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The consulting engineer in telecommunications

Summary

Despite the fact that the consulting engineer is ubiquitous in the pursuance of his work, many engineers, technicians and others engaged in the manufacturing industries have only a vague idea of the wide scope and importance of consultancy work. This is, perhaps, largely because, in Great Britain at least, the consulting engineer is barred by the ethics of his profession from advertising his services. This article describes, briefly, the functions, duties and responsibilities of the consulting engineer in telecommunications and gives a number of examples of the specialized types of tasks and projects which may be undertaken by the telecommunications department of a consultancy organization. A chart shows a typical make-up of a multi-discipline consultancy organisation.

Introduction

The consulting engineer is a professionally-qualified engineer who, in most cases, has had considerable practical engineering experience in industry or in the engineering branch of a government administration.

Consulting engineers are divided into three main categories: civil, mechanical and electrical, but within these three main divisions there are many specialized fields of activity. In the present article we are concerned with the specialist telecommunications consultant who will be a professionally-qualified electrical engineer. However, since his duties in their widest application, such as for instance, the planning of a complete telecommunications system, will call for specialized additional knowledge of both mechanical and civil engineering practices, he will need to call upon the services of fellow specialists in these branches. Some firms of consulting engineers employ specialists in the various branches of engineering and are, therefore, able to undertake complex telecommunications planning, advisory, inspection and commissioning work without having to seek outside assistance.

There are, of course, quite a number of well-known manufacturing and systems companies of high international repute who have similar specialist departments equally capable of handling all technical aspects of telecommunications projects both in the UK and abroad. However, on some projects, especially those put out to open tender, it is often very useful to have the backing of an accredited independent third party. Unlike commercial enterprises, consultants do not have any vested interest in the products and contractual conditions which will be applied to any project or contract. The client can therefore feel assured that his best interests are being properly looked after at all times, and most companies, irrespective of their own resources, welcome the presence of a consultant as a person to whom both sides can refer at a professional level and be sure of obtaining authoritative impartial judgements.

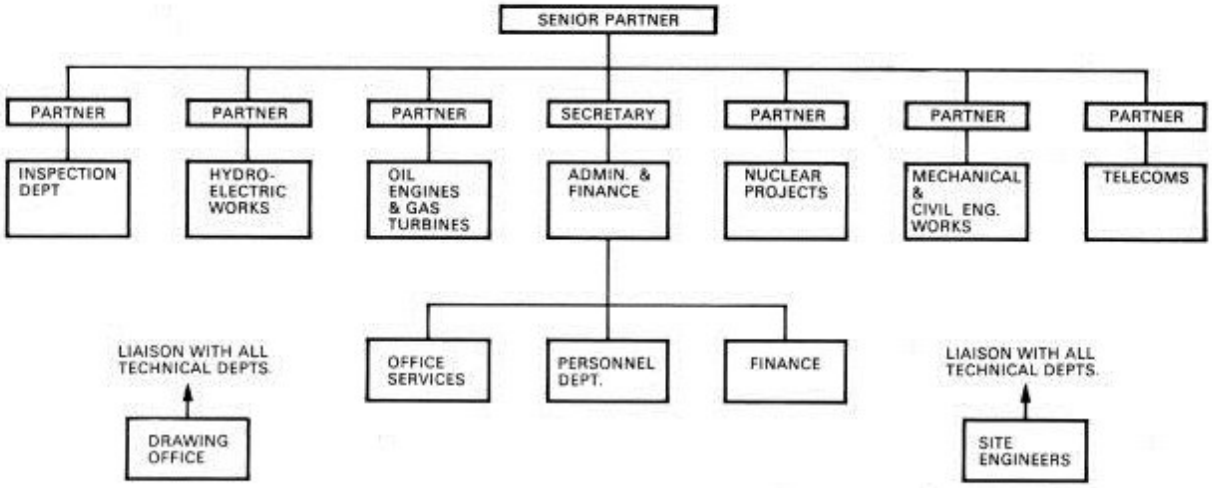
The consulting engineer in the UK does not engage in the manufacture or sale of plant or equipment, nor does he purchase, install or operate such plant or equipment. Under the Articles of the Association of Consulting Engineers in Great Britain, members are not permitted to have any financial interest whatsoever in concerns which engage in such activities.

A consulting engineer may work alone, but it is more usual for a partnership to be formed by a number of consulting engineers. The partners may undertake the administration and the detailed technical work of their practice, or they may employ a number of professional engineers, draughtsmen, accounting and clerical staff. In such cases, the partners concern themselves with the overall administration and technical supervision of the work of their staff and the client-consultant relationship. In the case of a large firm of consulting engineers comprising several specialist departments dealing with, for example, electrical power generation and transmission, mechanical and civil engineering works and telecommunications projects, a typical organizational diagram might be as shown in figure 1.

Duties and functions of the consulting engineer

The practice of consulting engineering originated in the latter part of the nineteenth century in Great Britain, and it has developed over many years on a recognized professional basis of relationship of trust between the consulting engineer and his client.

When an engineering project is originally conceived by a client (typically an administration or other authority) many factors involved in its successful planning and execution may be unknown. Therefore, before even a preliminary design or plan can be considered, it may be necessary to collect a great deal of information. Thus, a consulting engineer may be required to undertake a preliminary investigation on the economic and engineering feasibility of the project. This investigation will indicate whether or not the scheme is practicable and economically viable; the client will then be informed of this and, if it is decided to proceed with the project, a more detailed investigation will be undertaken and a feasibility report will be prepared for the clients' con-



Note. Where the title PARTNER is shown as Head of a Department, this may include two or more Partners and Associate Partners.

Figure 1. Typical organization chart of an engineering consultancy firm

sideration. When this has been accepted by the client, the consulting engineer will usually be instructed to proceed with the preparation of all the necessary plans and specifications and will also draw up forms of tender and conditions of contract. Futhermore, if so required, he will study the engineering and economic aspects of the tenders received from contractors and make a recommendation as to the most suitable and acceptable offer. Once a contractor has been awarded the contract, the consulting engineer examines and, after discussion with the contractor and obtaining his consent, may amend the working drawings and generally function as the liaison between client and contractor.

The consultant, or, in the case of a firm of consulting engineers, engineers on the staff, will also undertake the inspection of plant, equipment and materials during manufacture. In addition, if required, the consultant will appoint a resident engineer (or engineers) to supervise work during the construction of a project and the installation of equipment. Finally, the consulting engineer or his staff will, if required, carry out commissioning and acceptance tests, certify their correctness, and ensure that the completed project is handed over to the client in full and satisfactory operational condition. A typical project flow chart for such an activity is shown in figure 2.

From the foregoing, it will be understood that the consulting engineer works closely in concert with the client and the contractor throughout the preparation, manufacture, installation and testing of a project and the equipment which comprises it.

This is made possible because contracting firms recognize the integrity of consultants and know that, when granting them access to their premises for general liaison and inspection purposes, any matters discussed and any equipment seen in the development stage will be treated by the consultants with complete confidentiality.

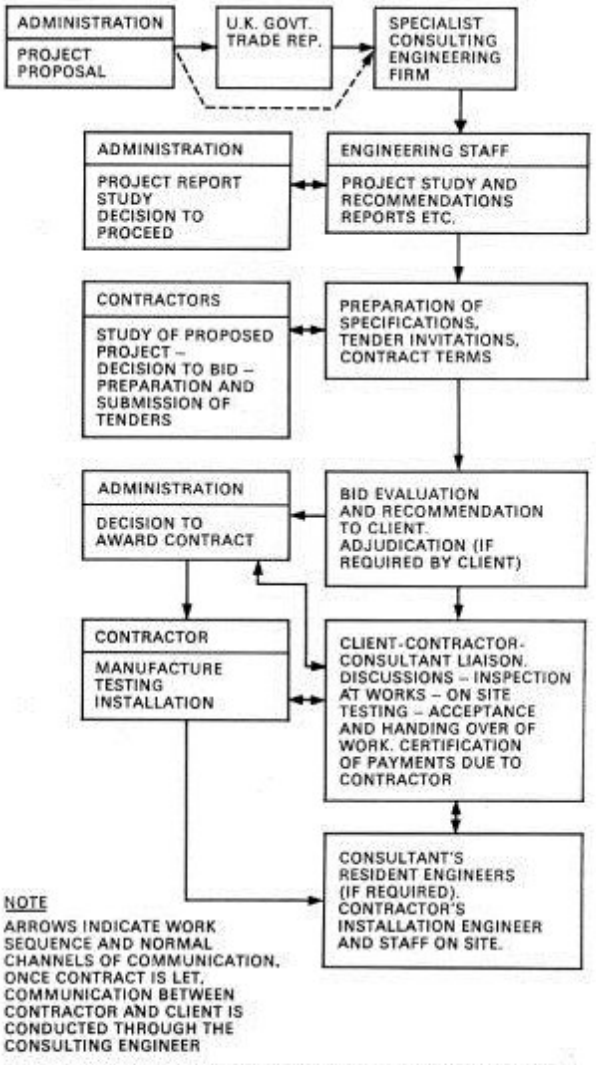


Figure 2. Diagram to show function of client–consultant–contractor relationship and duties

The services provided by the consultants are, in fact, an essential part of any engineering undertaking and would have to be performed by somebody whether or not a consultant was appointed.

However, if a client were to undertake these duties it is probable that, in many instances, additional specialist staff would have to be recruited for the purpose since the client's existing staff may not have the special experience or the time necessary to undertake such tasks as the preparation of detailed specifications and tender documents, the inspection of plant and materials and the supervision of work and testing on site. If, on the other hand, the contractor is asked to undertake the project design work, the extra cost of this work will undoubtedly have to be included in the contract price. In practice, this inevitable part of the cost of a project is best entrusted to an independent consulting engineer with benefit to both client and contractor.

Typical kinds of telecommunication projects

The following list of typical services and tasks undertaken by a large firm of consulting engineers, while by no means complete, will serve to convey some idea of the scope of such work in the telecommunications field:

(1) Radio route surveys for v.h.f, u.h.f and microwave domestic systems
(2) International h.f radio services planning
(3) International microwave routes – planning and survey
(4) National trunk networks (telephone and telegraph) – planning and survey
(5) Tropospheric scatter systems
(6) Airport communication and navigational aids
(7) Submarine cable systems
(8) Satellite communication systems
(9) Military communication systems
(10) Television systems (broadcast and cable distribution)
(11) Super power broadcast transmitters
(12) Mobile radio networks
(13) System control and telecommunications over high-voltage power networks
(14) Telephone and telex switching and signalling systems
(15) Advice on the operation and maintenance of telecommunication systems
(16) General equipment inspection work
(17) General project development and continuing supervision
(18) Telecommunications tariff studies
(19) Switching plans (numbering schemes and systems) STD – ISD (DDD – Direct Distance Dialing)
(20) Power line carrier (PLC) data logging – telemetry and remote control system planning

Consultants' fees

In the case of construction work, it is often the practice to base the consultant's fee on a percentage of the total capital cost of the project. The percentage will depend upon the magnitude and character of the work. In the case of preliminary surveys or general advice in connection with a proposed project, before commitment to large capital expenditure is undertaken by the client, it is usual for the consultant to charge a report fee plus time and expenses. In certain cases, by agreement, payment may take the form of a fixed, inclusive, fee.

Disputes

A completely independent consultant, with his technical skill and completely unbiased viewpoint, can render another valuable service to both client and contractor, on a basis fair to both parties, where disputes or misunderstandings occur in connection with a project in any of its stages. Such a service avoids the expense of arbitration or litigation and the deterioration of relations between client and contractor to the possible detriment of the work in hand.

Over the years, the client–consultant–contractor relationship which has evolved has proved to be most effective in ensuring fair treatment and mutually satisfactory settlement of such disputes or misunderstandings as may, from time to time, arise between client and contractor.

The consultants' world

Having described, briefly, the main functions of a consulting engineer, it is perhaps fitting to say a few words about the ambience in which he works and about some of the things which make his work and career both interesting and rewarding.

Clearly, a consultant and his engineering staff must possess a wide and soundly-based practical engineering experience in addition to their essential academic qualifications. This fund of knowledge is augmented and constantly updated as a consequence of their visits to manufacturers of equipment and plant in many countries. They thus acquire first-hand knowledge of the products of many manufacturers.

Also, they must follow trends of circuit and equipment design and new concepts of project planning by extensive reading of published technical articles and text-books. All this, in addition to being essential to enable them to render valuable service to clients, contributes to making their professional life and work a constantly renewed source of interest and satisfaction.

Overseas travel is another important aspect of their work and, apart from being interesting in itself, enables them to see at first hand how engineering tasks and problems are tackled in other lands. From time to time, members of the engineering staff will have the opportunity to spend a year or two, or more, as resident engineers in connection with large projects which require continuous supervision or to act as on-the-spot representatives of their firm in the service of a client who requires continuous first-hand consultancy service. In this way, a very valuable mutual relationship between the client and the consultancy is built up over the years.

A knowledge of one or two internationally used

foreign languages is an obvious asset, and many consultants and their engineers acquire such knowledge as a result of their residence overseas. This facility can be used to good advantage when the client requires that reports, specifications, tender and other documents be submitted in one of these languages as well as in the English version. For this purpose, of course, the engineer will need to have much more than just a 'working knowledge' of the languge concerned, but must be able to write fluently and correctly in the particular language and be familiar with the specialized engineering terminology involved. While such specialized knowledge is fairly rare in the engineering profession generally, there are some engineers, both in the manufacturing sphere and in consultancy work, who have acquired a proficiency which enables them to compose such documents as mentioned above or at least to be able to read and check for engineering accuracy the work of an outside technical translation agency.

Conclusion

Consulting engineering is a profession, and its members are bound by a strict code of conduct and professional etiquette.

All over the world, their value and duties are well known, and although the various authorities, administrations and government departments having engineering responsibilities will have their own staffs of engineers for the execution of normal work within the entity, the specialist knowledge of consulting engineers is frequently called upon when major new projects are undertaken.

The UK Government trade representative in any country is available to discuss questions arising in connection with the promotion of future projects, and to assist in putting the promoters in touch with suitable consulting engineers from whom expert technical and economic advice can be obtained.

Acknowledgement

The author wishes to thank Mr J. W. Marshall, Senior Partner, Preece, Cardew & Rider, for permission to publish this paper and Mr E. D. Knight, Partner, for his help and advice in its preparation.