-to-day basis as the project unfolds, and at the end of the program one may realize that only routine tests have been made. Occasional routine projects, moreover, have educational value, especially for graduate students. But, with the criteria to serve as a guide, the professor can usually pursue a consistent policy. He will not, of course, advertise his services or solicit work.

As a matter of fact, the professor-consultant need not feel on the defensive on account of his consulting practice. He has the opportunity, perhaps even the obligation, to provide a standard of professional competence not yet universal among consulting firms in the field of soil mechanics. Many such firms fall into a routine of boring, sampling, testing, and making recommendations for design that hardly constitutes professional service. All too few firms pay more than lip service to research or professional papers; they are too occupied by the urgencies of the moment. Fortunately there are notable exceptions.

Dr. Terzaghi has mentioned several types of service performed by the individual consultant before or during execution of a project. Often, in addition to these, the consultant is called upon in connection with a controversy even after the project is completed. Here there are both rewards and dangers. One of the rewards is the large amount of factual data, often concerning construction difficulties, that become available to the consultant in a brief time. Some of the writer's most interesting records of experiences have come to his attention in this way: In some instances, by assembling the facts from a disinterested point of view, the consultant may help to end the controversy without litigation; this is a rewarding situation indeed.

In controversial situations much depends on the attitude of the client. Some clients truly seek out the facts and a fair estimate of the situation. Others would like to direct the opinion of the consultant to their own purposes or interests. Occasionally one can do no more than withdraw from an assignment, if the client withholds or colors pertinent data or exerts pressure toward a favorable opinion. In con-

troversies the true reputation of a consultant emerges. The writer has been dismayed on occasion to discover that the "opposition" had retained a particular consultant because he knew the consultant's opinion would reflect the desires of the opposing party. On other occasions, the writer has been delighted to learn that a different consultant was on the opposite side of a controversy, even though that consultant was a highly competent individual, because he knew that the facts would be fairly and dispassionately used. A consultant can hardly have a more enviable reputation than to be desired as an opponent in spite of his great professional competence.

Finally, the writer would suggest that the consultant should be wary of making non-technical judgments. He is not a lawyer. He is often not called into a controversy until the battle lines are drawn. If he ventures out of his technical specialty, he may become unwillingly a pawn in the struggle.

DISCUSSION

BY FRANK A. MARSTON,* *Member*

I recall seeing a bas relief copied from an Italian church, of some centuries old, which depicted the head and shoulders of the architect, the contractor and the owner, in that order. The contractor was thumbing his nose at the other two. Apparently some of the problems of today in the field of construction are not new, particularly as regards human relations and responsibilities. Dr. Terzaghi's paper is worthy of thoughtful consideration. His understanding of the problems and experiences of a consultant in civil engineering can be appreciated sympathetically by any engineer who has practised in that field over a period of years.

There is no question but that the consulting engineer who can carry on his professional practise with a small office and only a few associates may have fewer worries than another who practises as part of a large organization. On the other hand, the former may not have the thrill and the satisfaction of accomplishment that comes to the latter, who not only consults with others, but is closely identified with all stages of the design and construction of important projects.

Much of the paper could have been titled, "The Importance of

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