PROFESSIONAL PRACTICE IN SOUTHEAST ASIA

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SYNOPSIS This report presents the current status and problems of geotechnical engineering practice in five countries which belong to the Southeast Asian Geotechnical Society. A survey questionnaire was sent to members of the local Associations of Consulting Engineers and other known geotechnical consultants. Information presented include profile and scope of practice, professional registration, code of ethics, technical codes, professional liability, quality assurance, business development, fee competition and major trends.

INTRODUCTION

This paper is one of "country" reports prepared by the members of the Technical Committee on Professional Practice (TC-20) of the International Society for Soil Mechanics and Foundation Engineering. Since the Southeast Asian Geotechnical Society (SEAGS) is a member society of the ISSMFE, the professional practice in the Southeast Asian region is thus treated in one report. For reasons associated with the formation and membership of the SEAGS, Southeast Asia is defined in this paper as comprising Hong Kong, Malaysia, Singapore, the Republic of China (Taiwan), Thailand and the Philippines. The total land area of these countries covers about 1.25 million sq km. With a total population of more than 160 million, the Southeast Asia has become the most rapidly developing region in the world during the past decade. Since major infrastructures and industries, were developed in the last 10 to 15 years, consulting engineering practice in these countries is relatively young and immature as compared to the developed countries such as USA and UK. In the earlier days of development in the Southeast Asian countries, professional engineering practice was dominated by foreign consultants or imported engineers. Many established western consulting engineering firms had branches in these countries. This was partly due to the fact that some countries received foreign aids such as ROC, Thailand and Philippines and the others are in the British Commonwealth which include Malaysia and Singapore. With the exception of Hong Kong, which is still a British Colony until 1997, and is more dominated by British-related consulting firms, a strong local consulting engineering practice is being established in the other 5 countries in the region. Development in the practice of geotechnical engineering in the region is somewhat following the same trend but at a somewhat slower pace. In other words, there are not many consulting engineering firms who are specializing in this field. A review of the development of geotechnical engineering in Southeast Asia has been made by the author (Moh, 1988).

NATIONAL PROFESSIONAL ORGANIZATION

The six countries of Southeast Asia do not have any special professional society for practicing geotechnical engineering organizations. In five of the countries, e.g. Hong Kong, Malaysia, Singapore, Thailand and the Philippines, there are Associations of Consulting Engineers which are members of the International Federation of Consulting Engineers (FIDIC). Majority of the civil engineering FIDIC consultants are members of these associations. However, some geotechnical specialist consultants do not join these associations. There are no legal requirement or binding for a consulting engineering firm to join such an association. Among the four Associations of Consulting Engineers, the one in Hong Kong has been officially accepted by the Government to discuss fee scales, liabilities, employment conditions of consulting engineers, etc.

In the Republic of China, there are three professional organizations for practicing civil engineers. They are the Taipei Civil Engineers Association, Kaohsiung Civil Engineers Association and Taiwan Provincial Civil Engineers Association. It is a legal requirement according to the Professional Engineers Act, all Registered Professional Civil Engineers in private practice, whether in consulting work or construction industry, must be a member of one of these associations. There are similar organizations for other professional disciplines. When geotechnical engineering becomes one of the approved professional discipline, an association(s) will have to be organized. In addition, an effort

is being made by a group of consulting engineering firms to form an Association of Consulting Engineers in ROC.

For technical matters, the Southeast Asian Geotechnical Society plays an important role in the region in addition to the local professional institutions.

PROFILE AND SCOPE OF PRACTICE

Survey

For the preparation of this report, a questionnaire was prepared by the author and sent to all major consulting engineering firms (except those do not practice in civil engineering) in the 6 countries requesting the following information:

(1) Firm's name, location of headquarter office and branch offices.

(2) Legal form or type of ownership of the business.

(3) Year organized.

(4) Gross income in 1987 on geotechnical related works.

(5) Composition and size of staff for geotechnical related works.

(6) Distribution of income for different types of clients.

(7) Types of services provided.

(8) Types of facilities available.

(9) Types of fee arrangement.

(10) Methods of procurement of projects.

The contents of the questionnaire were very similar to that prepared by Roberts (1985) in his survey of the US-based geotechnical firms. Since there are only a very few specialized geotechnical engineering consulting firms in the region, the questionnaire was sent to all major civil engineering consultants who are either members of the local Association of Consulting Engineers (ACE) or known to the author. Many small-size firms with less than 5 employees were not contacted.

Although responses were received from only 33 firms contacted, and not all firms who have replied provided information on all questions asked, the survey is believed to represent statistics from firms providing more than 60 to 70 per cent of the geotechnical consulting practice in the region. Many civil engineering firms do not provide geotechnical consulting services. The breakdown of the response is shown in Table 1 and the list of firms responded is included in the Appendix. It is interesting to note that among the non-members of the local Association of Consulting Engineers, majority of them are geotechnical consulting firms and the responses were better than that from the ACE members. For the Philippines, the author was able to contact only one firm. Although questionnaires were distributed through that firm, no response was received.

Table 1 Questionnaire Response by Countries

Country	Number of Questionnaire Sent		Number of Response		Percent of Response	
	Member ACE	Non Member	Member ACE	Non Member	Member ACE	Non Member
Hong Kong	28	3	10	3	36	100
Malaysia	11	18	2	4	18	22
Singapore	6	2	1	1	17	50
ROC	NA	8	-	8	-	100
Thailand	17	0	3	0	24	0
Philippines	1	-	1	-	-	-
Total	63	31	17	16	27	52

For reasons of relatively new development and other national policies, a fairly significant portion of the geotechnical work in the developing countries in Southeast Asia has been and is still being carried out by government or quasi-government organizations. This is particularly true in Hong Kong, ROC and Singapore. Hong Kong is very unique in having probably the largest government organization specializing in geotechnical engineering. The Geotechnical Control Office has a total staff of over 650 with 130 professionals and 240 sub-professional staff.

In addition to government agencies, many academic institutions and their faculty members in the region are also involved in geotechnical consultancy work, this is particularly true in Singapore, Thailand and ROC. Due to the availability of facilities and low overhead, the private firms often face unfair competitions.

In the ROC, three of the largest consulting engineering firms, each with a staff over 700, are sponsored by the government agencies, but operate as consulting engineering firms. These firms are therefore included in the survey.

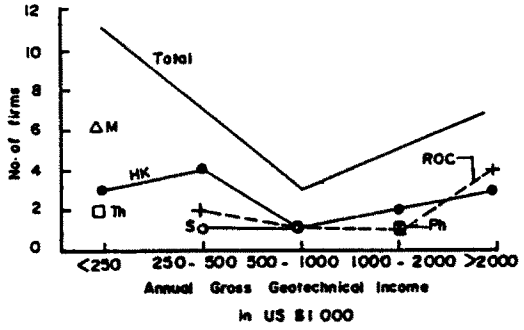
Size of Firms

The size of a consulting firm can be measured in terms of its annual gross income or the number of employees. The distributions of these two factors for the year 1987 from the survey are shown in Figs. 1 and 2. It is

interesting to note that in the Southeast Asia region, there are more firms either fairly small with total employees less than 20 or relatively large with many more than 50. Their corresponding gross annual incomes were less than US$0.5 million or more than US$2 million. The survey suggests that the firms surveyed can be divided into four broad categories based on income and number of employees:

(1) Group I - Very small firms with an income in 1987 of less than US$250,000 and with employees ranging from 3 to 16. Group I represents about 33 per cent of the firms surveyed.

(2) Group II - Small firms with gross income ranging between US$250,000 to US$500,000 and with 9 to 30 employees. Group II represents about 21 per cent of the firms surveyed.



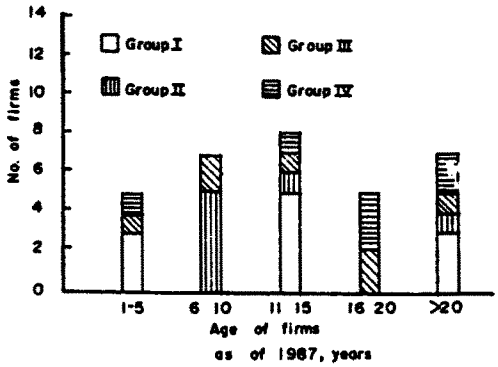
(3) Group III - Medium-sized firms with gross annual income ranging from US$500,000 up to US$2 million and with 17 to 60 employees. Group III represents about 24 per cent of the firms.

(4) Group IV - Medium-large-sized firms with gross annual income more than US$2 million but less than US$5 million and with 45 to 150 employees. Group IV accounts for about 21 per cent of the firms surveyed.

Group I and II firms are normally geotechnical specialized firms whilst Group IV firms are mostly large civil engineering consultants with geotechnical engineering department.

Age of Firms

Figure 3 shows the distribution of age of firms as of 1987. Majority of the firms is less than 20 years old. There is, however, no definite trend relating the age and the category which the firm belongs to. This is probably due to the fact that most of the older firms are multi-disciplines.



Composition of Staff

The staff composition of the firms surveyed varies considerably. In Table 2, two staff compositions are shown for each of the four categories of the firms. One is for the smaller sized firm, in terms of total number of employees in the particular Group and the other is for the firm with the largest number of employees. Many firms particularly those in Group IV are general civil engineering consultants, therefore multi-disciplines. Only those staff directly related to geotechnical work are included in the table. In Southeast Asia, drilling work is usually handled by site investigation contractors. Among the 33 firms surveyed, only 5 has drilling crews and none of the firms in Group IV has their own drilling crew. The 5 with drilling crews probably handled more site investigation work than consultancy.

Table 2 Composition of Staff

Composition of Staff	Group I	Group II	Group III	Group IV
Professionals Geotechnical Engineers				
with B.S. degree	2 - 3	3 - 14	2 - 1	15 - 65
with M.S. degree	0 - 1	5 - 6	2 - 10	12 - 20
with Doctorate	1 - 2	0 - 0	1 - 1	0 - 2
Engineering Geologists				
with B.S. degree	1 - 0	2 - 3	0 - 6	0 - 14
with M.S. degree	0 - 0	1 - 0	0 - 3	1 - 6
with Doctorate	0 - 0	0 - 0	0 - 0	0 - 1
Technicians	2 - 5	3 - 5	7 - 22	6 - 10
Drillers	0 - 0	0 - 0	0 - 0	0 - 0
Administrative	1 - 1	2 - 1	3 - 2	3 - 3
Clerical	1 - 1	1 - 1	1 - 3	3 - 2
Total	8 - 13	17 - 30	16 - 48	40 - 123

Table 3 Facilities

Equipment	Group I		Group II		Group III		Group IV	
	No of Firms	%	No of Firms	%	No of Firms	%	No of Firms	%
Drilling Equipment	1	9	2	29	3	38	0	0
Soil Testing (Lab) Physical Properties	5	45	4	57	5	63	5	71
Strength	4	36	4	57	5	63	5	71
Consolidation	4	36	4	57	5	63	5	71
Others	1	9	4	57	3	38	4	57
Chemical Properties	1	9	1	14	1	13	3	43
Cone Penetrometer	0	0	2	29	0	0	1	14
Instrumentation Monitoring	1	9	1	14	1	13	4	57
Rock Testing	1	9	3	43	3	38	4	57
Biological Tests	0	0	0	0	1	13	1	14

Table 4 Percent Distribution of Income by Client Category

Category of Client	Group I	Group II	Group III	Group IV
Governments	65, 40	15, 5	0, 75	58, 20
Government Enterprises	20, 0	0, 13	5, 12	42, 30
Architects and/or Engineers	2, 40	15, 67	40, 11	0, 10
Owners and/or Developers (Commercial)	2, 0	20, 0	5, 0	0, 10
Owners and/or Developers (Residential)	8, 5	20, 0	5, 0	0, 10
Owners and/or Developers (Industrial)	3, 0	15, 0	5, 1	0, 5
Contractors	0, 15	15, 15	40, 1	0, 10
Others	0, 0	0, 0	0, 0	0, 5

Facilities

The types of facilities owned by the four categories of consulting firms are summarized in Table 4. Over half of the firms have the capability to perform laboratory tests on soil samples. The facilities range from simple equipment to sophisticated testing facilities, such as fully automated dynamic triaxial testing assembly. A number of firms sub-contract out testing work to drilling contractors and testing laboratories. Those testing laboratories which provide little or no consultancy work have not been included in this survey.

Clients

Each firm was asked to estimate the percentages of work obtained from 8 categories of clients. The results indicate that there are considerable variations and no typical trend or distribution can be identified for any of the Group. Shown in Table 4 are two examples for each Group. The examples tend to illustrate somewhat the extremes. Generally speaking, the larger firms in Group IV tend to have more projects from the government or quasi-government sector.

Functions Provided

Table 5 illustrates per cent distribution of income by functions provided by the consulting firms in the 4 Groups. Ten categories of functions are selected same as those used by Roberts (1985) in his survey of the firms in USA. Since many of the functions cannot be clearly defined or separated in terms of project income, the figures are to the best rough estimates only. The examples shown in Table 5 are corresponding to the same firm in each Group in Table 4. There are several general observations which can be made from the survey results. They are :

(1) There were practically no client sponsored research for development projects carried out by consulting firms in Southeast Asia. Only one firm indicated this item in their return.

(2) There were practically no work related to investigation or study of toxic or hazadous wastes which is becoming increasingly important in many developed countries.

(3) A number of firms derives significant proportion of income from drilling services even though they do not maintain drilling crews.

Table 5 Percent Distribution of Income by Functions Provided

Functions	Group I	Group II	Group III	Group IV
Research & Development	0, 0	0, 0	0, 0	15, 0
Engineering Geology	0, 0	15, 10	2, 15	10, 10
Geotechnical Study Prior to Design	15, 20	45, 25	30, 15	7, 30
Design & Specifications	75, 50	20, 5	2, 5	25, 20
Drilling Services	0, 0	0, 25	30, 0	5, 10
Lab & In Situ Testing	0, 0	0, 15	26, 2	15, 12
Construction Monitoring	10, 15	20, 0	10, 60	5, 8
Post-Construction Monitoring	0, 15	0, 5	0, 0	5, 0
Hazadous	0, 0	0, 5	0, 0	3, 0
Other Geotechnical Services	0, 0	0, 10	0, 3	10, 10

Scope of Work

The typical scope of work which a geotechnical consulting firm provides includes:

1. Project familarization - This item includes site visit, discussion with client and other consultants on detail project requirements.

2. Field activities - Site investigation may be divided into stages depending upon the nature of the project. Work items may include site reconnaissance, geological mapping, geophysical exploration, drilling and sampling, and in situ testing.

   In many cases, the field work are carried out by site investigation contractors. The geotechnical consultant is responsible for supervision.

3. Laboratory testing - as shown in Table 3, more than 50 per cent of the firms surveyed have their own laboratory soil testing facilities. The program of testing is not only dependent on the size and nature of the project, but greatly depending upon the quality of the consulting firm.

4. Analyses and recommendations - The results of field exploration and laboratory testing are analyzed to develop conclusions and recommendations. The extent of analyses depends on the nature of the project and also the practice of the consulting firm.

5. Preparation of report - The results of all work performed on a project are then summarized in a written report. This report is sometimes required to be submitted to the government authorities.

6. Supplemental consultations - The geotechnical consultant often meets with the planner and designer, usually architects and structural engineers, prior to finalization of his report as well as after submitting his rsport but before finalization of design plan and specifications. Meeting with government review board and/or officials are often necessary.

7. Design and preparation of specifications - When the geotechnical consultant is engaged to do geotechnical-related designs such as foundations, substructures, retaining structures, slopes, and site formations, he will prepare design drawings and construction specifications.

8. Interview tenderers - The geotechnical consultant is often required by the client to assist in interviewing tenderers for subsurface construction even if the consultant was not the designer.

9. Construction supervision and assistance - Geotechnical consultant is sometimes engaged to provide construction supervision and monitoring, particularly where the design was carried out by the geotechnical consultant. Assistances to solve certain construction problems, such as interpretation of pile load test, dewatering, stability of temporary work, are often provided by the geotechnical consultant.

10. Instrumentation monitoring - Geotechnical consultant is often engaged to provide services to monitor instrumentations installed for construction safety control, such as deep excavation and tunnel, and interpretation of the monitored data.

How extensive is the scope of work involved in each project depends largely upon the size of the project. For some large and tall building project with several levels of basements, all the above ten items are included. It appears that in the Southeast Asia region, geotechnical consultants are more deeply involved in project developments in the ROC, Hong Kong and Singapore than Malaysia and Thailand.

PROFESSIONAL REGISTRATION

In the five Southeast Asian countries covered by this report, individual engineers are required to be registered to practice engineering. In none of these countries, Geotechnical Engineering has been officially classified as a branch of the professional engineering. The closest branches of professional engineering to geotechnical engineering are Civil Engineering and Structural Engineering. Table 6 summarizes the basic requirements for registration as a Professional Civil Engineer and Professional

Structural Engineer in the five countries. Many geotechnical engineers in the region practice as Professional Civil Engineer and/or Professional Structural Engineer. On the other hand, there is a significantly large number of practicing geotechnical engineers who are not registered Professional Engineers.

Table 6 Requirements for Professional Engineers' Registration

Country	Type of Registration	Qualification	Authority
ROC	P.Eng. (Civil) P.Eng. (Structural)	(1) Holding recognized academic qualifications (2) Passed National Higher Examination or special prescribed qualifications (3) Has obtained minimum 2 years practical experience	Professional Engineers Act 1947; Amendments, 1954, 1972, 1977, 1985
Hong Kong	Authorized Person (Eng.) Registered Structural Engineer	(1) Holding Corporate Member of ICE or Istructe, or recognized degree plus 4 years experience plus passing examination in professional practice	Building (Administration) Regulations, Cap. 123, Sec. 387 1960
Malaysia	P.Eng. (Civil)	(1) Registered as a Graduate Engineer (by degree and/or examination) (2) Has obtained practical experience (minimum 2 years) (3) Passed Professional interview or Corporate Member of the Institution of Engineers, Malaysia	Board of Engineers, Registration of Engineers Act 1967; Amendment 1967
Singapore	P.Eng. (Civil)	(1) Holding a recognized degree (2) Has obtained practical experience (minimum 2 years professional level) (3) Passed Professional practice examination	Board of Engineers, The Professional Engineers Act, 1970; Amendment 1977, 1980
Thailand	P.Eng. (Civil) (1) Associate Engineer (2) Ordinary Engineer (3) Senior Engineer	(1) Holding a recognized degree (2) Has practiced as an Associate Engineer for not less than 3 years (3) Has practiced as an ordinary Engineer for not less than 1 year	Engineering control Commission; Act on the Engineering Profession 1962

Geotechnical engineering reports normally are not required to be endorsed by Professional Engineers. Geotechnical-related designs are endorsed by Professional Civil or Structural Engineers. Up to the time of preparation of this report, there is no special legal requirement for registration of consulting engineering firms. The firms are just registered as business concerns. In Hong Kong, the Geotechnical Control Office maintains an unofficial list of approved geotechnical consultants who would be qualified to take on government projects. Many other government organizations in all five countries appear to have their own individual unofficial approved list of geotechnical consultants.

Actions are being taken by the geotechnical engineers in Hong Kong and ROC to pursue the relevant government authorities to recognize geotechnical engineering as an official professional discipline and to require registration. In June 1987, the Hong Kong Institution of Engineers has adopted amendments to the constitutions to include registration of professional engineers. Geotechnical Engineering has been listed as one of the major engineering disciplines for the 1988 National Higher Examinations which is the qualified examination for professional engineering registration. Similar to the geotechnical consultants, there is no requirement for special registration for laboratories, although there may be unofficial approved lists maintained by different government departments.

CODE OF ETHICS AND LAWS OF CONDUCT

In all five countries covered by this report, there is a general Code of Ethics for all professional engineers, either issued by the Board of Engineers or the Ministry which has the jurisdiction over professional engineers' registration. The contents of the Codes are similar to most of the Codes of Ethics in the developed countries.

In addition, the general Code of Conduct issued by FIDIC is prescribed.

Generally speaking, geotechnical reports are not required to be endorsed by Professional Engineers. In the ROC, submission for approval of building plans and designs to the local building control authorities must be accompanied by a site investigation report, i.e. usually a drilling and testing report. This report can be prepared by a drilling contractor. Similar requirement also exists in other countries. In Hong Kong, more stringent requirements are placed on geotechnical reports for slopeland developments. These reports must be submitted to the Geotechnical Control Office for review and approval before the building designs can be approved by the Building Ordinance Office. For all sizable development on slopelands, a preliminary geotechnical assessment is required to accompany the submission of a development plan.

In practice, all projects of over US$0.5 million would have a geotechnical report or at least a drilling report.

Endorsement by Professional Engineers (civil or structural) for geotechnical-related designs, such as foundations, substructures, retaining structures, site formation, ground improvement, etc. are usually required. All permanent structures must be subject to approval by the relevant authority. In the past, temporary works, such as shoring for excavation, did not require approval. However, there is a strong move in country like Singapore to require approval of all this type of work.

TECHNICAL PROCEDURES AND CODES

The technical level and standards of geotechnical engineering in Southeast Asia have progressed rapidly in the last decade (Moh, 1987). All sophisticated methods and tools for analysis are available and have been adopted by the geotechnical profession in the region. Majority of the practice and those

regulations in the local building codes follow either the British Standards, British Codes of Practice, the ASTM and ASCE Codes. In the ROC, Japanese Standards and guides to practice are also often used. The National Bureau of Standards of ROC has issued a series of Standards for Testing of Soils. They are essentially similar to those adopted in the BS, ASTM, or JIS methods. In the Building Codes issued by the Ministry of Interior, there is a chapter on foundations. The Geotechnical Engineering Committee of the Chinese Institute of Civil and Hydraulic Engineering is at the present in process of preparation of two codes of practice, one for site investigation and the other for foundation engineering. In Hong Kong, besides the Building Ordinance and the Unified General Specifications for Civil Engineering Works, there are several important guidance documents for geotechnical works issued by the Geotechnical Control Office including Geotechnical Manual for Slopes (1964), Guide to Retaining Wall Design (1982), Guide to Rock and Soil Descriptions (1987), and Guide to Site Investigation (1987). The Singapore Institute of Standards and Industrial Research has issued Code of Practice for Earthwork (1981), and Code of Practice for Foundations (1976).

PROFESSIONAL LIABILITY AND INSURANCE

In the past, professional liability insurance has not been very common in Southeast Asian countries, particularly for geotechnical engineering works. Due to the rapid development in recent years, both the size and the complexity of projects become bigger, more clients start to require geotechnical consultants, particularly those also carry out designs to have professional liability insurance. However, the insurance profession in the region has not been up-to-date. Most of the insurance brokers does not understand what is geotechnical engineering. Majority of the firms who carry professional liability insurance obtains their coverages from insurance companies outside their own countries. It is generally much easier for those well-established firms from developed countries to obtain insurance coverages through their home offices. Many small firms are having difficulty to get insurance coverages. Insurance premiums for geotechnical consultants are always much higher than that for structural engineers and architects. Table 7 summaries the survey results from the 33 firms in the region.

Table 7 Survey Results on Professional Liability Insurance

	Group I	Group II	Group III	Group IV
Number of Firms Carrying Insurance	7	5	3	6
Number of Firms with Insurance	4	2	5	1

PROJECT REPORTS

There are generally two types of geotechnical reports. The truly geotechnical reports are those prepared by geotechnical consultants. These reports normally contain all basic data obtained from the field exploration and laboratory testing, analyses and interpretation of the data, conclusions and recommendations. Recommendations usually include foundation type, bearing capacity, settlement estimations, soil and/or rock parameters for design use, groundwater conditions, and sometimes construction schemes and methods for solving anticipated difficulties. This type of report is primarily for the benefit of client and designer, and is seldom included as part of the tender document. Only the basic data are included in the design drawings or as a part of the tender information. The report, however, is often made available to the tenderers for reference.

The other type of reports are really just site investigation reports prepared by site investigation contractors. Besides boring logs and testing data, this type of reports sometimes also contain recommendations on foundation type and bearing capacity. More than often, this type of report is not prepared by qualified geotechnical engineer.

CONSTRUCTION MONITORING

Except for large scale projects or projects involving geotechnical design, the geotechnical consultants in this region are usually not directly involved in construction monitoring. Construction supervision or monitoring are usually handled by the design engineer or even architect. It is unfortunate that continuity of geotechnical services during construction is not provided by the same consultant who makes the recommendations and unawareness of inherent assumptions and simplifications often lead to construction problem and even failure.

When the geotechnical-related construction is designed by the geotechnical consultant, site supervision and/or monitoring are then also provided by the geotechnical consultant. In the preparation of technical specifications, the extent of the geotechnical consultant's involvement is also depending upon whether the consultant is responsible for design or not.

QUALITY ASSURANCE

The extent of quality assurance varies considerably among the firms. It depends greatly upon the size and policy of the firm. It is not possible to report a general procedure. As an example, in the author's own firm in Taiwan (which is a Group IV firm), there is a definite quality assurance program

which must be followed by every project. All the work produced by the engineers are double checked by another engineer and reviewed by the Project Engineer. Before any report or design is finalized to be issued, it mut be reviewed by the Department Manager and then the Chief Engineer, the latter serves as an independent QA reviewer. In the smaller sized offices of the author's group (Group II and Group III), the QA procedure is not so elaborate. However, there is always a senior person, usually the Resident Director, who is responsible to review the report and other products of project work before they are issued.

FEE COMPETITION AND CONTRACTS

There are generally three ways for a consulting firm to obtain projects. They are : competitive bidding, based on qualifications and technical proposal, and from sole source. Geotechnical consultant becomes a sole source either from established relationship with certain clientele or due to established reputation. Theoretically, selection of a consultant on the basis of qualifications and technical proposal appears to be the most logical approach. However, many clients are very money-conscious, many projects are often awarded solely on the basis of lowest price. This often leads to compromises in the scope of work and encourages inferior results and/or costly, conservative recommendations and design.

The FIDIC Policy Declarations on Competitive Bidding state that:

> "It is not in the interest of the client or of the profession that consulting engineers should seek or accept appointment under any system of competitive bidding for professional services. Selection of a consulting engineer for appointment should be made on consideration of competence and availability leaving the negotiation of fees and costs to be settled only with the engineer selected".

Although many of the firms in the region belongs to FIDIC through their local ACE, the above policy has not been seriously adhered to. Even some well established large firms practice undercut. Table 8 shows the range and average per cent distribution of income by method of procurement. Although more than 50 per cent falls in the category of "based on technical proposal", in fact, many of those proposals also included the cost item and selection of the consultant is usually heavily influenced by the price element. Sole source appears to be relatively in high percentage for Group I firms, but it drops to an average of only 10 per cent for the larger Group IV firms.

Table 8 Percent Distribution of Income by Method of Procurement of Project

Method of Procurement	Group I		Group II		Group III		Group IV	
	Range	Ave	Range	Ave	Range	Ave	Range	Ave
Competitive Bid	20 - 70	14.4	8 - 55	23.8	8 - 60	33.1	0 - 50	17.5
Technical Proposal	10 - 100	54.5	5 - 100	54.2	10 - 70	40.6	50 - 95	72.5
Sole Source	10 - 100	31.1	10 - 75	22.0	0 - 82	26.3	0 - 30	10.0

BUSINESS DEVELOPMENT

Just like any other consulting engineering firms around the world, geotechnical engineering firms must be actively involved in marketing their services to potential clients. The business development activities of consulting firms in Southeast Asia are not much different from that in the USA as described by Roberts (1985) and other countries. They may consist of a combination of the following :

1. Meeting potential clients through references by other satisfied clients and friends.
2. Meeting other professionals at technical conferences and meetings.
3. Presentation of technical papers at professional and industrial trade organizations.
4. Involvement with local business groups or civil activities.

Among the above four activities, the first is probably the most important one. Quality of service is always important in order to satisfy the client and to gain reputation. However, the importance of human relations in business development cannot be over-emphasized.

MAJOR TRENDS IN THE PRACTICE

As pointed out in earlier sections, the geotechnical engineering profession in Southeast Asia is relatively young comparing with other profession such as civil engineering and architecture. Although significant progress in the development of the profession has been made in the past decade, there are many problems which the profession is facing and must find means to improve. The following are some of the areas of practice which are of most concern to the profession.

1. Inadequate public awareness of the geotechnical profession - Many laymen do not understand the importance and contributions which can be made by the

geotechnical consultant for a development in terms of cost and safety. Unfortunately, even many architects, civil/structural engineers and government officials in charge of development projects fall into the same category. Geotechnical consultancy and design are therefore often handled by inadequately trained or inexperienced people. Registration of Geotechnical Engineering as an independent discipline appears to be of utmost importance.

2. Increase trend of use of competitive bidding as the basis of selecting geotechnical firms - The quality of geotechnical services depends greatly upon the knowledge and understanding of the field which the consultant possess. When price becomes the most important element in deciding the selection of a geotechnical consultant, many projects would fall into the hands of unqualified (geotechnically speaking) people. The profession should make every effort to adopt the FIDIC's Policy Declaration on Competitive Bidding.

3. Increased Problem of Professional Liability - Majority of the geotechnical consultants, particularly those in Southeast Asia, are very much technically oriented. They are generally unaware of, sometimes to the extent of ignorant, legal aspects of contractural matters and professional lability. With the increased problem of construction dispute and environmental impact due to geotechnical activities, it becomes important for the profession to acquire the necessary basic knowledge of legal aspect of the profession. This will also assist in dealing with insurance companies on professional liability insurance.

4. Increased complexity of skills and functions provided by geotechnical consulting engineers - Besides those areas of practice already common in Southeast Asia, there is one major area which is becoming more important and yet has not been tackled by the geotechnical consultants. The problem of environmental control, groundwater pollution and hazadous wastes is certainly going to be one of the major area of activity for the geotechnical consultants in the next decade. This area of activity requires additional skills and knowledge as compared to the conventional geotechnical practice.

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APPENDIX

List of consulting engineering firms responded to survey questionnaire.

ROC (Taiwan)

Asia-Tech Engineering consultants, Inc.
China Engineering Consultants, Inc.
CTCI Corporation
Earth Technology Corporation (Taiwan), Inc.
Moh and Associates, Inc.
Sinotech Engineering Consultants, Inc.
United Geotech, Inc.
Ya-Li Engineering Consultants, Co. Ltd.

Hong Kong

Charles Haswell & Partners (Far East)
Dames & Moore Hong Kong
Freeman Fox (Far East) Ltd.

Greg Wong & Associates, Ltd.
Harris & Sutherland (Far East) Ltd.
MAA Engineering Consultants (HK) Ltd.
Maunsell Geotechnical Services Ltd.
Mitchell McFarlane Brentnall & Partners
Mott, Hay & Anderson Hong Kong Ltd.
Oakervee Perrett & Partners
P & T Civil Engineers Ltd.
Scott Wilson Kirkpatrick & Partners
Wilbur Smith Associates

Malaysia

Arup Jururunding Sdn. Bhd.
Geotechnical & Environmental Associates Sdn. Bhd.
Moh and Associates (M) Sdn. Bhd.
Dr. W.H. Ting Consultants Sdn. Bhd.
Wan Mohamed & Khoo Sdn. Bhd.
Zaidun-Leeng Sdn. Bhd.

Philippines

Energosystems & Geosciences, Inc.

Singapore

Kiso-Jiban Consultants Co. Ltd.
Moh and Associates (S) Pte. Ltd.

Thailand

STS Engineering Consultants Co. Ltd.
Thai Professional Engineering Consultants, Co. Ltd.
Universal Engineering Consultants Co. Ltd.