Consulting and Contracting Practice in Pakistan
Advantages and Limitations

By

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A. Introduction

In the United States as well as in other highly developed countries the consulting engineering grew as a profession gradually. In general terms it could be stated that the everyday engineering problems of most of the undertaking have been taken care of by a regular engineering staff. On the other hand there are many instances when engineering designs had to be produced which were outside of the everyday engineering problems. As a simple example it was necessary to design a new plant. Such new plants have been designed in most instances at considerable time lags. The various undertakings could not afford to employ competent engineers to do the work and then discharge them until it was necessary to build a new plant. The temporary employment of a consulting engineer or firm provided very often the best solution.

The consulting engineering on the other hand was a profession which could keep competent engineers employed more regularly trying to arrange to obtain new assignments after one of the assignments had been completed.

In Pakistan the conditions are radically different in that respect that, after a comparatively slow development, very large engineering problems arose for solving of which there was not available a sufficient number of properly qualified local engineers. It must be expected that such extended engineering activity will necessarily continue so that the country will develop normally.

The modern conditions with the rapid advances in engineering theory and practices are making it still more difficult for the local engineers to get themselves in a short time sufficiently familiar with the problems involved.

As in other countries, the future depends to a large extent on the young generation of engineers. To develop a competent consulting engineer, ability and a good college education are only the first indispensable steps. A considerable number of years of experience and a keen, alert and wide-awake mind

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are the ingredients which will make possible the development of a high grade consulting engineer.

The next and very important factor is that there are only a few manufacturing firms in Pakistan which could deliver the machinery necessary for economic construction and operation of the various undertakings. That, of course, made it still more important to employ at present foreign engineers who are familiar with the equipment manufactured abroad that must be utilized. Of no less importance are the provisions that must be made so that the equipment would be used properly and economically.

In utilizing foreign engineering services in Pakistan, arrangements should be made to have as many as possible local engineers became familiar with the engineering problems and acquire the competence to handle them.

It will be necessary at present and in the future to employ foreign consulting engineering concerns to do the work which cannot be done satisfactorily by the Pakistan engineering forces, until such time as they will become sufficiently accustomed in this kind of work.

Some not very effective steps are being taken to force the foreign consulting concerns employed in Pakistan to give to the Pakistani engineering profession an opportunity to familiarize themselves with the problems. It is obvious that in so far as the foreign engineering firms are concerned, the presently accepted remuneration methods are such that it is commercially advantageous to employ as many as possible foreign engineers, paying them rates much higher than it would be necessary if local engineers would be available. If foreign engineers should work in Pakistan, it is obvious that high grade engineers must be induced to come to the country and to do that the conditions must be made attractive to them.

B. Various Approaches to Consulting and Constructing Engineering Problems in Different Countries

In the United States the independence of a consulting engineering firm is probably more pronounced than in many other industrially developed countries. In many of such countries the Consulting Engineers are connected with industrial concerns and part of their efforts are directed toward providing advantageous order to the concerns with which they are connected. The same may apply to contracting firms. Part of the engineering work which should be done by consulting organizations may be done by the contracting firms. The temptation to do the work to the advantage of the contracting firm lent not to the advantage of the client may become irresistible.

Under such conditions it also may become very difficult to properly supervise the work of the contractors and to be assured that it is the most

economic design resulting in the necessary high quality of work.

The complete separation of the consulting and contracting work seems to be one of the most important factors assuring economy and high quality of work.

Finally, lately there are developing consulting engineering services in which the technical requirements are more or less interwoven with political considerations. There is the possibility that direct orders are being given by the governments of foreign countries to the engineers that may not be advantageous to the clients.

The most desirable conditions would be if a consulting engineering firm does all the designing engineering work and supervising of the contractors and keeps as its main goal the interest of the clients and is not influenced by any other considerations.

That, of course, is the ideal which is not very often achieved. Even if the consulting firms do not have direct government, manufacturing, contracting or other interested organizations connections there is always a possibility that the financial return of the firm may be improved by partially sacrificing the interest of the clients. That brings out the element of reliability. The consulting engineering firm must be of the highest integrity in order to be able to do the best possible work and to protect the interest of the client under any conditions. That is of particular importance because many conditions may develop that cannot be foreseen at the time the original engineering contract is agreed upon and signed.

In projects of very large size it is customary to go to a higher expense by employing a few consulting firms. One usually acts as a general consultant taking care of the overall features and supervision of the project. The others, taking care of various parts usually under the supervision of the general consultant.

The details of these arrangements depend basically on the organization the clients have. If it is large and experienced enough, then it can take over the part of the work of the general consultant. Otherwise, nearly all the supervising and co-ordinating work has to be given over to the general consultant.

Finally, there are possible various degrees of co-operation between the client and the general and individual consultants, in the way of preparation the designs and supervising of the work of the contractors.

C. Consulting Practice versus Contracting Services

In selecting a consulting engineering firm, in most cases it is only possible to give the general outlines of what the particular firm should do.

After the firm becomes familiarized with the conditions that exist in the country, they can gradually work out the extent and the details of the activity.

Insofar as the construction organizations are concerned the condition is radically different in that respect, that the consulting engineers already prepared a more or less detailed design and proper specifications so that the activity of the construction firm can be closely supervised and the work must be done in accordance with the drawings and specifications.

That means that in selecting of the consulting engineers, a considerable amount of trust must be put in the firms selected and in the future, if the selection is not very happy, it becomes very difficult to change the situation. The basis of the selection of the consulting firm cannot be the difference in cost of the service. If an attempt would be made to invite bids for consulting services, the lowest bidder in all probability will be an organization which cannot satisfactorily fulfil the work expected, resulting not only in an unsatisfactory project but in a very expensive over-all cost.

The construction firms on the other hand, which have to perform a very definite job can end in most instances are selected on the basis of open bidding.

The previously prepared drawings and specifications make it clear what should be done by the contractor and how the work should be executed. What testing will be necessary before starting of the work and what testing done during its performance so as to assure first-class work in all respects.

If some work is not done satisfactorily, the supervising Consulting Engineers must stop the work and certify that the defects have been eliminated and corrected and only then, can the work be permitted to proceed and it must be done in the proper way.

Under such conditions, the contract can and normally is awarded to the lowest reliable bidder.

To make the procedure of selecting, consulting and construction work services more feasible and particularly if foreign firms should take part, it is customary to make out beforehand a list of reliable and experienced consulting and constructing firms that will be given consideration. The selection of the consulting firms would then be based on a negotiated contract which in the opinion of the client will provide the best services at a reasonable cost.

The success of the project depends on the way in which the design has been made by the consultants and on their supervision of the progress of the contractors' work. The selection of contractors being done on the basis of lowest bids, makes the problem somewhat simpler. Bids can be accepted for the various parts of the project and reliable contractors selected on the

basis of the lowest cost. Large parts of the project can be combined to reduce the number of contractors.

It is not unusual to ask for single bids covering even large projects. A single contractor or more often a joint venture of a number of contractors are presenting the lowest bid. In such cases, if the bid is accepted, they will become a single general contractor, that is, taking care of the complete project.

Finally, it probably is never done in the United States but outside of the United States there are known cases when a single organization or a joint venture of some kind takes care of all the work: investigation, design and construction.

The finished project is being turned over to the client, who in that way, avoided the necessity of doing any investigating, economic or engineering works.

Such approach requires a complete confidence of the client that the general consulting-constructing firm is highly competent and unusually reliable.

D. Size of Consulting Firms

In the United States in the past the consulting activities developed around a man or very few men, who had outstanding abilities and knowledge of the subjects involved.

Such service, of course, was the highest grade of service which could be provided, based on the ability, knowledge and integrity of one or very few men. Later on, some of the consulting firms which were very successful had to increase their staff considerably so as to be able to satisfy the requirements of numerous clients.

That lowered the quality of service rendered. The outstanding man or men, could not pass any more on all the most challenging problems. Instead, a large number of average engineers were employed and the heads of the firms could exercise only general supervision, their time being mostly taken by the large amount of the administrative work necessary for the engineering and financial success of a large undertaking.

On the other hand, a large consulting firm has obviously a larger overall experience and very often has available a larger number of experienced engineers and supporting staff, without which outstanding large projects cannot be done speedily and satisfactorily. In many instances the better financial standing of the larger organizations cannot be overlooked.

The men which have he task of selecting the best and most reasonable in its terms consulting engineering organization, must possess exceptionally good judgement to avoid making improper and sometimes very unfavourable and even disastrous selections.

E. Codes of Ethics, Guides and Manuals

In a few countries, and in particular in the United States, the standing of the engineers and the consulting engineers in particular are upheld for the benefit of the engineers as well as the country by promoting definite "Codes of Ethics".

These codes are issued in the United States by the Engineering Societies and are voluntary. There are no laws that would make possible the effective punishment of engineers that do not follow the Codes. Nevertheless, it is remarkable how in the United States the Engineering Profession follows the Codes of Ethics which are promulgated and enforced by the Engineering Societies.

The most outstanding is the Code of Ethics, formulated and constantly revised by one of the oldest Engineering Societies in the United States, the American Society of Civil Engneers (ASCE). The same society also issued GUIDE TO PROFESSIONAL PRACTICE UNDER THE CODE OF ETHICS, as well as a manual covering CONSULTING ENGINEERING.

A very considerable and still increasing amount of work is being done in the United States in building the thousands and thousands of miles of highways. To this must be added various kinds of work like intersections, protection, and so on, that make possible a reasonably safe and economic operation of the highway system.

The engineering societies and their codes and extension of them did not cover the highways in sufficient details. The American Road Builders' Association (ARBA) issued, therefore, a Reference Guide which partly extends the ASCE Manual and partly restates some of the principles of the ASCE Manual.

There are less extended Codes and Manuals guiding the Consulting Engineering Practice in Mechanical, Electrical and other engineering, as well as in the management and economic fields. All these guides follow more or less the pattern established by the ASCE and ARBA. To obtain a clear picture of the way Consulting Engineering is practiced in the United States, it would suffice to get acquainted with the pertinent publications of the ASCE and ARBA.

The Code of Ethics of the ASCE and the "Guide to Professional Practice Under Code of Ethics of the ASCE" are included in their entirety as appendices one and two. In addition, excerpts are attached from "Manual and Report of Engineering Practice" of the ASCE entitled "CONSULTING ENGINEERING, a Guide for the Engagement of Engineering Services", as appendix three. Excerpts from "Reference Guide for Negotiation of Engineering Services to be

performed by Consultants on Highway Projects in the United States" by ARBA, are attached as appendix four.

Any engineer who has the desire to follow the practice of engineering in an up-to-date way, should study carefully these four appendices. It may be of importance to note that the codes assume that the engineers which are engaged in consulting practice possess the necessary knowledge and experience. The main subjects of the matters included in the appendices are how to apply these knowledges and experience in an ethical way, taking in account the rightful interests of all parties involved.

In our life that rapidly becomes more and more complicated, the relationship of the engineers and the other parts of the population are becoming more and more important.

The technical competence of the engineers is assumed to be assured by his education, the professional registration, which is compulsory in all States in the United States and finally and probably most important in his practical engineering experience.

The attempt of any engineer to act in a consulting capacity in a field in which he has no sufficient experience and knowledge is considered as a heavy breach of the Code of Ethics.

F. Application of the General Principles involved in the International Engagement of Consulting Engineers

General Vogel published in the September-October 1964 issue of the MILITARY ENGINEER an article entitled:

CONSULTING ENGINEERS AND THE WORLD BANK

The subject of this article is obviously of considerable interest to the Pakistan engineers. It hardly would be possible to improve on General Vogel's presentation. It is knowledgeable, concise and gives a considerable amount o information in a very short article. With general Vogel's kind permission, this article is included in its entirety as appendix five.

The study of this article discloses the most modern approach to the international consulting engineers problems. The cases, dealt with by the World Bank involve mostly large projects. Many of them have never been properly studied and therefore the selection of the best qualified consulting engineering firms becomes a problem more difficut than it is in cases that are better known and have been at least partly investigated in the past.

Pakistan Engineers who may consider the offering of Consulting services by Pakistani Engineering firms should study this article very carefully.

G. Contracting Services

The contracting services should be considered from two viewpoints. First, any work which requires a considerable amount of local unskilled labour and local means of carrying loads, like the extensive use of donkeys, should naturally be taken care of by local contracting firms. It would be reasonable for the Government to take steps to have such contracting firms developed and keep them reasonably busy.

The second are the projects which require a considerable amount of high-cost construction equipment without which the work could not be completed or its completion would be unreasonably delayed. Such contracting services presumably can be better fulfilled, may be even at a smaller cost, by foreign contracting firms which possess large amounts of equipment and the men necessary to keep the equipment in efficient use. Only too often the author had the opportunity to observe expensive equipment belonging to the Governments of India or Pakistan which has been absolutely useless due to the impossibility to keep it in proper shape.

There are numerous instances where local contractors could take over the work between these two limits. Gradually they will have to acquire equipment, arrange repair shops, and get accustomed to do more and more work. Finally they are probable and in some instances possibly profitable joint ventures of foreign and local contractor. Here, it may be more advantageous if combined ownership could be arranged.

In the case of contracting firms, the conditions are somewhat simpler than in the case of consulting firms. There is more specialization since only exceptional large contracting firms can afford to have the various kind and sufficient amounts of equipment necessary to take over the large variety of jobs which a very large project requires.

H. Advantages and Limitations

The advantages of developing competent Consulting and Contracting Organizations in Pakistan are obvious.

Under present rapid development of engineering no country can obtain the maximum advantages by being constantly spoon-fed in solving of engineering problems.

That, to a certain extent, was done in Pakistan in the past, it is being done to a smaller extent at present but should be, as far as practical, excluded in the future. It would be very beneficial to Pakistan if such local firms would be available. The large amounts of money that are being paid to foreign firms, weaken Pakistan financially. Some part of that money may come back in

payment for local labour and local expenses. A large part of it however is permanently withdrawn. If reliable local firms could be engaged, the conditions would be quite different.

The limitations that are inherent in developing of Consulting and Contracting Firms, are not so obvious and therefore should be carefully considered.

1. There are many very good Pakistan engineers who possess outstanding engineering abilities.

2. There are very few Pakistan engineers who, in addition to their high engineering qualities, have extended administrative experience.

3. The present tendency of depriving the Pakistan engineers of administrative experience by appointing, nearly exclusively, Civil Service men without engineering background to head the government engineering organizations and to staff their Governing Boards is one of the main reasons for the shortage of administrative experience of Pakistan engineers. That follows the old British practice in India which at present, with the exceedingly rapid progress in science and engineering, is not followed any more even in Britain.

4. As the outlined history of development of Consulting Engineering in the United States indicates, there is a rather long experience insofar as the developing of Consulting Engineering in the United States is concerned. None of such long time development experience is available to Pakistan engineers.

5. The Codes and their various interpretations are an indication that it was sometimes difficult to bring the Consulting Engineering practice in the United States to its present high standing. That also is an experience not available to Pakistan engineers.

The problem really is how to make the Pakistan Engineers to step over, in a very short time, the many years which it took for the engineering professions of the highly developed countries to arrive at their present standing.

I. Familiarizing Pakistan Engineers with Modern Approach, Methods of Work and Practice of Consulting Engineering Firms

The rather considerable background information given in the paper and appendices, has the purpose of clarifying the functions of both the consulting and contracting services. It shows that each one of them is a rather complicated businesses venture. They require considerable know-how and financial resources.

If Pakistan would like to obtain the advantages of own consulting and contracting organizations, these complications must be realized and understood.

Costly failures must be avoided and lower cost local services must be provided that will be as valuable as the expensive high grade services, which can be obtained from abroad.

It isn't simply to get a commission and afterwards not know exactly what has to be done.

The background established in the United States may appear long, but after it has been developed, it is responsible for the high standing of the profession.

The methods which are at present used to familiarize the Pakistan engineers with modern consulting practice are not very effective.

Some Pakistani engineers are being employed by the foreign consulting firms in Pakistan, some of them are being sent over to the main offices of the consultants in the United States and other countries to work there at particular problems in which the consultants are employed. The Pakistani engineers are employed as low-cost engineers and their experience is necessarily kept at the low levels of the consulting services.

In a number of instances "Joint ventures" are entered into, by foreign and Pakistani consulting firms.

That, of course, is better than nothing, but it gives to the Pakistani only a limited approach to important management and engineering problems.

A radical change would be necessary to create effective and up-to-date opportunities for Pakistani engineers. That should be done in such a way as to make it advantageous for foreign concerns to have the participation of Pakistani engineers. It would be preferable to start with a consulting engineering concern.

The most effective way would be if a group of Pakistani engineers acquires a 50% interest in an established consulting firm, preferably in the United States. This would probably require the assistance of the Pakistan Government. It would be better to make such arrangement with a medium sized firm which does work in the United States and abroad. After the Pakistan engineers become half owners of the concern, they should not attempt to change radically the working of the engineering outfit.

To the contrary, the work should be extended, adding not only projects in the United States and in Pakistan but also in countries in which the concern has the necessary connections and can take the additional contracts. That will make it possible to acquire up-to-date experience in different parts of the world.

Normal and customary precautions should be taken, so that the money that will be paid by purchasing of the half interest in the firm should be used to increase the working capital but not to be simply distributed among the original owners of the concern.

After the arrangements of that kind are concluded, the foreign firm will have permanent Pakistan owner-partners and it could arrange for joint ventures with other Pakistan consulting firms limiting each such venture to particular assignments.

Such arrangement would put at the disposal of Pakistani engineers the knowledge and also the reputation which the foreign consulting firm acquired in the past.

That will be not only a major factor in the success of the firm, but will be of considerable importance from a psychological point of view in obtaining necessary financial assistance from abroad.

The Pakistani engineers employed by a consulting firm get very little experience in solving management difficulties. As co-owners of a foreign consulting firm, they necessarily will be involved in the solving of everyone of the more important management problems. That probably is the quickest, and may be the only way in which such knowledge can be acquired and applied to everybody's benefit.

At the same time, if the purchase of the foreign firm will be done in a business-like manner, and Pakistan engineers entering the firm will possess the necessary business acumen as well as high-grade engineering and administrative qualities, the acquiring of a half interest in the foreign firm should prove to be a profitable investment. The profits could be used to extend the activities of the firm or to repay gradually, mostly in the foreign currency, the money invested.

The half ownership of the firm, will make it possible to rotate the Pakistani engineers in particular the younger ones, among the different jobs giving them the opportunity to obtain knowledge and experience in the most effective and quick way.

That all should accellerate the pace at which Pakistani engineers will take part in the development of their own country.

To be able to perform successful consulting engineering services, it is necessary that the client trusts the consultant. Such trust is only possible if the client is convinced that the behaviour of the consultant is always ethical and follows strictly the "Code of Ethics" and all the Professional Practice Guides and Manuals based on the "Code of Ethics".

J. Conclusions

It will be a big advantage to the country if Consulting and Contracting firms should be organized by Pakistan engineers locally in Pakistan, as well as abroad. It is however of the utmost importance that such firms in no respect are inferior to similar firms in other countries.

A considerable disservice will be done to the country if either in the Ethical or Professional respects, the Pakistani Firms will not be of the highest standing.

A careful study of the five attachments to the paper should disclose how important are not only the high Engineering and Management Qualification, but how reliable and high-grade Consulting Service depends on the high ethical standards of the Consulting Engineers. It is of utmost importance not only to know what and how to do things physically, but also how to solve honourably the many difficult moral problems which every working consulting engineer has to meet.

The ethical standards in the United States have been developed during many years and were often influenced by many not very fortunate experience of the past.

The Pakistan engineers do not have the past experience of the engineering profession in the United States and must step directly from a primitive, into the modern quickly changing age.

It may be considered presumptuous for the author to stress too much the Ethics of the profession, but nevertheless he cannot refrain from expressing his feelings that in Pakistan the engineering ethics must be considered as an extension of the teachings of the Holy Koran to our present day problems, which were not existing in the time of the Prophet.

Such approach should assure that the Pakistan consultants will be trusted by the clients, whoever they may be.

APPENDIX ONE

1. CODE OF ETHICS[1]

As Amended to July 20, 1961

It shall be considered unprofessional and inconsistent with honourable and dignified conduct and contrary to the public interest for any member of the American Society of Civil Engineers :

1. To act for his client or for his employer otherwise than as a faithful agent or trustee.
2. To accept remuneration for services rendered other than from his client or his employer.
3. To invite or submit priced proposals under conditions that constitute price competition for professional services.
4. To attempt to supplant another engineer in a particular engagement after definite steps have been taken toward his employment.
5. To attempt to injure, falsely or maliciously, the professional reputation, business , or employment position of another engineer.
6. To review the work of another engineer for the same client, except with the knowledge of such engineer, unless such engineer's engagement on the work which is subject to review has been terminated.
7. To advertise engineering services in self-laudatory language, or in any other manner derogatory to the dignity of the profession.
8. To use the advantages of a salaried position to compete unfairly with other engineers.
9. To exert undue influence or to offer, solicit or accept compensation for the purpose of affecting negotiations for an engineering engagement.
10. To act in any manner derogatory to the honour, integrity or dignity of the engineering profession.

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1. On foreign engineering work, for which only United States engineering firms are to be considered, a member shall order his practice in accordance with the ASCE Code of Ethics. On other engineering works in a foreign country he may adapt his conduct according to the professional standards and customs of that country, but shall adhere as closely as practicable to the principles of this Code. (Adopted by ASCE Board of Direction October 7-8, 1963.)

APPENDIX TWO

Guide to Professional Practice Under Code of Ethics of the ASCE

GUIDE TO PROFESSIONAL PRACTICE UNDER THE CODE OF ETHICS

Article 1.—"It shall be considered unprofessional. . . . To act for his client or for his employer otherwise than as a faithful agent or trustee."

(1) He shall not undertake any assignment which would create a potential conflict of interest between the engineer and his client or his employer.

(2) He shall not disclose information concerning the business affairs or technical processes of his clients or employer without their consent.

(3) He shall not use information coming to him confidentially in the course of his assignment as a means of making personal profit if such action is adverse to the interests of his client, his employer, or the public.

(4) He shall not divulge any confidential findings of studies or actions of an engineering commission or board of which he is a member, without official consent.

(5) He shall not give professional advice which does not fully reflect his best professional judgment.

(6) He shall not misrepresent his qualifications to a client, to an employer, or to the profession.

(7) He shall not accept an assignment the results of which he will later act upon as a member of a public or quasi-public board.

(8) He shall act with fairness and justice to all parties when administering a construction or other contract.

(9) He shall engage, or advise engaging, experts and specialist, when in his judgement such services are to his client's or employer's best interests.

Article 2.—"It shall be considered unprofessional. . . . To accept remuneration for services rendered other than from his client or his employer."

(1) He shall not accept compensation from more than one interested party for the same service, or for services pertaining to the same work under circumstances where there may be a conflict of interest without the consent of all interested parties.

(2) He shall not accept any royalty or commission on any article or process used on the work for which he is responsible, without the consent of his client or employer.

Article 3.—"It shall be considered unprofessional....To invite or submit priced proposals under conditions that constitute price competition for professional services."

(1) He may, where price competition is clearly not involved, discuss with the prospective client the scope and cost of engineering services.

(2) He may reply to a request for a proposal, wherein price competition may be involved, by advocating the procedure for selecting an engineer suggested in the current ASCE Manual on Private Practice of Civil Engineering.

(3) When requested, prior to negotiations for services and wherein price competition may or may not be involved, he may advise a prospective client in regard to :

(*a*) Qualifications and availability.

(*b*) Scope and probable cost of engineering work by reference to published schedules of fees such as shown in the current ASCE Manual on Private Practice of Civil Engineering, or by reference to comparable work of similar scope.

(4) He shall not submit a priced proposal, written or verbal, which includes a stated fee or estimated range of fees in any form in response to :—

(*a*) A public advertisement for bids.

(*b*) Any invitation if there is reason to believe that multiple invitations have been issued and that price will be the primary consideration.

(5) He shall not be a party to requesting two or more priced proposals for comparative purposes where price is to be the primary consideration.

(6) He shall not solicit an engineering engagement by reducing charges after being informed of proposals of others.

(7) He shall not submit a proposal for an engineering engagement unless he is invited to do so.

Article 4.—"It shall be considered unprofessional....To attempt to supplant another engineer in a particular engagement after definite steps have been taken toward his employment."

(1) He shall not continue to seek employment on a specific engagement after being advised that another engineer has been selected subject to approval of detailed arrangements.

(2) He shall not solicit or accept employment from a client who already has an engineer under contract for the same work not yet completed or paid for.

(3) He shall not, in the event that another engineer has made a study and report on a specific project, approach the prospective client regarding subsequent phases of the project, unless such contact is initiated by the client.

Article 5.—"It shall be considered unprofessional....To attempt to injure, falsely or maliciously, the professional reputation, business, or employment position of another engineer."

This does not remove the moral obligation to expose unethical conduct before the proper authorities. Neither does it preclude a frank but private appraisal of employees or of engineers being considered for employment.

Article 6.—"It shall be considered unprofessional....To review the work of another engineer for the same client, except with the knowledge of such engineer, unless such engineer's engagement on the work which is subject to review has been terminated."

The article as stated is believed to be sufficiently explicit. However, even though the first engineer's services have been terminated, it is a matter of common courtesy to let him know that his work is being reviewed.

Article 7.—"It shall be considered unprofessional....To advertise engineering services in self-laudatory language, or in any other manner derogatory to the dignity of the profession."

(1) The following are considered to be permissible:

(*a*) Professional cards and other factual representations in recognized, dignified publications, and listings in rosters or directories published by responsible organizations, provided that the cards or listings are consistent in size and content, and are in a section of the publication regularly devoted to such professional cards. Information given must be factual, dignified, and free from ostentatious, complimentary, or laudatory implications.

(*b*) Brochures and other factual representations of experience,

facilities, personnel and capacity to render service, providing they are not misleading with respect to the engineer's direct participation in projects described.

(*c*) A statement of his name or the name of his firm and statement of his type of service posted on projects for which he renders services.

(*d*) Preparation or authorization of descriptive article for the lay or technical press, which are factual, dignified and free from ostentatious or laudatory implications. Such articles shall not imply anything more than his direct participation in work described.

(*e*) Permission by an engineer for his name to be used in commercial advertisements, such as may be published by contractors, material suppliers, etc., only by means of a modest dignified notation acknowledging the engineer's participation in the project described.

Article 8.—"It shall be considered unprofessional....To use the advantages of a salaried position to compete unfairly with other engineers."

(1) He shall not engage in outside engineering work to an extent prejudicial to his salaried position or detrimental to established engineering services, or which would result in a conflict of interest.

(2) He shall not compete unfairly by charging fees below those customary for engineers practising in the same field and in the same area.

(3) If permitted by his employer, his outside activities should preferably be confined to consultation on phases of engineering for which he has special qualifications not inherently available in usual engineering practice. Also, he would not ordinarily establish an office for the purpose of conducting such outside activities.

(4) He shall not use the influence of a salaried position to direct clients to an engineering office in which he has financial interest.

Article 9.—"It shall be considered unprofessional....To exert undue influence or to offer, solicit or accept compensation for the purpose of affecting negotiations for an engineering engagement."

(1) He shall not make political contributions for the purpose of influencing the selection of engineers on future engagements.

(2) He shall not give or receive any payments for the purpose of influencing the selection of an engineer for an engineering engagement.

(3) He shall not create obligation on prospective clients or employers through extravagant entertainment, gifts, or similar expenditures.

(4) He shall not engage in "fee splitting" or other distribution of fees for other than services performed and in proportion to the value of such services.

(5) He shall not solicit or accept an engineering engagement, or submit a proposal or contract covering engineering services when payment for such service is contingent upon results supporting a predetermined conclusion or upon a favourable finding with respect to economic feasibility.

(6) He shall not request, propose or accept an engineering engagement on a contingent fee basis if the contingent basis or the contingent services performed influence the selection of the engineer.

Article 10.—"It shall be considered unprofessional....To act in any manner derogatory to the honour, integrity or dignity of the engineering profession."

(1) He shall not be associated in responsibility for work with engineers who do not conform to ethical practices.

(2) He shall express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission, or other tribunal.

(3) He shall not issue statements, criticisms, or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

(4) He shall refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

(5) He shall exercise due restraint in criticizing another engineer's work.

(6) This article appropriately may be considered as a summation of the entire Code. It requires that a member of the Society shall act in accordance with high standards of moral conduct under any and all circumstances.

APPENDIX THREE

Excerpts from "ASCE —Manuals and Reports of Engineering Practice—No. 45"

CONSULTING ENGINEERING

A Guide for the Engagemet of Engineering Services.
(*Not included—Readers may refer to the original publication of ASCE*)

APPENDIX FOUR

Excerpts from "A Reference Guide for Negotiation of Engineering Services to be performed by consultants on Highway Projects in the United States" by the American Road Builders' Association.
(*Not included—Readers may refer to the original publication*).

APPENDIX FIVE

CONSULTING ENGINEERS AND THE WORLD BANK

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Every place on earth has inherent resources, peculiar to itself. In no two instances will they be found exactly the same. Often their benefits are available just for the taking—as from the climate and scenery, the seashores and the lakes—but more often resources must be developed. Efforts and talents of people must be applied to make them useful. Both tasks and benefits will accrue to the people who inhabit the area; who, individually and collectively, comprise the greatest resources of all. But, great as this human resource may be, it must be nurtured and exploited with care.

There is no easy road to the full development of human resources. Education, training, and experience are hard to attain, and skills are acquired slowly. Yet all of this is necessary for the development of natural resources; for their conversion to goods of trade and commerce. Unless a country can produce commodities for trade, its economy will fail.

In former years the pace of progress was much slower than it is today. Nations and their people functioned within smaller spheres, international competition was less keen, and communications had not developed to the point of

keeping everyone informed of everyone else's status and progress, thereby making unrest the rule, and "keeping-up-with-the-Joneses" an international game.

All this has changed; nations with new-found independence seek rapid progress; their people demand a better life—not just for their children to-morrow, but for themselves today. They cannot—and will not—be satisfied to wait for the slow acquisition of either the skills to build and create for themselves or the money to finance on a pay-as-you-go basis. Since these vital ingredients to progress are not otherwise available to these nations, they must be borrowed. The International Bank for Reconstruction and Development was established to assist in financing needed and worth-while undertakings of the developing nations. Included in such assistance is the provision of engineering skills and knowledge.

Professional services are required at several stages of a project. When it is first considered, studies must be undertaken to determine its feasibility. There would be few limits to modern engineering achievement if cost were not a consideration. But nearly everything has a price tag, and the important thing to determine is that it can be justified. This is a responsibility of the country seeking the loan, and the assistance of consulting engineers is generally needed. Their selection is extremely important for experience and judgment weigh heavily in feasibility studies of proposed projects. Moreover, the same engineering firm may be employed in connection with the ultimate project design and execution. The main concern of the Bank is that the firm selected shall have had satisfactory experience on comparable projects; that the staff to be assigned to the particular work is qualified and adequate; and that the terms under which the firm is to be employed are such as to assure exemplary execution of the project.

The need for a project is not in itself a criterion for its justification, for need may be born largely of desire. A basic question is whether it can yield returns sufficient to pay for itself and contribute substantially to the general economy. In some cases, however, this may be too demanding.

In the case of a power development there should be no question but that the project will be both self-supporting and self-liquidating. It must give promise of returns sufficient to defray the costs of maintenance, operation, depreciation, debt service, and taxes, along with provisions for expansion at rates low enough to encourage it.

Not all borrowings, however, are for revenue producing projects. In the field of resource development there are many needed and worth-while undertakings that cannot be revenue-producing in themselves, yet may create human

advantages bearing so strongly upon the welfare and advancement of the nation as to warrant justification. Some, such as flood control and navigation projects, may be supported by direct benefit-cost ratios; others may need to be considered, at least in part, in the light of secondary benefits anticipated.

Selection of a Consultant

The Bank maintains an extensive file of information on consulting firms from which capabilities and experience records may be quickly ascertained. Altogether, about twelve hundred firms are listed along with their personnel, not as a "register" of "approved" firms, but as a working information file. For obvious reasons, blanket approval could not be accorded to any firm by the bank.

As an international organization the Bank insures that its loans are put to work on an international basis. Consultants of all countries are treated equally, the main consideration being that of capability for the particular task. This principle is invoked so strongly that the Bank resists requests by borrowers for lists of firms from which they may make a choice. It is realized that impartiality is difficult to maintain and any suggestions, however well intended, might serve to favour some consultants or the consultants of some countries over others who might be equally qualified.

The same attempt to be impartial is made by the Bank in instances where it serves as an executing agency for studies financed in part by the United Nations Special Fund or from its own resources. In such cases, its role in the selection of consultants is more active, involving collaboration with the government or its responsible agency. Care is taken to prepare an initial list that will include candidate firms from a number of countries.

Large consulting firms have obvious advantages over the smaller ones in making themselves known and gaining contracts. They can point to the many large projects they have worked on, they can list more employees with greater collective experience, they can afford to establish and maintain offices in many countries around the world, they can send out representatives to make known their capabilities, and they can publish large and expensive brochures, richly illustrated in colour.

A small firm, while at a disadvantage to compete for the big jobs, which it probably could not undertake in any case, has much to offer in personal services for the smaller ones. Its top men, being less pressed with organizational details, can give greater attention to the assignment. With less overhead to carry and fewer people on the regular payroll, a diversity of specialized talent may be drawn from the ranks of individual consultants to fit the job.

In seeking consultants in resource development the project itself is something of a guide. If it is a major undertaking such as a large multipurpose dam involving power and perhaps lockage, it is obvious that only a large firm would be equipped to handle it. For lesser tasks, such as planning a net-work of feeder roads, designing a water system, or studying the feasibility of a limited power station, a small firm may prove more adaptable and provide greater satisfaction. A firm, otherwise qualified, should not be dropped merely because of its size.

The price of the service may be another consideration in the selection of consulting firms. Such a firm is, of course, an organization made up of professional men that will be guided by professional ethics in computing its fee. But this does not mean that the price is not negotiable. A country should first of all attempt to get the best firm for its development work, and price should not be considered at that point. Only after a choice has been made on the basis of ability to perform should cost be considered. If a suitable price cannot then be arranged, the next best firm under consideration may be asked for its estimates.

Common Interests

The Bank is vitally interested in the way a borrower undertakes a project, because of the purpose for which it was created: to provide and facilitate international investment in projects intended to increase production, raise living standards, and help bring about a better balance in world trade. If these purposes are to be accomplished, international competition for the work must be assured and it must be prosecuted in such a way that best results will be obtained at lowest cost to the borrower. While the borrower may not be concerned with the first of these objects, his interests with respect to the latter are identical with those of the Bank. Thus, Bank and borrower find themselves working together in full harmony on most phases of every project.

Whatever the popular impression of the banker and engineer, or however each may have regarded the other, the fact stands out that both are fundamentally economists and conservationists. The good banker is interested in making loans, but he will insist upon a worth-while purpose, the execution of that purpose with efficiency and dispatch, and results that will justify the expenditures. The good engineer is interested in making loans too, but his loans are of skill and knowledge rather than money. Since they are his wealth —his stock in trade—he will insist upon the same requirements.

Early in the century, before the engineering arts had acquired their great complexities, before specializations had developed in every conceivable field, the engineer was a fairly simple person. Portrayed usually as standing behind a

transit in field attire, he was described as "one who can do with one dollar what any fool can do with two." This certainly would not have put him at odds with his banker friends. But there was not a definite alliance between them for the simple reason that no need had appeared for large-scale undertakings requiring their joint efforts. Phrases such as "population explosion" had not been invented, there was enough unpolluted water in the flowing streams to satisfy the needs of the people, and industries had not encroached on the rivers so far as to be threatened by annual floods.

Then came two world wars, each in its time to speed up research and discovery. New industries arose to turn out new products, fabricated from new materials. Increasing demands on the parts of growing populations turned attention to the large-scale development of natural resources. Now the need for money and engineering were joined. Each proposed project presented a new set of problems, including economic and engineering feasibility, adequacy of design, execution of construction, and planning for effective use after completion. Engineers in growing numbers were needed.

The growing alliance between the banker and the engineer has now become secure. Engineers are called upon more and more for opinions in international work and domestic banks have their staff engineers as well. This has not changed the underlying principle that an engineer's service should be to his client: in the case of a study conducted by the Bank the responsibility of the engineer is to the Bank; when a project is financed by a loan and the engineer is employed by a borrower, his responsibility is to the borrower. But this presents no conflict, because his aims, the aims of the borrower, and those of the Bank are the same: to get the job done best at the least cost.