Elements of a Model Document to inform Owners, Architects & Engineers when engaging the services of Geotechnical Specialists

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Summary: The paper takes account of previous publications on *Geotechnical Risk* and *Documents to Inform Owners*, and sets out the elements considered to be important to a Model Document directed at informing Owners, Architects and Engineers about engaging the services of geotechnical specialists.

The paper stresses the importance of making clients aware of project-specific risks associated with geotechnical investigation and design. A common element of construction contracts is the risk associated with unanticipated ground conditions, resulting in delays, cost overruns, and potential disputes and litigation.

The findings of a survey on Liability & Litigation are outlined, and establishes common causes for disputes.

The importance of a proper selection process for appointment of geotechnical consultants/specialists is discussed, and criteria are proposed for clients and owners to consider. The paper stresses that cooperation between the professionals involved in a project, and the client is essential to a mutual scope development, and is fundamental to reducing liability of all members of the design team.

Development of a scope of work and project brief is discussed in detail, and it is suggested that the key to effective management is developing good relationships and maintaining communications.

The importance of observations and monitoring during construction is discussed, and it is recommended that the original geotechnical consultant or specialist should undertake the field observations during construction. When the Observational Method is not used, full responsibility for adverse performance might end up with the owner.

INTRODUCTION

The International Society for Soil Mechanics & Geotechnical Engineering Technical Committee TC20 has previously promoted Client Awareness as an important step in the procurement of specialist geotechnical services. A draft sub-committee report entitled "Promotion of Client Awareness (Draft 2000)", was included in the proceedings of the GeoEng 2000 Professional Practice Symposium, (Ulrichs, 2000).

Findings from a previous TC20 subcommittee report entitled "Liability and litigation in the practice of geotechnical engineering" and a workshop on the subject (Starr, 1997), listed common causes for disputes, and recommended that a position paper be prepared to inform clients. The present paper builds on the previous subcommittee reports, and builds on the contents of publications by the ASFE. It sets out the elements considered to be important to a Model Document directed at informing Owners, Architects and Engineers about engaging the services of geotechnical specialists.

PROJECT-SPECIFIC RISKS

Clients should be made aware of project-specific risks associated with geotechnical investigation and design. A common element of construction contracts is the risk associated with unanticipated ground conditions, resulting in delays, cost overruns, and potential disputes and litigation. These risks arise from uncertainty, due to variability in sub-surface profiles, and the statisticaliy small sample on which an assessment and resulting judgements are made.

COMMON CAUSES FOR DISPUTES

The findings of a survey conducted as part of the TC20 sub-committee on Liability & Litigation established the following common causes for disputes (Starr 1997):

- unexpected excavation conditions
- lack of understanding of engineering geology
- inadequate investigations due to budget constraints
- poor communications and lack of involvement of geotechnical specialists in the design and construction process
- settlement of structures, piling difficulties
- lack of experience and professionals working outside their area of expertise
- inexact nature of the art/science of geotechnical engineering
- groundwater problems
- geotechnical reports not directed at practical design or construction issues

SELECTION PROCESS

The selection of a geotechnical consultant/specialist should be based on the following criteria:

- Technical, professional & administrative competence of the managers and staff assigned to your project
- Quality of work
- Expertise in the area or speciality concerned
- Knowledge of local geology and ground conditions
- Expertise in the types of construction involved
- An understanding that the geotechnical consultant will be an equal member of the design team, and will be allowed to communicate with the other design professionals
- An understanding that the geotechnical engineer should fully participate in the development of the scope of investigation work, and reviewing plans, designs and specifications developed by others
- An understanding that the geotechnical engineer should monitor conditions during construction, and provide guidance on solutions to problems caused by unexpected ground conditions

Cooperation between the professionals and client involved in a project is essential to a mutual scope development, and is fundamental to reducing liability of all members of the design team.

DEVELOPMENT OF A SCOPE OF WORK & PROJECT BRIEF

The following steps are recommended in the development of the scope of work:

- The work scope should be discussed in terms of risks, alternatives and the advantages/disadvantages of different methods of investigation and testing
- The client needs to understand the risks in order to make effective decisions
- The customary approach by many architects and engineers of establishing a fixed (and often limited) scope of geotechnical services and inviting several firms to submit fee quotations, should be discouraged. The risks associated with this approach may result in liability for the architects and engineers who develop such limited scopes
- Cost savings made by reducing scopes are often more than off-set by higher costs of site preparation and foundation construction
- The fee basis should depend on the complexity of work;
  - fixed fee where scope of work is well defined and clearly understood
  - schedule of sums and hourly rates where work cannot be clearly defined
  - combination of agreed target hours and hourly rates where the scope of work is reasonably clear
- The brief should be established by clearly defining the scope of work in respect of deliverables, and associated time and cost, structuring the brief to reflect risks and complexities of tasks
- The brief should include a review of plans and specifications developed by other professionals
- The brief should include field observation and monitoring of site formation works and foundation construction

It should be stressed that no matter how comprehensive the scope of work, risks still remain.

MANAGING THE CONSULTANCY BRIEF

The key to management is developing good relationships and maintaining communications. In general, the geotechnical consultant is responsible for quality of the geotechnical engineering, but there is a shared responsibility with the client and other professionals for the appropriateness of the technical solutions.

An initial project meeting should be held at the start of an investigation. The frequency of progress or project meetings will depend on the nature and size of the commission.

- The consultancy should be managed to achieve the right result, and performance should be monitored.
- Geotechnical services typically include a formal report analysing the findings and giving recommendations. Risks can be managed by developing alternative solutions to technical problems.
- A review of plans and specification developed by other professionals should be based on the geotechnical recommendations.
- Include observation and monitoring by all appropriate means

In summary, good management of the brief is achieved by:

- communication
- coordination
- cooperation

OBSERVATIONS DURING CONSTRUCTION

The observational method was developed by the father of geotechnics, Karl Terzaghi.

The observational method is a two-stage process;

1. Development and implementation of an appropriate scope of investigation work that responds to the clients needs, recognising that profiles derived from such investigations have inherent uncertainties
2. Field observation during construction, which allows an assessment of the reliability of the sub-surface profile and appropriateness of preliminary recommendations.

It is recommended that the original geotechnical consultant or specialist should undertake the field observations during construction. When the Observational Method is not used, full responsibility for adverse performance might end up with the owner.

CONCLUSIONS & RECOMMENDATIONS

The elements of the process recommended when engaging the services of geotechnical specialists are summarized below in Figure 1.

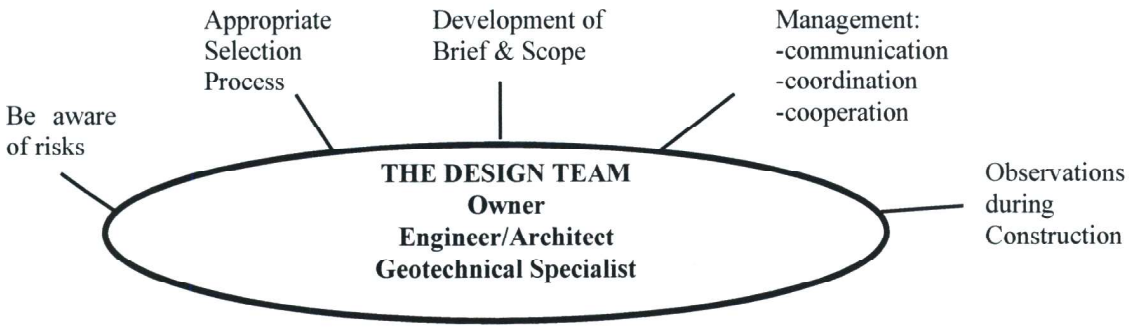

Figure 1. Elements of the process of engagement and use of geotechnical specialists

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