

he should be guided by its "Code of Ethics", as well. Similarly, members of the Boston Society of Civil Engineers are obligated to conform to its "Code of Ethics".<sup>1</sup>

I commend Dr. Terzaghi's paper to all engineers engaged in private practise and to those who employ their services.

### DISCUSSION

BY CARLTON S. PROCTOR\*

Dr. Terzaghi's highly interesting paper, reminiscent of his brilliant professional and pedagogical career, points out many of the pitfalls that beset the client of the "package deal" engineering-construction procedure. His paper makes clear the fact that such pitfalls are inherent to "package deals", whether practiced by the engineering-construction departments of the client organization or by an independent contractor.

While his paper primarily depicts a situation where the engineering-construction work is performed by the Owners' engineering-construction departments, the same arguments apply with equal or greater force to the situation where the work is performed under a package contract by contractors whose services include both design and construction. In the latter case, the situation is additionally weakened by top management pressures to produce designs fitting into requirements for the use of the contractor's own equipment and limited to the contractor's experience.

The writer's experience over the past 39 years, as a member of a firm of Consulting Engineers specializing in substructure, marine, dam and other "heavy" engineering, completely endorses such conclusions.

Dr. Terzaghi's paper presents the case for the independent consultant, unencumbered by an engineering organization; but it ignores the obvious fact that few independent consultants have acquired his pre-eminence as expert in his field. Hence this paper cites examples of potential and actual failures and engineering mistakes which would not normally be discovered in time by a lone consultant but which would have been precluded under standard professional provisions by

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<sup>1</sup>Jour. BSCE, Vol. 38, July 1951, p. 331.

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an integrated, experienced consulting engineering firm, whose practice was limited to purely professional service.

With the steady increase in complexity of engineering design in this engineering age; with the mounting demands for a practical working mastery of modern theory of engineering science coupled with the all-important value of broad experienced engineering judgement; in an era of diminishing supply versus increasing demand for thoroughly trained and experienced engineers, only the well-integrated engineering firm can meet today's demands.

In the long established practice of the writer's firm, full professional responsibility for design, specifications and supervision is accepted only where our contract provisions permit full latitude as to the acquisition of all pertinent data; our own laboratory soil investigations, comparative design studies to produce maximum stability, economy and utility; detailed supervision and inspection. Where the agreement for engineering services does not encompass these integrated services, disclaimers as to professional responsibilities are clearly established. Designers should carry through on supervision and inspection and each element of the project, from site selection to completion, should receive the benefit of specific experienced judgment in all fields of specialized complexity.

The antagonisms, the mutual exclusiveness, and the lack of incentive between design and supervision forces, as depicted in Dr. Terzaghi's paper, are inconceivable within the organization of a reputable consulting engineering firm; they can obtain only where the "package" type of engineering services are utilized. And "the layout of temporary installations is commonly left to the discretion of the superintendent of construction" only when the responsible engineering services are departmentalized within a parent organization or where engineering is organizationally interwoven with construction interests. Because as the paper so aptly puts it, "the contractor cannot be expected to be interested in the reasoning behind the design. His sole aim is . . . minimum expense".