

J. W. LOVATT & P. I. HELMORE

The organization of overseas work

INTRODUCTION

The previous papers presented to this Conference have dealt with the specific problems associated with water supply, sewerage, sewage treatment and the built environment in hot climates and the developing countries. The purpose of this paper is to consider some of the problems which arise when the works come to be implemented.

The problems will be better appreciated if we look first at the general situation in the developing countries. It is a matter for great concern because statistics show that two-thirds of the world population now live in these regions which include South and East Asia, Africa and Latin America and 85% of all childbirths that occur in the world today take place in these sectors. It has been estimated that the population of the developing countries is increasing by one million people each week and the fact that, generally, they are located in regions of climatic extremes adds considerable to the problems. Poverty, hunger and illiteracy abound and the bleak mathematics of population growth leave no doubt about the threat to humanity in the developing countries. Technological and scientific advances in communication media have brought a new awareness to the people in these countries that poverty is not their natural and unavoidable inheritance. There is growing concern about the ever widening gap in living standards of the richer and poorer nations and the tensions which this situation generates.

Vast expenditure is required to resolve this situation and it will be the engineer's task to ensure that available finance is expended to give the greatest good. It is an increasing feature

of the engineer's role, however, that final success will depend on his ability to convey to all concerned a clear sense of the direction of development activity and to take a positive interest in the reactions. It is no longer sufficient for the engineer operating in the developing countries just to exercise his technical competence and skill. Progress will be measured by his ability to understand and interpret the physical, political and cultural environment in which he is operating and this will almost certainly involve matters which transcend the normal scope of his profession. He must, therefore, acquire a much firmer grasp of the social, economic and ecological consequences of his operations and the past mistakes of the more industrialised nations, when everything was sacrificed to economic gain, will then be avoided.

It is against this background that the engineer operating overseas today has to conceive his solutions to a particular problem. The procedures for the implementation of the works are involved and complex and they do not follow any fixed pattern. Much will depend on the location of the country, its climate and geological formation, the form of government, the economy and, most important of all, the availability of finance. Nothing is possible without it but it is not necessarily a problem in all the developing countries. The oil rich nations of North Africa and the Middle East, for example, have money available for their development projects. They can establish the priorities, instigate any projects they please and commission experts to implement them.

The majority of the developing countries, however, are not so fortunate and, generally, they must rely on financial assistance from the more developed and richer nations either in the form of direct aid or by loans channelled through the international monetary agencies. Much has been achieved by this international co-operation but it has been calculated that the financial aid is, at present, still only one-third of what is required.

The procedures for the loan of international finance can be lengthy and complicated. Invariably they involve a feasibility study with no assurance that, on completion, the works will be implemented. The engineer will be involved in assessing and demonstrating the viability of his proposals and it is no simple matter always to measure the improvements to the well being and health of people in monetary terms. There is no doubt that the engineer operating overseas in such circumstances carries great responsibility in assessing and deciding with the economists, accountants and the politicians what is appropriate in any particular place. Local conditions vary considerably but there are basic factors common to all the developing countries which must be taken into account in implementing any project overseas, whatever the discipline may be. The most important of them are listed below and they fall conveniently into three groups, viz. design, construction and operation.

(a) Design

- i. Site investigations
- ii. Design Considerations
- iii. Availability of Materials

(b) Construction

- i. Climate
- ii. Availability of Labour
- iii. Contractor's previous experience
- iv. Local customs and religion
- v. Communications
- vi. Contract Documents
- vii. Supervision of Works

(c) Operation

- i. Training

SITE INVESTIGATIONS

Before commencing any designs the engineer would be wise to carry out detailed site investigations for local conditions will greatly influence his designs. Apart from the usual engineering investigations into ground and subsoil conditions, the availability of materials and labour will play an important part in the design and implementation of the works. The engineer must use local materials to the largest possible extent and he may be confronted with materials he is not familiar with and which may have a quality standard lower than he would consider acceptable in his home country. The investigations will almost certainly reveal a shortage of skill and experience in the labour to be employed and it may not even exist at all in any quantity. It will inevitably be less productive and greater numbers will need to be employed to produce an output equivalent to that in the more developed countries.

DESIGN CONSIDERATIONS

It behoves the design engineer operating in the developing countries to keep his designs as simple as possible and to avoid complicated construction features and sophisticated equipment. This is particularly important in countries where there is a shortage of skilled labour both for construction and subsequent operation and maintenance. His designs should, therefore, be simple and robust, maybe even a little out of date if this makes them easier to understand, to construct and to operate. In his enthusiasm always to improve on what has been done before the engineer is in some danger of imposing on a people something for which they may be quite unready and which will fail through inexperience and lack of operating skill. Progress is a fine thing but it has no mandate to change things overnight. It can still be achieved, however, providing the engineer takes into account the local conditions, accepts them and then, with a little ingenuity, exploits them to create something from the minimum of human and physical resources which will give some material benefit to the local people.

The engineer must understand that the works and equipment will possibly be misused, not intentionally, but through ignorance and inexperience of its operational features and lack of proper maintenance. Not only must they be simple to construct, therefore, but they must be simple to maintain. This applies particularly to mechanical and electrical equipment which can become unusually temperamental when installed a long way from home in climatic conditions not fully appreciated when it was designed and manufactured.

Design specifications for such equipment must be comprehensive and detailed both as to its protection during transport to a particular country and the conditions under which it will have to operate when it arrives.

AVAILABILITY OF MATERIALS

The engineer would be wise to consider the availability of materials for construction. It is not unusual to find a complete dearth of any constructional materials such as timber and cement and even local aggregates can be unsuitable. By their very nature developing countries have limited industrial facilities for the manufacture of steel, pipes and mechanical equipment.

The engineer will need to take these factors into account at the design stage in order to exploit such local resources as are available to the full. The importation of materials will add considerably to the cost and he will need to examine the resources of neighbouring countries to minimise transportation charges. If materials are arriving from several countries a carefully co-ordinated delivery programme is essential.

It must be remembered that manufacturing techniques and standards vary between one country and another and the engineer must investigate these in detail and, where necessary, adapt his specifications to conform with what is reasonably possible and practicable in the particular circumstances. He must also learn to improvise for despite the most detailed forward planning materials do not always arrive on time.

The exploitation of local resources is not always so simple as it may first appear. Despite pre-contract promises that they can be exploited the arrival on site of the construction teams is often the preliminary to endless negotiations and bargaining as to the prices to be paid and these can rocket overnight. The acquisition of land and opening up of quarries for aggregates can, for example, be a tortuous business particularly where alternative sources are limited or even non-existent. Simplified testing techniques may have to be established for quick checks on the quality of local materials.

CLIMATE

Allowance must be made for extremes of temperature which in a single country can vary from near freezing to the lower fifties centigrade. Very often construction work can be interrupted by sand storms and periods of torrential rain. Blown sand can play havoc with mechanical plant during site storage; transportation and erection and maintenance costs are high where these conditions occur. Heavy rain, lasting sometimes for several days, can seriously interfere with progress of work by washing away access roads and destroying excavations completely. High temperatures necessitate special arrangements for curing of concrete. Sometimes they necessitate staggering of working hours and the introduction of shift working to avoid the hours of temperature peaks. This imposes onerous working conditions on site supervisory staff. Considerable lethargy can occur amongst all concerned and constructional programmes are soon upset.

The health hazards are obvious particularly when a Contractor is operating in a country other than his own and his labour is unused to violent climatic extremes, the local food and standards of hygiene. Medical facilities can be very limited in some places.

AVAILABILITY OF LABOUR

The construction of a major project in a developing country involves the recruitment of a large labour force for local resources are often extremely limited both in numbers and skill.

It is usually a Government requirement in such countries that local labour be employed to the full, and indeed, that it be given priority, even though it may be completely inexperienced. Inevitably, the contractor will have to import skilled labour, supervisors, managers etc. and possibly several hundred unskilled labourers as well. The processing of visas, work permits etc. is a mammoth task in some developing countries, particularly where there is an inexperienced administration.

Language difficulties can arise and a labour force of mixed nationalities presents endless problems. Often they are quite incompatible as a result of local habits and customs. The contractor might well be faced with the necessity of establishing large labour camps with suitable housing, messing and entertainment facilities. If these are in remote areas the feeding of a large labour force and the disposal of its wastes present considerable problems in organisation and management.

It is, perhaps, not always appreciated that a contractor may be operating in another country because there is insufficient work in his own. He may be subsidised by his Government which may be seeking foreign exchange and his labour force may have been directed to work overseas, possibly unwillingly. This is not always conducive to happy relations and maximum effort in the execution of the work. Labour is not easily and quickly replaced when there are complicated procedures to be complied with regarding visas and work permits.

CONTRACTORS PREVIOUS EXPERIENCE

Construction of a major project in a developing country will usually attract tenders from a variety of international contractors. They will have their own methods and standards of workmanship peculiar to their own country but these might well prove inadequate elsewhere, particularly if the Contractor is now to operate in a discipline of which he has no previous experience.

Specifications for materials and workmanship must be detailed and clear as to what is required of the contractor. Tenders will need to be carefully compared to ensure that the requirements have been fully met and there are no ambiguities. When the successful tenderer is known a visit to his country is helpful to inspect works undertaken by him, to discuss and resolve possible difficulties in interpretation of the contract documents and to interview site supervisory staff. Language is an obvious problem which can cause endless communication difficulties on site.

LOCAL CUSTOMS

It is extremely important that all concerned with the execution of a project in a country other than their own acquaint themselves with the customs and habits of the local people. Apart from being discourteous, any attempt to override or ignore century old traditions and religious practices is to court disaster.

Some countries appear to have a constant stream of public holidays and feast days some of which may on occasion be declared overnight and without prior warning. They can last one or several days completely dislocating work schedules and leading to claims for delays,

Interference with the rights of way of local people and their animals can be troublesome while accidents and injuries to either may cause endless wrangling in the Courts.

Considerable patience, tact and understanding must be exercised in all relations with the local inhabitants.

COMMUNICATIONS

It may seem strange in this modern age to have to refer to communications but there are still many countries where they, or rather the lack of them, can be extremely frustrating. The postal and telegraph services are often inefficient and transport non-existent. When it would be desirable or comforting to seek advice or guidance of one's superiors it is often quite impossible without interminable delays. Supervisory staff have, therefore, to be much more self-reliant and capable of making on-the-spot decisions involving considerable sums of money.

Aircraft, carrying some vital spare part, arrive late. Bulk materials travelling by sea are delayed by the weather, strikes in some port thousands of miles away prevent them being loaded and when they arrive the dock facilities may prove inadequate for unloading. Onward transmission to the site over poor roads, or no roads at all, can be a hazardous business resulting in damage or breakages to materials urgently awaited at their destination.

CONTRACT DOCUMENTS

The preparation of documents for international tenders is an onerous task as they will be interpreted differently by Contractors of varying nationalities. Very often the employing authority has its own contract conditions which are, at times, penal in their effect on the Contractor and restrict the authority of the engineer. It is not always appreciated by the employer that the engineer also has a duty to the Contractor to ensure that he gets just and fair payment for the work executed particularly that which could not have been reasonably foreseen.

Any reference to standard specifications or codes of practice should be explicit and made with care. What is easily complied with in a highly developed country may be quite impossible in another where development is just commencing.

Local manufacturing arrangements can often be instituted to produce on site something which would otherwise have to be transported hundreds of miles and specifications should provide for this to be done if money can be saved thereby.

The Conditions of Contract should include particular clauses to cover any special local requirements or customs which may affect the progress of the work, particularly those which restrict the Contractor's commonly accepted activities.

SUPERVISION OF WORKS

Operating in a country overseas the engineer may well find himself involved in much more detailed supervision than would normally be the case. This applies particularly when the Contractor is from another country, too, and constructing works, of which he has no previous experience with poor quality labour.

It is fairly common for the engineer's site staff to find themselves performing menial tasks and instructing workmen themselves as to how a particular operation is to be carried out. The lower the skill of the labour the greater is the degree of supervision necessary and more site engineers are usually necessary on overseas work if standards are to be maintained.

A responsible contractor and his workmen will usually welcome instruction in executing works of which they have no previous experience and the engineer will have the satisfaction of having established proper standards of workmanship from the beginning. This co-operation can result in a finished project having a quality higher than is sometimes achieved in the more developed countries.

TRAINING

Whatever the discipline the completed works cannot operate satisfactorily without skilled operators particularly if the project includes any quantity of mechanical and electrical equipment. It is unlikely that suitable operators will be available locally and the engineer usually becomes involved in setting up some training programme locally or for selected personnel to be trained on similar installations in another country.

This task is not so simple as it may first appear for, not only is it common to find a lack of basic education, but it is difficult, in some countries, for workers to apply themselves to routine tasks for any length of time if this has not been their way of life. Training of personnel in another country does not always carry a guarantee that they will return to their own and accept the post for which they have been trained. As industrial activity develops counter-attractions appear in other spheres and it is understandable that trained personnel will exploit this situation to their material benefit.

The Author's experience is that under expatriate direction and Government control, training programmes are best carried out locally. They can, however, be time-consuming and frustrating and they require great patience and understanding of the local temperament and customs. The engineer must be in no hurry to depart from his completed works until he is quite satisfied that they are understood and will be operated and maintained properly.

It will be necessary to impress on the controlling Authority or Government Department the need to maintain adequate stocks of stores and spares. There is a strange reluctance in some countries to do this and very often a complete lack of understanding that new equipment needs any maintenance at all.

CONCLUSION

The main conclusion to be drawn from most of the various points set out earlier in the Paper is that successful participation in overseas work demands a very flexible approach in the design and organisation methods to be adopted.

As Engineers who have been trained and who have probably received most of our working experience in developed countries, we may have become mentally adjusted to established working methods and standards that have been evolved there. We must, however, recognise that such methods and standards may not be sensibly applied to all circumstances. This is not an argument for accepting "second best" but rather for acceptance of what is adequate for the particular requirements and can be readily achieved. Some real, although limited, achievements by simple methods are infinitely better than probable failure due to over sophistication.

In this respect our teaching institutions and all of us who take part in the training of students of Environmental Health Engineering from overseas countries have some part to play. When these students complete their training and return to their own country they often take up important positions with some influence on Environmental Health Engineering in their country. It is then important that they should understand that the working methods and standards that they have experienced in the developed countries may not be applicable or may take a long while to achieve in their own country and that they should have some understanding of what is necessary and can be achieved in their local circumstances in the immediate future.

Some flexibility should also be applied to the scope of work which the engineer recommends for a project. In considering the scope of a project and its objectives allowance must be made for the future but when this is done in respect of a developing country we are dealing with a period in which great fundamental social and economic changes must be expected. The nature and extent of these changes will not be predictable and neither is the speed by which they will occur but they are likely to have a significant effect on future public health requirements. In defining the scope of a project the engineer will consider the problems and the works necessary to provide solutions. In the case of developing countries it may be possible to start such considerations without the constraints of existing or previous systems. This should provide the engineer with the opportunity to influence the problems at source so that he can avoid difficulties which would probably be outside his control in a more developed society.

It is important that the engineer grasps this opportunity for he has a vital part to play in dealing with the problems overseas. If he is to make any real impact on the situation, however, he must adapt his thinking to the rapidly changing conditions. The economist will almost certainly insist that he does so, because the environment in the developing countries is changing at such a staggering rate that anything built there now might well be obsolete within a normal life span. The economist will argue that in this present financial climate we cannot afford to build for eternity. Labour and money are too expensive and with discount rates at such high levels, we can no longer afford to provide for generations as yet unborn.

It is difficult for the engineer to accept completely this philosophy for he is not accustomed to designing for obsolescence in his own lifetime. It must, however, influence his approach to the design and construction of works in the developing countries in view of the particular conditions which now exist there. It is a situation of tremendous challenge and opportunity for the engineer with an interest in Environmental Health Engineering which has been the theme of this Conference.

With tact, patience and a proper understanding of the problems, however, he could gain considerable satisfaction in overcoming them. At the same time he will have made a valuable contribution to the health and welfare of the people in the developing countries. He will certainly return to his own country a more able and wiser engineer and more understanding of his fellow men.