

Finance and contracting practices

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When I began my tunnelling career in the early 1950's there seemed to be only one course to follow in procuring civil engineering projects. A client recognised the need for a structure to serve some purpose for his business. He appointed an engineer to design an appropriate structure to satisfy the requirements of a brief which he provided.

The engineer then developed the brief and, using his professional and technical expertise, prepared a soundly engineered economic, technical solution, for which he would provide the client with a construction cost estimate.

The client would then decide whether or not he had the financial resources to afford to put the work in hand. Assuming that finance was available the engineer would then proceed to detailed design of the work, the preparation of contract documentation, and the invitation of bids from a list of contractors selected on the basis of their proven ability to carry out such work.

Conditions of contract were of a standard form, prepared by national professional institutions, or by FIDIC for international contracts. Descriptions of the details of the work were prepared, both in text and drawings, and a detailed bill of quantities enabled tenderers to prepare easily comparable bids for the construction.

Bids were evaluated and compared by the engineer, who would recommend an appropriate appointment to the client. On entering into the construction contract, the same engineer would be expected to monitor construction, agree temporary works, certify payments to the contractor and generally administer the contract.

DEVELOPMENT OF CONTRACTS

As contractors became more experienced and specialist, and their own engineering staffs grew, it was not unusual for bidding contractors to propose alternative designs, or methods of construction, in order to reduce the size of their bid, and hopefully increase their chances of success. Acceptance of such alternative proposals frequently led to problems, partly because the transfer of risk in design from engineer to contractor, partly through the loss of price comparability at the tender stage, and also to the difficulty of agreeing variations to the contractors proposals during construction.

Over time these arguments led to the development of design and construct contracts, target cost contracts and other variants, particularly in tunnelling, as set out in the document "Improved Contract Practices" referred to by my colleague Sir Alan Muir Wood in his contribution to these papers. In tunnelling in particular it seemed that there was a strong need to maintain "a continuous thread" right through the procurement process, to ensure that no part of the design philosophy was overlooked in the construction phase. The first change was to use the engineer simply to produce a feasibility study and cost budget, which the client would then take to selected construction contractors with a requirement to complete the design and carry out construction - the belief being that such a course would save the cost of employing an engineer, and would lead to innovative construction proposals. There was little satisfaction in this for the engineer, who found his designs taken over by others, and who lost the satisfaction of seeing his ideas come to fruition. Construction contractors, now bidding to provide the complete design and construct package, found that they could not support the breadth of design experience necessary for all types of work, and consulting engineers began bidding against each other for a share in the design work. This at least enabled them to retain

their identity as consulting engineers, but fee competition and pressure to accept the lowest bid led to some doubtful appointments, higher risks and more arguments.

New forms of contract have replaced the role of the engineer, and the impartial advice and independent inspection which came with it, with a construction manager and self imposed quality assurance. We hear much about "partnering" in construction contracting, meaning the creation of relationship between client and contractor which avoids confrontation and seeks to establish the construction as a common goal. Such an arrangement can certainly be made to work where the client is as strong as the contractor, and has the resources to carry his share of any unforeseen additional financial burden.

I will not venture too far into the dangers of quality assurance here, but it must always be seen as a part of a process which leads to confidence that the structure as a whole complies with the design. It must not become simply a checklist of activity where nobody is responsible for placing the results of quality assurance checks in the wider context of the whole project. This was a function which was traditionally performed by the engineer, who was free of the responsibility of managing the construction, but carried the responsibility for design. If the design engineer is to be employed by the construction contractor, it is of prime importance that he is permitted to mobilise the necessary resources and is given the necessary powers to ensure that construction follows the design.

We have witnessed recently, in the serious collapse of tunnels under construction at London's Heathrow Airport, how disastrous it can be in underground works if these links are weakened. The prosecutions which followed the accident demonstrated how confused the parties were over where the ultimate responsibilities lay for safety of the works. The new form of contract used, which has abandoned the concept of The Engineer without providing any suitable mechanism for ensuring the essential engineering continuity, must surely be the principal reason for this uncertainty. An unthinking adherence to principles of project management, with insufficient attention being paid to even the most basic engineering concepts can lead to inappropriate appointments, and a serious increase in risk for all parties.

PROJECT FINANCING

Turning now to the financing of projects, in one sense we have recently seen history repeating itself. I suppose that it is true to say that engineers can always dream up a project, and having done so their enthusiasm for it will always be high, a succession of "designers" of Channel Tunnel over the past 200 years proves the point.

150 years ago Brunel saw a need for a further crossing of the River Thames in London. He decided that a tunnel was an appropriate means by which to make this new crossing, and his enthusiasm never wavered. Unfortunately he had no client, so he had to raise the necessary finance himself, approaching the City of London's banks and financial institutions with his plans, cost estimates and revenue projections. He had to accept all the risks, and as we know, tunnelling problems twice caused him to run out of money, and his tunnel was never put to the purpose intended. I was personally reminded of this by American financiers when trying to raise the finance for the Channel Tunnel.

The efforts of Brunel and others gradually brought about the creation of railway and steamship companies which could afford to commission engineers to design works for them, and who had the financial strength to borrow money to pay for those works. The bulk of our work as engineers still comes from private client organisations and government departments, who can and do arrange for the financing of their projects.

However some governments are now taking the design and construct movement a stage further into Build-Own-Operate-Transfer (BOOT) projects, where a need for a facility is accepted but finance from taxation is not available. The project team thus finds itself back with Brunel, having to procure the finance, but they also have to create a company to operate the facility for a period during which they repay the project loans and generate a profit for themselves, before transferring ownership of the facility back to the government.

The governments of developing Nations, such as that in Lesotho, have invited bids for major projects where funding is expected to be available from international funding agencies, and have made the arrangement of funding a part of the contract. Construction contractors hungry for work cannot afford to ignore such contracts, and are thus forced to expand their expertise into project financing, and the negotiation of complex agreements between funding agencies for the provision of funds linked to their construction and completion programme.

The Channel Tunnel Project saw the governments of France and Britain adopt purely facilitating role, creating the necessary bi-national legal framework, but offering no financial assistance or guarantees of any kind to the successful bidder. Once again we were back to Brunel! The construction contractor appointed himself, by winning a government sponsored competition, but an owning /operating company (Eurotunnel) had to be instantly created to arrange for the financing and to award and administer the construction contract. The major part of the funding was provided in the form of commercial loans from a syndicate of over 200 banks from all over the world, but they insisted that one fifth of the funding should be in equity. Thus two parallel streams of funding activity had to be embarked upon and each had to be completed satisfactorily at precisely the same time, since each was conditional upon the other.

CONCLUSIONS

I suppose that, as we grow older, we are bound to regret the need for change, and indeed it is often difficult to see the advantages of some changes.

The new forms of contract seem to have been driven by a belief that money could be saved by cutting out the engineer as an independent entity, and that the management of a project would be simplified if all the risks and responsibilities were placed upon the shoulders of the construction contractor. There is also a current belief that "partnering" will avoid conflict, though I believe that conflict will always follow when either the client runs short of money, or the contractors shareholders feel that their dividend is supporting a failing contract.

It is interesting that as The Engineer is removed under the contract, so the need for Disputes Resolution Panels has increased, and a whole new profession is being created. Furthermore the type of person in great demand to take on the responsibilities of disputes resolution must have many years of practical experience, be held in respect by his peers, and have a reputation for impartiality. In fact just the type of person who should have been appointed Engineer, and who might have obviated the need for a disputes resolution panel!

I should not leave the subject of contract forms without mentioning the great amount of time and study, over many years, which has been given to the matter by the ITA Working Group on Contractual Practices. A considerable number of highly experienced tunnel engineers and interested lawyers have considered all aspects of the problems of risk sharing on tunnel projects, and the results of their labours have been published by ITA for the guidance of all. From what I have been able to discover about the use made of the ITA Recommendations, they are only rarely consulted by those nations who made the greatest input into their creation, but are more likely to be adopted by nations for whom tunnelling is unfamiliar. Perhaps we should ask why this is so? Otherwise we could be accused of not having the courage of our convictions.

I have many misgivings about passing the responsibility for arranging project financing with the construction contractor under the contract, which probably derives from my rather puritacal upbringing. My father always said "if you cannot afford it, don't buy it". To say to contractor "if you think you can make a profit out of building this project, then you can find the money" seems to transfer yet another risk from employer to contractor, and can easily result in the employer losing control over what is finally delivered to him.

We are all human, and project management is still only the result of collective human endeavour. I feel that we might improve the end result of all these changes if we spent more time studying human psychology before placing ever more complex burdens upon individuals insufficiently prepared by our education systems to carry them.