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ENGINEERING NEWS

QUARTERLY JOURNAL OF THE WEST PAKISTAN ENGINEERING CONGRESS

VOL. X ISSUE 1

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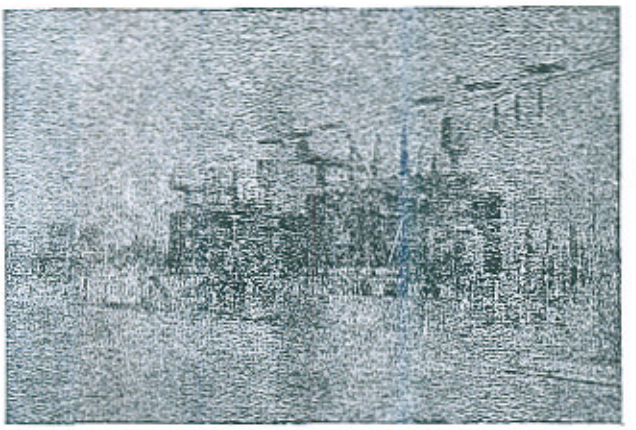
In this issue

From the small

distribution transformers...

...to the large

power transformers...



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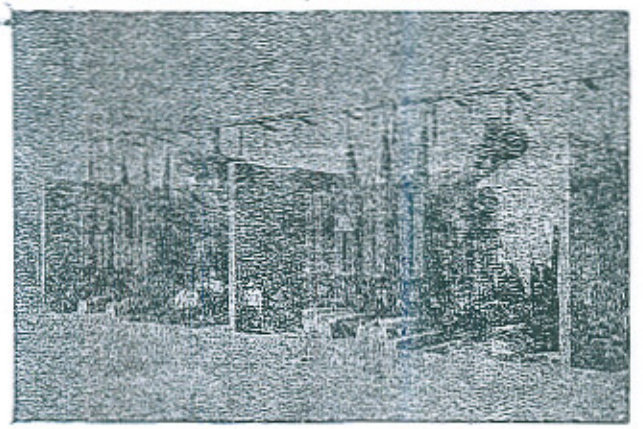

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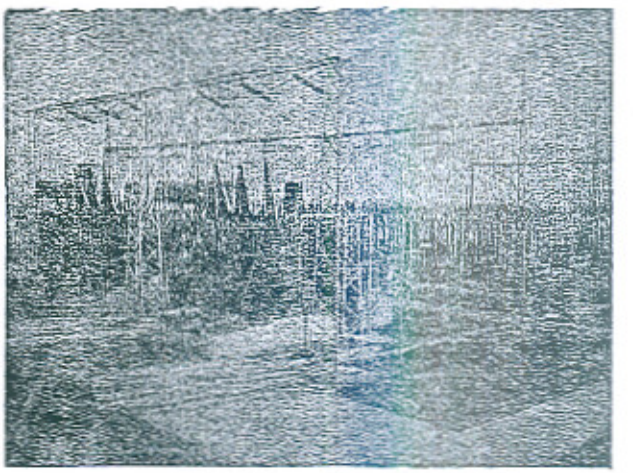

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Development of Pakistani Consulting Firms

The Symposium on consulting and contracting practices brought many interesting points into focus. Five Pakistanis and six representatives of foreign consulting firms discussed the various aspects of the subject.

Mr. Abbas, Commissioner, East Pakistan, WAPDA, who employs consultants, explained at great length the advantages of creating consulting and contracting organizations and their utilization. Mr. Azim-ud-din, head of A.C.E., an important consulting organization of Pakistan, stressed the difficulties experienced in competing with similar foreign organizations. Mr. Ahmad Khalil pointed to the stumbling blocks in the way of contracting firms in the country, and indicated measures for improving their lot.

Mr. A. A. Abadi and Mr. Razwan Abadi discussed specific problems connected with consulting practices. For acquiring experience and learning methods of consulting firms, Pakistani Engineers were attached to foreign consulting firms. Mr. Abadi laid emphasis on the difficulty of their adjustment to the new system. Mr. Razwan devoted his discourse to the advantages of competitive contract bids which are considered as a valuable achievement of the modern contracting system.

As for the six foreign participants, Messrs. A. V. Karpov, G. H. Waughn Lee, Gerald T. McCarthey and Montford Fuik, all directly or indirectly connected with foreign consulting firms operating in the country, dwelt upon the advantages of this system of Engineering. They spoke of the vast flexibility of the consultant firms to get the best advice and described at length other advantages normally not available to Government Institutions. Speaking from their own experience, they advised Pakistanis to draw up a code of Engineering Ethics and to form an association of consulting firms.

After a perusal of all the eleven contributions, one is still unable to find an answer to the question. Are conditions in the country ripe for the development of such institutions?

If we survey the formation of consulting firms in other countries we find that they have developed around some top notch experts imbued with advanced knowledge and experience. Very often university professors due to their superior knowledge have been the advisers to the consultants. Some top-most engineering experts are necessary for pivotal positions in the consultant firms.

Unfortunately this condition does not exist in our country. Our Engineering Universities are just taking shape. Qualified teachers are being collected together. They are yet to attain positions of eminence to be able to tackle tricky and complicated problems. The university and some Research Institutions are the only organizations em-

ploying engineers expected to possess up-to-date information regarding modern developments.

Itis true that some of the in-service engineers in Government organizations have years of experience at their back, but they have had little chance to keep abreast of the latest developments, and their knowledge is not up-to-date. Naturally it is evident that the time is not yet ripe for the development of consulting firms.

With the institution of semi-autonomous organizations in the country, a vast field of experts advice for consultants was opened. The country had no consulting services. This deficiency paved the way for foreign consultants. Another reason which imposed foreign consulting service in Pakistan was the need of acquiring loan for development projects. The loan-giving agencies considered it advantageous to compel the loan-receiving country to employ consultants, generally of their own choice. The Indus Basin works and *Wapda's* development projects brought in a large influx of consultants and even contractors, well experienced in their own special methods and techniques but quite alien to the conditions of this country. It was a big change, particularly for the serving engineers. Those who erstwhile were planning and designing engineering projects were suddenly debarred from these functions. They were now required to maintain the work designed by consultants and constructed by foreign firms. This was obviously a change for the worse.

Pakistan is passing through a transitional period. Just two decades ago the country was utilizing departmental engineering skill and the results were good. In spite of all the inherent defects and difficulties of Government Organizations, the engineering works of pre-independence are examples of great engineering skill and represent notable achievements.

It is true that modern engineering practice has grown more complicated. It requires specialised skills. For this type of engineering the system of in-service training as has remained in vogue for the last 60 to 80 years, is now not very suitable. With the changing engineering problems, the system of working must also change; but the change should be brought about by evolution not by revolution. Any new system imposed suddenly has always resulted in chaos and complications. Naturally the systematic development is the only right procedure.

"Seek, and ye shall find". When our engineers had to face problems, they strove, persevered and by dint of hard work found the solutions. Seventy or eighty years back army engineers started construction of Civil Works and by persistent hard work, perfected many new systems of construction suited to this country and which later on became a source of inspiration to other countries as well. We should certainly have our own consulting firms but to enable them to grow, we should create the proper atmosphere for their development.

We must introduce advanced learning in our teaching and Research Institutions.

Consulting firms will only develop when experts with advanced learning and up-to-date information are available in the country.

We must start creating confidence in our own engineers by entrusting them with complicated problems to which they must find the solutions through their own initiative and ingenuity.

When we have taken these measures, consulting firms will automatically crop up in our country.

West Pakistan Engineering Congress

(48th Annual Session)

INAUGURATED

The West Pakistan Engineering Congress held its 48th Annual General Session from Wednesday the 17th March 1965, and it lasted for four days. The first two days were devoted to the discussion of nine technical papers. One full day was devoted to the symposium on Consulting and Contracting Practices in Pakistan. Mr. Ghulam Farooq, former Governor of East Pakistan, and Chairman, West Pakistan WAPDA, opened the session. In this issue the full text of the address of Chaudory Abdul Hamid, the President of the Congress and the remarks of Mr. Ghulam Farooq are reproduced. Chaudhry Abdul Hamid addressed the engineers as under:—

"It is my privilege to extend to you, sir, a most hearty welcome on behalf of the West Pakistan Engineering Congress to its 48th Annual Session. We are indeed grateful to you for having spared time to grace this occasion in spite of your numerous and varied engagements. In the course of many high offices you have held before and after Independence you have remained closely associated with the work of Engineers. You have intimate knowledge of the responsibilities shouldered by them, the problems they encounter and the handicaps they face. The contributions they have made towards the development of the country are also known to you. In having you here today, therefore, we feel as if you are one of us, a thought which evokes in us a feeling of elation and pride.

Membership rises to 1021

Sir, the West Pakistan Engineering Congress is a successor body to the Punjab Engineering Congress which came into being in the year 1912. It crossed a historic milestone when it celebrated its Golden Jubilee in October, 1963. Its membership since integration of Provinces in 1955 has risen by 586 and now stands at 1021. Its members hail from all branches of engineering such as Irrigation, Communication and Works, Public Health, Electricity, Railways, Army and the Industry. Quite a number of its members are engaged in consulting and contracting work. Its membership thus reflects all aspects of engineering activity in the Province. Today the Engineering Congress is the oldest representative body of engineering profession in the country.

Time to Split into Specialised Groups

The pace at which engineering science and its application is developing in the present-

day world renders it well-nigh impossible for any person to remain abreast of the latest discoveries and methods in all branches of engineering. The progress is, in fact, taking place so rapidly that it is not easy to remain conversant with all the developments even in any one branch of engineering. Our deliberations over a wide range of subjects are at present being carried out on one common platform, that of the Engineering Congress. Time is not far, however, when under the auspices of a parent body of engineers subordinate bodies or groups will emerge to pursue discussions on subjects in specialized fields. So far papers have been presented and symposiums held on various subjects in joint gatherings of Civil, Electrical, Mechanical and other engineers. As the profession expands and membership grows, meetings will no doubt, have to be convened of various groups separately to devote themselves to particular category of subjects. There will, however, still be some subjects of common interest, such as those relating to multi-purpose schemes and matters covering engineering profession as a whole which will continue to be presented and discussed in a common Forum. The Annual Sessions will then hum with the activity of individual engineering groups as well as common assemblies. Such an evolution has invariably taken place in the engineering bodies of advanced countries of the world and will, no doubt, take place in Pakistan too as specialization gradually takes hold. There are signs already of an increasing interest in the accumulation and furtherance of engineering knowledge through the formation of local societies and associations. This is a healthy sign and indicates the determination of Pakistani engineers to prepare and brace themselves to the task of handling problems of varying nature and dimensions which they would be called upon to face in the planning and execution of the gigantic schemes coming up in the future.

More qualified Engineers needed

I have made a mention of handicaps from which our engineers suffer. These are quite varied. To begin with there is the shortage of numbers. In spite of the fact that the Engineering Universities are increasing admissions to their colleges almost yearly, there remains an acute dearth of engineers all over. I quote the case of my own department as an example. More than 40% of our Junior Engineers are promoted from ranks and are not technically qualified. It is obvious that in the circumstances efficiency and output at this level of the organization are bound to be adversely affected. In our new projects latest equipment is being imported and installed which can only be safe in the hands of people who fully understand its function both in theory and practice. Until such time as qualified engineers replace at least a requisite number of non-qualified Junior Engineers, the performance of various units cannot come up to the mark. I dare say the position is somewhat similar in other departments. There is thus a crying need for increase in the turn out of our Engineering Institutions. Government has taken a very wise and timely step in setting up Polytechnics in various towns. Some of these institutions are doing excellent work and their efforts will go a long way in providing suitably qualified technicians to the country. It is imperative, however, that a larger number of qualified engineers should come out of our Universities, if the needs of the huge developmental schemes planned for the future are to be adequately met.

Retrieve lost talent

There is a large number of Pakistan engineers serving in foreign countries. Some effective steps have to be taken to retrieve this lost talent. It is obvious that the country cannot afford to offer them the same salaries as they are drawing abroad, but short of that certain considerations can, I am sure, be shown to encourage them to serve in Pakistan. There is a great shortage of engineers in practically all countries of the world and our young men get enticed by the lucrative salaries they are given almost immediately after graduation. On returning to Pakistan they are faced with rather rigid conditions of service adopted by Government and semi-Government Departments. There should be some flexibility in the conditions of recruitment which would on the one hand enable the employer to pick deserving candidates and employ them on reasonably attractive conditions of service and at the same time safeguard the interests of those already in service. Any special qualifications or experience gained abroad should be given due consideration. In short all possible ways and means should be adopted to persuade our promising engineers to come back and serve in their homeland. It is understood that Government is already giving this matter a serious thought and some suitable measures are expected to be taken in this connection.

Better status needed

The most serious handicap from which the engineering profession in Pakistan seems to be suffering today is what may be termed as the lack of recognition of the status of engineers. The word "status" embraces such factors as, salary, scope of promotion, social position *vis-a-vis* other service, entry into higher tiers of not only technical but also administrative posts, etc. Reasons apart, the fact remains that the engineer today is only too perceptibly slipping into a state of apathy, bleak vision of the future and a feeling of frustration. In regard to salary our thanks are due to the Government for the recent upgrading of the scales of posts particularly at the lower and middle levels which have been greatly welcomed. With the enlargement of development programmes, the prospects of bright careers for the young as well as experienced engineers have considerably improved. The steady increase in the industrialization programme has created further opportunities for them.

As for the status of the engineer, *vis-a-vis* other services, the matter obviously requires a very careful and considered treatment. The steps that may be taken in this connection have to be commensurate with the role the Engineer is playing in the building of the nation. We would, therefore, earnestly appeal to those in authority to take a dispassionate view of the situation so that this important national heritage, *i.e.* the body of Engineers is nursed with understanding and appreciative hands and instead of being left to degenerate in an atmosphere of dissatisfaction and dejection is allowed to develop, flourish and add to the strength of the country shoulder to shoulder with all others working towards the same objective.

Engineers capable to grapple problems

The engineering profession in Pakistan, notwithstanding numerous handicaps it has had to meet had already proved its ability to grapple and deal with some of the most intricate and involved problems. While the profession acknowledges and appreciates the help and guidance it has received from some of the leading foreign consultants and experts, it feels that it has built up sufficient

confidence in itself to become progressively less dependent on outside assistance. In its efforts to develop and maintain high standards demanded of the profession today, it naturally expects to receive the support and blessings of all concerned. Lack of encouragement retards progress and this points to the desirability of reposing faith in engineers of the country. The tempo at which development is taking place is imposing and tremendous strain on the physical and mental resources of everyone connected with the planning and implementation of National projects. Occasional lapses and errors are, therefore, inevitable and even the best suffer from this inherent human failings at times. Genuine mistakes if not condoned are bound to stifle progress in any field of human activity and engineering is no exception. Unless initiative, which is the very essence of progress, is encouraged, there will be setbacks to further improvement. The responsibilities placed on the shoulders of engineers in the building of the country are heavy. There is so much to do in so short a time and all in the presence of problems so common to countries struggling to reach a respectable standard of development and self-sufficiency.

Advice to fellow engineers

To my fellow engineers, I would say that the colossal development programme ahead throws out a challenge to them. Out of the total amount provided for the fulfilment of the Third Five Year Plan something like 70 to 75% will be spent on schemes with which engineers will be directly or indirectly connected. This by itself brings out the importance of the part they have to play in country's future progress. They have, therefore, to dedicate themselves to the task of making the future plans a success. This should not be taken merely as a mercenary function but as a responsibility to be discharged with the spirit of service to the nation and country in mind.

While on the one hand they should, with proper decorum and methods, pursue the attainment of what they believe are their rights, on the other they should faithfully carry out an appraisal of themselves. If they discover any weakness in their ranks let them first own them and then go all out to eradicate them. There is nothing dishonourable in an effort at self-correction. It is gratifying to observe signs of awakening to the necessity of following and adhering to certain ethics.

There can be no doubt that the observance of a well defined code of behaviour and attitude is most essential for upholding the prestige of the profession. We have ourselves to evolve such a code and then to follow it religiously. This is something which calls for our urgent and serious attention. I hope the Congress in its future deliberations will deal with this important aspect of engineer's responsibility more thoroughly.

Engineering Academy a necessity

A matter which has been agitating the minds of Engineers for quite some time is that of the need of an Engineering Academy. During the course of my office as President of the Congress for nearly a year and half this point has been broached by many a member time and again. Space and time do not permit me to discuss in this address in detail the advantages of setting up an Engineering Academy but there is no gainsaying the fact that an Institution of this kind will provide proper means to the Engineer in acquiring advance knowledge and training in economical planning, programming, execution and administration of the schemes of the future. We would, therefore, request the

Government to initiate at as early a date as possible the examination of the proposal through a suitably constituted Committee so that as the justification for the creation of the Academy is established no further time is lost in giving it a concrete form.

Engineering Centre still needed

The decision to build an Engineering Centre had been taken by the Congress long ago. We had hoped that during the current Session we would at least be able to acquire the land and lay the foundation stone of the building of such a Centre. We have unfortunately not been successful so far in this venture for reasons partly beyond our control. I hope, however, that some positive steps will be taken in the forthcoming Session for this scheme to materialize.

It is perhaps customary for the outgoing President to give some account of the progress made in the various engineering fields during the course of the Session. I will accordingly make an attempt at giving below a brief summary of the achievements of the various agencies engaged in engineering works.

Several Dams in Offing

The Planning and Development of water and power resources of the Province continued to be done by Wapda and the work reached its pitch during 1963-64 this being the 4th year of the Second Five Year Plan period. The Rawal Dam was completed and the Filtration Plant capable of delivering 14 million gallons per day of filtered and chlorinated water supply to Rawalpindi Municipal Corporation and Cantt area, was installed. Work continued on Tanda Dam is expected to be completed during the summer of 1965. Work was commenced on the Karachi Irrigation Project which will help to grow food for Karachi area. Preliminary work and investigations were carried out on the Gomal Dam and Khairpur Projects. Gomal Dam is situated in South Waziristan and is a multipurpose project for producing hydro-electric power and providing irrigation facilities in D. I. Khan District.

Waterlogging and Salinity control continuing

The problem of Waterlogging and Salinity control continued to receive serious attention of the engineers. The Master Plan prepared by Wapda in 1961 for the first time brought out the vast magnitude of the problem and the tremendous resources which will have to be mobilized to rehabilitate and protect the agricultural lands which constitute the basic economic resources in West Pakistan. With 33 million acres of irrigated lands, the programme of reclamation and drainage will take many years to complete. This programme of reclamation is intimately connected with the development of water resources in West Pakistan particularly the exploitation of the vast groundwater resources which are available.

So far only a start has been made in implementing the reclamation projects but extensive and intensive investigations have been carried out throughout West Pakistan which have furnished scientific basis for the planning of future reclamation works. With the vast reservoir of groundwater in the Upper Indus Plains, the Tubewell Projects will not only achieve sub-surface drainage but at the same time provide considerable increase in the irrigation supplies. In the areas where the development of groundwater for irrigation use is not feasible alternative methods of drainage will have to be provided. During the Third Five Year Plan in order to accelerate the programme, it has been considered

necessary to provide the drainage and reclamation facilities in about 10 million acres. The same or even further accelerated tempo of development will have to be carried forward during the subsequent plan periods.

Indus Basin Projects are forging ahead

The Indus Basin Project being executed by Wapda to implement provisions of the Indus Waters Treaty 1960, is progressing very satisfactorily. It is anticipated that all the works except Tarbela Dam will be completed by the target date of March 1970 to enable Pakistan to meet with the Treaty obligations. The Mangla Dam, one of the world's biggest earthful dams, is more than half complete, while construction of Phase-I Link Canals and Barrage of Trimmu-Sidhnai-Mailsi-Bhalwal System has been completed on or ahead of the scheduled date of 31st March, 1965. Contracts for all, except one, of the Phase-II Works (Marala Barrage and Balloki-Suleimanki Link System) have been awarded and are progressing satisfactorily. Planning and design of Phase-III works (Chasma Barrage, Chasma Jhelum Link, Taunsa-Panjnad Link and Tarbela Dam) is also in the advanced stage and it is expected that contracts for all of these works will be awarded by early 1966.

The Irrigation Department undertook the construction of Dajal Branch System and Warsak High Level Canals, Mianwali Lift Irrigation Scheme, Chachar Pumping Scheme, Nara Pumping Scheme and a large number of Drainage Schemes throughout West Pakistan. Work was also started on the construction of Thatta-Sajawal Road Bridge over Indus which when completed will play a great role in social and economic uplift of the people. Apart from maintaining efficiently one of the largest irrigation systems in the world, the Department continued to play its important role in the work of Flood Control, Land Reclamation and Irrigation Research.

Tremendous Power Expansion

The Power Wing of Wapda which is responsible for both the development and operations of the power system in West Pakistan made tremendous progress during the last year and a half. In the northern Grid area, Multan Thermal Station was extended to give additional 130,000 kW and a Hydel Station of 13,800 kW capacity was commissioned at Nandipur. The system recorded a maximum demand of 384,000 kW during December, 1964. In the south, a Thermal Station of 15,000 kW capacity was commissioned at Quetta, and work was stepped up on the construction of 25,000 kW Thermal Station at Sukkur and extension of Hyderabad Thermal Station by 23,000 kW. The transmission and distribution networks were expanded both in the north and south and a total of 1,474 circuit miles of transmission lines was constructed. Electricity supply was made available to 84 new villages. During the year, 86,376 new connections were given to the consumers of all categories.

Commendable Progress by Railways

The Pakistan Western Railway made commendable progress in the achievement of their development plans.

The track on Karachi-Lalamusa primary main line is being rehabilitated and strengthened with the object of carrying heavier traffic and eventually raising the speed of trains from the existing 60 m.p.h. to 75 m.p.h.

First phase of the Karachi Circular Railway Project comprising about 18 miles of track linking Drigh Road and Drigh Colony stations on the main line with Wazir Mansion,

was completed and opened to passenger traffic on 10th November, 1964. The project involved construction of six major railway bridges, four roadover bridges, eleven foot-over bridges and a number of other engineering works.

The old Lansdowne bridge over Rohri channel on River Indus, on replacement by the newly constructed Ayub Bridge, has been converted into a road bridge and opened to vehicular traffic up to 3-ton axle loads.

The work on the construction of the Central Diesel Locomotive Workshops at Rawalpindi, which commenced in 1961, has been completed and the Shops are expected to go into operation in the second half of this year.

Four road over-bridges have been approved for construction across the railway lines to replace very busy level crossings at Hyderabad, Multan, Wazirabad and Taraki. Work on the first three over-bridges is in progress.

During the period under review surveys were undertaken for the following important rail links:—

1. Amruka-Wasawewala.
2. Jhol-Sinjhoro.
3. Dera Nawab Sahib-Panjnad.
4. Tando Mohammad Khan-Moghalbin.
5. Malir-Manghopir *via* University Campus.
6. Rawalpindi-Federal Capital Area, Islamabad.

In 1962 the West Pakistan Housing and Settlement Agency was transferred from the Central Government to the Provincial Government. The provision of housing to the refugees which was previously being dealt with by the Urban Rehabilitation Department has been entrusted to this Agency.

Roads Progress

During the period under review 180 miles of metalled road has been constructed by the West Pakistan B. & R. Department. In addition to this the department is responsible for the maintenance of 21,007 miles of roads in West Pakistan. A highway nucleus has been created in 1963 with a view to make a plan for expansion and renovation of national Highways system including new links connecting all important towns. Substantial work has been carried out on important links like Lahore-Multan-Kashmore-Hyderabad-Karachi Roads and Lahore-Lyallpur and Lahore-Sargodha Roads. The Department is further responsible for construction of a large number of buildings like, schools, hospitals, colleges and dispensaries etc. for various Government departments.

The Town Planning Department is responsible for the preparation of master plans for the expanding towns on the modern lines. A great deal of work has been done in this respect on most of the major towns of West Pakistan.

In conclusion I have to express my profound thanks to you, Sir, once again for honouring us with your presence today. I am also thankful to the honourable guests who have made it convenient to come and attend this function. I take this opportunity to thank the Members and Office-Bearers of the Council who have helped me in the deliberations over various important issues that came up before the Council during its meetings. My thanks are particularly due to Mr. I. A. S. Bokhari, Secretary of the Engineering Congress who so efficiently carried out his functions throughout the Session. This in view of the heavy responsibilities devolving on him in the performance of his official duties had put a great deal of burden on him which he has so cheerfully borne. Thank you all.

Mr. G. Farooq Addresses the Engineers

Mr. Ghulam Farooq, the Chief Guest of Honour and ex-Chairman WAPDA, mentioned his life-long association with the engineers. He mentioned the vast opportunities which are open to engineers in the third five-year plan and exhorted the engineers to acquire the never ending search for knowledge and the vast opportunities for them to serve their own country.

Mr. Farooq said,

"By extending to me your invitation to inaugurate the 48th Session of the West Pakistan Engineering Congress, you have done me a great honour. Your invitation, however, came as a surprise and at rather short notice. I was still gathering my thoughts after the return from the visit to China in the entourage of our President, Field-Marshal Ayub Khan and this is my apology for any inadequacy in my address. For a brief period of seven days, I felt transported into a new world and in an environment fascinating and instructive. You have already heard a good deal about this visit, and if I may epitomise it what we saw was the highest example of what may be called honesty of purpose, self-reliance and sustained effort.

Association with Engineers

My association with engineers came about almost from my infancy. My father happened to be engaged in construction work which extended over three provinces of the Indian sub-continent and my upbringing was thus in atmosphere of civil and mechanical engineering. A civil engineer in the employment of my father laid down for me the very first canon of my life "whether in Studies or Sports you must resolve to be on top". For the rest of my life incompetently but industriously, I have strived towards that goal. Coming of age the wheel of fortune led me into a professional line which represented a complete concentration of various engineering activities under the control of one organization. For a period of 27 years I was in the employment of the Indian Railway system occupying in course of time various posts and in all of them there was the closest possible association with Engineers. This period of 27 years had also interludes when I delved into coal mining and its engineering with diversion also into Iron and Steel Industry. My lot seems to have been wholly cast with engineers, as on coming to

Pakistan, I was given the charge of industrial development and finally reaching the peak of ascendance in my being drafted into that galaxy of engineers, the West Pakistan Water and Power Development Authority. I am deeply honoured, therefore, to be in your midst. This occasion reminds me of some couplets of the great Shaikh Saadi which came into my mind after many years.

گل خوشبو دو حام روزے
فتاد از دست محبوبے بدستم
بدو گفته که مشکم یا عنبرم
که از بوئے دل آویز تو ستم
گل گفت نے مشکم نے عنبرم
و لیکن مدتے با گل نشستم
جمال همنشین در من اثر کرد
وگرنه من همان خاکم که هستم

The Third Plan and the Engineers

Our country is on the threshold of an economy leap that will require on our part all courage and resolution. The outline of the 3rd Five-Year Plan is already out and the Plan will shortly be published in detail. The plan envisages an outlay of Rs. 5,200 crores. The unqualified success of the second 5-Year plan has prompted the Planners to raise their sights a good deal higher and a far bigger challenge will now be before the country, firstly to the people at large, and secondly to those who will carry the responsibility of actual execution. Truly speaking, this challenge is more for the Engineers than anyone else. The third 5-Year Plan opens up vast avenues of approach. There will be a large field of engineering projects many new and not undertaken in this country before with an almost unlimited scope in every conceivable branch of engineering. As one sees it, the engineers are the architects of the country. There should, therefore, be no room for gloomy thoughts. The future of the engineer is assured for ever, no longer a mere camp-follower, but as a leader both in thought and action. It would be their work that will lift the engineers to a position of honour and glory and their own thoughts and actions will control their future. Let therefore be no despondency and do not look for any favours or suffer from inferiority complex in any form.

Knowledge is never ending

Science and technical know-how is advancing at a fast pace. To catch up with the rest of the world, and then to keep in step with the progress of time, we must try and make ourselves acquainted with the inventions and improvements that are taking place every day. Arising out of my association with the Karachi Steel Mill Project, over the last twelve months, I have been meeting a number of Steel Consultants. It is amazing to see the progress and improvement in the metallurgical industries alone over the last four or five years. The technique of iron and steel making has been completely revolutionised, new processes introduced leading to large savings in manufacturing costs. This is to illustrate to you that in this present day world, the education of an engineer does not end with his leaving a University. His need and search for knowledge is never-ending. It is in this field that your Congress can play a great part. Let it be a Forum for technical papers, seminars, and discussions and let it become a central institution for the gathering of technical knowledge, and a club-house for its dissemination.

Make use of Engineering Talent in your own country

MR. PRESIDENT, in your Address you have

drawn attention to what you call the lack of opportunities for employment in this country, of engineers who secure their training and experience abroad. This is a point which has exercised the minds of many others. In my days with the P.I.D.C. or WAPDA and during my visits to foreign countries, I made it a mission not to let go any Pakistani engineer that I came across. I was not worried by the thought of the existence or otherwise of a sanctioned post. It was more a case of building up of an activity round an individual and one can assert with confidence that we did not go wrong. During a recent visit to the United States, by chance I came across a Pakistani Metallurgical Engineer who could be of use in the proposed Karachi Steel Mill, but as the fate of our scheme was yet in the lap of the Export-Import Bank, I approached a friend of mine, President of a well-known Consulting firm in the United States and asked whether the individual concerned could be offered some employment until we were in a position to take him. To my surprise, I received a letter thanking me for the reference and telling me that they found the individual so good that they had offered him a permanent post in their own organization. It is therefore a misfortune that we are unable to make use of good talent and that our young men have to seek employment abroad. However, in this connection, responsibility rests not so much on the Government, which is already the largest employer of technical men as on the private sector of our economy which is reluctant to open its doors to engineers and other technically qualified men. The third 5-Year Plan provides for an expenditure of Rs. 2,150 crores in the private sector. This for the private sector is a herculean task difficult of fulfilment unless the private sector reorientates its thoughts and extends opportunities without any discrimination to the trained young men of the country.

MR. PRESIDENT, I would not wish to hold up your deliberations. I know that your members are impatient for the invigorating breezes of wisdom and thoughts which you have in store for them. I wish you success in your proceedings and your deliberations."

The old and the new Council

The old Council at work

In October 1963, the General Body of the Congress elected the Council which remained in office for about one and a half year.

The President and four Vice-Presidents, seven honorary office bearers and 20 members held 19 meetings to decide about technical papers, selection of subject for symposium, enrolment of new members, award of medals etc.

Congress Members

The membership of the Congress has steadily increased from 726 in the year 1962 to 1021 at the time of the last annual session. At the end of December, 1964, the total membership stood at 991 which included six life members and the rest 985 were ordinary members. During this period 263 new members were enrolled. The assets of the Congress on 31-12-64 stood at Rs. 45,920.91 which included Rs. 39,873.91 as bank deposits. The Council realised Rs. 2,780 only towards the share of Engineering News, though last year ending December 1963, it was Rs. 5,300 out of the total Rs. 21,325 realised as subscription from the members.

Engineering News subscription raised

The journal has continued to run in deficit. Its expenditure stood at Rs. 6,718.75 against the income of Rs. 2,780 only. It was felt necessary to raise the annual subscription to Rs. 25 so as to enhance the share of the Engineering News to Rs. 10. The Council approved this suggestion and it was accepted by the General Body of the Congress.

The service of the Congress towards enhancing the technical information of the nation is above all question yet in spite of its all out efforts, it has not been possible to arrange for a permanent head quarter.

Congress holds 48th Annual Session

This year the annual session was held in the University Hall on Wednesday, the 17th March, 1965. The session started with the address of Ch. Abdul Hamid the President, followed by the address of the guest of honour, Mr. Ghulam Farooq. The Congress held six sessions, four devoted to the presentation and discussion of nine papers. In the rest two sessions the eleven papers of the symposium on consulting and contracting practices in Pakistan were discussed. In this volume of the journal we have reproduced

brief excerpts of all the papers presented in the proceedings and the symposium.

Business Session

Twelfth of March was a busy business session when the members elected the new Council before departure to East Pakistan for one week excursion trip to engineering works in that part of Pakistan.

The General Body elected the following 30 council members including a President, five Vice-Presidents, four office-bearers and 21 members of the Council.

The new Council constituted as under;—

President

1. Mr. A. M. Akhoond, Chief Engineer, West Pakistan Railways, Lahore.

Vice-Presidents

1. Mr. Ahmad Hassan, Chief Engineer and Adviser, Irrigation, (A.D.C.), Lytton Road, Lahore.
2. Mr. Sarwar Jan Khan, Chief Engineer, Irrigation, Peshawar Region, Peshawar.
3. Mr. Sayyid Hamid, Chief Engineer, Ground Water and Recl. Division, WAPDA, Lahore.
4. Mr. M. A. Waheed, Chief Engineer, Central Zone, B & R Department, Lahore.
5. Syed Irshad Hussain, General Manager, Packages Limited, Ferozepur Road, Lahore.

Honorary Secretary

1. Mr. C. A. Vali, Chief Research Officer P. W. R. Headquarters, Empress Road, Lahore.

Office Bearers

1. Mirza Abdul Latif, Section Officer, Irrigation and Power Department, Lahore. (Hony. Treasurer).
2. Mian Mahazr-ul-Haque, Deputy Director, Office of the Chief Engineer, B. & R, Quetta. (Auditor).
3. Syed Nazir Ahmad Shah, Executive Engineer, Construction Division, Lahore. (Hony. Business Manager).
4. Mr. Ashfaq Ahmad Qureshi, Executive Engineer, 3rd Provincial Div. B & R., Rifle Range, Lahore. (Hony. Publicity Secretary).

Members

1. Mr. A. R. Qureshi, Director-General, Housing and Settlement Agency, C & W. Deptt., Lahore.
2. Mr. S. S. Kirmani, Chief Engineer, I.B.P. WAPDA, Sunny View, Lahore.
3. Sh. Muhammad Akram, Chief Engineer, Eastern Region, B & R Deptt., Bahawalpur.
4. Mr. Saeed Ahmad, Chief Engineer, Western Zone, B & R Department, Quetta.
5. Mr. H. J. Asar, Chief Engineer, Remodelling Organization, Lahore.
6. Syed Muhammad Ayoob, Superintending Engineer, Irrigation, Khairpur Circle, Sukkur.
7. Mr. M. I. Parekh, Superintending Engineer, Ghulam Muhammad Barrage, Hyderabad.
8. Mr. Muhammad Aslam Khan, Deputy Chief Engineer (Irrigation), Leiah Region, A.D.C., Mianwali.
9. Mian Shamim Ahmad, Secretary, Land & Water Management Board, Lahore.
10. Mian Muhammad Khalil, Superintending Engineer, 1st Provincial Circle, McLeod Road, Lahore.

11. Mr. Khushal Khan, Superintending Engineer, Northern Irrigation Circle, Mardan.
12. Sh. Mukhtar Ahmad, Superintending Engineer, Public Health Engineering Circle, Temple Road, Lahore.
13. Mr. Z.A. Toor, Director, I.B.P. WAPDA, Sunny View, Kashmir Road, Lahore.
14. Dr. Mubashir Hassan, Consulting Engineer, P.O. Box. No. 730, Lahore.
15. Mr. M. R. Vehra, Superintending Engineer, Lahore Township Circle, 80-81/H, Model Town, Lahore.
16. Mr. Ghulam Jaffar Khan, Executive Engineer, E & M. Provincial Division, B & R Department, Lahore Cantt.
17. Mian Faizan-ul-Haque, Executive Engineer, Lahore Division, Canal Bank, Moghalpura, Lahore.
18. Syed Faiz Omar, Technical Officer, Central Zone, B & R Department, Lahore.
19. Mr. Khalil-ur-Rehman, Section Officer, Housing Bank Square, The Mall, Lahore.
20. Mr. Safdar Ali Gill, Assistant Director, Review Cell, Lahore.
21. Dr. Nazir Ahmad, Irrigation Research Institute, Lahore.

(*Continued from Page* 75)

search Institute for the Japan Electric Power Development Company. These studies are pursued by observations of actual earthquakes, by vibration tests on dams, and by tests on scale models. Vibration exciters embodying eccentric flywheels are used to determine the dynamic characteristics of actual dams, and the results are analysed by an analogue computer. Scale models are vibrated on a 22-ton vibrating table, and it is possible to feed into this table vibrations from records of actual earthquakes or of dam prototypes; this is done by means of a photographic film of the vibration which is passed in front of a photo-electric cell. A swing pendulum is also used to simulate the initial impact shock of an earthquake. One of the questions being studied is the difference between the dynamic and the static strength of concrete. Tests were carried out on a gravity, a hollow gravity, and an arch dam, and their dynamic characteristics ascertained. These dams have also been equipped with apparatus to record earthquakes, and certain records are discussed.

Several papers describe earthquake experience with particular dam some involving damage but non-failure.

The discussion of the rest two questions will be found in the next volume of the journal.

Proceedings of West Pakistan Engineering Congress, 1965

West Pakistan Engineering Congress held its Annual Session from 17 to 20 March 1965 when nine papers were presented and discussed. Another feature of this year meeting was a Symposium on Consulting and Contracting Practices in Pakistan. Eleven papers were presented on the subject of Symposium. In this volume we have given brief abstracts of the papers presented both in the proceedings and in the Symposium.

PAPER No. 363

"Slurry Trench Method of Cut-off".

By Rameez Ahmad Malik, Director (Mangla) I.B.P., WAPDA, Lahore.

The paper describes a method used by the Mangla Dam Contractors for extending the trench around the core trench of the main dam. The idea was to reduce the seepage when the core trench was excavated. Bentonite obtained from Wyoming U.S.A. and passed through 200 mesh sieve was used. A mix of 5% bentonite and 95% water by weight was prepared. This was allowed to flow into a trench 4 ft. wide. The excavation was carried out by Manitowoc 4600 dragline. The trench was excavated with Slurry always filling the excavated portion. The level of bentonite solution was 3 to 5 ft. above the watertable. The trench to a depth of 65 ft. was excavated and the sides of the trench never caved in. The bentonite mud plastered the walls of the trench without allowing any seepage of water. It is said that the bentonite mud is capable of supporting 85 ft. vertical walls. After excavating the trench it was filled with materials having all grades varying from 3 inches to those retained on 200 mesh size.

In the paper detail specifications relating to gravel filled slurry trench are given.

PAPER No. 364

"Marala Headworks—Soil Investigation"

By H. J. Asar, Chief Engineer, Remodelling Organization, Lahore.

In the absence of the author who had left for Haj, the paper was presented by Mr. Barkat Ali Luna. The paper is based upon Soil Investigations, which have recently been carried out to determine the present-day stability of Marala Headworks. A number of bores were made by rotary drill method with core recovery using double

tube core barrels with diamond or tungsten carbide bits. Below the concrete the soil exploration was carried out by split spoon method and by soil penetration technique. At many places, hollows were found below the floor and the strata close to the work was found to be in a lose state. As a result of the investigations, cement grouting of the foundation was carried out. The possibility of existence of loose sand was explained probably as a result of open pumping for dewatering during construction of the headworks. However, after the grouting the limiting head across the weir has been fixed equal to 10 feet during minimum flow period. It was also decided to examine the cracks slope on the every year and take proper care accordingly.

PAPER No. 365

The Engineering Profession in Pakistan

By S. S. Kirmani, Chief Engineer, I.B.P. WAPDA, Lahore.

This is one paper of its kind presented to the Congress. The author has considered all the forces and the strains which are in action against the engineering profession. It was mentioned that the class system of temporary engineers, Class II, and Class 1, service rules, lack of opportunities, inadequate communications, are important factors affecting the development of engineering competence in this country. He put forth the reasons for the above quoted statement that no two engineers agree. The author stated that the West Pakistan Engineering Congress has an interest and responsibility not only to promote technical competence amongst its members but also to promote, maintain and protect professional discipline and high ethical standards. The author in his closing remarks stated, "Will the profession wake up in time to recognize its peril and face the realities of today?" It must be realized that "all that is necessary for the forces of evil to win in the world is for enough good men to do nothing". Think of the profession, Visualize the dangers, Unite to inspire confidence, Organize to be effective and Act to achieve the noble objectives. "The pursuit of learned art is the spirit of service of the people", the two indispensable qualities that must be manifest in a truly professional career.

PAPER No. 366

Village Electrification through Micro-Power Plants on Canal Falls.

By Mohi-ud-Din Khan, Deputy Secretary (Development), Irrigation and Power Department, Lahore.

This paper is an attempt to suggest and improvise methods to electrify rural areas and villages where Irrigation canals with falls exist. The technique of hydraulic turbines has made amazing progress during the last 15 years. New types of machines such as vertical shaft impulse turbines, bulb units and pump turbine have come into use. Explaining the advantages of bulb units over Kaplan turbines, the author stated that the runner diameters of bulb unit are generally 7 to 8% less than those of Kaplan and its specific output is 20% higher. These units required much less structural work. These types result in saving of 30 to 35% of the cost of a power production. The paper deals with the present development trend in the bulb unit, their categories and their uses even on big rivers and tidal power station. A considerable data about micro-power unit design for very low head are also given in the paper. The author referred to

many areas where power transmission has not yet been completed and where several falls exist which can be made use of for the development of power by the Unit described in this paper.

PAPER No. 367

Design of a New Road Bridge over Jhelum River near Jhelum

By Abdus-Salam, Director Bridges, Communications and Works Department.

The existing rail-cum-road bridge at Jhelum is severely congested, is structurally inadequate for modern heavy traffic, and cannot be widened or strengthened economically. This crossing is one of the key points in the vital West Pakistan Highway and a new road bridge at this location is, therefore, an immediate necessity.

To meet this demand, a 3230 feet long bridge in prestressed concrete is under construction, 4000 feet downstream of the existing bridge. The complete bridge project was prepared in the Directorate of Bridges, Lahore and has been approved by M/s Donovan H. Lee and Partners, Consulting Engineers, London.

This paper briefly deals with the engineering investigations, structural design and cost economics of the bridge.

PAPER No. 368

An Estimate of Evaporation from Free Water Surface in West Pakistan

By Nazir Ahmad, Mohammad Sarfraz and Mohammad Akram

The authors put forth a new field of water conservation measures for the consideration of the members of the Congress. It was stated that they have determined a new Formula which was based upon the use of such meteorological parameters which were commonly observed at all places. The results of this formula give an estimate of evaporation which was very close to the actual measurement. The confirmation of these results were made on the available data of 18 stations and on the basis of evaporation contours for each month of the year, six-monthly and annual contours are plotted which are helpful to determine the order of the evaporation taking place from various sites in West Pakistan. The large amount of evaporation taking place from the existing storages or those in the planning stage was also brought to the notice of the members of the Congress. In the end it was stated that saving of this water by suitable means is most essential and it may be undertaken as soon as possible.

PAPER No. 369

Operating Bombanwala Ravi Bedian Depalpur Link Canal in 1961

By Mohammad Ali Chaudhry, Executive Engineer, B. S. Link Remodelling Division, Lahore.

In this paper the author brought to the notice of the engineers, the methods he had adopted to stabilize Bombanwala Ravi Bedian Link Canal to run its authorised supply of about 5000 cusecs. The job was fairly difficult but with proper planning of measures, it was possible to run the full design discharge in this channel.

PAPER No. 370

Highway Financing in Pakistan

By Saleem Akhtar Bhalli and Muzaffar Iqbal Sheikh

The financing of roads for their construction, improvement and maintenance is

being done from the general budget, but this question has never been exactly determined as who is to bear the full expenditure.

At present the Pakistan Road Development programme is financed out of the general revenue; part of the money is given by the Central Government while the balance is met by the Provincial revenue. There is toll on roads and there is no special fund for road development in the country.

The author has given figures about the huge amount of taxes collected by the Central Government directly or indirectly from road transport. Taxes in the form of custom duty are collectetd on the import of mineral oil, spirit, rubber tubes and tyres imported into the country. Sale tax is another source of income to the Government on these very items. The Central Excise Tax is another such item. Beside these taxes collected by the Central Government there are about 25 different kind of taxes collected by the Provincial Government. When the Government collects so much road development programme needs better attention. The author has further suggested the imposition of toll on all new bridges and new roads. Money obtained from International loan from parking charges, from tax on roads serving special industries such as mines can be diverted as source of income for road development, such are many of the suggestions put forth to improve the finance of the road development programme.

PAPER No. 371

Financial Planning of Water Supply Schemes

By Iqbal Ahmad Beg.

This is another paper containing many suggestions to develop a sound financial programme for water supply system. These suggestions are based upon the experience of many advance countries which have attained self-independence and self-sufficiency for water supply financial programme. According to the author the basic point for a financial programme are the establishment of an administrative and an independent set up of engineering for technical studies as well as an economic structure for financial resources. The sources of finances under different heads are explained. The financial sources include Government subsidiary, loans from the Government, loans from banks, diverting of general taxes from income, contribution of taxes from Insurance Company, contribution from philanthropist and International Aid-giving Agencies. The author has also mentioned the floating of Bonds as are done in many countries. The whole paper is full of very good information and suggestions for improving the water supply system on the basis of sound financial sources.

Symposium on Consulting and Contracting Practices in Pakistan

West Pakistan Engineering Congress in its 48th *Annual Session held a symposium on Consulting and Contracting Practices in Pakistan. Eleven authors contributed to the symposium which included five from Pakistan. Brief extract from each contribution is included for the information of the readers.*

1. CONSULTING AND CONTRACTING PRACTICES IN PAKISTAN

by B. M. ABBAS,
Commissioner, East Pakistan WAPDA.

The author has divided his contribution into two parts—consulting practices and contracting practices in Pakistan.

PART I—CONSULTING PRACTICES

1. Role of Private Consulting Firms in Modern Economy and Technology

A consultant can be defined as an independent, professional engineer who performs engineering services for clients on a fee basis. This definition is applicable to an engineer with a secretary as well as to a firm with a number of principals and hundreds of employees.

Any individual or organisation in need of engineering services may be a client. Consulting engineers may be engaged by individuals, industrial and commercial concerns, municipal and provincial or national bodies.

The scope of services available from the consulting engineer today is both broad and deep, embracing all branches and sub-branches of the profession. There are specialist firms who confine their work to specific activities within a specific branch; and general firms who are capable of performing in the full range and scope with multitude of variations occurring in between.

No one agency or entity of business, industry or government, can afford to maintain on its staff competent engineers in all the disciplines, and in the numbers demanded by today's complex society. The role of the private firm is to meet these demands.

2. Professional and Management Problems involved in the Practice of Consulting Engineering in the Present-Day Circumstances

The problem on the professional side is finding properly trained and experienced

personnel in sufficient numbers to staff the firm. Competition is keen among government agencies, industry and the private sectors for the services of the capable engineer. The individual engineer too, faces professional problems for he must keep abreast of an ever expanding technology while still meeting the demands of his daily tasks. An example of this can be found in the use of computers in engineering work. Consulting firms must improve their professional competency to make use of this advancement.

3. Engineering of Development Projects by Government Departments or Agencies *versus* by Private Consulting Firms

As already stated, the private consultant must be up-to-date in his professional competency if he is to remain in business. The Consultant does possess one great advantage over the governmental group *i.e.* flexibility. He is free to select the discipline or disciplines he wants to cover and the depth to which he will go. It must be agreed that the government department needs a core of career engineer employees, dedicated and equipped with the vision to plan the course towards the established goals. This hard core of engineers should be able to take care of the day to day or 'normal' engineer work load. The unusual, or the highly complex, or the heavy peak load can then well be given to the flexible private firm, equipped by its very nature to do these very things. The consulting engineer practice in this country is not yet firmly established, and high calibre people will be required in the departments to get the best out of consultants.

4. What should be done by Government and others to Promote the Development of Private Consulting Practice in Engineering

To develop this important segment of our resources the engineering profession, every encouragement should be offered by Government agencies. The East Pakistan WAPDA is doing this through utilisation of service of Pakistani engineering firms within selected engineering fields and within the capabilities of these firms to perform.

Private consulting services if adequately supported can help to meet local needs develop local materials, and design the type of economic construction that only a well engineered job can produce.

5. Need for an Association of Consulting Firms in Pakistan

Associations of consulting engineers exist in most of the more developed nations and are very useful in creating the necessary public image and establishing mutual confidence.

PART II—CONTRACTING PRACTICES

1. Departmental Construction of Engineering Works *versus* Construction through Contracts

It has been the experience of developed countries that construction of engineering works can be executed more expeditiously and economically by contract than by departmental forces.

2. Various Forms of Contracts and their Suitability in Particular Circumstances. Single Large Contracts *versus* Multiple Small Contracts

The various forms of contracts discussed under these headings are:—

(*a*) Unit Price Contracts
(*b*) Lump Sum Contracts
(*c*) Labour Contracts
(*d*) Cost plus fixed fee contracts
(*e*) So-called Target Estimate Contracts, with fixed fees and incentive bonus or penalty provisions

3. Is Contracting an Industry etc.

Contracting practice is definitely an industry and often a large industry, and even a very large enough. There is no reason why the contracting industry should not be subsided in its development as is done for other industry.

By sub-contracting, by encouragement in the matter of a just return for efforts, the individual contractor can grow and sometimes become capable of handling bigger contracts on his own.

4. Construction Contracts and Law

This problem has been met in all countries and through mode contract forms evolved by technical and construction associations by governmental bodies and industry, a degree of consistent uniformity has been achieved.

5. Administration of Large Contracts

Pakistani Engineers face more problems with less available means and manpower than any country of similar size and population. The future of the country hinges on engineering and its ability to utilise its available resources and to keep ahead of the problems that constantly change from day to day. It is this ability, coupled with a high standard of ethics, that will command the respect of people.

6. Pre-qualification of Contracts

In developing contracting practice, a very complete record should be kept of the performance of each contractor, which can be referred to and should become the best method of pre-qualification of contractors.

The evaluation of pre-qualification requires very sound judgement. This should be the function of a board composed of senior officers.

The register of contractors should be continually made up-dated so that a current record of the performance of all contractors is available.

* * *

2. CONSULTING AND CONTRACTING PRACTICE IN PAKISTAN, ADVANTAGES AND LIMITATIONS

By A. V. KARPOV

In this paper the author has compared the conditions existing in America and in Pakistan. The author has laid great stress on engineering Ethics which he has reproduced as Appendix to his paper. The main conclusions of his note are 'It will be a big advantage to the country if Consulting and Contracting firms are 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.

* * *

3. ENGINEERING RESOURCES OF PAKISTAN

By A. A. ABIDI

The object of this paper as put forth by the author is to examine some of the reasons for the disparity between the supply and demand of engineering services in the country and suggest some means of increasing the effective utilization of the existing professional talent and promote a balanced growth of the engineering resources in the public and private sectors.

The Government departments are the largest employers of engineering talent in the country, but a substantial proportion of technical personnel is engaged in performing office routine and complying with the large volume of procedural requirements, thus employing some engineers in wholly non-professional work and great many others in professional work for only a small part of their working hours.

With the accelerated pace of development work, it became necessary to create semi-autonomous public corporations which "could be clothed with the powers of the government, yet retain the flexibility and initiative of a private enterprise."

The dramatic results achieved by the P.I.D.C. led to more semi-autonomous bodies. However, the forces of bureaucracy soon started to have a suitable curb on the finances of these bodies. The large-scale programme of reclamation and construction and the Indus Basin treaty work necessitate the employment of foreign consultants with full responsibilities for planning and designing of administration and WAPDA assumed the role of the employers. In order to provide training by working with foreign engineers of international repute and learn their techniques and skills by sharing a part of their work, WAPDA made arrangements to depute a number of Pakistani engineers to the various consultant organizations. A large proportion of deputationists who were accustomed to the methods of work in the Government departments could not readily attune themselves to the *modus operandi* of the foreign firms, which led to their being placed in routine or semi-professional positions in the consultants organizations. Furthermore, the unfamiliarity with the terminology and codes of practice used by the foreign consultants often created a difficulty in communication, with the result that the foreign consultants often considered the local trainees as an unnecessary appendage to their organizations. In spite of the above difficulties, some Pakistani engineers gained valuable experience from their association with foreign consultants, although the larger proportion of engineers deputed to consultants complain of being unable to participate in the more important engineering functions

in which they wish to acquire experience.

* * *

4. CONSULTING AND CONTRACTING PRACTICE IN PAKISTAN

By G. H. VAUGHN LEE

The Consulting Engineers are professional men who have, or should have, a code of ethics, and their professional standing should be as much respected as those in the legal or medical professions. Engaging the services of a Consultant the Client should make his selection on the Consultant's experience in the particular type of work involved.

The Consultants firms gained considerable experience and know-how and this experience has passed over the years from one generation of partners to another. The Client's engineers who may often be highly qualified and very capable engineers, work in a limited field and inevitably have not got the same years of experience to fall back on. Such engineers are employed for a certain length of time and will eventually retire and there is the reasonable certainty that their experience departs with them, which is not the case in Consulting firms.

Consulting Engineers are professional men as are lawyers and doctors. The latter does not quote fees in advance but send their bills afterwards and the individual pays whether he likes it or not. The Consultant quotes his fee in advance, it is accepted by the Client and therefore the Consultants bill should be paid promptly.

The more a Government employs consultants the greater will become the knowledge of Consultants and this will be followed by greater economy in design which is to the benefit of the Government. The employment of Consultants by Governments will in turn lead to the employ of Consultants by others.

A number of firms working in Pakistan today will almost certainly belong to some Association or other similar body in their own country and will, or should, operate under the code of ethics, of their own Association.

* * *

5. CONSIDERATION IN THE ESTABLISHMENT OF A PAKISTAN ASSOCIATION OF CONSULTING ENGINEERS

By GERALD T. McCARTHY

The learned author has put forth detailed features for the organizations of consulting engineers in Pakistan. He has discussed the need for an association, its basic type, membership, headquarters, funds and international activities. He has laid great stress on the ethics of its members. Dealing with the external activities of the association, the author has discussed public relations, legislation, engineering education, relations of engineers with architects and contractors and finally the engineering for Government. In the concluding remarks the author has put forth that the foregoing general exposition of the possible activities of a Pakistan Association of Consulting Engineers is by no means comprehensive. It should indicate, however, the vast panorama of useful activity that may develop. If the fundamental objectives of the Association are service to your country and to your own profession, and if a sufficient number of your qualified engineers are willing to dedicate a portion of their time to the founding and development of an Association, I am confident that its value would soon come to be recognized widely throughout Pakistan. The direct and indirect benefits to all concerned would be well worth the effort.

6. CONSULTING SERVICES

By KHWAJA AZEEMUDDIN

The author has put fortht he difficulties being experienced by the consulting firms in this country. He particularly mentioned the difficulties of his own. Expressing about his own self he says:

"As is well known, I am an old Government servant who passed many years of life in the service of the community, making my modest contribution in the field of engineering. I had the honour to serve under and to be associated with some of the great names in this sub-continent in the field of engineering. I naturally learned to hold my head high as an engineer. But soon things were to change and a decline to set in the status and the prestige of Pakistani Engineers, not because they were not conversant with their profession but because Authority had ceased to have confidence in their professional ability and had begun to look to foreign engineers for help and guidance. It was also forgotten that foreigners could not possibly acquire that intimate knowledge of local conditions which enables engineers to judge what is best suited to the capabilities of local labour, local material, local talent, factors which are of considerable importance in the organization and implementation of engineering projects.

Foreign consultants tend to introduce practice prevalent in their own countries under completely different economic conditions. As a result an impression has been created that works, carried out by manual labour, not only takes time to complete but are costly. Indeed, this impression has gained such strength that soon Pakistan almost forgot how to utilise its biggest asset, its manpower resources, for its developmental projects. Within an amazingly short period of time, even Pakistani engineers began to believe that without heavy mechanical equipment nothing worthwhile could be achieved.

China has exploded this theory. Many gigantic projects have been completed in China without the use of any heavy mechanical equipment and that in less than a quarter of the time taken for similar projects in other countries with the help of the maximum use of mechanical equipment.

The second aspect of this practice is that it has turned Pakistan engineers into mere onlookers. No country in the world can develop a sound economy unless it possesses competent engineering talent in which it places its full confidence.

We in Pakistan are not as happily placed as our colleagues in USA or in Europe. In these regions consulting houses normally draw upon the large reservoirs of experienced engineers available, after works have been secured by them.

The author is a strong supporter of an Association of Consulting Engineers formed as in Europe and USA, and its motto should be live, let live and live together.

* * *

7. THE ROLE OF PRIVATE CONSULTING FIRMS IN MODERN WATER RESOURCE DEVELOPMENT

By E. MONTFORD FUCIK

In this paper the author has stated that over the last 50 years, the role of the private consulting engineers has undergone a dramatic change. The present-day projects are of such size and complexity that they can no longer be handled by an individual consulting engineer—the consultant today must have an integrated staff of specialists to be

in a position to cope with the varied technological problems that are inherent in large projects.

The private consultants must have sufficient staff to keep pace with these advances, therefore larger organizations are the order of the day.

With this brief introduction the author has put forth some examples of basin planning. He put forth examples of Lempa River and Yarmouk in Jordan. Discussing service during the construction period, the author has put forth the advantages of engineering inspection of construction and other miscellaneous services. While talking about role of the private consultant in Pakistan the author said "It appears to me that a great opportunity exists for the development of private consulting engineering firms in Pakistan. The large program of water resources development now in hand is providing a training ground of unparalleled scope for Pakistani engineers. By availing themselves of this experience, the engineers of Pakistan are obtaining the experience and judgment necessary to carry out such works on their own. I am sure that they will be able to put this experience to good use in the future by doing more and more of the engineering of water resources projects in Pakistan."

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8. ADMINISTRATION OF LARGE CONTRACTS

By J. R. GWYTHER

The task of the Consulting Engineer entrusted with the design and supervision of a project is to so manage its affairs that the objectives of the Employer are achieved in a swift, economical and satisfactory manner and to achieve this end it is essential for him to gain the early confidence and trust of both his Employer and the Contractor.

Upon the awarding of the contract, the Engineer will set up a subsidiary organisation resident at site to watch over the execution of the works. As in the case of the Engineer, his representative must also gain the confidence of the Employer and the Contractor at site so that both these parties to the contract may expect its administration to be fair and just.

Site Organisation

On the assumption of the responsibility a large contract may be divided into several main features of work. The organisation can be conveniently divided into Works Departments with the heads of these departments responsible to the Chief Resident Engineer for all the actions of the department.

The Resident Engineer in charge of each department will have a deputy to take charge in his absence and a sufficient number of engineers and overseers in the field and office with adequate transport to discharge their responsibilities.

Experience has shown that it is essential on a large contract to have Service Departments of surveyors, soil laboratory and concrete laboratory. All liason with the Engineer and Employer will be carried out by the Chief Resident Engineer or his direct staff. The Chief Resident Engineer requires besides his own personal staff technical department and a contractual department.

Problems

The purpose of the organization mentioned before is to administer the contract. It must avoid any tendency to slow the pace of the contractor and must accordingly be staffed with persons who appreciate its